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Improving Operations

Section 1 - Management Systems and Processes

Subsection i) Introduction to Systems and Processes

Dealing with and helping a rapidly growing business can be a challenge. The more entrepreneurial style of owner/founder(s) is often not bound by convention and rigid rules. Often their success has come from moving fast to exploit opportunities, so the world of systems and processes may not be at the top of their agenda.

As the delivery of products or services accelerates, capacity issues develop, it becomes increasingly difficult to know what is going on and the very way in which things are done probably has to be questioned.

Hot Spot Capacity Issues

If a business is a 'victim of its own success', problems and risks may occur in the following areas:

- In production situations, there may not be enough time for routine maintenance, so machine breakdowns may occur more frequently as equipment tries to produce more that the original design capacity.
- Management time becomes increasingly 're-active' to the problems and crisis' created by the rapid growth in the supply of products and/or services to the existing customer base.
- It may not be possible to meet new or unexpected orders so the business cannot continue to grow without expanding its scale of production (this possibly needing resource that is not available – finance, space etc).
- Employees and managers may feel under excessive pressure, leading to increased mistakes, absenteeism (a key measure of levels of motivation) and staff turnover.
- If the workspace is overcrowded, work may become less efficient due to the untidy working conditions, lack of storage space.
- Shrinkage (waste and/or theft) can increase as systems fail to flag up issues on production costs, deliveries etc.
- Labour costs may be accelerating out of control with staff working expensive overtime to satisfy orders.
- Inventory getting out of control with 'dead' stock building up and being disguised by the sheer workload.
- Business risks spiraling out of control with dependency on key machines, suppliers, customers or certain members of staff.
- Customer dissatisfaction increasing and not being monitored (no time for direct feedback and little monitoring of trends on returns etc).

As a general rule of thumb, most businesses operate well at something between 80 to 90% capacity utilisation. This is because fixed costs per unit are relatively low and there is some scope to meet new orders or carry out maintenance and training.

For high growth business, this 'safety margin' often does not exist and the business needs to manage the risk, build capacity and look at the way things are done to get process improvements.

The History of Process Improvement

In order to help the business tackle the concepts of business process and systems development, it is useful to remind ourselves of the basic principles of process management and some of the history in this area.

Back in the late 19th century, Frederick Winslow Taylor started to develop the idea of management as a scientific discipline. He applied the premise that all work and its organisational environment could be considered and designed upon scientific principles, i.e. that work processes could be studied in detail using an analytical approach. Upon the basis of this analysis, an optimal organisational structure and way of performing all work tasks could be identified and implemented. However, he was not the one to originally invent the concept. In 1886, a paper entitled *"The Engineer as Economist"*, written by Henry R. Towne for the American Society of Mechanical Engineers, had laid the bedrock for the development of scientific management.

The basic idea of scientific management was that work could be studied from an objective scientific perspective and that the analysis of the gathered information could be used for increasing productivity, especially of blue-collar work. Taylor summarised his observations in the following four principles:

- Observation and analysis through time study to set the optimal production rate. In other words, develop a science for each man's task– a One Best Way. This led to the word 'bean counter' being used to describe Taylor's (and later Gilbreth's) observers or 'time and motion' study men.

- Scientifically select the best man for the job and train him in the procedures he is expected to follow. This concept can be seen in many traditional production line situations.

- Cooperate with the man to ensure that the work is done as described. This means establishing a differential rate system of piece work and paying the man on an incentive basis, not according to the position.

- Divide the work between managers and workers so that managers are given the responsibility for planning and preparation of work, rather than the individual worker.

Scientific management's main characteristic is the strict separation of planning and doing, which was implemented by the use of a functional foremanship system. This means that a worker, depending on the task that he or she is performing, can report to different foreman, each of them being responsible for a small, specialised area.

Taylor's ideas had a major impact on manufacturing, but also administration. One of the most well-known examples is Ford Motor Co., which adopted the principles of scientific management at an early

stage, and built its assembly line for the T-model based on Taylor's model of work and authority distribution, thereby giving name to Fordism.

Later on, Taylor's ideas were extended by the time and motion studies performed by Frank Gilbreth and his wife Lillian. Henry Gantt, a co-worker of Taylor, developed Taylor's idea further, but placed more emphasis on the worker. He developed a reward system that no longer took into account only the output of the work, but was based on a fixed daily wage, and a bonus for completing the task.

Taylor's work can be, and has been, criticised many times for degrading individuals to become machinelike. One of the most famous critiques of the situation that an application of scientific management could result in, is shown in Charles Chaplin's movie *"Modern Times (film)"*. Despite that fact, Taylor was inspired by the vision of creating a workplace that is beneficial to all members of the organisation, both management and workers.

When looking at Taylor's ideas retrospectively, we can conclude, that they very well fitted the organisations of the early 20th century. The kind of organisation he proposed requires certain pre-conditions, which were satisfied in the technological and socio-economic environment of his time and the heritage from economic individualism and a Protestant view of work. However, despite the good intention of designing organisations where managers and workers could jointly contribute to the common achievements, Taylor missed the fact that he had been building his principles on some wrong assumptions. The strict belief in man being totally rational made him disregard the crucial issue of human behaviour, and the fact that money is insufficient as a single source of motivation in the workplace.

Peter Drucker noted a third problem related to scientific management, namely that there was no real concern about technology, i.e. that Taylor considered his theory as being general, and that it could be applied to any organization, independently of the technology used.

Whilst (in the age of information technology and modern systems) this makes some of the theory flawed when applied to modern situations, Scientific Management laid the foundations for many of the modern developments (such as lean manaufacturing, business process engineering and the Toyota Production System or TPS) and many of these are entirely relevant to the high growth situation.

Further reading

Davenport, Thomas, "*Process Innovation: Reengineering work through information technology*" Harvard Business School Press, Boston 1993

Hammer, Michael and Champy, James, *"Reengineering the Corporation: A Manifesto for Business Revolution*" Harper Business 1993

Johansson, Henry J. et al*., "Business Process Reengineering: Breakpoint Strategies for Market Dominance"* John Wiley & Sons 1993

Frederick Winslow Taylor, "*The Principles of Scientific Management*" Harper & Brothers*.* 1911

Gantt, Henry L., *Organizing for Work,* Harcourt, Brace, and Howe, New York, 1919. Reprinted by Hive Publishing Company, Easton, Maryland, 1973.

Drucker P F, *"The Practice of Management"* Harper & Row 1954

Subsection ii) What is a Process?

A business process is a set of interrelated tasks which solve a particular issue. In the case of the diagram below, the stages required in making a cup of tea are laid out so that they can clearly be seen in a process flow diagram. The difficulty in many high growth businesses is that the processes that have made it successful or that make things work are a mystery. It has been estimated in some surveys that up to 70% of the processes in a business are informal and undocumented. The key to helping the high growth business in this area is to identify and look at the critical processes where the greatest gains can be made.

Diagram 1 – A Simple Process 'A Cup of Tea'

Creating process flow diagrams for these critical and important processes is the start-point for any of the recognized business improvement techniques.

There is a standard ANSI (American National Standards Institute) convention for drawing the 'flow' of a process with symbols representing various activities, stages and decision points etc. This tends to be the common language of flow charts but any consistent and understood convention can be used. The basic ANSI ones are explained in the template below, although many others can crop up in programmes like Microsoft Visio.

Template 1 – ANSI Flow Chart symbols

It is useful to consider three distinct types of process when seeking to identify and prioritise those for analysis.

These are:

- Management processes, the processes that govern the operation of a system. Typical management processes include 'Risk Management' and 'Strategic Planning'.

- Operational processes, processes that constitute the core business and create the primary products and/or services. Typical operational processes are purchasing, manufacturing, marketing, and sales.

- Supporting processes, which support the core processes. Examples include accounting, recruitment, IT-support.

It is usually logical to consider each of these areas separately when introducing the business to the topic of process mapping. It is easier to gain experience and knowledge in this area with a 'concrete' and visible process in the operations area than to pick something intangible like a management process. As confidence grows and results are seen, the business can become much more receptive to tackling some of the harder to solve issues than accompany high growth.

Each business process can be broken down into several sub-processes, which have their own attributes, but they ultimately contribute to the overall process. The analysis of business processes typically includes the mapping of processes and sub-processes down to activity level so that we can actually see what is happening.

When the business understands what it is actually doing now, it can then move on to improve the processes, and a simple example of Business Process Re-engineering (BPR) is the option to use a tea bag instead of tea leaves and a pot (shown in the diagram earlier).

Of course life in a high growth business will not be as simple as making a cup of tea.

The diagram below is a good example of the type of complexity that can exist in a business.

Diagram 2 – Components & Processes from the PRINCE 2 methodology

The diagram shows a project being treated as a process. In the centre of the diagram there are the 'processes' that make up the overall project e.g. 'Starting a Project'. An example of further breakdown of a process is shown below with the PRINCE 2 sub-processes for 'Starting a Project'.

Diagram 3 – PRINCE 2 Breakdown of the Starting a Project process

On the outer portion of the diagram we have all the 'components' (as PRINCE 2 refers to them) that have to be managed and that inter-relate to each of the processes e.g., Configuration Management.

Tracking the components of a final product (and in PRINCE 2 a 'product' can be a service or a stage output) and their versions for release is called configuration management. There are many different methods of configuration management available. PRINCE2 defines the essential facilities and information requirements for a configuration management method and how it should link with other PRINCE2 components and techniques.

Configuration management can be thought of as asset or product control. The quality aspect defines the standards required and the configuration management is the means by which this can be achieved. Document versions, procedures for spotting variations and the status of products are among the things that information is required for.

A good example of the need for configuration control is the assembly of a car. How do the assemblers know that they have the correct components for this particular vehicle? Should it have leather upholstery? Have recent changes to the dashboard resulted in the correct dials arriving. The records kept by the configuration management system will check the serial number of the vehicle against the parts supplied to ensure they are the correct ones.

Keep it simple is a good mantra at times, but recognise when the more sophisticated techniques and levels of analysis are required.

Further reading

"Managing Successful Projects with PRINCE 2" TSO (The Stationery Office) London 2005

Davenport, Thomas, "*Process Innovation: Reengineering work through information technology*" Harvard Business School Press, Boston 1993

Hammer, Michael and Champy, James, *"Reengineering the Corporation: A Manifesto for Business Revolution*" Harper Business 1993

Section 2 – Mapping a Process

Subsection i) How to prepare

In order to make decisions about any process in a business, it is first necessary to map the existing processes.

Activity Overview Chart

As the typical high growth business will have many processes, it can be useful to create an overview of what is going on with an 'Activity Overview' chart, this being an extremely useful way of identifying priorities.

Diagram 4 – Activity Overview Chart Example

The activity overview chart flows from left to right and depicts groups of processes that occur over time. Some benefits of using an activity overview chart include being able to identify some relationships between processes and being able to depict which processes can run in parallel (e.g., to reduce cycle-times). Major milestones can also be identified using an activity overview chart if required.

The next stage is to map each individual process identified on the overview chart.

Individual Process Maps

Without doubt, the best people to map a process are those who carry it out. There can be many preconceived ideas about how something is done (especially by those who don't so it!) and it is vital that what actually happens is recorded. If this is not done, then re-engineering or changing it is a nonsense.

To map a process successfully, the following need to be understood.

- Responsibilities: what are the key responsibilities of the process area, e.g. What does (or should) the process produce for the high growth business and which areas of the business are involved (cross functional involvement) ?

- Activities: what are the key activities of the process area? This is the most important area and there are a number of questions that can be asked to clarify the activities:

    - What generates the process/task?
    - How is it done?
    - Why is it done?
    - What happens next?
    - What sequence are activities performed in?
    - How are these errors, problems ands exceptions handled?

- Inputs: What are the data, material and labour inputs into the process?

    - What forms and reports are used?
    - What computer files and systems are used?

    - Who performs each activity?
    - What is used in the activity (raw materials, processed materials etc)?

- Outputs: What are the key deliverables of the process (tangible or intangible)?

    - What is the output of the process?
    - How many outputs are there?
    - Where does the output go?

- Customers: Who are the recipients of the output of each activity?

    - Who are the internal customers of the process?
    - Who are the external customers of the process?

- Key Performance Indicators: What are (or should be) the key measures of the process? A few examples are given below but these could be any of the measures for the Balanced Scorecard approach or as per the list of common KPI's given later in the module.

    - Cycle times
    - Cost per unit
    - Staff turnover
    - Who reviews it and when is this done?
    - How long does it take?
    - What is the nature, frequency and cause of errors and problems?
    - Volumes

The next stage in the mapping process is to bring together and/or talk to the right people to carry out the task. It is vital to bring together people who know the process to input into the mapping task.

Use conventional or industry standard symbols as shown earlier to carry out the mapping process. It is also convention that the map 'flows' from top left to bottom right on any schematic. Tools to help with the job can range from post-it notes to software such as Microsoft Visio. The task of the coach is to help the high growth business choose the correct level of analysis and to advise if professional help should be sought to assist in this area.

The simple example of making a cup of tea was used to illustrate a process map earlier, an example of a more complex engineering process is shown below.

Diagram 5 – An Engineering Process Map

Some hints in carrying out effective process mapping:

- Use group facilitated sessions with process owners.

- Use individual interviews where appropriate.

- Understand cost, quality and time, processing time and elapsed time implications as you go.

- Document process and technology opportunities for improvement as you go.

Swim Lane Maps

Processes often span different areas, roles and business units and the concept of swim lanes is often used to map processes that cross these types of boundary.

Diagram 6 – Swim Lane Process Map

In the swim lane chart, processes are organised according to the department responsible for the specific part of the process. The very act of defining the different departments often produces surprises, as people realise just who gets involved in the process. The chart then reads from left to right. One good use of swim lane charts is in re-engineering and trying to analyse processes as to whether large efficiencies can be gained by eliminating process handoffs, consolidating roles, making greater use of technology, and in general, rethinking the value delivered across the entire flow.

