COMMENTARY

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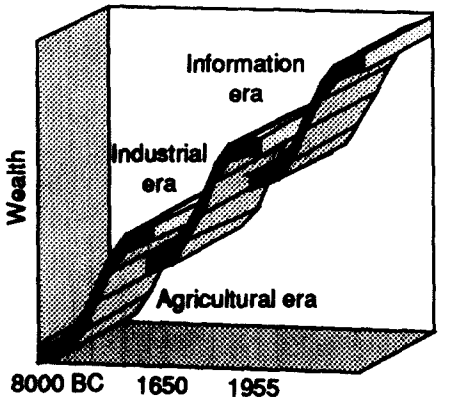
on

The Third Wave Breaks on the Shores of Accounting

Information technology (IT) is changing everything. It represents a new, post-industrial paradigm of wealth creation that is replacing the industrial paradigm and is profoundly changing the way business is done. Because of these changes in business, the decisions that management must make are very different from former decisions. If the purpose of accounting information is to support business decision-making, and management's decision types are changing, then it is natural to expect accounting to change — both internal and external accounting. Obviously, if business, management, and accounting change, accounting education and research must change: the types of students recruited, the curriculum, the set of required capabilities of graduates, and the issues investigated.

This article begins by summarizing the changes being driven by IT and their effect on the needs for accounting information (section I). Then the article summarizes the effect of both on needs for changes in internal accounting (section II), external accounting, including accounting standard setting (section III), public accounting firms (section IV), accounting education (section V), and accounting research (section VI). As the breadth of these issues must signal, the objective is to stimulate further thought and to demonstrate that it is needed.

Figure 1



Three fundamentally different methods of wealth creation. For each, a different form of accounting information is required.

I. IT IS THE DRIVER

Alvin Toffler's image of the "third wave" is a good model for considering economic changes. He notes, in his book *The Third Wave*, that until about 8000 B.C., the dominant mode of life was foraging, fishing, hunting, and herding. You caught what you ate and you ate what you caught. But, about 10,000 years ago, agriculture was developed, and became the first major new wealth-creating technology. Agriculture had momentous implications for civilization, as formerly nomadic people became bound to the land they were cultivating. This led to requirements for defense, government, and laws. It is our first example of enormous social and economic changes flowing from the introduction of a new technology.

The agricultural paradigm of wealth creation was dominant for about 10 millennia, until the second great wave of new technology occurred — industry — exploiting the discovery that energy could be harnessed to amplify human labor in the factory. Far more raw material could be converted to finished goods than with manual labor alone. Industrialization also had huge implications for civilization, as the cities, where the factories were located, became more densely populated, and marketplaces developed for the exchange of increasingly specialized products. This is our second example of profound social and economic changes flowing from the introduction of a new technology.

The industrial paradigm was dominant for a much shorter time, until it began to be replaced by the third great wave of change —

the information revolution. This can be dated to the 1950s, with the invention of the transistor and the installation of the first commercial computer (although the first computers used vacuum tubes, the happy marriage of computing and semi-conductors was prompt). In the third wave, the engine that drives the system is not physical labor, as it is in agriculture; not machines, as it is in industry; but information. As with prior waves of technological change, we can expect important social and economic changes, and we can already see the dim outlines. These include the increase in economic power of those countries that can make the most effective use of knowledge-workers. They also include accelerating the demise of the socialist economies, which could only hang on during the relatively slower rates of change in the industrial era. The information age demands the rapid adaptation that a free market thrives on, and the socialist systems were too phlegmatic — governmentally and managerially — to adapt.

These three great waves of change have characteristic technologies in several dimensions (Figure 2).

Figure 2

Technology	1st Wave	2nd Wave	3rd Wave
physical	labor	machinery	semi-conductors
information	writing	printing	computer
accounting	single-entry	double-entry	triple-entry(?)

There are characteristic information technologies for each wave. The IT for the first wave was writing, which was developed to keep accounting records. (If you sent a camel-load of spices to Damascus, you had to have some way of knowing that the camel driver was not misappropriating the cargo, so you needed a bill of lading, etc.)

The IT underlying the second wave was movable-type printing, which was developed by Gutenberg around 1450, although the onset of the industrial age did not occur for several centuries thereafter. The development of movable type was a necessary (although not sufficient) condition for the industrial revolution. For the first time, knowledge could come out of the monastic libraries, where it had been locked up in unique, handwritten books. With the invention of movable type, books could be mass produced. Thus, information could be widely diffused, permitting the development of modern science and technology.

The IT for the third wave is the digital computer, making possible fast, inexpensive information storage and processing. When harnessed to its full potential (that is, in conjunction with the associated software, data bases, and telecommunications), the digital computer permits vast leveraging of knowledge-work.

Accountability technologies also change with the technological waves. In the first wave, when events unfolded at the stately, annual pace of agriculture, simple accountability concepts were sufficient. If you lived in ancient Egypt, the one thing you knew was that things were always the same. The sun came up *every* day in the east and went down *every* day in the west. The Nile flooded *every* year, in the same season. For millennia, every year was identical. The idea of progress was, to the ancient Egyptians, non-existent. If you were the Pharaoh, all you needed to know was whether there was enough grain in the storehouses to feed the people during the annual flood and build another pyramid. When your world is this stable and predictable, you need only a very simple accounting technology — single-entry accounting; you just count your assets and obligations.

When the second wave arrived, however, single-entry accounting was not sufficient. Things began to move faster. However, double-entry bookkeeping had already been codified by Pacioli in 1494. This development preceded the second wave, but double-entry bookkeeping was a necessary (although not sufficient) condition for the industrial revolution. In double-entry accounting, the debits equal the credits. The debits represent the benefits to the company and the credits represent the sacrifices. These debits and credits provide a very convenient way of keeping track of a large number of contracts in various stages of execution — committed, partially executed, and

fully-executed. A simple accounting entry could record each stage of the contract. Thus, double-entry bookkeeping enabled an entity to keep track of a large number of contracts in various stages of execution. A bundle of contracts is nothing more or less than a corporation, and a corporation is the vehicle required to aggregate the capital to build the factories and buy the machinery to have an industrial revolution. Although double-entry accounting did not *cause* the industrial revolution, it could scarcely have occurred without the accounting technology.

It is reasonable to assume that the third wave will demand a new accountability technology. However, it has not yet emerged. Yuji Ijiri has proposed a system of triple-entry accounting that is original and a major step in the right direction. In this model, the first derivative of wealth with respect to time is income (w'), and the second derivative of wealth with respect to time is "thrust" or the rate of change of income (w'') Figure 3 summarizes the notation.

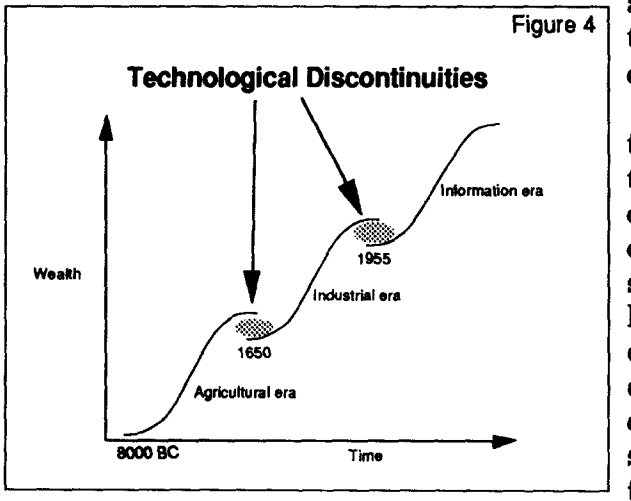
Figure 3

Notation

w	=	wealth (as a function of time)
w'	=	first derivative of wealth with respect to time (that is, income)
w''	=	second derivative of wealth with respect to time (that is, the rate of change in income)

Putting these accounting levels in terms of the three waves of wealth creation: in the first wave, there was single-entry accounting — accounting at the w (or wealth) level — and the prototypical financial statement was a balance sheet. In the second wave, double-entry accounting permitted articulated statements of position and change. Change is at the w' level. The prototypical financial statement for that wave was the income statement, and later the funds flow statement, but they are both at the same level of flow. So if single entry was good for the first wave and double entry for the second wave, is triple entry good for the third wave?

Figure 4



To the extent it measures at the w'' level, it is a step in the right direction, but it may not go far enough to satisfy third-wave accountability needs. The reason is that Ijiri's triple-entry accounting operates on the same industrial-era resources and obligations as are included in today's financial statements, whereas the crucial assets for the post-industrial firm are very different assets, as discussed below. In other words, a model based on second-wave concepts of assets, liabilities, revenue, and expense is not likely to be sufficient for the third wave.

The three waves are summarized in Figure 4. The "s" curves represent the introduction, exploitation, and maturity of each wealth-creation paradigm. As each wave exhausts its potential, a new wave begins. Each new curve starts a little lower than where the last curve left off because there's a cost involved in switching from one technology to another, and that cost is the technological discontinuity as people try to get off the old curve and onto the new. Old jobs become obsolete, and people scramble to retrain and seek new types of jobs. Educational requirements shift, economic forms change, and, as noted above, there are large social costs.

The second period of technological discontinuity, between the second and third waves, includes our entire professional lifetimes. We are living that technological discontinuity, as people displaced from the second curve desperately seek a foothold on the third curve. A dramatic example of this can be seen in Eastern Europe, as the industrial to post-industrial shift that the West has had 35 years to assimilate is being crammed into a few months or years.

Just because we are in a post-industrial economy doesn't mean that we can forget the first two waves. People still like to eat (the agricultural wave), and they still like to drive around in automobiles (the industrial wave). But the current distribution of the U.S. workforce leaves only two percent of the people growing food and ten percent actually making things in factories. Already over sixty percent of the workforce is on the third curve, made up of primary and secondary information sectors. The primary information sector comprises entities that are principally concerned with the production or use of information — for example, computer manufacturers, universities, law firms, accounting firms, publishers, and entertainment. The secondary information sector comprises those parts of non-information businesses that produce or use information, such as the engineering and marketing departments in an industrial firm. Already, modern IT is pervading every aspect of our economy and changing the way we do business.

IT Changes Business

Leadership businesses — those that can grasp the business potential of IT — use the technology to get closer to their customers. As IT condenses time and space, it literally closes the time and space gaps between customers' demands and enterprises' fulfillment. They use IT to improve quality, in fact, to achieve ever-improving quality. And they use technology to "demassify" their products, that is, provide more differentiated products or services for market segments or even individual customers.

