Operations Management

# Block Objectives:

# Explain the role & purpose of the operations function

# Understand the impact that the operations function can have on organisational structure

# Name and explain the most important design decisions

# Name and describe some of the techniques that can be used to inform design decisions

# What are the challenges in planning and controlling operations

# Name and describe appropriate planning and control approaches & techniques

# Why is supply chain perspective in OPM important

# Name and describe important approaches & techniques in Quality Management

# How to select appropriate measures and practices to improve performance of an operation

# WHAT IS OPERATIONS MANAGEMENT - (Sessions 5 – 7 / Slack Chapter 1 & 2)

* One of the three core functions
* Overlaps with other functions
* Distinguish:
  + Operations Management: activities, decisions and responsibilities of managing the production and delivery of products and services
  + Operations Function: management of resources as part of producing the goods and services to satisfy customer requirements
  + Operations Managers: staff responsible for managing some or all of the resources that comprise the operations function
* Activities / Responsibilities
  + Understand the operations strategic objectives – translate strategy into action
  + Develop an operations strategy for the organisation
  + Designing the operations products, services and processes
  + Planning and controlling of operations
  + Improving the performance of the operation
* Importance / success
  + Can have impact on strategic success if
    - manage its operations efficiently
    - meets customer requirements efficiently
  + OM can reduce COSTS
  + OM can reduce need for INVESTMENT
  + OM can increase REVENUE
  + OM can enhance INNOVATION
  + OM can effect PROFITABILITY
* New Agenda: trends exhilarated over the last years = more challenging environment
  + Globalization
  + Technology
  + Increased cost pressures
* Similarities: between all operations
  + All can be modelled as input – transformation-output
  + Mixture of tangible and intangible
  + Part of larger supply network to satisfy Customer requirements
  + Processes as part of internal customer – supplier relationship network
  + End-to-End business processes cut across functionality based processes
* Differences:
  + The four V’s
    - Volume of output
    - Variety of output
    - Variation of demand
    - Visibility / customer contact
  + High Volume – low Variety/variation/visibility = low cost
* Hierarchy of Operations: 3 levels
  + Operation / supply network / process (internal customers & suppliers)

The Transformation Model is the basis for the process view of organisations and can be applied to any part of the organisation and at any level.

## ROLES OF OPERATIONS MANAGEMENT

|  |  |
| --- | --- |
| * Implement business strategy * Support business strategy * Drive business strategy | Represents a learning curve going from implementation to support to driving strategy |

**Four Stage Model – Hayes & Wheelwright**

Used to evaluate role and contribution of the operations function and traces progression through the stages

|  |  |
| --- | --- |
| Stage 1: internal neutrality   * Poorest contribution * Holds company back * Inward looking * Improvement attempts by avoidance of mistakes | Stage 2: External neutrality   * Comparing against competition * Attempt to implement best practice |
| Stage 3: Internally supportive   * Among the best in the market * Aspire to be the best * Link strategy with operations | Stage 4: Externally supportive   * Subtle difference to 3 * Operations as foundation for success * Long term view * Development of operations based capabilities * Innovative, creative & proactive |

## PURPOSE OF OPERATIONS MANAGEMENT - PERFORMANCE OBJECTIVES:

Strategically, these relate to the interest of the shareholders and its responsibilities toward Customers, suppliers, shareholder, employees and society in general.

* Quality: do it right - consistent conformance to customer expectations
  + INTERNALLY: Reduces Cost
  + INTERNALLY: Increases dependability
  + EXTERNALLY: satisfy customer
* Speed: do it fast - elapsed time between request and delivery of product or service
  + INTERNALLY Reduces inventory
  + INTERNALLY Reduces risk
  + EXTERNALLY: Important aspect of customer service
* Dependability: do it on time - delivery as promised
  + INTERNALLY Saves time
  + INTERNALLY Saves money
  + INTERNALLY Gives stability
  + EXTERNALLY: Important aspect of customer service – helps build reputation
* Flexibility: ability to change - degree of change in processes: What / How / When
  + INTERNALLY Speeds up response
  + INTERNALLY Saves time
  + INTERNALLY Maintains dependability
  + EXTERNALLY: product/service flexibility / mix flexibility / volume flexibility / delivery flexibility
* Cost:do it cheaply - price appropriately and allow for return
  + INTERNALLY : Low cost universally attractive
  + INTERNALLY :Improve productivity
  + INTERNALLY: Operate effectively
  + EXTERNALLY: reduced price allows higher volumes
  + EXTERNALLY: increase profitability