Milestone Maps

The milestone map reads from left to right and depicts keys points in time that have been reached for a business process.

Diagram 7 – Milestone Map Example

The milestone chart is useful in cases where the endpoints of a process are important to focus on. This type of chart can be used in conjunction with the other charts or separately. The developing high growth business can use the milestone map to consider the development of key performance indicators and can build an MIS around the key milestones.

Subsection ii) Business Process Mapping

As has already been referred to in the previous subsection, the business should start looking at process mapping at a high level. The activity overview chart can be the basis for deciding which processes to have a look at.

Activity overview charts can be done for the whole of a small high growth company, or in more complex situations, the three areas of business process can be considered (management processes, operational processes and support processes).

To what levels of process mapping the business should go to at any point in time is a matter of judgment. A large company may have the resources to undertake a comprehensive look at this area. A smaller and more constrained business should obviously just pick one or two key areas at a time. Guidance may be needed in this area.

When the areas for mapping have been decided, start with the 'big picture' for each process and drop in levels of detail as required (a process box with a small plus sign in a box at the bottom denotes a sub-process).

Diagram 8 – Levels of Process Mapping

Clearly define the beginning and the end of each process and decide and define the key inputs and outputs. Literally walk through each process with the people involved, using techniques such as post-it notes or software as appropriate. If the mapping gets bogged down, take a break or move on to another area. Identify process and technology improvements as you go but don't forget that the primary object of the exercise is to capture how it is done now. Constantly verify the accuracy of the process map as it is produced.

Some Do's and Don'ts or hot spots:

- Do map the process as it actually happens.
- Do think about the process across the whole of the business.
- Do involve and talk to everyone involved in the process.
- Do clearly define the start and end of the process before trying to map it.
- Do start at a high level and work down in terms of detail.
- Do ask questions at all stages.
- Don't map the process as you think it happens or how you would like it to happen.
- Don't restrict the process map to one area (swim lanes).
- Don't map the process in isolation.
- Don't attempt to process map if there is no defined start and finish point.

- Don't get bogged down in detail.

At the end of a process mapping exercise, the start point, end point and customers should be clear. Inputs and outputs should be identified and the person or persons responsible for each task should also be identified. A person with no knowledge of the process should be able to understand how the process happens and the level of detail should be sufficient to describe inefficiencies in the process.

Walton M*, "The Deming Management Method"* Perigee Trade 1988

DeMarco T, *"Structured Analysis and System Specification"* Prentice Hall 1979

Subsection iii) Introduction to Business Process Re-engineering (BPR)

As It is now

The task of looking at processes and establishing what needs to be changed is often referred to as Business Process Re-engineering or BPR.

The methodology is simple, how are things at the moment in the business, how do we want them to be and how are we going to get to where we want to be.

The first stage, mapping the processes is described in the previous subsection. Whilst this is happening, it is good practice to note down opportunities to improve e.g. technologically or to eliminate waste as this is being done.

Being able to spot 'waste' is common during the mapping process. There are generally considered to be three types of waste in a process.

- Type 1 waste: This can be switched off or simply stopped. Examples would include machinery powered up when it is not being used for some time or a small component being cut from an excessively large block.

- Type 2 waste: This is designed into the process, so would need to be designed out to make gains. An example would be the manual production of a report that could be replaced by an IT system, or a component being made in-house that could be made more efficiently by a sub-contractor.

- Type 3 waste: This type of 'waste' does not add value to the product or service but is required for the survival of the process. An example could be a legal requirement in terms of reporting such as a VAT return.

Once the process is fully mapped, 'easy opportunities' or hot spots for improving processes in companies are:

- Loops, where a step in a process is handled by the same person a number of times.

- Hand-offs, where there is confusion between one area and another.

- Dead-ends, where a report or a document is not actually used or needed any longer.

- Use of Technology, making the best use of technology or eliminating inappropriate use of applications or technology.

- Repetition, a step in a process is repeated.

- Duplication of effort, within a process task or across different departments.

- Black Holes, a step in a process which results in delays or stoppages.

- Overlapping processes, implying duplication or repetition.

- Processes that have many steps, the question being – are they all required?
- Sequential steps that could be done in parallel, therefore avoiding repetition or duplication of effort.
- Omission of critical steps, quality or checks.
- Unnecessary paperwork, is it all essential?
- Unnecessary delays.
- Insufficient linkages between other processes, divisions, customers, suppliers as these should be as seamless as possible.

An excellent example of obvious gains that can be made in a process is shown in the diagram below.

Diagram 9 – Purpose of Calls to a Finance Department

As part of a BPR process, this council tax department analysed the reason for calls to the centre. It was horrified to find out that 49% of the calls were 'waste' and added no value to the task of collecting in council tax.

The reasons were many, operators not being able to make instant judgments and sensible decisions, long reporting chains etc. The result was that the average time to collect the tax from the date of bill issue was 57 days. Changes to the process brought this down to 19 days within 6 months.

As we want it to be

Once we have established how things are at the moment, there are a number of ways in which we can determine how we should make changes. What is common to all of the approaches is the need to have a clear understanding as to the 'vision' established for the process. This can (and should) relate back as far as the strategic planning objectives for the high growth business. If it is not clear as to the purpose of the process review, e.g. faster response times to customer enquiries, then change can be brought about for no clear purpose.

Once the 'vision' for the process is established, then the new process can be based on principles such as:

- Improved performance measures.
- Less time.
- Less people.
- Better customer focus/more access channels.
- More consistency across departments/regions.
- Better management information.
- Less repetition.
- Sharpening of roles and responsibilities.
- More user friendly.
- Technology improvements.

The next section looks at some of the techniques that can be applied to processes to suggest changes.

Section 3 – Process Analysis

There are a number of techniques that can be used in a business to analysis the current situation. This section takes a look at some of the more common ones.

Subsection i) Pareto Analysis

Pareto Analysis is a useful statistical technique that can be used to analyse the information gleaned through the process mapping exercise.

It uses the Pareto Principle (also know as the 80/20 rule) the idea that by doing 20% of the work you can generate 80% of the benefit of doing the whole job. Or in terms of quality improvement, a large majority of problems (80%) are produced by a few key causes (20%). This is also known as the vital few and the trivial many.

In the late 1940s quality management guru Joseph M. Juran suggested the principle and named it after Italian economist Vilfredo Pareto, who observed that 80% of income in Italy went to 20% of the population. Pareto later carried out surveys on a number of other countries and found to his surprise that a similar distribution applied.

The 80/20 rule can be applied to almost anything:

- 80% of customer complaints arise from 20% of the products or services.
- 80% of delays in schedule arise from 20% of the possible causes of the delays.
- 20% of the products or services account for 80% of the profit.
- 20% of the sales-force produces 80% of the business revenues.
- 20% of a systems defects cause 80% of its problems.

A more detailed example could be in the area of stock control. In a larger company, their are frequently elaborate procedures for stock control with considerable paperwork flow. This is usually because the systems and procedures are geared to the most costly or fast-moving items. As a result, trivial parts may cost a firm more in paperwork than they cost to purchase or to produce. One answer is to split the stock into three types, usually called A, B and C.

Grade A items are the top 10 percent or so in money terms while grade C are the bottom 50-75 percent. Grade B are the items in between. It is often well worthwhile treating these three types of stock in a different way leading to considerable savings in money tied up in stock.

Production control can use the same principle by identifying these vital few processes, which control the manufacture, and then building the planning around these key processes. In quality control concentrating in particular on the most troublesome causes follows the principle. In management control, the principle is used by top management looking continually at certain key figures.

An example of how to carry out a simple pareto analysis exercise is shown on the template below.

Template 2 – Pareto Analysis Example

Difficulties associated with Pareto Analysis:

- Misrepresentation of the data.
- Inappropriate measurements depicted.
- Lack of understanding of how it should be applied to particular problems.
- Knowing when and how to use Pareto Analysis.
- Inaccurate plotting of cumulative percent data.

Overcoming the difficulties.

- Define the purpose of using the tool.
- Identify the most appropriate measurement parameters.
- Use check sheets to collect data for the likely major causes.
- Arrange the data in descending order of value and calculate % frequency and/or cost and cumulative percent.
- Plot the cumulative percent through the top right side of the first bar.
- Carefully scrutinise the results. Has the exercise clarified the situation?

Conclusion

Even in circumstances which do not strictly conform to the 80 : 20 rule, the method is an extremely useful way to identify the most critical aspects on which to concentrate. When used correctly Pareto Analysis is a powerful and effective tool for analysing why and how processes should be changed in a high growth business.

Further reading

Reynard S & Mann D ***"****Pareto Charts: Plain & Simple (Learning and Application Guide)****"*** Joiner Associates 1995

Subsection ii) Statistical Analysis

Statistics is the science of variation. Statistical analysis is concerned with gaining an understanding of variation and what causes it, with a view to exploiting it when we can and containing it when we have to.

Statistical analysis for the high growth business is concerned with problem solving and assisting decision making. This is achieved through the definition, production, analysis and interpretation of data in context. In simple terms, measuring and interpreting the 'right' things.

Statistical thinking involves a focus on processes, the recognition that all processes are subject to variation and that identifying, characterising, quantifying and reducing process variation are keys to business success.

The key to helping the high growth business is identifying measures which will provide the most suitable information for these purposes and working out easy ways to interpret this information.

An example of this is a simple normal distribution or 'bell' curve.

Diagram 10 – 'Bell' Distribution Curve

Manufacturing engineers try to set up processes with adequate capability to provide parts which are free of any problems. Hidden in this statement, however, is a statistical limitation, because every process has a variability with a statistical bell curve of a certain width (see diagram above).

This means that there will be some parts produced that will be beyond the acceptable specification limits, even if the mean value during production is right on the design value. The current buzzword in statistical circles concerning process capability is "Six Sigma" (Six Sigma is a registered trade mark of the Motorola Company). The techniques are described in a later part of the module.

Put simply, this means that the process engineers should strive to improve the process to achieve a capability which will make the bell curve of variability narrow enough such that 3σ (three process standard deviations) on each side of the mean will fit inside the specification limits of the part. Then, with the process centered, the fraction of nonconforming parts will be about one in a thousand on each end of the bell curve (usually one end is more detrimental than the other). Accomplishing 6σ is quite a feat inasmuch as manufacturing practice until recent years frequently operated on 2σ or 3σ capability, with sorting of output to eliminate nonconforming material. 6σ seems to be the ultimate goal for process capability excellence. 6σ is what statisticians strive for. It should be noted that 1 in 1000 nonconforming is not the same as unique. In ten million parts during ideal production, the result is about 10 000 ± 100 bad ones.

Whilst this might all seem a little sophisticated for a small high growth business, it is a good indication of the value of analyzing the right information at the right time. High growth companies need to get the best value back from their efforts.

Statistical analysis has become an essential tool in problem solving and process improvement and the high growth business should benefit from choosing an appropriate approach in this area.

Priorities for the Business are:

- Identifying what needs to be measured to solve problems/improve processes.
- Arranging to collect the information in a simple and accurate way.
- Using the appropriate techniques to identify key patterns, relationships and distributions.
- Quantifying uncertainty.
- Reporting of the results in an understandable way.
- Being able to use the results of the analysis to see what changes need to be made.

Further reading

Stuart M, *"An Introduction to Statistical Analysis for Business and Industry"* Hodder Arnold 2003

Section 4 – Managing Performance & Management by Objectives (MBO)

Subsection i) Managing Process Performance

The concept of the Balanced Scorecard has been introduced in other modules but is considered to be a good framework for developing the performance measures required in a high growth business and some of the key points regarding performance measures are reiterated here.

Diagram 11 - Kaplan & Norton's Balanced Scorecard

The scorecard produces a balance between:

- Four key business perspectives: financial, customer, internal processes and innovation.
- How the business sees itself and how others see it.
- The short term and the long term
- The situation at a moment in time and change over time

All of the perspectives can be relevant when looking at processes and considering how to monitor progress.

The four perspectives are:

- **The Financial Perspective** - how does the business look from the traditional money viewpoint?
- **The Customer Perspective** - how do the customers see the business?
- **The Internal Perspective** - how well does it manage its operational processes?
- **The Innovation and Learning Perspective** – can the business continue to improve and create value? This perspective also examines how a business learns and grows.

Each of the four perspectives can be used to identify high growth control issues and to plan strategies to remove uncertainty.

Financial Perspective Measures

Some of the most common KPI's that are incorporated in the financial perspective are:

- Market share
- Revenue growth
- Profit ratio
- Return on investment
- Economic value added
- Return on capital employed
- Operating cost management
- Operating ratios and loss ratios
- Corporate goals
- Survival
- Profitability
- Growth
- Increased return on assets

- Profit growth
- Measures
- Cash flow
- Net profitability ratio
- Sales revenue
- Growth in sales revenue
- Cost reduction
- ROCE
- Share price
- Return on shareholder funds
- Process cost savings

Customer Perspective Measures

Some of the common KPI's used in this area include;

- Customer satisfaction indices
- Level of repeat purchases
- Market share
- On time deliveries
- Number of complaints
- Average time to process orders
- Returned orders
- Response time
- Reliability
- New customer acquisitions
- Perceived value for money

Internal Perspective Measures

Some of the common KPI's used in this area include;

- Efficiency improvements
- Reduction in unit costs
- Reduced waste
- Improvements in morale
- Increase in capacity utilisation
- Increased productivity
- % defective output
- Amount of recycled waste
- Amount of reworking

Innovation & Learning Perspective Measures

Some of the common KPI's used in this area include:

- Numbers of new products
- % sales from new products
- Amount of training carried out and its effectiveness
- Number of strategic skills learned.