The industrial era relied upon mass production to reduce prices. Henry Ford would sell you a Model T in the color of your choice, as long as it was black. Restricted choice is acceptable to customers only as long as there are no alternatives in the marketplace. But today, companies use IT to create a much broader array of products. In fact, computer integrated manufacturing (CIM) permits them to produce "one-off" products.

An example of demassification through IT can be seen in home entertainment. Not too long ago, you had a choice among three networks: NBC, CBS, and ABC. Today, your cable company provides 40 to 80 channels. Moreover, your VCR expands that to a virtually infinite array of programming that can be very tightly tailored to your specific interests.

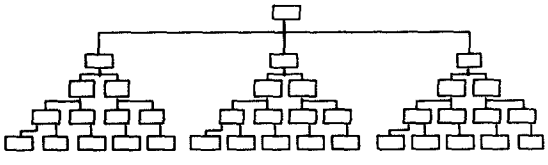
Yet another feature of IT's influence is the capacity it has provided to manage an enterprise on a global scale — to operate everywhere in a coordinated fashion.

Leadership companies use IT to create these kinds of strategic advantage. Then companies not in the leadership class wake up to find that their customers are abandoning them, leaving them with only two choices: harness IT themselves to try to catch up to the leaders or go broke. The followers embark upon a frantic quest to exploit IT — to improve quality, decrease product and production cycle times, focus on the creation of value for the customers, go global themselves, and fill in the gap in their human and technological resources through such new business forms as partnering and alliances. They're forced to discover how to make strategic use of IT.

IT Changes Management

In this period of technological discontinuity, business managers face a set of issues different from those faced by the managers of industrial enterprises. We can contrast the management issues facing second-wave vs. third-wave enterprises.

Figure 5
Hierarchical Organization Structure



The second-wave manager operates an enterprise with a hierarchical organizational structure. Within that structure, managers try to achieve some target rate of economic activity.

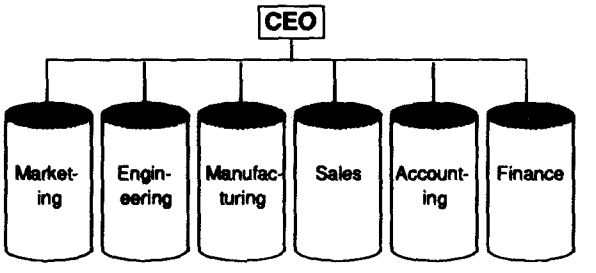
The hierarchical structure appears like an inverted tree, modeled on the structure of the Church and the military (Figure 5). The

advantage of this structure is that a very large number of employees can be managed and controlled. For example, if each boss in a company managed six subordinates, a nine-layer organization could contain two million employees. But with the size advantage comes a disadvantage: lack of agility.

This can be seen by altering the hierarchical figure to enclose each of the main functional branches in stovepipes (Figure 6). These stovepipes impede the horizontal flow of information and facilitate vertical flows. A typical organization has such stovepipes as marketing, engineering, manufacturing, sales, accounting, and finance.

Figure 6

Industry Was "Stovepiped"



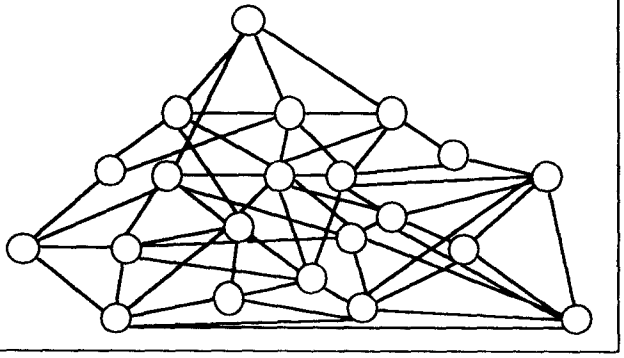
The stovepiped company may discern that its competitors have a better product and realize that it must adapt rapidly. So the marketing function figures out what basket of capabilities would appeal to customers. They deliver the requirements to the engineering function, which replies that the product can't be designed. So the marketers and engineers trade ideas for a while until they reach agreement on a product that would appeal to customers and can be designed. They then take it to the manufacturing function, which replies that it can't make the product. After considerable additional exchange of messages, these three agree. Next the sales force views the prospective product and asks how it can be expected to sell such a product at the price necessary to cover costs. Many more exchanges later, the finance department blows the whistle, because there's no funding available to buy the necessary manufacturing equipment. An all-too-typical result of this type of halting behavior in the stovepiped company is that American automakers require an average of six years to bring a new product idea to the showroom floor.

Managers of these hierarchical, second-wave companies at least have a relatively simple job. They receive an endowment of resources when they become managers, and they employ those resources to convert raw materials into finished goods, assuming it's a manufacturing company. Under Frederick Taylor's principles of scientific management, managers determined the best way to do things, using such tools as time-and-motion studies. The "best way" was then locked into the organization to make sure it would continue to do things the best way. Control systems were developed to achieve that lock-in. A scientifically managed company had an optimal rate of return, an optimal rate of activity — that is, activity was conceived at the w' level. Such a system even has an optimal, non-zero rate of scrap.

But the management of a third-wave company is different. There is both a different organizational structure and a different set of managerial tasks.

Figure 7

The Networked Organization



The organization changes from the tree structure to the networked form of organization (Figure 7). The network is enabled by IT — the technology of wide-area networks — which permits the firm to have any two or more people cooperate on any specific task as required. Messages can flow unimpeded in any direction. The networked organization rapidly forms and reforms itself around a rapidly changing set of tasks.

To visualize how a networked organization operates differently, consider Digital Equipment Corporation (DEC). This company has one of the largest wide-area networks in the world, with over 80,000 employees on the network. Every second year, DEC holds the largest single-vendor trade show in the world, called DEC World. DEC budgets over $60 million and invites more than fifty thousand people to attend the show, which takes place over a two-week period. DEC designs and produces this show over the wide-area network, obviating the need for persons to be assigned to the task full-time and even the need for meetings. DEC people throughout the world participate in the design and execution of this enormous project using the medium of an "electronic conference."

Figure 8

Super-Fast Innovators

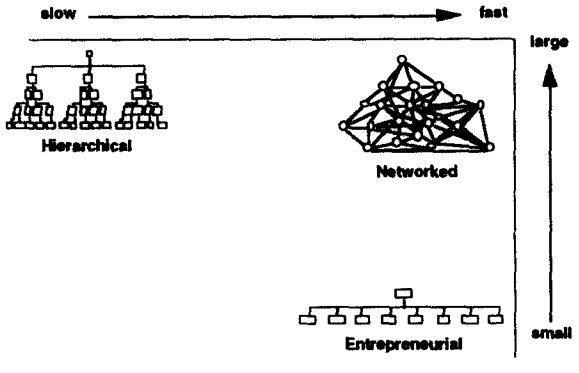
Company	*Product*	*Old Cycle*	*New Cycle*
Honda	autos	5 years	3 years
AT&T	phones	2 years	1 year
Navistar	trucks	5 years	2.5 years
H-P	printers	4.5 years	22 months

When companies are able to break through the functional stovepipes, results similar to those in Figure 8 can be achieved. If Detroit takes six years to get a new car to market and market conditions change — say, as a result of changes in oil prices or consumer preference for safety — and Honda can get a new car to market in three years, it is easy to predict which will end up with increased market share

Organization forms can be arrayed in a two-dimensional space: size and adaptability (Figure 9). In one corner are the hierarchical organizations; they can be as large as necessary, but move like sloths. The entrepreneurial form in another corner is much prized for its flexibility and nimbleness in the marketplace; the entrepreneur can turn the organization on a dime. Unfortunately, such an organization is condemned to remain small. In another corner is the networked organization; IT permits it to possess both large scale and agility. Of course, the hierarchical organization form has not vanished; most organizations can still produce a hierarchical organization chart. However, if you look at the way the organization actually operates, it typically has many networks — formal and informal — superimposed on the hierarchy. The fully networked firm has not yet emerged, but the direction of evolution is clear.

Figure 9

Emerging Organizational Form



In addition to working in a newly emerging organizational structure, third-wave managers face a new — and more difficult — set of managerial demands. Unlike the typical second-wave managers, who received an endowment of assets to operate and turn over to their successors unimpaired, third-wave managers haplessly inherit an obsolescent basket of resources. They get the keys to a local firm that must go global, an oversized firm that must be downsized, an electro-mechanical firm that must go solid-state. One of the hardest tasks is the conversion of the human resource base from the old model (white collar-blue collar) to the new model (knowledge-workers). The white-collar workers were the brains who told the blue-collar workers (the brawn) what to do. The accounting systems measured whether the brawn did what they were told so that they could be disciplined.

But the third-wave organization seeks and thrives on change — innovation and improving quality — and to achieve that, everyone in the organization, right down to the shop floor, must participate. Those we often still think of as blue-collar workers become