# OPERATIONS STRATEGY

## WHAT IS STRATEGY?

* A total pattern of decisions and actions that influence the long-term direction of the business.
* ‘Operations’ is not the same as ‘operational’

|  |  |
| --- | --- |
| Operations  The resources that create products and services | Operational  Opposite of strategic, meaning day-to-day and detailed |

* Distinguish between ‘content’ and ‘process’

|  |  |
| --- | --- |
| Content  The specific decisions and actions which set the operations role, objectives and activities | Process  The method that is used to make the specific ‘content’ decisions |
|  |  |

* Four Perspectives on strategy show pressures contributing to strategy
  + Top-down: influence of corporate strategy on operations decisions (what the business wants to do)
    - Business & Functional Strategies
  + Bottom-up: the influence of operations experience on operations decisions (activity builds strategy)
    - Emergent strategies
  + Market requirements: performance objectives reflecting the market position being translated into operations decisions
    - Competitive / Order Winning / qualifying / less important Factors
    - Product Life cycle
  + Operations resource capabilities: inherent ability of operations processes and resources
    - Resource Based View (RBV) (Resource constraints & capabilities)
    - Intangible Resources
    - Structural and infrastructural decisions

|  |  |
| --- | --- |
| Structural decision areas:   * Facilities * Capacity Management * Technology * Supply Network | Infrastructural decision areas:   * Planning and control * Quality * Work organisation * HR * Performance measurement * New product development |

* Implementation
  + The five P’s
    - Purpose: shared understanding of motivation, boundaries and context
    - Point of entry: senior management support is central to implementation
    - Process: fit, sustainability, risk analysis helps explicit formulation
    - Project management: basic PM disciplines need to be in place (resource and time planning, controls, communication, reviews)
    - Participation: selection of staff involved in implementation is critical
* Process of operations strategy guides the trade-offs between performance objectives
* Strategy should address the relative priorities of the Performance objectives (polar representation p. 54)
* Trade offs:
  + Prof: Wickham Skinner *“… no one today can design a 500-passenger plane that can land on an aircraft carrier and also break the sound barrier. Much the same thing is true in… [operations]*
  + Two views on trade offs:
    - Repositioning: trade off improvements in one area in reduction of performance in others (*operational focus & operation-within-an- operation concept)*
    - Effectiveness: overcome trade offs by improving performance in one or more areas can be achieved without reduction of performance in another *(efficient frontier)*

**Critic on strategy models:**

Too complex to be produced by simple stage models; these models highlight key issues that should be taken into account but cannot be used to single-handedly produce a strategy

# PROCESS DESIGN

|  |  |
| --- | --- |
| * Supply Network design * Layout & Flow * Job Design * Product & Service Design * Process Technology |  |

## What is process design?

* Process Design is the activity which shapes the physical form and purpose of both products and services and the processes that produce them
* Design activity is more likely to be successful if the complementary activities of product or service design and process design are coordinated

**Key points:**

* Design happens before construction
* Process design and product / service design should be considered together (interactively)
* Process design should reflect process objectives
* Its purpose is to make sure that the performance of the process is appropriate for whatever it is trying to achieve
* Performance objectives translate into process design objectives

## Generic Process Types & the product-process matrix

|  |  |
| --- | --- |
| Manufacturing   * Project * Jobbing * Batch * Mass * Continuous | Service   * Professional services * Service shops * Mass services |

## Volume – Variety effect on process design

* The overall nature of any process is strongly influenced by the volume and variety of what is has to process
* The concept of process types summarizes how volume and variety affect overall process design

## How are processes designed in detail?

* Process mapping shows sequencing: Initially by breaking them down into individual activities using common symbols to represent types of activity, then sequenced.
* Little’s Law measures performance: throughput time equals work-in-progress multiplied by cycle time: TPT = WiP x CT
* Variability has a significant effect on the performance of processes, particularly the relationship between waiting time and utilization.

# NEW PRODUCT DESIGN

## Objectives of process design

* The overall purpose of process design is to meet the needs of customers through achieving appropriate levels of quality, speed, dependability, flexibility and cost
* Take into account environmental issues incl.
  + - source and suitability of materials
    - sources and quantities of energy consumed
    - amount and type of waste material
    - the life of the product itself
    - end-of-life state of the product

## Aspects of product design

* Concept: the understanding of the nature, use and value of the product
* Package: the group of ‘component products and services that provide those benefits described in the concept
* Process: the way in which the component products and series will be created and delivered.

