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The Just-In-Time Philosophy
And The Accounting Implications

by

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AN OVERVIEW

The first chapter is the introduction, which looks at the accounting practices of the Just In Case philosophy and the changes JIT has brought to the traditional accounting. Under the "Just In Case" philosophy mass production was encouraged in the expectation that there would be big demand for products. This mass production policy had created a lot of problems, such as inventory was bought in large quantities, big warehouses were built to store them, big machines were bought to consume them, and employed an army of people to feed them. The resultant effect was that products had unnecessary costs added to them and products became uncompetitive in the market. Then JIT came along and changed the traditional manufacturing and accounting systems. Inventory valuation has become less important to financial accounting. The traditional discrimination of human recourse accounting is not tolerated. Direct labour is no longer considered as a cost driver to allocate overhead costs. JIT has brought a host of other changes to the traditional accounting.

The second chapter is set apart for the JIT philosophy. Under JIT raw materials enter through at one end of the production process and finished products come out at the other end as saleable commodities. As soon as they come out of the production line, they are delivered to the customer. It is a philosophy which has an uncompromising attitude towards quality. Flexibility is the key word of the JIT philosophy. This flexibility revolves around the machines, the people who

use them and the manufacturing plant where they are located. The workforce need multi-skills to perform a variety of tasks expected of them. Small batch of products are produced to detect and correct problems as they occur. JIT's goal is zero inventory which requires the co-operation of vendors. A close co-operation between the vendor and the recipient is mutually beneficial to both parties. Improvement is an ongoing process which means that no matter how mean and lean a manufacturing process is, it can be made meaner and leaner. The benefits of JIT are enormous for a company. Manufacturing lead time is squeezed to the lowest level, inventory is reduced to zero, in turn, by fulfilling these objectives, inventory goes down, space utilisation becomes more efficient and the company's products become more saleable in the market.

The third chapter is about human resource accounting and its implications. JIT has brought an awareness and an importance of human resources in general and accounting for such resources in particular. The traditional discrimination of human resource accounting is not tolerated in a JIT environment because human resource is the crucible in which JIT is moulded. Irrespective of what accounting methods are used, human resource accounting should be accorded the same Generally Accepted Accounting Principles (GAAP) as accorded to physical resource accounting.

Financial accounting and its implications are explained in chapter four. In financial accounting the valuation of

inventory at balance date is vital in two ways: to determine cost of goods sold for the profit and loss statement, and current assets for the balance sheet. It is unacceptable in a JIT environment to value inventory at actual rate and draw it out at standard rate. JIT has reduced the traditional three inventory accounts into two - Raw material In Process Inventory and Finished Goods Inventory. Some of the traditional distortions of financial accounting are undesirable to JIT. In a JIT environment the economic value of a firm is the composite of its tangible and Intangible assets. JIT prefers discounted cash flow method to the traditional ROI method.

The pitfalls of present cost accounting are described in chapter five. The Present cost accounting which was developed almost a century ago is not conducive to a global competitive environment. The allocation of overhead cost based on direct labour has distorted product costs, pricing and marketing decisions. Two of the traditional product costing systems are job order costing and process costing. The former is a work order driven system which caters for special orders whereas the latter deals with similar products that have a continuous production flow. The standard cost system was brought in later on to revamp the product cost system by separating the cost of inefficiencies from the cost of activities. A host of other traditional standard cost variance analyses will have high infant mortality rate when JIT is up and running efficiently. JIT strives for the elimination of unnecessary costs rather

than reduce it through control measures. Direct labour as the cost driver to allocate overhead cost has created distortions to the traditional product costing whereas machine hour as the cost driver has brought rectitude to the JIT product costing.

The sixth chapter contains management accounting and its implications. Management accounting practices have been influenced by the financial accounting theories for a long time. The prudence concept and the matching principle of financial accounting have a domineering effect on management accounting. Financial accounting concepts are so deeply permeate into management accounting practices that many managements insist on preparing management accounting reports on the same basis as the published financial accounting reports. JIT has restored some of the lost glories of management accounting. This is especially noticeable in performance analysis.

JIT cost accounting of the future is in chapter seven. JIT has revolutionised the traditional manufacturing and the accounting concepts as well. Two of JIT's future cost accounting concepts are: Flush Costing _ front and back flushing, and Activity Based Costing. Flushing is a way of identifying all materials and components in a sub-assembly and removing them from the stock records. The front flushing is done before the product is being built while the back flushing is done after the product is being built. ABC's main function is to examine the activities of the indirect departments in

order to compute product costs. Unlike the traditional product costing, ABC does not consider overhead costs as a big chunk of costs to be allocated. Instead, overhead costs are a combination of the indirect activities which need to be dissected to come up with a quantity measure that can be related to a finished product.

The eighth chapter sheds some lights on the Australian experiences of JIT manufacturing. Two of Australia's Vehicle manufactures, the Ford and the Toyota company, have successfully introduced the JIT philosophy to their manufacturing. There are lot of similarities in both of these companies' JIT operations. Accounting implications of JIT are non-existent in both companies. JIT has brought some remarkable changes to these two companies' manufacturing and the quality of vehicles produced have improved dramatically. In contrast to the Australian experience the innovative accountants of Hewlett Packard Vancouver Division have introduced some new accounting concepts to complement their JIT manufacturing. In spite of the fact that there are differing views about the usefulness of standard cost in a JIT environment, HP has successfully incorporated standard cost to its new JIT product cost system.

The ninth chapter is the conclusion. Production has come a long way from a mass production to a demand driven production. The innovative accountants of the Hewlett Packard company have come out of traditions and conventions of accounting, which

pervaded accounting for centuries, and introduced some new accounting techniques to complement their JIT production. JIT is an ongoing process of doing things better in manufacturing. As JIT strives for manufacturing excellence, (figure 7) the accounting systems have to constantly keep up with the changes that are taking place in manufacturing. It is quite obvious that JIT has brought changes to the traditional accounting in inventory valuation, product costing and performance analysis. JIT is still in its infancy in Ford and Toyota. When JIT is up and running smoothly more changes in accounting can be expected.

CHAPTER 1

INTRODUCTION

In recent years many of the major industrialised nations have been facing problems, such as low productivity, poor quality products and decreasing market share for their products in the market. This is mainly due to the "Just In Case" philosophy some of the companies have been following over the years. The Just In Case philosophy had a one track goal — 'mass production. The production strategy of most companies was to over produce (Figure 8). The idea behind this strategy was that "just in case" there might be big demand for their products. This mass production strategy had unleashed a lot of problems, such as large amount of inventories were bought, large warehouses were built to house them, large machines were bought to consume them and employed an army of people to feed them. As a Consequence products had unnecessary costs added to them and products became unsaleable in the market.

²The implications of this philosophy had far reaching effects on every facet of accounting (Figure 9). Inventory valuation was an integral part of financial accounting at balance date to determine cost of goods sold for the profit and loss statement and current assets for the balance sheet. Cost

¹Kaplan, R.S. 'Accounting Lag: The obsolescence of Cost Accounting System', California Management Review, Winter 1986, pp 176-179.

²Seglund, R; & Ibrreche, S. 'Just-In-Time: the accounting implications', Management Accounting, Aug 1984, pp.43-45.

accounting with its product costing techniques enabled management to make product pricing and marketing decisions. Most of these decisions were based on distorted product cost information and products became uncompetitive. In spite of the fact that management accounting was subservient to financial accounting concepts in many ways, it had its share of a somewhat muted role to play.

This philosophy moved through the latter part of the 1970 like an ocean liner over troubled waters, just a wave away from disaster. Torpedoed by distorted product costing, rattled by unsaleable finished goods and wilted away market share for products. This period also witnessed the oil price shock and the Japanese and other western economies were reeling. Toyota pioneered Just In Time manufacturing philosophy has catapulted Japan to an enviable position of the World's best manufacturer of consumer products.

The advent of the "Just In Time philosophy" has changed manufacturing and accounting concepts of the past. JIT with zero inventory there is an inconsequential importance to inventory valuation. Inventory valuation has little impact on financial accounting. ³Human resources and accounting for such resources have found equal importance as physical resources. The economic value of a firm is the composite of its tangible and intangible assets. A host of other accounting practices

³Helms, A; & Marilyn, M. 'Meeting the Human Resource Challenges of JIT through Management Development', Journal of Management Development (UK), Vol:9, pp 28-34.

have gone through remarkable changes in a JIT environment.

Today, periodicals are inundated with an avalanche of articles extolling the virtues and the accounting implications of JIT. It has been well and truly established that JIT is a superior manufacturing philosophy. My intention, through this minor thesis, is to test whether there are any accounting implications when a company embraces the JIT philosophy. There is no known research has done in this topic. Had there been a research done in this topic it would have been easier to replicate and tailor it to suit for the Australian conditions.

In my endeavour to do justice to this minor thesis I have prepared a questionnaire (Appendix A) and sent it to five JIT practising companies in Victoria. The response was lukewarm and I had to resort to follow up procedures. Two managers, one each from Ford and Toyota, have consented for interviews to clear up some of the matters in the questionnaire which I have sent to them. Statistically speaking the sample size is too small to make any inferences about the accounting implications of JIT and more importantly, the validity of some of JIT's theories. A proper research is needed to test the accounting implications and some of the theories of the JIT philosophy.

A proper research in JIT and Accounting Implications is not possible in Australia at the present moment because JIT is still in its infancy. So I have chosen a field experimentation _ a questionnaire approach. As a rule pre-testing and pilot

survey techniques have to be carried out prior to the preparation of the questionnaire. Non-participation and non-cooperation from managements of JIT practicing companies have made it difficult to do so. So the questionnaire was prepared after reading numerous articles about JIT and Accounting Implications. Interview methods have been used as follow-up procedures to clear up some of the matters in the questionnaire. The two participants from Ford and Toyota have only allowed two interviews because of their heavy work schedules. The participants are Mr. G. Boxer, CPA of Ford motor company and Mr. P. Gubbles, CPA of Toyota. Mr. Boxer, who is the manager of special projects, has the reputation of a trouble shooter. Mr. P. Gubbles is the Plant Accounting Manager. Both men have extensive knowledge of JIT and both have visited Japan and learned about the JIT philosophy.

CHAPTER 2

THE JUST IN TIME PHILOSOPHY

⁴The Just-In-Time philosophy is based on simplicity. It is based on the existence of a highly competitive market that demands a high degree of flexibility and minimum investment to reduce the risk from sudden and unexpected changes in technology. Total Quality Control is a basic ingredient of this philosophy.

Total Quality Control

Under total quality control(TQC) the responsibility is shifted to production workers. The goal of TQC is to identify and correct errors at the point where they occur in the manufacturing process. Combining JIT and TQC prevent continued production of defective parts because JIT uses very small lot sizes (the goal is one). Defective units are immediately identified at the next work station and reworked so production can continue. In certain cases a worker can shut down the production line until a process that causes the defect is corrected. The Hewlett Packard plant in USA, a flashing red light and a siren are turned on when workers first detect that a production line or work centre is producing a non-conformed part. The engineers are alerted and the production line is shut down until the problem is fixed. When the red light starts flashing and the siren begins blaring, it would naturally be expected that there is some thing wrong. Is it not a better way of getting people's attention to fix the

⁴Wantuck, K. 'Concept Of Just-In-Time Manufacturing method', Technology Transfer Council Publication, 1985, pp 1-14.

problem?

A Pull System

JIT is a pull system (Figure 1) unlike the traditional Material Requirement Planning which caters for a push system. Under JIT inventory is pushed only if a work centre is ready to accept it. Units are produced to order and are transferred only when the next work centre signals it is ready. A work centre must stop producing if it gets ahead of the subsequent work centre. In MRP each work centre produces to satisfy the estimated demand and then pushes through the process. In a JIT environment, the plant load is uniform and the cell is operating and if it calls for idle time, the cost accountant cannot institute a measure that calls for efficiency on the equipment in the cell. MRP does not go away with JIT philosophy. It is a building block for the JIT philosophy.

The traditional MRP system caters for a bill of material. A bill of material is a list of items like materials to be purchased, purchased part to be machined and jobs to be subcontracted out. The JIT philosophy is well organised to reduce levels in the bill of materials. The JIT bill of material is a simple parts list of how many parts are needed, when such parts are needed and when to order such parts to produce the finished product.

Shop Floor Control And Zero Inventory

The shop floor control is very important in a JIT environment. Elements of traditional shop floor control includes production control, shipping and receiving and stock keeping. In most

companies a lot of employees are involved in the receiving, despatch and other material stores with in the shop floor. The aim of JIT philosophy is a zero inventory in the plant. Inventory is supplied by suppliers as required to the shop floor. This means most of the stores will disappear and the employees working in these stores will become redundant. When zero inventory is achieved by a company, a dispatch store is all it requires to send finished product to customers. The elimination of waste is a paramount importance to JIT philosophy. Shop floor control has a new meaning in a JIT environment. With zero inventory in the plant, vendors supply inventories straight to the shop floor as required and from there they go straight into machines and parts are produced in accordance with customer specifications.

Some of the small companies in USA are facing problems in achieving zero inventory in their manufacturing plants. This is mainly because they do not have huge capital at their disposal to lure vendors into a collaborative business venture. They have some form of a diluted JIT philosophy with traditional shop floor controls. In their endeavour to eliminate some of the wastes in the traditional shop floor control, they decided to stabilise and automate the shop floor activities. They stabilised some of these activities by the repetitive manufacturing and automated them by the Computer Integrated Manufacturing system (CIM).

According to JIT "inventory is the root of all evils". A large

amount of money invested in inventory, which is not required to produce parts immediately, is a waste of money. In most companies the fear of shortage of raw material is one of the reasons for buying inventory in large quantities. Most companies accept this as a rule not as an exception to the rule. Keeping large amount of unnecessary inventory in warehouses is not only a waste of capital investment but also a waste of space utilisation. In between the movement of inventory from stores to the shop floor it passes through too many hands. These costs add up to a company's exorbitant overhead costs. It has been recognised that at the time of physical stock, in most companies examination of result generally show that the inventory contains (Figure 6) human errors. Some of these errors are: transaction errors; someone may have double ordered to make sure that at least one order arrived on time; extra safety stock to cover machine breakdowns and leftovers from quality inspection disputes that never resolved.

Importance Of Vendor Co-operation

In a JIT environment it is essential to have a close co-operation between the ⁵vendor and the recipient. Usually the supplier networks operate as a collaboration or as a profit sharing venture. The important thing is to select vendors who can meet the delivery requirements and are also willing to collaborate in a venture that leads to profit for the vendor and the recipient. Usually vendors are selected on the basis

⁵Robinson, M. A. 'Vendor Analysis Supports JIT',
Management Accounting, Dec 1987, page 20.

of their competitive bids and also based on other criterion. This criterion includes quality of delivery, on time delivery and agree to accept the return of substandard materials. Some big companies in USA apply rating system in selecting their vendors. The most common method is the Leaner Averaging Method. It is an objective assessment method. This method allows a better assessment of each vendor's strength and weakness and gives a more meaningful comparison of the competing vendors.

Flexibility

'Flexibility is the key word in a JIT environment. Flexibility in the sense that the machines must be capable of performing multiple machining tasks and the workforce must be well trained to perform a variety of tasks expected of them. In other words, this flexibility evolves around from the equipment (machines) in the manufacturing plant to the workforce who operate them. These machines should also be flexible and responsive to meet market and demand expectations. In a JIT approach fast changeovers from one product to another product is very essential. It is true that less sophisticated machines, which can easily be set-up by operators, will do fast changeovers from one product to another. For instance, in Japan some of the traditional manufacturing plants have small machines on casters. They make fast changeovers and make products of higher qualities. These machines have never been subjected to large capital

'Walleigh, R. C. 'What is your excuse for not using JIT', Harvard Business Review, March-April 1986, pp 38-54.

investments. Another feature of these machines is that, in case a new product is failing to meet its planned sales, they are versatile and flexible enough to divert to produce other products. The flexibility of these machines is that they can be moved around the manufacturing plant in a matter of minutes.

Over Production Is A Crime

Machine utilisation reports are often ⁷misleading and dangerous in a JIT environment. It is better to have machine idle than to build inventory. JIT is a demand driven philosophy. A plant should make no more or no less than a customer requires. As small batches are produced, the machines will be under utilised most of the time. In a way this under utilisation of machines is a blessing in disguise. Machine operators will have more time to maintain and keep the machines in better shapes. This enables to produce better quality products. In a JIT environment it is a "crime" to over produce. Toyota's plant in Japan over production is considered as a waste of valuable resources. To them over production will result in the accumulation of Finished Goods Inventory on hand and to say nothing of the cost associated with the storage of such inventories.

Housekeeping

Plant lay out and housekeeping are essential to the successful implementation of the JIT philosophy. The plant must be kept clean and tidy. This does not mean as clean as one could "eat

⁷Maskell, B. 'Capital Equipment Purchasing And JIT', Management Accounting, June 1987, pp 12-14.

off the floor ". It should be close to it. Housekeeping contributes to efficiency and productivity. Plant lay out must be arranged in such a way that material introduced at one end of the process should come out at the other end as finished product or a semi-assembled part ready for final assembly. This is like a 100 metre dash in which a runner takes seconds to finish the race. In other words, material goes through the production process in a flash and finished product is produced without hitches along the way. This action mirrors the production process of the plant.

⁸In order to achieve this goal the plant equipment must be arranged into a straight line process flow or U - shaped process cell. This arrangement makes sense because all the machining, milling and drilling of parts are done concurrently. In other words, operators have machines in the same area for machining, milling and drilling of parts as required.

This arrangement simplifies material. Different types of equipment are arranged a few feet apart and are connected by short roller conveyors. As a result of this arrangement, material can flow one piece at a time from machine to machine. This arrangement also enables the coordination of worker activities. Workers will be more engaged in production than

⁸Jamrog, M. R. 'Just-In-time Manufacturing: Just-In-Time for US Manufacturers', A Price Waterhouse Publication, 1987, pp 17-25.

chasing material or missing parts. One worker should be able to handle multiple machines. The synchronisation of fabrication and final assembly area is an attainable goal. The use of a conveyer belt to move material within the plant will eliminate material handlers and forklift trucks.

The ultimate result of this arrangement is the enhancement of quality control. As material moves one piece at a time, inspection methods must be incorporated on line. Defective parts are identified and corrected on the spot. This type of on the spot quality check is known as source inspection. Quality control inspectors are not required to do this the source inspection. Workers are well trained to do this task.

The Kanban Control System

When the JIT philosophy is well established and running smoothly in a company, the manufacturing process goes through a lot of innovations. The Kanban Control System (Figure 4) is a feature of the JIT manufacturing philosophy. The term Kanban refers to a block of wood that tells the supplier, or the person who represents the immediate upstream to process or to refill a particular order. Instead of a complicated master plan, such link in the production chain simply draws the parts it needed to complete its schedule from the preceding link. The Kanban Control System is a pull system.

A simpler way of defining ⁹Kanban is that it is the use of a

⁹Lu, D. J. 'Kanban JUST-IN-TIME AT TOYOTA', Productivity Press, Cambridge, Massachusetts, 1986, pp 87-95.

standardised container or a bin to move parts around the cell. When a container or a bin becomes empty, it shows how many parts are to be made to fill it. Kanban signals when materials are to be moved between work centres in the sense that each work centre signals the preceding work centre when it is ready to receive more materials. Units are produced to order and transferred only when the next work centre signals it is ready. A work centre must stop producing if it gets ahead of the subsequent work centre. This is the pull system. Kanban differs from the MRP. Kanban produces parts based on the order of the next work centre, whereas in MRP each work centre produces to satisfy the estimated demand and then pushes through the process. In other words in MRP material is moved between work centres irrespective of the fact that whether other work centres in the production line needed material and then push through the process. This is known as the push system.

The Japanese producers have been inclined to treat the task required to making an automobile more like operating a supermarket than launching a rocket. Consider the task of sending a rocket to the moon. Not only must one computer simultaneously control an incredible number of variables in a situation where failure of one component can lead to catastrophe, but two or three computers must also running simultaneously to provide backup if one fails. On the other hand a supermarket does not need such elaborate controls. Unlike an elaborate system with low marginal returns, a simple

Kanban system is sufficient to make sure that the shelves are stocked and to know which product is selling well and which product is not selling well and able to track the high cost item. The analogy of running a supermarket and launching a rocket to the moon vindicates the difference between the Japanese and the Western manufacturing philosophy.