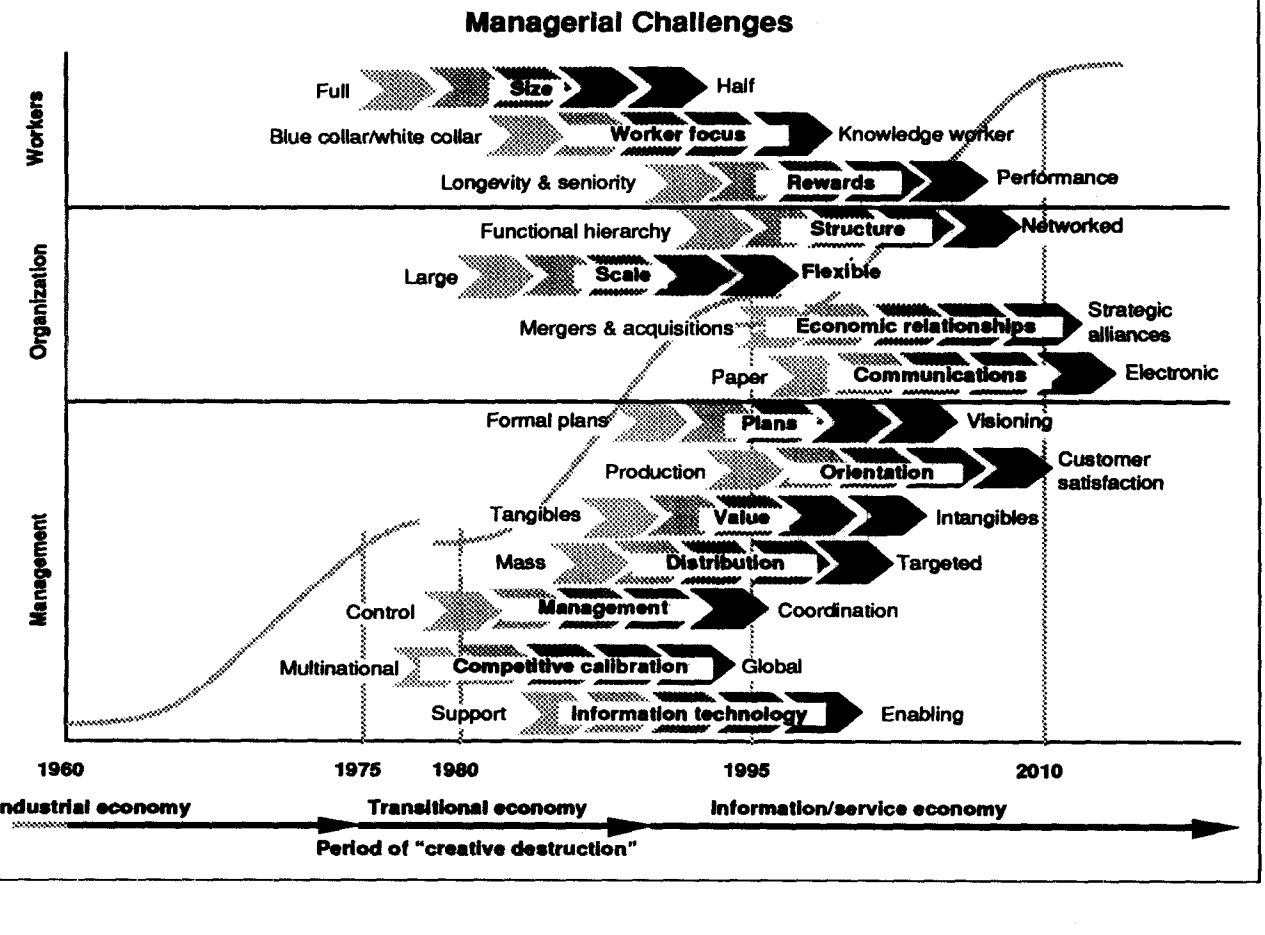
knowledge-workers in the third-wave firm. A gasoline truck driver now drives up to the tanks and opens the valves. This is not a second-wave truck — it has an on-board computer that tells the driver where to go next and how to optimize the route. *Every* job is becoming a knowledge-work job. Consider that shop-floor workers in a Japanese automobile factory spend 20 percent of their time in educational activities; management envisages them not as the brawn that is just supposed to do what it is told, but as a part of the aggregate brainpower of the organization; they are supposed to help figure out how to improve quality, speed production, and contribute to customer satisfaction.

Moreover, it is not sufficient for management merely to change all the resources of the organization; it must also change all the production processes. It must, for example, shrink product-design and production cycles. This can't be done simply by doing everything faster ("turning up the RPMs"). Management must redesign both products and production processes. They must reorient the entire organization from facing inward to the product to facing outward to the customer.

Most important, management must strive for quality products and services — not just good or excellent quality, but ever-improving quality. There is never a time when you can't figure out some way to improve. So quality targets are adjusted upwards over time. For example, the automobile you would have considered high quality in the 1930s would not rate your second glance today. Nostalgically, we like to say that cars were better in the old days, but it is not true. In the old days, after you drove an automobile 50,000 miles, you junked it. Today you drive it 50,000 miles and change the oil. There has been a huge improvement in quality, but the job is never finished.

Once a company masters fits, finishes, and durability, it proceeds to more abstract quali-

Figure 10

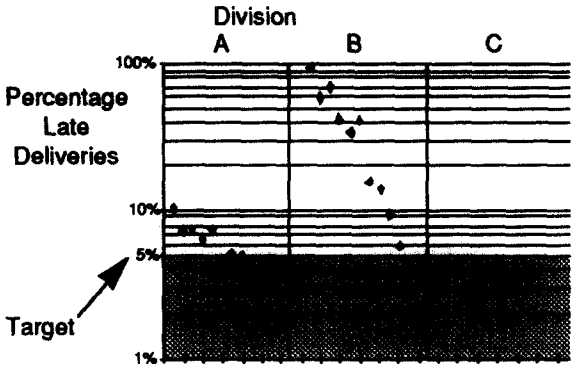


ties, such as the intuitive feel of the product. At length, you begin to realize that there is never any product or service that is so good that it can't be made better.

Management must create the organization that is inexorably biased toward process and product improvement.

The kinds of challenges facing management making the transition to the third wave are summed up graphically in Figure 10. It depicts those challenges for a hypothetical company being transformed to adapt to the post-industrial era. Companies would encounter the challenges at different times, but management would need information to assess progress and make decisions for each of the transforming arrows. They would therefore have accounting needs different from those of second-wave managers. The next section contrasts the two sets of accounting issues.

Figure 11



II. CHANGES IN BUSINESS REQUIRE CHANGES IN INTERNAL ACCOUNTING INFORMATION

Internal accounting information is decision-support information developed for use within the entity. In the second wave, this was known as "managerial accounting information," a term that conveys that the information is for the purpose of managing and controlling the organization. Applied to a third-wave company, the term would be imprecise, because every worker is a knowledge-worker expected to advance the interests of the firm. Information is intended to empower all workers, not just managers.

Remember that the second-wave, industrial-era accountant is measuring assets, liabilities, income, and expense: s/he is measuring at the w' level. Second-wave accounting systems lock in the Taylor model. They impound a strong assumption: there is a best way to do things, and once it is determined, we lock it into the organization; one of the tools we use to lock it in is cost accounting. For example, standard cost systems produce variances, which are systematically driven to zero. In other words, we drive the second derivative (the rate of change in processes) to zero. Typical measurements in a second-wave system are at the w' level — the rate of activity level.

Figure 11 shows a typical w' measure, this one a quality measure. The measure is on-time customer service, and the figure plots monthly late deliveries for three divisions. The target is no more than 5 percent late deliveries. The target is a rate of activity that is considered satisfactory — at the w' level. Division C appears to be the best division because it always meets the target for on-time delivery. Division B appears to be the worst division because it has never *yet* met the target. (We will reconsider this analysis later when we discuss the way these results would be analyzed in a third-wave accounting system.)

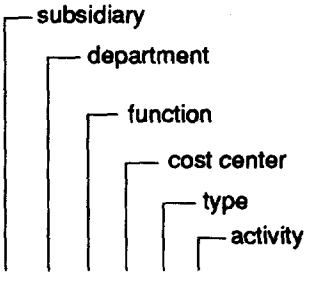
Another characteristic of a second-wave accounting system is that it focuses on tangible assets, that is, the assets of the industrial revolution. These include inventory and fixed assets: for example, coal, iron, and steam engines. And these assets are stated at cost. Accordingly, we focus on *costs*, which is the *production* side, rather than the *value created*, which is the *customer* side.

Second-wave accounting has a simplifying convention: we originate no accounting information until there is a transaction with an outside party. Only then will information be recorded and then journalized, posted, summarized, and reported. In this way the accounting is based on events and it is focussed on the past.

Finally, the second-wave accounting system maps the hierarchical organization. The general ledger coding structure is a virtual map of the hierarchy (Figure 12). The most significant digits represent the major branches high in the organization chart, and the least significant digits represent the "shop-floor" activities at the bottom of the organization chart. To obtain consolidated financial statements, we sort on the left digits, and to obtain activity statements, we sort on the right digits.

Figure 12

The General Ledger Maps the Hierarchy



The account coding structure locks the tree structure into the organization. The organization that tries to become networked and tries to break through the stovepipes is "snapped back" to the hierarchy by the accounting structure. Even if it forms interdisciplinary task forces to solve business problems and those task forces develop business-wide solutions, the budgetary process thwarts interfunctional cooperation. It has no way to deal effectively with shared costs and benefits, thus suppressing cross-functional behavior. In effect, the account structure is a powerfully conservative force trapping the organization in the second wave.

In summary, second-wave accounting systems operate at the w' level, consider only tangible assets, focus inwardly on products, wait for events to occur before originating accounting entries, and lock in the hierarchical organizational form.

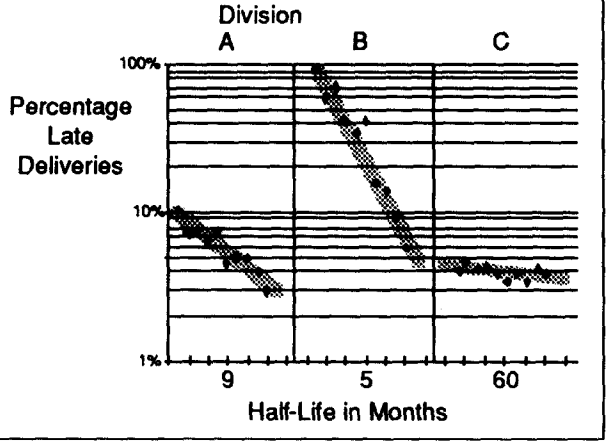
Recently, I was speaking with the founder and CEO of a highly successful software company. He told me that "trying to run my organization with the output of our accounting department is like trying to fly an airplane that has only one dial — a dial that shows the sum of airspeed and altitude. If it's low, I'm in trouble, but I don't even know why." This view is all too typical of CEOs' views of the value of their second-wave accounting systems.

Now we can contrast this to the third-wave accounting system. This necessarily is somewhat speculative, because these systems have not yet emerged. But I venture the following predictions about third-wave accounting systems.

First, they will focus on changes in resources and processes. Because the third-wave manager must transform the organization — both its resources and processes — accounting should provide measures of transformation, including rates of change in resources and processes. In other words it must move up from the w and w' levels to the w' and w'' levels. It must repudiate the Taylor model, which suppresses all change, including improvement. In a third-wave accounting system, the typical measurement would be at the w'' level.

Figure 13

On-Time Customer Service



We saw (in Figure 11) a w' measure of on-time customer service. Figure 13 depicts the same company with the same data. This figure is the same as the one above except that the 5 percent target for late deliveries is gone. Instead, the time required for each division to cut its rate of failure in half is computed (the half-life in months). The new target is to minimize the half-life. On the ba-

sis of this new target, division B appears to be the best (rather than worst) division, and division C appears to be the worst (rather than best). With the same company and the same data, the w'' (or third-wave) view yields quite a different picture than the w' (or second-wave) view.

