A Study of Today's Manufacturing Environment Focusing On Cost Management, Activity-Based Costing, and Just-In-Time Inventories

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by

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Abstract

This discussion of the manufacturing environment of today focuses on three prominent and changing aspects: Cost Management, Activity-Based Cost Accounting, and Just-In-Time Inventory Systems. After introducing traditional cost accounting systems and their obvious deficiencies the discussion turns towards the needs of today's environment in manufacturing. Focusing on the informational needs of management that are to be generated by manufacturing cost accounting systems has led to the advent of Activity-Based Costing and the conservation of cost through Just-In-Time Inventory system application.
It has become apparent that American industries are not keeping up with their foreign counterparts. One of the main reasons for this is the lack of pertinent cost information available to management. While American technology and production advancement have changed in order to try and make up some of the foreign dominance, no changes have been made in the accounting area. Management is responsible for making intelligent decisions about their strategies and production with accounting systems that are old and no longer cater to today's manufacturing environment. In fact, "virtually all management accounting practices in use today were developed before 1925" (Worthy, F.S., October 1987). These systems were advanced when they were first implemented, but manufacturing has changed drastically in the past 66 years.

The primary modification in manufacturing has been the dramatic change in customer value. Before the 1970's, manufacturing leaders were concerned mainly with product value and overall competitiveness. After the 1970's companies have resorted to competition based on cost. Today, contention is based on quality and flexibility in addition to cost (Johnson H.T., June 1988). Industries have changed in that they no longer have only one product line in the market. Diversification is seen as a necessity to be competitive by today's standards. Another difference in manufacturing is the turn away from product standardization. Customers have begun to demand specialized products. They know what they want and they refuse to settle for
less causing American manufacturers to respond to customer needs. A third transition between the industries of yesterday and today is the new emphasis on marketing and distribution costs. The traditional accounting systems have no way to absorb all of the information generated by these logistics because these costs were not deemed as pertinent when the traditional systems were designed (Worthy, F.S., October 1987).

Another fatal flaw for the traditional management accounting systems is arbitrary cost allocation (Drury, C., May 1990). Of the three main components of cost; direct labor, direct materials, and manufacturing overhead, direct labor and direct materials have in general been fairly straightforward to calculate. Determining overhead, on the other hand, is not as easy to record for it is solely dependent on specified activities that are said to generate overhead, called allocation bases.

In traditional manufacturing accounting systems, the allocation base usually varies directly with the volume of a product that is being produced (Drury, C., May 1990). Often overhead has been determined by one such base, direct labor hours. The problem with this means of determining manufacturing overhead is that direct labor is no longer a prominent cost in today's manufacturing environment. With the continual technology advancements in automation, labor, which used to account for up to 50% of the total cost, has been reduced to generating merely 5-10% of the total cost. This gross misrepresentation of overhead encourages management to make bad manufacturing decisions such as
maintaining output by maximizing the use of labor and machinery, thus building inventory" (Arme, A.C., October 1987). With the advent of Just-In-Time Inventory, the effects of this misrepresentation have received great attention.

It should not come as a surprise that American industries have fallen behind in today's manufacturing environment with the erroneous information that they must rely on to make their decisions. The emphasis on financial accounting information is fine for financial statement preparation, but managers need more than total costs, inventory costs, and net income figures on which to base their decisions (Johnson H.T., June 1988). When managers use traditional numbers to judge individual product costs, they open themselves up to "serious marketing errors because of the over aggregated averages that traditional cost accounting systems use to allocate" (Johnson H.T., June 1988). Indirect costs appear to systematically distort costs of individual products. This distortion is caused by distributing manufacturing overhead according to weights, allocation bases, that vary with the product volume. This in turn causes products with more direct labor hours to assumedly incur proportionately more of the indirect costs, which is not always appropriate (Johnson H.T., June 1988).

Traditional cost accounting systems that are in place today are hurting our U. S. manufacturing companies. Because of the lack of pertinent cost information poor decisions are being made about products. Many firms may be aggressively pushing
unprofitable products because the product's true costs are hidden in the information managers are given. Poor capital investment decisions are another casualty of traditional cost systems. Usually these decisions are based on overhead savings that managers expect from their products. When these savings never materialize, the company is already committed (Cooper, R., January 1991).