## Stages of Product design

## Importance of good design

* Good business sense: translates customer needs into products / services and raises profitability
* Formalizing particularly important issues of concept, package and process implied by the design
* Design is a process itself that must be designed according to the process design principles

## Interactive Design

* Looking at product/service design and process design together can improve quality of both and helps to ‘break-even’ on its investment earlier than looking at both separately
* Reduces Time-to-Market (TTM) which can aid competitive advantage
* Best managed through:
  + - Employing simultaneous development, making decisions as early as possible
    - Ensure early conflict resolution helps prevent costly delay later in process
    - Use project-based organizational structure to ensure team is focused and coherently dedicated to that single design.

# Techniques used to inform design decisions

## DESIGN SIMPLIFICATION

* Standardisation: The degree to which processes, products or services are prevented from varying over time
* Commonality: The degree to which a range of products or services incorporate identical components (aka parts commonality)
* Modularisation: The use of standardized sub-components of a product or service that can be put together in different ways to create a high degree of variety.

## DESIGN IMPROVEMENT

* Quality function deployment (QFD): A technique used to ensure that the eventual design of a product or service actually meets the needs of its customers – whats and hows (aka house of quality)
* Value engineering (VE): An approach to cost reduction in product design that examines the purpose of a product or service, its basic functions and its secondary functions
* Taguchi Methods (after Genichi Taguchi): a technique that uses design combinations to test the robustness of a design – achieve a design that can cope with uncertainties (shock resistant, water resistant etc.

## PROTOTYPING – FINAL STAGES OF DESIGN

* Virtual prototype: a computer-based model of a product, process or service that can be tested for its characteristics before the actual process, product or service is produced (more cost effective that physical prototype)
* Computer-aided design (CAD): a system that provides the computer-ability to create and modify product, service or process design

# SUPPLY NETWORK & SUPPLY CHAIN MANAGEMENT (Session 11 & 17 / Chapters 6 & 13)

## What is the Supply Network?

* The network of suppliers and customers that have a relationship with an operation.

## What is Supply Chain Management?

* A broad concept which includes the management of the entire supply chain (strand/links) from the supplier of raw material to the end customer
* Its component activities include purchasing, physical distribution management; logistics; materials management and customer relationship management (CRM)
  + CRM being criticised for not offering direct help to customers.

## Types of supply network relationships and how they work:

* Supply Networks consist of individual buyer-supplier pairs. Use of internet/technology has brought the following categorization:
  + B2B = Business to Business
  + B2C = Business to Consumer
  + C2B = Consumer to Business
  + C2C = Customer to Customer
* Traditional Market supplier relationships aka short term transactional relationship: purchaser chooses suppliers on individual/periodic basis. No long-term relationship making it difficult to build internal capabilities.
* Virtual operations are an extreme form of outsourcing, the operations sub-contracts almost all its activities
* Partnership supplier relationships: customers forming long term relationships with suppliers = stability of demand in exchange for high level service.

Supply network configuration

* Main issues
  + The overall shape of the supply network
    - single sourcing
    - multi sourcing
    - global sourcing & social responsibility
  + Nature and extend of outsourcing and vertical integration
* Change the shape of the network may involve reducing the number of suppliers to develop closer relationships, and to bypass any intermediate (disintermediation) operations in the network, co-opetition
* Outsourcing or vertical integration concerns the nature of the ownership of the operations within a supply network. The direction of vertical integration refers to whether an organization wants to own operations on its supply or demand side (forward or backward integration)
* The extent of vertical integration relates to whether an organization wants to own a wide span of the stage in the supply network and the balance refers to whether organizations can trade with only their vertically integrated partners or with any other organizations.

### Dangers of outsourcing

* Loss of control of supply process
* Leakage of intellectual property
* Loss of skills and competencies

## Supply Chain Behaviour

* Functional markets require efficient supply chains (Marshall Fisher) because they are relatively predictable
* Innovative markets require dynamic (Responsive) supply chains (Marshall Fisher) because they are less predictable
* Bullwhip effect: the tendency of supply chains to amplify relatively small changes at the demand side of a supply chain so that the disruption at the supply end of the chain is much greater

## Supply chain improvement (reduction of bullwhip effect)

Supply chain management is concern with improving the supply chain and coordinating the activities of everyone in the chain. E-business has helped this a lot. Some of the effects are

* Information sharing: has become much easier and more efficient
* Channel alignment: adjustments can be harmonized throughout the chain (helped by EDI)
* Operational efficiency: individual efforts to reduce complexity, reduce costs and throughput time results in a cumulative effect for the whole chain
* Supply Chain Time Compression: speeding up the flow of materials down the chain and the flow of information up the chain
* Supply risks are being managed as a countermeasure to their vulnerability.

## Advantage of supply network perspective

* It helps to understand how it can compete effectively within the network. This is because a supply network approach requires operations managers to think about their suppliers and their customers as operations.
* It can also help to identify particularly significant links within the network and hence identify long-term strategic changes which will affect the operations.