Total Quality Control is an ingredient of the JIT philosophy. The Toyota motor company in Japan has achieved total quality control with the help of Kanban. They use computers to work out monthly production schedules and production volumes. Their daily variations are all controlled by the movement of Kanban.

Computer Integrated Manufacturing

Another innovation of JIT manufacturing is the Computer Integrated Manufacturing (CIM). As companies work to implement CIM concept, they usually recognise that an effective CIM environment cannot be purchased, must be strived for it. They recognise that CIM is the use of a combination of attitudes and technologies aimed at achieving a manufacturing competitive advantage. Rising overhead cost is the major concern of many manufacturing companies today. CIM plays an important part by helping management to eliminate unnecessary overhead costs. For example, if a transaction is bar-coded and laser read as it goes by on a conveyor belt the cost could be less than that of a person to stop it, read it and then to key it into a computer.

Uniform Plant Load

Uniform Plant Load (Figure 2) is an innovative and unique

approach. UPL means make what is needed to be sold. If a company is to sell parts daily then it has to produce parts daily. This is the way UPL operates. Suppose if 100 units of an item to be made, the machines in a cell are initially set-up to make 60 units in a uniform manner and gradually increase production until the required 100 units are made. The Toyota automobile plant in Japan the UPL approach has been successfully operating for years. This approach helps Toyota to monitor the fluctuating sales and adjust it in accordance with the Uniform Plant Load. Initially Toyota had to overcome problems like the clustering up of under utilised cell performance capacity and over absorbed overhead.

Multi-Skilled Workforce

Workers need multi-skills in a JIT manufacturing environment. The production lot is too small to be responsive to manufacturing disruptions. JIT relies on workers' high performance, dedication and multi-skills which require extensive training in all aspects of production process. This approach is different to the "Just In Case" philosophy where a production worker's skill is limited to the extent that a tool maker knows how to make tools. A multi-skilled worker will be able to do a variety of tasks in a manufacturing plant. Multi-skills provide workers with the ability to earn more and provide them with much wider career opportunities. Management has the flexibility to use the workers' skill as required. This flexibility enables a Foreman to move workers around when production requirement of work centres fluctuate. With a multi-skilled workforce and a flexible work environment, JIT

considers the work force as a capital investment. As the motive of any investor is to invest properly and to get a better return, the JIT philosophy's investment in a multi-skilled work force is a rule not an exception.

Unlike the "Just In Case" philosophy, the JIT philosophy requires the co-operation of workers and management. As smaller batches are produced, production problems are fixed along the way. Who will be in a better position to know these problems? Who are the ones with the pulse on the action? The workers are the ones who constantly work with the machines. So they are in a better position to know the problems than the managers. In a JIT environment management must listen to the workers and consult with them in every step of the process.

The Quality Control Circles

In Japan they have Quality Control Circles (Figure 3) in their factories. This is essential for the success of the JIT philosophy. A quality control circle is a small group of employees, from the same work area, who voluntarily meet regularly to study quality control and productivity improvement techniques. The QCC recognises that every member of an organisation, no matter how humble his\her position in the organisation, possesses ideas to improve their productivity and that of those around them. Unlike the traditional top down approach of decision making, QCC encourages the bottom-up approach of decision making. Traditionally managers make decisions and workers are there to carry them out. This traditional approach has created a

demoralised workforce with little or nothing to contribute to the decision making process. The workers' suggestions are encouraged in Japan's Toyota automobile plant and good suggestions are accepted on their merit. Some of the suggestions even have led to quality and production improvements.

One of the features of QCC is the quality improvement which is an ongoing process. As one production problem gets uncovered and fixed, then another problem will come up to be fixed. There is always a better way of doing things in a JIT environment. It will also lead to quality monitoring where statistical methods are used to improve quality. This method eliminates the guess work out of quality control.

In a nutshell the benefit JIT manufacturing philosophy (Figure 5) will bring to a company is enormous. The manufacturing lead time is squeezed to the lowest level, inventory goes down, changeover time goes down, labour content goes down, space utilisation becomes more efficient and quality goes up. In turn, by fulfilling these objectives, the finished products will be more competitive in the market place and this will result in a substantially higher profit for the company.

CHAPTER 3

HUMAN RESOURCE ACCOUNTING

The matching principle of accounting which subscribes that costs or benefits incurred in a particular accounting period should be matched with revenue generated in that period. If no revenue is generated for that particular period the cost should be expensed straight away. If there is a chance that in future revenue can be generated, then the cost should be capitalised as an asset and carried forward until such time as the revenue is realised. Human resource accounting should be accorded this same matching principle as accorded to physical resource accounting.

¹⁰Some of the traditional excuses for different treatment of human resources are: the firm does not own them; there is a need to have good relations with employees; and people are sensitive to the value others place on them. From a valuation viewpoint human resources may at first appear to be different than physical resources because the firm does not own them. So as other resources which the firm does not own them. Purchase of utilities or insurance, leases and other executory contracts have elements in common with labour contracts but the labour contracts have never been bestowed the same GAAP treatment as accorded to the physical resources.

One might point out that human resources are treated

¹⁰Clampa, D. 'The Human Resource Challenge', *Manufacturing Systems*, Oct 1989, pp 74-76.

differently than physical resources because of the need to have a good relationship with employees. Traditionally, in most cases, the employers and the employees are at each other's throat _ one sees the other as the enemy. More significantly, a good relationship with customers, suppliers, banks and governmental agencies is also important. Furthermore, goodwill is not something that is attributable to physical resources alone, rather it is attributable to the composite of human and physical resources.

It has often been said that applying valuation to human resources is an onerous task. This is because people are sensitive to the value others place on them. This is one of the reasons why salary details of people are kept confidential. This should not be an excuse for bestowing different accounting treatment to human resources.

The capitalisation method subscribes that human resources should be evaluated by the present value (capitalised value) of discounted future wages and salaries to be paid to the employees until their retirement. The time horizon of retirement of employees may be too long to make a reliable estimate of future wages and salaries. This is true because employees are hired on a contractual basis where most labour contracts are cancellable. Most often the employees are on the lookout for greener pastures and the employer has the right to hire or fire an employee as he/she wishes. This capitalised method is based on the idea that financial statements should

contain more information about a firm's future rights and obligations to human resources.

The replacement cost approach is more concerned about the replacement cost of an employee. In other words, the costs a firm would incur if the present employees were to be replaced. A myriad of questions are unanswered. With whom shall we replace an employee? What quality in an employee one should look for? How soon the decision be made? Under what conditions should the economic value of an employee be determined? It may sound some what strange that the replacement cost approach is more concerned about the price of human resources rather than the quality.

The economic value approach on the other hand latches on the economic concept of opportunity cost. The opportunity cost is the sacrifice to be made to divert an employee from one position to another position. The opportunity cost approach is made difficult by the absence of an open market for people. For example, ¹¹Hekimian and Jones (1967) of opinion that if a division is expect to earn \$140,000 more profit by hiring 8 additional engineers, then the division should be in a position to bid up to \$1,400,000, at the target return on investment of 10 percent, in order to obtain those engineers from the other division. Their argument is that this return on

¹¹This may be called the opportunity cost approach since the economic value may be considered the opportunity cost associated with loosing the human resources.

investment figure should be the basis for calculating the division's overall actual return on investment to be shown in the balance sheet.

On the flip side of the coin, a much narrower approach to accounting for human resources is the historic cost approach. It is a xerox copy of the matching principle of accounting which subscribes that costs should be expensed in the period they incur. A proposed change is, a deviation from the original historic cost approach, the capitalisation of the cost as an asset and the amortisation of the asset over the expected service life of the employees. The new approach calls for a better matching of costs and benefits, particularly in regard to hiring, training and relocation costs. The allocation of costs in this regard has the practical appeal of comparability with traditional accounting treatment for assets. The historic cost accounting subscribes that all monetary transactions are recorded so that an account may be rendered. It is easy to construct the human resource accounts from the existing cost information records. The historic cost as a basis for human resource accounting enables the management to account for stewardship and to meet the criteria of timeliness and costliness for preparing the information.

Accounting Implications

¹²In recent years there has been an awareness among employers about the importance of human resources in general and

¹²Hermanson, R. H. 'Accounting for Human Asset', Graduate School of Business Administration, Michigan State University, 1988, pp. 20-25.

accounting for such resources in particular. The emergence of JIT as an alternative manufacturing philosophy may have contributed to such an awareness. JIT considers employees as capital investment and the proper utilisation of these investments in a manner which would be beneficial to both the employers and the employees. It would be beneficial to the employers because multi-skilled employees would be in a position to perform a variety of tasks expected of them. This is contrary to the traditional view of a tool maker who is only expected to make tools nothing else. JIT has provided a window of opportunities for the employees. Unskilled employees will go through a constant on and off the plant training. The aim of this constant training is to provide them with multi-skills. The promotional prospectus of a multi-skilled employee within the manufacturing plant is enormous.

In a JIT environment the human and the physical resources are integral parts of the smooth running of a firm. The traditional enmity between the employer and the employee disappears. The Quality Control Circles and Bottom-Up decision process will give the employees a sense of belonging to the firm. The Quality Control Circles enable them to make decisions pertaining to the smooth running of a production plant while the bottom-up approach gets the best creative minds out of them. ¹³In such a cordial working environment the employer and the employees have only one common goal _ to

¹³Giles, W. J; & Robinson, D.F. 'Human Asset Accounting', Institute Of Personal Management, June 1987, pp 70-75

produce quality products. More importantly, in such an environment, according to JIT, human resources would add more value to goodwill than physical resources alone.

Japan the citadel of the JIT philosophy where the employees are given life long employment opportunities. In Japan most employees spend their working life with one employer. The traditional capitalised approach may well be suited to the Japanese environment. Moreover, the traditional argument for the replacement and the opportunity costs are quite academic in a JIT environment. The replacement cost of a multi-skilled employee is non-existent in a JIT environment. Even if an employee leaves for greener pastures, another multi-skilled employee is ready to fill in the position vacated by that employee. There is no opportunity cost involved in moving one multi-skilled employee from one production process to another production process. Flexibility is the key word in a JIT production environment and this flexibility enables the Foreman in a production plant to move a multi-skilled employee wherever the skill of that employee is required.

Irrespective of what accounting method is used for human resources, in a ¹⁴JIT environment the important consideration is that the same Generally Accepted Accounting Principles (GAAP) should be accorded to physical and human resources. The foundation of JIT is built on human resources and if the

¹⁴Clampa, D. 'The human Resource Challenge', Manufacturing Systems, Oct 1989, pp 74-76.

foundation is not strong, the superstructure will collapse. In other words, human resource is the crucible in which JIT is moulded.

CHAPTER 4

FINANCIAL ACCOUNTING

In financial accounting the valuation of inventory has an important part to play. It is essential to value inventory at balance date to determine cost of goods sold for the profit and loss statement and current assets for the balance sheet. In other words, the valuation of inventory is significant from the standpoint of the profit and loss statement and the balance sheet. In the former case the valuation may materially influence the cost of goods sold and the net profit whilst in the latter case the valuation may influence the current asset total, the grand total of all assets, the current ratio and the retained earning amount. The normal basis for inventory valuation is at cost. The cost in relation to inventories include the purchase price of the goods and all expenditures associated from the raw material stage to the finished goods stage. Thus it includes storing costs, overhead costs, occupancy costs and so on. When it comes to determine the cost of goods sold, a host of inventory costing methods exist. They are: First-In First-Out, Last-In First-Out, Weighted Average cost and so on.

In the traditional method of allocating cost to inventory valuation there is a ¹⁵dichotomy between original (i.e. historic) cost or current cost to be used for determining the cost of goods sold. The prudence concept of financial

¹⁵Anthony, R.N; & Reece, J.S. Management Accounting. 1975, pp 486-490.

accounting entails that all losses are anticipated in any period and defers recognition of profits or gains in the absence of certainty. This conservatism can be found when cost of goods sold is calculated (opening inventories at cost plus purchases minus closing inventories at cost). If profits are determined along these lines it means that only realised profits are included and unrealised profits are ignored. For example, if inventories costing for \$400 are bought and half of them are sold for \$300 the gross profit is determined as \$100 (Table 6).

Traditionally accounting is ¹⁶lumbered with the responsibility for reporting the value of inventory. Accounting does not order, schedule or perform the transactions which affect its balances. As a matter of fact accounting function has no control over inventory quantities, yet accountants must provide explanations in the event of their loss. It is a very common practice in the traditional manufacturing to cost inventory at actual rate and draws it out at standard rate. Any accounting system that operates under this notion is not only burying problems associated with inventory but also produces surprising results at physical inventory count. It has been accepted that, when physical stock take is carried out, in most companies examination of results generally show that the inventory contains human errors. Some of the human errors are: inconsistent application of costs; transaction

¹⁶Holbrook, W. 'Practical Accounting Advice for JIT production', CIM Review, Winter 1985, pp 49-54.

errors; someone may have double ordered to make sure that at least one order arrived on time; extra safety stock to cover machine breakdowns and leftovers from quality inspection disputes that never resolved.

A manufacturing company has three types of inventory accounts at balance date. They are Raw material Inventory, WIP Inventory and Finished Goods Inventory. In addition to that separate accounts are shown for raw materials used, cost of goods manufactured and cost of goods sold (Table 1). The table shows the flow of costs through inventories. The cost of raw material used is based on the assumption that the amount of raw material used is the difference between materials available for use during the period (the sum of beginning inventory and the net purchases) and the ending inventory. A credit balance of \$264,000 which is made up of the beginning inventory of \$154,000 plus purchases of \$273,000 less \$163,000 raw material on hand at the period.

Depreciation is important in financial accounting to deal with the problem of allocating expenditures incurred in an accounting period. A company may have a number of fixed assets which have to be used in an accounting period for the production of goods. The cost of the usage of such assets have to be allocated in the accounting period in which they have incurred. The matching principle requires that cost incurred in a particular accounting period has to be matched with revenue generated in that period. If chances of benefits

derived from certain expenditure over a number of accounting periods, then that expenditure should be retained in the balance sheet and allocate systematically to those periods. In a financial accounting context depreciation is regarded as an allocation process. Depreciation methods like straight line, diminishing balance, and sum of year's digits have been generally used to allocate costs. The methods used to allocate costs for depreciation in financial accounting are often highly arbitrary. The arbitrary nature of allocation of cost is such that two firms may have identical fixed assets which they plan to use the same way, but choose to depreciate it over different time periods. The differing cost allocation will produce different profit figures for them.

Accounting Implications

¹⁷In theory JIT caters for zero inventory. But in practice it is an unattainable goal for most JIT practising companies in Europe and America. Most companies in USA keep three days of raw materials as safety stocks to meet the unexpected stock out problems. This in turn will create WIP inventory. The reduction of stock on hand and the subsequent small amount of WIP indicates that it is not important to track material in and out of a separate inventory category called the WIP inventory. The accountants of the Hewlett Packard Vancouver division have revolutionised the traditional three inventory accounts and reduced them to two. The traditional WIP and Raw material accounts are merged as one account and it is called

¹⁷Kaplan, R. S. 'Yesterday's accounting undermines production', Harvard Business Review, July-Aug 1984, pp 95-101.

the Raw material In Process account. In addition to that they have kept the traditional Finished Goods Inventory. They debit the RIP inventory account and credit the Accounts payable account whenever raw materials are bought.

The cost of goods sold for JIT at balance date should be: purchases minus ending inventory (FGI) which includes labour and manufacturing costs. As a rule, in a JIT manufacturing environment there will be no WIP inventory left to be carried forward for the next period as the beginning inventory (Figure 11). The assumption is that goods produced are delivered to the customer straightaway. In such a production environment there will be no WIP Inventory and Finished Goods Inventory.

¹⁸JIT is a demand driven production technique which dictates the production of quality products to meet the customer requirements and demands. In a JIT production environment the raw material goes through at one end of the manufacturing process and finished product comes out at the other end as a saleable commodity. In such a production environment it is reasonable to assume that, from raw materials to finished goods, the inventory moves through the manufacturing process in an orderly first-in first-out parade. The FIFO is the recommended inventory costing method for JIT. Not only FIFO meets the current costing requirements but also it is in compliance with the Australian Accounting Standards. The

¹⁸William, H. 'Practical Accounting Advice for Just-In-Time production', CIM REVIEW, Winter 1985, pp 49-54.

suitability of the FIFO method for a JIT manufacturer is based on the assumption that costs are debited or credited in the order of their occurrences. As a Consequence the cost of goods sold in the profit and loss statement and the amount of inventory in the balance sheet would then reflect the most recent costs.

In spite of the fact that accounting standards are aimed at giving a fair accounting treatment and reporting of assets in the financial statements, most companies give undue importance to tangible assets and scant regard is bestowed to intangible assets. According to JIT the economic value of a company is the composite of its tangible and intangible assets measured in terms of current market price. There is no juxtaposition to this JIT concept and what is being followed by most JIT practising companies today. JIT is even advocating to broaden the traditional concept of goodwill by the inclusion of items like multi-skilled workforce, employee morale, reliable suppliers, customer loyalty and so on.

In a JIT environment it is quite unlikely that the cost allocation of depreciation is going to be different from the traditional approach. But there are some perceptible differences in allocating costs to depreciation in a JIT environment. Depreciation is charged on the basis of units of outputs produced rather than the time it took to produce the outputs. Depreciation can also be charged to work cells based on the number of units produced. In any case the JIT concept

of cost allocation for depreciation is going to be difficult to implement because the accounting standard has not changed accordingly.

The traditional payables and receivables are paper-bound. Starting from purchase requisitions to payments to customers, a massive amount of documents pass through so many hands. In most companies an army of employees are engaged in matching up and storing out these massive documents. The number of people engaged in sorting out and matching up this snow-storm of documents will certainly add to a company's exorbitant overhead costs.

Invoices and purchase orders for parts received and supplied on an ongoing basis will become obsolete as a company adopts the JIT philosophy. Vendors can deliver and be paid according to a production schedule supplied to them by the manufacturer. Likewise, customers can supply their production schedules and will pay according to their receipt or consumption of goods. Vendors are selected on a Rating System which enables to select reliable suppliers who in turn deliver quality products. This system is advantageous to both parties. The customer has few reliable vendors who supply quality products and gets paid as he delivers the parts. The accountants of the Hewlett Packard have changed the accounts payable system to accommodate their JIT purchasing. The retention of an ever increasing massive documents was the major problem. The solution was an automated accounts system with on-line

transaction matching and archiving done on microfiche
(Figure 25).

CHAPTER 5

COST ACCOUNTING

¹⁹The Present cost accounting system was based on concepts developed almost a century ago when the nature of competition and the demand for information were very different from what they are today (Figure 10). In a global competitive environment a company's survival is depend on how good and cost effective its products are. ²⁰In most company's examination of poor profit margin would reveal that the traditional product costing distorts product pricing and marketing decisions. For example, the traditional cost accounting has quantity measures for labour and material, but there is no quantity measures for overhead. It is always a big chunk of costs to be allocated. The allocation of overhead, in most cases, is based on direct labour which is not conducive to the modern automated production environment (Figure 24). The resultant effect is that products have become uncompetitive due to decisions that are made on distorted product costs.

²¹Determining a product's unit cost is one of the basic functions of a cost accounting system. The success of a business is based on its product costing method in number of

¹⁹Kaplan, R. S. 'Cost Accounting A Revolution in the making', Corporate Accounting, 1989, pp 10-16.

²⁰Cooper, R; & Kaplan, R.S. 'Measure Costs Right: Make the Right Decisions', Harvard Business Review, Sept-Oct 1988, pp 96-103.