These errors are threatening enough by themselves, but when today's extreme competition is added the magnitude of the errors is a lot greater. The reason for this is that when competition is at its height, the competitors actively seek others' mistakes in order to take advantage of the company's error and better themselves in the process. It has been suggested that managers use 'focused' competition, meaning that they should reduce their range of products allowing them to actually know their products better in terms of advantages and disadvantages. This knowledge would then enable product design changes to be made with more ease and exactness. Another reason that accurate product costs are so valuable in a marketplace full of competition is attributable to suppliers. Managers need to know their product costs in order to bid on their suppliers. Since competition for suppliers is bound to be great, managers need to know what they have to work with in terms of allowable expenditures and total product cost (Cooper, R., January 1991).

Manufacturing companies have recently realized that the traditional cost accounting systems in use today are, "seriously
deficient for the new manufacturing environment" (Howell, R.A., and Soucy, S.R., August 1987). "It [traditional system] encourages inappropriate behavior and fails to provide information that management needs to make sound decisions and be truly competitive" (Howell, R.A., and Soucy, S.R., August 1987). Traditional systems do not account for the rapid increase in automation techniques employed in today's factories. Such automation brings about higher quality in products along with an increase in product reliability. Automation helps to lower inventories by making the manufacturing process not only faster, but more flexible as well. The dramatic change from labor to automation has shifted the proportion and characteristics of many manufacturing costs (Howell, R.A., and Soucy, S.R., August 1987).

When considering the changes brought about by automation competition is most evident in the improvements in microcomputers. Such computers are more readily accessible today and their abilities are much improved. Higher levels of product reliability are also a factor in tight competition. The higher product quality brought about by automation means less re-work time and less scrap.

Automation has had an impact is product delivery lead times. The trend is to try and lower lead times so that inventories may be reduced. Competition is also rigorously involved in efforts to reduce manufacturing costs by using more efficient automation. It is evident that when the traditional cost systems were created and first implemented it was a totally different manufacturing
environment with little automation and perhaps less intense competition (Brimon, J.A., March 1986).

Product diversity is another area in which traditional systems are inadequate. By introducing new products and improving production processes manufacturing companies have increased their product line diversity. Unfortunately those companies that are still relying on their traditional cost accounting systems are reducing the overall accuracy of their reported product costs (Cooper, R., January 1991). "The introduction of a new product that is significantly different from the others can increase product cost distortion because traditional cost systems report average product costs" (Cooper, R., January 1991). By improving the manufacturing processes with the use of automation, less direct labor and more support functions are being used. Since most of the traditional systems allocate overhead cost on the basis of direct labor hours, these new products that use less direct labor are being undercosted (Cooper, R., January 1991).

Traditional cost accounting systems are obsolete when the manufacturing firm increases automation. The new machinery uses less direct labor while increasing the use of support functions. Most products that are created through automated processes tend not to have enough overhead allocated to them. This obsolescence can also be seen in the simplification of manufacturing processes and when technological improvements are made. When simplification occurs, there is no need for the old complex
systems that give non-pertinent information, and when there are improvements made to the production process, traditional systems often have a hard time adapting to the changes. There is a definite lag in using traditional systems whenever there is a change in the support functions used by a new product because the allocation of overhead will generally not be correct (Cooper, R., January-February 1989). Since many of the events that generate the tell-tale signs of system obsolescence are occurring with regularity in today's manufacturing environment it is necessary to make changes in the traditional systems if manufacturing companies are ever to compete in the marketplace.

Today's Manufacturing Environment

Today's manufacturing environment is much different than it has been in the past. One such difference is the ever increasing international market that has been augmented by the new found efficiency in transportation. Another characteristic of today's manufacturing environment is the reduced cost of communication and gathering information. Today's environment also stresses the necessity of flexibility in the manufacturing processes (Worthy, F.S., October 1987). "Before world War II most U. S. businesses were simple and homogeneous. Today they are neither. Cost and value cannot be assessed by transaction-based [traditional system] cost information. Achieving profitability requires activity-based information" (Johnson H.T., June 1988).

