Managing Project Quality

Project Skills

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MANAGING PROJECT QUALITY

PROJECT SKILLS

Managing Project Quality: Project Skills
1st edition

ISBN 978-87-403-1273-7

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PREFACE

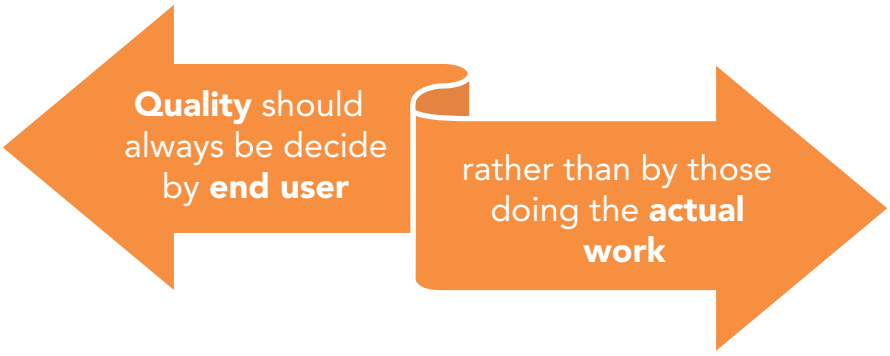
This eBook describes the process managing project quality. Every organization has its own predefined quality policies, and it is the responsibility of the project manager to translate these processes into project activities.

You will learn:

- Why quality management is treated as a distinct area.
- How to identify quality requirements and set standards.
- How to perform quality assurance.
- How to monitor and control quality.
- How to tell when a project is out of control.
- How to plan for the testing and auditing of project quality.

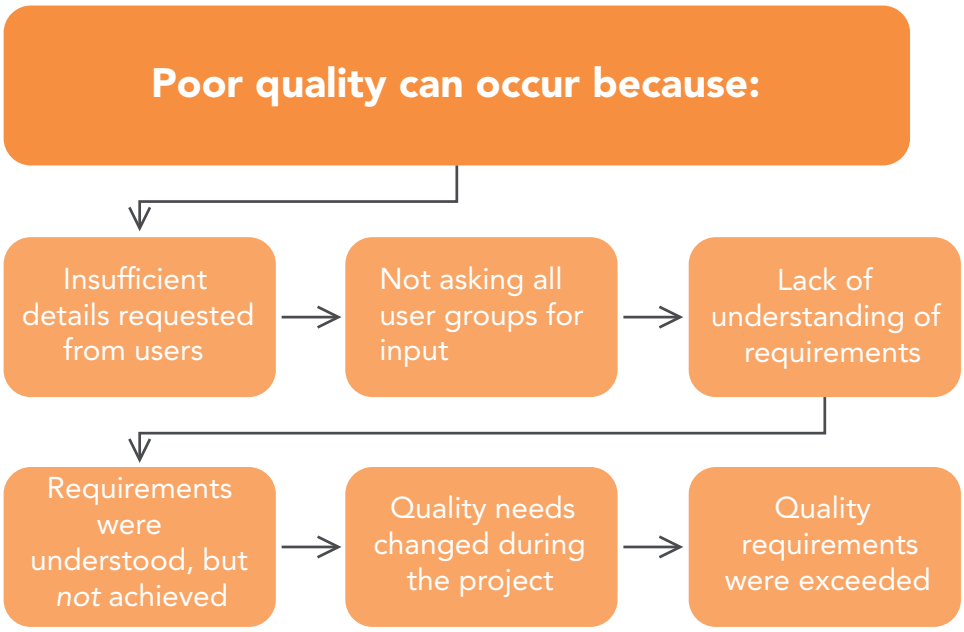
1 INTRODUCTION

There is an old saying that goes "If something is worth doing, it is worth doing right." That is certainly the case when undertaking any kind of a project within your organization. There is little point to taking on a new project, only to complete it to a low standard of quality that will not reflect well on you or your organization.