²¹Frecka, T. J. 'Accountants take The offensive of "Just-In-Time', Target, Spring 1987, pp 19-23.

ways. Firstly, unit costs are an important element in determining an adequate, fair and competitive selling price. Secondly, product costing information often forms the basis for forecasting and controlling operations and costs. Finally, products' unit costs are needed to arrive at the ending inventory balances. Many techniques are used for product costing and every company adds its own unique procedures. The two of the most prominent product costing methods are Job Order Cost and Process Cost systems . The Standard cost system was developed later on to revamp the existing product costing. Unlike the misconception the standard costing is not the third cost accounting system. It is often used with Job Order Costing or Process Costing system.

²²Job costing is the typical method of cost accumulation and the assignment in plants that process readily identifiable units or batches of products through multiple work centres. A job order costing system is used for unique or special order products. In such a system material, direct labour and factory overhead costs are assigned to specific job orders or batch of products. A predetermined overhead is computed by dividing the total estimated overhead costs for a period by the total activity basis expected for that period. Factory overhead costs are applied to a job order by multiplying the predetermined overhead rate by the amount of the activity base (such as direct labour hours). The unit cost is determined by

²²Anderson, H. R; Needles, B. E; & Calwell, J. C.
'Managerial Accounting', Houghton, Mifflin, pp 572-574.

dividing the total manufacturing costs assigned to each job with the number of units produced for that order. The job order costing attempts to specifically identify and allocate all costs to specific job orders or batch of products through an operation of work orders.

The job order cost system generally follow the absorption costing procedure _ allocating all manufacturing costs to individual products. It caters for the perpetual approach to inventory maintenance and valuation. Material and supply costs are initially debited to the Material Inventory Control account. Labour costs are debited to the Factory Payroll account. Various factory overheads are debited to Factory Overhead Control account. As products are being manufactured, direct labour and direct material costs are transferred to WIP Inventory Control account by using a predetermined overhead rate. These overhead costs are credited to the Factory Overhead Applied account. When products or jobs are completed, the costs assigned to them are transferred to Finished Goods Inventory Control account. These costs are transferred to the Cost of Goods Sold account when the products are sold.

A proper job order cost system requires the preparation of journal entries for each of the following transactions: purchase of materials; purchase of operating supplies; requisition of materials and supplies into production; recording of payroll liabilities; payment of payroll to employees; distribution of factory payroll to production

accounts; cash payment of overhead costs; recording of non-cash overhead costs, such as depreciation of factory and equipment; application of factory overhead cost to production; transfer of costs of completed jobs from the WIP inventory Control account to Finished Goods Inventory Control account; sale of products and transfer of related costs from the Finished Goods Inventory Control account to Cost of Goods Sold account; and disposition of under-applied and over-applied factory overhead.

Process costing is at the opposite end of the spectrum from job order costing. It is a product cost system used by companies which are engaged in making many similar products that have a continuous production flow. In other words, it is more economical to account for product related costs for a period of time (a week or a month) than to try to assign them to specific products or job orders. It deals primarily with averages as opposed to specific. Units costs are computed by dividing total manufacturing costs assigned to departments or work centres during a week or a month by the number of units produced during that time.

Process costing requires relatively minimal data collection. Labour is accumulated through the payroll system and material cost accumulation is based on withdrawals from the inventory. Manufacturing overhead is allocated the same way as in job order cost system. The major difference between process cost and job order cost system is the way costs are allocated to

products.

Standard cost is a scientific predetermination of what something should cost. This predetermination of the costs include direct material, direct labour and factory overhead. The predetermined overhead costing of the job order costing or process costing, however, has some similarities: both forecast dollar amounts to be used in product costing, and both depends on expected costs and quantities of budgeted items. These similarities ends at this point. Predetermined overhead rates are simple projections of past cost patterns whereas standard cost is based on engineering estimates, direct material quality, forecasted demand, worker input and so on.

Standard costing is a total cost concept which replaces all manufacturing costs with standard (or predetermined) cost data. Accounts pertaining to Direct Material Inventory, WIP Inventory, FGI Inventory and Cost of Goods Sold are debited or credited in terms of standard costs, not actual costs . Separate actual costs records are kept to compare it with standard costs at the end of the accounting period. The difference between the two costs is the variance. A favourable variance occur when the actual cost is less than the standard cost and the opposite outcome will result in an unfavourable variance. The variance analysis is an effective cost control tool at the management's disposal to reduce waste and inefficiency. Table 2 shows how the traditional standard cost is calculated and the cost driver is direct labour hours. The

factory overhead for standard costing is calculated the same way as the predetermined overhead rate explained previously. In standard costing the factory overhead rate is made up of two parts: the rate for variable costs and the rate for fixed costs. They are computed separately due to the requirement of different application bases.

The recording of journal entries for standard direct labour, direct material and factory overhead costs are similar to the recording of the actual cost data. The only noticeable difference is that these manufacturing costs are entered in the WIP Inventory account at the standard cost rate. Any transfer of units from any one of these manufacturing costs to the FGI inventory or the Cost of Goods Sold account will automatically be at the standard unit cost. In other words, when standard cost system is used the cost that flows through the production and inventory account will be at standard cost rather than at actual cost. When actual cost of the manufacturing cost differs from the standard cost, a difference will occur. The difference may be favourable or unfavourable and they are recorded in the variance accounts. Unfavourable variances are debited and favourable variance are credited (Table 5).

Standard cost system divides factory overhead into variable and fixed overhead. This is done because separate absorption rates are essential for variable and fixed overheads. More importantly, it is essential to have the factory overhead

separated as variable and fixed overheads for the successful operation of the flexible overhead budget. Under a flexible overhead budget at the end of the accounting period the output of the month is known and that will enable to determine what should be the factory overhead applicable to that actual output.

Accounting Implications

²³The JIT manufacturing philosophy has caused a reassessment of the traditional product costing techniques. For the first time in forty years the existing product cost system has been challenged as inaccurate and outdated. These product cost systems were developed at a time when most companies had manufactured a narrow range of products. Back then, the costs such as direct labour and direct materials could easily be traced to individual products. Today, product lines have proliferated. For example, the Hewlett Packard now sells 5000 different product lines. Direct labour is a small part of the production cost in a JIT automated production environment. As a consequence, allocating manufacturing overhead by burden rate on direct labour is a distortion. Managers, in some companies selling multiple product lines, make pricing decisions based on distorted product costs. Most companies detect this problem after their profitability and competitiveness have wilted away. To be able to succeed as manufacturers of quality products in a global competitive environment, companies have to overhaul their product costing

²³Eiler, R. G. 'Is Your Cost accounting up to date?', Harvard Business Review, July/Aug 1982, pp 133-139.

techniques.

²⁴Product costing and accounting for product costs are not an overly complicated procedure under JIT. The JIT philosophy strives for excellent manufacturing which means that no matter how lean and mean a manufacturing process is, it can be made leaner and meaner. This obsession has given the elimination of waste and non-value added parts the top priority in a JIT environment. There are five elements in the traditional product costing. They are: processing time; inspection time; moving time; queue time; and storage time. These five elements are as equally important to JIT product costing as to the traditional product costing. The costs of processing time are merged with material costs or conversion costs and charged to products as the same way as the traditional process costing method. The conversion cost is a combination of direct labour and factory overhead costs. Combining them is convenient because material costs, as a rule, are generally not incurred uniformly throughout the production process. Instead, they are normally incurred at the beginning or at the end of the production process. Thanks to this difference, the equivalent amount of materials will not be the same as for the conversion costs. On the flip side of the coin, both direct labour costs and factory overhead costs are incurred uniformly throughout the production process. The other four elements have little or nothing to do with production process. These four elements are

²⁴Anderson, H. R; Needles, B. E; & Caldwell, J. C.
'Managerial Accounting', Houghton Mifflin, pp 576-580.

eliminated through cost control measures.

In a traditional production operation the emphasis is focused on cost control. In a JIT environment the aim is to eliminate all unnecessary costs rather than reducing them through control measures. Before the elimination process to start, it is imperative to understand what are the unnecessary costs which need to be eliminated. Once the cost driver, the activity that causes the costs to incur, is identified, the elimination process can begin. It can be done either by treating the indirect cost that causes the cost driver as a legitimate product cost and allocate it as part of the conversion cost or by eliminating the cost driver itself.

The traditional product costs are unduly influenced by the variable costs, ²⁵especially direct labour costs. Direct labour is the main cost driver in the traditional product costing and most factory overhead is allocated on the basis of direct labour hours. In a JIT environment costs have little correlation with direct labour. The use of flexible manufacturing systems and automated production cells have brought a new perspective to allocating costs to factory overhead. In such a JIT environment machine hours have replaced direct labour hours as the legitimate cost driver to be used to allocate factory overhead costs. The adoption of machine hours for allocating costs to factory overhead is

²⁵Anderson, H. R; Needles, B. E; & Caldwell, J. C.
'Managerial Accounting', Houghton Mifflin, pp 584-622.

sensible because in most JIT production process there are more machines than workers. In extreme cases where an entire production cell can be operated by one operator. In traditional product costing the selection of direct labour as the cost driver to allocate factory overhead has created distortions whereas machine hours as the cost driver has brought some rectitude to JIT product costing.

The advantage of choosing machine hours as the cost driver is that it takes the guess work out of allocating overhead costs. In the traditional job cost environment the actual overhead costs fluctuate from month to month because of the timing of fixed overhead costs. Therefore some method must be used to allocate overhead costs to products before the end of the accounting period. The most common way is the selection of a predetermined overhead rate. The success of using a good predetermined overhead rate depends on two factors: one is a good estimate of the total amount of the overhead; and the other is a good forecast of the production activity that will be used as the allocation basis. If the estimate is wrong, the overhead will be wrong and the resultant effect will be over-applied or under-applied overhead rates.

Table 3 shows the advantage of using machine hours as the cost driver to allocate overhead costs in a JIT automated environment. In this particular case the use of direct labour has distorted the selling price of the three products, A, B and C. Product A and B are over-priced and product C is under

priced. An error in pricing a product may result in loss of customers and market share, So accurate product costs are important for a company's overall profitability and the existence in a competitive world.

The work order is an indispensable part of the traditional job order cost system. It is a device through which labour costs are charged to a specific product. There is also the tendency in job order costing to allocate job numbers to each item to be produced. So products with multiple line items will have multiple job numbers in the work order. As a worker works on specific item, the time he/she spends on that item gets charged in the work order. Costs are therefore accumulated as the factory work order moves through the production process. When all the items are completed the work order is a record of all the labour hours and the materials required for the completion of those items. In a JIT environment there are no work orders (Figure 12). Daily production schedules are provided for each production cell and typically only finished items are reported by the cell over the course of the day. This is well consistent with the JIT philosophy of reduction of transactions and lead time. As a matter of fact the total of all related costs are allocated to the days production, not to the individual jobs or tasks.

In a JIT environment without work orders labour and overhead costs must be alternatively allocated to inventory and production costs. Direct labour is a small portion of the

production cost. It is advisable not to treat it as a separate cost element, rather include it as a portion of the overhead. The accountants the of Hewlett Packard plant in USA have decided to treat manufacturing overhead as an expense and charged directly to the Cost of Goods Sold. This action is well consistent with the GAAP concept of a cost incurred in one period should be expensed in the same period.

²⁶In a JIT environment the variance analysis has an inconsequential importance, to be precisely no importance at all. Material price variance or quantity variance will not occur because the vendor and the recipient have prior agreement on the amount of materials to be supplied and the price of such materials. More importantly, materials are delivered by the vendor on small lot sizes to the factory floor. This approach eliminates the unnecessary paperwork of having to raise material requisition to get material from the stores and at the end of the day leftover materials having to send back to the store to get credit for them. This way the problem of quantity variance can be eliminated. Labour rate and efficiency variance are inconsequential in a JIT automated environment because one or two operators can successfully operate a production floor. More importantly, it will be quite unlikely that labour rate and efficiency variances occur because JIT caters for a multi-skilled work force who are remunerated according to the skill they possess. A litany of

²⁶Mecimore, C. D. 'Techniques In Inventory Management And Control', National Association Of Accountant Publication, 1987, pp 147-150.

other variance analyses of the traditional standard costing will have a high infant mortality rates when JIT is up and running smoothly.

There are differing views among the proponents of JIT about the usefulness of standard costing in a JIT manufacturing²⁷environment. One school of thought is in favour of retaining the standard cost system with modifications while the other prefer the historic cost as the standard. The latter group went one step further by advocating the use of historic costs when evaluating current costs. To them the use of standard cost has no usefulness because JIT is striving to eliminate inefficiencies as they occur.

Replacing standard cost with historic cost will cause many problems. The idea of past performance is an acceptable performance is anathema to the JIT philosophy. JIT is a system which advocates constant changes where past performance has no useful purpose. As previously explained historic cost understates the value of assets and overstates profits. The suggestion of JIT prefer historic cost to standard cost when evaluating current cost is not consistent with JIT's aim of manufacturing excellence. It can neither suggest that historic cost is a lesser evil nor a better choice.

²⁷'Relevance Regained', An Interview with Professor R. S. Kaplan, Management Accounting, Sept 1988, pp 38-40.

²⁸In the JIT environment of today the Hewlett Packard has modified the standard cost to suit their product costing. The reduction of vendors and the long term purchase contracts have enhanced HP's control over quality and price of materials. In addition to that bill of material and labour specification sheets have been constantly updated. Their highly automated production environment results in the production of products in a standard, repetitive manner. In such an environment standard costing has become an integral part of HP's product costing.

²⁸David, D. 'Product Costing in a JIT environment', Management Accounting, March 1990, pp 40-42.

CHAPTER 6

MANAGEMENT ACCOUNTING

Modern management accounting's origin goes back to the 19th century. The cost engineers of that period were assiduously engaged in monitoring plant efficiency by computing unit cost.

²⁹Most of these engineers worked in single process and single product firms. These firms presented few problems in identifying and tracing costs. Their familiarity with the production process had helped them to a considerable extent to focus on the unit cost calculation which they considered to be the critical attribute of the process they were controlling.

In spite of the fact that most of the current management and cost accounting techniques were known in 1920, few innovative firms were practising them. This period also witnessed the emergence of the accounting profession which offered a means of dealing with (but not solving) the cost allocation problems. By and large the accounting profession's approach was to ignore tracing costs and costing products and focused on inventory valuation by arbitrary and codified cost allocation rules that relied on volume measures to allocate costs to products.

During the period between 1920 and late 1970 most firms assumed that financial accounting information could be adopted

²⁹Atkinson, A. A. 'Financial and management accounting: the odd couple', CMA magazine, Dec-Jan 1989, pp 42-46.

for use by the decision makers within the firm. ³⁰This sway of financial accounting might have been the influence of the prudence concept and to a lesser extent the stewardship theory. The usefulness of prudence concept and stewardship theory is debatable in management accounting. The weight they have exerted on management accounting practice is considerable. Management accounting role is to give timely and accurate information to decision makers. A systematically biased conservative and understated profit figures are not the type of information the decision makers need. Such information will more likely to lead to sub-optimal decision making and less than efficient allocation of resources. The stewardship theory of financial accounting has provided historic cost rather than current or opportunity cost information the decision makers often require. This subservient attitude of traditional management accounting to financial accounting has created so many problems, especially with regard to estimates, forecasting and budgeting, depreciation and return on investment.

Accounting has always been subjected to doubts and uncertainties. This nature of accounting has given credence to the prudence concept of financial accounting. This prudence concept continues to permeate into management accounting as well. These uncertainties and doubts, which have forced up on management accounting, would suggest the need for the use of a

³⁰Brooks, M. J. 'Financial accounting principles and management accounting practice', Management Accounting, Oct 1988, pp 20-22.

range of likely outcomes rather than a single-point estimate. For instance, accounting has been concerned with forecasting the present value of future transactions than with reporting the values of past transactions. A Single point value in management accounting most often convey an unjustifiably certain view of profit and financial position of a firm and ignore the real level of uncertainty implicit in them. The conventional wisdom followed by many managements is that management accounting information should be prepared on the same basis as the published financial accounts. The debate on accounting for the effects of changing prices and the criticism of the proposal for an alternative profit figure produced by management accounting seem rather odd that managements are quite willing to accept that differing solutions are required for a variety of issues whilst managements are reluctant to accept that different context requires different accounting information. The pluralist approach of having two sets of profit figures may be anathema for external reporting and nothing stopping them for internal consumption. This pluralist approach is well consistent with management accounting role of independent reporting.

A range of likely outcomes would be useful in the presentation of forecasts and budgets. The companies using this approach are few and far between because of the financial accounting inhibitions that there is only one 'true and fair' figure. This view coupled with the application of the prudence concept encourages budget padding — the overestimation of budget

figures. The conventional wisdom suggests that habitually most managers submit and justify budgets that are padded and a proper scrutiny would reveal that most budgeted figures can be made leaner and meaner. The Overestimation of budget figures has the advantage of providing a favourable budgeted outcome when the actual figures are lower than the budgeted figures. As long as there is reward for over-budgeting and punishment for under-budgeting (as it often does) budget padding will continue. This budget padding not only promote misallocation of resources but also such budget figures cannot sensibly be used for performance monitoring.

The matching principle of financial accounting entails that income is determined by matching expense against revenue. As a consequence of this principle, depreciation charge is an allocation process rather than a valuation process in a financial accounting context. Moreover the methods used for the allocation of depreciation charge are arbitrary. In a management accounting context depreciation is a valuation process. This valuation process necessitates that depreciation is a process of using up a fixed asset. Precisely it is the consumption cost of the use of a fixed asset and any change in value from its original value is reflected over a period of time. The financial accounting domination coupled with the management inertia prevents management accounting to choose a different depreciation method. ³¹The conventional

³¹Atkinson, A. A. 'Financial and Management Accounting: the odd couple', CMA Magazine, Jan 1989, pp 42-46.

ROI method is riddled with flaws and not suitable for the evaluation of capital investment decisions. Now it has been widely recognised that Discounted Cash Flow (DCF) techniques for assessing proposed investments are superior to the ROI techniques. Some managements reluctance to accept DCF calculations may not be actually due to any technical difficulties at all, but it may well be another case of financial accounting dominance over management accounting practice. More importantly, management may be unwilling to have two methods for dealing with what may appear to be the same issue. Financial accounting ,as it seems, is very uncomfortable with the methods that are based on estimates of future cash flows. This attitude of financial accounting may well be due to its prudence and variability concept.

The important theoretical attributes of management accounting is to provide management with information to: (1) monitor operating results in order to evaluate managerial performance and control operations, (2) coordinate activities within the firm, (3) make decisions about product design, mix and price and (4) plan operations. In practice theses theoretical attributes of management accounting are submerged in financial accounting principles. The influence of financial accounting over management accounting is powerful and extensive. Management accounting has a distinct and a different role to paly. Techniques like marginal costing, cost volume profit analysis and DCF calculations are pointing towards a distinct and a separate body of principles do exist and management

accounting does have a theoretical base that is distinct and different from financial accounting. The challenge management accounting faces in the 90s and beyond is to regain its proper role of providing management with timely and accurate information, not to act as a lackey of financial accounting. Will JIT be the saviour of management accounting?

Accounting Implications

In a JIT environment the management accounting role is different. This is in no way to suggest that the dominance of financial accounting principles is going to disappear overnight. So long as management is not far-sighted, the financial accounting principles will continue to permeate into the management accounting practices. A JIT management accountant is not a paper pusher who is confined to the four walls of an office. ³²In addition to the traditional role the management accountant is expected to involve in production process and identify weakness and take remedial measures to correct them.

³³There are some noticeable changes that have taken place in management accounting and management accounting has regained some of its lost splendour. This is especially noticeable in performance analysis (Figure 14). Some of the traditional

³²Howell, R. A; & Soucy, S. R. 'Operating Control in the New Manufacturing Environment', Management Accounting, October 1987, p.25-31.

³³Anderson, H. R; Needles, B. E; & Caldwell, J. C. 'Managerial Accounting', Houghton Mifflin, 1990, pp 633-638.

management accounting performance analyses have become redundant and some new performance analyses have elbowed their way into prominence. For example, many companies are accustomed to judge the performance of the purchase manager based on the purchase price variance. Such performance analyses are no longer required because the vendors are under contract to supply raw material on an agreed price. In its place the supplier performance of on time delivery of quality materials has become more important. Some of the other performance analyses which have become the flavour of JIT are: product quality, product delivery, inventory control, material scrap control, and machine management and maintenance.

