A

PROJECT REPORT

ON

"A CASE STUDY ON VENDOR SELECTION AND EVALUTION IN HIGH GROWTH ORGANISATIONS"

UNDERTAKEN AT

ARB INDIA LIMITED

IN PARTIAL FULFILMENT OF

POST GRADUATE DIPLOMA IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT

MIT SCHOOL OF DISTANCE EDUCATION, PUNE.

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MIT SCHOOL OF DISTANCE EDUCATION PUNE - 411 038

YEAR 2022- 2024

CERTIFICATE

This is to certify that **MR.SATYAVEER KUMAR**
Has completed the project report with us for his/her project report work on " A CASE STUDY ON VENDOR SELECTION AND EVALUTION IN HIGH GROWTH ORGANISATIONS**"** in fulfillment for the Completion of his Course with MITSDE on "**PGDM in LOGISTICS AND SUPPLY CHAIN MANAGEMENT**" as prescribed By MIT School of Distance Education, Pune.

This Project Report is record of authentic work carried out by him with guidance by our relevant department from dated **11th SEPT.2024.**

To
The Director
MIT School of Distance Education,

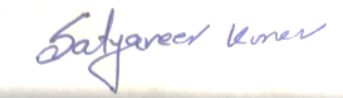
Respected Sir,

This is to request you to kindly exempt me from submitting the certificate from my organization for Project Work due to the reason mentioned below:

Tick the right option
1. As per the Rules of the Organization
2. Self Employed
3. Working in Public Sector
4. Full time Student

.
Thanking you in anticipation of your approval to my request.

Regards,



(Students' Name and Signature)

MR.SATYAVEER KUMAR
Student ID: MIT2022D02424

DECLARATION

I hereby declare that this project report entitled "A CASE STUDY ON VENDOR SELECTION AND EVALUTION IN HIGH GROWTH ORGANISATIONS" is a bonfide record of the project work carried out by me during the academic year 2022-2024, in fulfilment of the requirements for the award of **POST GRADUATE DIPLOMA IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT (PGDM)** of MIT School of Distance
Education.

This work has not been undertaken or submitted elsewhere in connection with any other academic course.

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ACKNOWLEDGEMENT

I would like to take this opportunity to express my sincere thanks and gratitude to Mr. Mahesh Mane of **ARB INDIA LIMITED** for giving me an opportunity to do my project workin your esteemed organization and it has indeed been a great learning and enjoyable experience.

I would like to express my deep sense of gratitude and profound thanks to all staff members of **ARB INDIA LIMITED** for their kind support and cooperation which helped me in gaining lotsof knowledge and experience to do my project work successfully.

At last but not least, I am thankful to my Family and Friends for their moral support, endurance and encouragement during the course of the project.

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ABSTRACT

This report provides an analysis and evaluation of the system, the advantages and disadvantages of the system and how it would benefit. The ,system is a process where goods are ordered as required, as opposed to the currently used batch processing system where goods are made in bulk and stored in warehouses until sold. The vendor management system was initially developed to not only cut down the amount of waste produced by other systems, which was seen as incurring unnecessary costs rather than adding value to the company, but to also meet customer demands with minimum delays. It has been found that when implemented correctly the vendor management system can benefit the company in numerous ways. For example, it has been shown to reduce the amount of inventory stored in warehouses as goods are sold direct to the customer as ordered. It has also been shown to speed up production lead times, eliminate and/or minimize the amount of quality control and reduce the amount of faulty stock returned. As well as benefiting companies in reducing transportation costs, as goods are sent from the factory to the customer rather than via a warehouse first. Another advantage is, the OM system allows the company to keep up to date with customer demands and new technologies as the goods are made to order so the newest technology available is used. This is extremely important when dealing with goods that have a high turnover such as computers, because the goods would be produced as needed. It has also been proven to eliminate waste on any goods manufactured which have become obsolete due to technological advances. While there are some disadvantages to the OM system, such as stock outs and possible communication break downs, (explained in detail in the report), the advantages far out weight the disadvantages.

INTRODUCTION TO THE STUDY

Aim of doing the project:

- To Implement the management study and understand they better in the way of our project.

Objective of doing the project:

- To implement our learning's of the project.
- To be upgraded with the practical business life.
- To develop the project skills in us.
- To increase our confidence level.
- To implement the quality to work.

Importance of doing the project:

- Acquiring detailed knowledge in a particular topic.
- Dealing with the practical corporate environment.
- Dealing with the practical models.
- Throwing out best possible project skills to stand out of the crowd.
- Enhancing the Creative and Innovative skills.

Methodology of data collection:

1. Primary Data Collection: - survey, questionnaire, data analysis

2. Secondary Data Collection: - internet, newspaper, books

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CHAPTER 1
INTRODUCTION

In recent years the concept of materials management is being widely accepted by industrially advanced countries for more effective coordination and control over material because materials costs (including investment in materials, handling cost, transportation and storage costs, insurance, wastage and obsolescence costs etc.) constitute

"Vendor Management is a term used to connote controlling the kind, amount, location, movement and timing of the various commodities used in and produced by the industrial enterprise".

"Vendor Management is essentially an activity of an enterprise for the procurement and use of materials distinctly separate from the process of procurement and the use of human skills and labor for the ultimate deployment to attain some predetermined objectives".

"Vendor Management is the function responsible for the co-ordination of planning, sourcing, purchasing, moving, storing, and controlling.

Materials in an optimum manner so as to provide a pre-decided service to the customer at a minimum cost".

Vendors planning and programming:

Material planning and programming is the main function of Materials management. It facilitates the procurement of material at Proper time for manufacturing purpose.

Purchasing of raw material and capital goods:

Management's next function is to purchase materials such as quantity, quality, and cost effectiveness.

Inventory control:

It ensures the provision of the required quantity of inventories of required quality at the required time with the minimum amount of Capital investment.

Receiving storekeeping and warehousing:

The next function of materials management is to receive materials to keep in stores and ware house.

Value engineering and value analysis:

Value analysis is a study of character – wise cost of an item such as Quality, design, methods of manufacture consumption aspect etc.

Transportation – internal and external:

Transport and traffic department in a big manufacturing concern plays a significant role in the movement of materials to the best advantage of the concern transportation.

Disposal of scrap and surplus

Obsolete

Surplus

Scrap

Importance of Material Management

OM & E originally encapsulated the logistics aspects of the Coproduction System. Ourcurrent view of what it should encapsulate incorporates some of the principles of "leanness" because by itself and specifically detached from Kanab and continuous improvement it beginsto lose its meaning. Also to implement these techniques without flexible, reliable processes and appropriate organization is impossible. However at this point it begins to blur with agile manufacturing principles. This section should therefore be read in conjunction with these othersand as a minimum OM should include:

- Strategic Capacity Management for example the use of multiple small machines (rather

than "efficient" expensive machines that have to be kept busy).

- Group Technology (Also commonly called "Cellular" manufacturing). This is based on the principle that ARB Center (possibly product focused) manufacture is much simpler, with less interference of material flows, than factories where similar processes are grouped together, such as heat treatment. This principle has also been applied to other

  Processes where natural groups are formed to perform a complete process aligned to customer needs in manufacturing and other industries, and "category management" in procurement. However we have shown in some circumstances that the benefits of cellular manufacturing can be gained by creating virtual cells (without moving the plant). (See Business Process Reengineering / Organizational Redesign)
- Production smoothing, avoids the problems associated with poor demand tracking (See Demand Management) and unnecessary interference of the production schedule. In a recent consultancy assignment we established that whilst customer orders were highly volatile, the underlying demand was extremely stable. The volatility downstream in the supply chain was in fact being artificially induced by poor customer planning, resulting in late changes to the order schedule, to bring the orders back in line with the very stable underlying demand! However many companies experience cyclic or seasonal demand, where it is beneficial, and in some cases vital, to flex or move resources to respond to fluctuating demand, the alternative being to pre-build stock to a forecast to afford some production smoothness, at some risk and tying up of capital. A refinement of this process is, in addition, to use "Tact" times (See Previous Technique of the Week T021: "Tact Time, Measuring Throughput Time") to set rates of production. I.e. the hourly rate of demand from customers (as opposed to coarser units of time and uncorrupted by planning parameters).
- Leveled schedules, bring more stability and regular patterns of production (See Previous Best Practice of the Week 005: Level Scheduling).
- Labor balancing when used in conjunction with Tact time (Previous Best Practice of the Week 046: "Using Tact Time to Manage Your Business") highlights process / line imbalance from the cycle time of one material to the next and indicates the need to balance the manning for each material (and the opportunity to improve the slowest to achieve balance). There are some dangers here in achieving balance. (See the question at the end of this article.) This is the guiding principle of lean manufacturing where the problem would be permanently solved as opposed to the traditional approach of buffering the uncertainty with stock.
- Set-up reduction, which is based on the principle that small is beautiful as far as batch sizes are concerned and that what is required, is made that day without inflating batch sizes. (In the article Previous Technique of the Week T019: Avoiding Set Ups and Reducing Changeover Times (SMED) (and thereby reducing batch sizes)) we show that there is in fact much more to this than the set-up reduction techniques proposed by Shingo. But there are a number of techniques available to do this stated by Shingo. His SMED techniques give rise to the opportunity to reduce batch sizes by up to a factor of 50. It should be remembered however that this should be applied to the bottleneck first and maybe even stop there.
- Standard working. Defined by the operator, not the industrial engineer, it is a prescribed sequence of production steps done by one operator and balanced to the required rate of

demand. It becomes the basis of understanding the job and therefore what can be improved.

- Visual controls. Characteristic of OM factories are simple visible controls, held locallywhere they are used to monitor key performance indicators and used as a spur to improvement. This is a deliberate attempt to give eyeball control rather than the over-sophistication provided by remote computer systems. Examples include:

- Lowering cost content :
- If effective materials management is done the cost content may be kept at the lowest level.
- Direct and Indirect method :
- The cost of materials and indirect cost remain within control limit.
- Minimum inventory loss:
- Though an efficient materials management we can reduce the risk of loss from fraud and theft.
- Full utilization of tools and equipment's :
- Tools and equipment's are effectively utilized provided there is an execution of good materials management.
- Cost records of material are made feasible :
- By materials management, cost of materials used in different department or job may be determined very easily.
- Perpetual inventory system :
- Preparation of accurate reports meant for management can only be possible through perpetual inventory system and availability of other inventory records.
- Ensuring receipt of right materials :

Material department duty is to see what is being supplied against his orders and to ensure that he receives the correct material for the money paid

- Good seller and buyer relationship:
- Good buyer and seller relationship is very essential in an effective material management.
- Selection of suppliers:
- In selecting suppliers, consideration should be given not only to price but also to quality and delivery time.
- Negotiation:
- Negotiation work is effectively done by material management.
- Reduction length of manufacturing cycle:
- Effective use of men, material and machine reduces the length of manufacturing cycle.
- Quality control is maintained:
- Quality control is a technique of scientific management which has the object of improving industrial efficiency by concentrating on better standards of quality.

ABOUT THE COMPONY

This entrepreneurial and win-win relationship driven culture continues to guide Sequin all its endeavors.
1.3. Employer spotlight:
INFO
Is one of India's leading global IT Services companies, providing software-led IT solutions, remote infrastructure management services and BPO? Having made a foray into the global IT landscape in 1999 after its IPO, focuses on Transformational Outsourcing, and working with clients in areas that impact and re-define the core of their business. The company leverages an extensive global offshore infrastructure and its global network of offices in 16 countries to deliver solutions across select verticals including Financial Services, Retail & Consumer, Life Sciences Aerospace, Automotive, Semiconductors, Telecom and MPE (Media Publishing & Entertainment) 13

Sequin India:
ARB has evolved from a dream of eight youngsters in 1977 to the country's top IT group today. Our well-balanced portfolio of turnkey solutions across equipment's, software and services make our offerings end-to-end for all IT needs of the Indian customers. Our recognitions speak of our dominant position in India. V&D100 2005, No. 1 Security service provider in India by DQ Annual 2004, No.1 Infra service provider by CMP 2005, and No.1 PC Brand recognize us as No.1 Network Management service provider in India for the last 5 years in India. ARB is known to be the harbinger of technology in the country. Our partnerships with technology leaders like JDA, Oracle, SAP, KANA, Intel, and Microsoft go back to the time when India was being recognized as a growing and strategic market. Along with global capability, ARB
has leveraged such relationships to create value for Indiancustomers - the comprehensive integrated market surveillance solution for SEBI being one such example. Our services are backed
by an extensive direct support infrastructure spread across 170locations nationwide, which offer 24-x7 support offering for critical sites. With more than70 SAP implementations till date, ARB has been rendering service to key Indian players in Banking, Retail and Government. We are committed to the Indian Market and will continue to invest more to further enrich our end-to end IT offerings for this market. Our flexible engagement models, richheritage of technology solutions and over 29 years of leadership across service areas gives a strategic advantage to meet the nation's IT

ARB Enterprise is a leading Global Technology and IT enterprise that comprises two companies listed in India – ARB Technologies & ARB Systems. The 3-decade-oldenterprise, founded in 1976, is one of India's original IT garage start-ups. Its range
of offerings span Product Engineering, Technology and Application Services, BPO,Infrastructure Se rvices, IT Hardware, Systems Integration, and distribution of ICT products. The ARB
team comprises approximately 42,000 professionals of diversenationalities, who operate from 16 countries including 300 points of presence in India ARB has global partnerships with several leading Fortune 1000 firms, including leading IT and Technology firms. ARB Technologies is one of India's leading global IT Servicescompanies, providing software-

led IT solutions, remote infrastructure managementservices and BPO. Having made a foray into the global IT landscape in 1999 after insipid, ARB Technologies focuses on Transformational Outsourcing, working with clients in areas that impact and re-define the core of their business. The company leverages an extensive global offshore infrastructure and its global network of offices in 16 countriesto deliver solutions across select verticals including Financial Services, Retail &Consumer, Life Sciences Aerospace, Automotive, Semiconductors, Telecom and MPE (Media Publishing & Entertainment). For the quarter ending 31st December 2006, INFO Technologies, along with its subsidiaries had revenue (TTM) of US $ 1.155 billion (Rs.5220 core) and employed 38,317 professionals.15

1.5. Strong SAP Capabilities:

ARB Technologies is one of the largest global SAP service providers in India, providing spectrum of SAP services. ARB Technologies has developed strong capabilities on the SAP Net Weaver platform and drives market demand in the SAP world through unique market propositions and upgrade offerings to my SAP ERP. ARB is a value
added reseller and services partner across multiple geographies. With a track record of successfuleng agement in this space, ARB has received prestigious awards from SAP - distinguished partner award 2005, best my SAP HCM implementation award 2005, Sap's "outstanding partner" award for implementation/upgrade project 2004, and more. Forrester has lauded ARB Technologies is one of a number of firms in this space and is a viable candidate for multinational firms that are contemplating global outsourcing and are interested in SAP implementation and maintenance services.

1.6. VISION STATEMENT

•

Together we create enterprises of tomorrow.

1.7. MISSION STATEMENT

•

To provide world class information technology solution and services to enable our customers to serve their customer better'.

1.8. QUALITY POLICY STATEMENT

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"We will deliver defect-free products, service and solutions to meet the requirements of our external and fuel initiative and foster active by allowing individuals freedom of action and innovation in attaining defined objectives.

OUR PEOPLE OBJECTIVE

To help ARB system people share in the company's success, which they
make possible to provide job security based on their Operation; to recognize their individualachievement s and to help them gain a sense of satisfaction and accomplishment from their work.

1.10. CORE VALUES

We shall uphold the dignity of individual
We shall honor all commitments.
We shall be committed to Quality. Innovation and growth in every endeavor.
We shall be responsible Corporate Citizens.17

1.11. A SNAPSHOT OF ARB systems Ltd.

•

India's leading IT company ARB in say is India's largest information technology (IT), transnational conglomerate. With its-depth expertise in developing solution spanning diverse technologies.

•

ARB Insist aims to propel its course on to the high growth Path total Technology Integration. Towards capturing two Ends of market spectrum - enterprise solution and PCs. ARB Insist has made significant strategic infrastructure investments in the
professionalservices Organization (PSO), the Support Services Organization (SSO) and itsmanufacturing plant at Pondicherry. Thus it is the manufacturer of general purposecomputer and provides services in th e areas of IT Consultancy, system integration, Software Development and Training.

•

It makes true technology integration possible across multiple platforms, this
was possible because of the in-depth expertise in developing state-of-the-art indigenoushardware solution; thorough understanding of networking technology.

