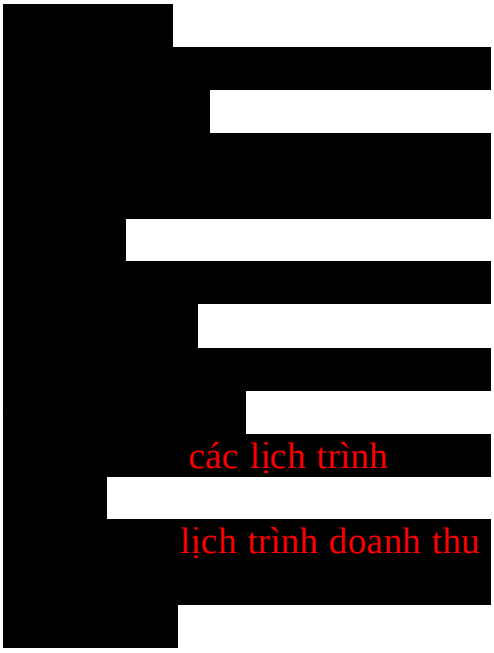
"Revenue Accounting" in the Age of E-Commerce: Exploring Its Conceptual and Analytical Frameworks GSIA Working Paper No. 2000-21 ABSTRACT This paper explores "revenue accounting" in contrast to traditional "cost accounting." Revenue accounting is to serve information needs of managers and investors in planning and controlling a firm's sales activities and their financial consequences, especially in the ECommerce Age. Weaknesses of traditional accounting have become particularly evident recently, for example, the lack of 1) revenue mileposts, 2) revenue sustainability measurements, and 3) intangibles capitalization. Some tentative remedies are considered. Several revenue mileposts are explored to gauge progress in earning revenues and a Markov process is applied to an example involving mileposts. Revenue momentum, measured by the exponential smoothing method, is examined as a way of getting	“Kế toán doanh thu” trong thời đại Thương mại điện tử: Tìm hiểu về Khuôn khổ lý thuyết và Mô hình phân tích. Tài liệu nghiên cứu của GSIA số 2000-21 TÓM TẮT Tài liệu này nghiên cứu “kế toán doanh thu” trong mối quan hệ tương phản với “kế toán chi phí” truyền thống. Mục đích của kế toán doanh thu là để đáp ứng nhu cầu thông tin của các nhà quản lý và nhà đầu tư trong việc hoạch định và kiểm soát hoạt động bán hàng của một công ty và các kết quả tài chính của những hoạt động này, đặc biệt là trong Thời đại Thương mại điện tử. Những nhược điểm của kế toán truyền thống trở nên đặc biệt rõ ràng trong thời gian gần đây, ví dụ như thiếu 1) lịch trình doanh thu (cột mốc doanh thu) cụ thể, 2) các phương pháp đo tính bền vững doanh thu, và 3) vốn hóa tài sản vô hình. Người ta đã xét đến một số biện pháp dự kiến. Nhiều lịch trình doanh thu (cột mốc doanh thu) được nghiên cứu để đánh giá quá trình tạo doanh thu và quá trình Markov được áp dụng cho một trường hợp liên quan đến các lịch trình (cột mốc). Đà doanh thu, đo bằng phương pháp san bằng số mũ, được khảo sát như một cách thu thập thông tin	

feedback on revenue sustainability; and the use of the sustainability concept in the analysis of fixed and variable revenues is illustrated. A project-oriented approach in a manner similar to capital budgeting and to Reserve Recognition Accounting is proposed by treating each customer as a project. Standardization of forecasts are also considered as an important way of bypassing the capitalization issue. The paper emphasizes at the end the need to develop a conceptual framework of revenue accounting and, as a tentative measure, proposes five basic postulates and five operational postulates of revenue accounting. TABLE OF CONTENTS 1. Need for Revenue Accounting, 1 2. Weaknesses of Traditional Accounting and Their Remedies, 2 3. Competitive Advantages of Accountants, 5 4. Revenue Accounting: Managerial and Financial, 7 5. Establishing Revenue Mileposts, 9 6. Using Mileposts: A Markov Process with Payoffs, 12	phản hồi về tính bền vững doanh thu; đồng thời minh họa việc sử dụng khái niệm tính bền vững trong phân tích doanh thu cố định và biến đổi.   	

The authors are Associate Professor of Accounting and Robert M. Trueblood University Professor of Accounting and Economics, respectively, at the Graduate School of Industrial Administration, Carnegie Mellon University, Pittsburgh, PA 15213. Comments are welcome and should be directly addressed to either of the authors, jglover@andrew.cmu.edu or ijiri@andrew.cmu.edu.

Submitted to the Journal of Accounting and Public Policy.

1. Need for Revenue

Accounting This paper explores "revenue accounting" in contrast to traditional cost accounting. Cost accounting was developed in the Industrial Age in which measurement, analysis, and control of product cost became an indispensable part of doing business. Cost accounting has contributed significantly by making various phases of production processes measurable, analyzable, and controllable in monetary terms. The E-Commerce Age, started near the turn of the century with a big blast, was created by the Internet and related breakthroughs in science and technology. While their impact was concentrated in the last decade of the twentieth century, the shift from the product-orientation in the Industrial Age to the customer-orientation in the E-Commerce Age was evident even several decades earlier. This shift was caused by society becoming rapidly affluent, thus moving from a product-scarce society to a customer-scarce society. In addition, the Internet brought a qualitative	[redacted] giai đoạn khác nhau của [redacted] bước đột phá có liên quan mang tính [redacted]	

difference in the way business is conducted. It opened a way to short-circuit traditional distribution channels. It has now become technologically possible for producers, who had to rely on wholesalers and retailers to distribute their products, to directly deal with end-users. It is no longer a question of "whether" but a question of "how" to join e-commerce, minimizing any frictions with those in traditional distribution channels. The number of customer accounts of such companies has skyrocketed as a result. They have become much more sales-oriented companies than before. Demand for data on customers has increased drastically. E-commerce, in return, produces a huge amount of transaction and customer data online that would not otherwise be collected. In addition, a number of data mining techniques have been developed to produce needed information quickly and cheaply. Data and information have become abundantly available. On top of data recorded and reported in traditional accounting, we now have much finer, tailor-made classifications of	sỉ tham gia thương mại điện tử bất kỳ trở ngại nào với họ các Vì vậy dồi dào	

revenues and customers as well as many pre-revenue data such as orders and website visits.