For the past two decades most companies in the western world have lost market share of their products primarily due to poor quality products. During the same period Japan has attained the status as the world's best manufacturer of consumer products. Japan has increased the quality of her products while still lowering the price. Therefore, the companies which have embraced the JIT philosophy should have the goal of producing quality products at a price that will be competitive in the world markets. Management accounting has an important role to play in helping management achieving this goal. Hitherto product quality was the responsibility of the shop floor. In a JIT environment, as part of the product quality performance analysis, the management accountant must emphasise that product quality starts with product design (Figures 15,16). Product design is only a part of product quality.

There are other ingredients. They are: high quality materials; quality workforce; an efficient quality control; and products of high quality is shipped to the customer. The product quality performance analysis report is an eye opener to the management. It reveals the management what is going on in the shop floor, how products are fared and what necessary steps are to be taken to ensure that products are of superior qualities.

The traditional manufacturing was beset by the delinquency of on-time delivery of finished products. In a JIT environment no company can afford to have the luxury of by-passing the delivery cycle, the time period between the acceptance of an order and final delivery of the product, and remain competitive in the market. JIT's goal is for product delivery to be precisely 100 percent on time. In order to meet this goal companies must establish and maintain an uncompromising consistency and reliability within the manufacturing process. As part of product delivery performance analysis the management accountant has to establish and maintain several control measures to help management to minimise the delivery cycle. This new role of management accountant revolves around monitoring of purchase order lead time, production cycle time, delivery time and delivery cycle time. Trend analysis of delivery cycle time coupled with on-time delivery performance records should be made available on a daily or weekly basis.

Inventory has been one of the largest asset balances in the

balance sheet. Accountants have been trained to verify inventory balances and compute the value of the inventory even though accounting has nothing to do with the ordering, scheduling or performing the transactions that affects its balances. According to the Japanese Inventory is the root of all evils of the traditional manufacturing.

JIT caters for a zero inventory in the plant. The concept of zero inventory is unattainable to most JIT practising companies in the western world. The management accountant's role must be to strive for zero inventory and if it is unattainable, inventory storage should be kept to a reasonable level to meet the quotidian (daily) production requirements (Figures 17,18,19). The JIT inventory control performance should be aimed at detecting why inventory does exist, not with devices to measure its accurate valuation.

³⁴The traditional manufacturing would budget for scrap, say 8 percent, with the aim to get no variance. If the target is achieved then it is fine. It is not fine. The aim should be zero scrap and continuously working until perfection is achieved. In a JIT environment scrap is seen as a non-value added cost of material, labour and overhead costs. If a Japanese company production manager were to ask how much would he budget for scarp, he would most certainly pretend as though he would not understand the translation. To him the question

³⁴Johnson, H. T. 'A Blueprint For World Class Management Accounting', June 1988, pp 23-30.

is an insult to his sensibilities. To a Japanese company the acceptable level of scrap is zero. It is the management accountant's responsibility to develop control measures to prevent scrap. It may sound odd that instead of the production manager the management accountant develops control measures to prevent scraps. The new role of the management accountant in a JIT environment should not only encompass the computation of financial data on the cost of scraps but non-financial measures should also be developed and maintained to curb scrap.

Another of the management accountant's role is machine management and maintenance. JIT's automated environment with CIM/FMS machines require a large amount of capital investment. In a JIT balance sheet the largest item is often automated machineries and equipment. Conventionally a well managed company's motive is full machine utilisation. If a product is a success the machines are over-utilised to the extend of multiple shift bases and most often maintenance of the machines is overlooked. Frequency of machine break downs and poor quality products are the results. Quality is the buzz word of JIT. In order to achieve this, a proper maintenance of machines is important. The management accountant's role is to keep machine maintenance records which reveal machine management, maintenance and equipment capacity utilisation.

CHAPTER 7

THE JIT COSTING OF THE FUTURE

The JIT manufacturing philosophy has revolutionised manufacturing and it has revolutionised the accounting concepts as well. All facets of accounting have gone through remarkable changes. Keeping up with its goal of efficiency, JIT has changed the traditional financial, management and cost accounting. Two of the JIT innovative cost accounting concepts of the future are: Flushed Costing, and Activity Based Costing.

Flushed Costing

The terms 'front flushed' and 'back flushed' are the two of JIT's modern costing techniques. ³⁵Flushing is a way of identifying all the materials and components associated with an assembly and removing them from the stock records. The Front flushing is done before the part is being built whilst the back flushing is done after the part is being built (Figure 23). In other words, there is no tracking of materials and components from material stores through WIP and FGI. Instead, before and after a product is being built all materials and components are identified through bill of materials and remove them from the MRP records. It has to be borne in mind that materials are not kept in the stores. Instead, they are delivered by the vendor to the shop floor. Unlike the traditional method of tracking materials from the stores through WIP and FGI, this JIT approach is much simpler.

³⁵Graham, I. 'Just-In-Time Management Of manufacturing', A Joint Elsevier/Technical Communications Publication, 1988, pp 30-31.

³⁶The striking feature of this cost system is the decrementing of inventory records after the completed products pass through final inspection. The system recognises that as the product passes through final inspection it must have all of its components in place. Simultaneously each component is removed from the material stock records and the attendant adjustment is made accordingly. The advantage of back-flushing is the reduction of the number of transactions required to record inventory movements and that will in turn reduce the time required for data collection, preparation and computer processing. More importantly, back-flushing will enhance inventory accuracy. However, the back-flushing has two implications: the system treats all materials as being available even though some of them have become part of the finished products; and materials and the attendant records are removed when product is completed. The material does not carry overhead costs while production is in progress. The Hewlett Packard company has tried to overcome these problems by having two days of material in process on hand and this has reduced the risk of material stock-outs. With two days of inventory on hand, the WIP has become inconsequential and the application of overhead cost is not important.

The JIT innovation of this costing system is also aimed at eliminating detailed accounting transactions (Figures

³⁶Foster, G; & Horngren, C. T. 'Cost Accounting And Cost Management Issues', Management Accounting, June 1987, pp 19-25. ³⁶

20,21,22). The front flush accounting first focuses on the output of an organisation and the back flush accounting works backward by allocating costs between cost of goods sold and inventory.

Activity Based Costing

Activity Based Costing is the other new approach of JIT product costing of the future. ³⁷Its main function is to examine the activities of the indirect departments in an organisation in order to compute product costs. These activities of the indirect departments play an important role in designing, making, selling and servicing products. The purpose of the close scrutiny of these activities is many fold. Firstly, to examine which of these activities have been delivered by the organisational resources. Secondly, to find out the unit costs involved in delivering these activities. Thirdly, to determine the number of products using these activities and the amount of units consumed by each product. These close scrutiny may well enhance product improvements and the allocation of proper overhead costs to products.

One of the main purpose of product costing in the traditional accounting system is to value inventory for financial reporting. Product costs based on the traditional cost accounting information can make serious marketing errors. This is mainly due to the application of over-aggregated averages to distribute indirect costs to products and as a result the

³⁷'Relevance Regained', An interview with Professor Robert S. Kaplan, Management Accounting, September 1988, pp 40-42.

costs of individual products are distorted. This distortion is the result of using direct labour as the cost driver to allocate overhead costs. A product with more direct labour hours is subjected to incur proportionately more indirect costs than another product with less direct labour hours. More importantly, traditional cost accounting has the tendency to over-cost high volume products and overlook the ones that most likely to cause growth in overhead costs. There is also the tendency to under-cost low volume products which are mainly responsible for the proliferation of overhead costs.

Unlike the traditional method of costing, ABC does not consider overhead cost is something to be allocated. Overhead cost is the cost of the indirect activities. It is a contributory factor for the overall success of the organisation. The difficulty of tracking overhead is that it is a combination of a number of indirect activities. ABC's task is to dissect these indirect activities, find out the costs of these activities and come up with a quantity measure that can be related to a finished product.

A business with multiple product lines and high indirect costs cannot afford to relay on the traditional product costing methods to make marketing and pricing decisions. The importance of Activity Based Costing with regard to product mix and pricing decisions is highlighted in figure 26. This is based on a case study of an American company whose product costing problem typifies the experience of American business

generally. The two curves (figure 26) show some what different view of the products' profit. The traditional cost information indicates that all products make profit. The activity based curve reveals just the opposite _ a high percentage of products generate losses. The end result is that products claimed to be profitable by the traditional product cost system have sustained losses according to the activity based systems. A fictitious Activity Based Costing example is illustrated in Table 4. It is crystal clear that product X requires more engineering and purchasing resources than the suggested 10 percent material overhead recovery rate.

CHAPTER 8

JIT AND THE AUSTRALIAN EXPERIENCES

The Ford Motor Company And JIT

The Ford Motor company has been using the JIT manufacturing philosophy for the last five years. Initially the transition from a Just-In-Case to a Just-In-Time philosophy had its teething problems. Now the toothache is over. JIT is a part and parcel of Ford. The company accepts the fact that the traditional Top-Down decision making process is counter-productive in a JIT environment. In order to improve the morale of the workforce the company has a Bottom-Up decision making process in the manufacturing plant. Workers suggestions regarding manufacturing efficiency and quality improvement of products are encouraged. Each production cell has Quality Control Circles (Team) and each Team has the responsibility to take decisions pertaining to its production cell.

The Ford Motor Company recognises the importance of a multi-skilled work force. In pursuit of a multi-skilled workforce the company has an extensive on and off the plant training. On completion of these training Vehicle Industry Certificates (VIC) are awarded to participants of the training. These training programs are aimed at giving the employees a career structure and the remuneration is based on the skill each employee possesses. The duration of the on the plant training ranges from two to six weeks. This on the plant practical training is complemented by an off the plant theoretical training at TAFE colleges. On completion of these training an

employee is considered as a multi-skilled employee.

The Ford Motor Company is striving to have a zero inventory in the plant. The Australian Industrial culture is not conducive to attain this goal. Australia's notorious industrial relations problems coupled with the fear of stock-outs of raw materials have forced the company to maintain four days of inventory as a safety stock. This arrangement is necessary because the JIT philosophy is still in its infancy in the Ford Motor Company. The company management is proud of this achievement. To the Ford motor company's credit, it has achieved zero inventory in certain automotive part components by entering into a close collaboration with a network of vendors. For example, car transmissions are supplied by the BTR industries on an hourly basis. This means trucks roll-up and off-load car transmissions on an hourly basis. Ford's Geelong manufacturing operation supply fully assembled engine on a Just-In-Time basis. These vendors are selected on a rating scale. The rating scale is based on reliability, on-time delivery of quality products, quality of their manufacturing systems, the ability to resolve issues on a timely basis and so on . The performance of vendors are graded as Quality Number one (Q1), two (Q2) three (Q3) and so on. If a vendor performs to the Ford Motor Company's satisfaction that vendor will get eighty five or more points and as a result will receive the Q1 status. Lesser performance on the part of the vendors will be graded accordingly. It is the vendors' on advantage that they should be on Q1 status because

non-performing vendors' contracts are not renewed.

In spite of the fact that the Ford Motor Company has a reliable supplier networks, it often experiences stock-out problems. Some of the reasons for the stock-outs are: the vendor may be behind schedule; inventory may have been misplaced; and inventory may have been lost or stolen. The resultant effect of the stock-out is that production has to come to a halt. Under the old JIC (Just-In-Case) system if there was a stock-out, the production time was lost and workers became idle. The flexibility of JIT in the Ford Company is such that no worker becomes idle because of a stock-out. The Quality Control Circles (Team) decide how to deal with the problem. They delegate their members to engage in other productive activities within the manufacturing plant. If a stock-out occurs as a result of non-performance on the part of a vendor, that vendor has to pay for the cost of lost production.

Since the adoption of JIT, the Ford motor company has not changed the accounting methods to deal with the changes JIT has brought to the traditional manufacturing. The proponents of JIT have advocated numerous changes to account for human resources, financial accounting, cost accounting and management accounting. According to the manager these are theories which are quite unsuited to the environment in which the Ford Motor Company operates.

Even though the company recognises the importance of a multi-skilled workforce, it does not see the correlation between JIT and human resources. My suggestion of human resource as a capital investment does not get any response either. When I pressed for the replacement and opportunity cost of a multi-skilled employee, the manager told me that no such costs are involved in hiring or moving an employee within the manufacturing plant. From that I came to the conclusion that human resources are not accorded the same GAAP treatment as bestowed to physical resources.

Inventory valuation is an important part of financial accounting. The company has the three inventory accounts (Raw material, WIP and Finished Goods). These three inventory accounts are still used in the production plant where they have zero inventories. The First-In First-Out method is used in inventory valuation. This method is well consistent with the JIT philosophy and more importantly, it is in compliance with the Australian Accounting Standards.

The product cost system used by the company is process costing. Process costing is necessary because of the similar products (vehicles) the company produces that have a continuous production flow. The process cost system allows to account for product related costs economically for a period of time (a week or a month) rather than allocate them to specific products or job orders. The production plant is not fully automated. The operation is labour intensive and direct labour

is used as the cost driver to allocate overhead costs.

The management accountant still has the traditional role of providing the decision maker with timely and accurate information. Variance analysis is still part and parcel of the process cost system. In 1993 most of the vendors are expected to be on Q1 status which means that price increase of any kind during the contractual period has to be borne by the vendors. This way the company hopes to eliminate the material price and quantity variances. The elimination of labour rate and quantity variance are difficult because of the number of awards and wage increases are based these awards.

The benefit JIT has brought to the Ford Motor Company is enormous. The workforce is more dedicated and multi-skilled. Industrial disputations have been reduced to a considerable extend. Inventory levels in the plant are reduced to four days. Manufacturing lead time is squeezed to the lowest level. The quality of cars produced has gone up. There are still rooms for improvement. JIT is still in its infancy in the Ford Motor Company. The management hopes for better and bigger improvements when JIT is up and running smoothly.

The Toyota Motor Company And JIT

Toyota of Japan is considered as the pioneer in developing the JIT philosophy. Its subsidiary Toyota of Australia is following the foot steps of the parent company. The JIT manufacturing philosophy has been in operation in Toyota for the last seven years. There are lot of similarities in the JIT

operation in both Ford and Toyota. Like Ford, Toyota has a multi-skilled workforce and the company has achieved zero inventory in certain areas of its production plant. Vendors are selected on a rating scale and vendors' contracts are renewed on the basis of their performance.

Toyota uses the Kanban Control System to move parts from the store to the manufacturing plant by the use of bar-codes. The re-order of raw materials have to strike a balance between the Economic Order Quantity and the carrying costs like transport and handling charges. This approach is not an ideal JIT system which does not tolerate the delivery of raw materials to the store. As a rule, JIT caters for zero inventory and vendors are expected to deliver raw materials to the shop floor, not to the receiving store. The manager told me that this approach is adopted to avoid a stock out problem because some vendors may not be able to meet their contractual obligations of on time delivery of raw materials. Inventories are kept in the store as a safety stock to meet the stock out problems. According to the manager the Australian industrial relations problems are not conducive to have a zero inventory in the plant.

Toyota also experiences the occasional stock out problems. In order to avoid this problem Toyota has more than one vendor at its disposal in case one vendor is unable to meet his contractual obligations. In most of their automotive parts they have stocks on hand to meet the stock out problems.

Unlike Ford the Toyota company keeps more than four days of stock as safety stocks.

Just like Ford human resources are not accorded the same GAAP treatment as bestowed to physical resources. Human resources are neither considered as a capital investment nor recorded as an investment in the financial statements. There is no replacement cost involved in hiring or opportunity cost involved in moving a multi-skilled employee within the manufacturing plant. The flexibility of JIT in Toyota means that employees with multi-skills are expected to do a variety of tasks and management can move them wherever their skills are required.

Inventory valuation is to meet the financial accounting obligation. In other words, inventory valuation is carried out at balance date to calculate cost of goods sold for the profit and loss statement and current assets for the balance sheet. Toyota has a First-In First-Out inventory method. The company still has the traditional three inventory accounts. One noticeable change is that finished goods inventory is not the responsibility of the Toyota manufacturing plant. No sooner the automobiles come out of the production lines than the responsibility of those automobiles is passed on to the Toyota sales department. In other words, as soon as the automobiles are produced they are moved out of the manufacturing plant to the sales department and finished goods inventory is that department's responsibility. Another feature of Toyota's

accounting is that intangible assets are not recorded in the financial statements. The reason for this is that there is no yardstick to measure the intangible assets.

Toyota has a process cost system which is based on actual cost, not based on standard cost. WIP inventory is kept at a reasonably high level through out the production process because of the products (vehicles) produced have a continuous production flow. In most cases direct labour is not the burden rate to allocate overhead costs. The overhead expenses are allocated on the basis of what they call the factory burden of indirect expenses. This is a combination of fixed and variable costs. These costs are allocated on the basis of the continuous production flow. Direct labour is used to allocate labour on-costs such as long service leave, holiday pay, sick leave, payroll tax and so on. On average direct labour is only involved in 35 hours per vehicle produced. This means, in terms of total cost, direct labour is not a big component. As the company moves towards automation, the plant managers are always on the look out to reduce the controllable cost, the direct labour cost.

Toyota Still uses variance analysis to measure performance in the plant. Within the organisation all departments have budget targets to meet. Variances of any kind have to be offset by productivity improvements. Vendors are expected to meet their contractual obligations. Increases in price of any kind occurring during the contractual period have to be borne by

the vendor. The traditional management accountant role has changed in Toyota. Traditionally the management accountant's office is located in the corporate department of the business. In Toyota the management accountant's office is moved to the manufacturing plant. This move is consistent with the expanded role the management accountant is expected to play in a JIT environment. In Toyota the management accountant is not a paper pusher who is confined within the four walls of an office space and gives advice to the decision makers. Management accountant is constantly involved in control measures to improve productivity and quality improvements.

Like the Ford company JIT has brought a new meaning to Toyota's manufacturing. With a multi-skilled workforce, Toyota has achieved manufacturing excellence in vehicle production. This manufacturing excellence has catapulted Toyota to the number one status as the market leader in 1991. The Toyota management recognises that they have a long way to go to catch up with their parent company. In order to keep up with the JIT tradition of constant improvements for quality, the management of Toyota Australia is assiduously striving for quality improvements in its vehicle production.

A Contrast of The Australian Experience With The Hewlett Packard Vancouver Division JIT Operation

While the accountants of Ford and Toyoata company are still desisting to break out of the straight-jacket of conventions and traditions that have constricted accounting for centuries, their counterparts in Hewlett Packard have innovated

accounting and brought changes to accommodate their JIT manufacturing. In the early part of the 1980 the management of HP was well aware of the malignant nature of their manufacturing system and they decided that the surgery had to be drastic. The management had no hesitation in bringing the JIT manufacturing philosophy to revamp their outdated manufacturing system. The accountants were also equal to the task. They were well aware of the fact that it would not have the desired effect if the JIT philosophy were to be introduced without the necessary overhaul of the accounting system. They innovated every facet of accounting to complement their new JIT manufacturing philosophy. It was only a matter of time before the changes have spread to HP's subsidiaries throughout the world. One of the subsidiaries is the Hewlett Packard Vancouver Division. It has a unique JIT product cost system.

³⁸The Hewlett Packard Vancouver division has a revolutionised JIT inventory valuation system. In HP the product cycle time is less than one day and the WIP is under two days of supply. The innovative accountants have followed the new trend in JIT by eliminating the traditional WIP inventory account. In their inventory valuation they have only two accounts _ RIP and FGI. They have a Job Order Cost system.

Standard cost is used to value RIP at HP. The price variance of actual price paid and standard cost of material is recorded

³⁸ A publication of the Hewlett Packard Vancouver Division. 27-4-1985.

at the time of purchase. Normally the material remains in RIP status during production until it moves to FGI or the material is scrapped or shipped to another HP plant on an internal order. In any of these events the components are decremented from their on hand stock balance in RIP. This reduction of components from RIP occur on product completion or consumption. This is known as ³⁹post deduct. Material changes in RIP necessitate accounting transaction. The accuracy of post-deduct is very important. The post-deduct with single recording of movement of components replaces the elaborate recording of raw material and WIP of the traditional job order cost system.