•

As a part of this plan to market more and more technology integration services world-wide, Sequin sys has already taken a step in the direction of export by localizing its service comprising software, hardware design and development, value added support service networking abs repair services and overseas integration projects to meet the demands of the global clients. Company's continuous and consistent anticipation of the requirement of the IT Industry has led it to undertake the acquisition of the business of ARB solutions limited (now known as Frontline Division), ARB Peripherals Limited (now known
the acquisition of 18

Customer Support Organization (CSO) activities of ARB Office Automation Limited (now known as office Automation Division)
FRONTLINE DIVISION
Frontline Division, formerly ARB solution Ltd. (ARB Insole) started with the aim
of increasing market penetration by handing sear nets not covered by ARB Insist and creating new niches. Today it specializes.19

In the production of goods or services.
Four Types of Focus Dimensions Used in LOGISTICS AND SUPPLY CHAIN MANAGEMENT
Every business operates along four basic focus dimensions: Material, customers,
internal processes, and learning and innovation. These theoretical divisions of operationsmanagement come from the research of Robert S. Kaplan and David P. Norton.
Thedimensions aren't mutually exclusive. For example, employees who become morecompetent through learning can improve the functioning of internal processes, according to "Management Principles: A Contemporary Edition for Africa," by P. J. Smite .Material The heart of the financial dimension for most businesses is profit, though short-term financial goals might entail sacrificing current profits to increase future capacity. For example, a company might decide to reinvest all its profits into new and better machinery to increase production capacity and efficiency, but the ultimate goal remains
greater profit. Managers must control the flow of money through the organization to ensureshort-term goals align with long-term goals. Customers are the foundation of your business. Without the flow of their money through your organization, everything grinds to a halt. Managers aim to maximize the flow of customer money, but that doesn't always mean securing as many customers as possible.
A boutique hotel, for example, might focus on serving relatively few high-payingcustomers, while a

chain hotel focuses on the wide swath of people who are unwilling to20

Pay high prices. Though each business targets customers who have different needs, meeting those needs is equally vital to their profitability. Internal Processes Optimization of internal processes leads to greater profitability and customer satisfaction. For example, a manager might focus on developing efficient communications within an organization to ensure orders travel quickly from the customer service department to
the production line. The manager further expedites the order by ensuring the productiondepartment syncs with the shipping department to get the order to the customer quickly. Fine-tuning the process to make it maximally efficient keeps operating costs low and pleases customers, leading to greater profits. Learning and
InnovationTechnology progresses and so must businesses. An invention that improves amanufacturing process, for example, might be a game changer that forces factories to upgrade their processes or lag behind competitors. A good manager stays abreast of technological shifts; a great manager anticipates and initiates change by encouraging her organization to focus on learning and innovation. Practically, this can mean anything from having a well-funded research-and-development team to paying for continuing education for employees. An organization that surmounts cognitive limitations stays one step ahead of its competitors.
Understanding LOGISTICS AND SUPPLY CHAIN MANAGEMENT
Consider the ingredients of your breakfast this morning. Unless you live on a farm and produced them yourself, they passed through
anumber of different processing steps between the farmer and your table.Every organization has an operations function, whether or not it is called ‘operations’. The goal or purpose of most organizations involves the production of goods and/or 21

Services. Operations in some form has been around as long as human Endeavour
itself but, in modern manufacturing and service industry at least, it has changed dramaticallyover time. To some (especially those professionally involved in LOGISTICS AND SUPPLY CHAIN MANAGEMENT!) LOGISTICS AND SUPPLY CHAIN MANAGEMENT involves everything an organization does. In this sense, every manager is an operations manager.
LOGISTICS AND SUPPLY CHAIN MANAGEMENT definitions
There are many differing definitions of LOGISTICS AND SUPPLY CHAIN MANAGEMENT; we have picked a range for you to look at below. Depending on your specific area of LOGISTICS AND SUPPLY CHAIN MANAGEMENT, some may suit your role or understanding better, but overall they all make a similar point. · The efficient and effective implementation of the policies and tasks necessary tosatisfy an organization’s customers, employees, and management (andstockholders, if a publicly owned company)· The management of systems or processes that create goods and/or provide
services "The on-going activities of designing, reviewing and using the operating system, to achieve service outputs as determined by the organization for customers" (Wright,
1999)· Management of main business activity: the organizing and controlling of thefundamental business activity of providing goods and services to customers· LOGISTICS AND SUPPLY CHAIN MANAGEMENT deals with the design and management of products, processes, services and supply chains. It considers the acquisition, development, and utilization of resources that firms need to deliver the goods and services their clients want.

· The purvey of LOGISTICS AND SUPPLY CHAIN MANAGEMENT ranges from strategic to tactical and
operationallevels. Representative strategic issues include determining the size and location of manufactur

ing plants, deciding the structure of service or telecommunications networks, and designing technology supply chains.· Tactical issues include plant layout and structure, project management methods, and equipment selection and replacement. Operational issues include production scheduling and control, inventory management, quality control and inspection, traffic and materials handling, and equipment maintenance policies.· LOGISTICS AND SUPPLY CHAIN
MANAGEMENT is an area of management concerned with overseeing,designing,
controlling the process of production and redesigning business operations in the production of goods and/or services. It involves the responsibility of ensuring
that business operations are efficient in terms of using as few resources as needed, andeffective in terms of meeting customer requirements. It is concerned with managing the process that converts inputs (in the form of materials, labor and energy) into outputs (in the form of goods and/or services).
IOM would like to thank Derek Thomason FIOM, Unipart Expert Practices, for sharing examples and information contained in this section for the benefit of members and those interested in learning more about what operations so what does it means?
What exactly does this mean in real terms? What kinds of tasks, roles and responsibilities do people working in LOGISTICS AND SUPPLY CHAIN MANAGEMENT have?
Forecast demand
– Market product – Adapt to comply with customer demand23
– Understand what the customer wants – Understand how much the customer wants – Set targets (timescales) – Know product demand – Measuring standards – Produce sales invoices / solve customer disputes – Measure outputs – Plan production and timescales
Sourcing and procurement
– Order materials – Negotiate price – Check delivery with order – Reconcile invoice with correct supplier statement – Pay on time – Buy supplies – Order materials – Stock control – Buying resources and allocating – Inventory / stock control24

– Schedule suppliers – Managing stock (getting it in the right place at the right time) – Locating and procuring supplies – Pay suppliers
Creation of output
– Managing budgets – Cost implications – Buy cost effective materials – Replenish inventories – Arrange for necessary equipment – Schedule material / staff / equipment to produce goods and services – Plan ‘work order’ – Produce product – Produce goods – Converting supplied materials (adding value) – Quality control – Measure conformance / quality

CHAPTER 2
LOGISTIC SYSTEMS

Logistics, has the elements of a philosophy as well as various practice elements.While the OM philosophy is applicable to any type of organization, the practice elements apply mainly to repetitive manufacturing material such as the production and assembly of automobiles or appliances.

Although the term logistics ,can be defined narrowly as a production or inventory scheduling technique, it is more frequently defined as a very broad philosophy that incorporates many of the concepts of communitarian capitalism that are outlined in Chapter 1. VM is more appropriately thought of as a philosophy because, even though it includes a variety of techniques,it is much more than a collection of management practices. There is considerable support for the argument that successful implementation of an VM system requires an entirely different mentality, or attitude, on the part of management and workers than the typical attitudes underlying traditional business practices and relationships. Although a precise, or financial definition of OM has not been developed, it basically involves the elimination of waste and excess by acquiring resources and performing activities only as they are needed by customers at the next stage in the process. For example, inventory buffers are viewed as an evil in that they hide problems such as defective parts, production bottlenecks, long machine set-ups and competitive behavior within the company.

A more comprehensive definition of VM can be developed by considering the main elements thatare attributed to successful OM systems. These elements can be separated into two broad categories including attitude and practice. While the elements of attitude can be adopted by any organization, the elements of practice are mainly applicable to companies involved in repetitive

Manufacturing. From an accounting viewpoint, these are companies that would normally use theprocess cost accumulation method.

Philosophy

The philosophy of OM is simple - Inventory is defined to be waste. Logistics, inventory systems expose the hidden causes of inventory keeping and are therefore not a simple solution that a company can adopt; there is a whole new way of working that the company must follow inorder to manage its consequences. The ideas in this way of working come from many different disciplines including statistics, industrial engineering, production management and behavioral science. In the VM inventory philosophy there are views with respect to how inventory is looked upon, what it says about the management within the company, and the main principle behind VM.

Inventory is seen as incurring costs, or waste, instead of adding value, contrary to traditional accounting. This does not mean to say that VM is implemented without awareness that removinginventory exposes pre-existing manufacturing issues. Under this way of working, businesses areencouraged to eliminate inventory that doesn't compensate for manufacturing issues, and then toconstantly improve processes so that less inventory can be kept. Secondly, allowing any stock habituates the management to stock keeping and it can then be a bit like a narcotic. Managementare then tempted to keep stock there to hide problems within the production system. These problems include backups at work centers, machine reliability, and process variability, lack of flexibility of employees and equipment, and inadequate capacity among other things.

In short, the logistics inventory system is all about having "the right material, at the righttime, at the right place, and in the exact amount" without the safety net of Inventory, the implications of which are broad for the implementers.

An OM system requires an attitude that places emphasis on the following:

1. Material with a value chain perspective,
2. Respect for people at all levels,
3. Quality at the source,
4. simplification or just enough resources,
5. Continuous improvement and
6. A long term perspective.

An OM system also incorporates the following practices:

1. logistics purchasing,
2. Focused factories,
3. Cellular manufacturing,

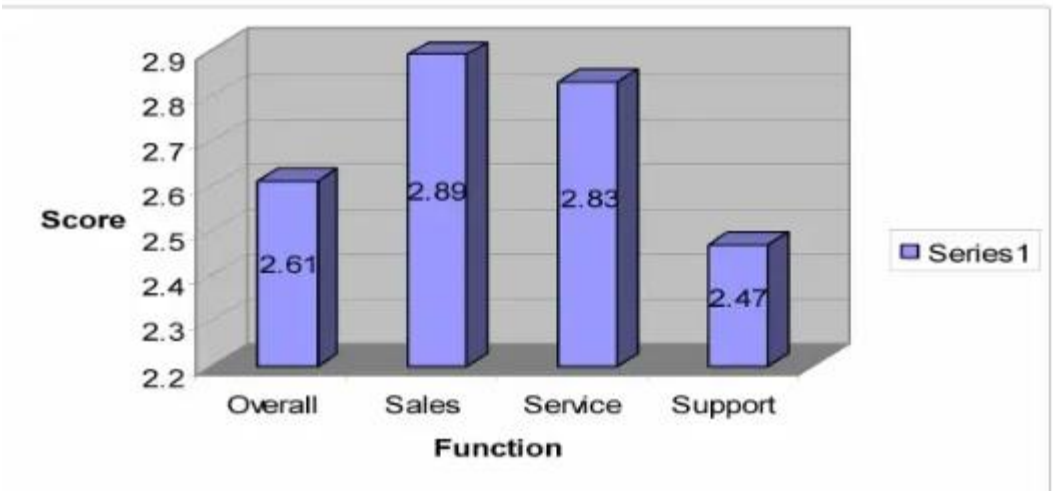
LOGISTICS production,

1. Operations distribution,
2. Simplified accounting and
3. Process oriented performance measurements.

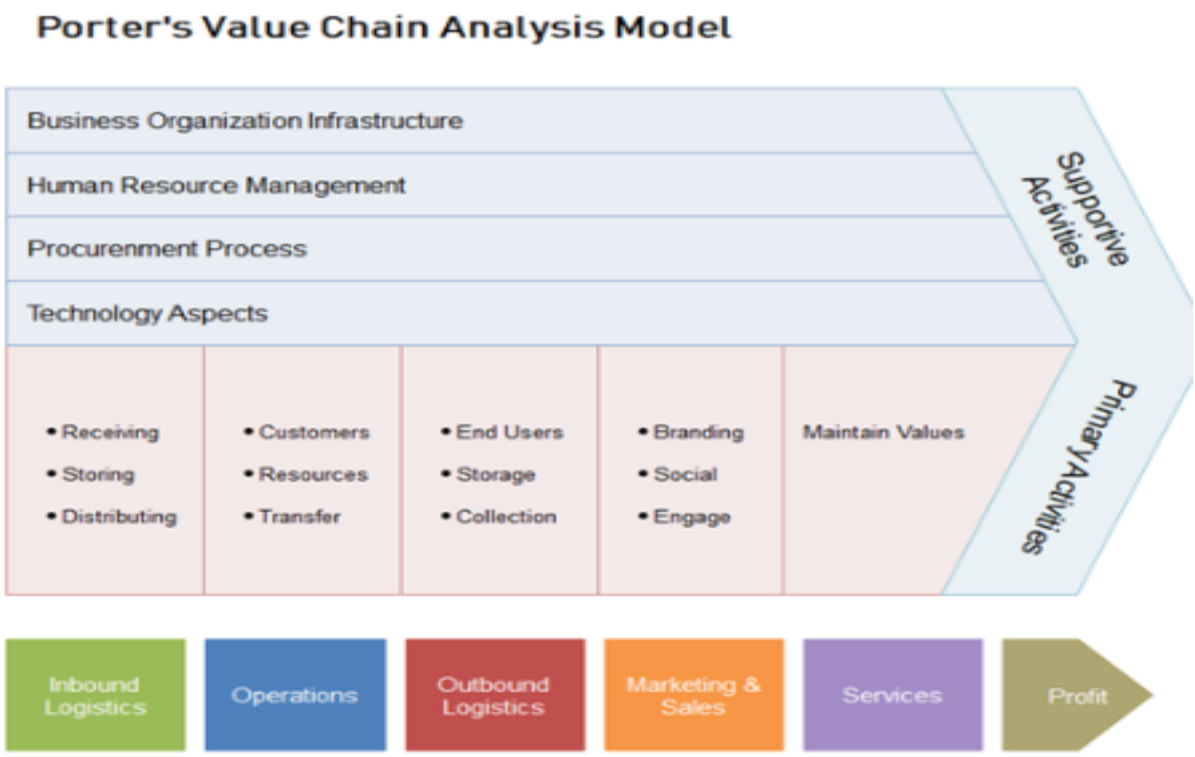
The VMAttitude
Material with a Value Chain Perspective

A company's value chain consist of the connected set of value-creating activities that are required to produce, distribute and service a product from the initial suppliers of raw materials to the final consumer. According to Michael Porter, a company's value chain is part of a larger value system that includes the value chains of suppliers, distributors and buyers. Figure 8-1 illustrates the value systems for a single industry firm and a diversified firm. Each firm in the value system has a separate value chain, but these value chains are interdependent. Buyers (other companies or individuals) depend on distributors who depend on producers who depend on suppliers who in turn depend on other suppliers.

Using Porter's terminology, the value chain for a specific company starts with a generic value chain illustrated in Figure 8-2. The company's value chain includes an infrastructure made up of physical assets and various activities that support the entire chain. For example, the infrastructure includes activities such as general management, accounting, Material, legal services, and security.Other major support activities include human resource management, technology development and procurement or purchasing. A company's primary activities include inbound logistics material, outbound logistics, marketing & sales and customer service. Inbound logistics includes sub-activities such as transportation, receiving, inspection and materials handling. Material s involve many activities including research & development, product design, engineering, energy, planning, scheduling, production activities and maintenance. Outbound logistics refers to activities such as processing customer orders and outbound transportation. Marketing & sales activities include advertising, and sales promotion. Finally, customer service includes such activities as customer training, maintaining spare parts and repair service.



The value chain and value system concepts explicitly recognize the interrelationships, or linkages, within the economic system. Recognizing and exploiting these interdependencies is important because OM systems depend on high levels of co material by everyone connected to the value chain, i.e., both inside and outside the company? Since waste and excess arenot allowed in an OM system, everyone in the value chain must work together as a team to ensure a smooth, efficient flow of output. Advocates of the OM Traditional systems concentrate on the value added by production activities, while the value chain perspective also includes the value added by vendors, distributors and customer service personnel. philosophy point out that the competition that typically occurs between workers and departments in traditional individualistic based systems is inconsistent with the OM concept because it produces excess that adds costs andhides problems.