In order to have pride in what you have accomplished, and for it to benefit the organization in the long run, the quality needs to be up to the standards of everything else that you do.

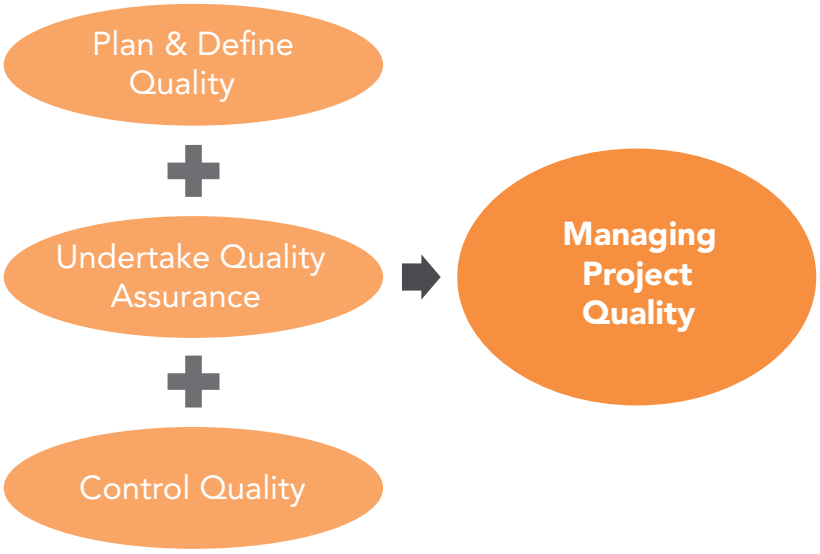
Project quality management is the process of establishing a level of expected quality at the start of a project, and then maintaining that quality throughout until the project has been completed. There are several areas that are often at the root of poor quality and are shown in the diagram below.



It might be easiest to think of this concept in terms of an example – such as a new product that you organization is trying to produce. Rather than simply aiming to produce a product that can accomplish a given task, you may set out to create a product that can accomplish that task while also meeting various other measures of quality. Things like durability, materials used, methods of construction, and more can all be ways that the quality is measured.

Organizations who are serious about not only present profits but also future growth take quality control very seriously. Everything that goes onto market representing your brand name is going to be seen as a reflection of the company as a whole. Even one or two sub-standard products can harm the reputation of an otherwise outstanding brand name.

There are three stages a project manager must go through to manage project quality properly as shown in the diagram.



Planning Quality Management

Before the project gets underway, it is best to analyze the level of quality that you intend to put into a given product. It isn't good enough just to say that you wish to make the product to 'as high of a standard as possible'. Quality is forever linked to cost, and so you must take your project budget into consideration as part of this planning process. Certainly you would use the best possible materials available if you can afford them, but the product must be cost-effective to be of any use to the organization.

The process of planning quality can be complex because it has to balance the interests of overall quality with the reality of a budget and is an essential part of project communication throughout the project life cycle.

One of the important parts of this stage of the process is outlining exactly how quality is going to be measured during the project.

1) Are there certain tests that can be done along the way?
2) What are industry standards for this kind of product, and how are you intending to compare to them?

Being specific with what exactly will define quality for your project goes a long way toward making the next steps in project quality management easier and more effective.

Performing Quality Assurance

Now that your quality plan is in place, the next step is outlining how you are successfully going to meet that plan and put it into action. The methods that you intend to use during the project itself need to align with the quality goals that have been outlined previously.

Toward this end, experience can be greatly beneficial to understanding what kind of processes lead to quality results. If you have people within your organization who have done this kind of work before and can offer direction in terms of quality assurance, it is greatly important to use that knowledge to your advantage.

You don't want to be making quality assurance adjustments 'on the fly'. Every bit of time that is put into a project is directly associated with a cost, so wasting time is only going to increase the overall expense of the project in the end.

Rather than having to scramble mid-project to make quality adjustments, putting a structured, independent review as part of your project quality assurance is essential. These quality audits will determine the 'fit' of project activities to the policies of project and its organization.