RIP with on-hand balances of all components provide a detailed backup for the general ledger RIP balances when extended by standard cost. Quotidian (daily) on-hand balances of all components in RIP are being measured for accuracy by cycle counting.

In HP the number of on-hand finished products, which are being extended by standard cost, in FGI at the end of the month provides the backup for the general ledger FGI balance. The composite of both RIP and FGI are the verification for the bulk of the plant inventory. This can be explained in the following way:

³⁹ A publication of the Hewlett Packard Vancouver Division
27-4-1985

N EXAMPLE OF THE POST-DEDUCT

The single level components list for product X :

Standard Material List

Component A		\$1.50.
"	B	\$2.00
"	C	\$3.50

Standard Cost		\$7.00

1. The three RIP components of on-hand quantity are as shown below :

Components	RIP	On-hand Balance	FGI
A		5	
B		6	
C		10	

2. One unit of product X passes to FGI, components A, B and C are post-deducted from RIP and product X is added to FGI.

Components:	RIP		FGI	
	On-Hand (Before post-deduct)	On-Hand (After post-deduct)	Post-deduct	
A	5	4	-1	+ product X
B	6	4	-2	"
C	10	9	-1	"

General Ledger Entry:

Dr.	FGI	\$6.00	
	Cr.	RIP	\$6.00

In Hewlett Packard production variances are also a problem. As

standard costs are set at six months interval, material standard for assemblies and products are based upon the specific point in time. With this twice yearly standard cost setting arrangement, an avalanche of engineering changes take place between these periods. If necessary steps are not taken to meet this challenge by an interim revision of the standard cost, then a material list variance will be created. This variance is the difference between the material list used to set the standard cost and the current list used to assemble the product. The material list variance is recorded in the following way:

Dr. Finished Goods Inventory	\$6.00		
Dr. Material List Variance	\$1.00		
		Cr. RIP	\$7.00

In HP's Job Order costing the material quantity variance consists of material list changes as well as any structural problems (material used in assembly differs from the product structure). The culprit for this problem in HP is the work order. All material used in production is issued to work orders and subsequently varianced. In a post-deduct situation, both on-hand balances and dollar amounts in RIP are decreased based solely upon the product structure. Variance of material usage from product structure causes the on-hand balance in RIP as well as the dollar amount of RIP inventory.

In HP cycle counting is the approach followed to overcome this problem. Quotidian (daily) cycle counting of parts are important. This approach corrects the on-hand balances in RIP

and the inventory is adjusted accordingly. In other words, this cycle counting corrects the imbalances in RIP inventory and inventory is adjusted up or down as required. In a JIT environment materials are delivered on a hand to mouth basis _ supplied as required. Any significant structural problem or unauthorised usage is detected immediately because material shortage will occur.

CHAPTER 9

CONCLUSION

Manufacturing has come a long way from a mass production to a demand driven production. This demand driven production has necessitated an overhaul of the accounting systems of the past. The conservative nature of the accounting profession which in the past was more at home with conventions and traditions. The advent of JIT has forced the accounting profession to have a serious look at the traditional accounting practices and how these practises are going to measure up against the JIT philosophy. As JIT is firmly anchored in manufacturing, the accounting profession can now focus on solving tomorrow's problems rather than unravelling yesterday's errors.

The accountants of ⁴⁰Hewlett Packad have shown their disdain to conventions and traditions which encompassed accounting for centuries and they assiduously tried to innovate accounting to complement their JIT manufacturing. Not only they have pushed away the traditional accounting pedestal which they used to perch on but also they have zeroed in on the traditional accounting practices which are not conducive to their JIT manufacturing. Their aberration from traditions has been more of a necessity than an obsession. Their innovations range from the transfer of direct labour cost to manufacturing overhead and the reduction of the traditional three inventory accounts

⁴⁰Hunt, R. 'Direct Labour Cost Not always Relevant AT H-P', Management Accounting, Feb 1987, pp 19-25.

to two. They have also innovated inventory valuation, product costing and performance analysis.

Toyota of Japan's phenomenal success in manufacturing excellence has spurred the Australian vehicle manufactures to move towards a demand driven production technology. ⁴¹The transition from the outdated manufacturing of the past to a JIT manufacturing has become a necessity for the survival of the Australian vehicle industry. Producing poor quality motor vehicles and hiding behind the protection of the tariffs have been a tradition with the Australian motor vehicle industry for a long time. The "Button car plan" is aimed at a viable motor vehicle industry and the gradual phasing-out of the tariffs. This will push the motor vehicle industry into the forefront of a level playing field where it has to compete with the overseas motor vehicle manufacturers. JIT is still in its infancy in the Australian motor industry and there are promising signs that the industry is getting out of the shackles of the manufacturing problems. More importantly, there are palpable signs that the quality of motor vehicles produced have been steadily improving.

The Australian experiences of the JIT philosophy and its implications on accounting are just like making a splash without creating new ripples. The two of the JIT practising automobile companies the Ford and the Toyota company still use

⁴¹Buxey, G. 'Australian Automobile Industry: JIT production and Labour Relations', Industrial Management and Data Systems (UK), Vol: 91, 1991, pp 8-16.

traditional accounting methods. The baffling part of their accounting system is that they still use direct labour as the cost driver to allocate overhead costs even in automated production plants. The levelling factor of these two JIT practising companies' accounting practice is that neither of them consider human resource is more important to JIT nor inventory valuation is less important. The attainment of plant wide zero inventory is still a mirage. One can only hope that there will be more accounting changes are in the offing when JIT is up and running smoothly.

The old adage says "practice what you preach". JIT's aim is to eliminate unnecessary costs rather than use devices to control them. There is no juxtaposition to this JIT concept and what is being followed by most JIT practising companies today. Most JIT practising companies have tailored JIT to suit their manufacturing or production requirements. The Ford Company manager's sentiment _ of these JIT theories are unsuited to the environment in which The Ford Motor Company operates _ will probably echo in most JIT practising companies' operations today. Human resource accounting and JIT are poles apart at the moment. The suggestion of human resource accounting is important to JIT may have been somebody's figment of imagination.

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1. 1949年10月1日，中华人民共和国成立。
2. 1954年9月，第一届全国人民代表大会第一次会议在北京召开。
3. 1956年，中国完成对农业、手工业和资本主义工商业的社会主义改造。
4. 1958年，中国掀起“大跃进”运动，提出“超英赶美”的口号。
5. 1960年，中苏关系破裂，中国开始自力更生。
6. 1966年，中国发动“文化大革命”，导致国民经济陷入困境。
7. 1976年，中国结束“文化大革命”，进入改革开放新时期。
8. 1978年，中共十一届三中全会召开，确立以经济建设为中心，实行改革开放。
9. 1984年，中共十二届三中全会召开，提出经济体制改革。
10. 1992年，中共十四大召开，确立社会主义市场经济体制。
11. 1997年，中共十五大召开，确立邓小平理论。
12. 1999年，中国成功研制并发射了第一艘载人飞船。
13. 2001年，中国加入世界贸易组织。
14. 2003年，中国成功发射了第一艘载人飞船。
15. 2008年，中国成功举办北京奥运会。
16. 2012年，中共十八大召开，确立科学发展观。
17. 2013年，中国提出“一带一路”倡议。
18. 2017年，中共十九大召开，确立习近平新时代中国特色社会主义思想。
19. 2019年，中国成功研制并发射了嫦娥四号月球探测器。
20. 2020年，中国成功抗击新冠肺炎疫情。

QUESTIONS

QUESTIONNAIRES

HUMAN RESOURCE AND JIT

1. Do you think Human Resource is the crucible in which JIT is moulded?
2. If the answer is yes. Do you agree that Human resources should be accorded the same Generally Accepted Accounting Principles (GAAP) as accorded to physical resources?
3. Do you agree that flexibility and multi-skilled workforce are essential to the success of JIT?
4. If the answer is yes, Do you agree that the workforce is a capital asset and the proper utilisation of that asset is beneficial to the employer and employee?
5. Is there any opportunity cost involved in moving one multi-skilled employee from one production process to another production process?
6. Have you ever come across the problem of replacing a multi-skilled employee?
7. If you have, what are the problems of replacing a multi-skilled employee?
8. Is replacement cost a problem?
9. Are there enough multi-skilled employees available to pick and choose?
10. Do you agree that the financial statements should contain more information about the firm's future rights and obligations to human resources?

FINANCIAL ACCOUNTING AND JIT

11. Do you agree that in financial accounting valuation of inventory has an important part to play?
12. Is n't it true that valuation of inventory is essential to determine cost of goods sold for profit and loss statement and current assets for balance sheet?
13. Do you know that according to JIT inventory is the root of all evils and that the aim of JIT is zero inventory on the plant?
14. Do you agree that the Australian conditions are not conducive to have zero inventory on the plant?
15. Do you have zero inventory on the plant?

16. Do you have close collaboration with your vendors?
17. How do you select your vendors?
18. Do you have a rating scale in selecting your vendors?
19. What are the criteria in selecting vendors?
20. Do your vendors supply raw material to meet your production requirements on a daily basis ?
21. Do you have penalty system for non performing vendors?
22. Do you renew the contract of a non performing vendor?
23. Have you ever had the problem of a stock out?
24. How do you handle such a situation?
25. JIT says the traditional three inventory accounts (the raw material inventory, Work - In - Process inventory and Finished Goods inventory) are unsuited to JIT philosophy. Do you agree?
26. With zero inventory on the plant, there should only be two inventory accounts. The Raw Material and WIP inventory should be merged as Raw Material In Process inventory and Finished Goods inventory. Do you have two inventory accounts?
27. What type of inventory costing method do you have?
28. In a JIT environment Raw Materials to Finished Goods go through the manufacturing process in a first-in first-out fashion. So First-in First-out costing method is suited to JIT. Do you agree?
29. JIT says the economic value of a company is the composite of the tangible and intangible assets measured in terms of the current market price. Do you agree?
30. JIT says intangible assets should also include items like multi-skilled workforce, a firm's ability to deliver quality products on time, employee morale, customer loyalty and reliable suppliers. Do you agree to this suggestion?
31. If you answer affirmatively, Do you think the accounting standards should be changed accordingly?
32. Do you have any objection to the JIT concept of allocating depreciation based on the units of output produced rather than based on the time to produce the output?
33. Do you pay your vendors at the time of delivery of raw material?

34. Traditional payables and receivables are paperbound. Have you noticed any change since the adoption of JIT?

COST ACCOUNTING AND JIT

35. Do you accept the fact that the basic function of traditional cost accounting system is to determine a product's unit cost?
36. Have you changed your cost system since the adoption of JIT?
37. What type of cost system do you have?
38. Do you agree that in a JIT environment the direct labour is a small part of the production process?
39. Do you still use direct labour as the cost driver to allocate overhead costs?
40. If the answer is yes, Would n't you agree that in a JIT automated environment machine hours are more appropriate cost driver to allocate overhead costs?
41. Do you agree that in such a JIT environment the use of direct labour as a cost driver to allocate overhead cost will distort product costs?
42. Do you provide production schedules daily to each production cell?
43. Are finished goods the only item reported by the production cells daily?
44. Do you agree that in a JIT production total of all related costs are allocated to the days production and not to jobs or tasks?
45. Do you still have work orders as part of your product cost system?
46. Do you still use variance analysis to measure efficiency?
47. Do you agree that people give undue importance to variance analysis?
48. According to JIT the elimination of unnecessary costs is more important than creating devices to control them. Do you agree?
49. Do you know the term Activity Based Costing?
50. Do you have an Activity Based Costing system?
51. Do you know what is meant by Flushed Costing?

52. Do you have a Flushed Costing System?

MANAGEMENT ACCOUNTING AND JIT

53. Have you noticed any change in management accounting since the adoption of JIT?

54. Do you agree that management accounting role in JIT is more than giving accurate information to decision makers?

55. JIT says management accountant's role is to create performance analysis to gauge product quality, product delivery, inventory control, material scrap control and machine management and maintenance. Do you agree?

56. Can you explain your management accountant's role?

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FIGURE 1

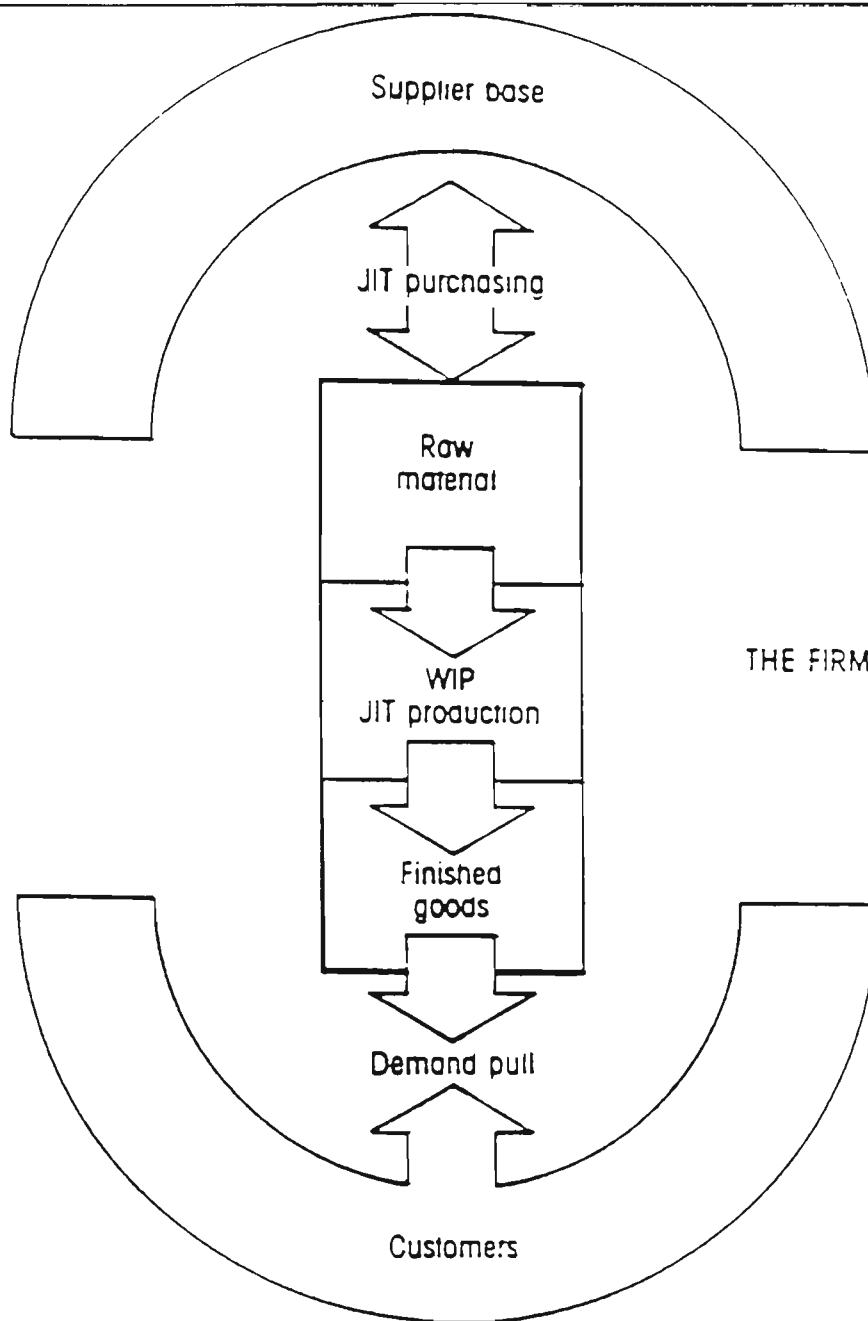


Table 1 JIT Operations

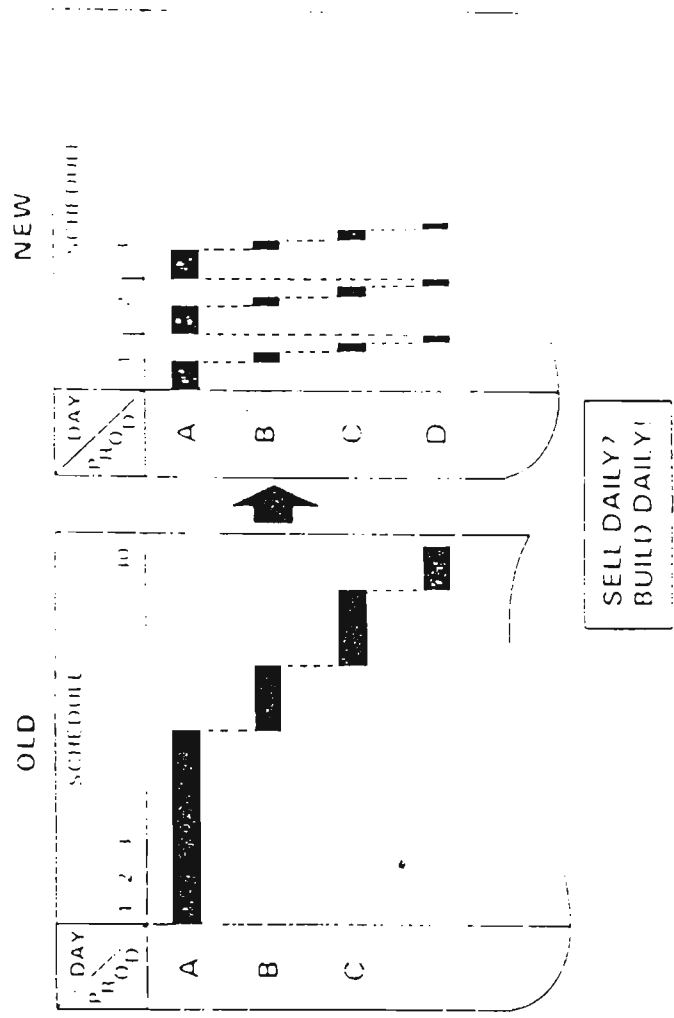
JIT purchasing

- Raw materials stock reduction
- Frequent deliveries
- Control over delivery timing
- Fewer suppliers
- Long-term contracts
- Quality assurance
- Liaison re specifications

JIT production

- WIP reduction
- FG reduction
- Preventive maintenance
- Reduced set-up times
- Modular production
- Zero-defect policy
- U-shaped or parallel production lines
- Product simplification
- Kanban
- 'Flexible' workforce
- Standardised containers
- Continuous improvement
- Reduced lot sizes
- Quality control integrated with production