- Value of new product in sales
- R&D as % of sales
- Number of employee suggestions.
- Extent of employee empowerment

The Balanced Scorecard concept can be used in process measurement in most high growth businesses, the advantage being that it may have already been set up to audit the current situation generally and to measure overall performance.

There are many free templates available for download that can be used to develop and record appropriate measures for the scorecard. One example can be found on the Microsoft Office web resource. More complex free examples can be found with a quick internet search and there are many commercial packages available as well.

A simple and straightforward template is provided below for the high growth coach to use.

Template 3 - Balanced Scorecard Template

Further reading.

R.S. Kaplan and D.P. Norton. "The Balanced Scorecard - measures that drive performance". Harvard Business Review, January 1992

Douglas W. Hubbard "How to Measure Anything: Finding the Value of Intangibles in Business" John Wily & Sons, 2007

Subsection ii) Managing Process and People Performance

One aspect of managing processes is identifying the steps in the process, analysing the situation and adjusting things to be better. KPI's are established to give feed-back and decisions are made from the information received. In other words, the high business needs to be able to performance manage the process with an appropriate MIS. There is also a people side to performance management and it can be difficult to separate the two. For that reason, this section introduces and comments on some of the issues that affect both aspects.

There are a number of basic steps that any business needs to take to develop and implement an effective process (and by definition) a people performance management system. The emphasis should be on developing a strategy tailored to help the high growth business perform well which is not too complex for the benefits it delivers. It is really a question of measuring what is important initially, and building up the complexity of the measures at an appropriate rate.

You may well note an apparent lack of measures in some businesses, and while they are small, this may be compensated for by the knowledge of the owner/founder(s).

So, the most important steps that must be considered in business at the right time to manage processes and people performance are:

To develop the planning habit

The business and strategic planning must take account of what can realistically be delivered with the business resources available and consider the people management implications. Once the plans and priorities have been established these then need to be translated into service, team and individual performance plans. This is a highly skilled task that is critical for process and performance management to work well. If there are no plans, then what does the business measure progress against in a meaningful manner?

Establish what aspects of performance need to be measured (KPI's)

Any key performance indicators being used must be clearly communicated to the appropriate people, along with other measures being used to define performance. The focus should be on measuring what matters and trying to keep these measures to a reasonable number. The *'Controlling Growth & Managing Uncertainty'* module has a detailed section on developing KPI's in the various areas of the business and the previous section reminder on the Balanced Scorecard concept can be considered here.

The template of common KPI measures is reproduced below for information.

Template 4 – Common KPI measurement areas

Set up systems to monitor and evaluate

Systems need to be set up to ensure that processes and people performance can be monitored and evaluated on an ongoing basis to ensure that it is improving the 'vision' for the process e.g. product and/or service delivery. It is therefore essential that the performance management approach in particular, supports the business development and people management strategies, so that it helps rather than hinders progress. It really is easy here to get carried away with setting up systems that

get in the way of the high growth business continuing to grow. The other major issue here is the capability of the existing systems to be interrogated for information. Easy gains can be made here sometimes without major investment or disruption.

Tell people what is expected of them

During the early stages of the development of a high growth business, it is unlikely that individual employees will have had any form of competence assessment, appraisal or formal objective setting. It can be an exciting environment and people perform enthusiastically up to a point. The time comes when this informality will hinder rather than help the further development of the high growth business, but the matter needs to be handled sympathetically, e.g. the introduction of an appraisal system can be fraught with difficulty if not carefully implemented.

Telling people what is expected of them can be done through a combination of approaches such as the use of competences, policies and procedures. Whatever approaches are deemed appropriate, people should be given specific responsibilities for managing processes.

Agree specific performance and process objectives

As has already been noted in many of the other modules, any objective needs to be specific, measurable, agreed, realistic and time bound (SMART).
Strategic and business plans and priorities need to be translated into service, team and individual performance objectives and related to process.

Agreeing individual performance and employee development needs is normally carried out using a combined performance appraisal and staff development process (see comments above). This approach provides the framework for helping those responsible translate service and team plans into individual plans and objectives and agree how these will be met. There may be considerable mistrust of such a system based on previous bad experiences, but these can be overcome with a well planned introduction. Individual plans and objectives are most effective when both manager and employee agree them and coaches need to help the owner/founder(s) do this in an appropriate fashion.

Develop an internal communications system

This can be a major problem as a business expands. The early situation of everyone knowing everything tends not to last long and a strategy is required to keep pace with the growth.

To be effective, messages need to be communicated in a range of different ways to ensure that all employees receive the message and understand it. There is a wide range of different approaches that can be adopted to ensure employees are kept in contact with key performance and process issues e.g. staff briefings; meetings; lunch time seminars; use of an intranet; mini articles or stories in staff magazines; posters; bulletin boards; email alerts; line management and supervision meetings.

Ensure the performance appraisal system is in place, is well understood and working effectively

Despite all the previous warnings about timeliness and difficulty of implementation in a business, at some point an appraisal system becomes essential for continued and sustainable growth.

A performance appraisal system is used to set objectives, identify support needs and measure progress against objectives. For it to work effectively it needs to be clearly understood by both

appraisers and employees. This means ensuring that appraisers have access to guidance and training to ensure that they manage performance effectively throughout the year and employees at all levels within the business have the necessary support, guidance or training to enable them to actively engage in the performance appraisal process.

The performance appraisal system should also be regularly reviewed to ensure that it is achieving what is required.

Support employees to help them perform well

As growth continues in a business, it is easy for the employees to become overloaded and demoralised as the workload continues. People may have responsibility thrust upon then without preparation. Long working hours start to lose the attraction. A 'sink or swim' attitude can become prevalent and the owner/founder(s) can fail to appreciate what is happening. New starters fail to appreciate what is required of them from the start and may not become effective quickly.

Effective induction and probation processes for new employees are extremely important in high growth businesses, setting the right expectations for performance on both sides. If this early stage is managed well it may be possible to intervene to prevent or minimise individual capability issues later on. Feedback from this process may also highlight problems with job design or recruitment processes, which then need to be rectified.

Responsibility for meeting staff development needs to be addressed in the business. There is probably no dedicated HR function and often this aspect is paid lip-service as people are busy with the 'day' job. Whatever the approach, the high growth business needs an overview of its capability and how it plans to address any gaps that will hamper the achievement of its objectives. This strategic human resource management would normally be the responsibility of the HR function in a large company, but may have no proper home in the high growth company.

Developing employee capacity to deliver the high growth business objectives is likely to be achieved in a variety of ways. All employees, even those who have been in the same post for some time, should be encouraged to consider how they are performing and what else they could learn or do differently to deliver better services. In some cases these needs will be adequately met through attending training courses but there are many other possibilities, such as job shadowing, mentoring, e-learning, and working on projects or reading manuals. Wherever possible the employee should be given the opportunity to agree the most suitable option within the capability of the high growth company to make it happen.

Performance needs to be actively managed and monitored throughout the year. An essential part of this dialogue is the giving and receiving of feedback. For this to work effectively the organisational climate must encourage the sharing of both success and failure. Without this employees will be reluctant to comply and the quality of the feedback may be lacking. As well as managers, employees at all levels in the organisation may also need support, guidance or training to enable them to actively engage in the performance appraisal process.

Seek performance improvement

Of course, there will be circumstances where performance does not meet the required standard. At the business level, this will mean identifying what the barriers are to effective performance and putting in place a strategy to deliver improvement. At both team and individual level the principles will

be the same, but it may be more difficult to manage, as individual sensitivities and complexities may be at the fore.

Having in place a clear process for dealing with inadequate performance is important. However, it is essential that the process does not take over from the desired outcome, which is to seek performance improvement. Identifying the reason for inadequate performance is the first step. From this the business can determine further action, which may involve disciplinary procedures; additional training or support; monitoring and review mechanisms; redeployment; changing job roles or in some cases dismissal. It is also important that learning from these actions is taken on board, for example to improve future performance management mechanisms or selection methods.

Formal capability or disciplinary proceedings take time, effort and resources, which could otherwise be targeted at more positive interventions, such as recognising good performance. If performance management is embedded into day-to-day management practice it is likely that inadequate performance will be managed and improved before it gets this far. Good management counseling skills can keep the business out of the tribunal.

Recognise and reward good performance

This is the part that many companies overlook; instead they take good performance for granted and focus on those who have not met the standard. However, to retain motivation and continuously improve, it is essential that good performance is recognised and where appropriate, rewarded. Recognition and reward will mean different things to different people; for some financial reward in the form of pay rises or bonuses may be important, whereas for others recognition that their contribution has made a difference will be enough.

When determining what will be the most appropriate reward the owner/founder(s) will need to understand what motivates their workforce and how they can meet this need. Pay systems and processes will be important, but it will also be necessary to identify other reward mechanisms such as opportunities for development and career progression if possible. It must also be accepted that sometimes the business will be too small to keep some people. It is better to plan for this that to suddenly lose a key individual.

Recognising performance is also about sharing success stories across the high growth business and highlighting how good performance helps it as a whole.

Subsection iii) Management by Objectives

Management by Objectives (MBO) is a process of agreeing upon objectives within a business so that owner/founder(s) and employees of a business agree to the objectives and understand what they are. In relationship to process management and improving operations, it provides an unambiguous and SMART set of targets for all.

Management by Objectives as a term was first popularized by Peter Drucker in 1954 in his book 'The Practice of Management'.

Domains and levels

Objectives can be set in all domains of activities (production, services, sales, R&D, human resources, finance, information system...).

Some objectives are collective, for a whole department or the whole company, others can be individualised.

Rationale

It is all too easy for people to fail to outline, and agree with their employees, what it is that everyone is trying to achieve. MBO substitutes for good intentions a process that requires rather precise written description of objectives for the period ahead and timelines for their monitoring and achievement. The process requires that the owner/founder(s) and the employee agree to what the employee will attempt to achieve in the period ahead, and (importantly) that the employee accepts and agree to the objectives (otherwise commitment will be lacking).

For example, whatever else an owner/founder(s) and employee may discuss and agree in their regular discussions, let us suppose that they feel that it will be sensible to introduce a key performance indicator to show the development of sales revenue in a part of the firm. Then the manager and the employee need to discuss what is being planned, what the time-schedule is and what the indicator might or might not be. Thereafter the two of them should liaise to ensure that the objective is being attended to and will be delivered on time.

Businesses often have scarce resources and so it is vital for the owner/founder(s) to consider whether the objectives that are jointly agreed within the business are the right ones and represent the best allocation of effort.

Practice

MBO is often achieved using set targets. MBO introduced the SMART criteria: Objectives for MBO must be SMART (Specific, Measurable, Achievable, Realistic, and Time-Specific).
Objectives need quantifying and monitoring. Reliable Management information systems are needed to establish relevant objectives and monitor their "reach ratio" in an objective way.

Pay incentives (bonuses) are often linked to results in reaching the objectives.

Limitations

Care has to be taken to get the right balance in this area in the business. There is evidence to show that some employees can distort the situation be concentrating on aspects of the process that directly contribute towards a narrow performance measure. The overall situation must be considered and taken into account.

MBO can also be seen as 'de-humanising' and shares many of the criticisms leveled at Taylor's original concept of Scientific Management (described earlier).

Further Reading

Drucker P F, *"The Practice of Management"* Harper & Row 1954

Section 5 – Lean and other Business Improvement Concepts

Business Process Re-engineering is probably the most useful concept for a growth business. It looks at incremental gains and easy wins to sustain the growth successes of the past. In time, however, the high growth business may need to become increasingly sophisticated in terms of its approach to sustaining a competitive advantage in the areas of product manufacturing and the development of services.

For this reason, this section of the module describes some of the other major business improvement techniques pioneered by the Japanese after the Second World War. It is up to individuals to judge the relevance of the material for the circumstances that they are dealing with, selecting appropriate concepts to help the high growth business with (e.g. 5S as a starting point & described in the lean process template below).

Subsection i) Lean Manufacturing & The Toyota Production System (TPS)

This section explores some of the concepts around lean manufacturing principles that may apply to the business. Whilst the concept was originally developed around traditional manufacturing, the latest developments have been to apply the principles to service based industries.

Template 5 – Example Lean Implementation Programme

Lean manufacturing is a generic process management philosophy derived mostly from the Toyota Production System (TPS) but also from other sources. It is renowned for its focus on reduction of the original Toyota 'seven wastes' in order to improve overall customer value. Lean is often linked with Six Sigma because of that methodology's emphasis on reduction of process variation (or its converse smoothness) and Toyota's combined usage.

"Lean" is viewed by many as the latest management fad in the cost-reduction arena. It has for many the advantage of a very descriptive active name and has been, in many cases, used like any other cost-reduction approach. This has meant that the "Lean" word can be found in many places, projects and proposals.

For many, Lean is the set of TPS 'tools' that assist in the identification and steady elimination of waste (muda), the improvement of quality, and production time and cost reduction. The Japanese terms from Toyota are quite strongly represented in "Lean". To solve the problem of waste, Lean Manufacturing has several 'tools' at its disposal. These include continuous process improvement (kaizen), the "5 Whys" and mistake-proofing (poka-yoke). In this way it can be seen as taking a very similar approach to other improvement methodologies.

There is a second approach to Lean Manufacturing, which is promoted by Toyota, in which the focus is upon improving the 'flow' or smoothness of work (thereby steadily eliminating mura, unevenness) through the system and not upon 'waste reduction' per se. Techniques to improve flow include production leveling, "pull" production (by means of kanban and the Heijunka box). This is a fundamentally different approach to most improvement methodologies which may partially account for its lack of popularity.