In spite of this dramatic development in business, accountants seem to have been rather slow in taking actions. If the Industrial Age needed cost accounting, the E-Commerce Age now needs "Revenue Accounting," accounting oriented toward serving information needs of managers and investors in planning and controlling a firm's sales activities and their financial consequences. As cost accounting was developed in cooperation with production people, revenue accounting should be developed in cooperation with marketing people. It is the purpose of this paper to explore how such a system of accounting may be developed and to provide examples of key concepts that may be used in developing a conceptual framework for revenue accounting.

2. Weaknesses of Traditional Accounting and Their Remedies

Weaknesses of traditional accounting, especially from the standpoint of Internet start-up companies, have

been pointed out in many aspects of accounting. Perhaps some of the most serious ones for which improvements are desperately needed can be summarized as: revenue mileposts, revenue sustainability measurements, and intangibles capitalization. 1) Revenue Mileposts: A first weakness of traditional accounting, as far as the revenue side is concerned, has been on having only a single point of recognition, i.e., the realization principle under which revenue is recognized all at once upon delivery of the product. Exceptions exist in the case of long-term construction contracts and installment sales, but this principle is in sharp contrast with cost accounting in which costs are accumulated at various stages of production. The same accumulation of efforts does exist on the revenue side of activities, too, in developing customer relations and product recognition. The only difference is that production efforts are embodied in the product frequently with tangible changes in the product, while the effect of marketing efforts is often not visible until the point of sale	[redacted] ghi nhận doanh thu là	

at which the product changes hands. Nevertheless, some mileposts of revenues, such as the receipt of inquiry or order, may be developed and the progress toward them reported systematically.

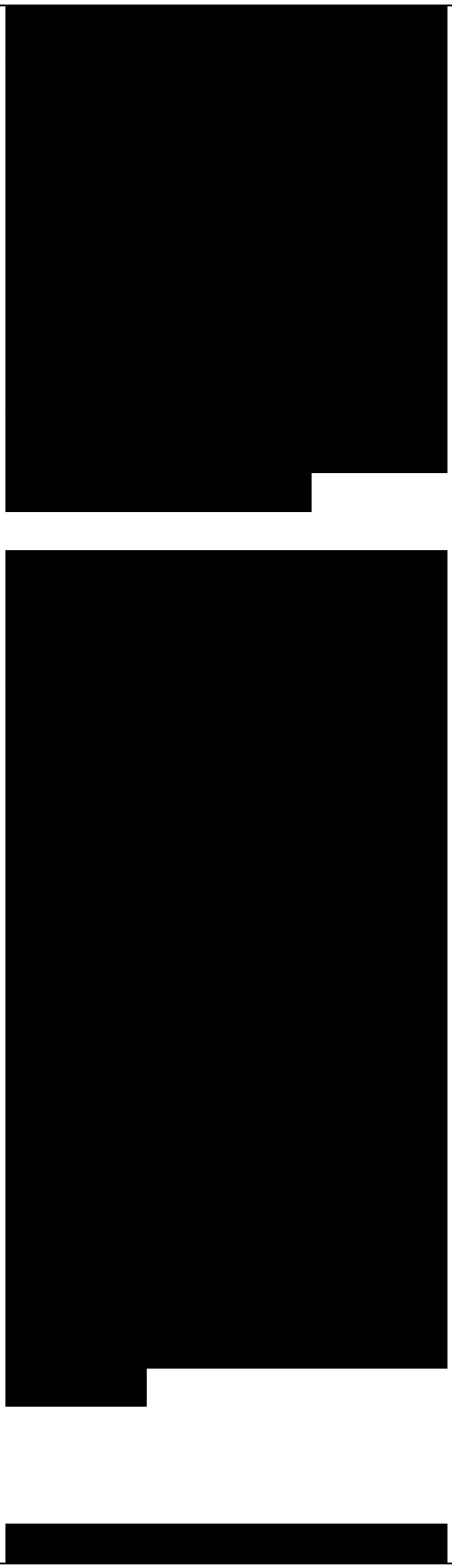
2) Revenue Sustainability Measurements: A second weakness of traditional accounting on the revenue side has been on the lack of information regarding the sustainability of revenue. Recurring revenues are much more valuable than non-recurring revenues yet traditional accounting has not provided benchmarks by which revenues can be divided into the two or even finer categories. Valuation of a firm with a given amount of annual revenues can vary greatly depending upon how sustainable such revenues are likely to be in the future. While measurement of revenues along the dimension of sustainability is difficult, revenue accounting should at least be able to provide information to assist managers and investors in assessing the value of the firm.

3) Intangibles Capitalization: The third and perhaps the most serious weakness is the bias in

traditional accounting against recognizing intangible assets on the balance sheet. Start-up companies spend enormous sums of money in advertising and promotion to develop customer base and capture market share. Start-up companies also spend large amounts of money on R&D. Such expenditures correspond to investments in properties, plant, and equipment (PPE) in the Industrial Age.

Capitalization of PPE expenditures has been an accepted principle in traditional accounting, even if the market value of the investment may be less than the book value. Yet, capitalization of advertising or R&D expenditures has been unacceptable in traditional accounting, with minor exceptions, in spite of the fact that the benefit of investment or its disposal value is often just as uncertain regardless of whether the investment is tangible or intangible. The existing accounting practice is viewed as an obsolete carryover from the Industrial Age in which a firm's value was largely built on bricks and mortar and other tangible assets.