Businesses are beginning to generate internal information at the w'' level. Moreover, they are beginning to write contracts on this basis as well. The second-wave procurement contract demands a defect rate of less than x parts per thousand. The third-wave procurement contract demands a defect rate of less than x parts per 1,000 this quarter, x parts per 10,000 next quarter, and x parts per 100,000 the following quarter.

Figure 14

Super-Fast Producers

Company	*Product*	*Old Cycle*	*New Cycle*
GE	circuit breakers	3 weeks	3 days
Motorola	pagers	3 weeks	2 hours
H-P	testers	4 weeks	5 days
Brunswick	fishing reels	3 weeks	1 week

The resources and obligations measured in a third-wave accounting system must also change. The resources that drive the third-wave company are information-based assets, such as R&D, human assets, knowledge, data, and capacity for innovation. These assets don't even appear on second-wave balance sheets. We cannot leave them out of the accountability set and expect managers and investors to reach sound decisions.

Figure 15

Comparison of 2nd and 3rd Wave Accounting Systems

Industrial era	*Information era*
resources (w) and processes (w')	rates of change in resources (w') and processes (w")
tangibles	intangibles
products	customers
events	processes
maps hierarchy	enables network

Because the third-wave organization is focussed outward on customers, its accounting system must be concerned with measuring the values created for customers.

The third-wave accounting system must enable the network rather than lock in the hierarchy.

Finally, the third-wave accounting system must provide real-time dials on the business rather than waiting for events to occur before recording them, thus providing only a retrospective look at the enterprise. As a practical matter, more and more businesses, through use of computer integrated manufacturing, resemble continuous-process activities. It is increasingly unusual to see work-in-process sitting on the shop floor for weeks and months. What we see is completely redesigned production processes that minimize the non-value-added time.

Figure 14 illustrates the order-of-magnitude improvements possible with process redesign through IT. The production cycle times represent the elapsed time from order to finished goods. With such virtually continuous processes, it is possible to think about "process-dials" in real time on the business.

As noted, this third-wave accounting system is a set of predictions, because there aren't any such systems yet. But these predictions (see Figure 15) embody a focus shift from the w and w' levels to the w' and w'' levels, from tangibles to intangibles, from products to customers, from events to real-time dials on the processes, and from mapping the hierarchy to enabling the network.

We can take these speculations further by focusing on the kinds of information management actually uses to run the business, instead of on the categories of traditional accounting.

At the highest strategic level, running the business means determining the "industry(ies)" in which the company wants to participate and the fundamental approach to succeeding in the industry(ies) the company already participates in. However, the information needed for such purposes is broader than what accounting systems can systematically collect

and generate. For example, strategic thinking at this level involves considering social, technological, and political trends, and no accounting system is likely to be designed to do that. To get a better fix on what kind of information might be feasible to include, we can use Michael Porter's model of the elements of industry structure (see Figure 23). According to the model, the key elements are (1) the threat of new entrants, (2) the threat of substitutes, (3) bargaining power vs. suppliers, (4) bargaining power vs. customers, and (5) the intensity of rivalry of the present competitors.

No accounting system is likely to report systematically on the threats of substitute products and new competitors entering the market, even though such information would be helpful whenever it was obtained. However, there is a lot of relevant information in the three remaining categories that can be collected and reported systematically to assist management in its strategic and tactical decision making. Selected examples of such information are presented below for each industry in which the company has a strategic business unit ("SBU"):

Competitive position of SBU (for company and its principal competitors)

- Percent of sales from products developed in last x months (excluding product-line extensions).
- Average time to bring a new product idea to the marketplace.
- Market's perception of quality of products vs. competition.
- Market's perception of quality of service vs. competition.

Bargaining power vs. customers

- Percent (number) of customers accounting for x percent of total sales.
- Customers' industry concentration.

Bargaining power vs. suppliers

- Percent (number) of suppliers accounting for x percent of total purchases.
- Suppliers' industry concentration.

The sources of these types of data vary by industry and may include public data bases, competitor intelligence systems, and the company's own transaction systems. Each type would be useful, but customer data is perhaps the most important for a third-wave company. Without a focus on the customer, a company has little chance of success in the third-wave economy. For this reason, we shall explore the issue of accounting for customer satisfaction more closely.

Bargaining Power vs. Customers

Customer satisfaction is closely related to customers' perceptions of the *quality* of products and services they receive from a vendor. There may be as many definitions of quality as there are customers. But, in general, the closer the fit between customer desires and product attributes, the higher the customer is likely to assess quality. An *apparently* high quality product (measured, say, by fit, finish, and durability) that poorly fulfills the customer's desires is not likely to be rated as high quality.

Customers' standards for judging quality are not fixed, but change over time. Many products considered high quality fifty years ago wouldn't rate second glances in today's marketplace, because standards have risen — spectacularly for some products: think of airplanes, stereos, and business equipment. In other areas, standards haven't changed as much: a good loaf of bread fifty years ago would still be a good loaf of bread today.

The fact that perceptions of quality change over time suggests that quality is a relative concept. There's no measure that objectively states the quality of a product or service for all time. All we can say is that consumers can compare the quality of two products or services and say which is better quality. Similarly, a consumer could consider a particular product or service and specify what would make it higher quality. For these reasons, surveys of customers' perceptions of quality are irreplaceable. Nevertheless, data on the characteristics of products that lead to customer satisfaction are just as important. Without this link to the design and productive processes, there would be no path to improvement.

Other factors equal, consumers would probably rate a product higher in quality if it:

- had more utility,
- were cheaper, or
- were available sooner.

Each of these would have to be studied closely. For example, if we could read the customer's mind, we might find that:

- utility encompasses durability, reliability, performance, and maintainability,
- cost includes not only purchase cost, but total life-cycle cost of ownership, and
- timeliness embraces shorter product design and manufacturing cycles and even an element of innovation (the innovator having more timely products than the replicator).

Some of these components are monitored today by most manufacturers (for example, cost, outgoing quality levels, and on-time deliveries), though often the customer's definitions of acceptable quality and on-time delivery differ from the company's. Other indicators of quality can be teased out of information already contained in, or easily added to, accounting records. The computing capacity inexpensively available today permits far more thorough analysis of accounting data to infer key components of customer satisfaction. For example:

- *Durability.* If sales documentation were expanded to include the age of units being replaced, measures of durability under actual customer conditions could be developed.
- *Reliability.* Analysis of parts and service records could yield up-time ratios and mean-time-to-failure figures under actual use conditions.
- *Performance.* Customer reorder rates and trends would indicate satisfaction with performance.
- *Innovation.* Percentage of revenue from products that did not exist two years ago would indicate the level and trend of innovation. (The ability to sell new products to customers is a more valid measure of innovation than, say, the number of patents obtained.)
- *Product-design cycle.* Elapsed time from product conception to first commercial sale. For longer-term projects, milestones can be tracked.
- *Manufacturing cycle.* Elapsed time from raw materials to finished goods. A close relative is the ratio of work-in-process inventory to sales.

Technology will open more possibilities for the future. For example, when caller identification becomes available, the information in a company's telephone switch (which is, after all, just a part of the company's computer system) will permit monitoring of customer-satisfaction issues from call patterns. A burst of calls from customers' maintenance shops to the company's engineering department could signal deteriorating maintainability. A reciprocal burst could signify that engineers were not able to diagnose problems in real time, but had to investigate and call back later.

Reconceiving the Exchange Transaction

Even though most of the information on quality discussed above is "nontraditional" in accounting systems, it could be processed from data in today's records. However, the importance of information on customer interactions suggests that basic exchange accounting could be rethought in order to capture more of that kind of information.

As I have noted, the traditional system is based on initiating accounting information only when events are transacted with outside parties. This has obvious virtues. Companies will always need to keep track of transactions with customers, suppliers, and employees; otherwise, they wouldn't know the status of their many outstanding rights and obligations. Nevertheless, events with outside parties that are recorded under the traditional accounting model are only a segment in a series of interactions, and those other interactions are potentially useful in evaluating customer satisfaction. The interactions are depicted more fully in Figure 16.

In simple systems, only the receipt of cash is recorded (cash-basis accounting). As the band of interactions that receives accounting recognition expands, it tends to reach further backward in the process. Accrual basis accounting records both the shipment of goods and the receipt of cash. Governmental "fund" accounting picks up the commitment. Theoretically, a commercial company could also start with the commitment. Although "fund" accounting records appropriations and encumbrances on only the purchase side, the concept can be applied to the sales side. A commercial company, for example, has committed sales or backlog.

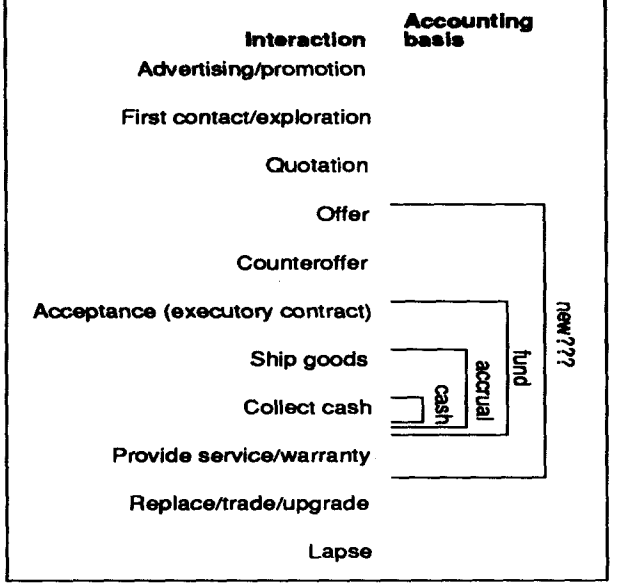
The plain fact is that the breadth of the data to be recorded is optional. A system might, for example, pick up outstanding offers (in effect, one-sided entries — with no mutual consideration). It might be designed around the *entire customer relationship* rather than the individual sales *transaction*. And with modern information technology, it might be cost-effective to systematically record more customer interactions.

Today's systems typically record six facts for each transaction: transaction type (for example, credit sale), identity of other party to transaction (customer, supplier, employee), description of goods or services, unit price, quantity, and date (a seventh fact — the identity of the entity itself — is implicit). This set could be extended — for example, to include such additional facts as whether the goods were first-time or repeat sales or replacements, the age of goods replaced, competitive offers (quality, price, etc.), and the supply-chain position of the purchaser. Any types of information actually collected would have to be determined by their usefulness to management in running the business, and the effort to collect them would have to be justified by that usefulness.