## LOCATION OF CAPACITY

* Reasons for location decisions
  + - Changes in demand
    - Changes in supply
* Objectives: The aim of the location decision is to achieve an appropriate balance between three related objectives
  + - Spatially variable costs of the operation
    - The service of the operation is able to provide to its customers
    - The revenue potential of the operation.
  + Supply side influences (can be presented in transformation model style as inputs (operation in the middle)
    - Labour costs
    - Land costs
    - Energy costs
    - Transportation costs
    - Community factors (social, political and environment factors of location)
  + Demand-side influences (can be presented in transformation model style as outputs) (operation in the middle)
    - Labour skills
    - Suitability of the site
    - Image of the location
    - Convenience for customers
  + Techniques
    - Weighted-score method: comparing attractiveness of various location based on a score system
    - Centre-of-gravity method: geographical location that balances weighted importance of other operations in direct relationship with this one

### Long-term Capacity planning

* + - Supply & demand
    - Forecasting (Qualitative: Panel/Delphi/Scenario & Quantitative: Time series / causal modelling)
    - Economies of scale / Diseconomies of scale
    - Profit maximisation

# PROCESS TECHNOLOGY

## What is Process Technology?

* The machines, equipment or devises that help operations to create or deliver products and services.
  + Indirect process technology facilitates the direct creation of prod. & serv.
* Operation Managers don’t need to know the technical details but need to be able to answer:
  + What does it do?
  + How does it do it?
  + What advantages does it give?
  + What constraints does it impose?
* Classification of process technology
  + Materials processing: form, shape or move materials.
    - Significant technologies: robots, automated guided vehicles, computer-integrated manufacturing systems, flexible manufacturing systems
  + Information processing: IT impacts on the way business is conducted
    - Significant Technologies: networks, wireless LANs, internet, world wide web, extranets
  + Customer processing: defined in type of customer interaction like
    - Active interaction (direct contact e.g ATM);
    - passive interaction (no control e.g. cinema);
    - Hidden interaction (generally unaware e.g. security camera);
    - interaction through an intermediary (someone else operates the technology e.g. call centre)
      * Significant technologies: no agreed classification and is allocated to the form of contact listed above
* Technology should reflect the volume-variety requirements of the operation
* Generic Characteristics:
  + All can be conceptualised into three dimensions
    - The degree of automation of the technology
    - The scale or saleability of the technology
    - The degree of coupling / connectivity
* Choice of Technology:
  + Market requirements evaluation using the five Performance Objectives
  + Operations resource evaluation – what impact on constraints and capabilities
  + Financial evaluation
    - Time value of money
    - Net present value
    - Discount rate

# Planning and controlling operations

## What is planning and control?

It is the reconciliation of the potential of the operation to supply products and services and the demands of its customers on the operations i.e. it matches supply from the operations operation with demand from its customers. P & C is the set of day-to day activities that runs the operation on an ongoing basis.

## What is the difference between planning and control?

* Planning is concerned with the future.
* Planning is the formalisation of what is intended to happen in the long-term future
* Control is the process of coping with changes to the plan and operation as they happen (immediate future)
* Planning and Control tend to merge into each other
* The balance between the two depends on the moment in time: long-term: planning tends to be dominant – short-term: control tends to be dominant.
* Planning decisions:
  + What activities should take place in the operation
  + When should those activities take place
  + What resources should be allocates
* Control means:
  + Understand what is actually happening in the operation
  + Decide the severity of deviation from what should be happening
  + If deviation change/reallocate resource to affect operation’s activities

## The Nature of supply and demand

Difficulty of the planning and control task depends on the degree of uncertainty

* Demand:
  + Dependent demand: relatively predictable because depends on factors that are known
  + Independent demand: not obvious or directly dependant on the demand for other products or services
* Responses to demand
  + Resource to order: buy when needed/demanded by customer
  + Create-to-order: produce products only when they are demanded by customer
  + Make-to-stock: Production prior to being demanded by customer
* P:D Ratios: contrasts the total length of time customers wait between asking for a product and delivery and the total throughput time to produce the product/service.
  + Depends on the operation
  + Ratios indicate a degree of speculation (the larger P is compared to D the higher the speculation and the risk) = make to order eliminates all the risk as P & D are equal

Planning and control requires the reconciliation of supply and demand in terms of volumes, timing and quality:

* Activities:
  + Loading: the amount of work allocated to work centre
    - Finite Loading: allocates work up to a set limit
    - Infinite Loading: allocates work irrespective of capacity or other limits
  + Sequencing: decide the order in which work is to be performed
  + Scheduling: indicates detailed time table of what work, when and where
    - Forward: start work as soon as possible
    - Backwards: start work as late as possible
  + Monitoring and controlling: monitoring of plan created through above activities
    - Push control: indicates that work is being being send forward to be started as soon as it is finished at previous station
    - Pull control: indicates that work is requested from workstations only when it is required (basis for JIT)

# Capacity management strategies (aggregate planning & control)

(Session 15 / Chapter 11)

## What is capacity?

* The maximum level of value-added activity which they can achieve under normal operating conditions over a period of time.