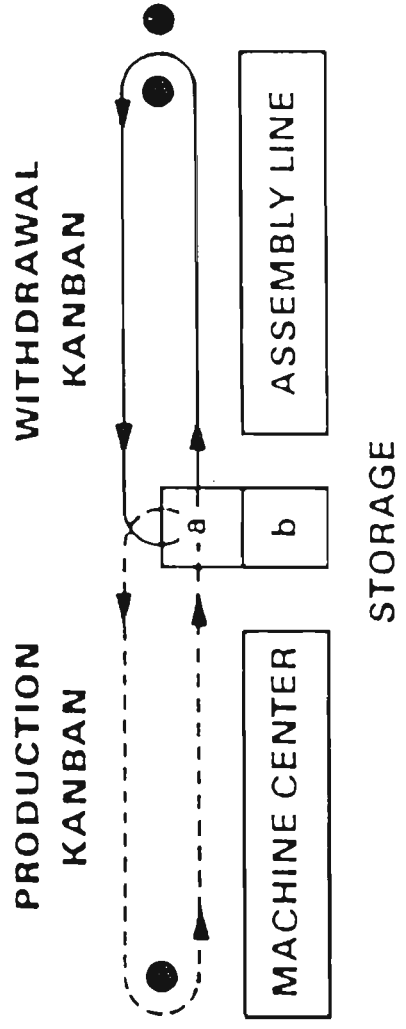
LOAD LEVELING



Q. C. CIRCLES EFFECTIVENESS AT TOYOTA

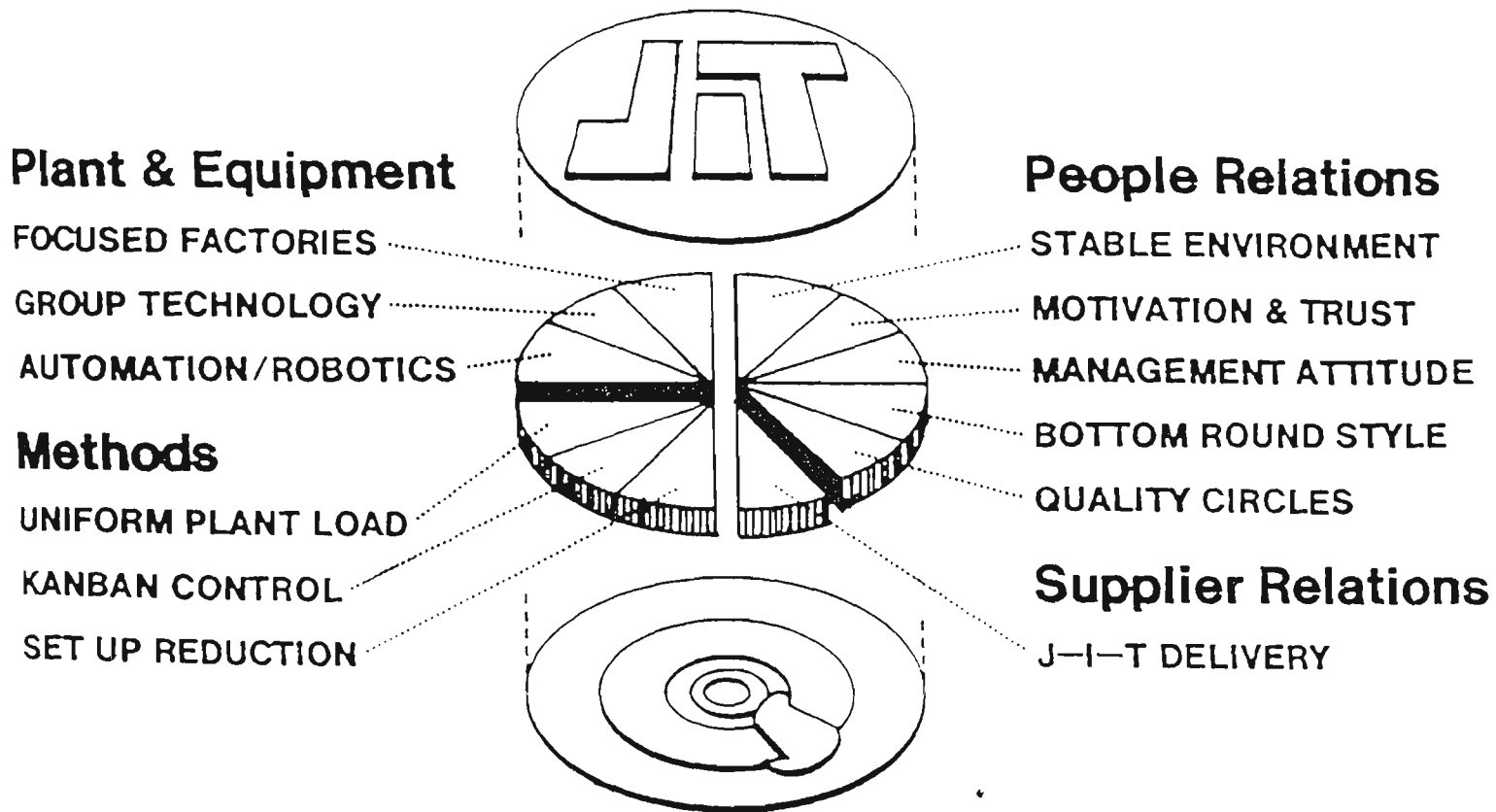
<u>YEAR</u>	<u>TOTAL PROPOSALS</u>	<u>PROPOSALS PER CAPITA</u>	<u>ACCEP- TED</u>
1960	9,000	1.0	39%
1970	40,000	2.5	70%
1973	247,000	12.2	76%
1976	380,000	15.3	83%
1983	1,910,000	38.8	95%

FLOW OF TWO KANBANS



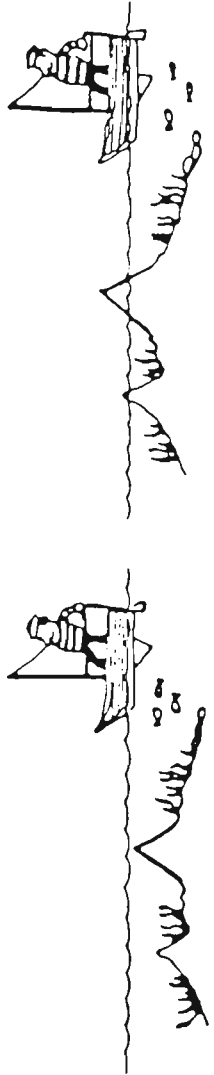
FITTING THE PIECES TOGETHER

JUST-IN-TIME Strategy



QUALITY at the SOURCE

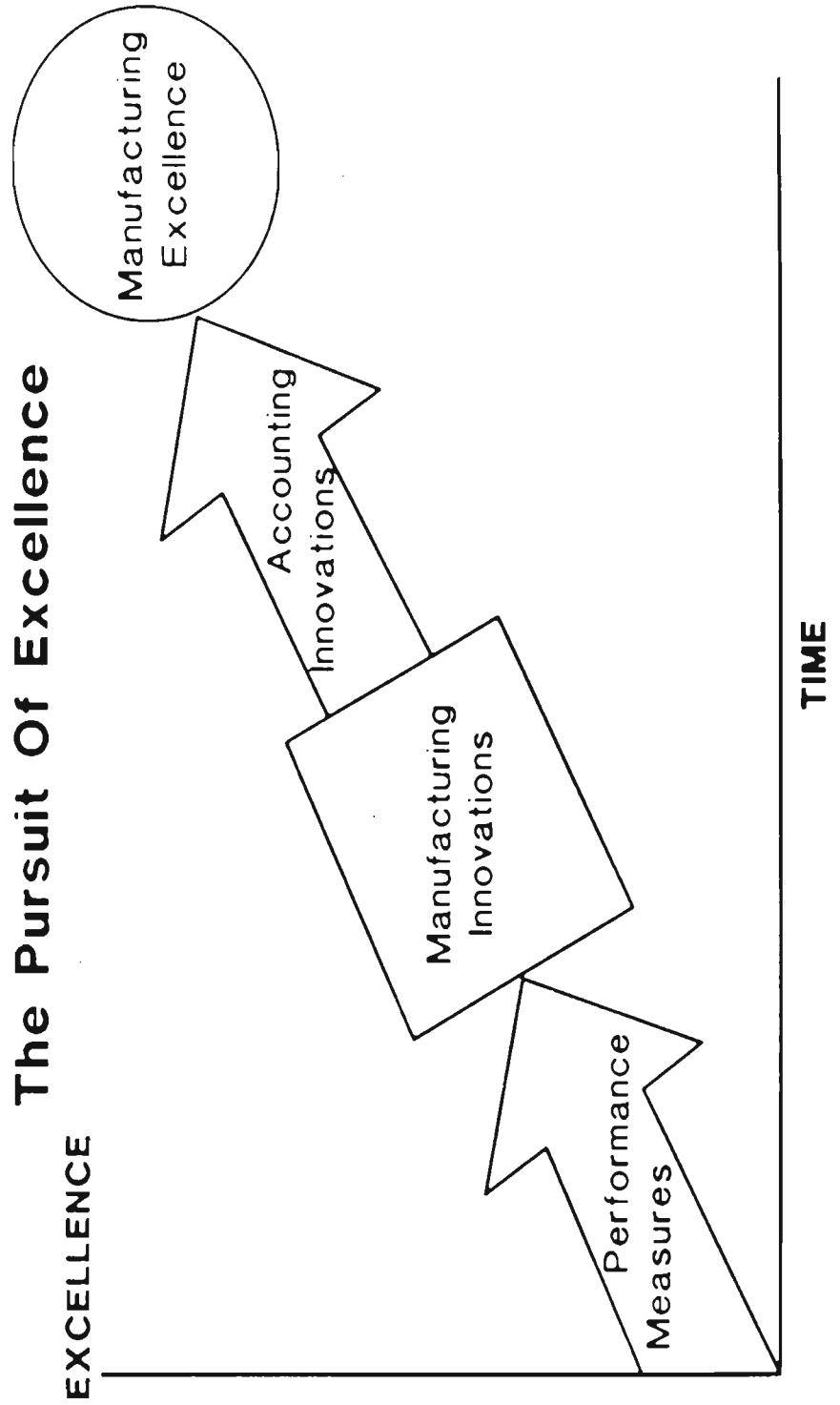
INVENTORY HIDES PROBLEMS



PROBLEMS
HIDDEN

PROBLEMS
EXPOSED

Figure 1.1



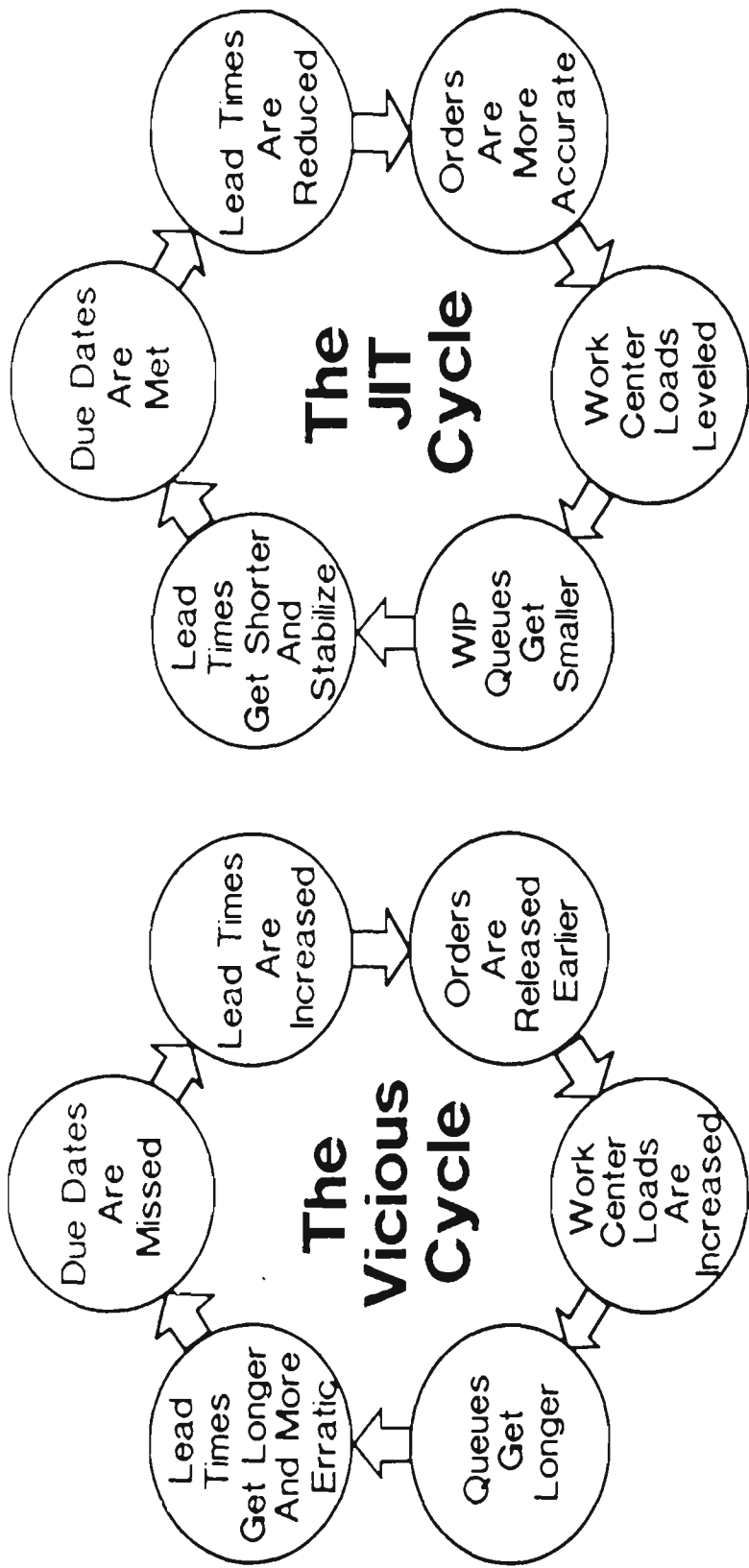
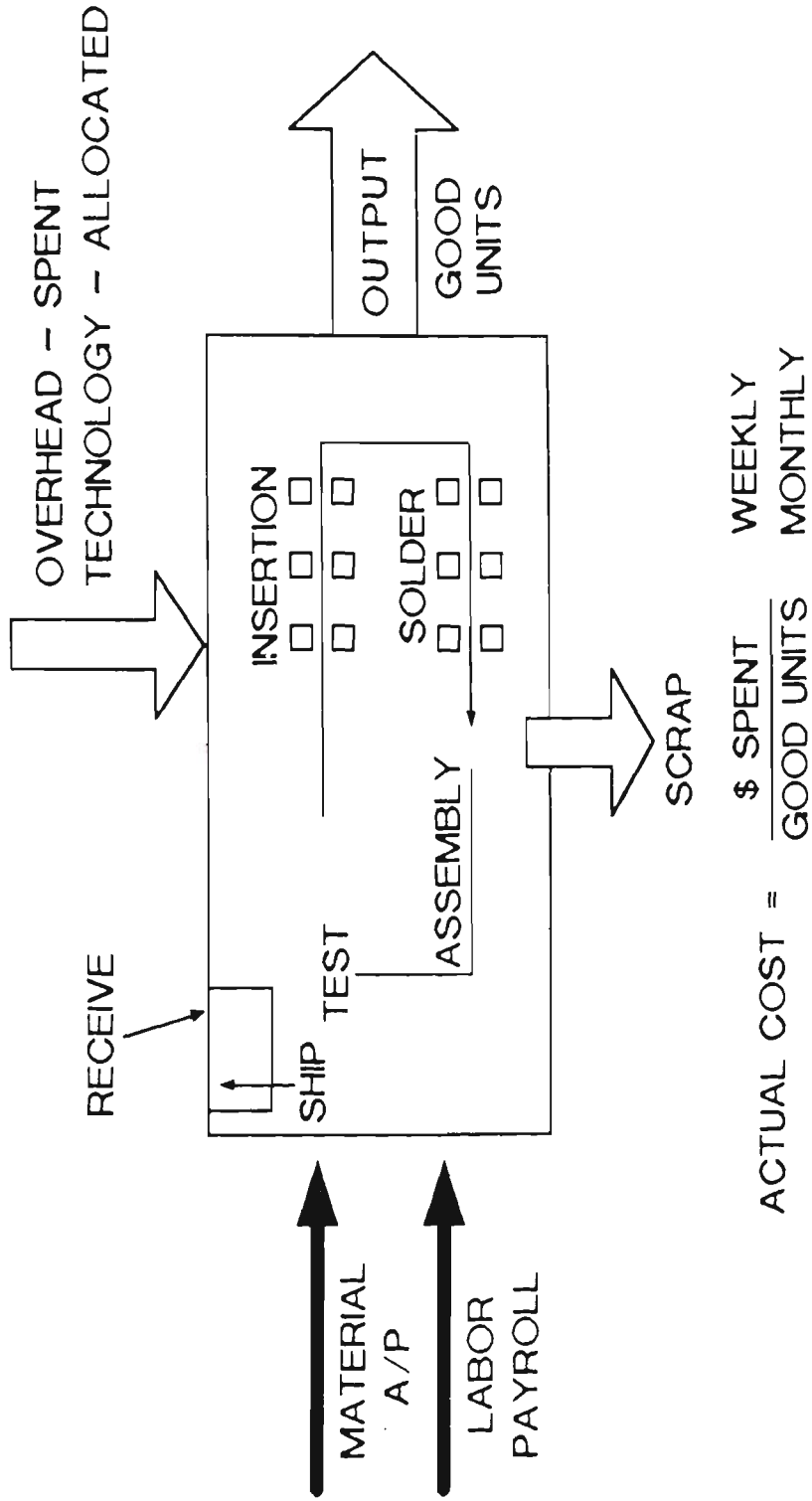


Figure 2.2

ACCOUNTING IN A JIT SHOP

Figure 5.4



**CAN JIT BE IMPLEMENTED USING
TODAY'S COSTING MEASUREMENT?**

Figure 3.3



Very, Very Difficult

U-line layout

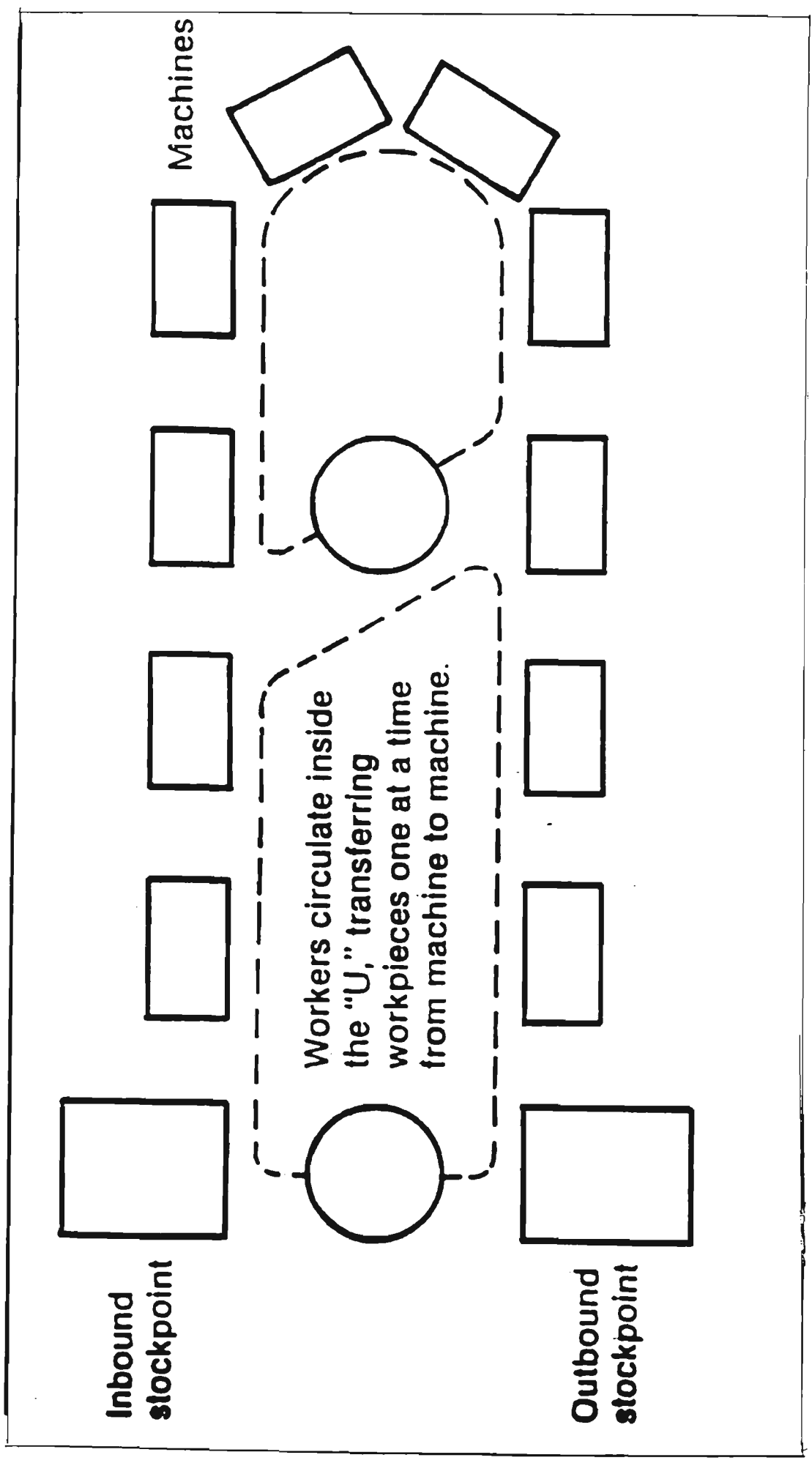


Figure 10.3

Accounting Summary

- Identify Cost Drivers
- Expand Beyond Traditional Role
- Simplicity as Overriding Goal
- Tailor Approach to Specific Environment
- Deemphasize Direct Labor Tracking and Reporting
- Adopt Pilot Approaches
- Large Scale Concept Education Required
- Elimination of Work Orders
- Elimination of RM and Creation of RIP
- Changes in OH Allocation Methods