A similar set of questions could be asked about the other major transaction systems: those for suppliers and employees.

Figure 16

Customer Interface



IT Makes Third-wave Accounting Systems Possible

IT, the cause of the third wave and new information needs, also makes the needed accounting systems feasible. The IT capabilities listed below will enable third-wave companies to collect, analyze, report, and disseminate the new types of information.

- ***Automated data capture.*** This is a tremendous cost advantage offered by IT — the opportunity to design customer, employee, and supplier interfaces in such a way that interaction data are automatically captured.
- ***Instantaneous access and processing.*** This is the time dimension of IT's advantage. The third-wave accounting system must be able to analyze and react to marketplace data in real time. The data and analyses must be accessible to managers immediately.
- ***Geographical freedom.*** This is the space dimension of IT's advantage. The third-wave accounting system must address all aspects of the company without being handicapped by the relative remoteness of locations. Teamed with the time dimension, it means that information from anywhere in the company can be accessible to managers immediately, that there can be company-wide sharing of data.
- ***Fully versatile analysis and reporting.*** IT can allow the third-wave accounting system to perform new analyses and re-

port in new formats as needed. The manager of the third-wave company must be able to have data reported in the manner desired, even if the report has never been demanded before.

- ***Capacity for additional data types.*** IT can allow the manager to add new information types to the accounting system without redesigning its entire structure and while retaining the other advantages already described.
- ***Access to external data bases.*** IT can allow the third-wave accounting system to tap external data bases. Much of the information needed for the third-wave accounting system is about competitors and other marketplace features. Such information would be available from public data bases and could be marshalled on demand for managers.

The characteristics just described are those of the wide area network and the relational data base.

A wide area network is more than a set of wires. It is also the intelligence (embedded in software) to navigate through the network to find and take advantage of information. Information does not exist in a vacuum — it was created by someone. So the ability to find information is also the ability to find expertise — the person who created the information. This is a crucial aspect of the nimble, adaptive company, opening the way for productive interactions as well as additional sharing. Some have concluded that the key resource of the modern enterprise is its aggregate brainpower, but that this is useless unless it can be marshalled on demand. The wide area network is essential to finding and marshalling corporate brainpower.

The relational data base concept provides that data can be added along any dimension. New types of data — for example, information about suppliers, customers, and competitors — can be added to existing systems without altering existing uses and functions. Once the new data are added and their relationships to the existing data are specified, they can be used with the old data types to create new types of reports and analyses.

These reports and analyses are not limited. The same relational data base can be "viewed" from many angles. The traditional angles (or "views") are personnel, sales, credit, production, etc. However, it is also possible to adopt the following angles (assuming only that relevant data have been captured): strategic planner, market analyst, customer, supplier, and competitor.

The wide area network is extensible. It is not bounded by the structure of the organization. For example, it can connect to public data bases, to customers, and to suppliers. These sources can supply much of the external information discussed above. They can also receive information from the company. Management can permit suppliers and customers restricted views into the company. One form of this sharing is EDI — electronic data interchange.

Many companies have wide area networks and relational data bases, but are not full-fledged third-wave companies. The technologies are necessary but not sufficient in themselves to create a third-wave accounting system. The systems must be designed to serve the company's needs, must reflect the company's vision and managerial strategy, and must be integral to its structure, style, and purpose. Then the capabilities must be managed effectively, prompting behavioral changes among personnel that harness the technologies for competitive advantage.

III. CHANGES IN BUSINESS AND NEW ACCOUNTING NEEDS REQUIRE CHANGES IN EXTERNAL ACCOUNTING

Like "management accounting," "financial accounting" is a second-wave term. It limits the reporting entity's accountability to financial information, and third-wave entities have external accountabilities that go beyond financial information. These accountabilities represent accounting needs that call in question the efficacy of GAAP.

Much of what users want to know about the company is nonfinancial. The same reasoning makes "financial" a constraint that limits the usefulness of GAAP. For example, us-

ers want to know the company's mission and goals, its strategy, the industries in which the company participates, the competitive position of the company within those industries, the relative levels of quality and customer satisfaction of the company and its competitors, progress in product-design and production cycle-time reduction and productivity, and development of the company's human assets. None of these can easily be reduced to financial numbers.

Besides being limited by the concept of financial information, today's GAAP present investors with *periodic, historical, cost-basis statements*. Each of the four italicized words represents an additional second-wave limitation on external reporting.

Periodic financial statements follow the annual agricultural (first wave!) cycle, later expanded to quarterly in the United States (but not everywhere). However, the volatility of today's markets suggests that more frequent reporting of some sort would be beneficial, and IT permits it.

GAAP's insistence on *historical* information is another limitation. We know that users wish to estimate the magnitude, timing, and uncertainty of *future* cash flows, and the FASB's concepts statements recognize it. In addition, the third wave increases the speed of change to such an extent that straight-line extrapolations from the past are no longer good predictors of the future. This condition and users' purposes suggest that forecast information should be supplied.

GAAP also favors *cost-basis* information, despite the fact that assets and liabilities are subject to increasingly rapid shifts in value. The call for mark-to-market accounting for financial entities is evidence of the strain third-wave economics has put on GAAP.

And finally, GAAP presents information in *statements* — physical aggregations of data presented in a standardized form on paper — whereas IT opens the possibility of presenting data in different forms. IT makes possible the real-time release of salient facts as they occur. IT also makes it possible to deliver analytical models over wide-area networks. For example, instead of (or in addition to) presenting physical external statements to investors, users might log onto the company's system and manipulate the company's spreadsheet to analyze and reanalyze the company's data along dimensions different from those reported or change management's assumptions and reanalyze the data.

GAAP has several of the limitations of traditional internal accounting. It focuses on transaction-based financial information, looks inward at the product instead of outward at the customer, and measures at the resources and process levels (w and w') instead of the changes in resources and changes in processes levels (w' and w''). It favors tangible assets with balance-sheet expression, while disfavoring intangible assets (such as human assets, information assets, and R&D) by treating them as expenses.

Discounting even half of the limitations cited in this section, the case for a reconsideration of GAAP is still powerful. But the FASB is not free simply to figure out a better GAAP model and impose it. The Board works in a political environment. Its pronouncements affect the creation and distribution of wealth, and those affected naturally lobby for their interests. Kenneth Arrow taught that for making decisions that affect people's welfare, there is no "scientific" method that is both rational and fair — that the only alternative is political.

The FASB, then, is quite properly a quasi-political body, constituted to consider the desires of the parties with a stake in the outcome when fulfilling its mission — and they are diverse constituencies that seldom agree. One of the few things that financial statement preparers agree upon is that the scoring rules should not be changed in the middle of the game. Thus there is a powerful constituency in favor of the *status quo*. Add the attesters — who are dissuaded from change by unknown, but probably unbearable, legal liabilities — and you have an implacably conservative environment. The same managements that complain that they can't run the business with today's accounting information are the ones who make pilgrimages to Norwalk to lobby *against* changes.

The academician's natural retort is, "OK, we can't change external accounting. But we can change internal accounting, because it can be anything management wants it to be in order to run their business. So, that's where our target should be."

There are three problems with this answer: (1) the impediments to change within the company are far greater than commonly recognized, (2) there are serious risks if we permit internal and external accounting to diverge, and (3) the decisions of investors and managers are fundamentally similar.

In the first place, every entity has its own microcosm of the political misalignment that prevents consensus for change at the GAAP level. In all likelihood, the internal losers would be the advantaged constituencies — those with the highest propensity and strongest clout to resist change — for example, functional vice presidents, who lose power when stovepipes are abolished. Thus the political drama played out in public in Norwalk is played out in private in numerous corporate offices.

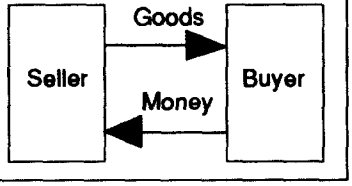
In the second place, we run a big risk if we permit internal and external accounting to get out of sync with each other. If they measure conceptually different outcomes, a tension will arise between internal and external accounting that may lead management to do things that they know are sub-optimal. For example, in a bad quarter, they may be motivated to window-dress the external accounts by doing things that they know not to be rational from a managerial standpoint — like firing people, the third-wave human assets, who may be more important to future success than relatively obsolete plant and equipment. It is often stated that American managers suffer from a short-term orientation caused, presumably, by quarterly reporting. However, the problem is not quarterly reporting, it is the difference between external accounting and economic reality (ideally reflected in internal accounting) that gives rise to such acts. If GAAP were a good model of economic success, there would be no harm in managers trying to maximize along a GAAP measurement scale as often as possible. The problem is that GAAP is not a good measurement of the creation of real values. To avoid the creation of motivations for uneconomic behavior, external and internal accounting systems ought to be "consistent." Consistent, in this sense, permits different "views," but into the same underlying reality.

An analogy: If you're in New York and want to go to Boston, you need a map. The type of map depends on how you're going to get there. For hiking, you need a topographical map so you can avoid mountains. For driving, you need a road map. For going by boat, you need a marine navigation map. For flying, you need a map that shows the locations of tall buildings, and so forth. Though each of those views is different, depending on the use to which it is put, the underlying reality is consistent: New York and Boston remain the same distance from each other, the same direction, and so forth. In the same sense, business requires consistency between the external and internal accounting systems.

In the third place, the tasks of investors and managers are essentially similar, though performed at different levels. Each is interested in selecting among competing investment alternatives so as to maximize the present value of future cash flows. Accordingly, the decision information used by each may be different in degree of detail (fineness) but should be, as noted above, "consistent."

Figure 17

A Simple Exchange



If standard setters are to break out of the second-wave paradigm, they will have to think of new models that are not grounded on the simple transaction. The typical second-wave transaction is depicted in Figure 17, which shows the exchange of goods (or services) for money (or a promise to pay money in the very near future).

The current GAAP model impounds the following assumptions:

- Nothing accountable happens until there is an exchange.
- Exchanges are bargained at arm's length.