## Planning and control capacity

* Distinguish between long-, medium- and short-term capacity decisions
  + Medium- and short term are when capacity levels are adjusting within physical constraints set through long-term capacity planning
* Objectives:
  + Costs are affected by the balance between capacity and demand (capacity higher than demand = high unit costs)
  + Revenues: capacity equal/higher demand – no revenue is lost)
  + Working capital: inventory binds working capital
  + Quality: any disruption to the operations routine could have an impact (e.g. hiring of seasonal staff)
  + Speed: can be enhanced?
  + Dependability: depends on how close demand levels are to capacity
  + Flexibility: especially volume flexibility is enhanced by surplus capacity.

## Measuring demand and capacity

* Measuring capacity depends on the activity mix and can be based on either:
  + Its input resources
  + Output it produces
  + Design capacity and effective capacity
  + Utilization (actual output / design capacity
  + Efficiency (actual output / effective capacity
  + Overall Equipment Effectiveness (OEE)
    - Time that equipment is available to operate
    - Quality of the product or service it produces
    - Speed or throughput rate of the equipment
* Almost all operations have some kind of fluctuation in demand caused by a combination of climatic, festive, behavioural, political, financial or social factors
  + Demand seasonality
  + Supply seasonality
* Forecasting is a key input in capacity planning and control if fulfils three basic requirements
  + - It is expressed in terms which are useful to capacity P&C (same unit as capacity required)
    - It is as accurate as possible (there is a lag between deciding to change capacity and changing capacity)
    - It gives an indication of relative uncertainty

## Alternative Capacity plans

* Level capacity (i.e. absorb demand) –tries to keep output constant
* Chase demand (adjust output to match demand)
  + Methods of adjusting capacity
    - Overtime /idle time
    - Annualized hours
    - Hire & fire
    - Part-time staff
    - Sub-contracting
* Manage Demand
  + Most common approach is to change price
  + Advertising
  + Alternative products
* Mixed plans: above plans are called pure plans and usually organisations apply mix approaches to fulfil their required combination of competitive and operational objectives.
* Yield Management: a collection of methods that can be used to ensure the an operation (usually with fixed capacity) maximises its potential to generate profit) – common for airlines
  + Capacity is relatively fixed
  + Market can be clearly segmented
  + Service cannot be stored
  + Services is sold in advance
  + Marginal cost of sale is low.
* Challenge for operations mangers is how to manage the resources at their disposal to cope with fluctuation in demand – satisfying customers while meeting organisational demands

## Choosing an approach

Before deciding on a capacity plan the organisation needs to be aware of the consequences of each plan.

* Methods:
  + Cumulative representations of demand and capacity
  + Queuing theory: mathematical approach modelling random activities in order to predict the behaviour of queuing systems (aka waiting line theory)

# Inventory Management (Session 16 / Chapter 12)

## What is inventory?

* The stored accumulation of the transformed resources in an operation
* Inventory or stock can be used to describe transforming resources but in connection with control these are almost always used for transformed resources
* Almost all operations keep some kind of inventory, mostly of materials but also of information and customers

## Why is inventory necessary?

* Inventory occurs in operation because the timing of supply and the timing of demand do not always match
* Inventory is needed to smooth the differences between supply and demand
* Main reasons for inventory:
  + Buffer inventory: to cope with random/unexpected interruption
  + Cycle inventory: to cope with inability to make all products simultaneously
  + De-coupling inventory: to allow different stages of processing to operate at different speeds and with different schedules
  + Anticipation inventory: to cope with planned fluctuations in supply and demand
  + Pipeline Inventory: to cope with transportation delays in the supply network

## Disadvantages of holding inventory

* Binds working capital thus tying up money that could be used elsewhere
* If not used quickly increasing risk of damage, loss, deterioration or obsolescence
* Takes up space that has to be managed and contributes, therefore to overhead costs