While the manufacturing environment has been changing
rapidly, the traditional cost accounting systems have remained stagnant, thereby producing a great need to develop new accounting systems. New systems have two general responsibilities. They need to help executives in their cost management activities. When there is a change in the manufacturing process, the accounting system needs to not only be responsive to the change, but should also be easily tailored to the new process. New accounting systems should also have a primary cost management focus on the underlying activities. If activities are well managed, then their costs should fall making the products more competitive in the market (Horngren, C.T., and Foster, G., 1991).

Cost accounting systems need to be involved in three functions. The first area is inventory valuation for financial and tax statements. The system needs to be able to distribute periodic production costs between goods in stock and cost of goods sold. The second function of cost systems needs to be operational control. The system should be able to provide information on consumed resources during an operating period to production and department managers. The third function of the cost accounting system needs to be individual product cost measurement (Kaplan, R.S., January-February 1988). "Businesses can no longer afford cost systems that work well only to value inventory for financial reporting" (Kaplan, R.S., January-February 1988).

One of the biggest changes in the manufacturing environment
is automation. Traditional systems customarily allocated all manufacturing overhead on the basis of direct labor hours. When direct labor was a primary factor in production, direct labor hours was a good allocation base. Today, however, direct labor has been reduced from near 40% to a mere 5% of product cost. The diminishing labor cost is attributable to the advanced automation (Worthy, F.S., October 1987). "Labor-based allocation methods are unlikely to represent a reasonable basis for approximating the overhead resources demanded by products. Output is determined by machines and workers are, in effect, machine tenders" (Drury, C., May 1990). Today direct labor hours as a sole means of allocation results in unrealistic figures and causes distortion of product cost profitability (Worthy, F.S., October 1987).

Cost Management

With the exposed deficiencies of the traditional cost accounting systems currently in use and the demands of the changing manufacturing environment, "Manufacturers world wide now find themselves at a crossroad. In order to compete effectively, companies must simultaneously strive to manufacture sophisticated products at an exceptionally low cost while maintaining high quality with outstanding customer service" (Brimson, J.A., March 1986). The concept of cost management, with the main philosophy being, "to know exactly what your costs are and to manage them well," was devised to help shed light on the dilemma (Ames, B.C.,
and Hlavacek, J.D., January-February 1990).

The goals of cost management coincide with basic truisms of business. Over the long run, it is essential to be the low cost supplier to deal effectively with growing competition, as well as making the effort to keep inflation-adjusted costs of producing and supplying at a minimum. Another goal of cost management is to allow the true cost and profit picture for each product, product/market segment, and for all key customers to always be known. Managers must not let traditional accounting practices cover up this pertinent information. Cost management also concentrates on the cash flow and balance sheet strengths as much as on profits (Ames, B.C., and Hlavacek, J.D., January-February 1990).

Cost accounting systems should be of help in trying to implement a cost management approach to manufacturing. "Accounting systems should offer cost management more than a mere collection of financial data for income statements and balance sheets" (Horngren, C.T., and Foster, G., 1991). The systems should be able to generate pertinent information such as product costs, downtime, and delivery rates for a wide variety of internal decisions and tasks along with actively using the generated information (Horngren, C.T., and Foster, G., 1991).

Cost management realizes that new cost accounting will indeed be different from classical, or traditional cost accounting. The focus of cost management, and subsequently new cost accounting, is increased productivity and manufacturing
process reliability. The ideal cost management scenario would be to lower inventories through the use of greater automation and information technology while simultaneously increasing product variety (Howell, R.A., and Soucy, S.R., August 1987).

In order to attain the goals set by cost management, changes in accounting need to take place because at this point accounting is not providing useful information. The traditional systems are generating lots of reports that are either all saying the same things or are not saying anything at all. The first change to take place should be the consolidation of routine reports. This gives the managers the same information in a much condensed form and reduces wasted time looking at the same information on several reports. Another change that should be implemented is spending less time on more accurate data. The cost system should generate less information, but the data collected would be of greater importance giving the managers more control ultimately. Above all others system changes, is the need for the accountants to understand the causes of cost. It is only after this understanding that true cost management benefits can be realized (Semich, J.W., January 1989).