Furthermore, resources of

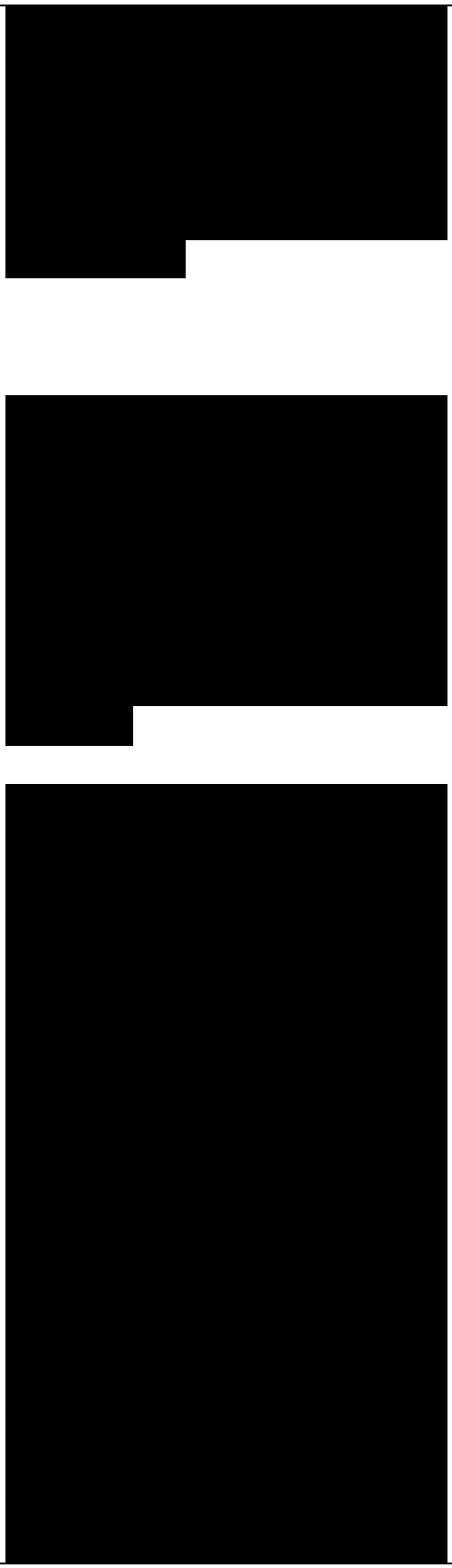


start-up companies are often concentrated in yet another in-tangible, human resources (officers and employees as well as customers). Human resource ac-counting that was discussed in the accounting literature some 30 years ago is now becoming a serious issue in many Internet businesses. Even shareholders are viewed as important human resources of the business, as the caliber of major shareholders themselves enhances the value of the business. It is indeed a network of all people related to the business that creates the value of a business. These weaknesses of traditional accounting are often viewed as reasons for the large gap in the market value and the book value of Internet companies and for negative price-earnings ratios. Many of such accusations are misplaced. It is definitely possible that market valuation may be found to be overly optimistic especially in view of a recent sell-off of technology stocks. Furthermore, accounting valuation need not be equal to or closely approximate market valuation for it to be useful since market valuation	[redacted] dẫn đến tỷ lệ giá-lợi nhuận	

may still be identified through a suitable transformation of accounting valuation. However, such a rebuttal does not excuse accountants from improving the system by making it more suitable for the new economy. The valuation gap should thus be viewed as suggesting opportunities for accounting to stay in touch with the transition in business and economy from the Industrial Age to the E-Commerce Age. In later sections, we will consider tentative remedies to each of the above three key defi-ciencies in traditional accounting. Here, however, we first consider a couple of other key issues in developing revenue accounting.

3. Competitive Advantages of Accountants

As accountants deal with marketing data to develop revenue accounting, their competitive advantages over marketing people may become an issue. E-commerce is so wide-open that anyone can move into it overnight. Yet to stay competitive and survive, one must have some competitive advantages. Accountants doing consulting work have advantages over other

consultants in that accountants are often familiar with the client's accounting system. Likewise accountants' competitive advantages in developing revenue accounting must lie in their knowledge of accounting systems and standards in traditional accounting. This point requires further elaboration since, on the surface, any knowledge of traditional accounting may seem to be a hindrance in developing anything in the world of e-commerce in which speed and flexibility are indispensable. Even in this new age, standardization plays an important role. Data obtained without standards can be highly subjective and difficult to communicate precisely and difficult to gain trust on. If they are developed and used for decisions by the same person, this may not be a problem. However, quite frequently one must explain the data to get an approval on a decision or to account for the decision. Even a chief executive officer must describe business performance to venture capitalists to keep getting funding from them. Data used		

for such purposes must have a certain minimum level of objectivity. Standards are essential, though not sufficient, for assuring objectivity. Marketing data is no exception.

Hence, accountants' first competitive advantage lies in their experience in developing and maintaining measurement standards. This offered an important source of contribution in dealing with production data in cooperation with production people. It should also offer the same in dealing with marketing data in cooperation with marketing people.

Accountants' second advantage in dealing with marketing data comes from their experience in creating a system of integrated performance measurements from numerous individual measurements. Net income is a typical performance measure that is derived from a huge set of heterogeneous transactions following generally accepted accounting principles. Furthermore, the fact that this performance measure has gained considerable trust of investors and managers is observed routinely.

For example, reported

accounting earnings are widely used in incentive compensation plans; for the creator of information, there is perhaps no greater compliment than people actually betting their money trusting the information. In addition, stock price is often sensitively tied to changes in accounting standards that affect reported accounting earnings without any changes in the economic conditions of the firm. The Securities and Exchange Commission's recent crack down on big bath accounting and other earnings manipulations is also a good indication of the investors' trust on reported accounting earnings. These are indeed great compliments to accountants' long-term efforts in creating and maintaining the performance measurement system which gained investors' trust so much.