Controlling Quality

This is what happens once the project is underway. All of the great planning that has already been done won't do you any good if it isn't adhered to closely along the way. Quality control might be the most important piece of the whole project quality management puzzle because correcting any problems as soon as possible will save you wasted time and money down the line.

Testing is probably going to be the biggest piece of quality control for most organizations. There are a variety of tools and techniques that can be used to monitor and control quality of work packages and activities throughout the project. This includes such tools as:

- Prioritization matrices
- PDPC
- Tree diagrams
- Interrelationship digraphs
- Affinity diagrams
- Matrix diagrams
- Activity Network Diagrams

If you are developing a new product that you intend to take to market at the completion of the project, it should be tested throughout to make sure it is tracking properly with the guidelines that you have set up. If the tests of the product aren't meeting your expectations, you will know that something needs to be fixed or improved in order to improve quality.

In many ways, the longevity of your organization may be determined by how well you handle project quality management for each new initiative that is undertaken. Organizations that routinely produce low-quality goods are rarely in business for long, even if they are trying to compete at a low price point.

Quality wins out in the end more often than not, so project quality management is a piece of the puzzle that shouldn't be left out. Like all other pieces of project management, it starts will thorough preparation before the project is even underway.

Laying out the quality expectations for the project, as well as the methods that should allow those expectations to be met, is one of the first priorities of any new project. The plan for quality must be in line with the budget for the project, plus the skills and equipment are in place to make it happen, good quality control should be the only thing standing between you and a satisfactory result.

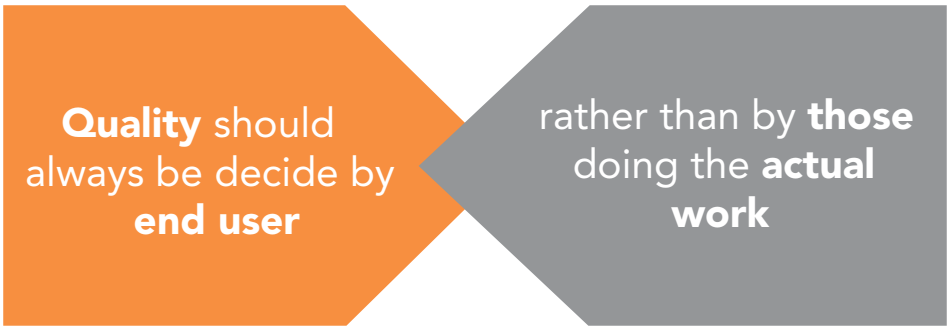
MANAGING PROJECT QUALITY

2 MANAGING PROJECT QUALITY

Quality management includes the processes and activities of the performing organization that determine quality policies, objectives, and responsibilities so that the project will satisfy the needs for which it was undertaken.

It implements the quality management system through policy and procedures with continuous process improvement activities conducted throughout, as appropriate. Quality management, like every other aspect of the project management, should be proactive. Limiting the quality management to detecting defects is reactive. You should plan the quality and prepare an environment that does not create defects, instead of finding and repairing defects.

Many people who are new to project management find it strange that quality is treated as a separate area. Surely, quality should be present in every aspect of the project. This way of thinking begs the question, why is quality treated as something that can be managed separately? To answer this, we need to define exactly what we mean by 'quality' and who gets to decide what this definition is.



In some situations a quality standard might be obvious, for example a computer system used by customer service staff must be able to deal with peak loads. In this case, a quality standard could specify that when one hundred staff are inputting data at the same time, the system response time must still be less than two seconds.

However quality is not always quite so easy to define; consider the design of the computer interface to capture customer data.

> *The software engineer responsible for the design might consider conformance to industry standards to be a sign of quality.*
> *The user might consider it more important that the design matches the interfaces that they already use.*

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In this example, it is more important that the users will be able to work more efficiently than that the design conforms to some theoretical external standard. In fact, it should always be the end user who decides what counts as quality rather than the people doing the work. Although this can be complicated when a project has a number of users who have different priorities.