After the basic changes in cost reporting, cost management continues to demand change. "More and more managers are insisting that accounting get involved in Just-in-time and Total Quality programs up front- to learn the philosophy of quality production, to know what to look for when analyzing costs and benefits of new systems, and to change the focus of their
accounting systems from cost accounting to cost management" (Semich, J.W., January 1989).

Companies oftentimes fail at the onset of cost management because their costs are out of sync from their competitors. This is the result of companies not knowing and/or understanding their own true costs. In order for companies to become more in tune with their true product costs they need to be able to answer the following questions with accuracy.

1. What are the directly attributable and fully allocated costs for each major product line?

2. What is the present break even point, how is it related to capacity, and how much can volume be increased before break even point will have to move up?

3. What is the incremental cost/profit on each unit produced/sold over current break even point?

4. How do costs change with change in volume? What costs are inescapable if volume declines?


The current trends that are influencing cost management are the decreasing direct labor component of product cost, the increasing cost of new equipment, and the increasing cost of gathering computerized cost accounting information (Brimson, J.A., March 1986).

Activity-Based Costing

It has been shown that direct labor hours are no longer an
acceptable allocation base for manufacturing overhead due to the declining percentage of direct labor in the overall product cost. One suggested alternative is to use specified activities as the allocation bases. "Virtually all of a company's activities exist to support the production and delivery of today's goods and services. They should therefore all be considered product costs. And since nearly all factory and corporate support costs are divisible or separable, they can be split apart and traced to individual products or product families" (Kaplan, R.S., September-October 1988).

Activity-based cost accounting [ABC] is defined as, "a collection of financial and operational performance information dealing with significant activities of the business" (Romano, P.L., May 1988). Activity-based accounting centralizes the focus of cost accounting towards planning and control. "Beyond business functions or departments, activity-based accounting focuses on activities as the fundamental cost objects and uses the cost of these activities as building blocks for compiling the cost of other cost objects" (Horngren, C.T., and Foster, G., 1991). It should be noted that activity-based cost accounting is compatible with all types of process product-costing and job-order costing systems (Horngren, C.T., and Foster, G., 1991).

Activity-based cost accounting was developed by Robin Cooper and Robert S. Kaplan, professors at the Harvard School of Business. It was designed to help meet the need of having more understanding of cost behavior and to aid in determining what
causes manufacturing overhead costs. The most prominent feature of activity-based cost accounting is the effort to gain a greater understanding of cost behavior by looking at the forces behind the cost (Drury, C., May 1990). These forces are then analyzed into acts. Costs from these acts are then traced from the activity to the products by the consumption of the act (Cooper, R., September 1990).

Activity-based cost accounting is extremely helpful in comparing the activities in different departments. It allows for the better management of activities by enabling executives to identify the causes and effects of relationships in an accurate and detailed manner. Activity-based accounting is being widely accepted by manufacturing firms because the information that is necessary for the system is easily obtained through technology and the information gathered tends to accentuate the interrelationships among the activities in different departments (Horngren, C.T., and Foster, G., 1991).

Activity-based cost accounting can help management in making decisions if care is taken to ensure that relevant data is being generated from the system. This is achieved if the total cost can be partitioned into cost pools each of which depending solely upon one activity. There is a limited number of activity measures that can satisfactorily represent a diverse range of actual activities. "The cost accumulated in each cost pool must be proportional to the level of activity in that cost pool. Costs that are not strictly variable at the level of the cost pool
should be excluded from the allocations and handled in some other manner" (Noreen, E., Fall 1991).

Another way to ensure that relevant cost data is being extracted is to partition each activity into elements that solely depend upon each product. This key factor rules out the condition of joint processes and dependencies between products in the production process (Noreen, E., Fall 1991). "If care is not exercised in the design of an ABC system and there does indeed exist fixed costs or joint costs, then the costs generated by the ABC system will not provide reliable signals for the kinds of decisions for which ABC systems have apparently been designed" (Noreen, E., Fall 1991).