Accountants' third advantage comes from their experience in developing and refining cost accounting systems. Measurements, records, models, analyses, reports, principles, and standards in cost accounting are all valuable sources in developing systems in

revenue accounting. This does not mean that a blind translation of cost accounting terms and concepts will be useful in revenue accounting. But it does mean that this legacy from accountants in the past will likely offer a valuable checklist and a springboard in designing revenue accounting. Some example of how the cost-revenue parallelism can be used will be shown in a later section.

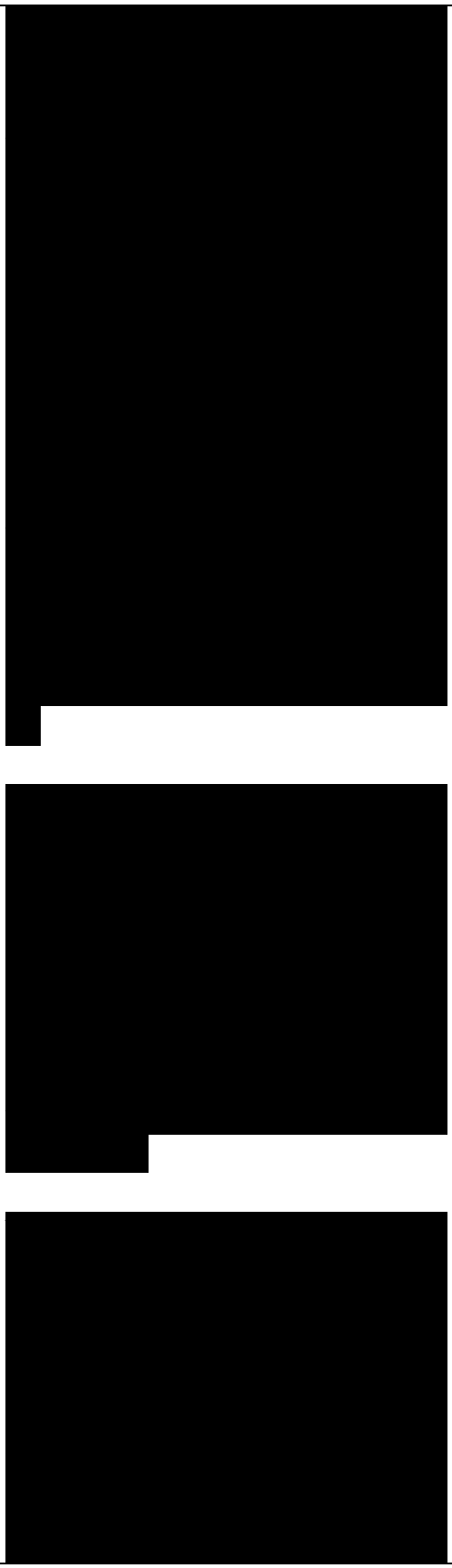
Accountants' fourth advantage is their abilities and experiences in establishing systems of audit and other control and compliance mechanisms. Accounting and auditing go hand-in- hand in establishing reliable systems. Auditing plays an even more crucial role in e-commerce because of the lack of face-to-face contact in traditional trade. The importance of the role played by the auditors in building trustful relationships in e-commerce has been emphasized in ecommerce publications as something indispensable in "a new age, new purpose, and new commerce. "

4. Revenue Accounting: Managerial and Financial

The next question we need to

consider is whether or not revenue accounting should be developed as a part of managerial accounting or financial accounting. Managerial accounting is oriented toward managers or internal users of data, while financial accounting is oriented toward investors or external users of data. But this distinction based on the users being internal or external is becoming less and less important as more detailed data are disclosed to investors; for example, in the E-Commerce Age, venture capitalists work closely with managers.

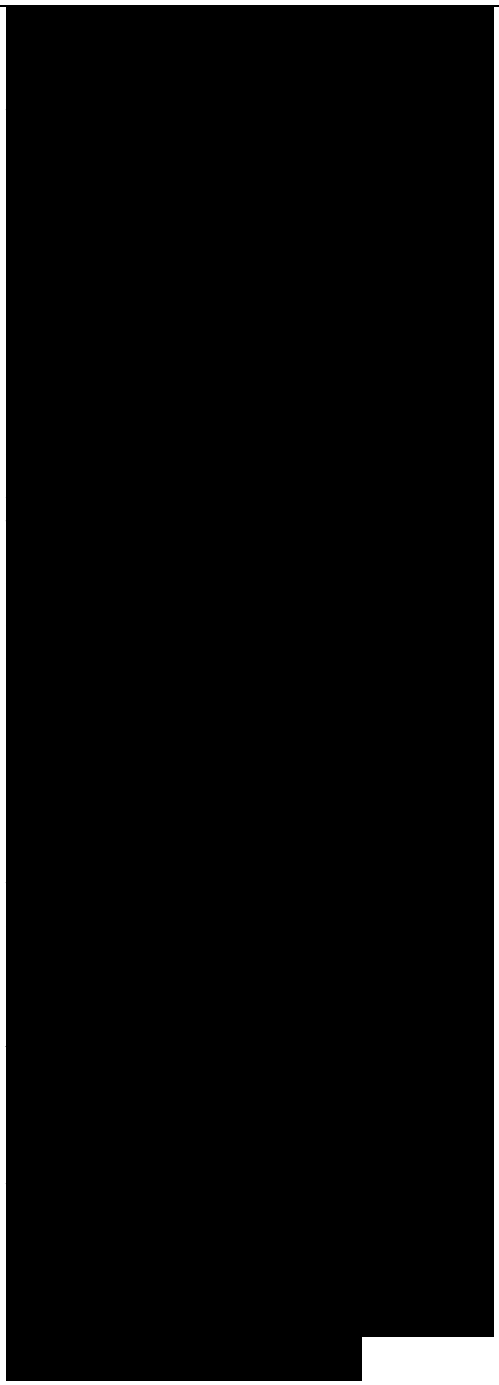
However, the question is still important because of the significant difference between the two branches of accounting in terms of the level of standardization. Standards developed in financial accounting are enforced upon all listed corporations in the country and the compliance is audited. In contrast, with the exception of regulated industries, any standards developed in managerial accounting have much more limited applicability and enforcement. A high level of standardization may promote more trust and reliance from



the users of data, especially if coupled with a compliance audit, but at the same time it may stifle efforts to experiment and flexibly apply standards in light of specific individual situations.