Respect for People at all Levels

Most of the elements of an OM system require that all of the constituencies (employees, customers, vendors and management) and individuals within those constituencies have a high regard for each other. Institutionalizing the concept of respect for others is not just a nice thing for a company to do, it is an important element in the OM competitive strategy. For example, traditional management systems tend to create adversarial relationships between employees and management through a hierarchy of authoritarian supervisors. In an OM system, workers are cross trained and empowered to make decisions that are restricted to supervisors in companies with traditional management systems. Respect tends to build the trust between employees and management that is needed to successfully implement programs for cross training and empowerment. Such programs help employees grow and bond with the company. This sequential set of outcomes produces more knowledgeable employees, fewer layers of management, lower labor turnover, higher quality and lower costs.

Quality at the Source (Judoka)

Quality at the source means to identify and correct problems when and where they occur. The Japanese refer to this concept as judoka. In an OM system, everyone in the company is responsible for quality and workers use statistical control charts and other techniques to monitor their own work. Everyone's attitude must include the idea that quality is my job, where quality is defined asconformance to specifications, as opposed to design quality.2

Judoka also includes automated inspection frequently referred to as automation. The idea is tomake inspection part of the production process, rather than a separate activity, to insure that defective work is not moved on to the next stage in the process. The goal is to stop the production line and correct the problem at the source of the problem.

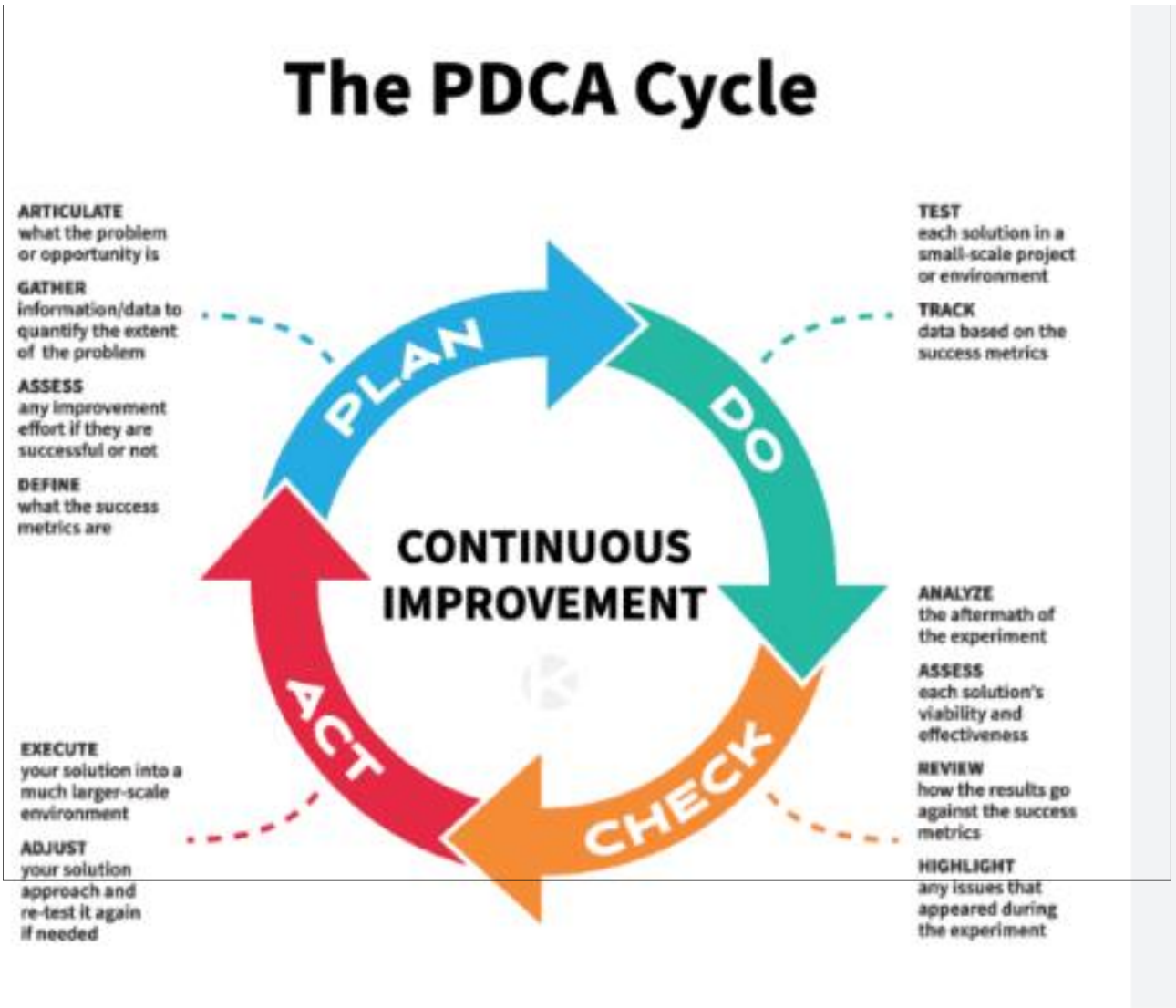
Simplification or Just Enough Resources

A goal of OM systems is to achieve zero work in process inventory buffers so that products flow continuously through the system. OM also includes the goal of zero ending finished goods inventory. This reflects the idea that OM is a demand pull system rather than a speculative push system. Customer orders drive production. The process starts with the final consumers who place demands on the sales force, who place demands on the production facilities, who in turn place demands on upstream activities throughout the system. Although eliminating excess inventory is an important part of an OM system, the concept is much broader than an inventory control or production scheduling method. An OM system also emphasizes simplification and zero excess (waste) in all areas of business. The objective is for the company to acquire just enough resources including vendors, human resources, and capacity. This is a very different concept from the idea underlying traditional systems where excess resources are planned just-in-case (JIC) they are needed. The OM view is that excess of any kind hides problems such as low quality raw materials and unreliable vendors, employees and equipment. Remove the excess and the problems become visible.

A comparison of the JIC and OM approaches is illustrated in Figure 8-3. The ship represents the Company, the water represents the Company's resources and the rock formation symbolizes the Company's problems. In the just-in-case illustration on the left, the ship is perilously close to the rocks hidden below the surface. In the logistics illustration on the right, the water level is lowered (excess resources removed), revealing the rocks or problems that need to be solved.

Continuous Improvement (Kaizen)

The Japanese refer to continuous improvement as kaizen (pronounced ky'zen). To the Japanese, kaizen means to strive relentlessly to increase quality, efficiency and effectiveness in all areas of life including personal, family, social, and work. Although this concept definition may sound somewhat individualistic, the Japanese emphasize small incremental, but cumulative holistic improvements. The continuous improvement approach is illustrated by the Stewart-Deming plan-do-check or study-action (PDCA or PDSA) cycle that appears in Figure 8-4. The plan step includes identifying a problem, or potential for improvement, and developing a plan for the problem's solution. The do step includes a trial run of the planned solution which is evaluated in the check step. Correctly evaluating the trial run depends on an understanding of the variation in the system. It is important not to confuse common causes with special causes of variation. The check step includes revisions to the plan where they appear to be needed. The final action step represents the implementation of the plan. The PDCA cycle involves using a variety of statistical tools and is a never ending activity for companies that embrace the continuous improvement methodology. Some of the statistical tools are discussed below.


The PDCA Cycle
ARTICULATE
what the problem or opportunity is
GATHER
information/data to quantify the extent of the problem
ASSESS
any improvement effort if they are successful or not
DEFINE
what the success metrics are
PLAN
DO
CHECK
ACT
CONTINUOUS IMPROVEMENT
TEST
each solution in a small-scale project or environment
TRACK
data based on the success metrics
ANALYZE
the aftermath of the experiment
ASSESS
each solution's viability and effectiveness
REVIEW
how the results go against the success metrics
HIGHLIGHT
any issues that appeared during the experiment
EXECUTE
your solution into a much larger-scale environment
ADJUST
your solution approach and re-test it again if needed

PDCA Statistical Tools

Some of the statistical tools used in the continuous improvement cycle include: 1. Pareto diagrams,

2. Fishbone, or cause and affect diagrams,

3. Histograms,

4. Other graphs and charts, e.g., pie charts,

5. Control charts and

6. Scatter diagrams and related techniques, e.g., regression and correlation analysis.

Pareto diagrams show the causes of problems in bar chart format. The idea is to graphically display opportunities for potential improvement. For example, Figure 8-5 illustrates the reasons for down time at a particular cell. These include A - Out of parts, B - Defective part, C -

Equipment failure, D - Operator error and E - Power failure. Figure 8-5 reveals at a glance that nearly fifty percent of the down time is caused by a shortage of parts and another thirty percent results from defective parts.

FIGURE 8-5
PARETO DIAGRAM*

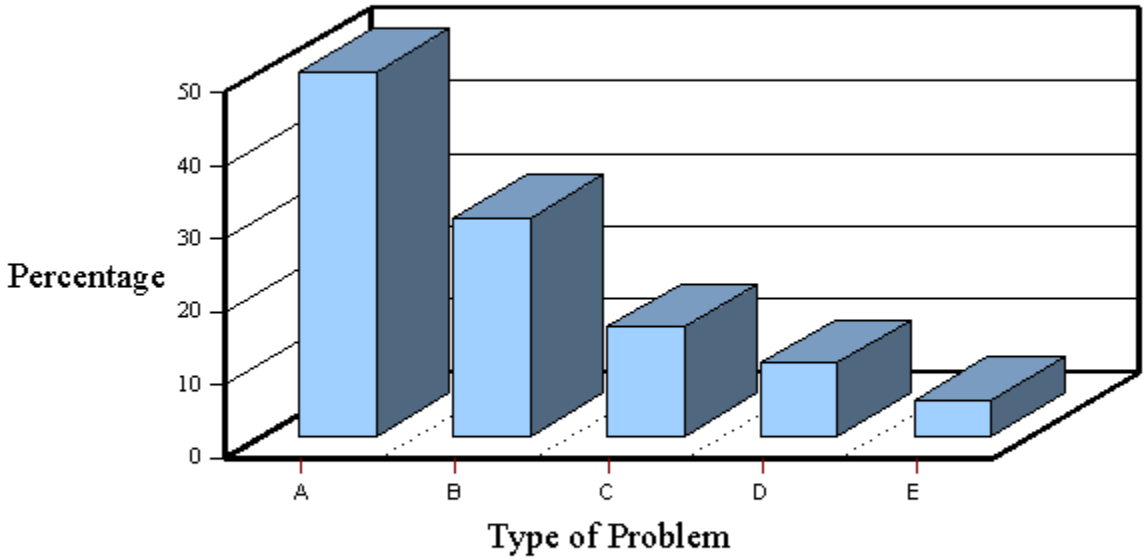
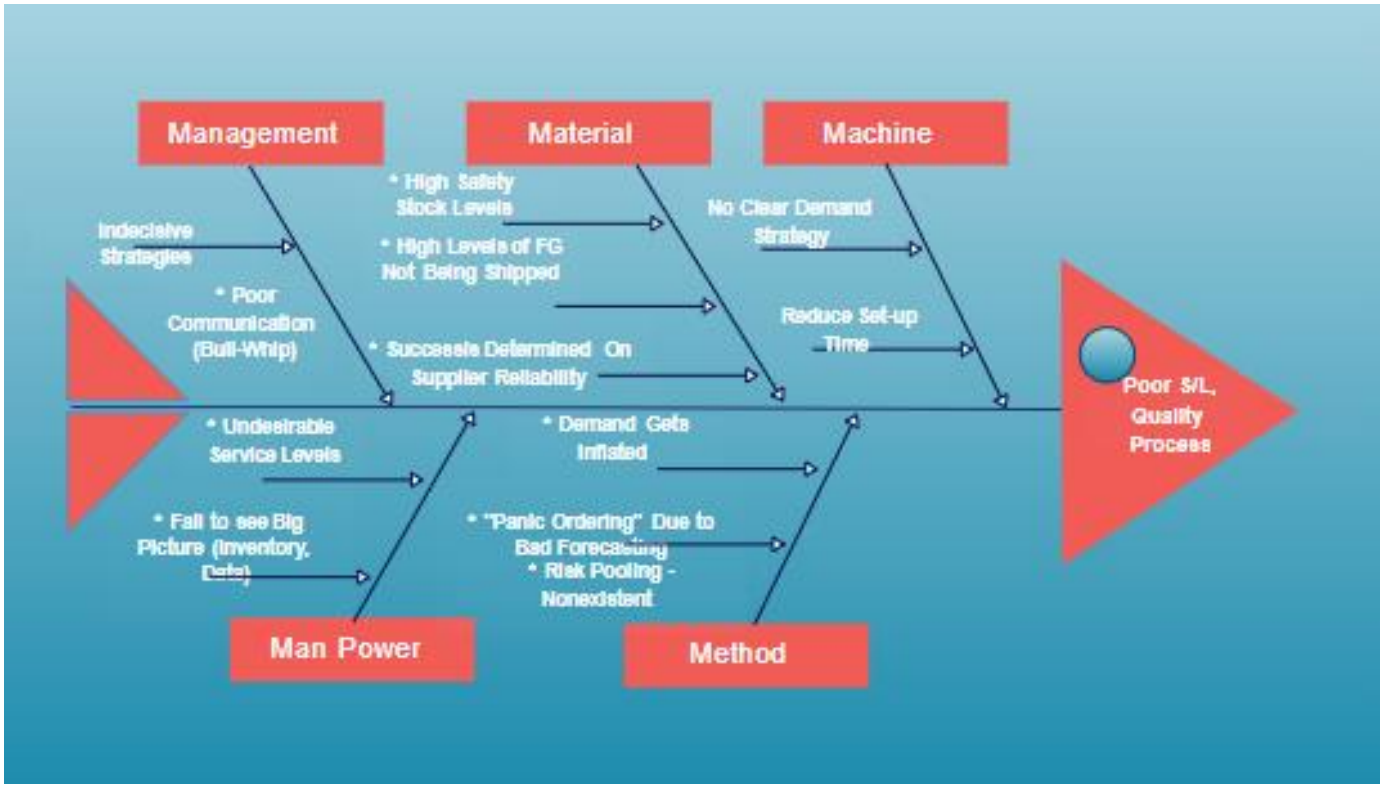


*Chart problems, A, B, C, D and E by frequency or percentage of the total to illustrate the significance of each problem for potential improvement.

Fishbone diagrams show a sketch of the relationships that may contribute to a particular problem. For example, Figure 8-6 presents an abbreviated fishbone diagram for the downtime problem mentioned above. Shortages of parts and defective parts are related to vendors and delivery schedules. Equipment failures are related to the characteristics of the equipment such as age and preventive maintenance. Operator errors, on the other hand may be caused by a lack of training or experience. In other cases, the characteristics of the process may be at fault.



Histograms show the distribution of a performance measurement such as the number of shortages, or the number of defects, over a period of time. Figure 8-7 illustrates the number of material shortages per day for a particular period. The chart reveals that the number of shortages ranges from one to fifteen per day with eight representing the most frequent number.

Other types of graphs include pie charts and line graphs. Pie charts are used to show the various parts of a problem, process or financial measurement in proportion to the whole. Figure 8-8 illustrates the various types of product costs in proportion to total factory costs. The idea is to emphasize the areas with the greatest potential for improvement. Line charts are very useful for showing trends in nearly any type of measurement. For example Figure 8-9 illustrates the number of parts shortages over a fifty-two week period.