The information generated by the activity-based cost accounting system allows management to prioritize and focus their cost reduction efforts (Sharman, P., February 1990). "ABC is not designed to trigger automatic decisions. It is designed to give more accurate information about production/support activities and product costs so management can concentrate on the products and processes with the most leverage on profits" (Kaplan, R.S., September-October 1988). The main push of ABC is to "help managers make better decisions about product design, pricing, marketing mix, and to encourage continual operating improvements" (Kaplan, R.S., September-October 1988). Activity-based cost accounting influences the management accountant to act as an "internal management consultant." The benefits of using managerial accountants to provide information to engineers and
staff should be clear. Who is more qualified to provide relevant information other than the people that are directly employed by the business and know it inside out? (Sharman, P., February 1990).

Activity-based cost accounting looks to identify activity centers. When analyzing a production process, there are too many actions to substantiate the use of different cost drivers for each action. These actions are therefore aggregated, or combined, to create an activity. A single cost driver is in effect for each activity. The level of aggregation does not affect whether product costs are reported separately or collectively, it merely affects the amount of detail in reporting costs (Cooper, R., November 1990).

Activity-based cost accounting identifies the manufacturing overhead performed by the organization and computes the cost to perform each activity. The costs are traced throughout the process of converting direct materials and labor into the finished article for each individual product (Sharman, P., February 1990). "The process of tracing costs, first from resources to activities and then from activities to specific products, cannot be done with surgical precision. We cannot estimate to four significant digits the added burden on support resources of introducing two new variations of a product. But it is better to be basically correct with activity-based costing, say, within 5% or 10% of the actual demands a product makes on organizational resources, than to be precisely wrong (perhaps as
much as 200% using outdated allocation techniques" (Kaplan, R.S., September-October 1988).

While the added benefits of activity-based cost accounting are many, it is not the most feasible system for every manufacturing firm. When considering the modification of a traditional system, three factors should be contemplated. First, the sophistication of the company's information system needs to be evaluated. If the system is not up to date, the cost associated with the upgrading process needs to be a determinant. The second factor is the cost of errors. The current system must be rated by the accuracy of the information it generates. The third primary factor that needs to be evaluated is the level of diversity in the company's products. If the company manufactures a wide variety of products the costs that are generated using a traditional system are erroneous because traditional systems don't allow for different products to consume different amounts of overhead (Cooper, R., January 1991).

A major difference between traditional and activity-based cost accounting systems that must be addressed is that traditional systems tend to cost products without regard to the activities that produce the products. Activity-based accounting goes straight to the origin of the product, the manufacturing process, for costing. "ABC cost systems use direct costing information in the same way as traditional systems. Where ABC systems differ is that they create a bill of activities for overhead" (Sharman, P., February 1990).
Traditional systems are primarily concerned with generating cost information for firms with relatively low product diversity and a high labor content. Today, product lines have multiplied and marketing channels have increased. "Direct labor now represents a small fraction of corporate costs, while expenses covering factory support operations, marketing, distribution, engineering, and other overhead functions have exploded" (Kaplan, R.S., September-October 1988). It is still very common for companies to allocate using direct labor as a base or even not allocating at all. "These simplistic approaches are no longer justifiable- especially given the plummeting costs of information technology. Intensified global competition and radically new production technologies have made accurate product cost information crucial to competitive success" (Kaplan, R.S., September-October 1988).

Other differences between traditional systems and activity-based systems include trying to predict changes in cost information. Traditional systems concentrate on what has happened in the past, whereas activity-based systems not only look at the past data, but aim to predict how long before another cost change will occur in the future. Traditional systems are concerned with the bottom line results of product costs only. The goal of the new activity-based system is to identify and gain a greater understanding of the factors that influence the costs of the products (Edersheim, E.H., March 1989).

Another factor to consider when trying to choose between
keeping the traditional system or implementing the new activity-based approach is cost distortion. Activity-based costing systems provide relative accuracy, while the traditional systems strive for total accuracy and provide absolute inaccuracy (Sharman, P., February 1990). These cost distortions have two generalities: product cost differences are higher for low volumes than for high and the aggregate difference between the product costs are higher for small products than for larger products. Activity-based costing alleviates some of the distortion by taking differences in relative consumption of inputs into account and tracing appropriate amounts of consumed input to each product (Cooper, R., September 1990).