Here again, we can learn from cost accounting. While cost accounting is typically taught under the heading of managerial accounting, cost accounting also has many ties with financial accounting because inventory costs derived from cost accounting must satisfy financial accounting standards. Thus, for example, while a firm may adopt variable costing for managerial accounting purposes, ending inventory balance must be recomputed using full costing for financial accounting purposes. Depreciation may be applied flexibly but at the end of a period, it must be adjusted back to meet financial accounting standards. In fact, cost accounting has been constructed so as to meet the needs flexibly for both managerial accounting and financial ac- counting out of a single system.

Cost accounting and revenue accounting are sister accountings to each other.

Think of a company split between two subsidiaries, one specializing in production and the other in sales. The production subsidiary uses cost accounting. The sales subsidiary uses revenue accounting. The holding company takes care of all financing and administrative functions. Cost accounting and revenue accounting are both subparts of "income accounting" in which revenues, costs, and expenses are all integrated. They both have managerial accounting components and financial accounting components. This understanding helps us to conclude that revenue accounting should be developed with both managerial accounting and financial accounting in mind. Obviously, it is much easier to start with management accounting components where things can be created, modified, and standardized much more flexibly. But in all steps, we should have an eye on financial accounting components so that some of the important standards developed in managerial revenue accounting will eventually be worked into financial accounting standards.		

Ultimately, we believe that revenue accounting should lead to comprehensive "revenue statements," just as cost accounting led to comprehensive cost statements such as a statement of cost of goods manufactured or a statement of cost variances. In this way, reporting standards can be developed in tandem so that both the revenue side and the cost side of the income statement are given equal weight by means of these statements. What form such revenue statements take may be difficult to say before revenue accounting is given a structure. But in developing revenue accounting we should always keep in mind the forms and contents of revenue statements.

We now move to some tentative solutions to the three deficiencies in traditional accounting mentioned earlier. They will be discussed in the sections that follow, namely revenue mileposts in sections 5 and 6, revenue sustainability measurements in sections 7 and 8, and intangibles capitalization in sections 9 and 10.

5. Establishing Revenue Mileposts

Cost accounting was

developed tracing the tangible movements of goods through the production process, adding costs at each stage of the process. Conceptually at least, revenue ac-counting should do the same, tracing the process in which customers' demand is turned into revenues. While this process has often been unobservable in the past, e-commerce has made at least a portion of the process observable through complete on-line recording of customers' or potential customers' browsing of the website. At least initially, this data should form a valuable input to managerial revenue accounting and may eventually find a way to financial revenue accounting as demand for early feedback increases among investors. We shall present nine key candidates grouped into I. Pre-Revenue (promotion, inquiry, ordering); II. Revenue (delivery, payment, return); and III Post-Revenue (warranty, liability, disposal).

a) Product promotion: This is a point at which product announcement, advertisement, or other form of promotion, is made. It may be beneficial to distinguish between company promotion

and product promotion so that revenue accounting may treat them differently. b) Product inquiries: This is a point at which a customer takes an action, requesting information about the product, browsing the website for it or otherwise inquiring about it. The number of website visits, brochures given out, or phone answers given, may all be important indicators of potential orders. c) Product ordering: That is a point at which an order is received. While this is not a point at which accounting transactions are initiated, for many sales people, this is the point where they consider a touchdown was made. In fact, the so-called "book-bill ratio," the ratio of booking orders to billing upon delivery, is an important indicator of how the flow of orders and the flow of deliveries match up in the revenue generating process. There is no reason why revenue accounting cannot get started at the order point, which may be identified as "revenue origination" in contrast to "revenue realization. " d) Product delivery: This is the point at which revenues are considered to have been	[redacted]	

"realized" or "earned" because the seller's commitment has been largely fulfilled with possible exceptions of warranty or other minor commitments. This is the normal revenue recognition point in traditional accounting. e) Product payment: This is the point at which the customer makes payment for the product they received. This point may coincide with d) product delivery as in the case of credit card sales or may precede it in the case of an advance payment. This is a transaction invariably recorded under traditional accounting. f) Product return: This is a point at which the customer returns the product for a refund. This is also a transaction recorded under traditional accounting. g) Product warranty: This is a time period in which the product is under a warranty. The end of the warranty period may be considered the end of the revenue accounting cycle under normal circumstances since all commitments made by both parties are now fully performed. h) Product liability: This is a time period in which the	[redacted]	

product is contingently exposed to product liability suits or recalls due to defects. While, normally, there may be no need to be concerned with such contingencies, revenue accounting should cover all interfaces with customers including these contingencies if and when they become likely or imminent.	[redacted]	
i) Product disposal: This is a point at which the product is disposed of in a way that is environmentally acceptable. The seller of the product may be held responsible for the proper disposal or, at least, may take steps voluntarily for the customers to return the product to the seller for safe disposal as currently observed in the case of printer cartridges.	[redacted]	
At each of these nine or more phases in revenue accounting, there are quantitative in-formation that is important for managers and for investors. The challenge for revenue accounting is to standardize measurements at each phase so that they can be interpreted with minimum risk of misunderstanding. The measure should be in monetary terms as long as	[redacted]	

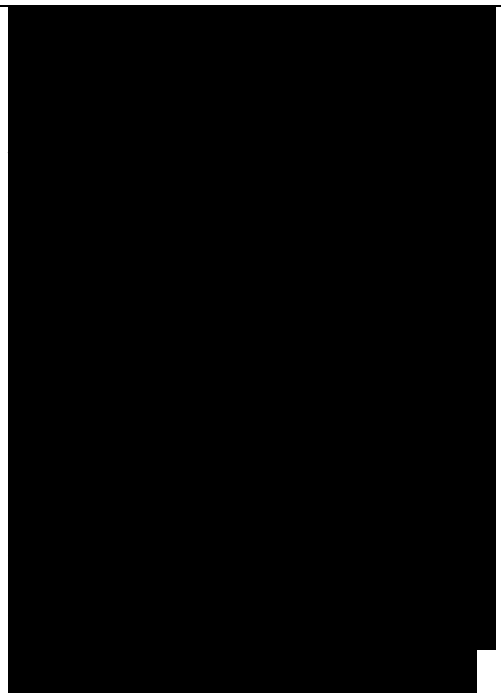
this is possible but, if not, it may be in non-monetary terms such as frequencies, volumetrics, or other physical measures.