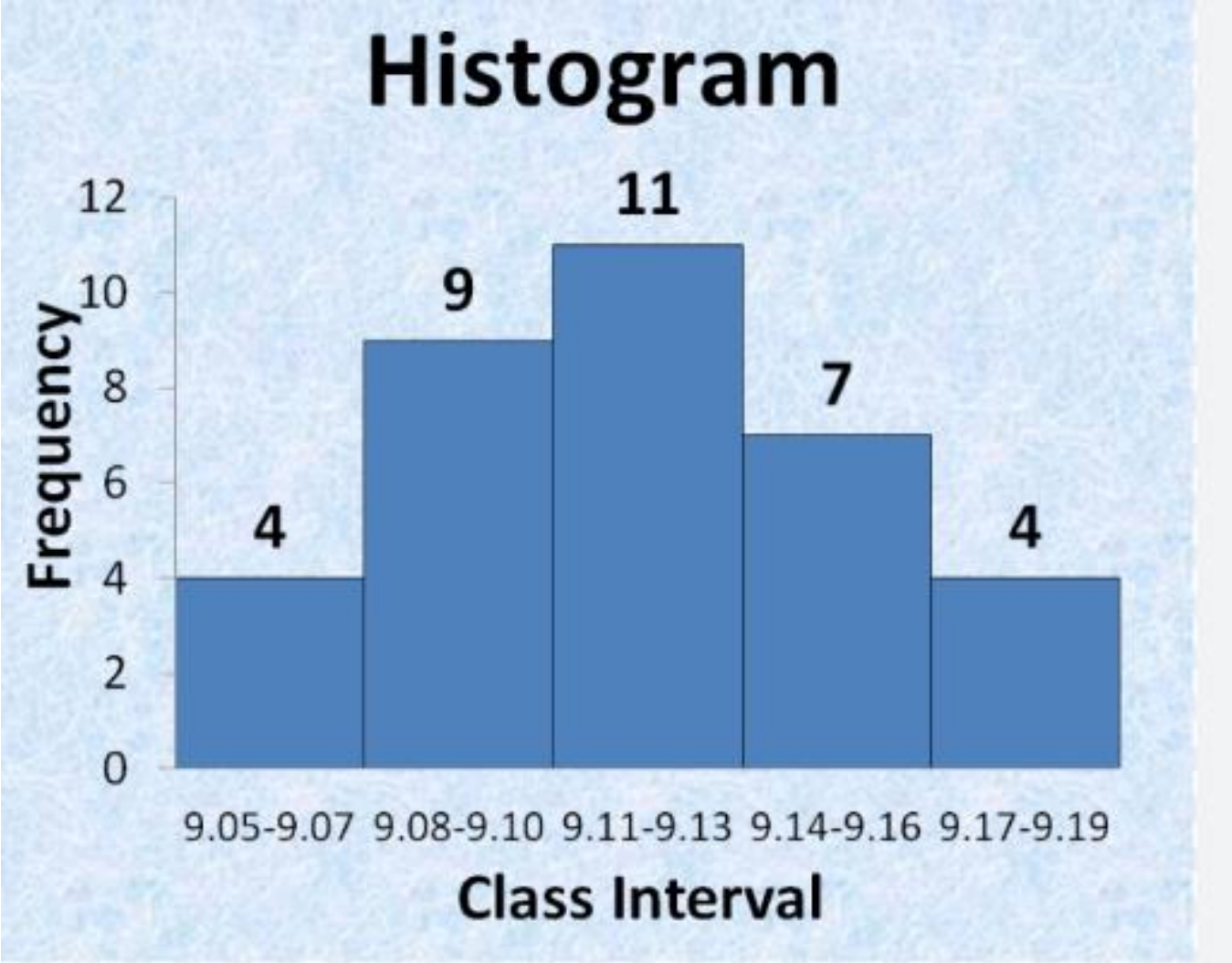
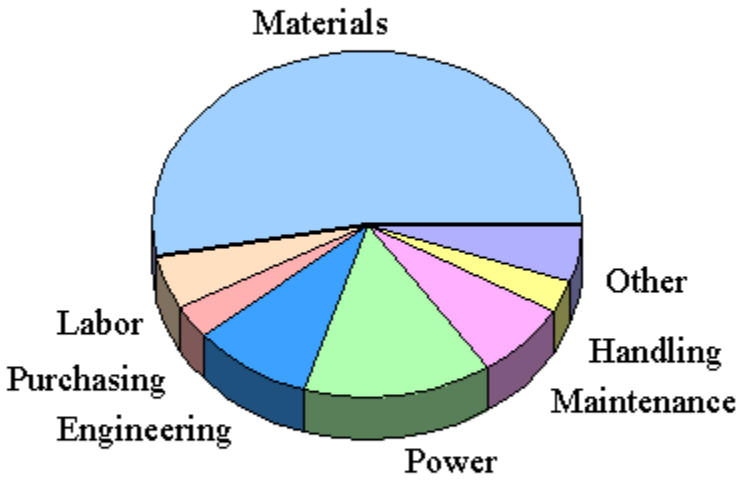
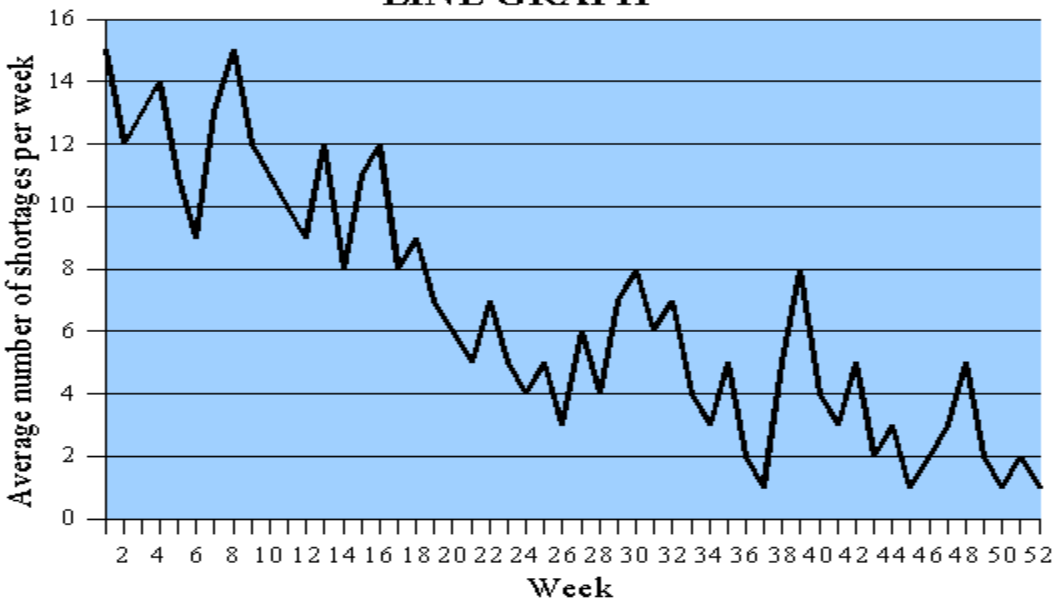

Histogram
Frequency
12
10
8
6
4
2
0
4
9
11
7
4
9.05-9.07
9.08-9.10
9.11-9.13
9.14-9.16
9.17-9.19
Class Interval

FIGURE 8-8
PIE CHART*



* Pie charts show the various parts in proportion to the total. In this example, each type of product costs is illustrated as a proportion of the total costs. Used to reveal the areas of greatest potential improvement.

FIGURE 8-9
LINE GRAPH*



*** Used to show trends such as parts shortages per week, number of defects, number of line stops, setup time and nearly any other measurement.**

Control charts and scatter diagrams are perhaps the most important statistical tools available to aid in the PDCA continuous improvement effort. That is why they were given considerable attention in Chapter 3. Recall that control charts are used to determine when a process is stable and whether or not it is in control. Control charts are also used in the check step to reveal the success of the plan and do steps in improving the mean outcome or in reducing the variability of the process. Scatter diagrams and the related regression and correlation techniques are powerful tools for identifying cause and effect relationships. Refer back to Chapter 3 for a review of these important statistical tools.

A Long Term Perspective

Although the effect of a small improvement may seem trivial, the concept of continuous improvement becomes a powerful strategy in the long run as the cumulative benefits of hundreds, perhaps thousands of small improvements are obtained. It is somewhat analogous to an athlete training for the Olympics. The person trains daily to obtain small increases in fitness and skill. After years of cumulative incremental improvements, the athlete may reach world class status. The goal for the company pursuing continuous improvement is also to achieve and maintain a world class competitive position. Thus, a long term perspective is an essential ingredient of the OM philosophy.

CHAPTER 3
VENDOR MANAGEMENT

A brief discussion of each of the OM practices is included in the sections below.Logistics Purchasing
When the concepts of OM are applied to the purchasing function, all of the elements of attitudediscussed above must be included. In addition, the adoption of OM purchasing includes the following characteristics:

1. Establishing long term agreements with vendors on delivery and price.
2. Purchasing from a smaller number of vendors than in traditional systems.
3. Certifying vendors on quality, price and schedule attainment.
4. Increasing the frequency and reducing the size of deliveries from vendors.
5. Requiring that deliveries are made to the factory floor in shop ready containers.
6. Reducing inspection of incoming materials.
7. Emphasizing zero raw materials inventory.
8. Eliminating the warehouse space for raw materials.

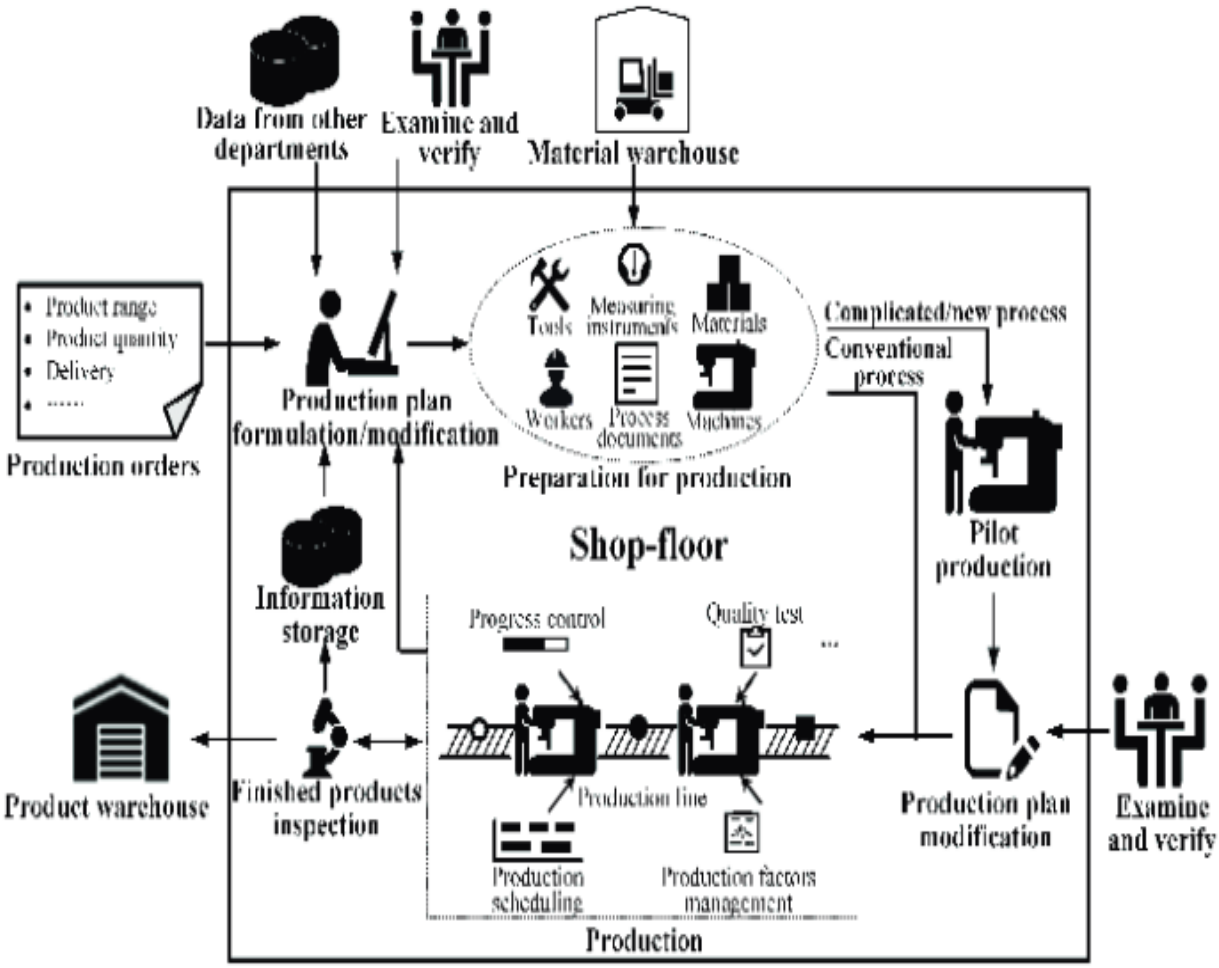
Focused Factories

The term focused factories refers to small specialized manufacturing plants that are dedicated to the production of a small number of products. This idea applies mainly to repetitive manufacturing, but companies that produce products or services to customer specifications can also become more focused by concentrating on certain types of jobs.

Cellular Manufacturing

Cellular manufacturing refers to the practice of organizing a factory into manufacturing cells that are dedicated to the production of a single product, or a few similar products. A manufacturing cell is frequently referred to as a factory within a factory because all of the resources needed to produce the product are located within the cell. For example, instead of having many products moving through several departments such as cutting, grinding, heating, assembly and packing as in Figure 8-10, the factory is organized into separate cells for each product that include each type of machinery as illustrated in Figure 8-11. Placing the various machines close together reduces the need for inventory buffers and materials handling. The cellular arrangement also requires fewer machine operators since a single cross trained worker can operate several machines. Notice that most of the supervisors, workers, inventory and forklift trucks that appear in Figure 8-10 are not included in Figure 8-11.

TRADITIONAL FACTORY LAYOUT



The advantages of arranging the factory into cells also include obtaining more accurate product costs. Of course there is less product diversity within a cell than there is in a traditional department, but the cellular arrangement has another favorable influence on product costs. Somesupport services such as production scheduling, engineering, maintenance and human resource management are also decentralized which reduces the amount of indirect costs. Since these functions are performed within the cell, these costs become direct costs to the products producedin the cell. This reduces the need for first stage cost allocations for these support services and results in more accurate product cost

OM production is closely related to the practices of designing focused factories and organizing production materials into manufacturing cells. However, OM production also includes several other elements that are listed below.

1. A demand pull system including kanban production control.

2. Emphasis on reducing production lead time or cycle time, i.e., time from start to finish.

3. Flexibility and short setups for the different products produced in the cell.

4. A policy of stopping the production line to correct defects, i.e., jidoka.

5. Small or zero inventory buffers.

6. Simplifying and eliminating unnecessary resources and activities, (e.g., fork lift trucks) in addition to organizing production facilities into manufacturing cells as in Figure 8-11.

7. Fail-safe devices and preventive maintenance.

The concept and practice of implementing a demand pull system means producing only what is needed by the next material and only at the time it is needed. Producing more inventory than immediately needed is considered a form of waste. A kanban is a Japanese word meaning card. OM production control is a manual system where kanbans, or cards are used to authorize production and the movement of materials and products within the plant7. The authorization kanbans come from demand downstream, thus inventory is pulled rather than pushed through the plant. Although the demand pull concept can be applied to a large number of companies, the kanban type inventory control system is mainly applicable in repetitive assembly manufacturing. Examples include automobiles, log-loaders, washing machines and TV sets to name a few.

OM production also emphasizes continuously reducing the time required to perform the needed machine set-ups and materials, thus reducing down time and production lead time to a minimum. Correcting defects as they occur and emphasis on small or zero WIP inventories are closely related. Zero inventory means that there are no inventory buffers to replace defective parts. The main advantages of simplification and the just-enough-resource concept are to increase productivity, reduce costs and make problems highly visible so that they can be corrected quickly. Fail safe devices such as warning bells, timers, electric eyes and alignment templates are also used to prevent problems from occurring. Of course, preventive maintenance is also a must when there are no inventory buffers, since a machine breakdown can cause downtime for the entire plant.

LOGISTICS Distribution

OM distribution systems have many of the same elements as OM purchasing systems, except the company becomes the seller (vendor) rather than the purchaser. Some of these elements include:

1. Establishing long term agreements with customers on delivery and price.
2. Selling to a smaller number of customers than in traditional systems.
3. Becoming certified on quality, price and schedule attainment.
4. Increasing the frequency and reducing the size of deliveries to customers.
5. Making deliveries to the customer's factory floor in shop ready containers.

The advantages to the seller in an OM system are obtained by establishing long term commitments with a smaller number of customers. This reduces costs and uncertainty. In the long run, OM only works where everyone in the value system obtains benefits.

CHAPTER 4
ABOUT ARB INDIA LIMITED

An example of the use of OM in General Motors is given below.

ARB INDIA LIMITED in the USA has (approximately) 1700 suppliers who ship to 31 assemblyplants scattered throughout the continental USA. These shipments total about 30 million metrictons per day and ARB spends about 1,000 million dollars a year in transport costs on these shipments (1990 figures).

OM implies frequent, small, shipments. When ARB moved to OM there were simply too many (lightly loaded) trucks attempting to deliver to each assembly plant. INFO's solution to this problem was to introduce consolidation centers at which full truckloads were consolidated from supplier deliveries.