## How much should an operation hold?

* Depends on balancing the costs associated with holding stocks against the costs associated with placing an order.
* Main stock-holding costs are usually related to working capital – main order costs are usually associated with the transactions necessary to generate the information to place an order
* Best know approach to determining the amount of inventory to order is the economic order quantity formula (EOQ).
  + EOQ=√(2COD/CH)
    - CO = cost of placing the order
    - D = annual demand in units
    - CH = annual stockholding cost
* Can be adapted to different types of inventory profile using different stock behaviour assumptions
* EOQ approach has been subject to criticisms regarding the true cost of holding stock, the real cost of placing an order and the use of EOQ models as prescriptive devices

## When should an operation replenish its inventory?

* Partly this depends on the uncertainty of demand.
* Orders usually timed to leave average safety stock. The level of safety stock is influenced by variability of both demand and lead time of sully
* These two variables are usually combined into lead-time usage distribution
  + Continuous review
  + Periodic review
* Using re-order levels as triggers (time consuming and expensive)

## How can inventory be controlled?

* ABC classification of stock using the pareto principle to distinguish between different values/types of stock (80/20 Rule i.e. 80 % of sales are generated by 20% of all stock items)
* ABC classification in combination with timing influences above (uncertainty, lead time deterioration risk)
* Computer-based information systems which depend on accurate inventory records but can
  + Update stock records
  + Generation of orders
  + Generation of inventory status reports
  + Generation of demand forecast

# Lean operations

Lean is an approach to operations which tries to meet demand instantaneously with perfect quality and no waste and fast throughput

* Contributes to low inventories, thus
* Saves working capital
* Improves an operation’s ability to improve its intrinsic efficiency
* Can be applied directly to service operations (mostly)

## Main elements of lean philosophy

* It can be summarized as concerning three overlapping elements
  + Elimination of waste in all its forms
  + The inclusion of all staff of the operation in its improvement
  + The idea that all improvement should be on a continuous basis

## JIT techniques

* Develop ‘basic working practices
* Design for manufacture
* Focused operations to reduce complexity
* Use of simple, small machines with emphasis on being robust and flexible
* Rearrange layout and flow to enhance simplicity
* Encourage reliability
* Reduce set up and changeover times to enhance flexibility
* Involving alls staff in the improvement of the operation
* Making all problems visible to staff

## JIT planning and control techniques

* Pull scheduling
* Kanban control
* Levelled scheduling
* Synchronization of flow
* Mixed-model scheduling

# Quality Control (Session19 & 20 / Chapter 17)

## The Nature or Quality

* Quality is a major influence on customer (dis)satisfaction
* The most visible part of what an operation does
* Quality performance objective has an external impact incluencing customer satisfaction and internal impact which leads to stable and efficient processes
* Inside the organisation it can reduce cost through fewer mistakes and increase dependability

## Five approaches to Quality ( Prof. David Garvin)

* The transcendent approach: views quality as synonymous with *innate excellence* – the *best possible* in terms of the respective specification
* The manufacturing-based approach: provision of *error free* products or services and conform precisely to specifications
* The User based approach: product is ‘*fit for purpose’* meaning not only adhering to specifications but it also appropriate for customer specification
* The Product-based approach: views quality as a *precise set of characteristics* that will satisfy customers
* The value-based approach: builds on to the manufacturing approach by also considering *cost and price*

## Difficulties in defining Quality

* Operations View: Quality is consistent conformance to customers’ expectation
  + Conformance means meeting a set of precise specifications (key operations task) (*manufacturing based)*
  + Consistent means a process with measurable outcome *(product-based*)
  + Customers expectations: recognized they must meet customers expectations and may be influenced by price *(user and value based)*
* Customer’s View: difficult to define as each customer has a different perception of quality. It is shaped by the gap between perception and expectation.

## Diagnosing quality problems

If the customers’ perceived quality is such that the perception is below expectation quality is perceived poor and the problem is likely to lie somewhere else i.e. there is another gap between what the customer wants and operations delivers:

### Four other gaps:

* Gap1: customer’s specification-operations specification gap
  + Mismatch between customer’s expected specification and operations specification
* Gap 2: Concept-specification gap
  + The concept of the product/service has not been specified/translated as expected by operations internally
* Gap 3: quality-specification – actual quality
  + Mismatch between the operations specification of quality and the actual quality produced (measurements/colour etc)
* Gap 4: actual quality-communicated image
  + The quality communicated to the ‘outside world’ (market image) does not match the actual product or service

## Conformance to specifications – Quality planning and control

Conformance to specification means producing a product/service to its design specification.