The difference between these two approaches is not the goal but the prime approach to achieving it. The implementation of smooth flow exposes quality problems which already existed and thus waste reduction naturally happens as a consequence. The advantage claimed for this approach is that it

naturally takes a system-wide perspective whereas a 'waste' focus has this perspective, sometimes wrongly, assumed.

The TPS has two pillar concepts: Just In Time (flow) and autonomation (smart automation). Adherents of the Toyota approach would say that the smooth 'flow'ing delivery of 'value' achieves all these improvements as a side-effect. If production 'flows' perfectly then there is no inventory, if customer valued features are the only ones produced then product design is simplified and effort is only expended on features the customer values. The other of the two TPS pillars is the very human aspect of 'autonomation' whereby automation is achieved with a human touch. This aims to give the machines enough 'intelligence' to recognise when they are working abnormally and flag this for human attention. Thus humans do not have to monitor normal production and only have to focus on abnormal, or fault, conditions. A reduction in human workload that is probably much desired by all involved since it removes much routine and repetitive activity that humans often do not enjoy and where they are therefore not at their most effective.

Lean implementation is therefore focused on getting the right things, to the right place, at the right time, in the right quantity to achieve perfect work flow while minimizing waste and being flexible and able to change. These concepts of flexibility and change are principally required to allow production leveling, but have their analogues in other processes such as R&D. The flexibility and ability to change are not open-ended, and therefore often not expensive capability requirements. More importantly, all of these concepts have to be understood, appreciated, and embraced by the actual employees who build the products and therefore own the processes that deliver the value. The cultural and managerial aspects of Lean are just as, and possibly more, important than the actual tools or methodologies of production itself. There are many examples of Lean tool implementation without sustained benefit and these are often blamed on weak understanding of Lean in the organisation.

Types of waste

Whilst the elimination of waste may seem like a simple and clear subject it is noticeable that waste is often very conservatively identified. This then hugely reduces the potential of such an aim. The elimination of waste is the goal of Lean, Toyota defined three types of waste: muda or nonvalue-added work, muri or overburden and mura or unevenness.

To illustrate the state of this thinking Shigeo Shingo observed that it's only the last turn of a bolt that tightens it - the rest is just movement. This ever finer clarification of waste is key to establishing distinctions between value-adding activity, waste and non-value adding work. Non-value adding work is waste that must be done under the present work conditions. It is key to measure, or estimate, the size of these wastes in order to demonstrate the effect of the changes achieved and therefore the movement towards the goal.

The 'flow' (or smoothness) based approach aims to achieve JIT by removing the variation caused by work scheduling and thereby provide a driver, rationale or target and priorities for implementation, using a variety of techniques. The effort to achieve JIT exposes many quality problems that had been hidden by buffer stocks, by forcing smooth flow of only value-adding steps these problems become visible and must be dealt with explicitly.

Muri is all the unreasonable work that management imposes on workers and machines because of poor organisation, such as carrying heavy weights, moving things around, dangerous tasks, even working significantly faster than usual, etc. It is pushing a person or a machine beyond its natural limits. This may simply be asking a greater level of performance from a process than it can handle

without taking shortcuts and informally modifying decision criteria. Unreasonable work is almost always a cause of multiple variations.

The original seven muda 'deadly wastes' are:

- Overproduction (production ahead of demand)
- Transportation (moving products that is not actually required to perform the processing)
- Waiting (waiting for the next production step)
- Inventory (all components, work-in-progress and finished product not being processed)
- Motion (people or equipment moving or walking more than is required to perform the processing)
- Over Processing (due to poor tool or product design creating activity)
- Defects (the effort involved in inspecting for and fixing defects)

Lean implementation

Lean is about more than just cutting costs in the factory. One crucial insight is that most costs are assigned when a product is designed. Often an engineer will specify familiar, safe materials and processes rather than inexpensive, efficient ones. This reduces project risk, that is, the cost to the engineer, while increasing financial risks, and decreasing profits. Good organisations develop and review checklists to review product designs.

Companies must often look beyond the shop-floor to find opportunities for improving overall company cost and performance. At the system engineering level, requirements are reviewed with marketing and customer representatives to eliminate costly requirements. Shared modules may be developed, such as multipurpose power-supplies or shared mechanical components or fasteners. Requirements are assigned to the cheapest discipline. For example, adjustments may be moved into software, and measurements away from a mechanical solution to an electronic solution. Another approach is to choose connection or power-transport methods that are cheap or that used standardised components that become available in a competitive market.

Lean Leadership

The role of the leaders within the organisation is the fundamental element of sustaining the progress of lean thinking. Experienced kaizen members at Toyota, for example, often bring up the concept of "Senpai, Kohai," and "Sensei," because they strongly feel that transferring of Toyota culture down and across the Toyota can only happen when more experienced Toyota Sensei continuously coach and guide the less experienced lean champions. Unfortunately, most lean practitioners outside of Japan focus on the tools and methodologies of lean, versus the philosophy and culture of lean.

One of the dislocative effects of Lean is in the area of KPIs (Key Process Indicators). The KPIs by which a plant/facility are judged will often be driving behaviour by leadership within it, e.g. Production against forecast, because the KPIs themselves assume a particular approach to the work being done.

Lean services

Lean, as a concept or brand, has captured the imagination of many in different spheres of activity. Examples of these from many sectors are listed below.

A study conducted on behalf of the Scottish Executive, by Warwick University, in 2005/06 found that Lean methods were applicable to the public sector, but that most results had been achieved using a much more restricted range of techniques than Lean provides.

The challenge in moving Lean to services is the lack of widely available reference implementations to allow people to see how it can work and the impact it does have. This makes it more difficult to build the level of belief seen as necessary for strong implementation. It is also the case that the manufacturing examples of 'techniques' or 'tools' need to be 'translated' into a service context which has not yet received the level of work or publicity that would give starting points for implementers. The upshot of this is that each implementation often 'feels its way' along as must the early industrial engineers of Toyota. This places huge importance upon sponsorship to encourage and protect these experimental developments. On the positive side there are many examples in service industries accessible through the Lean Enterprise Academy (car servicing, hospital admissions, administrative processes etc) of Lean delivering important results. At this time, however, they are not well publicised.

Subsection ii) Kaizen

Kaizen, Japanese for "change for the better" or "improvement"; (the English translation is "continuous improvement" or "continual improvement").

Kaizen aims to eliminate waste (defined as "activities that add cost but do not add value"). It is often the case that this means "to take it apart and put back together in a better way." This is then followed by standardization of this 'better way' with others, through standardized work.

Kaizen is a daily activity whose purpose goes beyond simple productivity improvement. It is also a process that, when done correctly, humanizes the workplace, eliminates overly hard work (both mental and physical) "muri", and teaches people how to perform experiments on their work using the scientific method and how to learn to spot and eliminate waste in business processes.

To be most effective Kaizen must operate with three principles in place:

- consider the process and the results (not results-only);
- systemic thinking of the whole process and not just that immediately in view (i.e. big picture, not solely the narrow view); and
- a learning, non-judgmental, non-blaming (because blaming is wasteful) approach and intent.

People at all levels of an organisation participate in kaizen, from the CEO down, as well as external stakeholders when applicable. The format for kaizen can be individual, suggestion system, small group, or large group. In Toyota it is usually a local improvement within a workstation or local area and involves a small group in improving their own work environment and productivity. This group is often guided through the Kaizen process by a line supervisor, indeed, sometimes this is the line supervisor's key role.

Whilst Kaizen (in Toyota) usually delivers small improvements, the culture of continual aligned small improvements and standardisation yields large results in the form of compound productivity improvement. Hence the English translation of Kaizen can be: "continuous improvement", or "continual improvement."

This philosophy differs from the "command-and-control" improvement programs of the mid-twentieth century. Kaizen methodology includes making changes and monitoring results, then adjusting. Large-scale pre-planning and extensive project scheduling are replaced by smaller experiments, which can be rapidly adapted as new improvements are suggested.

The Toyota Production System is known for kaizen, where all line personnel are expected to stop their moving production line in case of any abnormality and, along with their supervisor, suggest an improvement to resolve the abnormality which may initiate a kaizen.

Subsection iii) Six Sigma

Six Sigma is a set of practices originally developed by Motorola to systematically improve processes by eliminating defects. A defect is defined as nonconformity of a product or service to its specifications.

While the particulars of the methodology were originally formulated by Bill Smith at Motorola in 1986, Six Sigma was heavily inspired by six preceding decades of quality improvement methodologies such as quality control, TQM, and Zero Defects.

Like its predecessors, Six Sigma asserts the following:

- Continuous efforts to reduce variation in process outputs is key to business success
- Manufacturing and business processes can be measured, analyzed, improved and controlled
- Succeeding at achieving sustained quality improvement requires commitment from the entire organization, particularly from top-level management

The term "Six Sigma" refers to the ability of highly capable processes to produce output within specification. In particular, processes that operate with six sigma quality produce at defect levels below 3.4 defects per (one) million opportunities (DPMO). Six Sigma's implicit goal is to improve all processes to that level of quality or better.

Methodology

Six Sigma has two key methodologies: DMAIC and DMADV, both inspired by W. Edwards Deming's Plan-Do-Check-Act Cycle: DMAIC is used to improve an existing business process, and DMADV is used to create new product or process designs for predictable, defect-free performance.

DMAIC

Basic methodology consists of the following five steps:

- *Define* the process improvement goals that are consistent with customer demands and enterprise strategy.
- *Measure* the current process and collect relevant data for future comparison.
- *Analyse* to verify relationship and causality of factors. Determine what the relationship is, and attempt to ensure that all factors have been considered.
- *Improve* or optimize the process based upon the analysis using techniques like Design of Experiments.
- *Control* to ensure that any variances are corrected before they result in defects. Set up pilot runs to establish process capability, transition to production and thereafter continuously measure the process and institute control mechanisms.

DMADV

Basic methodology consists of the following five steps:

- *Define* the goals of the design activity that are consistent with customer demands and enterprise strategy.
- *Measure* and identify CTQs (critical to qualities), product capabilities, production process capability, and risk assessments.
- *Analyse* to develop and design alternatives, create high-level design and evaluate design capability to select the best design.
- *Design* details, optimize the design, and plan for design verification. This phase may require simulations.
- *Verify* the design, set up pilot runs, implement production process and handover to process owners.

Some people have used DMAICR (*Realise*). Others contend that focusing on the financial gains realized through Six Sigma is counter-productive and that said financial gains are simply byproducts of a good process improvement.

Statistics and robustness

The core of the Six Sigma methodology is a data-driven, systematic approach to problem solving, with a focus on customer impact. Statistical tools and analysis are often useful in the process. However, it is a mistake to view the core of the Six Sigma methodology as statistics; an acceptable Six Sigma project can be started with only rudimentary statistical tools.
Still, some professional statisticians criticize Six Sigma because practitioners have highly varied levels of understanding of the statistics involved.
Six Sigma as a problem-solving approach has traditionally been used in fields such as business, engineering, and production processes.

Implementation roles

One of the key innovations of Six Sigma is the professionalizing of quality management functions. Prior to Six Sigma, Quality Management in practice was largely relegated to the production floor and to statisticians in a separate quality department. Six Sigma borrows martial arts ranking terminology to define a hierarchy (and career path) that cuts across all business functions and a promotion path straight into the executive suite.
Six Sigma identifies several key roles for its successful implementation.

Executive Leadership includes CEO and other key top management team members. They are responsible for setting up a vision for Six Sigma implementation. They also empower the other role holders with the freedom and resources to explore new ideas for breakthrough improvements.

Champions are responsible for the Six Sigma implementation across the organization in an integrated manner. The Executive Leadership draws them from the upper management. Champions also act as mentors to Black Belts. At GE this level of certification is now called "Quality Leader".

Master Black Belts, identified by champions, act as in-house expert coaches for the organization on Six Sigma. They devote 100% of their time to Six Sigma. They assist champions and guide Black Belts

and Green Belts. Apart from the usual rigor of statistics, their time is spent on ensuring integrated deployment of Six Sigma across various functions and departments.

Experts This level of skill is used primarily within Aerospace and Defense Business Sectors. Experts work across company boundaries, improving services, processes, and products for their suppliers, their entire campuses, and for their customers. Raytheon Incorporated was one of the first companies to introduce Experts to their organizations. At Raytheon, Experts work not only across multiple sites, but across business divisions, incorporating lessons learned throughout the company.

Black Belts operate under Master Black Belts to apply Six Sigma methodology to specific projects. They devote 100% of their time to Six Sigma. They primarily focus on Six Sigma project execution, whereas Champions and Master Black Belts focus on identifying projects/functions for Six Sigma.

Green Belts are the employees who take up Six Sigma implementation along with their other job responsibilities. They operate under the guidance of Black Belts and support them in achieving the overall results.

Yellow Belts are employees who have been trained in Six Sigma techniques as part of a corporate-wide initiative, but have not completed a Six Sigma project and are not expected to actively engage in quality improvement activities.
In many recent programs, Green Belts and Black Belts are empowered to initiate, expand, and lead projects in their area of responsibility.

Subsection iv) Poka-yoke

Poka-yoke - pronounced "POH-kah YOH-keh", means "fail-safing" or "mistake-proofing" — avoiding (yokeru) inadvertent errors (poka)) is a behavior-shaping constraint, or a method of preventing errors by putting limits on how an operation can be performed in order to force the correct completion of the operation. The concept was originated by Shigeo Shingo as part of the Toyota Production System. Originally described as Baka-yoke, but as this means "fool-proofing" (or "idiot proofing") the name was changed to the milder Poka-yoke.

An example of this in general experience is the inability to remove a car key from the ignition switch of an automobile if the automatic transmission is not first put in the "Park" position, so that the driver cannot leave the car in an unsafe parking condition where the wheels are not locked against movement. In the IT world another example can be found in a normal 3.5" floppy disk: the top-right corner is shaped in a certain way so that the disk cannot be inserted upside-down. In the manufacturing world an example might be that the jig for holding pieces for processing only allows pieces to be held in one orientation, or has switches on the jig to detect whether a hole has been previously cut or not, or it might count the number of spot welds created to ensure that, say, four have been executed by the operator.