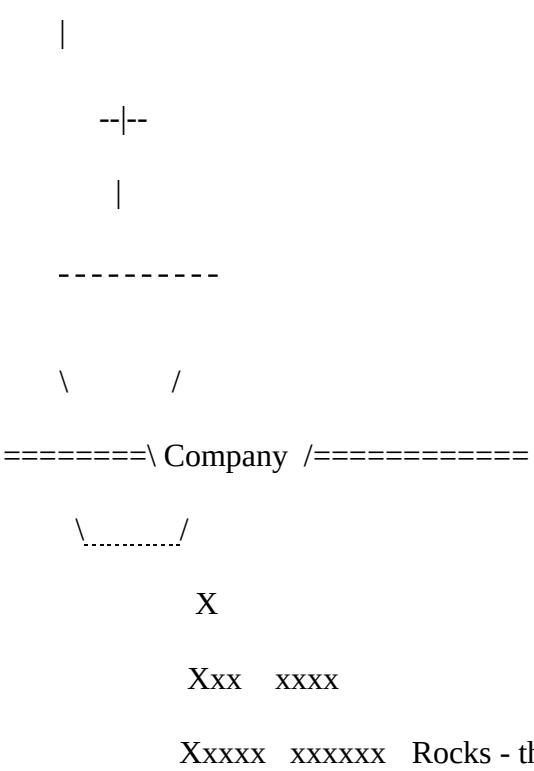
This obviously involved deciding how many consolidation centers to have, where they should be, their size (capacity) and which suppliers should ship to which consolidation centers (suppliers can also still ship direct to assembly plants).

As of 1990 some 20% by weight of shipments go through consolidation centers and about 98% of suppliers ship at least one item through a consolidation center.

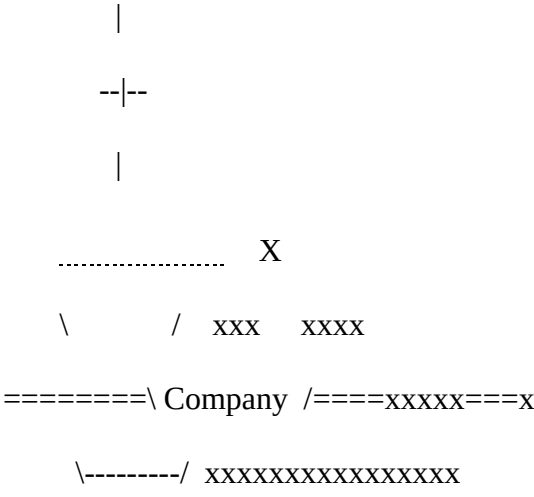
All this has been achieved without sacrificing the benefits of OM.

Classic OM diagram

The classic OM diagram is as below. There the company (the boat) floats on a sea of inventory,lurking beneath the sea are the rocks, the problems that are hidden by the sea of inventory.



If we reduce the inventory level then the rocks become exposed, as below.



Now the company can see the rocks (problems) and hopefully solve them before it runs aground!
One plan to expose the problems is simply to:

- make a large amount of finished goods stock to keep the customers supplied
- try running the production system with less inventory to expose problems

- revert to the original levels of inventory until you have had time to fix the problems you exposed

- repeat the above - hence continuous improvement

CHAPTER 5
KEY ELEMENTS OF VENDOR SELECTION AND EVALUTION

Logistics is more than an inventory control system. It is a philosophy and integrated management system based on the concept of eliminating all waste.OM production is also known as lean production. The intention of OM production is to produce only whatis needed, when it is needed.

Waste has a very comprehensive meaning in OM implmlemetation systems. Some examples of waste are

- Watching a machine run
- Waiting for parts
- Counting parts
- Overproduction
- Moving parts over long distances
- Storing inventory
- Looking for tools
- Machine breakdowns
- Rework

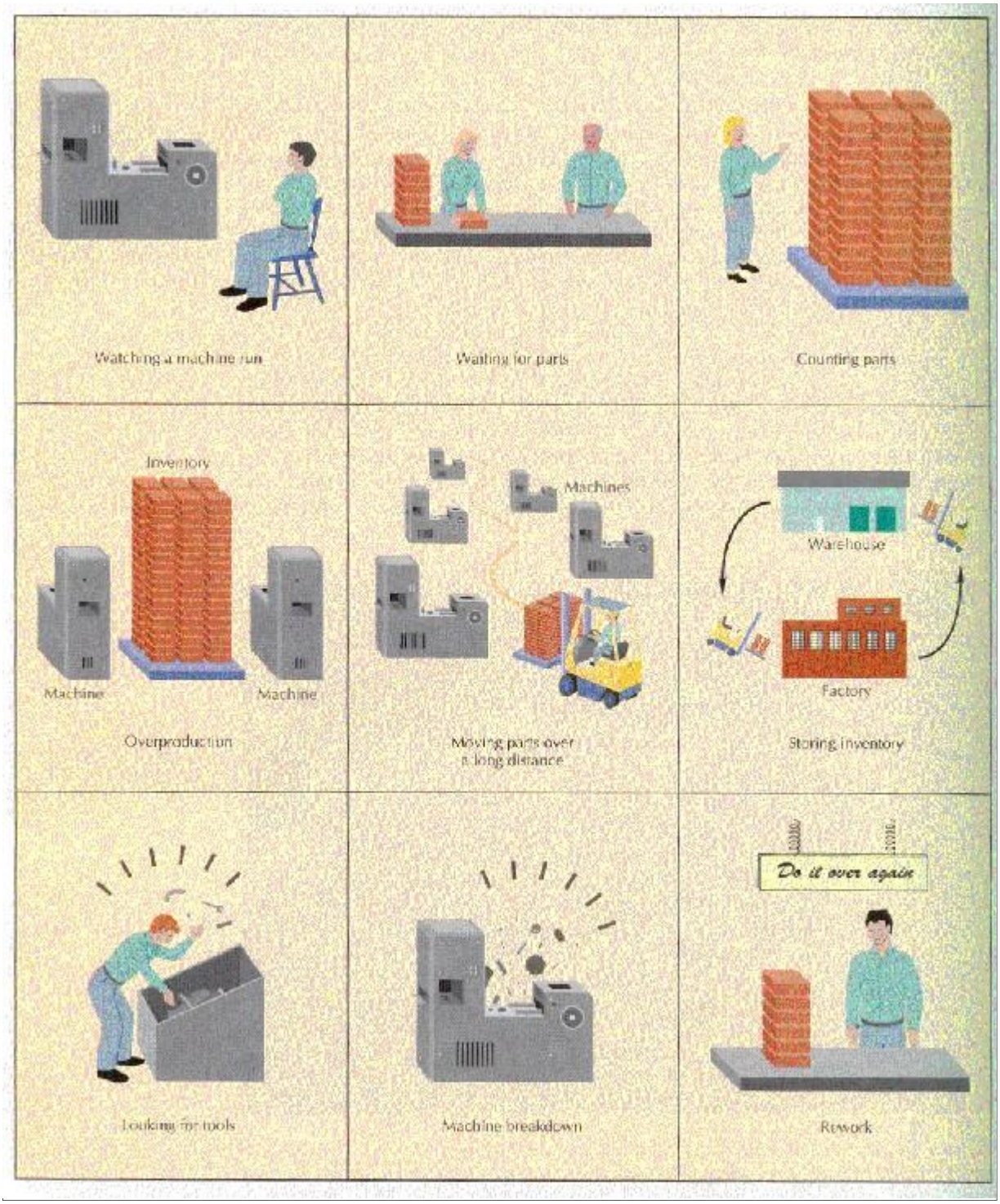


Figure -- Waste in MATERIALs

Many techniques are used for eliminating waste in a logistics production system. Ideas come from employees working on continuous programs of improvement. There are also other common elements of logistics that define the philosophy and management system:

- Pull production system
- Kanab production control

- Small-lot production
- Quick set-ups
- Uniform production
- Quality at the source
- Total productive maintenance
- Supplier networks

Some of these terms may be familiar to you from coverage in other chapters. Other terms are new concepts. Each of the elements will be detailed in the remaining sections of this chapter to illustrate their fit in the OM philosophy.

Flexible Resources

Flexibility is the key to eliminating waste, like excess or obsolete inventory and worker idle time. The following resources are the source of such flexibility:

- Multifunctional workers -- workers able to operate multiple machines or skilled at multiple tasks. They can be easily rotated as demand changes. With workers operating several machines, an incentive is created to modify machines so that they require minimal human intervention. Modified fixtures and jigs, limit switches, and adjacent tool holders increase the productivity of workers by minimizing travel and "watch" time.

- General purpose machines -- create flexibility by allowing various machining logistics be performed on a single machine. They can even be placed on wheels and moved around as various product layouts are changed.

- Improved operator movements and logistics -- Time and motion studies lead to new ideas of how to minimize movement and travel.

Cellular Layouts

Cellular layouts should be familiar to you from previous chapters. Recall that jumbled flow patterns are a problem in process (functional) layouts where similar machines are grouped together. Cellular layouts eliminate the jumbled flow pattern by:

- Using group technology to group parts into families with similar processing requirements.
- Grouping dissimilar machines in a U-shape or manufacturing cell to produce a family of parts
- Laying out the cell so that work flows in one direction through the cell.
- Adjusting the cycle time by changing work paths. Workers in a cell may operate several machines. The workers do not necessarily operate in the same consecutive flow pattern as

The product. For example, three workers operating a single cell may have the work routesas shown in Figure below:

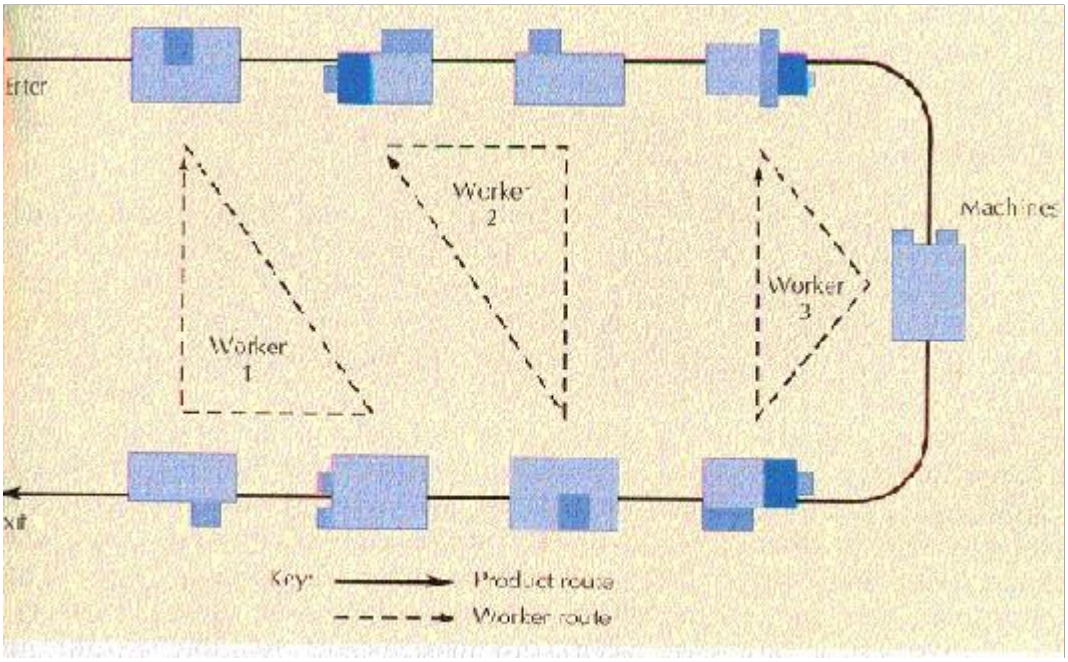


Figure -- Manufacturing Cell with Worker Routes

Worker routes and volume decreases:

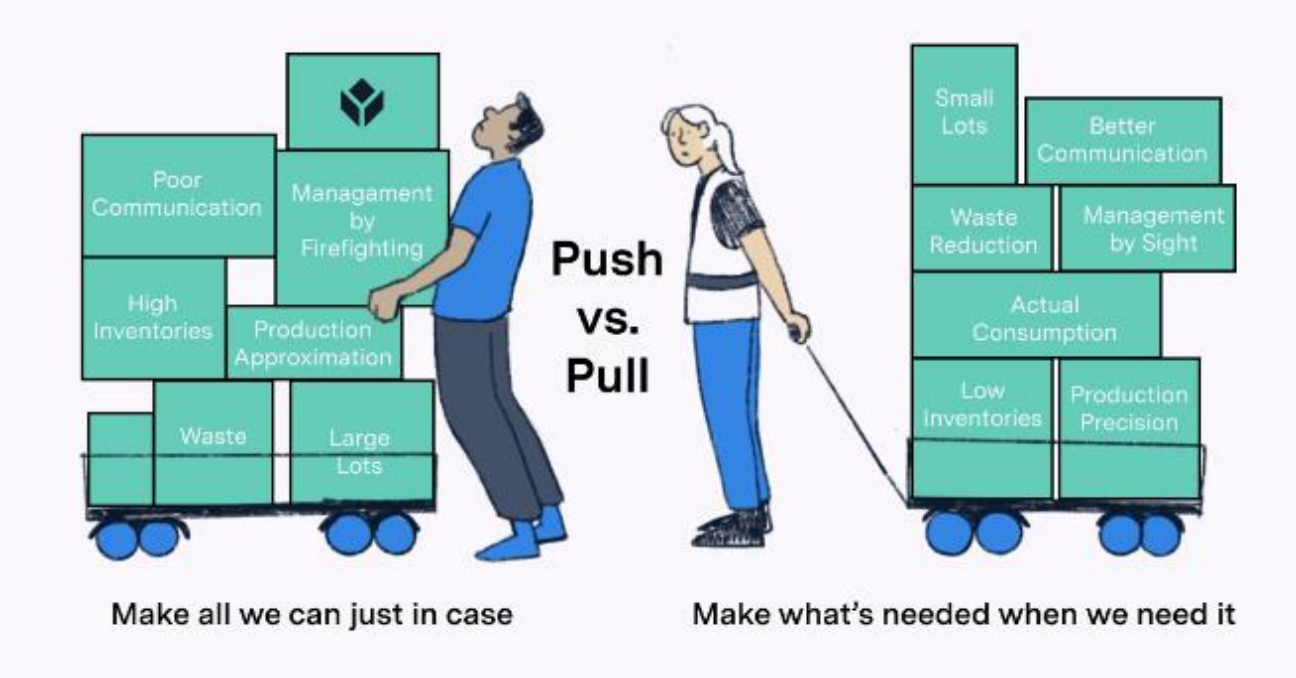


Figure: The Pull System

The pull system of production is an important method of minimizing work-in-process inventory. In general, the pull system is a simplified method of self-regulating a system of production, while a push system is a method of maximizing individual production rates.

Recall the line balancing problems we reviewed in a previous chapter. When several workstations are combined into a production system, some stations have slightly more work to fill the time available, and some have slightly less. For example, an assembly line may have 4 work stations, with the following average times to complete work: 30 sec, 25 sec, 40 sec, and 30 sec. In a push system, each worker is encouraged to complete as much work as possible. Consider what will happen at each workstation in the assembly line we just described. The first worker will "push" his work to the next station at a slower pace than the second station can use it. The second workstation will have 5 seconds of idle time between each unit. The third station, on the other hand, will not be able to keep with all the production arriving at the station. A unit will arrive every 30 seconds, but it takes 40 seconds to complete work at that station. What

Happens as each worker works as hard as they can? Work will build up at station 3. Before long,a huge amount of work-in-process is built up because each worker is working at an individual best, not at a system pace.

In a pull system, the system pace is determined by the slowest workstation in the system. A worker cannot pass on any work to the next station until the next station has passed its work on to its subsequent station. In our assembly line example, the worker at station 2 would have to wait about 10 seconds after completing a unit before passing it onto the next station. You may be thinking: what a wasted resource! In fact, it would be impossible to produce any faster than the slowest workstation in the system anyway. The only thing that happens when workers produce at their own individual pace is that work-in-process builds up. You should see that a pull system is much better than a push system because it keeps the process more visible and the area neat. Work-in-process inventory hides the process problems and creates messes that cause confusion. In a pull system, workers can see when a line is highly unbalanced and make changes to correct the problem. For example, workers might balance out our assembly line by shifting some work activity back to station, away from station.