Current Cost Accounting Practice

Figure 8.4

- Historical Costing Philosophy
- Costing/Inventory Valuation Method
 - Weighted Average Cost
- Cost Elements
 - Direct Labor
 - Direct Material
 - Burden
 - Manufacturing Engineering
- Ledger Driven
- Full Cost Recovery
- Reconciliations
 - Ledger
 - Material Logistics/Floor Control Systems
- Monthly Update/Measurements
 - Product Cost/Inventory

Figure 5.5

PERFORMANCE MEASURES

J I T

- Good Units Produced / Planned Output
- Cost Per Unit
- Initial Operability – Customer Service
- Cost Reduction / Productivity Improvement
- Inventory Turnover
- Engineering Change
- Preventive Maintenance & Repair
- Component Cost

Figure 12.10A

Performance Measures

Design

- Number of Engineering Changes
- Severity of Engineering Change
- Number of Components Per Finished Product
- Number of Manufacturing Operations Per Finished Product
- Lead Time to Engineer (Design) a Finished Product
- Start-Up Time (From Design to Production)

	1	2	3	4	5
BC					
MRP	X	X	X		
JIT	X	X	X		
IA				X	X
CI					X

Figure 12.10B

Performance Measures

Design

- Number of Tools Required Per Finished Product
- Life/Cost of Tooling Per Finished Product
- Additional Requirements
 - Material Handling Equipment
 - Gauges
 - Materials
 - Layout
 - Process
 - Work Rules
- Number of Products
- Options Per Product
- Manufacturing Skills Required

	1	2	3	4	5
BC					
MRP	X	X			
JIT			X		
IA					
CI					

Figure 12.10C

Performance Measures

Materials Management

- Component Lead Times
- Raw Inventory Investment/Turnover Ratio
- WIP Inventory Investment/Turnover Ratio
- Finished Inventory Investment/Turnover Ratio
- Total Inventory Investment/Turnover Ratio
- Stocking Policies
 - Lot Sizes
 - E.O.Q.'s
 - Safety Stock

	1	2	3	4	5
BC		X	X	X	X
MRP	X	X	X	X	X
JIT	X	X	X	X	X
IA	X	X	X	X	X
CI	X	X	X	X	X

Figure 12.10D

Performance Measures Materials Management

- Purchased Components (# & Lead Time)
- Manufactured Components (# & Lead Time)
- Stocking Locations
 - # of Distribution Centers
 - # of Storerooms
- Transportation Lead Time
- Material Handling
- Vendor Performance

	1	2	3	4	5
BC	X	X			
MRP		X	X		
JIT			X	X	
IA				X	
CI					X

Figure 12.10E

Performance Measures

Materials Management

- Customer Service Level
 - Late Deliveries
 - On-Time Deliveries
 - Back Orders
 - Cancelled Orders
- Forecast Accuracy
- Demand Fluctuation
- Availability & Accuracy of Information

	1	2	3	4	5
BC	X	X	X	X	X
MRP		X	X	X	X
JIT			X	X	X
IA				X	X
CI-M					X

**Figure 11.2
BACKFLUSH COSTING**

The purpose of a backflush costing system is to eliminate detailed accounting transactions. As the flow of materials through a shop is streamlined, the need to maintain a detailed analysis of raw materials versus work-in-process inventories is eliminated. The goal is to reduce WIP buffers and reduce complexity as cycle time is improved. Rather than focusing on tracking movement through the plant, the system works backward when allocating cost to finished goods and inventory.

The following discussion of backflush accounting first appeared in *Management Accounting* in June 1987. It represents Foster and Horngren's interpretation of this process. Note that there is some discrepancy regarding the actual costs originally recorded and the "standard" used to cost the finished goods movements. As supported by the results from the field, rolling averages of actual costs are replacing engineered standards for costing purposes. The key point to remember is that the use to be made of the information drives the actual aggregation basis choice. In tracing costs to materials for cost management purposes, actuals or rolling averages of actuals is the best measure. For performance evaluation, different measures are appropriate (e.g., yield and % scrap on the plant floor or current cost against rolling average for purchasing; see flowchart).

Silicon Valley Computers (SVC), a hypothetical company, manufactures keyboards for personal computers and has a backflush costing system. The costing system has two trigger points for making entries in the internal accounting system: Purchase of raw materials and components, and the manufacture of a finished good unit.

For the month of April, there are no beginning inventories of raw materials, work-in-process, or finished goods. The standard material cost per keyboard unit in April is \$19. For product costing purposes, SVC combines labor costs and indirect manufacturing costs into a single conversion cost category. The standard conversion cost per keyboard unit in April is \$12. SVC has two inventory accounts, a combined Raw and WIP account and a finished goods account.

The following steps are followed by SVC in its backflush costing system:

1. Record the raw materials purchased in the reporting period. Assume that during April materials purchases were \$1,950,000.

Inventory-Raw and WIP	\$1,950,000	
Accounts Payable		\$1,950,000

2. Determine the number of finished units manufactured during the reporting period. Assume that 100,000 keyboard units were manufactured in April.

3. Compute the standard cost of each finished unit. This step typically will use a bill of materials. For SVC, the standard cost per unit is \$31 (\$19 standard material cost + \$12 standard conversion cost).

4. Record the cost of finished goods manufactured in the reporting period:

Inventory-Finished Goods	\$3,100,000	
Inventory-Raw and WIP		\$1,900,000
Conversion Cost		1,200,000

Putting It All Together

Assume that 99,000 units were sold during the month. The end of month inventory balance for April would be:

Inventory-Raw and WIP	\$50,000
Inventory-Finished Goods, 1,000 units @ \$31	<u>31,000</u>
	<u>\$81,000</u>

The elimination of the work-in-process account considerably reduces the amount of detail in the internal accounting system. (There still may be tracking of units on the production line, but there is no "costs attach" tracking in the internal accounting system via work tickets.)

Variant No. 1

A variant of the above is a backflush cost system with the second trigger point for making entries at the sale rather than at the manufacture of a finished good unit. The reasons are:

- To remove the incentive for managers to produce for inventory. (Under the "costs attach" assumption implicit in job, operation and process costing, period expenses can be reduced by producing units not sold and by increasing work-in-process.)
- To increase the focus of managers on a plant-wide goal (producing salable units) rather than an individual unit goal (such as increase labor efficiency at an individual production cell).

This variant has the same effect on net income as immediate expensing to the period of all conversion costs.

The summary accounting entry would be:

Cost of Goods Sold	\$3,100,000
Inventory-Raw and WIP	\$1,900,000
Conversion Cost	1,200,000

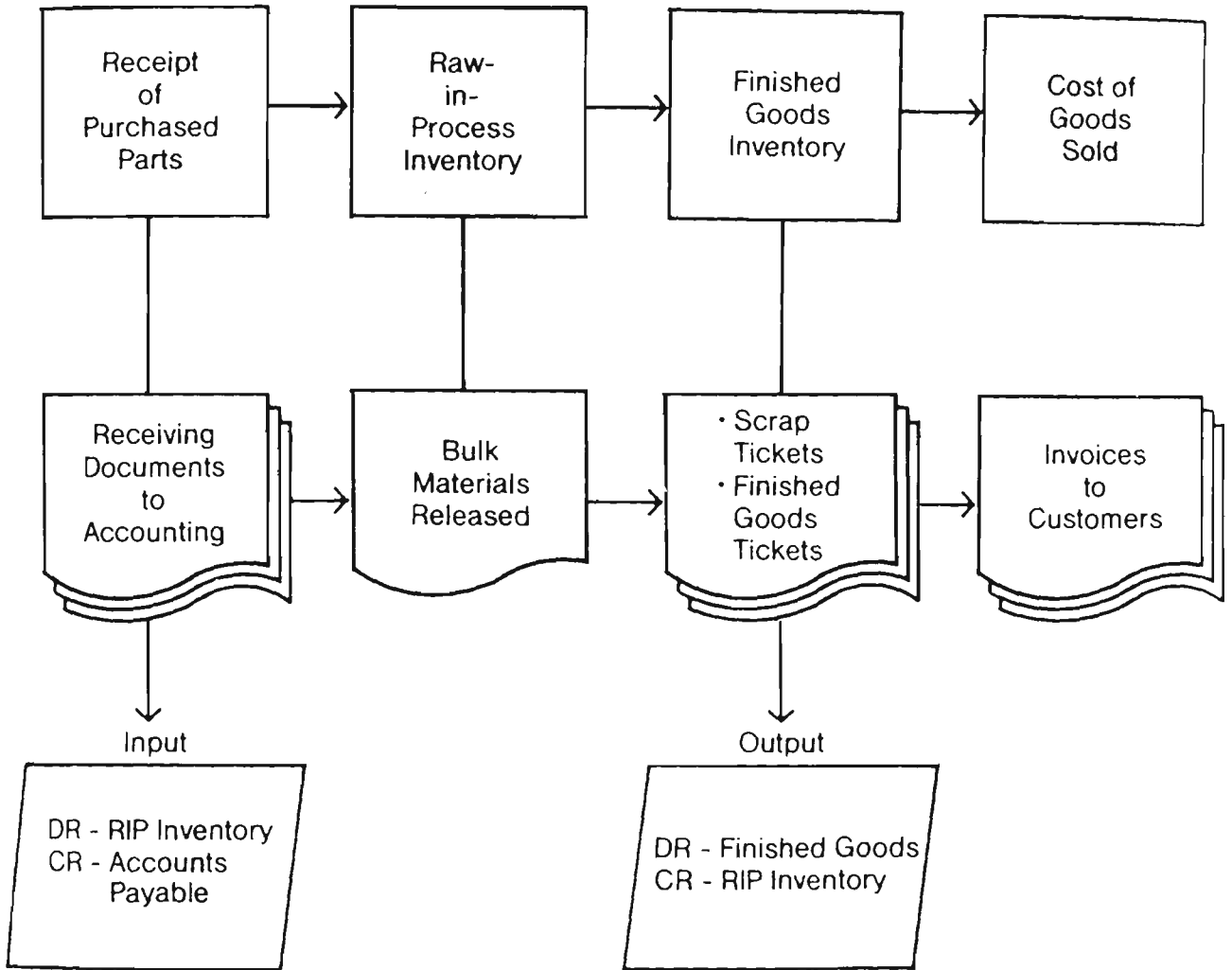
Variant No. 2

The simplest version of a backflush product costing system has only one trigger point for making entries in the accounting system. Assume this trigger point is the manufacture of a finished good unit. For the example used previously, the summary entry would be:

Inventory-Finished Goods	\$3,100,000
Accounts Payable	\$1,900,000
Conversion Cost	1,200,000

From: George Foster and Charles Horngren, "JIT: Cost Accounting and Cost Management Issues." *Management Accounting*, June 1987, pp. 19-25.

Figure 11.2 (Cont.)
BACKFLUSHING - BASIC FLOW

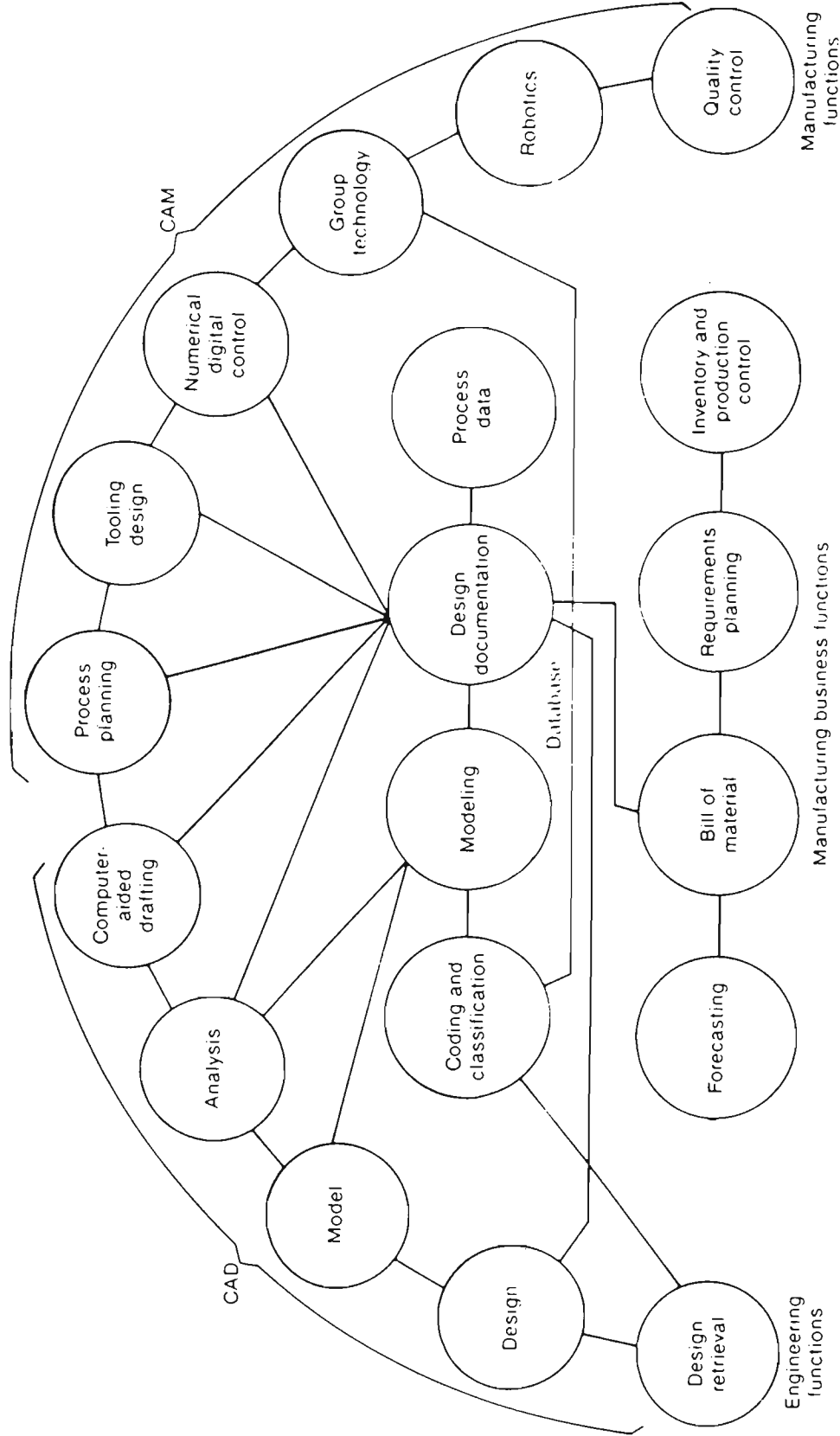


1. Record at Cost
 - (a) Calculate Price/Actual This Purchase
 - (b) Compare to Prior *Rolling Average* to Evaluate Purchasing Performance
 - (c) Update Standard = Recalculate Rolling Average

2. Record at Rolling Average
 - (a) Calculate Actual Units Produced
 - (b) Calculate Raw Materials Consumed
 - (c) Actual Cost =
$$\frac{(b) \times \text{Rolling Average}}{\text{Total Units (Good)}}$$
 - (d) Evaluate Performance on Yield (Actual Units/Raw Materials) and Actual Cost

Figure 2.1

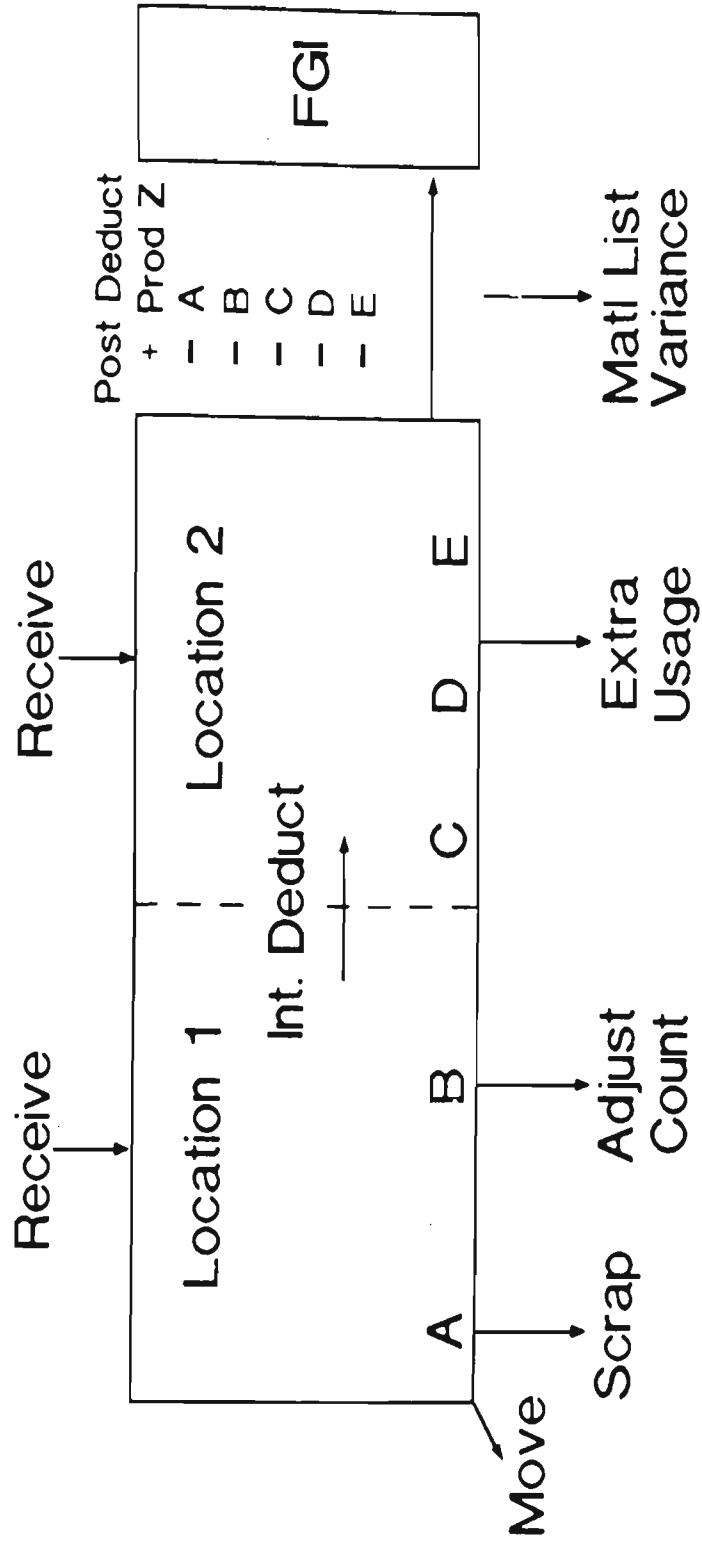
CAD/CAM Functions Integrated with Engineering, Manufacturing, and Business Functions