Implementation

Shigeo Shingo recognises three types of Poka-Yoke:

- The contact method identifies defects by whether or not contact is established between the device and the product. Colour detection and other product property techniques are considered extensions of this.

- The fixed-value method determines whether a given number of movements have been made.

- The motion-step method determines whether the prescribed steps or motions of the process have been followed.

Poka-yoke either give warnings or can prevent, or control, the wrong action. It is suggested that the choice between these two should be made based on the behaviours in the process, occasional errors may warrant warnings whereas frequent errors, or those impossible to correct, may warrant a control poka-yoke.

Subsection v) Kanban

Kanban maintains inventory levels; a signal is sent to produce and deliver a new shipment as material is consumed. These signals are tracked through the replenishment cycle and bring extraordinary visibility to suppliers and buyers.

Kanban is a concept related to Lean or Just In Time (JIT) production, but these two concepts are not the same. (The Japanese word "kanban" is a common everyday term meaning "signboard" or "billboard" and utterly lacks the specialized meaning which this loanword has acquired in English.) According to Taiichi Ohno, the man credited with developing JIT, kanban is a means through which JIT is achieved.

Kanban is a signaling system. As its name suggests, Kanban historically uses cards to signal the need for an item. However, other devices such as plastic markers (Kanban squares) or balls (often golf balls) or an empty part-transport trolley can also be used to trigger the movement, production, or supply of a unit in a factory.

It was out of a need to maintain the level of improvements that the kanban system was devised by Toyota. Kanban became an effective tool to support the running of the production system as a whole. In addition, it proved to be an excellent way for promoting improvements because restricting the number of kanban in circulation highlighted problem areas.

Origins

The term kanban describes an embellished wooden or metal sign which has often been reduced to become a trade mark or seal. Since the 17th century, this expression in the Japanese mercantile system has been as important to the merchants of Japan as military banners have been to the samurai. Visual puns, calligraphy and ingenious shapes, or Kanban, define the trade and class of a business or tradesman. Often produced within rigid Confucian restrictions on size and color, the signs and seals are masterpieces of logo and symbol design. For example, a sumo wrestler, symbol of strength, may be used as kanban on a pharmacy sign to advertise a treatment for anemia.

In the late 1940s Toyota was studying US supermarkets with a view to applying some of their management techniques to their work. This interest came about because in a supermarket the customer can get what is needed at the time needed in the amount needed. The supermarket only stocks what it believes it will sell and the customer only takes what they need because their supply is assured. This led Toyota to view earlier processes, to that in focus, as a kind of store. The process goes to this store to get its needed components and the store then replenishes those components. It is the rate of this replenishment which is controlled by kanban which give permission to produce. In 1953 Toyota applied this logic in their main plant machine shop.

Implementation

With this in mind, it is not surprising that an important determinant of the relative merits of "push" and "pull" production scheduling is the quality of the demand forecast. Kanban is a pull system that determines the supply, or production, according to the actual demand of the customers. In contexts where demand is difficult to forecast the best one can do is to quickly respond to observed demand. This is exactly what a kanban system does, it acts as a demand signal which immediately propagates through the entire chain. "Push" systems often encounter serious difficulties when demand forecasts turn out to be inaccurate. Where the response cannot be quick enough, e.g. significant lost

sales/downstream production, then stock building may be appropriate by issuing more kanban. Taiichi Ohno states that kanban must follow strict rules of use.

Toyota have six simple rules, and that close monitoring of these rules is a never ending problem to ensure that kanban does what is required.

A simple example of the Kanban system implementation might be a "three bin system" for the brought out parts (where there is no in-house manufacturing) -- one bin on the factory floor, one bin in the factory store and one bin at the suppliers' store. The bins usually have a removable card that contains the product details and other relevant information -- the Kanban card. When the bin on the shop floor is empty, the bin and Kanban card are returned to the store. The store then replaces the bin on the factory floor with a full bin which also contains a Kanban card. The store then contacts the supplier and returns the now empty bin with its Kanban card. The suppliers inbound product bin with its Kanban card is then delivered into the factory store completing the final step to the system. Thus the process will never run out of product and could also be described as a "loop", providing the exact amount required, with only "one" spare so there will never be an issue of "over-supply". This 'spare' bin allows for the uncertainty in supply, use and transport that are inherent in the system. The secret to a good Kanban system is to calculate how many Kanban cards are required for each product. Most factories using kanban use the coloured board system (Heijunka Box). This consists of a board created especially for the purpose of holding the Kanban cards.

Another example of kanban thinking: in the production of a widget, the operator has two shelves, one on either side of their workplace. The raw materials can be designated to arrive on one shelf and the finished articles placed on the other. These shelves can then be designated to act as kanbans. The outgoing kanban signals the customer's need so that when it is empty, the operator must produce one more widget.

The Kanban is sized so that it can only hold a fixed number of items decided by the customer needs (usually one). When the operator begins work, he takes the raw material from the incoming kanban, which when seen by the supplier, signals that the customer needs one more.

Further reading

Imai, Masaaki *"Kaizen: The Key to Japan's Competitive Success"* McGraw-Hill/Irwin 1986

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Womack & Jones, *"Lean Thinking*" Free Press 2003

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Ohno, Taiichi, *"Toyota Production System: Beyond Large-Scale Production"* Productivity Press 1988

Section 6 – Knowledge Management

Subsection i) Introduction to Knowledge Management

The purpose of this final section of the module is to explore the concept of knowledge management in the world of a growth business.

Most of the content of the 'Improving Operations' module has focused on 'knowing what we know' and analysing this information to look at improving processes. There are difficulties in gathering information at times. Systems may not exist or may not be capable of producing the right information at the right time. But putting this on one side, the data exists and generallly we can help the high growth business to get at it.

Knowledge is defined by Davenport & Prusak (Working Knowledge)as follows:

"Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knower's. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms."

In the context of a growth business, data is analysed and turned into information and then human judgment and experience turns the information into Knowledge.

Diagram 12 – Data to Information to Knowledge

To make matters more complex, Nancy Dixon identifies two distinct types of knowledge that she called tacit and explicit.

Explicit knowledge is the easier to understand and manage. It is easy to write down or pass on to someone else. A typical example would be a set of instructions for operating a machine or a diagram of component assemby. Many of the processes within a buisness will be run on the basis of explicit knowledge.

Tacit knowledge is a more difficult thing to manage. It relies hughly on talent or experience, how do you explain how to play a guitar or write a best selling book to someone who has no artistic or literary flair?

Knowledge walks. People leave and take what they know with them. People cannot be ordered to share what they know. Tacit knowledge relies on cereating the right circustances for people to willingly talk, show and transfer their knowledge to others.

In small companies, this willingness to share and to communicate is often high. It is as the growth continues that the active management of knowledge becomes more and more important.

Dixon identified 5 different knowledge transfer types and it is useful to look at the issues for high growth companies in each of the five areas.

A decision tree showing how to identify the type of knowledge poetentially being transferred is shown in the template below.

Template 6 – Knowledge Transfer Decision Tree

Subsection ii) Serial Transfer

This is when a small team does the same task or process in one setting, and what they learn has to be transferred to the next time that the team does the task in a different setting e.g. a boiler installation team. *The type of knowledge is generally tacit and explicit.*

It is common in this situation that the team members won't take the time to meet and review what happens each time that they do the task.

Guidelines for the useful transfer of knowledge are:

- Making sure meetings achieve something of value
- Making sure team members are aware of the outcome (e.g. an improvement in performance)
- Encouraging team to design own internal measures of improvement, which are not necessarily reported outside the group

If team members do not contribute to meetings

- Encourage all team members to contribute by
- Using a standardized format for questions
- E.g. (1) What was supposed to happen?
- What happened?
- What accounts for the difference?
- Have a team member (someone familiar with the process) act as facilitator
- Have a "no recriminations policy" and encourage truth telling
- Do not publish minutes outside the group

Team members disperse before the end of the project

- If the same team does not do the next project together, then the techniques for serial transfer may need to be supplemented with those for other types of transfer
- For lengthy projects, hold meetings at regular intervals
- Invite team members who have moved on to other projects

Subsection iii) Near Transfer

This is where one team doing a task is transferred to other teams doing the same task. This can be in the same building or on the other side of the country e.g. two production facilities making the same product wanting to share what they learn with each other. Often an electronic means of knowledge transfer is simply installed and people expected to use it. *The type of knowledge is generally explicit.*

If people won't use knowledge made available to them electronically on a "database"

- Make sure a "business driver" is present (something that gives benefit to the user and encourages them to access the system) e.g. a need to reduce time and/or costs
- Make sure the knowledge is relevant to the "business driver"
- Use face-to-face meetings to enable contributors to the database to get to know one another

- Have a means of monitoring usage of the knowledge, and the effects of using it
- Designate people responsible for inputting and retrieving knowledge from the "database"

People won't use ideas invented by someone else

- Identify and build on informal knowledge sharing that is already happening
- Who is already sharing information?
- What information are they sharing?
- Why are they sharing it?
- Those already sharing knowledge may be best placed to expand the informal system

People don't have time to share

- Check that there is sufficient similarity between source and receiving teams to enable brevity
- If brevity is not possible, then the knowledge is probably not explicit. Therefore techniques for other types of transfer may need to be employed

Subsection iv) Far Transfer

Far transfer is all about the most difficult type of knowledge – tacit knowledge. Far transfer is not a regular feature in most businesses. A good example would be a brainstorm session on process mapping or re-engineering a process. *The type of knowledge is almost always tacit.*

How do we get tacit knowledge out of people's heads?

- Don't try to write tacit knowledge down
- Move people around so that they can interact with others to transfer their tacit knowledge
- Technology is less useful for tacit knowledge

People won't ask for help

- In any organization there are some people who call on each other for help
- Start with those people who are already interested and involved
- Far Transfer can work even if only a small percentage of people share knowledge
- Introduce some formality into existing knowledge sharing, to make it easier for those people who are interested to share knowledge
- It will then become easier for others to participate
- Give the knowledge-sharing procedure formal backing by giving it a name (e.g. BP use "Peer Assist" for the process of gathering experts to make decisions on drilling new wells).

Subsection v) Strategic Transfer

Strategic transfer is probably rare in a high growth business and is markedly different to the other four types. This is where knowledge is being gathered and recorded *in case it is needed again.* An example may be lessons learnt from a merger with or acquisition of another company, or the lessons learnt during a consultation process for strategic planning. The decision to carry out strategic transfer is a senior one and the process must be driven from the top. *The type of knowledge is tacit and explicit.*

It's too expensive to have knowledge specialists

- "Borrow" people on a temporary basis from elsewhere in the organization
- Dedicating people to the task may appear expensive, but it highlights the organization's interest in knowledge sharing
- Strategic transfer does require some people dedicated to the task
- Only engage in strategic transfer when it is critical to the businesses' future
- Use other, less costly and more effective knowledge transfer methods for other types of knowledge transfer

People will not want to conform to company-imposed "best practice"

- Emphasize that knowledge sharing is about bringing people and their ideas together, not about imposing practices
- Allow knowledge products to contain multiple options based on various ideas brought by knowledge specialists

Subsection vi) Expert Transfer

This is a straightforward type of transfer characterised by a team needing technical help from another team or group of experts. It is one of the few forms of knowledge transfer that is positively helped by technology and a classic example would be a forum or blog on the internet. *The type of knowledge is explicit.*

Our technology is not sophisticated enough to connect people

- Make sure software is compatible
- If there is incompatibility, start the system with those people who do have compatible software, and extend it later
- Use a help-line or an "intermediary" as an interim measure, if people cannot connect to one another directly

Our people aren't computer literate

- Make sure people have the hardware and software
- Train people to use the technology

Further reading

Dixon N, *"Common Knowledge"* Harvard Business School Press 2000

Davenport T & Prusak L, *"Working Knowledge"* Harvard Business School Press 1998

Diagram 1 – A Simple Process 'A Cup of Tea'