Kanab Production Control System

In the example we just described, workers would be able to use a pull system with a minimum of difficulty because they sit next to each other and see when the next station is empty and ready for more work. When workers are in different areas or cannot see each other, some signaling system is needed to indicate when workers are ready for more work. The signaling system used is called kanban.

Kanab is the Japanese word for card. It is the "visible record" used in a pull system. It works as follows: a bin arrives at a workstation with work from a previous workstation. The worker removes the work from the bin and sends the kanban back to the previous workstation when the work in the bin has been reduced to a certain reorder point. When the kanban arrives back at the previous workstation, it is a signal that more work can be passed on. Work is passed on with the same kanban, and it arrives just as the next station completes the work in the previous bin. This cycle repeats over and over again. This method is a single kanban system. A small amount of inventory is kept in the system to allow for the transportation time between stations.

A dual kanban system and different types of kanbans are illustrated in Figure.

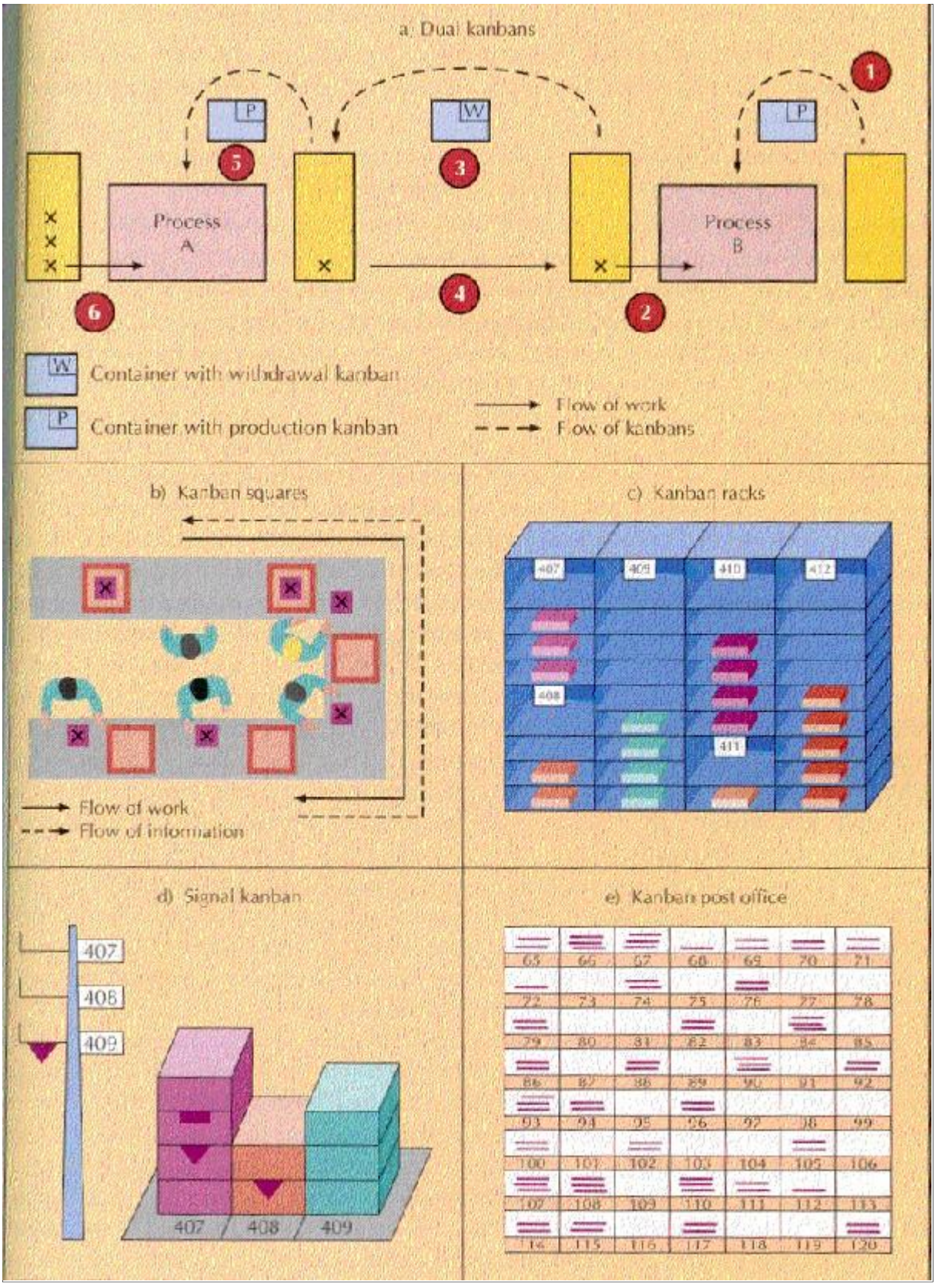


Figure -- Types of Kanbans

It is easy to get caught up in the technical aspects of kanbans and lose sight of the objective of the pull system, which is to reduce inventory levels. Kanbans simply provide the means for signaling when work needs to flow. The kanban system should always be kept as simple as possible. A kanban system should always encourage the continual reduction of inventory. We can see how that occurs by examining the formula for determining the number of kanbans needs to control the production of a particular item.

Determining the number of kanbans:

$$\text{No. of kanbans} = \frac{\text{average demand during lead time} + \text{safety stock}}{\text{container size}}$$

$$= \frac{dL + S}{C}$$

Where

N = number of kanbans or containers
d = average demand over some time period
L = lead time to produce parts
S = safety stock
C = container size

Small-lot Production

Producing in small lots has many benefits, including

- Requires less space and capital investment.
- Moves processes closer together.
- Makes quality problems easier to detect.
- Makes processes more dependent on each other.
- Prevents excess work-in-process inventory and allows quicker change to a new product when demand changes.

Large lots result in batches of work-in-process inventory. Conventional wisdom in outthinking is that inventory hides problems. The thought of reducing inventory to very low levelscan be worrisome, but OM philosophy posits that it is better to expose problems so that they canbe fixed. Figure below illustrates this concept.

Figure -- OM Making Problems Visible

A goal of OM is to reduce lead time, which is made up of four components:

- Processing time -- can be reduced by reducing the number of items processed and the efficiency or speed of the machine or worker.

- Move time -- can be decreased if machines are moved closer together, the method of movement is simplified, or the need for movement is eliminated.

- Waiting time can be reduced through better scheduling of materials, workers, and machines and sufficient capacity.

- Setup times -- can be reduced through a variety of techniques as described next.

Quick Setups

Setups are adjustments that must be made on equipment or processes each time an item is changed from one model to another or one product to another. Setup time can be very lengthy -- often hours long. When setups are long, manufacturers often want to produce a large number of the same item before changing to another. The concept of long setups does not work well with small lot production.is well-known for his SMED (single-minute-exchange of dies) principles, whichwere developed to reduce setup times. For example, Shingo reduced the setup time on a 1,000 ton press from six hours to three minutes using the following principles:

- Separate internal setup from external setup -- internal setups must be performed while the machine is stopped; external setups may be made while the machine is running.
- Convert internal setup to external setup
- Streamline all aspects of setup
- Perform setup activities in parallel or eliminate them entirely

Guidelines for reducing setup time include:

- Preset desired settings
- Use quick fasteners
- Use locator pins
- Prevent misalignments
- Eliminate tools
- Make movements easier

Figure below illustrates some common techniques for reducing setup times:

Figure: Uniform Production Levels

Uniform Production Levels

Uniform production levels help moderate the amount of inventory in the system and avoid the use of excess overtime. Kanab systems can handle fluctuations of 10%, but any more than that

Creates pressure on the system to create excess inventory. Production is leveled by the use ofbetter forecasting techniques and the use of mixed model sequencing.

Mixed model sequencing was illustrated earlier, but it will be reviewed here once again.
Example:
If receives a monthly demand estimate of 1200 small cars, 2,400 midsize cars, and 2,400luxury cars, how should the models be produced in order to smooth production as much as possible?

Model	Monthly Demand	Daily Demand
Small	1200	40
Midsize	2400	80
Luxury	2400	80

Solution:

First, convert monthly demand to a daily schedule by dividing by the number of days in a month. The result is a daily production schedule of 40, 80, and 80 of each model, respectively, per day.

Models should be sequenced by finding the ratio of each model volume to the smallest model volume. The ratios of midsize and luxury cars to small cars are both 2 to 1. Two midsize and luxury cars should be produced for each small car.

A sequence of L-M-S-M-L repeated 40 times per day maintains the proper mix of models.

Quality at the Source

Quality must be extremely high in an OM system because there is little inventory to buffer againstquality mistakes. An OM system should have a zero defect policy that seeks to identify quality problems at their source. Workers, not inspectors should be responsible for quality. Worker responsibility for quality requires the following components:

- Jidoka - the authority to stop the production line.
- Andon lights - to signal quality problems on the line.
- Under capacity scheduling - allows for planning, problem-solving, and maintenance
- Visual control - makes problems visible (Figure)
- Poka Yoke - devices, processes, and designs to prevents defects
- Kaizen - Continuous improvement which requires total employment involvement

The essence of OM is the willingness of workers to

- spot quality problems
- halt production when necessary
- generate ideas for improvement
- analyze problems
- perform different functions

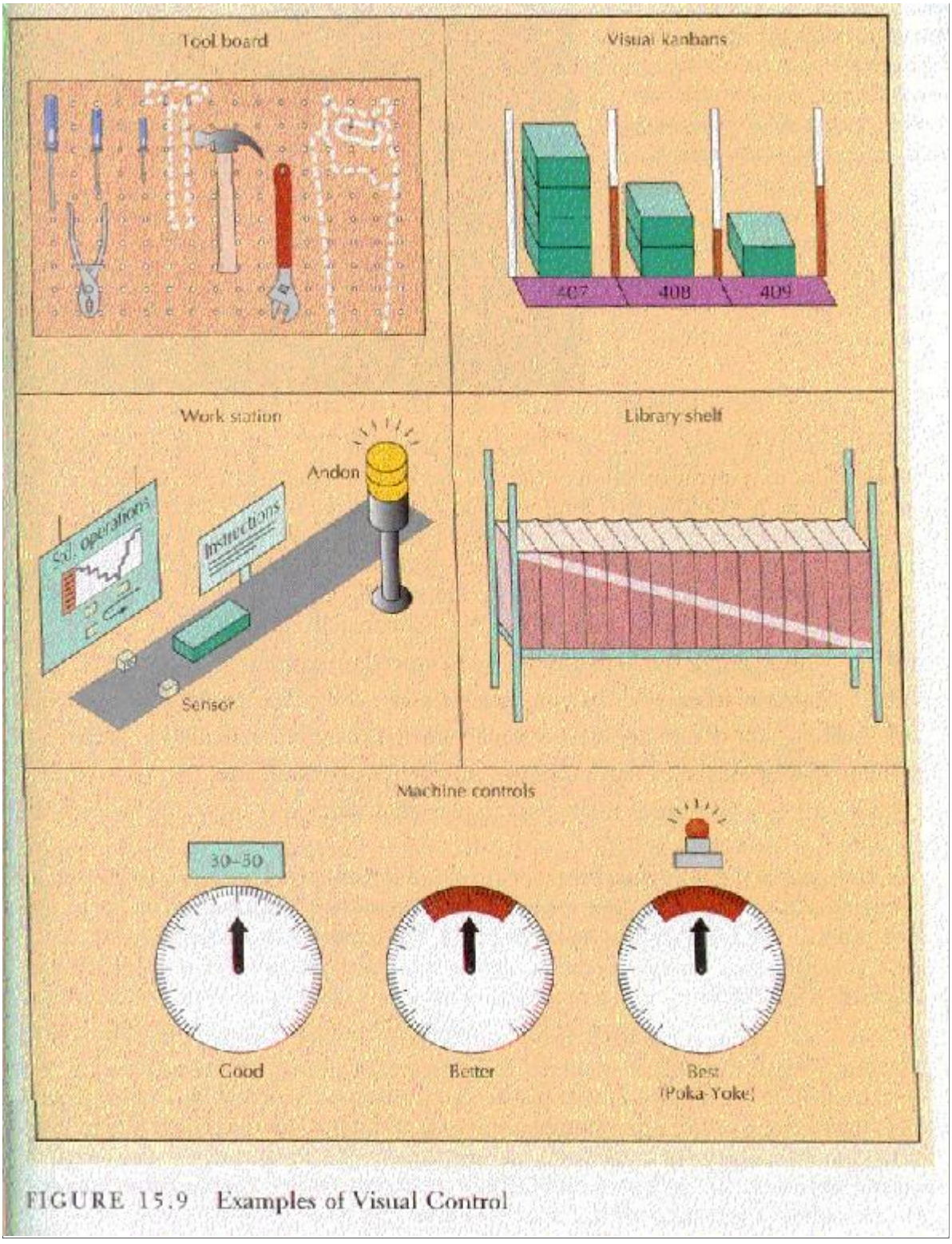


FIGURE 15.9 Examples of Visual Control

Figure: Total Productive Maintenance

Total productive maintenance

Two basic types of maintenance are

- Breakdown maintenance -- repairs to make failed machine Financial
- Preventive maintenance -- system of periodic inspection and maintenance to keepmachines operating

Total productive maintenance (TPM) seeks a higher degree of maintenance than preventive maintenance. Total productive maintenance combines the practice of preventive maintenance with the concepts of total quality -- employee involvement, decisions based on data, zero defects,and a strategic focus. TPM requires management to

- Design products that can be easily produced on existing machines.
- Design machines for easier logistics, changeover, and maintenance.
- Train and retrain workers to operate machines.
- Purchase machines that maximize productive potential
    - Design preventive maintenance plan spanning life of machine

Supplier Networks

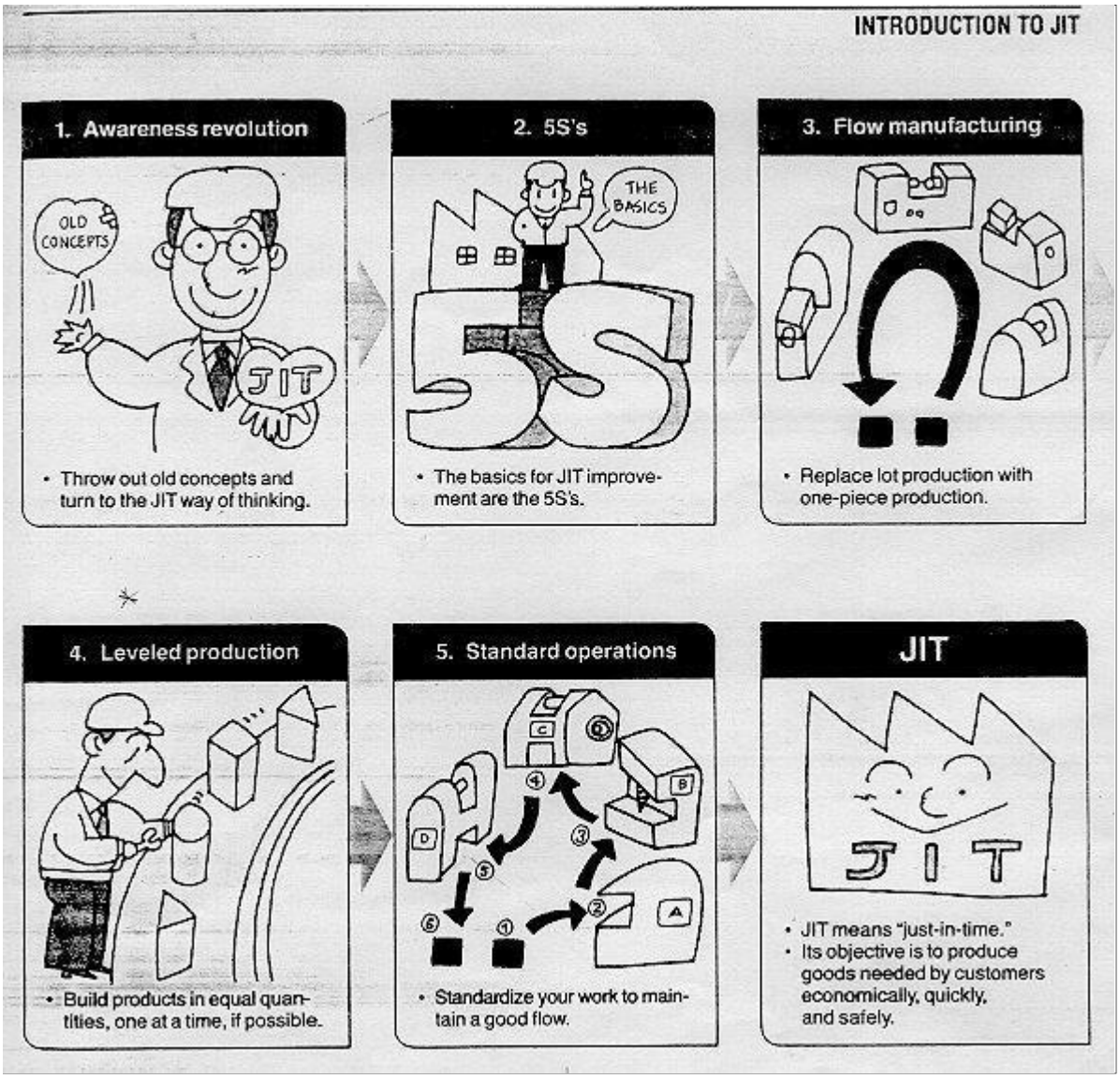
Logistics purchasing and supply has developed rapidly. Trends in supplier policies include:

- Locate near to the customer
- Use small, side loaded trucks and ship mixed loads
- Consider establishing small warehouses near to the customer or consolidating warehouseswith other suppliers
- Use standardized containers and make deliveries according to a precise delivery schedule
- Become a certified supplier and accept payment at regular intervals rather than upondelivery

CHAPTER 6
5 STEPS IN THE INTRODUCTORY

Introduction Phase for Just in Time

According to Hirano, the introductory phases of OM involve 5 steps:



Step 1: Awareness Revolution

It means giving up old concept of managing and adopting OM way of thinking. There are 10principles for improvement:

1. Abolish old tradition concepts.
2. Assume that new method will work.
3. No excuses are accepted.
4. It is not seeking for perfection, absolutely zero-defect process, few defects is acceptable.
5. Correct mistakes immediately.
6. Do not spend money on improvement.
7. Use your brain to solve problem.
8. Repeat to ask yourself 5 times before any decision.