As a customer goes through each phase in a particular purchase, the progress is recorded and evaluated instantly in comparison with data on what this customer did in the past. Probabilities are applied, not only based on the company's overall experience, but also based on this particular customer's actions. Decisions on whether or not transactions should be recorded on the basis of estimates may also be customized based on the individual customer's buying habit. For managerial revenue accounting, transactions may be recognized early and refined as the customer makes progress. For financial revenue accounting, recognition may have to be delayed to a later point in the cycle. In either case, recognition on the books of revenue accounts must be made under a set of well-specified standards.

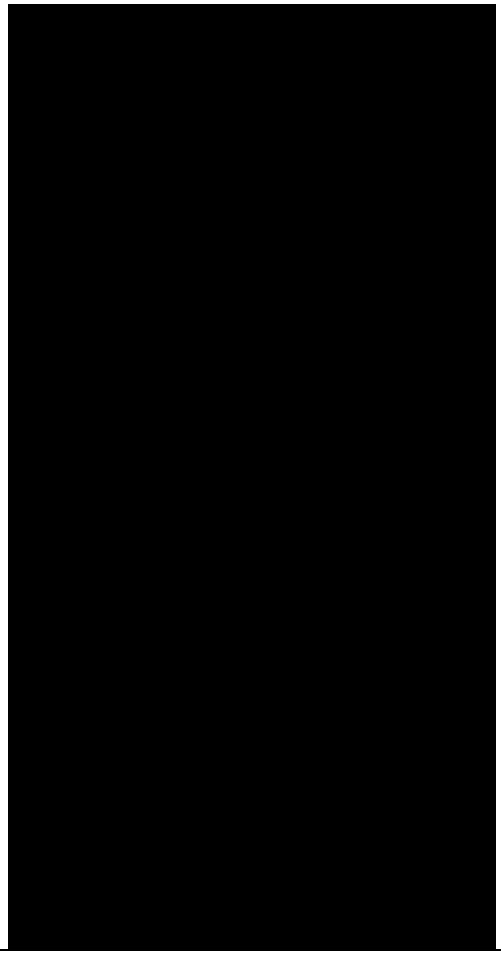
6. Using Mileposts: A Markov Process with Payoffs

Let us now consider analytical uses of mileposts so that data collected at these

points can be used profitably by managers and investors. There have been and will be numerous models developed in marketing to take advantage of the data explosion. The following is merely an illustration of how a partitioning of the revenue generating processes might improve the task of managing and investing, just as a partitioning of the production processes have in the past. Here the model we choose to illustrate is a Markov model with an associated payoff matrix.



To illustrate the process in the simplest way, let us consider only two states that a customer can be in, a "browser" and a "buyer," the meaning of which will be explained shortly. A customer in any period belongs to one and only one state and, at the end of a period, can move to the other state or stay in the same state. The probability the customer will be in a given state during the current period depends only on the state s/he was in during the immediately preceding period (the previous period). A period here may be a day, a week, a month, a quarter, or a year, depending upon how frequently the product is



bought by customers on the average--for groceries a week may be appropriate, while for appliances a year or longer may be appropriate. Here, for the purpose of concreteness, we will assume that a month is used as a period. We shall also assume, for simplicity, that a firm sells only one product.

For any given month, a customer is a "buyer" if s/he bought the product of the firm during the current month and is a "browser" if s/he did not. All customers are assumed to browse the website of the firm. In the short run, browsers cost the firm as marketing and advertising costs are needed to generate browsing, while buyers benefit the firm from their purchases. The amount of cost or benefit depends upon not only the current state the customer is in but what state s/he was in the previous period.

If a customer was a browser in the previous period and is also a browser in the current period, designated by "browser/browser", the cost to the firm is $2 (a payoff of -$2) in the current period, while if s/he was a browser in the previous period and a buyer in the current period

(browser/buyer), the benefit to the firm is $3 (a payoff of $3) in the current period. On the other hand, if a customer was a buyer in the previous period and is a browser in the current period (buyer/browser), the cost to the firm is $1 (a payoff of -$1), while if a customer was a buyer in the previous period and is also a buyer in the current period (buyer/buyer), the benefit to the firm is $9 (a payoff of $9). These payoffs along with transition probabilities, which will be explained shortly, are depicted in Figure 1 and summarized in Table 1 in the form of a payoff matrix and a transition matrix.

[redacted]

We now move on to the transition matrix in Table 1. If a customer was a browser in the previous period, there is an 80% (0.8) probability that s/he will stay as a browser (with no purchase) in the current period and a 20% (0.2) probability that s/he will become a buyer (with a purchase) in the current period. On the other hand, if a customer was a buyer in the previous period, there is a 40% (0.4) probability that s/he will become a browser (with no purchase) in the current period and a 60%

(0.6) probability that s/he will stay as a buyer (with a purchase) in the current period.

We then trace a customer who was a browser in period 0, called "initial browser." Applying the above transition probabilities, in period 1 s/he will be a browser with probability 0.8 and a buyer with probability 0.2, which we shall state as [0.8, 0.2]. In period 2, s/he will become a browser in one of two ways -- i) s/he was a browser in period 1 and stay as a browser in period 2 with probability 0.8*0.8 = 0.64; and ii) s/he was a buyer in period 1 and become a browser in period 2 with probability 0.2*0.4 = 0.08. Hence the probability that the initial browser will be a browser in period 2 is 0.8*0.8 + 0.2*0.4 = 0.64 + 0.08 = 0.72.