In the example we have been using, it may be important for customer service staff who deal with billing to see a summary of the past two years of payment history on the 'home' screen whereas staff who deal with complaints might prefer to see the complaint history. Focusing too much on one group of users may compromise the others and leave them dissatisfied. This illustrates one reason why a system to manage quality is required.

MANAGING PROJECT QUALITY

There are six possible reasons why quality standards might not be met despite everyone on the project team doing their best to deliver the project as specified.

1. The users were not asked to specify their requirements in sufficient detail
2. Not all of the user groups were asked
3. The requirements were not understood
4. They were understood but could not be achieved
5. The quality requirements changed during the project
6. The quality requirements were exceeded

The first five points are easily understandable, but the last one needs some explanation. If quality requirements have been exceeded then someone somewhere has done more work than has been planned for in that part of the project.

This work needs to be paid for, in either time or money and this has not been budgeted for. Because there is a lag when comparing actual progress against planned progress and for money actually spent against the budget, this is not usually obvious at the time.

The result of exceeding the quality plan is that sooner or later either more money needs to found or the scope of the project needs to be reduced. Neither of these things is acceptable.

MANAGING PROJECT QUALITY

The purpose of quality management is to make sure that the project meets the needs for which it was created. To do this it needs to take account of the reasons above why it might not. It needs to ensure that:

1. Users are asked to specify their requirements in sufficient detail
2. Requirements are fully documented
3. All stakeholders agree to them
4. There is a recognized process to deal with any changes
5. There is a process for monitoring and controlling quality

Modern quality management complements project management and both disciplines recognize the importance of:

Customer Satisfaction

This involves understanding, evaluating, defining, and managing expectations so that customer requirements are met. This requires a combination of conformance to requirements, to ensure the project produces what it was created to produce, and fitness for use (the product or service must satisfy real needs).

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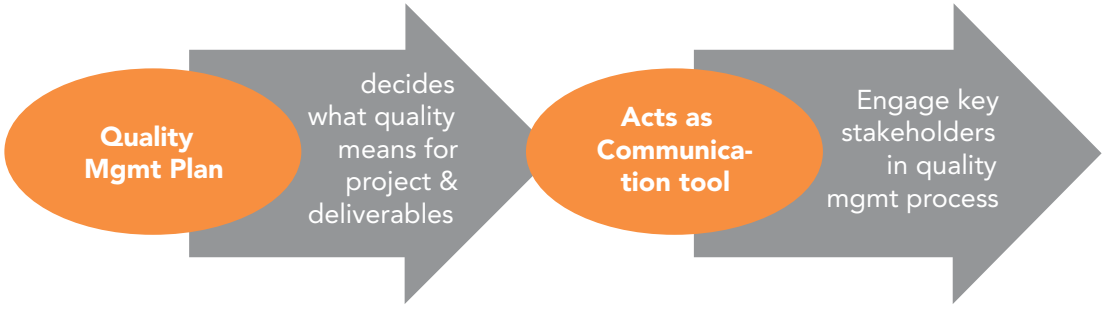
Prevention Over Inspection
One of the fundamental tenets of modern quality management states that quality is planned, designed, and built in rather than inspected in. The cost of preventing mistakes is generally much less than the cost of correcting them when they are found by inspection.

Continuous Improvement
The plan-do-check-act cycle is the basis for quality improvement. This is described in detail in the 'Project Management Processes' eBook, which can be downloaded free from this website.

Management Responsibility
Success requires the participation of all members of the project team, but remains the responsibility of management to provide the resources needed to succeed.

You will need to decide what quality means for this particular project and its deliverables. This information makes up the quality plan, which is part of the project plan. Planning for quality is no different from planning for any other task.



It aims to produce a description of what the quality requirements are and how they are going to be achieved. As well as providing a definition of quality the quality plan also acts as a communication tool to engage key stakeholders in the quality management process. You can check out the complete range of project management eBooks free from our website.