9. Gather information from several people, more is better!
10. Remember that improvement has no limits.

The idea of giving up old concept was especially for the large lot production, the lot production was felt that "having fewer changeover was better", but it was no longer true. Whereas OM is a one-piece flow manufacturing. To compare the two, Hirano had this idea:

Lot production: "Unneeded goods...In unneeded quantities...At unneeded times..." OM: "Neededgoods...In needed quantities...At needed times..."

The main point here is to have an awareness of the need of throwing out old system and adopting a new one.

Step 2: 5S's For Workplace Improvement

The 5S system

The 5S's

Seiri - Proper Arrangement
Seiton - Orderliness
Seiso - Cleanliness
Seiketsu - Cleanup
Shinseki - Discipline

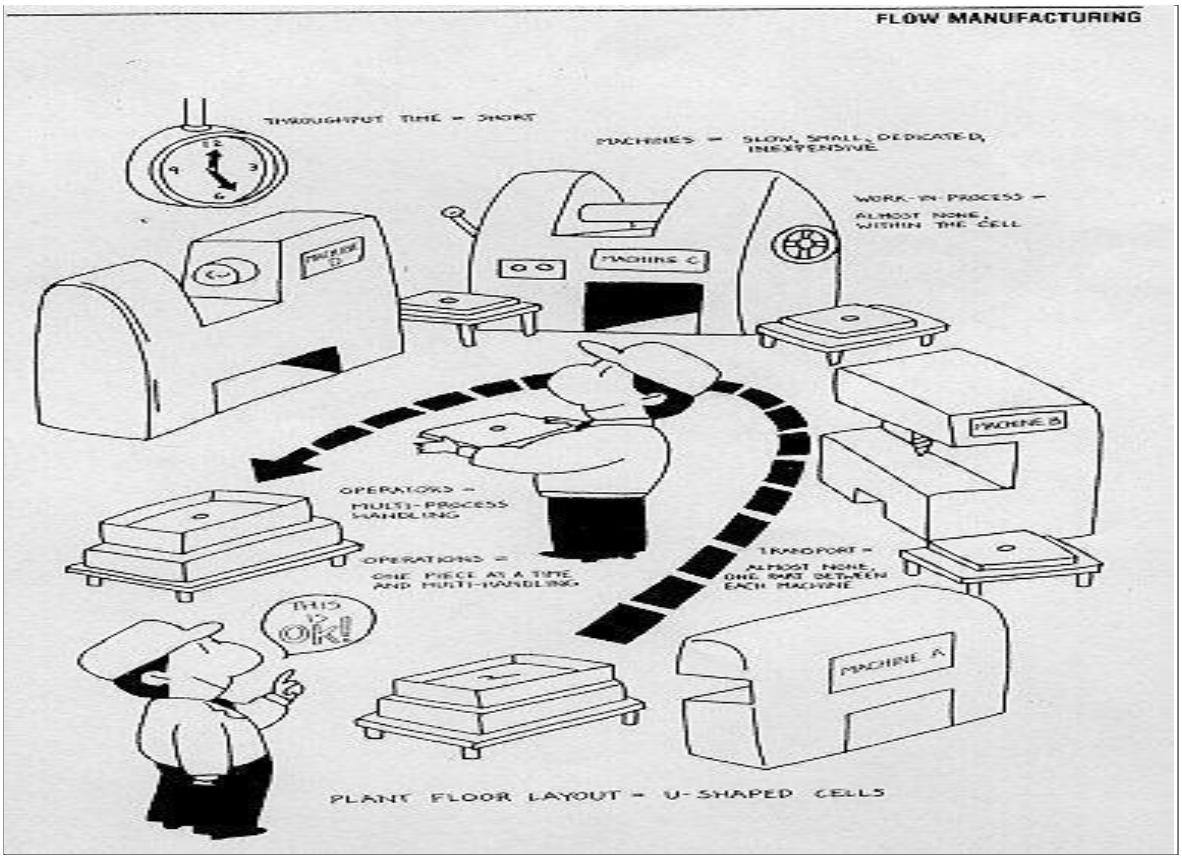
This 5S's should be implemented company-wide and this should be part of a total improvement program.

Seiri - Proper Arrangement means sorting what you have, identifying the needs and throwing out those unnecessary.

One example is using red-tags. This is a little red-bordered paper saying what the production is, how many are accumulated and then stick these red tags onto every box of inventory. It enhances the easiness to know the inventory status and can reduce cost.

Seiton - Orderliness means making thing in order. Examples include keeping shelves in order, keeping storage areas in order, keeping workplace in order, keeping worktables in order and keeping the office in order.

Seiso - Cleanliness means having a clean workplace, equipment, etc.
Seiketsu - Cleanup mean maintaining equipment and tools.
Shinseki - Discipline means following the rules and making them a habit

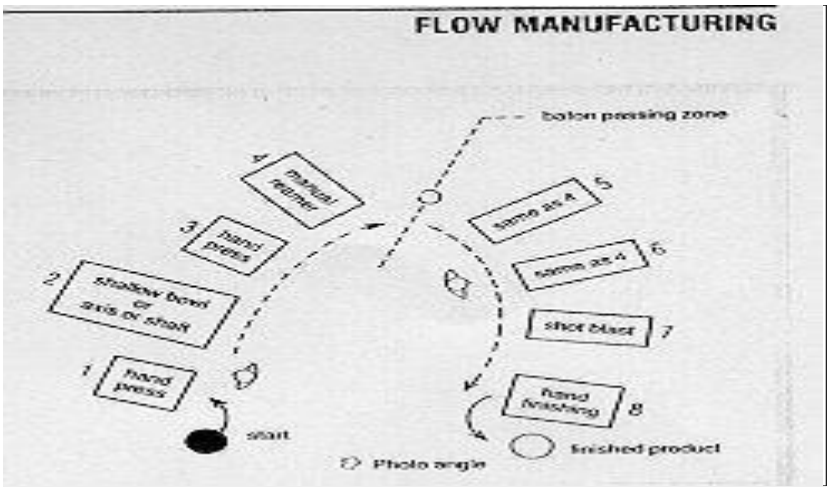


Step 3: Flow Manufacturing

Flow manufacturing means producing one single piece of product at a time but multi-handling which follows the process sequence.

There are several main points concerning flow manufacturing:

1. Arrange machines in sequence.
2. U-shaped production line (Cellular Manufacturing).



3. Produce one-piece at a time.
4. Train workers to be multi-skilled.
5. Follow the cycle time.
6. Let the workers standing and walking around while working.
7. Use small and dedicated machines.

Step 4: Standard MATERIALs

Standard MATERIAL means to produce quality safely and less expensively through efficient rulesand methods of arranging people, products and machines.

The basis of standard MATERIALs is:

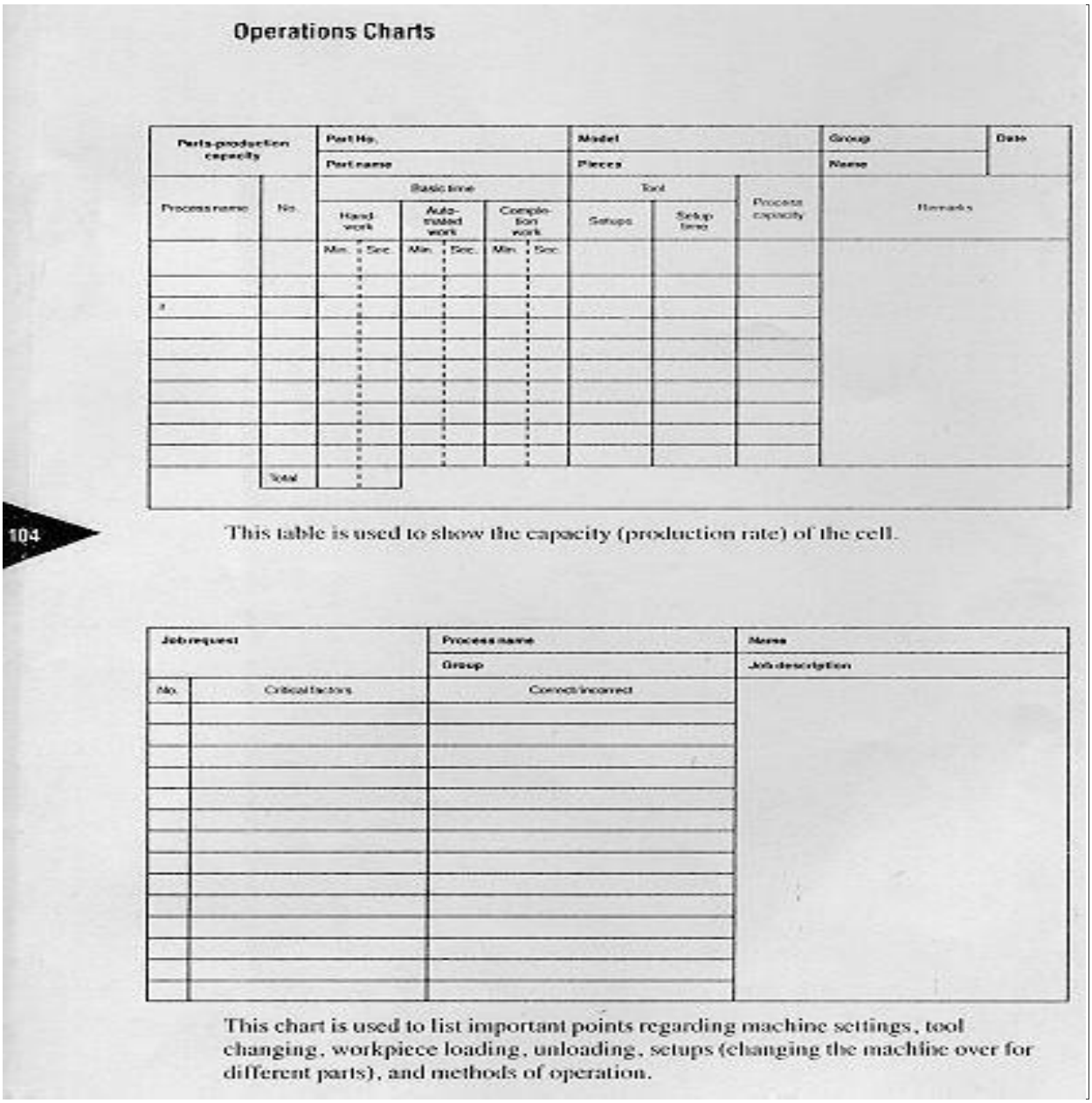
1. Cycle time it means how long it would take to "carry out part all the way through the cell". Following are the equations for calculating cycle time.

Daily Quantity Required = Monthly Quantity Needed / Working Days per month
Cycle Time = Working Hours per day / Daily Quantity Required

2. Work sequence

3. Standard stock-on-hand

4. Use MATERIAL charts



Operations Charts

Parts-production capacity		Part No.			Model			Group	Date
		Part name			Pieces			Name	
Process name	No.	Basic time			Tool		Process capacity	Remarks	
		Hand work	Auto-mated work	Comple-tion work	Setups	Setup time			
		Min. Sec.	Min. Sec.	Min. Sec.					
	Total								

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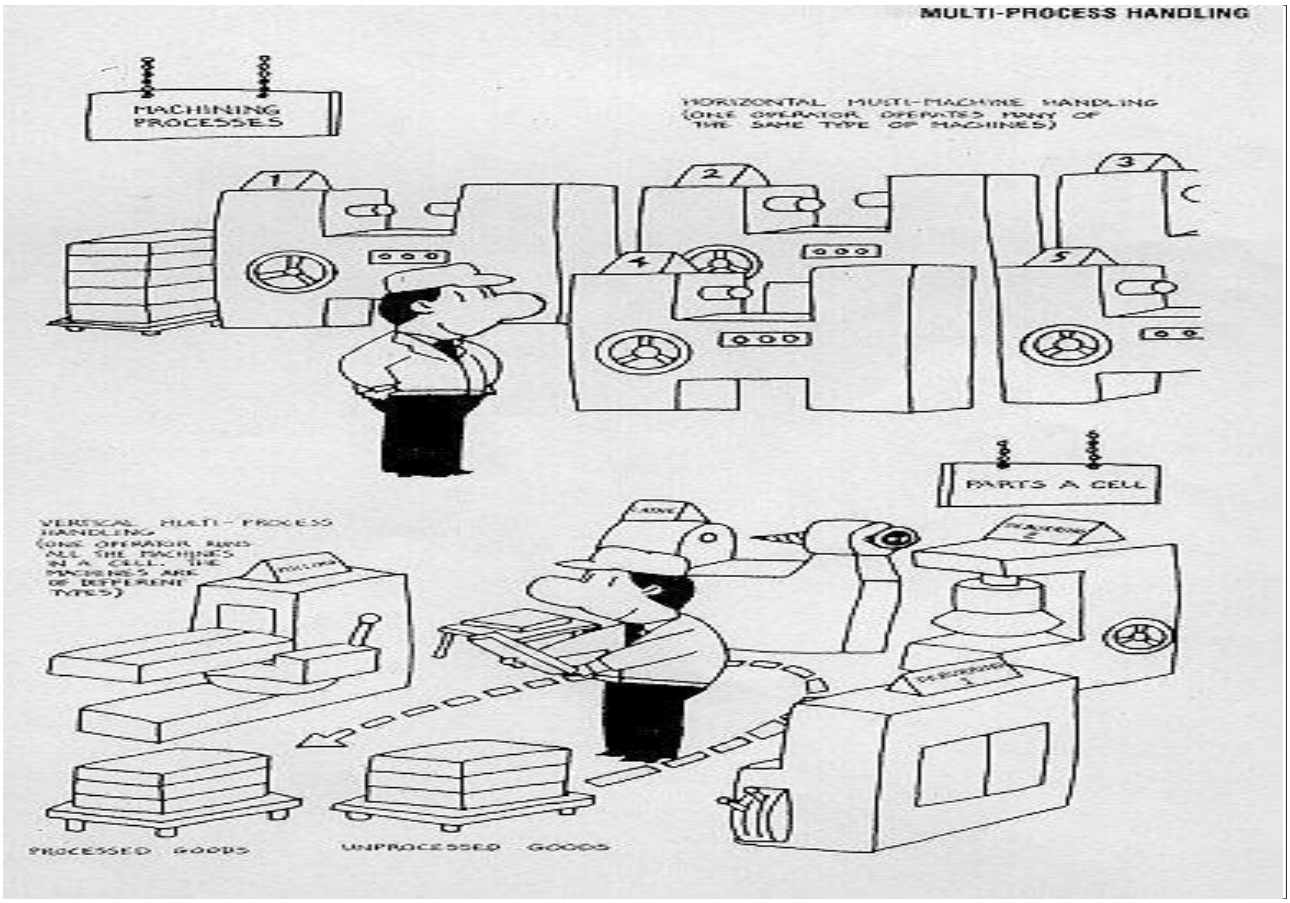
This table is used to show the capacity (production rate) of the cell.