The probability that s/he will be a buyer in period 2 is obviously 1 - 0.72 = 0.28, but this can be computed more minutely as 0.2*0.6 = 0.12 for buyer/buyer and 0.8*0.2 = 0.16 for browser/buyer, the total being 0.12 + 0.16 = 0.28 as expected. Thus, this customer's probabilities in period 2 may be represented as [0.72, 0.28]. Likewise, we

obtain [0.688, 0.312] for period 3 and it can be shown that the series converges to [2/3, 1/3].

For a customer who was a buyer in period 0, called "initial buyer," using exactly the same computations we obtain [0.4, 0.6] for period 1, [0.56, 0.44] for period 2, [0.624, 0.376] for period 3, and again it can be shown that the series converges to [2/3, 1/3]. Hence, in the long run, it does not matter whether a customer is an initial browser or an initial buyer since the probabilities converge to [2/3, 1/3] and the firm can expect on the average 2 browsers and 1 buyer out of 3 customers.

Let us now combine the transition matrix and the payoff matrix to find the value of a customer to the firm. First, consider an initial browser. S/he has a probability of 0.8 of staying a browser, thus causing a -$2 payoff to the firm, and a 0.2 probability of becoming a buyer, thus causing a $3 payoff to the firm. Therefore, the expected value of the payoff to the firm in period 1 is 0.8*(-2) + 0.2*3 = -1 or cost to the firm of $1. Likewise, the expected value

of the payoff to the firm in period 1 from an initial buyer is 0.4*(-1) + 0.6*9 = 5 or a benefit to the firm of $5. As a short-hand, we combine payoffs for both an initial browser (-1) and an initial buyer (5) and express them as {-1, 5}. This is shown in the last column of Table 1.

To figure the payoff in period 2 from this initial browser, we move one period backward. If this customer stays as a browser in period 1 (probability 0.8), the expected payoff in period 2 is, as computed in the above, -$1, while if s/he becomes a buyer in period 1 (probability 0.2), the expected payoff in period 2 is $5. Hence, the expected payoff in period 2 is 0.8*(-1) + 0.2*5 = 0.2. Likewise, we compute the payoff in period 2 from an initial buyer. If this customer becomes a browser in period 1 (probability 0.4), the expected payoff in period 2 is, as computed in the above, -$1, while if s/he stays as a buyer in period 1 (probability 0.6), the expected payoff in period 2 is $5. Hence, the expected payoff in period 2 is 0.4*(-1) + 0.6*5 = 2.6. Again, we express the combined payoffs as {0.2, 2.6}.

Repeating the process of

going backward one period at a time, we figure the expected payoffs in period 3 to be {0.68, 1.64} since 0.8*0.2 + 0.2*2.6 = 0.68 and 0.4*0.2 + 0.6*2.6 = 1.64. The same for periods 4 and 5 are, respectively, {0.872, 1.256} and {0.9488, 1.1024}, after which the payoffs converge to {1, 1} rather quickly. This is quite understandable since the transition probabilities for both the initial browser and the initial buyer converges to [2/3, 1/3], no matter what their starting state was; hence, their payoffs also converge to 2/3*(-1) + 1/3*5 = 1 regardless of their starting state. Table 2 below provides a summary of transition probabilities and expected payoffs over the first several periods.

We close this section with emphasis on the benefit of mileposts that lead to revenue re-alization. With the knowledge of a steady state distribution of [2/3, 1/3] and the associated expected payoffs of {1, 1}, it is now easy to say that a customer on the average contributes $1 per period to the firm regardless of whether they are currently browsers or buyers. But we must keep in mind that these data were obtained as a result

of a more finely tuned analysis behind these numbers that was made possible by the milepost data. In addition, the milepost data also allows the transitional process leading to a steady state to be examined carefully and promotes understanding of the near-term transitional phenomena as well. For this reason, the above analysis was presented as a way of illustrating the importance of mileposts by means of a simple example.

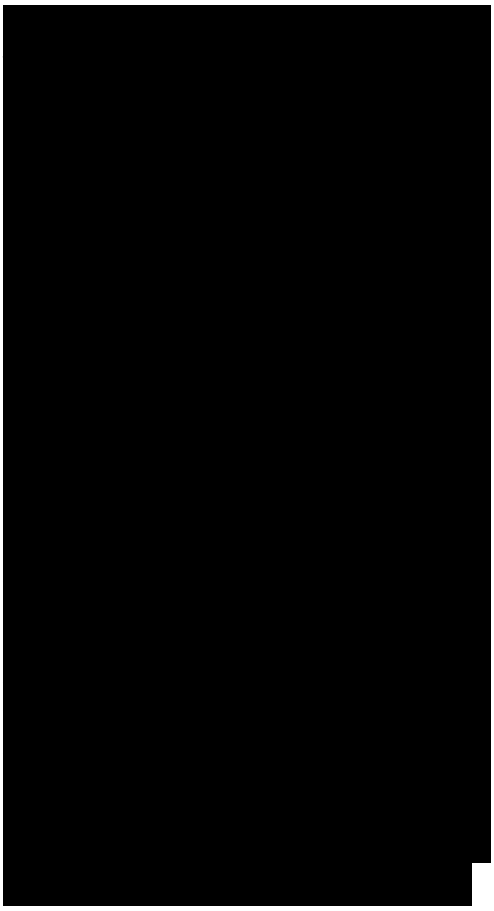
Having started with the most minute milepost analysis leading to revenue realization, we now move to a higher level issue dealing with the sustainability of revenues. Here, our focus will be on revenues, not the processes leading up to the revenue realization, to see what kind of new concepts and measurements may need to be introduced in order to answer questions related to the sustainability of revenues.

7. Revenue Momentum and Sustainability Measurements

The concept of sustainability of revenues mentioned earlier is closely related to the notion of momentum explored in momentum accounting (Ijiri 1989). Once revenue is

earned, it often keeps repeating itself in the future. This is due to a customer's tendency to go back to the same seller in order to avoid an additional cost of getting acquainted with a new seller. The tendency of revenues to recur is called revenue momentum.