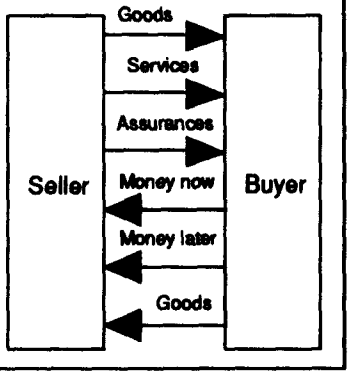
- Exchanges are simple (cash for goods or services).
- One side of each exchange is cash virtually now.

It is the simple equivalence of the values of the cash (or virtual cash) and noncash components of the simple exchange, bargained at arm's length, that makes double-entry bookkeeping work.

However, IT permits persons doing business to engage in much more elaborate exchanges and keep track of them. Figure 18 shows a more complex (though not the most complex possible) exchange that invalidates an assumption underlying GAAP accounting, because there is no way to allocate the value of "money now" (the only directly measurable component of the exchange) to the five noncash components of the exchange. GAAP must come to terms with this more complex world if it is to retain its relevance.

Figure 18

A Complex Exchange



Following are some implications for standard setters entering the third wave. They should:

- Study the behavior of users, not just their stated preferences or their comments on GAAP. If they use non-GAAP information in attempting to predict future cash flows, assume it is useful.
- Study IT era internal information needs.
- Focus on third-wave value drivers (information-based assets and people).
- Focus on continuous rather than periodic information flows.
- Focus on measurements that signal change in the rate of change (that is, w'').
- Provide continuing service (consultation, education, software) to constituencies.
- Educate managements and users as to the third-wave accounting paradigm.

IV. CHANGES IN BUSINESS AND NEW ACCOUNTING NEEDS REQUIRE CHANGES IN PUBLIC ACCOUNTING FIRMS

Public accounting firms have not adjusted to the third wave. The biggest challenge they face is that a very large part of their practices is tied — loosely or tightly — to historical cost-basis financial statements that are losing their utility. Most accounting, auditing, and tax work and perhaps half of consulting work is related to historical cost-basis financial statements or accounting systems. Yet, unlike other enterprises whose product is declining in utility, public accounting firms cannot unilaterally redesign the product, because GAAP and tax laws are determined externally.

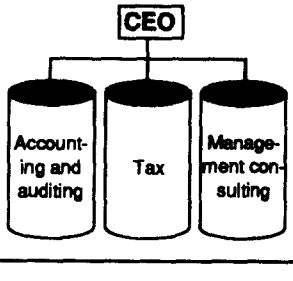
CPA firms are also organized the way second-wave entities are organized. They are "stovepiped," as depicted in Figure 19, instead of networked, divided instead of teamed. They must break through these stovepipes in order to better serve their clients.

CPA firms have two separate, though related, product lines: attest services and consulting services (which, broadly defined, subsume tax services). Each of these will be dealt with in turn.

The third wave creates two separate opportunities for attest service: it produces vast new streams of information that demand attestation, and it provides the means to automate much of the attest process.

Figure 19

CPA Firms are "Stovepiped"

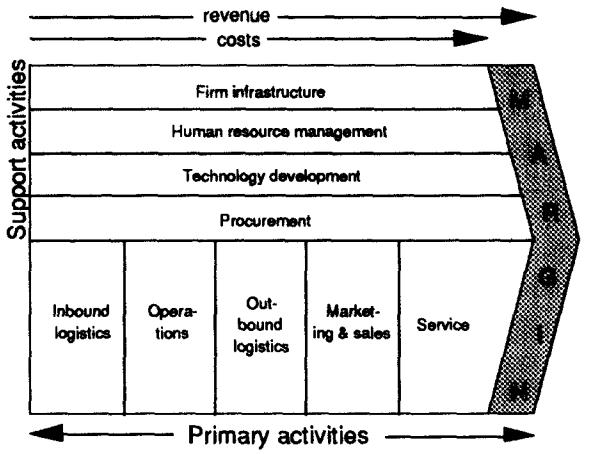


Historically, CPAs have attested to financial statements, but these statements contain a declining share of the information used by investors. In a survey I did about ten years ago, I already found more than 400 examples of attestation to information other than the financial statements. These included attestation to forecasts, projections, feasibility studies, EDP software, internal controls, utility rate applica-

tions, contract costs (cost-plus-fixed-fee contracts), regulatory filings, lease contingencies, royalties (coal, oil, motion pictures, etc.), compliance with regulations, occupancy statistics, enrollment statistics, attendance statistics, political contributions, labor negotiations data, third-party reimbursement claims, and many others. The more new data streams, the more attestation opportunities arise.

The development of new data streams must be seen in terms of the conditions for economic demand for attestation services. Whenever (1) users need the information, (2) there is a conflict of interest between the preparer and the user of the information, (3) the information is "auditable," and (4) there is a favorable cost-benefit ratio for attestation, the conditions for economic demand of attest services are in place. Taken together with the new streams of information being generated, the opportunities are promising.

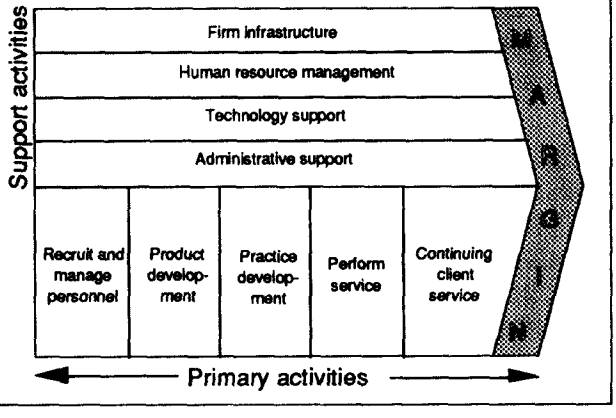
Figure 20
Generic Value Arrow



Source: Michael Porter

At the same time these opportunities are developing, IT is changing the production technology of auditing, providing more efficient and different means of attestation. These include more and cheaper computing power, wide-area networks, and the emergence of "intelligent" software. In combination, these resources permit redesigning the audit to piggy-back the client's systems in real time, producing attestation on demand.

Figure 21
CPA Firm Value Arrow



Now we turn to the nonattest services of CPA firms. It is helpful to consider these services by applying Michael Porter's value-chain analysis.

In value-chain analysis, all the activities of the firm are mapped into a value arrow (see Figure 20). The overall length of the arrow represents total value created by the organization: in a competitive market, that is what customers are willing to pay — that is, revenue. In order to create those values, costs are incurred, which is represented by the shorter (unshaded) length of the arrow. The difference between revenue and cost (the shaded area) is margin. In order to increase margin, the enterprise can, for example, increase value to customers or decrease costs. The activities of the firm are mapped into the various cells in the arrow, representing two basic groups: those that create value for customers (primary activities) and those that don't, but are required in order to sustain the entity (supporting activities). Generically, the primary activities are inbound logistics, operations, outbound logistics, marketing and sales, and continuing service. For Ford, operations is building the car. But building and delivering it are not enough: Ford must help the customer keep the car on the road — continuing service.

A value arrow for an accounting firm is depicted in Figure 21. If accounting firms are to prosper, they must make their clients better off. They cannot make their clients better off through selling them raw materials at lower prices or lending them money at lower rates.

So how can CPA firms make their clients better off? What is their special value to clients? What can they do for clients swimming in pools of new information? One formulation is that CPAs can attempt to make their clients better off through the use of information and information systems. This is because clients are all interested in the strategic use of the growing sources of information available to them, and CPAs are information specialists.

Figure 22 shows the CPA firm as one of the client's suppliers. The CPA firm's goal is to make its clients better off — to maximize total value along the value chain. The way to do that is to help the client make its customers better off.

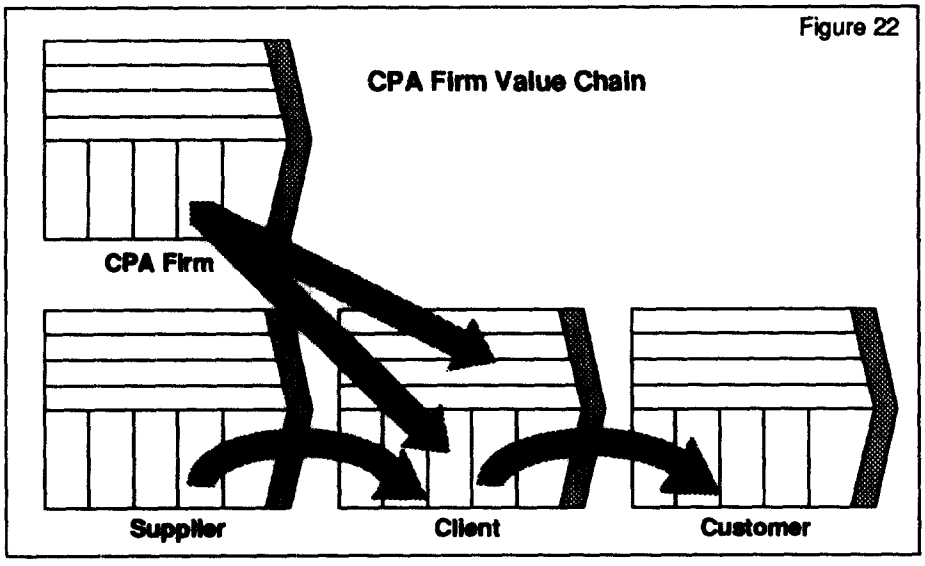


Figure 22

If we look at the traditional products of CPA firms — audits and tax compliance, we see that they are directed to the support activities of client firms (the upper arrow from the CPA firm to the client in Figure 22). These services provide value by lowering the cost of capital and by minimizing tax expense. Nevertheless, these services are not directed at the clients' *primary* value-adding activities. In order for the CPA firm to flourish, it must focus on services directed to the strategic use of information to facilitate the primary value-adding functions in its clients' organizations.

First steps necessary to achieve this include the following:

- Develop a fundamental understanding of the strategic value of information systems.
- Understand how the client's primary value-adding activities create value.
- Figure out how the client can create more value through the use of information and information systems.
- Identify, coordinate, and develop the resources in the firm to make it happen.

Only then are CPA firms likely to flourish in the long term.

V. CHANGES IN BUSINESS AND NEW ACCOUNTING NEEDS REQUIRE CHANGES IN ACCOUNTING EDUCATION

The changes discussed to this point have important implications for education. Graduates are no longer entering second-wave companies. Even those companies that appear to be prototypical industrial companies are in the process of transformation. They are becoming richer in the use of information and IT. In many cases, even their products contain more information; for example, today's Ford contains thirteen computers (to manage lighting, carburetion, braking, entertainment, etc.). Graduates need to be able to function in these emerging third-wave companies, and the curriculum must be changed to give them the capabilities.