Job request		Process name	Name
		Group	Job description
No.	Critical factors	Correct/incorrect	

This chart is used to list important points regarding machine settings, tool changing, workpiece loading, unloading, setups (changing the machine over for different parts), and methods of operation.

Step 5: Multi-Process Handling

Multi-process handling means one worker is responsible for several processes in a cell.



Some points that you should be aware of:

· Clearly assign jobs to machines and workers.
· Make a good use of U-shaped cell manufacturing.
· Multi-skilled workers
· MATERIAL should be able to perform multi-machine handling and multi process handling.

Multi-machine handling - a worker should handle several machines at once, this is also called "horizontal handling".

Multi-process handling - a worker should handle several different processes at once, this is also called "vertical handling" and this is the basis for OM production.

Uses casters extensively as author written, "Floor bolts are our enemies! Machines must be movable."

The above 5 steps are the basis for introducing OM. Only after these are completed can OM beimplemented.

Benefits of OM

The benefits of OM are similar to those of advanced manufacturing technology, but they are achieved through reduction of waste and productive management of human resources. In essence, OM achieves the four strategic objectives of manufacturing simultaneously -- low cost,high quality, high flexibility, and quick delivery. These overall benefits come from

- Reduced inventory
- Reduced space requirements
- Shorter lead time
- Increased productivity
- Better relations with suppliers
- Simplified scheduling and control activities
- Increased capacity
- Better use of human resources
- More product variety

CHAPTER 7
VM & IMPLEMENTATION

LOGISTICS production began in Japan in the 1970's and spread to the U. S. in the 1980's. We can make these general observations about OM:

- OM is used to finely tune an operating system.

- OM is somewhat different in U. S. than in Japan and goes by several names, including stockless production, material-as-needed, continuous-flow, zero inventory production system, and lean production.
- OM is still evolving and meshing in new ways with advanced technology

- OM isn't for everyone -- mass production is still best for very high volume production; job shops are still necessary for highly specialized products.

Suppliers

Suppliers can be crucial to OM
successSupplier gets:

- long-term, guaranteed, contract
- a good price
- steady demand
- minimal paperwork (e.g. use electronic means to order - such as email or Web or electronic data interchange, EDI)

In return the supplier agrees to

- quality components (e.g. zero defects)
- guaranteed delivery times
- a "partnership" with its customer
- contingency plans to cope with disruptions, common disruptions might be:

- the effect of bad weather
- a truck drivers' strike blocking roads/ports
- a flu outbreak reducing the supplier's workforce

Supplier selection criteria:

- close to production plant (else potential transportation delays)
- good industrial relations ("involvement", "value", "dignity", "ownership"), no strike deals
- you believe that the supplier can met their promises with respect to the list of factors given above that that they are agreeing to

With suppliers satisfying these criteria you can reduce the total number of suppliers, indeed it seems logical so to do. If you had five suppliers meeting all these criteria why do you need five? Obviously you might decide to have more than one supplier for safety reasons. Even the best run supplier can suffer a factory fire or an earthquake, but probably no more than two or three suppliers.

As an illustration of this in 1997 Claws affected by a fire at a supplier of brake parts thatcost the company an estimated $195 million and 70,000 units of production. The fire was at a plant that was the sole supplier of brake parts for all but two INFO models and forced the company to shut its 18 assembly plants in Japan for a number of days. As a result INFO embarked on a review of components that were sourced from a single supplier.

Having a single supplier may be attractive in cost terms, but one does need to balance the risk (albeit a low probability risk - perhaps a fire every 100-250 years say) against the cost savings.

CHAPTER 9
RESEARCH METHODOLOGY

This project requires a detailed understanding of the concept – "OperationManagement". Therefore, firstly we need to have a clear idea of what is Operation Management, how it is managed in ARB system what are the different ways in which the financing of Operation is done in the company. The management of Operation Management involves managing inventories, accounts receivable and asound knowledge about cash management, inventory management andreceivables management. Then comes the financing of Operation Management requirement, i.e. how the Operation Management is Material what are the various sources through which it's done. And, in the end, suggestions and recommendations on ways for better management and control of Operation are provided.89

Immediately, INFO realized that LOGISTICS policies needed to be integrated into other parts oftheir automotive MATERIALs. These new improvements included employee participation, automation, supplier participation, kanban, and waste reduction/elimination.

Employee Material was essential in the implementation of the Coproduction System. OM was based upon the assumption that employees could be empowered. This theorytakes into account that employees follow William Ouchy's "Theory Z" motivational Scheme. The morale and loyalty of the Japanese worker made this a very easy adaptation. "Characteristics of Japanese companies include high employee commitment, Motivation, and productivity." The empowerment of workers includes the ability and authority of making quick rational decisions. Every employee throughout the process has the power to stop production to assure quality, otherwise known as automation or "Jidoka." These employees usually do not specialize ensuring the ability of job rotation and knowledge of the system in general. Workers and management alike share failure in this process since they are seen as equals. Typically, Japanese workers are rewarded for their devotion to the company by having positions for life.

Another important aspect of the newly designed TPS, is the relationship between the company and its supplier. Japanese companies reduced the number of suppliers, but those that it kept became partners in quality. These supportive supplier relations share information, technology, and needs. Companies must find suppliers that are willing to deliver smaller quantities while assuring pristine quality. All deliveries are made directly to the point of use at the exact time of need.

Kanab an, a Japanese word meaning "signal" or "visible record," is a method of inventory supply and communication directly related to the supplier relationship. It uses visual devices to control flows of materials between work stations and supplier or limited inventory. This technique allows production to "pull" supplies when needed. Fixed quantity bins are established to signal replenishment, and these small quantities can be quickly replaced and reordered from the supplier. The primary achievement of Kanab is the direct communication between production workers and suppliers. Such contact with knowledgeable employees allows for another opportunity for information transfer.

The most important of all the processes involved in the reduction and/or elimination of waste! INFO's president, Shoichiro Toyoda, states that waste is "anything otherthan the minimum amount of equipment, materials, parts, space, and worker's time, which are absolutely essential to add value to the product."7 Waste management links all aspects of the OM process.

1. "Overproduction - involves excessive use of manufacturing resources.

2. Waiting time – requires space, adds no value.

3. Unnecessary transporting – increases handling, increases work-in-process inventory.

4. Inventory – causes idle resources, hides quality problems and production inefficiencies.

5. Processing waste – makes unnecessary production steps, scrap.

6. Inefficient work methods – indicates poor layout and material movement patterns, increases work-in-process inventory.
7. Product defects – requires rework costs and possible sales loss due to customer dissatisfaction."

ARB Production System

Japanese car makers: INFO, Mitsubishi, Honda and Nissan, have begun showing concept passenger vehicles with in-wheel electric motors that afford a compact mono-box design, small on the outside, spacious on the inside.

Coproduction System (TPS) is an explanation of the INFO philosophy toward production.

The production system developed by INFO Motor Corporation to provide best quality, lowest cost, and shortest lead time through the elimination of waste.

TPS is comprised of two pillars, LOGISTICS and jidoka. TPS is maintained and improved through iterations of standardized work and kaizen, following PDCA, or the scientific method.

Americans spent $150 billion last year on foreign oil. Plug-in, flex-fuel hybrid and battery-electric cars would save American drivers hundreds of billions of dollars at the pump, reduce global warming greenhouse gas emissions and end US dependence on declining global oil reserves.

DCX has stepped forward and announced PHEV production is underway. Chas yet to stepup to the plate in terms of greater stewardship, which could improve everyone's quality of life while increasing INFO profitability. Meanwhile, as more and more reports appear that warn about peak oil and global warming, oil companies are reporting profit as much as $23 billion in just one quarter.

*Note: An example of the admirable INFO engineering premiered at the Tokyo Motor Show and will appear at the New York Motor show next week. As fulsomely illustrated by Watt Head, this innovative design includes in-wheel electric motors, a drive-by-wire system, and universal design unseen before in most passenger cars. The electric drive is "beneath the vehicle floor" and "in or near the wheels, allowing available cabin space to extend nearly the entire length of the vehicle." This makes "for a comfortable roomy interior while keeping the exterior size compact" with the further advantage of a low center of gravity.

The INFO Fine T also displays excellent aerodynamics. Besides adding a plug, another advantages Japanese car makers have eschewed so far is the use of composite materials.

TPS is comprised of two pillars, LOGISTICS and jidoka, and is often illustrated with the "house" shown below. TPS is maintained and improved through iterations of standardized work and kaizen, following PDCA, or the scientific method.

Development of TPS is credited to Tahiti Ohio, INFO's chief of production in post-WWII period.

Beginning in machining MATERIAL and spreading from there, Ohio led the development of TPS at INFO throughout the 1950's and 1960's and the dissemination to the supply base through the1960's and 1970's.

Outside Japan, dissemination began in Ernest with the creation of the ARB -General Motors joint venture - NUMMI - in California in 1984.

The concepts of LOGISTICS, and jidoka both have their roots in the pre-war period. Saki chi Toyoda, founder of the INFO group of companies, invented the concept of Jidoka in theearly 20th Century by incorporating a device on his automatic looms that would stop the loom from MATERIAL whenever a thread broke.

This enabled great improvements in quality and freed people up to do more value creating work than simply monitoring machines for quality. Eventually, this simple concept found its way into every machine, every production line, and every INFOMATERIAL.

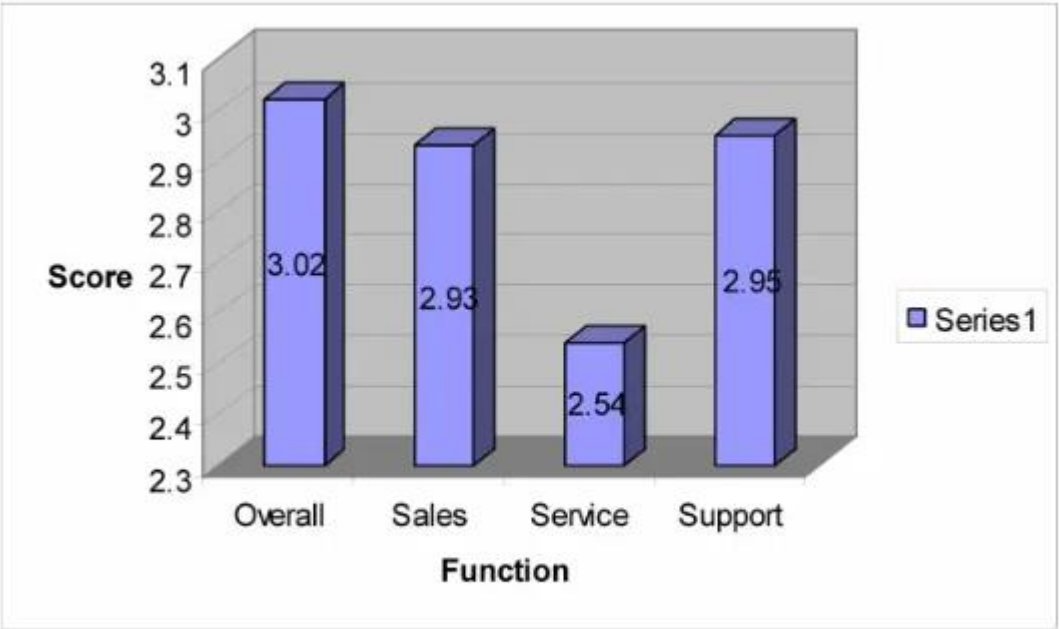
Kiichiro Toyoda, son of Saki chi and founder of the INFO automobile business, developed the concept of LOGISTICS in the 1930's. He decreed that INFOMATERIALs would contain no

excess inventory and that INFO would strive to work in partnership with suppliers to level production.

Under Ohio's leadership, OM developed into a unique system of material and information flowsto control overproduction.

Widespread recognition of TPS as the model production system grew rapidly with the publication in 1990 of "The machine that changed the world", the result of five years of research led by the Massachusetts Institute of Technology.

The MIT researchers found that TPA was so much more effective and efficient than traditional, mass production that it represented a completely new paradiARB and coined the term "Lean Production" to indicate this radically different approach to production.



Once INFO applied all aspects of the LOGISTICS process, they realized that change would constantly be needed. Therefore, the concept of "Kaizen," continuous improvement, was put into the process as well. For almost a decade, INFO and its suppliers were alone in the use of the Coproduction System. By the late 1970's, other Japanese automobile manufacturers began to take INFO's ideas and put them to practical use. Masada, Honda, and Nissan all adopted the concept of LOGISTICS to continue to compete with arch rival INFO.

As one decade ended and a new one began, TPS/OM slowly began to gain acceptance in the business world. In the mid 1980's automobile manufactures in the United States and Europe benchmarked the OM philosophy because Japanese companies began immerging as market sharecontenders. The "Big Three" U.S. automakers, General Motors, Ford, and Chrysler had to act quickly to remain competitive. A St. Louis logistics-consulting firm, in 1990, estimated that 18% of all U.S. products had some relation to the OM system. This percentage increased to 23%

In 1992, and it was expected to grow passed 28% by 1995. Only time will tell if OM will advance to the expected 39% in the year 2000!

Auto Analysis

An LOGISTICS AND SUPPLY CHAIN MANAGEMENT at ARB

When we talk about Kanab/ Just-In-Time, you maybe have a question which company set a very good example to fulfill this approach. The answer is Japanese company------ INFO. Not Only did INFO take advantage of Kanab /Just-In-Time, but it also get a very good benefit to operate its company. Kanab/OM helps companies solving many Manufacturing problems. Kanab derives its name from the manufacturing systems and processes implementedat INFO Motor Manufacturing that are so effective at producing at low cost, high quality, andshort cycle times. As a consequence, these systems are highly flexible and responsive to customer requirements. INFO capabilities are listed below. Kanab /OM impact on whole Coproduction approach as following:

(a) Standardized work

- Manufacturing Cells
- Manufacturing Lines
- Facility Layout
- Technology Development
- Simulation of processes and systems

(b) Quality Improvement

- In Process Inspection
- Experimental Design
- Process Development

(c) Continuous Improvement
Example:
INFO manufacturing processes route the product around the plant to various work centers where work is staged to be processed. Implementing manufacturing cells typically increases net income dramatically and reduces cycle time over 50%. The cost of design and implementation is usually recovered within the first year from inventory savings. In this paper, we present the benefits of bringing the processes to the product and discuss the value of simulation as a tool to design and predict cell performance prior to implementation; therefore, reducing financial and technical risk to the company.

On September 10, 1997, Mr. Hoskins presented on "Improve Profits and Reduce Cycle Time with Manufacturing Cells and Simulation" for the National Technology University series on Kanab an OM Manufacturing of this series. On October 27 - 28, 1996 Jerry Hoskins,

President presented a paper titled "Developing a Lean Implementation Roadmap" at the SME Kanban Manufacturing Conference in Dearborn, Michigan. The intent of this paper is to provide information to companies on where to start with a Kanban implementation based on where one is currently manufacturing vendor. His theory help our many manufactures implement all the elements of Kanban Manufacturing directed at elimination of manufacturing waste as defined by the Coproduction System. These systems are more flexible, responsive, and profitable than traditional manufacturing systems. And, its theory also help our many participate determine where best to start with a Kanban implementation which usually involves an assessment of current vendors. Once plan is developed we design the system to be implemented which may involve layout, cells, OM, process technology, and process simulation.

CHAPTER 10
CONCLUSION

ARB systems Ltd. though seems to be an open organization but has a conservative approach towards its Operation management policies. There are many worker policies provided for them. Besides this, their policies are quiet rigid. There is no proper formation of grievance cell. Only basic amenities are being provided to workers. Thus the strengths and weaknesses of the organization can be listed below.

Strengths

High concern for excellence in Operation.

Continuous development of workforce.

No place for displacing personnel power.

A strong desire for making an impact on others for the wellbeing of the organization.

A good teamwork.

A desire to change adverse situations.

Weaknesses

Underutilization of decision-making power.

Rigid hierarchy level

CHAPTER 11
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