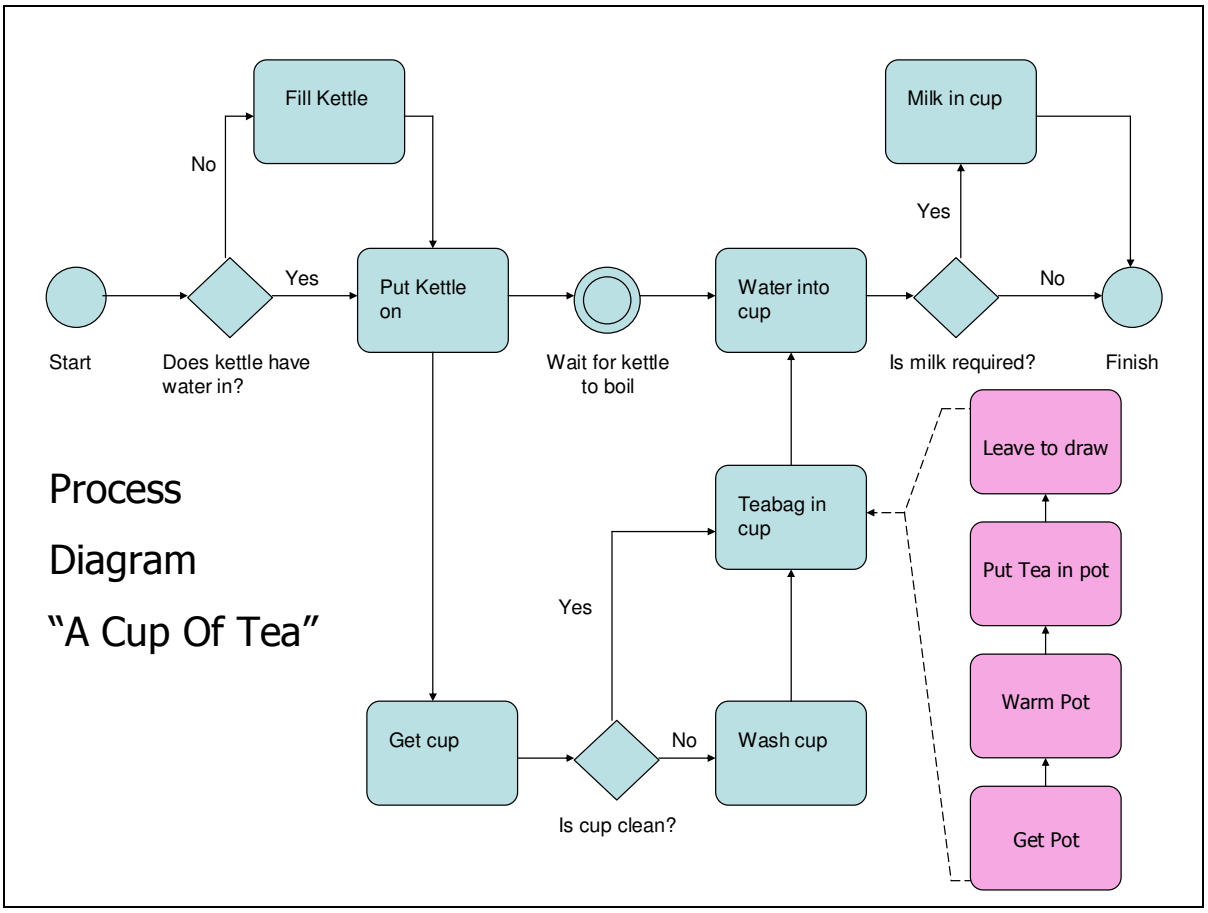


Diagram 2 – Components & Processes from the PRINCE 2 methodology

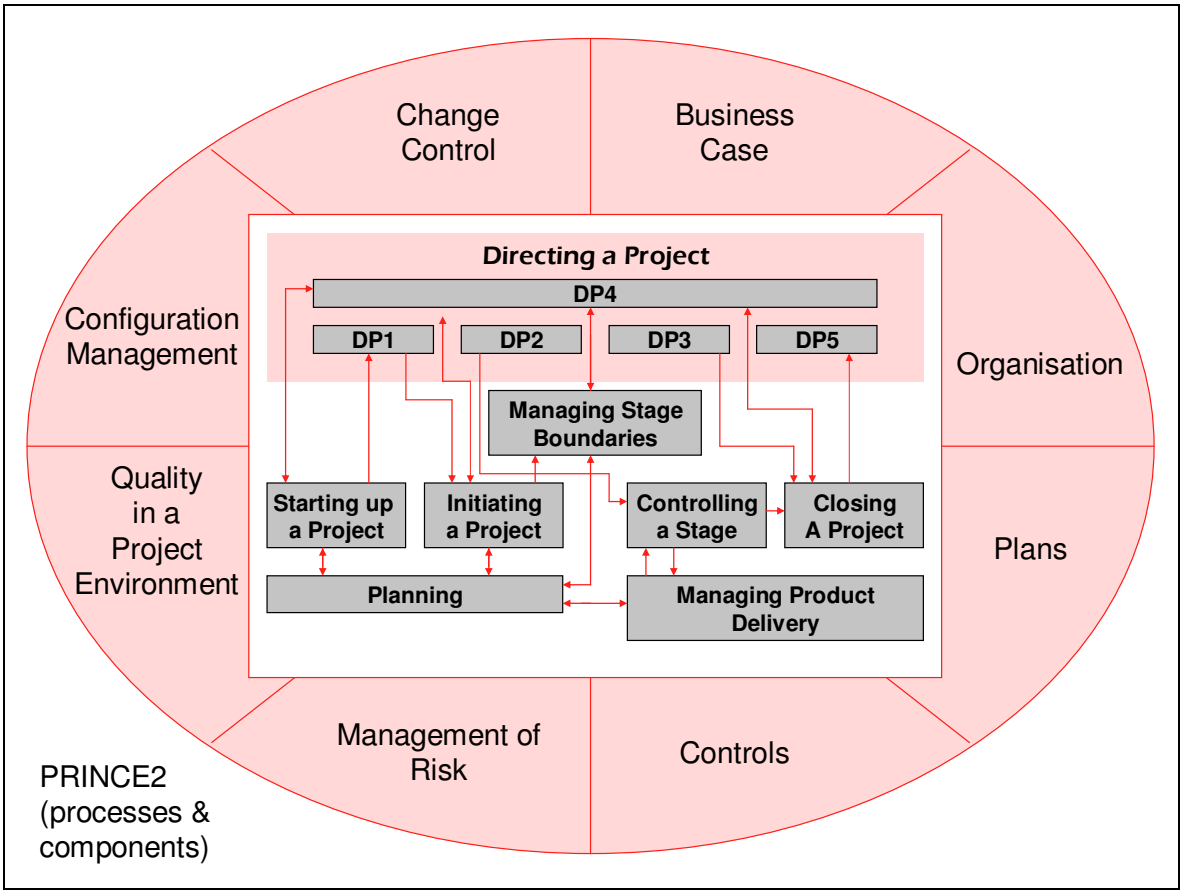


Diagram 3 – PRINCE 2 Breakdown of the Starting a Project process

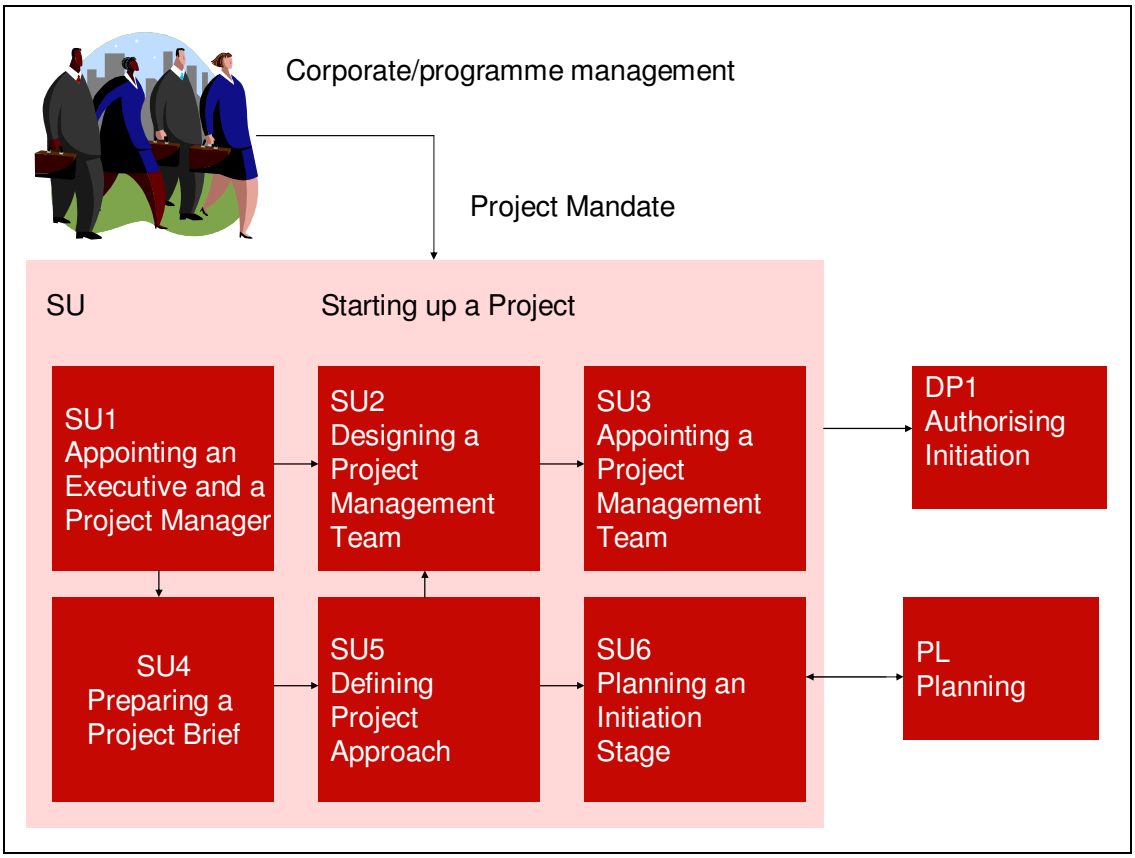


Diagram 4 – Activity Overview Chart Example

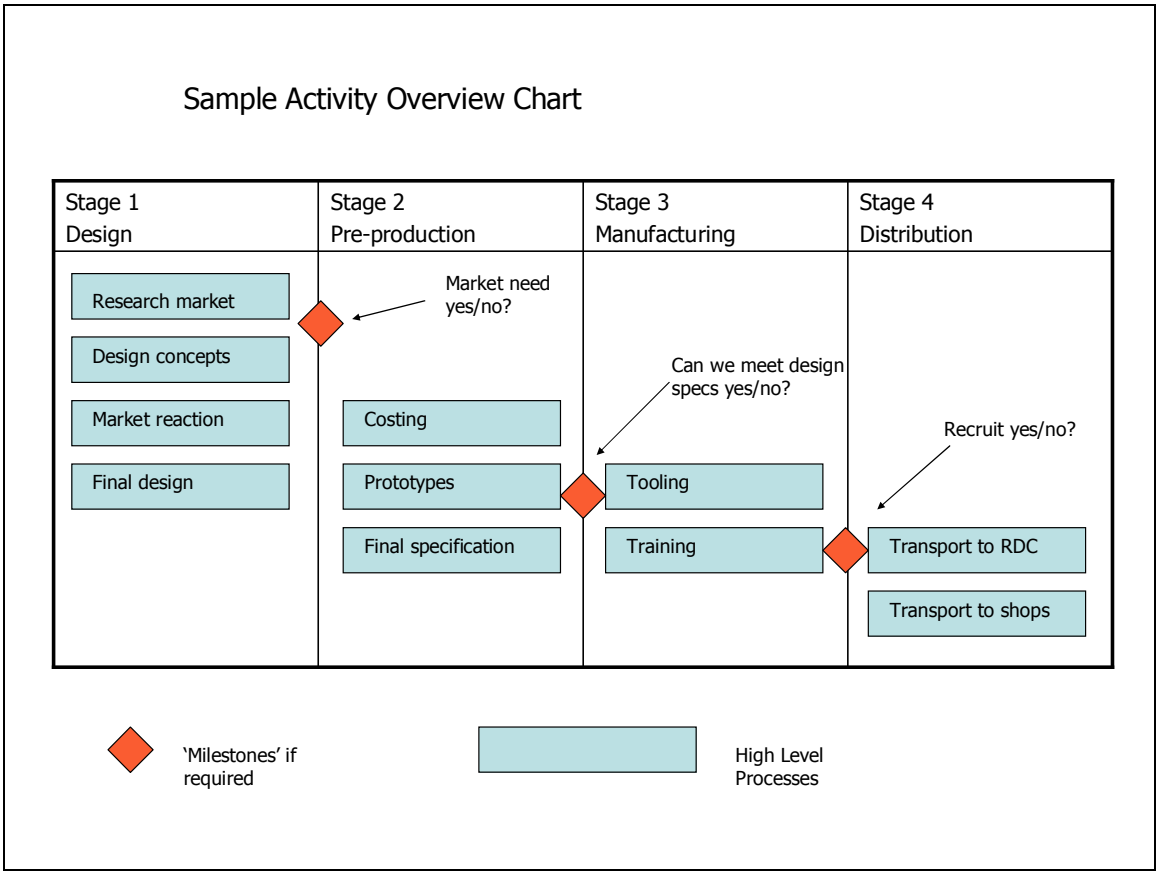


Diagram 5 – An Engineering Process Map

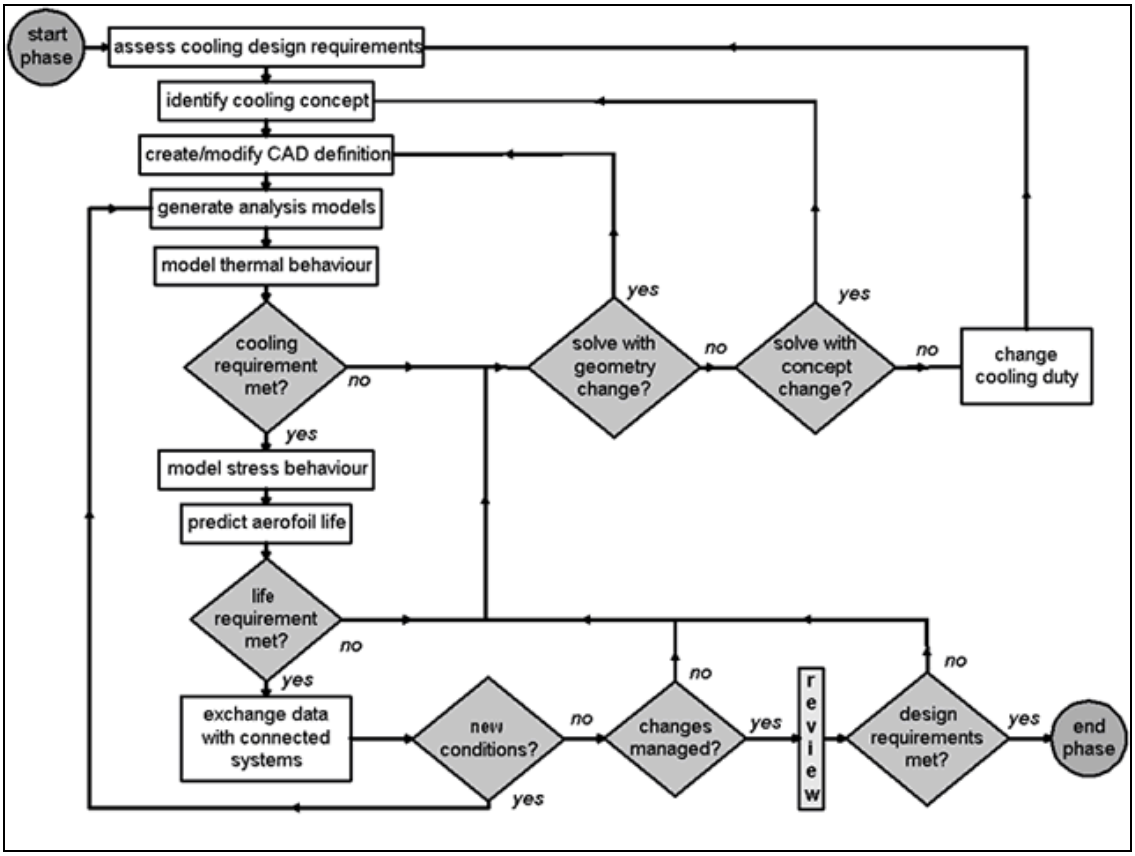


Diagram 6 – Swim Lane Process Map

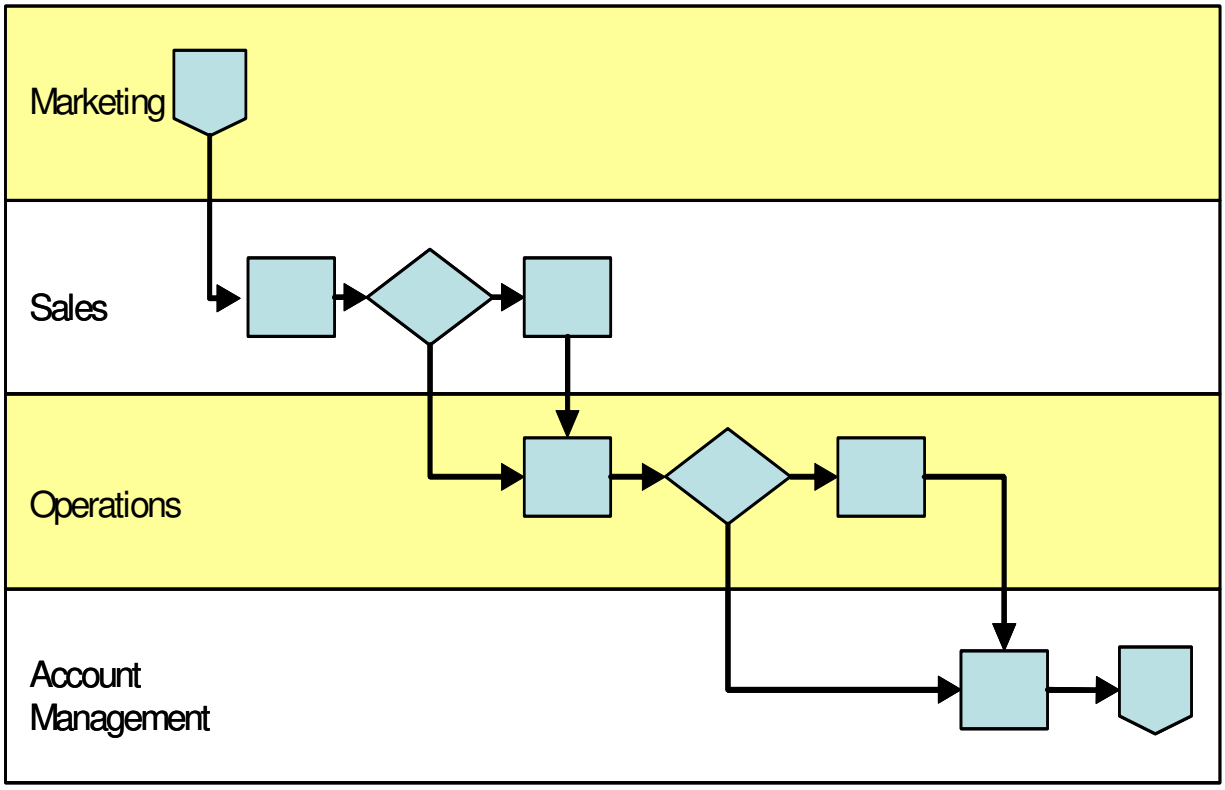


Diagram 7 – Milestone Map Example

Milestone Map Example

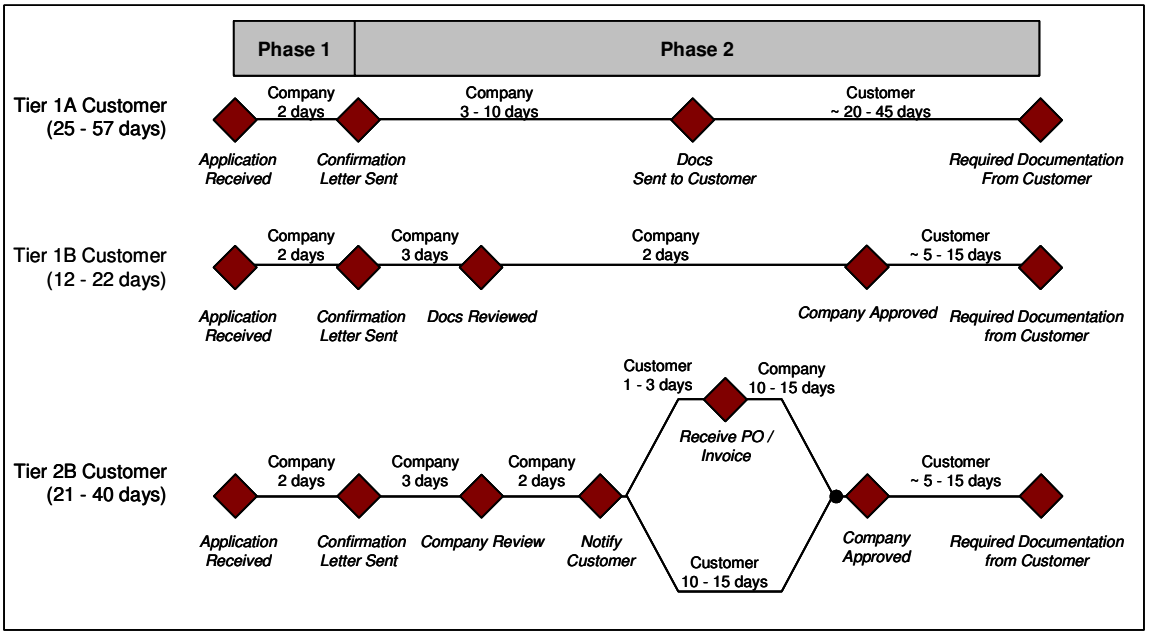


Diagram 8 – Levels of Process Mapping

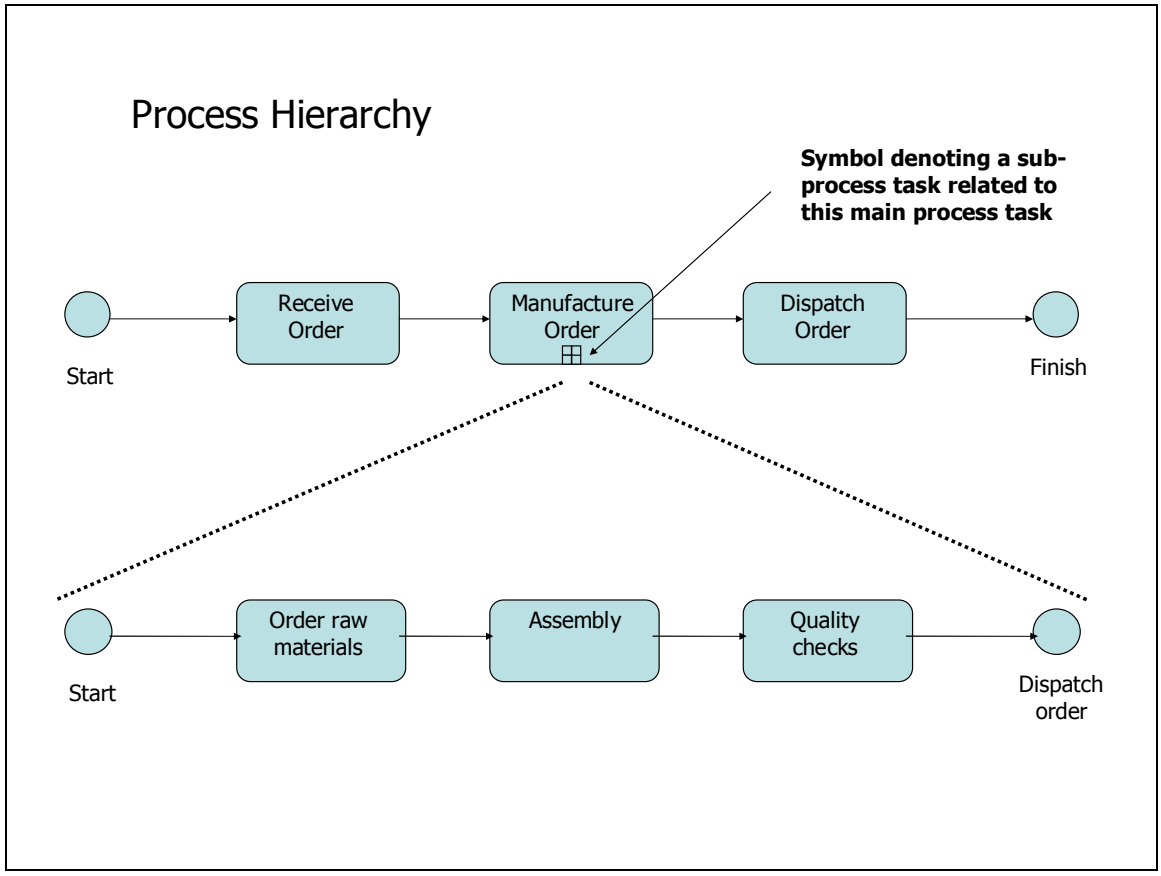


Diagram 9 – Purpose of Calls to a Finance Department

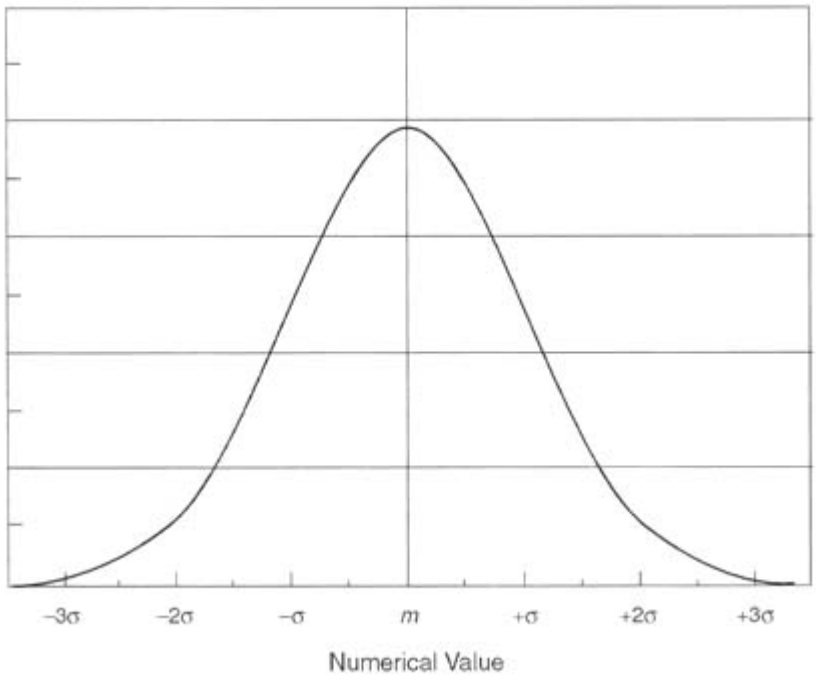
Reason for call

		Visit		Call		Post		All	
I am Moving	V	20	15%	173	19%	261	31%	454	24%
Here is the information which you asked for	F	27	21%	19	2%	308	37%	354	19%
I want to pay	V	12	9%	137	15%	12	1%	161	9%
I want to make a payment arrangement	V	14	11%	75	8%	30	4%	119	6%
The number of people living in my house has changed	V	2	2%	20	2%	16	2%	38	2%
Someone has died	V	3	2%	10	1%	20	2%	33	2%
I've changed my name	V	1	1%	8	1%	3	0%	12	1%
You have not done what I asked	F	3	2%	30	3%	6	1%	39	2%
I don't understand	F	19	15%	206	22%	9	1%	234	12%
You have made a mistake/Something has gone wrong	F	6	5%	89	10%	25	3%	120	6%
Something else has changed	V	9	7%	34	4%	106	13%	149	8%
I have contacted the wrong person	F	15	11%	116	13%	45	5%	176	9%
		131		917		841		1889	

51% of calls add value to the process

49% of calls are 'waste'

Diagram 10 – 'Bell' or Normal Distribution Curve



A bell curve plotting the numerical values in a population versus the number of times the value occurs, with indications for the standard deviation σ locations along the curve. In this, m is the mean for the population, with σ ± from m including 68% of the data, σ2± from m including 95% if the data and σ3± from m including 99.8% of the data.