The American Accounting Association recognized many of these needs in its Bedford Report (1986). Although the report focused on changes in the profession and what was necessary to prepare students to function in the new professional environment, it also recognized that the challenge to the capabilities of graduating accountants derived from economic change: "The accounting profession...is in a state of flux, reflecting massive changes taking place in technology and social values, and in social, government, and business institutions."

The Bedford report rightly held that "The fundamental challenge to accounting educators...is how to identify an appropriate balance between a broad fundamental education and a sufficient accounting education in special fields." Breadth meant strengthening the general-education component of students' experience and revising accounting courses to treat the discipline as an information development and distribution function for economic decision making.

A similar stance was taken by the leaders of the largest accounting firms in a signed paper issued in 1989 (*Perspectives on Education: Capabilities for Success in the Accounting Profession*). The paper called for educational breadth and stressed the need for students to develop analytical and conceptual thinking about accounting as opposed to memorizing the voluminous and rapidly expanding rules accountants must apply in their everyday work.

Considering the principle of comparative advantage, higher education clearly can do better than employers at general education: for example, communications, language, analytical abilities, economics, and quantitative methods. But practice firms are at no disadvantage with technical content: for example, computer auditing, statistical sampling, and FASB 96. To maximize comparative advantage, employers look to colleges and universities to deliver the components of general education.

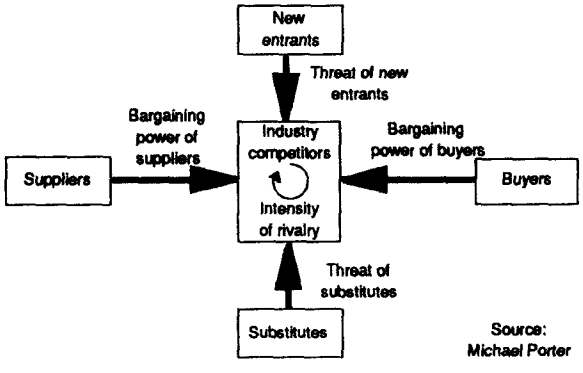
The new curriculum must integrate technology. Merely giving students PCs and having them learn word-processor and spread-sheet programs is insufficient to prepare them to enter third-wave companies. They need to learn how organizations can enhance the value they deliver to customers through networking. They need the experience of participating in a network.

The new curriculum should also be oriented to give students an appreciation and some understanding of the various aspects of globalism. Accreditation standards already mention an "international" requirement, but too often this has been satisfied with an optional half-course in international accounting. That approach cannot, for example, allow the student to appreciate the ways in which every business today faces global issues. Every enterprise, no matter how local it appears to be — even if it appears to be bolted to the ground in Oklahoma with all of its customers within five miles — is affected by nonlocal events and conditions. We can pursue this briefly by positing the Tulsa General Hospital and asking whether its claim to being strictly local is valid.

First let's look at the organization in the context of Michael Porter's "5-box" analysis of the competitive situation (Figure 23). Consider the suppliers: the medical imaging and diagnostic hardware comes from Germany and Sweden, and the new residents come from Saudi Arabia, Pakistan, and India. Even if the customers are local, whether that customer base stays put in Tulsa is profoundly affected by what happens to the world price of oil, which is largely determined in the Middle East. Then there's the threat of new competition — say a large, multi-national healthcare organization that enters the Tulsa market or simply buys the Tulsa General Hospital. And finally, there's the threat of product substitution, as, for example, new medical and surgical equipment — invented overseas — changes in-patient services to out-patient procedures that can be performed in doctors' offices.

Figure 23

Elements of Industry Structure



To get across the message that all enterprises face global issues, a global perspective should be built into all elements of the curriculum. To package that perspective in a half-course in international accounting is to understate its pervasiveness.

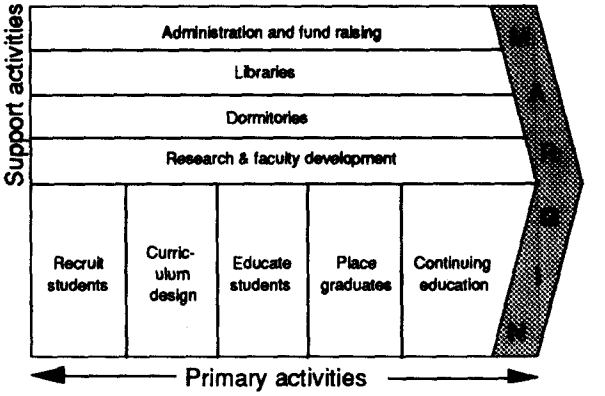
Finally, since the renovated curriculum must prepare graduates to enter third-wave companies, it must teach an accounting model suitable to third-wave circumstances. This is a demanding challenge, but the need is clear.

A Strategic Planning Model for Higher Education

The needed changes — which pervade the entire education of accountants — require strategic planning by accounting departments and educational institutions. They must redesign their product and their delivery process. They must adopt their own "customer" orientation and figure out how to create greater educational value for their "customers" — the students and their employers. Porter's value-chain analysis is again a useful analytical model to apply.

Figure 24 shows how Porter's generic value arrow can be adapted to the university. Its primary activities are recruiting students (inbound logistics), curriculum design (marketing), educating students (operations), placing students (outbound logistics), and continuing education (service). The support activities — the infrastructure necessary to open the doors each morning — include libraries, dormitories, administration, fund raising, research, and faculty development. (This value arrow relates to the education "product line" of the university. Research universities have a second product line — new knowledge — and research would be a primary activity in such a value arrow. See section VI of this article concerning accounting research.)

Figure 24
University Value Arrow

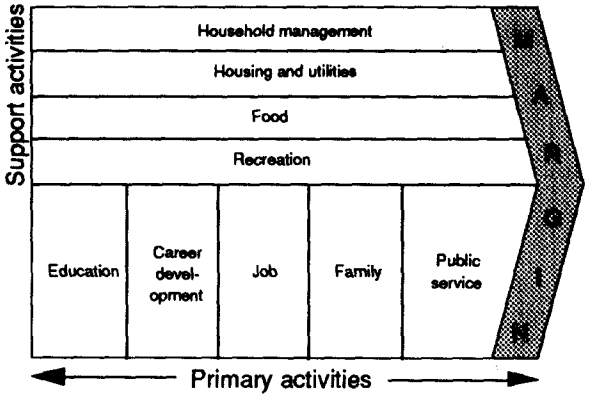


Of course, value created by the university is more than just revenue (tuition, room, and board) because education has significant positive externalities. So let's think about total value as the "utils" produced for graduates, which is much greater than the tuition and costs they pay.

Of the value-creating activities, curriculum design is the key process by which the university designs its "product" to be of most value to its customers: students and their employers. In order to maximize total value created, it is necessary to consider the customers.

The customers also have a value arrow; with inbound and outbound logistics, operations, and so forth. Figure 25 is a candidate value arrow for a student (or, generically, a citizen). The student also expects to create value, and, again, revenue (salary) may not be a sufficient measure, so we can think about the total of values that an individual can create in a lifetime.

Figure 25
Student/Citizen Value Arrow



A student/citizen has the primary value activities of education, career development, job, family, and an altruistic component of public service. The supporting infrastructure includes housing, food, and so on. Although other student arrows could be proposed, all educators must agree that "education" is a primary value-producing activity for student/citizens.

After developing these individual arrows, the interesting part is concatenating them into a value chain. This permits analysis of value created across the entire chain, including the university's component. The value chain in

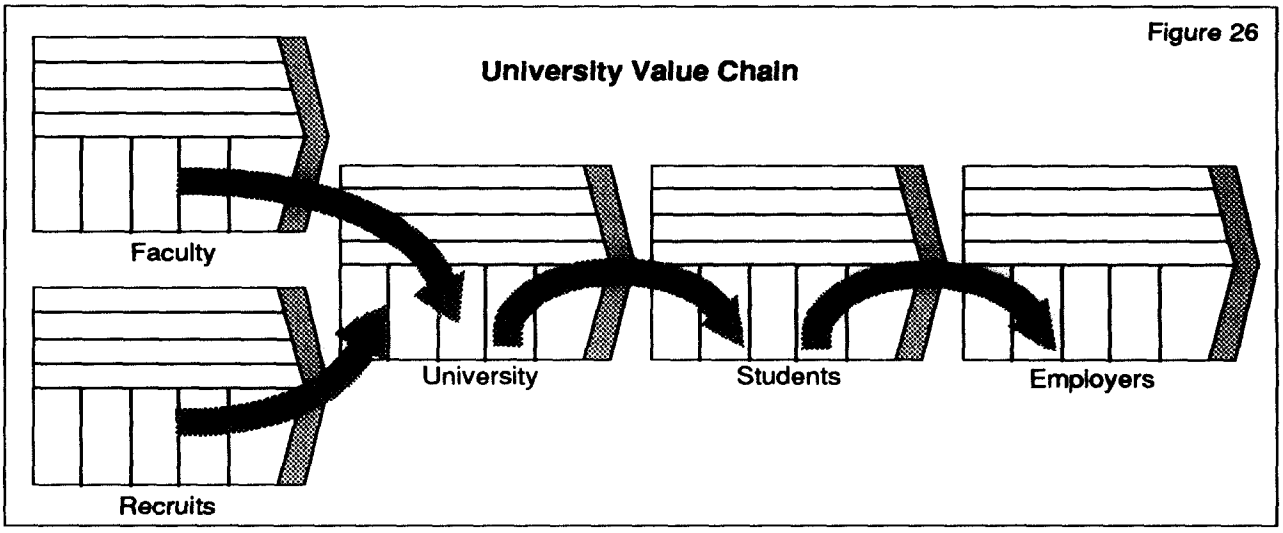


Figure 26 includes the university, its suppliers (faculty and recruits), its customers (students), and their customers (employers). The model permits analysis of the curriculum in terms of how the university can create value for both students and employers, all the way down the value chain. In the value chain, note that the needs of students and employers are related — not identical, but related — because, although education aspires to create broader values (for example, capacities for enlightened citizenship and cultural appreciation), it must also create employability.

Value-chain analysis need not look only forward in the value chain, but can also look backward as Figure 26 shows; the university is not the beginning — other value activities precede it. These include the primary inputs to higher education: faculty and students. The value chain has implications for these sources of value.