Source: CAD/CAM Handbook

Figure 6.2

Backflushing Company C



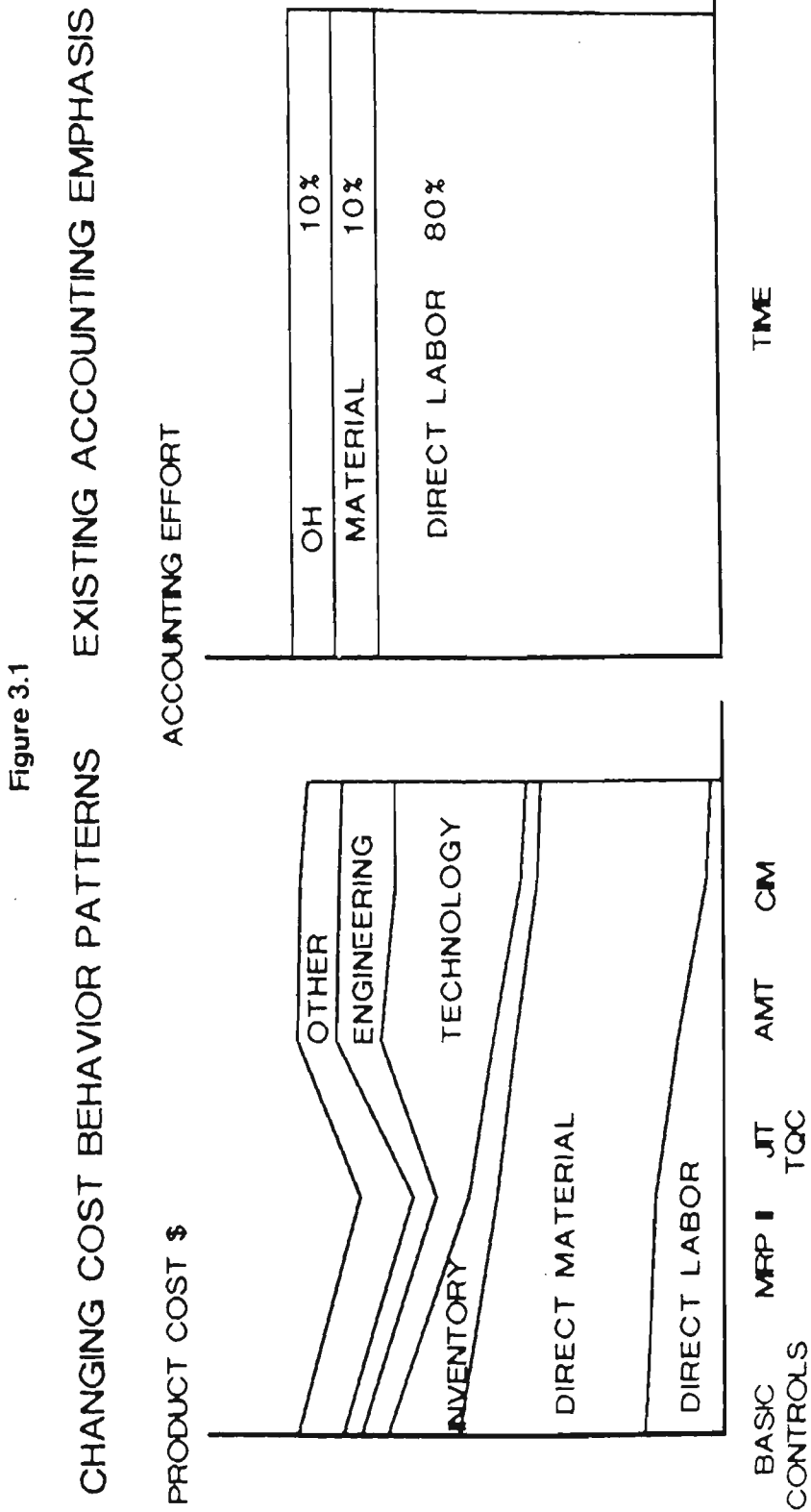


Figure 1

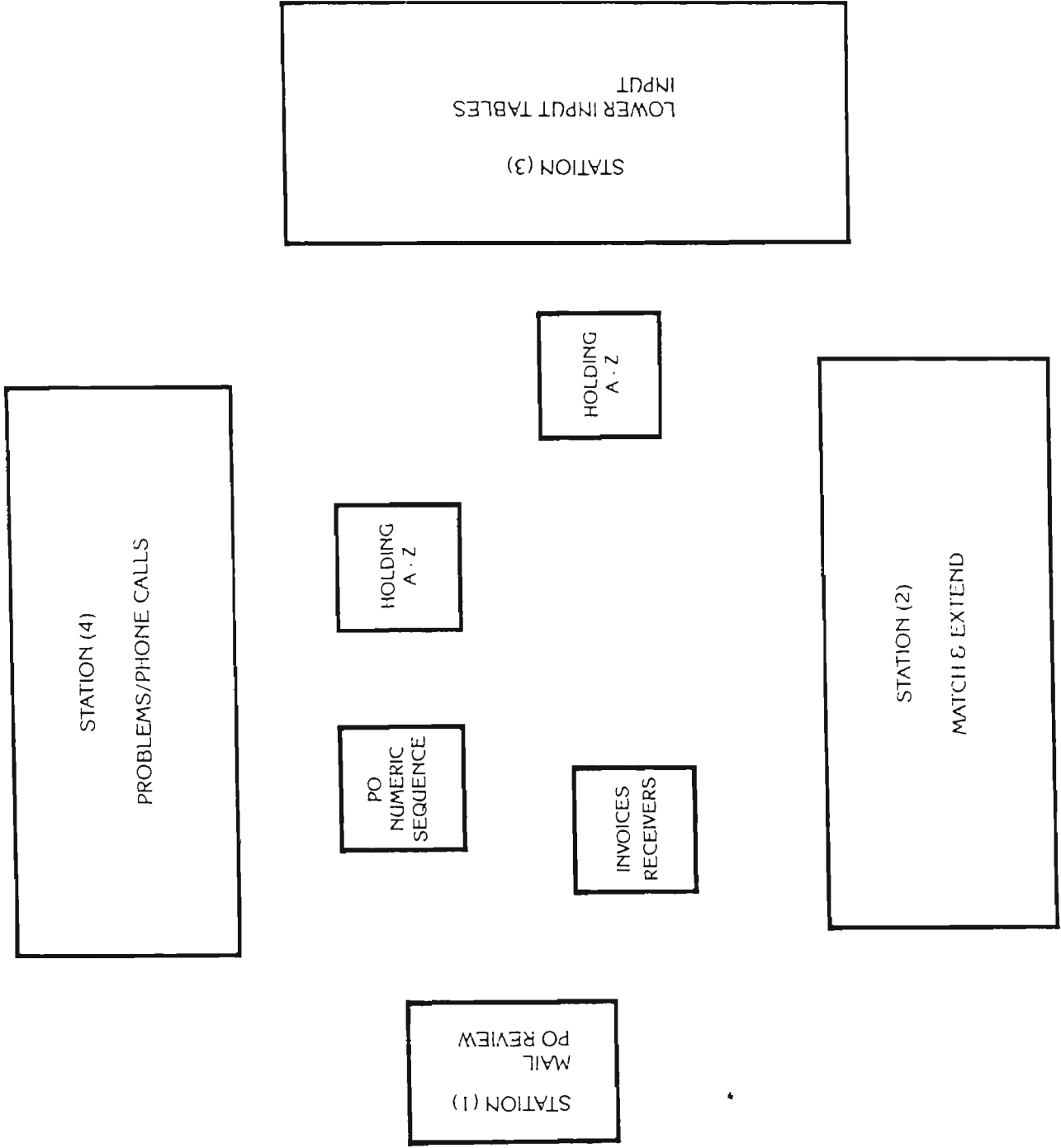
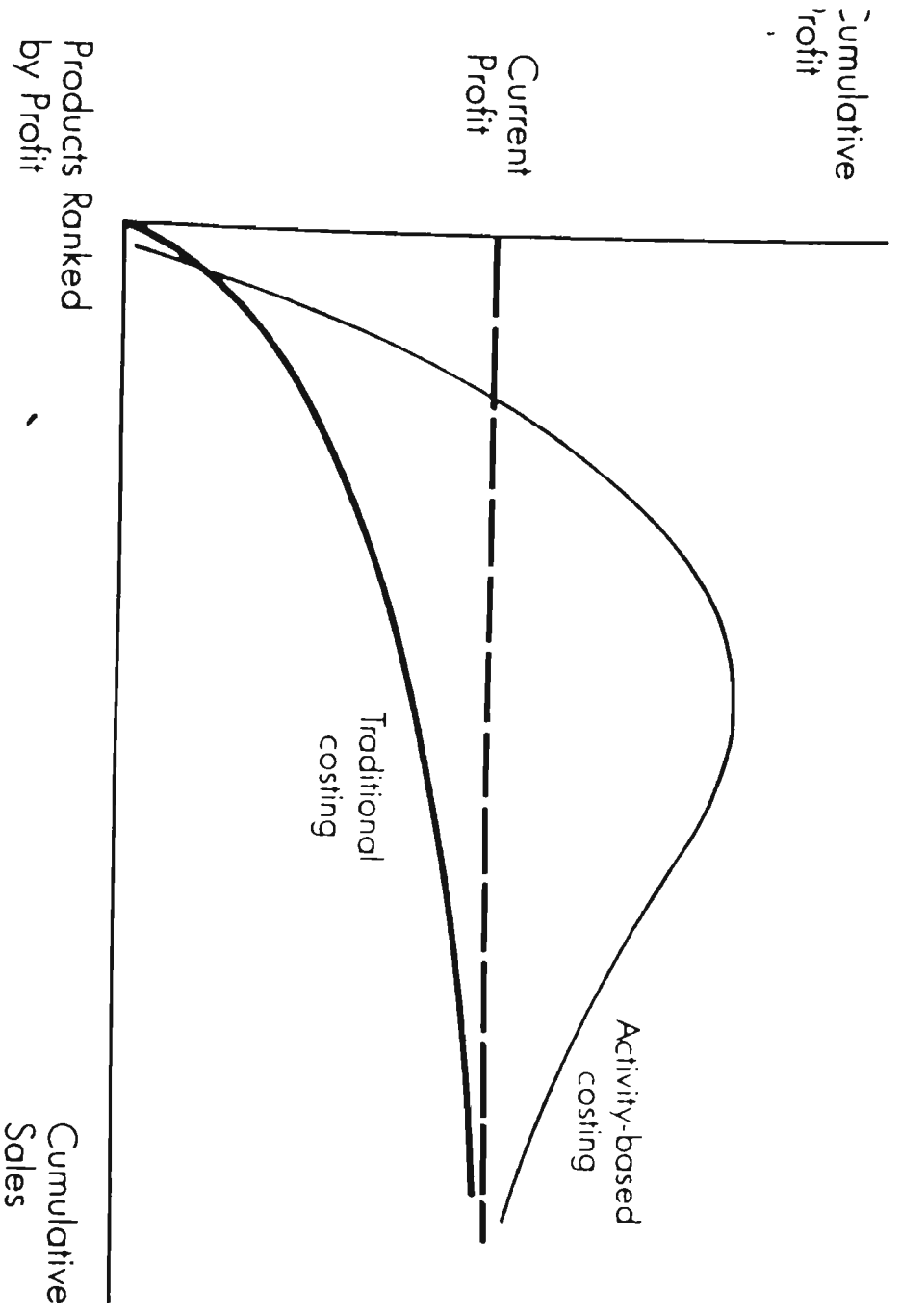


FIGURE 4 / PRODUCT PROFIT/VOLUME PROFILE



Source: Robin Cooper, Schrader Bellows

Figures 1-6

From: Wantuck, K. 'Concept of Just In Time Manufacturing Management Technique, Technological Transfer Council Publication, 1988, pp 1-19.

Figures 7-25

From: McNair, C.J; & Mosconi, W. 'Meeting the Technology Challenge: Cost Accounting in a JIT Environment', A joint study by National Association of Accountants & Coopers and Lybrand, 1988, pp 224-260.

Figure 26

From: Johnson, H. T. 'Activity - Based Information: A Blueprint for World-Class Management Accounting', Management Accounting, June 1988, p 29.

APPENDIX C

Table 1

FLOW OF COST THROUGH INVENTORIES
(000 omitted)

Raw Material Inventory		
Balance Jan. 1	154	264
Purchases	273	
Jan. 31	163	
<p>Raw Material Used: $154 + 273 - 163 = 264$</p>		
Goods in Process Inventory		
Balance, Jan. 1	19	570
Raw Materials	264	
Other Mfg. Costs	330	
Jan. 31	43	
<p>Costs of Goods Manufactured: $19 + 273 + 330 - 43 = 570$</p>		
Finished Goods Inventory		
Balance, Jan. 1	69	573
Goods Manufactured	570	
Jan. 31	66	
<p>Cost of Goods Sold: $69 + 570 - 66 = 573$</p>		
Cost of Goods Sold		
	573	573

From: Anthony, R.N; & Reece, J.S. 'Management Accounting', Text and Cases, Fifth Edition, 1975, Richard D. Irwin, p. 162

Table 2

4A CALCULATION OF STANDARD UNIT COST

Direct material, 50 kg of material @ \$1.....	\$50.00
Direct labour, 10 hours @ \$4.....	\$40.00
Factory overhead:	
Variable overhead (10 hours @ \$4.....)	\$40.00
Fixed overhead (10 hours @ \$2.....)	\$20.00
Total standard cost of one unit.....	<u>\$160.00</u>

⁴Anthony, R. N; & Reece, J. S. 'Management Accounting', Text and Cases, Fifth Edition, 1975, Richard D. Irwin, p 178.

42A COMPARATIVE STUDY OF OVERHEAD APPLIED ON THE PRODUCTS BASED ON DIRECT LABOUR HOURS AND MACHINE HOURS

<u>Unit Information</u>	<u>Product A</u>	<u>Product B</u>	<u>Product C</u>
Raw material cost	\$3.00	\$4.00	\$10.00
Direct labour cost	.5 hours	.8 hours	.2 hours
Direct labour cost per hour	\$16	\$16	\$16
Machine hours	3.2 hours	4.hours	5 hours
Total annual unit sales	30,000	50,000	15,000
Total factory overhead	\$1,680,000	\$4,480,000	\$1,568,000

It is assumed that material handling and storage require an overhead of 20 percent of the cost of raw material which is subtracted from the factory overhead cost total. The company set the selling price at 140 percent of the units production cost.

Factory overhead based on direct labour dollars.

	<u>Total Factory Overhead Cost</u>	<u>Total Direct Labour Cost</u>
<u>Product A</u>		
Factory Overhead cost	\$1,650,000	
Direct labour cost:		
.5 x 16 x 30000 units		\$240,000
<u>Product B</u>		
Factory Overhead cost	\$4,480,000	
Direct labour cost:		
.8 x 15 x 50000 units		\$640,000
<u>Product C</u>		

⁴²Anderson, H. R; Needles, B. E; & Caldwell, J. C, 'Managerial Accounting', Houghton Mifflin, pp 630-632.

Factory Overhead cost	\$1,575,000	
Direct labour cost:		
.2 x 16 x 10000 units		\$32,000
<u>Total</u>	<u>\$7,728,000</u>	<u>\$912,000</u>

Factory Overhead application rate:

$\$7,728,000 / \$912,000 = 847.37\%$ of direct labour cost.

Each product's unit cost and selling price based on overhead rate

	<u>Product A</u>	<u>Product B</u>	<u>Product C</u>
Unit cost information:			
Raw material cost	\$3.00	\$5.00	\$7.00
Direct labour cost:			
.5hrs at \$16/hr	\$8.00		
.8hrs at \$16/hr		\$12.80	
.2 hr at \$16/hr			\$3.20
Factory overhead cost:			
\$8 x 8.4737	\$67.79		
\$12.80 x 8.4737		\$108.46	
\$3.20 x 8.4737			\$27.12
<u>Total unit cost</u>	<u>\$78.79</u>	<u>\$125.26</u>	<u>\$40.32</u>
Unit selling price:			
\$78.79 x 140%	<u>\$110.31</u>		
\$125.26 x 140%		<u>\$175.36</u>	
\$40.32 x 140%			<u>\$56.45</u>

Factory overhead rate based on machine hours

	<u>Net</u>	<u>Total</u>
	<u>Factory</u>	<u>Machine</u>
	<u>Overhead</u>	<u>Hours</u>
	<u>Cost</u>	<u>Required</u>
<u>Product A</u>		
Factory overhead cost	\$1,680,000	
less material handling cost		

\$3 x 30,000 units x 20% 18,000

Net factory overhead cost \$1,662,000

Machine hours required:

3.2hrs x 30,000 \$96,000

Product B

Factory overhead cost \$4,480,000

less material handling cost

\$4 x 50,000 x 20% 40,000

Net factory overhead cost \$4,440,500

Machine hours required:

4hrs x 50,000 200,000

Product C

Factory overhead cost \$1,568,000

less material handling cost

\$10 x 10,000 x 20% 20,200

Net factory overhead cost \$1,548,000

Machine hours required:

5hrs x 10,000 50,000

Factory overhead rates per machine hour:

1,662,100 /96,000 MH = \$17.3125/mh

4,440,000/200,000 MH = \$22.20/mh

1,548,000/50,000 = \$30.96/mh

Each products unit cost and selling price based on overhead rates

	<u>Product A</u>	<u>Product B</u>	<u>Product C</u>
Unit cost information:			
Raw materials cost	\$3.00	\$4.00	\$10.00
Material handling overhead cost at 20%	0.60	.80	2.00
Direct labour cost:			
.5hr at \$16/hr	8.00		
.8hr at \$16/hr		12.80	
.2hr at \$16/hr			3.20
Factory overhead cost			

\$3.2hr x\$ 17.3125	55.40		
\$4.00 x\$22.20		88.80	
\$5.00 x\$30.96			154.80
<u>Total unit cost</u>	<u>\$67.00</u>	<u>\$106.40</u>	<u>\$170.00</u>
Unit selling price:			
\$67.00 x 140%	<u>\$93.80</u>		
\$106.40 x 140%		<u>\$148.96</u>	
\$170.00 x 140%			<u>\$232.00</u>

A comparison of the selling prices

Direct labour basis	\$110.31	\$175.36	\$56.45
Machine hour basis	\$93.80	\$148.96	\$238.00
Difference	<u>\$16.51</u>	<u>\$26.40</u>	<u>(\$181.55)</u>

It is quite clear that product A and B are overpriced and product C is under priced. In a global competitive environment no company can have the luxury of making incorrect pricing decisions and stay in business.

Table 4

⁴³A fictitious Activity Based Costing example is illustrated as follows:

Budgeted material value for product X is \$1500

Overhead recovery rate 10 percent

Financial information relating to product is:

Material value	\$400
Manufacturing	200 drillings
Engineering	5 engineers
Purchasing	2 buyers
Budgeted volume	2000 units

Standard cost for product X:

Materials	\$400
-----------	-------

Overhead cost @ 10%

of material value	40
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\$440

Activity based cost for product X:

Material value	\$400.00
Drilling @ 0.05	10.00
Engineering	87.50 *
Purchasing	25.00 #
	<u>522.50</u>

* Engineering cost per unit =

5 engineers @ \$35,000 / 2000 units = \$87.50 per unit

Purchasing cost per unit =

2 buyers @ \$25,000 / 2000 units = \$25 per unit

⁴³Dugdale, D; & Shrimpton, S. 'Product costing in a JIT environment', Management Accounting, March 1990, page 42.

Table 5

⁴⁵A JOURNAL ENTRY OF STANDARD COSTING

Direct Materials Purchase:

Materials Inventory (800kg @ \$6).....	4,800	
Price variance.....		80
Accounts Payable (at actual cost).....		4,720

(To record purchase of direct material and resulting variance)

The accounts payable is recorded at actual cost to show the proper liability

Direct Materials Requisitions:

WIP Inventory (720 kg @ \$6).....	4,320	
Quantity variance.....	480	
Material inventory.....		4,800

(To record the usage of direct materials and resulting variance)

The direct material used is two-dimensional _ quantity and price.

Direct Labour:

WIP Inventory (432 hr @ \$8.50/hr).....	3,672	
Rate variance.....	315	
Efficiency variance.....	153	
Factory payroll (450 hr @ 9.20/hr).....		4,140

(To charge labour cost to WIP and identify the resulting variances)

Direct labour cost is also two dimensional _ efficiency and rate. The factory payroll must be credited for actual labour cost.

⁴⁵Anthony, R.N; & Reece, J.S. 'Management Accounting', Text and Cases, Fifth Edition, 1975. pp 165-170.

Table 6

46A REALISED PROFIT DETERMINATION

Sales		\$300
Less Cost Of Goods Sold		
Purchases	\$400	
- Closing Stock (at cost)	200	
	<u> </u>	200
		<u> </u>
Gross Profit		<u>\$100</u>

⁴⁶Harrison, J. 'Accounting a direct approach', Second Edition, 1970, page 176.