Diagram 11 - Kaplan & Norton's Balanced Scorecard

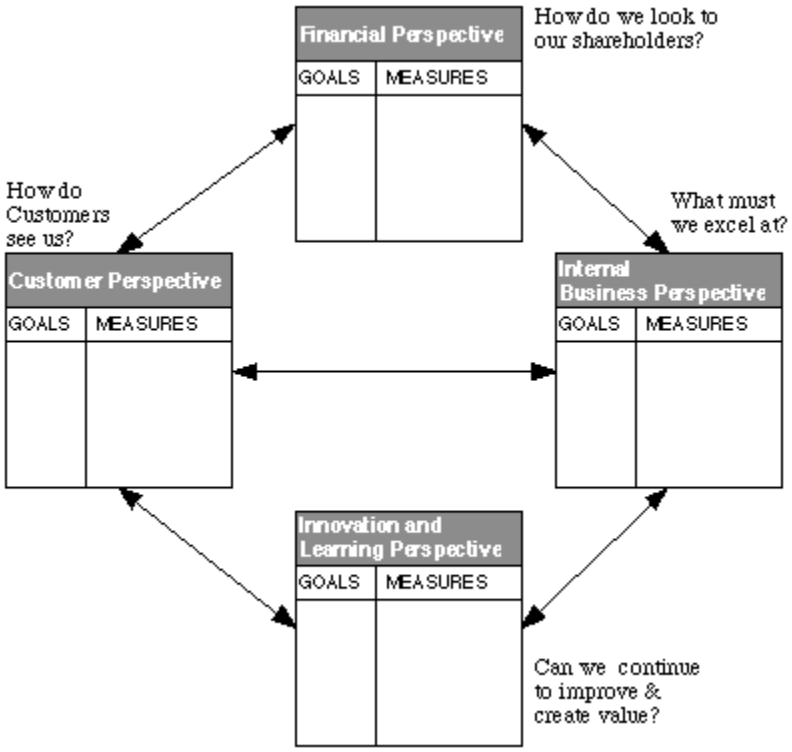
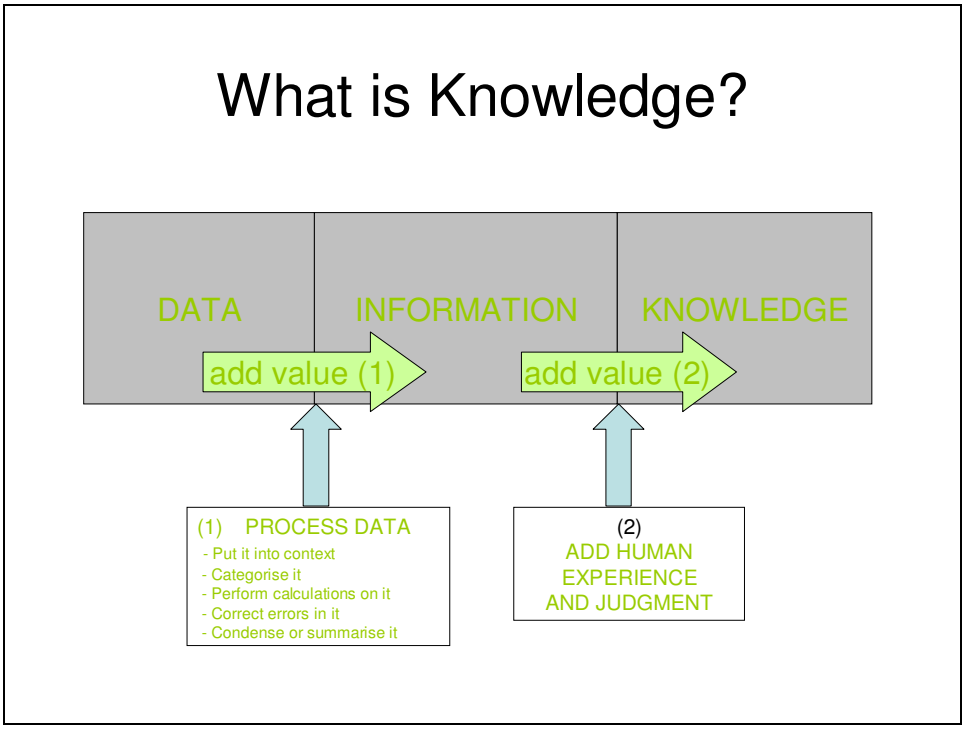


Diagram 12 – Data to Information to Knowledge

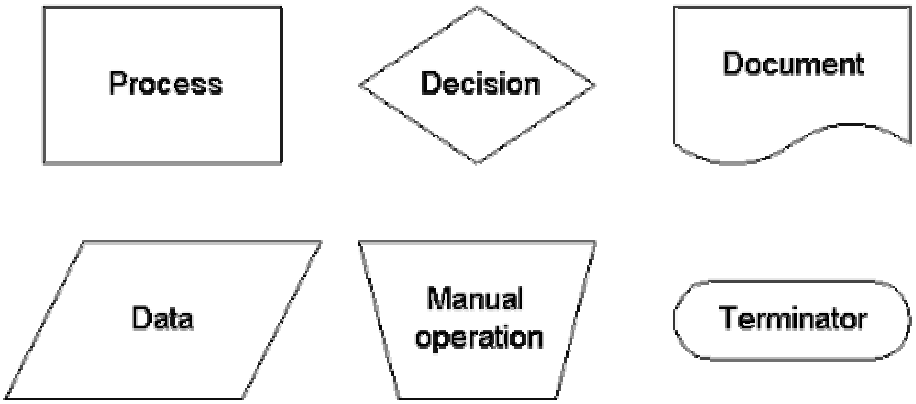


Template 1 – ANSI Flow Chart symbols

A flow chart is defined as a pictorial representation describing a process being studied or even used to plan stages of a project. Flow charts tend to provide people with a common language or reference point when dealing with a project or process.

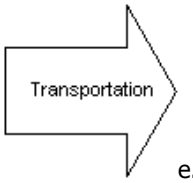
When dealing with a process flow chart, two separate stages of the process should be considered: the overall picture of producing a finished product and a detailed breakdown of each process.

The basic flow chart symbols below are used when analyzing the whole picture.



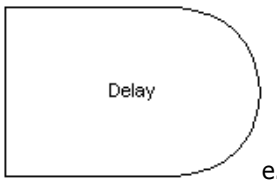
The next level of detail is to look at each process within the overall picture. The ANSI standard symbols used most often for this purpose include the following:

e.g. Weld, glue, type, sew.



e.g. Ship, move by hand, truck.

e.g. Bin, Rack, Pallet, File, Save.



e.g. conveyor, cure, set.

e.g. gauge, proof read, , or check quality.

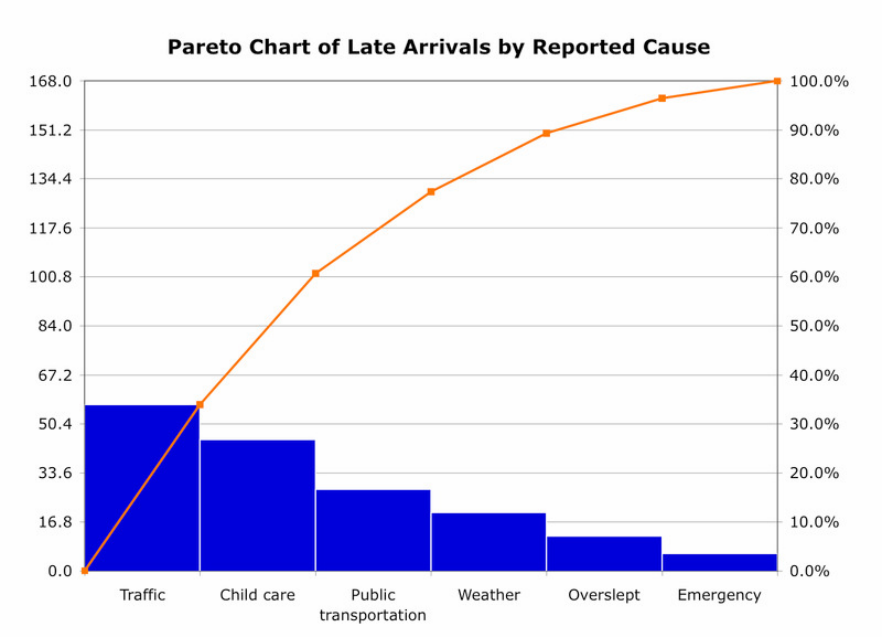
e.g. Combination shows a joint process.

Template 2 – Pareto Analysis Example

Pareto Analysis

There are seven steps to identifying the important causes of problems using Pareto Analysis:

1. Form a table listing the causes and their frequency as a percentage.
2. Arrange the rows in the decreasing order of importance of the causes, i.e. the most important cause first (in this example the most important cause is traffic).
3. Add a cumulative percentage column to the table.
4. Plot with causes on x-axis and cumulative percentage on y-axis.
5. Join the above points to form a curve.
6. Plot (on the same graph) a bar graph with causes on x-axis and percent frequency on y-axis.
7. Draw a line at 80% on y-axis parallel to x-axis. Then drop the line at the point of intersection with the curve on x-axis. This point on the x-axis separates the important causes on the left and less important causes on the right.



This is a simple example of a Pareto diagram using sample data showing the reported cause of late arrival at work. It clearly indicates what 20% of cases are causing 80% of the problems and where efforts should be focused to achieve the greatest improvement.

Template 3 - Balanced Scorecard Template

Balanced Scorecard Perspective	Main Objective(s)	Key Measure(s)	Target(s)	Overall Initiative(s)
Financial How are we perceived by our shareholders? What is the strategy for growth, profitability, and risk viewed from the perspective of the shareholder?				
Customer How do our customers perceive us? What is the strategy for creating value and differentiation from the perspective of the customer?				
Internal At what processes must we excel? What are the strategic priorities for various business processes, which create customer and shareholder satisfaction?				
Learning and Innovation How do we sustain our ability to be innovative and to change? What are the priorities to create a climate that supports business change, innovation, and growth?				

Template 4 – Common KPI measurement areas

- Productivity: Employee output or products/services (units/sales/pound), the uptime levels and how employees use their time (sales-to-assets ratio, sales revenue from new customers, forward sales orders, new prospects etc).

- Quality: The ability to meet and/or exceed the requirements and expectations of the customer (satisfaction surveys, direct feedback/indirect feedback (customer complaints, returns, production measures such as faults per batch etc).

- Profitability: The traditional measures of the overall effectiveness of the management organisation in generating profits (profit contribution by segment/customer, margin spreads etc).

- Timeliness: The points in time (day/week/ month) when management and employee tasks are completed (on-time delivery, percent of late orders).

- Process Efficiency: Measures how effectively the management organisation incorporates quality control, BPR, lean manufacture, kaizen etc, and streamlining operational processes (yield percentage, process uptime, and capacity utilisation).

- Cycle Time: The duration of time (hours/days/months) required by employees to complete tasks (processing time, time to service customer).

- Resource Utilisation: Measures how effectively the management organisation leverages existing business resources such as assets, bricks and mortar, investments (sales per total assets, sales per channel, win rate).

- Cost Savings: How successfully the management organisation achieves economies of scale and scope of work with its people, staff and practices to control operational and overhead costs (cost per unit, inventory turns, cost of goods etc).

- Growth: The ability of the management organisation to maintain competitive economic position in the growth of the economy and industry (market share, customer acquisition/retention, account penetration etc).

- Innovation: The capability of the business to develop new products, processes and services to penetrate new markets and customer segments (new patents, new product rollouts, R&D spend).

- Technology: How effectively the IT organisation develops, implements and maintains information management infrastructure and applications (IT capital spending, CRM technologies implemented, Web-enabled access etc).

Template 5 – Example Lean Implementation Programme

- Senior management to agree and discuss their lean vision
- Management brainstorm to identify project leader and set objectives
- Communicate plan and vision to the workforce
- Ask for volunteers to form the Lean Implementation team (5-7 works best, all from different departments)
- Appoint members of the Lean Manufacturing Implementation Team
- Train the Implementation Team in the various lean tools - make a point of trying to visit other non competing businesses which have implemented lean
- Select a Pilot Project – 5S is a good place to start (see below)
- Run the pilot for 2-3 months - evaluate, review and learn from your mistakes
- Roll out pilot to other factory areas
- Evaluate results, encourage feedback
- Stabilize the positive results by teaching supervisors how to train the new standards you've developed with TWI methodology (Training Within Industry)
- Once you are satisfied that you have a habitual program, consider introducing the next lean tool. Select the one which will give you the biggest return for your business.
- With a muri or flow based approach
- Sort out as many of the visible quality problems as you can, as well as downtime and other instability problems, and get the internal scrap acknowledged and its management started.
- make the flow of parts through the system/process as continuous as possible using workcells and market locations where necessary and avoiding variations in the operators work cycle
- introduce standard work and stabilise the work pace through the system
- start pulling work through the system, look at the production scheduling and move towards daily orders with kanban cards
- even out the production flow by reducing batch sizes, increase delivery frequency internally and if possible externally, level internal demand
- improve exposed quality issues using the tools
- remove some people and go through this work again

5S

Often in the west, alternative terms are used for the five S's. These are "Sort, Straighten, Shine, Systemize and Sustain". "Standardize" is also used as an alternative for "Systemize". Sometimes "Safety" is included as 6th S. Similarly 5Cs aim at same goal but without the strength of maintaining the 5S name.

Clear-out and Classify
Clearing items no longer required
Tagging items that may be required and storing away from workplace

Configure
A specific place for specific items
" A place for everything & everything in its place"

Clean and check
Identify cleaning zones, establish cleaning routines
Conformity

Custom and practice
Monitor process adherence

Continually validate process
customer satisfaction by doing scientific training to workers
continually focus on man, machine, materials & method

Template 6 – Knowledge Transfer Decision Tree