Cost distortion not only effects product costs, but effects management's decision making ability as well. Distortion makes many decisions obscure. "Managers wind up not really knowing what it costs to make a product or perform a service" (Edersheim, E.H., March 1989). The reality of many corporate costs is masked by the overwhelming distortion that traditional systems seem to generate (Edersheim, E.H., March 1989).

Once the decision to change cost accounting systems is made based on product diversity, the significance of the cost itself changes from cost distortion to the emphasis being on what causes the cost. The manufacturing firm must prepare for the switch. Top management must fully support the change in cost systems, for there are too many changes and new policies that must be enacted and enforced (Collins, F., and Werner, M.L., June 1990). "Top
executives may be understandably reluctant to abandon existing product cost systems in favor of a new approach that reflects a radically different philosophy" (Kaplan, R.S., September-October 1988). This is why it is recommended that any changes be made gradually by starting with existing cost aggregates, or pools. These selected cost pools should be relatively self-contained and manageable (Collins, F., and Werner, M.L., June 1990). The team approach is another tool to help make the switch easier. By creating a team to investigate and actually determine what costs to include in the individual cost pools, acceptance of the change is more likely (Collins, F., and Werner, M.L., June 1990).

The overall objective in designing an activity-based costing system is to provide the most benefits possible at the lowest overall cost. In doing so the first priority is to collect data on all of the direct labor and direct material costs. Once this information is analyzed it is necessary to examine the demands on indirect resources made by particular products. Particular emphasis should be placed on expensive resources. Focus should also be on product diversity and the resources whose consumption varies a lot from product to product. Special consideration should be taken on those indirect resources whose demand patterns are unrelated to the traditional allocation measures of direct labor, direct materials, and processing time (Kaplan, R.S., September-October 1988).

In designing an effective activity-based costing system, importance also needs to be placed in aggregating actions in the
manufacturing process into activities. The cost of these newly formed activities, which are subsequently grouped into cost centers, then needs to be determined (Cooper, R., November 1990). In depth analysis of how specific causal factors affect each product line item within each activity center needs to be determined. Calculation of the product costs and the extent to which each activity in a company's operation contributes to these costs should then be performed (Edersheim, E.H., March 1989). The biggest difficulty in designing an activity-based costing system is in trying to create a system that is economical to maintain, yet doesn't introduce excess distortion (Cooper, R., November 1990).

The aggregate costs associated with changing from a traditional system to an activity-based costing approach consists of not only obtaining the support of management, but also training the management to operate and understand the new system. Other costs include those of identifying the team to design the system and trying to make the switch over more easy by tying the new system into the company's existing information system. An activity-based costing system is justified when the costs of installation and operation are more than offset by the long term benefits (Cooper, R., January 1991).

Among the benefits of activity-based cost accounting is the opportunity for the firm to specifically plan for the activities and resources that are needed to support the strategic goals. This is accomplished through the understanding of the activities
comprising the manufacturing process and not just the end product. Another advantage to the new cost system is the capturing of transaction data that ultimately helps in tracing the costs from the activities to the products. This transaction data is also incredibly useful in pinpointing when and where changes need to be made (Romano, P.L., May 1988).

Activity-based cost accounting is also beneficial in eliminating and reducing manufacturing costs. After the system identifies the activities involved and the costs associated with them, the natural progression is to try to diminish the costs. In addition, activity-based information is instrumental in showing the high cost of a few long production runs. The information generated demonstrates that maintaining these complex production lines is costly, particularly when many short production runs are more efficient. The cost associated with long infrequent runs are often times hidden, whereas, the costs pertaining to shorter runs are superiorly disclosed in the data of the activities. The activity-based accounting systems are also responsible for improving the awareness of management. With the focus on costs and the activities that create the costs, managers are forced to be more in tune to the manufacturing process (Collins, F., and Werner, M.L., June 1990).

In looking to the future of the new activity-based cost accounting systems the realization is that all manufacturing firms are not equal. Each firm has different information requirements and therefore has customized demands on their cost
accounting systems. Manufacturing firms will more commonly use a variety of allocation bases simultaneously in order to get more accurate costs for their activities. By doing so, managers are realizing that each activity is different and that universal allocation bases introduce costing distortions. The most important message that activity-based costing delivers is that a cost system can not account for everything. All systems are bound by their limitations (Worthy, F.S., October 1987).