This is part of Quality planning and control divided into 6 steps:

1. Define the quality characteristics (based on consequences of design specifications):
   1. Functionality
   2. Appearance
   3. Reliability
   4. Durability
   5. Recovery
   6. Contact
2. Decide how to measure each quality characteristic (variables & attributes)
3. Set quality standards for each quality characteristic (define the boundary between good & poor)
4. Control quality against those standards

* Quality Sampling: gives rise to Type I & Type II erroneous judgement
* Statistical Process Control (SPC)
* Acceptance sampling (accepting a whole batch based on a sample)

1. Find and correct causes of poor quality
2. Continue to make improvements.

## Total Quality Management (TQM)

Slack et al: a holistic approach to the management of quality that emphasizes the role of all parts of an organization and all people within an organization to influence and improve quality; heavily influenced by various quality ‘gurus’ it reached its peak of popularity in the 1980s and 1990s.

## What is TQM?

* A philosophy about how to approach the organisation of quality improvement
* Based on the following beliefs:
  + organisations need to make improving quality a central part of their operations
  + Quality improvement is the business of everyone in the organisation
  + Organisations should see to improve every aspect of everything that they do
  + The pursuit of quality improvement is a continuous and never-ending task
* TQM can be viewed as a natural extension of earlier approaches to quality management
* TQM meets the needs and expectations of the customers
  + Seeing things from a customer’s point of view
  + Customers are viewed as part of the organization not as external
* TQM covers all parts of the organisation
  + Concept of *internal customer* and *internal supplier*
  + Service Level Agreements (SLAs) formalization of internal customer concept
* Every person in the organization contributes to quality
  + If everyone has the ability to impair quality – everyone has the ability to improve quality (link to HRM – empowerment)
* All costs are considered (Quality related costs)
  + Prevention costs: incurred trying to prevent problems and errors to happen in the first place
  + Appraisal costs: associated with checking, monitoring and controlling quality
  + Internal failure costs: associated with internal costs of errors and failure
  + External failure costs: associated with costs of errors and failures reaching customers
  + Getting it right first time approach: shift from reactive to proactive

**Quality gurus:** A. Feigenbaum (1958), W.E. Deming, J.M. Juran, K. Ishikawa, G. Taguchi, P.B. Crosby

## Quality Systems and procedures

Quality system is the organizational structure, responsibilities, procedures, processes and resources for implementing quality management.

Prof: Barrie Dale: […] *a quality system is good management practice.*

### Quality systems:

**Documents**

* Level 1: Company quality manual

Fundamental document and provides a concise summary of the quality management policy and quality systems along with the company objectives and its organization.

* Level 2: Procedures manual

Describes the system functions, structure and responsibilities in each department

* Level 3: Work instructions, specifications and detailed methods for performing work activities

**ISO 9000 approach**

A set of worldwide standard that establish the requirements for companies quality management systems, last revised in 2000, there are several sets of standards.

### Four Principles:

* Quality management should be customer focused
* Quality performance should be measured relating processes for production and customer satisfaction
* Quality management should be improvement driven
* Top management must demonstrate their commitment to maintaining and continually improving management systems

### Advantages:

* Useful discipline to ‘sensible’ process-oriented procedures
* Improvement of error reduction, reduced customer complaints reduced costs of quality
* ISO9000 audit is generally accepted
* ISO9000 procedures can help identify unnecessary extisting procedures
* Marketing benefit of portraying quality as important objective

### Criticism:

* Encourages ‘management by manual’ and over-systemized decision making
* Process is expensive
* Time and cost invested in achieving compliance is excessive
* Too formulaic

## Successful TQM implementation

* Adopt a quality strategy
* Top management support (also part of IM
* A steering group
* Group-based improvement
* Success is recognized
* Training is the heart of quality improvement

SixSigma approach

to organizing improvement holds that improvement is only successful if significant resources and training are devoted to their management. Terms associated

* Master Belt: experts in the use of SixSigma tools and techniques
* Black Belts: can take lead in organizing improvemtn teams
* Green Belt: works within improvement teams – possibly its leader

### TQM loses its effectiveness = Quality disillusionment / quality droop

Prescriptions:

* Do not define TQM to narrowly
* All quality improvements in relation to performance objectives
* TQM is not a substitute for normal managerial leadership
* TQM is not a ‘bolt-on attachment’ to the organisation (should be integrated)
* Avoid the hype
* Adapt TQM to the circumstances of the organisation

## Differences between traditional quality management and TQM

* TQM rejects the notion of a trade-off between quality costs
* Traditional QM assumes a optimum amount of quality effort – diminishing returns on quality costs assumed
* TQM argues that no operation should settle for acceptable quality levels but aim for zero-defect standard
* TQM stresses quality is an integral part of everyone’s work
* ‘optimum-quality level’ approach does not challenge statt to find ways of improving quality