While revenue is (i) measured in a monetary unit such as dollars and (ii) measured for a given period of time such as for year 2001, revenue momentum is (i) measured in a monetary unit "per period" such as dollars per month and (ii) measured at a given "point in time," e.g., as of 12/31/2001. Revenue is a flow concept, hence it appears in a statement of flows such as an income statement, while revenue momentum is a stock concept, hence it appears in a statement of stocks such as a balance sheet. In fact, revenue momentum is an important "asset" of the firm that can be measured and evaluated at a single point in time.



If revenue momentum is constant, revenue is equal to revenue momentum times duration in which the momentum lasts. Revenue momentum of $10

million/month will produce $10 million revenue if its duration is 1 month (i.e., $10 million/month x 1 month = $10 million to clarify dimensions), while it will produce $120 million if its duration is 12 months. Similarly, actual revenue of $144 million for a year may be converted into its equivalent average revenue momentum of $12 million/month that lasted for 12 months.	[redacted]	
Traditional accounting takes a view that revenues should be measured and reported as-suming zero momentum. Under this view, revenues are always earned from scratch. Hence, if a $10 million revenue is earned in this month, the entire sum reflects the contribution of the management in this month.	[redacted]	
An alternative view, stated in its extreme form, is that once revenues are created, they recur forever with no dissipation whatsoever. Under this view, the management that created the revenue momentum initially should get credit for revenues earned from that point on to eternity.	[redacted]	
Traditional accounting's view is analogous to the Aristotelian view of motion,	[redacted]	

which says a moving object keeps moving because force is applied constantly. Momentum accounting's view, in its purest form, is analogous to the Newtonian view of motion, which says a moving object keeps moving on a linear path with a constant velocity without any force. The two views differ in drawing a picture of the "status quo." Traditional accounting draws the line of status quo at zero revenue; momentum accounting draws the line of status quo at revenue being earned at a constant speed.

Truth probably lies between the two. Revenue does have momentum but it dissipates at some dissipation rate. The question is which of the two offers a better base to start from. Clearly in the E-Commerce Age in which values are projected into the future at a far greater pace than before, the momentum accounting view is the one that is most in line with the norm of business. Here, how fast momentum dissipates must be measured, just like a depreciation rate, based on the available data either on a customer-by-customer basis or on an aggregate revenue basis. Furthermore, revenue

momentum may not just dissipate; it may grow in the future as one satisfied customer begets another, yielding a negative dissipation rate.

Revenue accounting should be built upon a concept and measurement of revenue momentum under a set of standards. Here we will show only a simple approach using an exponential smoothing model,

(1) $M^* = (1 - a)M + aA.$

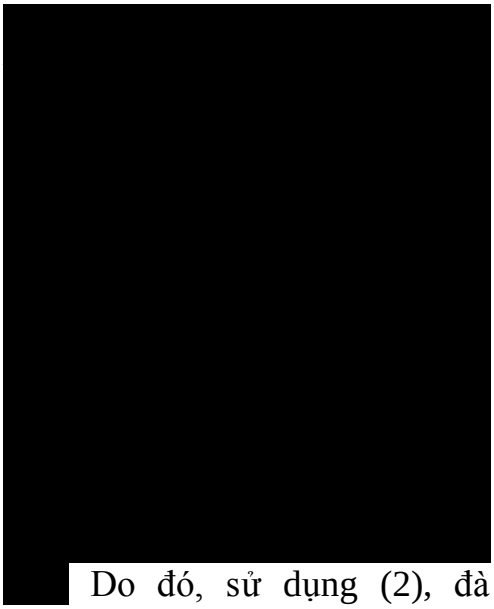
This says that ending momentum, M*, is a weighted average of beginning momentum M and average actual momentum A for the period, where weights of (1 - a) and a are applied, respectively, $0 < a < 1$. If beginning momentum M = \$30/mo (/mo is short for "per month" and \$ millions omitted), A = \$40/mo, and a = .3, ending momentum M* is obtained as $M^* = (1 - .3)*30 + .3*40 = 33$ or \$33/mo. An equivalent form of (1) may make the process clearer, that is:

(2) $M^* = M + a (A - M).$

That is, ending momentum M* is equal to beginning momentum M with a fractional (a) adjustment for the momentum change (A - M). The latter is a change

from beginning momentum M to average actual momentum A. Under this formula, M* = $30/mo + .3($40/mo - $30/mo) = $33/mo. For a = .3, then 30% of the change from M to A is added to M to update it.

Here, a is called a smoothing constant. A smaller value is chosen for a mature, stable environment because a sudden change in revenue is not likely to last, and a larger value is chosen for a immature, volatile environment because a sudden change in revenue may signal a fundamental shift in the market. This process is analogous to inventory costing methods such as FIFO, LIFO, and weighted average methods which are ways of mixing new and old prices adaptively. Exponential smoothing applied to revenue momentum is likewise a way of mixing new and old momenta adaptively. In the latter, however, we may want to leave management more discretion to update the smoothing constant a to determine how quickly or how slowly we want to adapt to the changing environment; errors can be made by adapting too quickly as well

as too slowly. Table 3 and Figure 2 show an example of exponential smoothing of monthly revenues, using smoothing constant, alpha, equal to 0.5, 0.2 and 0.05. For example, in the previous month, the firm had $100 revenue which is treated as the starting value of revenue momentum. In month 1, we find that the actual revenue was $80. We then adjust and update the momentum by taking a times the difference of 80 and 100. Hence, using (2), the new momentum is 100 + a(80 - 100) which is 90 for a = 0.5, 96 for a = 0.2, and 99 for a = 0.05. HỒNG UYÊN KẾT THÚC	 Do đó, sử dụng (2), đà doanh thu mới là 100 + a(80 - 100) là 90 cho a = 0,5, 96 cho a = 0,2, và 99 cho a = 0,05.	