Just-In-Time Inventory Systems

Today's manufacturing environment characterized by incredible global competition, "is leading U.S. companies toward a renewed commitment to excellence in manufacturing. Attention to the quality of products and processes, the level of inventories, and the improvement of work-force policies has made manufacturing once again a key element in the strategies of companies intending to be world-class competitors" (Kaplan, R.S., July-August 1984). As has been noted, both cost management and activity-based costing approaches have been geared towards product and process quality and have been known to enhance some work-force practices. Inventory levels are now being addressed because of the excessive cost associated with holding inventory. "Efforts to reduce inventories are forcing manufacturers to identify the root causes of inventories and make the necessary modifications to their manufacturing processes to eliminate them" (Howell, R.A., and Soucy, S.R., August 1987). As inventory
levels decrease, management is expanding their realization that current data generated through traditional systems does not reflect the proper resource usages of the products (Howell, R.A., and Soucy, S.R., August 1987).

Manufacturing companies are now being introduced to the Just-In-Time inventory approach [JIT]. The concepts involved in JIT theory allow the cost saving philosophy to be applied to all aspects of business including production, purchasing, and delivery (Sadhevani, A.J., Sarhan, M.H., and Kiringoda, D., December 1985). This approach revolves around the idea of receiving supplies and direct materials "just in time" to use them, cutting down on the holding costs as well as the space needed for their storage. In terms of manufacturing parts used for in-house assembly, the key is to produce the right parts at the right times, only when the parts are needed and only in the quantity that is needed ("JIT Production Systems," April 1990). Just-In-Time inventory systems run on a "pull" approach to manufacturing. "Parts run through the production system based on end-unit demand, focusing on maintaining a constant flow of components rather than batches of work-in-process" ("JIT Production Systems," April 1990). Other concepts in JIT are related to quality. With emphasis placed on doing the job correctly the first time, JIT systems aim at reducing rework and improving the overall quality of products ("JIT Production Systems," April 1990).

Management has become dedicated to the elimination of waste
which includes, "costs associated with items such as scrap, moving, and storing" (Sandwell, R., and Molyneux, N., September 1989). They are also paying a great deal of attention to lead times for they realize that shorter lead times reduce total costs. The ultimate goal of the new JIT theory is to convert raw material into finished goods with lead times equal to the processing times, thus eliminating all non-value added time ("JIT Production Systems," April 1990).

Just-In-Time inventory approaches center around four fundamental aspects. The first, is that all non-value added activities in the manufacturing process be eliminated. Non-value added activities are the activities that add cost to the product without adding value. Secondly, is the commitment to high quality. By producing only what is needed there is less waste and more time for quality control measures. Thirdly, Just-In-Time theory strives for continuous improvements in activity efficiency, which is apparent through the effort to reduce lead times. The fourth fundamental aspect of JIT inventory systems is the emphasis placed on simplifying and increasing the visibility of value-added activities (Foster, G., and Horngren, C.T., Winter 1988).

Any inventory system established with the JIT philosophy in mind will need to make changes in their manufacturing environment. The design of products will concentrate on economical production processes. This entails doing away with any unnecessary complexity so that the product may be produced at the
lowest cost. The plant layout may have to be altered to accommodate the change to a "flow" manufacturing idea. Flow manufacturing is dedicated to eliminating materials handling costs. The layout is designed so that the materials have the least amount of transportation. The manufacturing environment that installs a JIT inventory concept may wish to install worker involvement programs. In doing so, the firm may gain invaluable manufacturing process knowledge directly from the workers who are more in touch with the procedures (Bowman, J.D., February 1991).

In summary the main logic behind the implementation of a Just-In-Time inventory system is if fewer supplies are needed, then better suppliers can be used (Raia, E., Fall 1991). An added benefit of relying on few suppliers is that more intimate relations can develop allowing for more reliability and better service (Griffin, L., and Harrell, A., Fall 1991). If better suppliers are used, then there will be fewer production rejects. If there are fewer production rejects, then there are better process controls in place, and if there are better process controls in place, then there is less product inspection needed, therefore saving on product cost (Raia, E., Fall 1991).