Figure 26 implies that faculty should be selected for their ability to serve the university's value creating activities, particularly its customer satisfaction activities. That would mean selecting faculty with regard for their ability to teach. And it would mean demanding evidence of ability to teach from suppliers of faculty — that is, the doctoral granting institutions that supply new assistant professors.

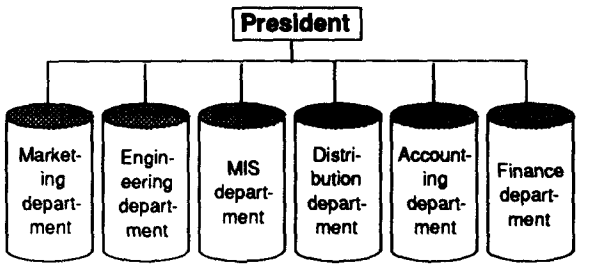
The other main input to higher education is the students — that is, recruits from secondary education. Universities frequently complain that the quality of K through 12 education in America is so poor that the university is reduced to remediation. Higher education cannot just wring its hands, saying "K-through-12 education in the U.S. is in the tank." If Ford Motor Company were putting bad tires on their automobiles, the tires were blowing out, the automobiles were rolling over, and the Ford drivers were perishing, Ford would not wring its hands and say "Isn't that terrible?" It would work with the tire manufacturers; help them design a better tire; and mate that tire to the automobile to maximize safety, convenience, comfort, durability, and reliability. Similarly, higher education in the U.S. cannot just sit around wringing its hands about K through 12 and do nothing about it. It must participate in solving the problem.

The Structural Problem and the Emerging Consensus

Higher education is not organized to adapt its educational service to the third-wave environment. Colleges and universities are structured very much like the industrial-era organizations, with the same stovepipes and the same antiquated budgetary systems that militate against interdisciplinary cooperation (Figure 27 depicts stovepipes in the typical business school).

Given this kind of structure, we must ask how the new curriculum can be developed. The reforms in general education, for example, require communication among the departments. Courses in a business school should be both complementary and integrative. How can a university give the students a wholehearted and convincing message that networked organizations can create more value for customers if it is locked into the stovepipe structure? The irony of the current structure of academic organizations is that some think of the networked organization as "collegial."

Figure 27
The University Is Also "Stovepiped"



As a result of new demands in the context of old structures, universities have a difficult task. But it isn't a hopeless task, especially since there is an emerging consensus that curriculum reform is necessary. The consensus includes faculty (who are embracing the philosophy of the Bedford Report), university administration, employers, accreditors, and regulators.

The consensus is being propelled and reinforced by the forces of consumer demand. These forces have been fed by several factors that are creating a "buyers' market." First, the "baby bust" means that the next time there will be as many entering students as in 1989 will be in 1997, and we have not yet hit the demographic bottom. Second, students are increasingly mobile and will vote with their feet. Third, IT puts more information into the hands of potential students, who can use this power to make more informed choices. Fourth, advocacy of the principle that consumers of higher education have the right to know about what they are being offered is growing. One example is the recently enacted "Student Right-To-Know Act" — a general consumer information law that aims to "help prospective students...make an informed judgment about the educational benefits available at a given institution of higher education."

Market conditions will force higher education — just as it has forced other service providers and industrial concerns — to stop looking only inward at the product, and look outward at the value created for the consumers. This means focusing on curriculum design, teaching methods, and learning materials. However, a one-time change (at the w' level), where you figure out the best way to do it, then quit, will not help enter the third-wave era. The curriculum-design function, for example, must be a continuous process at the w'' level. The national interest can no longer tolerate what the Bedford Committee found: fifty years with no significant change in the accounting curriculum. It's not enough to redesign the curriculum and say, "That's it; we have the new one; it's optimal," and disband the curriculum renovation process. From now on, it's a full-time job.

The Accounting Education Change Commission (AECC) is both evidence of the emerging consumerism and of the cooperation among interested parties that can bring about needed change. The AECC originated in a call by a consumer group, the (then) eight largest accounting firms, who are major employers of accounting graduates. They fund the AECC and have representatives serving on it. But the AECC was appointed by the American Accounting Association and is administered by AAA members. The largest component membership group on the AECC is accounting academicians (ten of eighteen); nonpractitioner employers are represented; and so is the AICPA.

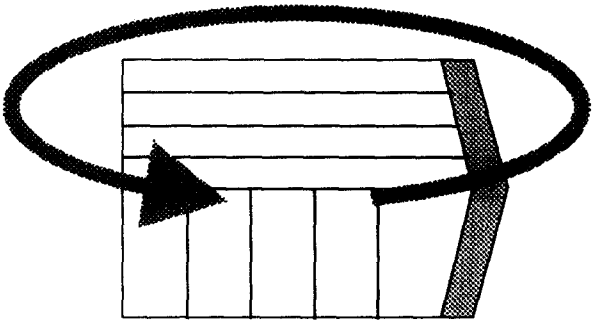
This cooperative effort has enlisted a far wider participation in reform through grants for projects on curriculum reform, which have already reached 13 schools. The AECC has published widely disseminated statements on educational reform; presentations by members and grant recipients have been attended by nearly 19,000 people; and articles on the AECC's work have appeared in academic journals. When the American Assembly of Col-

legiate Schools of Business was revising its accreditation standards, the AECC worked hard and cooperatively as an interested party.

The conjunction of a consensus for curriculum reform and growing evidence of joint action to further it could mean the prospects for improvement are better than they have been for many years. From this perspective, it is not surprising that the AECC found that accounting faculty were farther ahead than the faculty of other professions in pursuing curriculum reform. The AECC investigated several other professions (including law, dentistry, medicine, engineering, pharmacology, and nursing) to see whether their curriculum reforms could serve as models for the efforts in accounting. In each case, a consensus on the need for change was just emerging. The joint-action stage had not been reached as it has in accounting.

Figure 28

Research Value Chain (According to Critics)



University

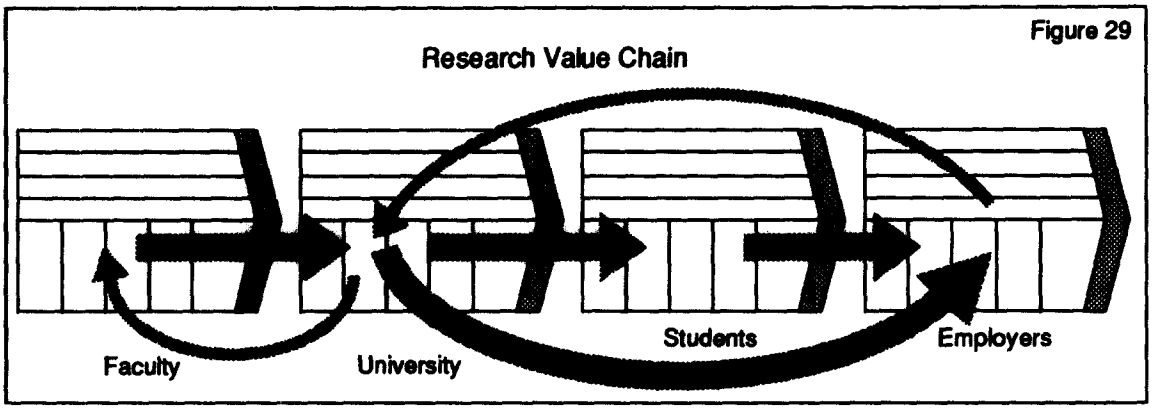
VI. CHANGES IN BUSINESS AND NEW ACCOUNTING NEEDS REQUIRE CHANGES IN ACCOUNTING RESEARCH

I have saved research for last in this article because every section above has implications for accounting research. If accounting, as we have known it, has been rendered obsolete by IT, then IT also opens enormous opportunities. The task facing accounting researchers is to analyze the information requirements of third-wave managers and investors and figure out how to meet them. There are tasks for empirical researchers (figuring out the needs of decision makers and testing the efficacy of new information types in satisfying those needs) and conceptual researchers (developing the new conceptual models of accounting that are more rigorous and elegant than the *ad hoc* responses to new information needs described in the sections above).

Accounting research is also subject to value chain analysis. Figure 28 depicts the value chain of research as seen by some critics. It depicts a closed circle in which faculty members are both the suppliers and consumers of research.

However, I believe that Figure 29 shows a more accurate picture of accounting research. Certainly, some research is exploratory and consumed mostly by other researchers. But if the research enterprise achieves sufficient energy, it can produce the values shown in the two arrows depicting value to students, through incorporation of new knowledge into the curriculum, and value to employers (that is, business and industry) through business application of new knowledge.

Figures 28 and 29 can be compared to a laser. A laser is a tube with reflective ends, one of which is semitransparent. An apparatus excites atoms in the tube to release photons, which bounce from one end of the tube to the other, their energy raised on each bounce. If the design is wrong or the energy input is insufficient, the photons just bounce around in the tube (in Figure 28, the research ideas fail to achieve sufficient energy and just "bounce around in the (academic) tube"). But if the design is right and there is sufficient energy, the photons (insights) eventually acquire enough energy to break through the semitransparent end of the tube, emerging as a bright, coherent beam of usable light. Figure 29 shows the results when the research process reaches the necessary energy: it emits a beam of usable light that illuminates the nonresearch world. The tuning of this process to maximize total value created by the research endeavor involves management of the



research process to achieve the right balance among (as Ernest Boyer would say) the scholarships of discovery, integration, application, and teaching.

To some extent, accounting research is "stovepiped" too, into such categories as "financial" accounting, "managerial" accounting, auditing, tax accounting, and systems. For accounting researchers to enter the third-wave paradigm, they will also need to break through these stovepipes, because the customers for their new knowledge have scant interest in researchers' categories of subject matter; they are interested only in how the new knowledge will help them solve business problems.

VII. CONCLUSION

IT is creating a wave of change that is crashing over accounting's shoreline. It crashed across industry in the 1970s. Then it crashed across the services in the 1980s. And it will crash across accounting in the 1990s. It is changing the way business is done and the problems faced by managers. Managers now need new types of information in order to make decisions, so internal and external accounting must be changed. Higher education can simply react to these changes, or it can take a more active role, embracing the future, adapting rapidly, and facilitating the adaptations of others. The challenge to academic accountants is to invent the third-wave accounting paradigm and produce the graduates who can function effectively in the third-wave organizations they will be joining. The challenge to nonacademic accountants is to make the organizational and political changes to implement the new accounting paradigm.