# Performance Improvements (Session 21&22, Chapter18)

## Measuring performance

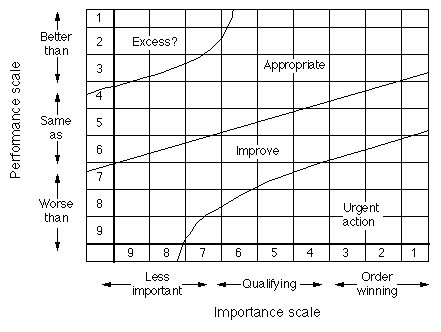
* Performance measurement is the activity of measuring and assessing the various aspects of a process or whole operation’s performance.
* Performance measurement is the process of quantifying action
* Performance measurement is the prerequisite in determining whether a operation is good, bad or indifferent
* Polar diagrams: give’s no help to on-going improvement – partially effective
* Generic issues:
  + What factors to include as performance measures?
    - An aggregate breakdown into composite measures of performance objectives: quality, speed, dependability, flexibility and cost
  + Which are the most important performance measures?
    - Key Performance Indicators (KPIs) that reflect strategic objectives and the bundle of detailed measured that make the KPIs
  + What detailed measures to use?
    - The five performance objectives are made up of many smaller measures
    - Balance Score Cards
      * Use a wide range of aspects
      * Able to link performance measurements to strategic objectives see diagram below
* Setting target performance
  + Historically-based targets: compare current with previous
  + Strategic targets – sets regarded ‘appropriate’ to achieve strategic objectives
  + External performance-based-targets: targets according to achievements by competitors
  + Absolute performance target – based on theoretical upper limit of performance.
* Benchmarking: the process of learning from others
  + Internal benchmarking
  + External benchmarking
  + Non-competitive benchmarking
  + Competitive benchmarking
  + Performance benchmarking
  + Practice benchmarking

## Improvement priorities

* The needs and preferences of customers
* The performance and activities of competitors
* Judging importance to customers:
  + Order-winning factors
  + Qualifying factors
  + Less important factors (e.g. competitive factors

## Importance – performance matrix

A technique that brings together scores that indicate the relative importance and relative performance of different competitive factors in order to prioritize them as candidates for improvement



## Approaches to improvement

Two strategies:

|  |  |
| --- | --- |
| BREAKTHROUGH IMPROVEMENT   * Western individualism approach * Innovation & technology driven * Sudden and usually steep change * Done by a few * High investment costs * Focus: radical, creative, everything is possible * Concept: Business Process Reengineering (BPR) (see also IM) | CONTINUOUS IMPROVEMENT   * Japanese collectivism approach * People driven * Small ongoing improvements * involvement of everyone * less costly * Called ‘kaizen’ by Masaaki Imai * Focus: adaptability, teamwork, attention to detail * Concepts: PDCA & DMAIC Cycle |

## Improvement Cycle Models

Improvement cycles are a repeated questioning of working process or activity.

Two main concepts:

* Plan, Do, Check, Act CYCLE aka Deming Cycle
* Define, Measure, Analyse, Improve, Control CYCLE (associated with SixSigma)

# Operations management Challenges (Session 23 / Chapter 21)

GLOBALISATION

The extension of operations’ supply chain to cover the whole world, even small company’s can have an international dimension (thanks to the internet)

**Main points:**

* Anti-globalisation movement: the debate around the changing status of the nation state and its retreat before the forces of globalisation.
* Ethical globalisation: reconciliation of globalisation and its impact on society aims for recognition of:
  + shared responsibilities on global challenges (pollution, poverty etc)
  + equality of individuals regardless of nation
  + importance of gender and impacts on different economic and social policies
  + an increasingly connected world needs also be connected through shared values and norms of behaviour and systems of accountability

CORPORATE SOCIAL RESPONSIBILITY

The impact of the way operations is managed on customers, employees, locale community etc. i.e. the economic and ethical implications of operations management

ENVIRONMENTAL PROTECTION

Activities and decisions in operations management that minimize the negative impact of processes, products and services on the environment.

**Main Points:**

* environmental impact created by operations activities
* environmental burden (EB) created by operations activities: EB = P(opulation) x A(ffluence of population) x T(echnology)
* Environmental reporting: publicising of environmental practices, policies and performance
* ISO14000: International standard on environmental management

TECHNOLOGICAL AWARENESS

Need to understand the implications of technologies which could become important

Concept of Disruptive Technologies (also see IM)

KNOWLEDGE MANAGEMENT (same concepts as described in IM)

Knowledge is a key resource and ultimately gained thought experience and operations

Concepts of:

* Processes: the arrangement of resources that produce some mixture of products and services.
* explicit knowledge: easily transferable, formal and can be written down
* tacit knowledge: gained through personal experience, not easily transferable