Implementing a Just-In-Time inventory system should involve the top management's support if it is to be a successful change. The support of the middle management and supervisors is also needed, however this may be harder to obtain. Just-In-Time inventory eliminates the cushion that middle management has enjoyed when defective raw materials, production errors, and
irregular supply and demand have occurred. Just-In-Time exposes the management inadequacies by reducing their margin of error (Griffin, L., and Harrell, A., Fall 1991).

Once the new inventory system has been implemented there are four keys to keeping the system running effectively. First, stable production schedules need to be established. The manufacturers need to provide the supplier with a notice of their production schedules in advance. The second key to efficiency is coordinated transportation. Distant suppliers may need to combine with local suppliers in order to coordinate the shipments. A third factor is efficient communication. Both manufacturers and suppliers need to have speed and reliability in their communication. Electronic data interchange linkages and paperless transaction systems are ways to promote reliability and efficiency in transferring data. The last component in keeping the new inventory system running smoothly is quality control. Source inspections at the supplier's plant or quality control systems that guarantee defect-free production are in demand (Copacino, W.C., June 1988).

Future implications of Just-In-Time inventory systems include several achievable dimensions:

1. Set-up time reduction = reduced to 1/3 of original
2. Small lot production = lower work in process and finished goods inventory quicker detection of defects
3. Small lot transportation = without, must wait until all of batch finished before going on to next machine
4. Zero defect quality control
5. Leveling of production = number produced is average daily demand

6. In-house modification and production of equipment

7. Just-In-Time supply arrangements

8. Employee involvement in continuous improvement
   (McLachlin, R.M., and Piper, C., Summer 1990)

While the benefits associated with Just-In-Time inventory seem numerous, there are distinct obstacles to a successful implementation. One such obstacle is any manufacturing constraints that may be present dictating the amount of inventory necessary on hand, as well as, formal departmental boundaries which prohibit the interaction needed for proper implementation. Another restraint on implementation could be organizational resistance coming from the managers that don't like the added responsibility for accuracy that is evident in their positions. Poor quality in purchased goods is an additional hurdle that must be overcome ("Why U.S. Companies Are Embracing JIT," November 1990). If any company is serious about, "wishing to improve their competitive edge through the reduction of product cost and improvement in manufacturing lead times," (Sandwell, R., and Molyneux, N., September 1989) they will concentrate on dealing with or eliminating fully all obstacles in order to share in the profitability of the benefits.

Conclusion

As the deficiencies of the existing traditional cost accounting systems are becoming more apparent in the struggle to
compete in the world market of today's manufacturing environment, it has become increasingly more important to provide management with pertinent and relevant cost information. New costing attitudes have been forced into existence in response to the new information revelation.

The theory of cost management, with emphasis on not merely knowing the costs involved but having an understanding of how to control and manage them, has become the overall goal of American manufacturers. The trend towards extensive cost knowledge cannot be attained through the existing inadequate traditional costing systems. These old systems fail to generate the useful cost information that is essential for managers to make valuable and strategic cost decisions, therefore new costing systems need to be implemented.

Activity-based costing is such a method that was created in order to help attain cost management goals of cost understanding by generating information not only about the costs themselves, but information regarding the driving forces behind the costs. In years past, this allocation had been based on direct labor hours. Today's manufacturing environment, however, calls for the allocation base to be more directly related to the activity that creates the cost allowing for more control and ultimate understanding of the costs.

The relatively recent Just-In-Time inventory system also stems from the primary goal American manufacturing goal of cost management. This inventory system aims at cost reduction through
eliminating inventory build up and there by reducing costs associated with storage, insurance, and transportation. Managers are being forced to examine the inefficiencies of their manufacturing processes and to make the necessary modifications to reduce excess inventory.

Although American manufacturers have lagged behind in cost control and management in the past, the need for change has clearly been recognized. Through the understanding of new philosophies such as cost management and new techniques such as activity-based costing and just-in-time inventory systems, the slow and hard process of change is decidedly well under way.
BIBLIOGRAPHY