A quality plan can be as simple or as detailed as warranted by the project. The plan below is short and simple but it makes it clear to everyone on the project what is expected in terms of quality. In practice, quality planning is inseparable from general planning because quality criteria are required as part of the product descriptions. That is, they need to be thought about when a deliverable is being specified rather than 'added on' afterwards.

MANAGING PROJECT QUALITY

Imagine a project to produce a brochure for a new Smartphone. One of the selling points of this new Smartphone model is that it is extremely rugged. The photographs in the brochure need to show the phone being used in various outdoor environments like construction sites and oil rigs. The quality criteria for these photographs might specify that the phone must be clearly identifiable in each photo with the brand name visible.

In another project, one of the final deliverables is a hand held device for scanning barcodes. Quality criteria for this physical product would include things like operational distances from the object being scanned, light levels, acceptable error rates, etc.

Quality criteria should always be used to define the characteristics of a product in terms that are quantifiable and measurable. The criteria effectively define 'quality' and are used as a benchmark against which to measure the finished product.

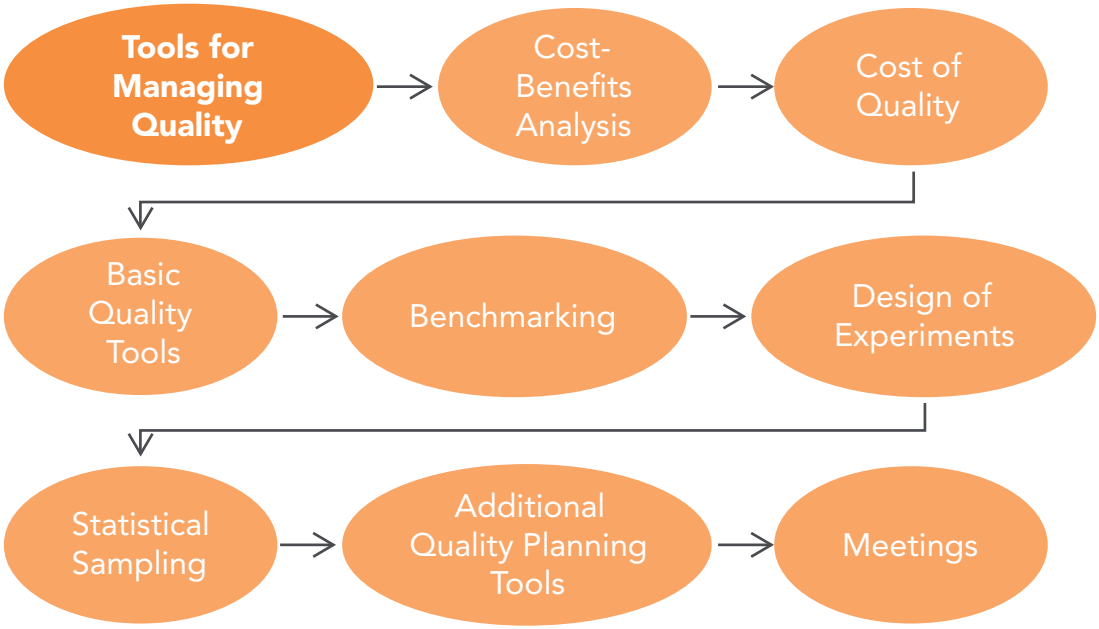
They should be detailed in the related product description and should be established by considering what the important characteristics of a product are in satisfying the need that it addresses. The quality criteria of a project should always be stated objectively, subjective statements like 'quick response' or 'maintainable' are unsatisfactory because they can't be measured.

Key Points

- The purpose of quality management is to make sure that the project meets the needs for which it was created.
- Modern quality management complements project management and both disciplines recognize the importance of customer satisfaction and prevention over inspection.
- Customer satisfaction involves understanding, evaluating, defining, and managing expectations so that customer requirements are met.
- Prevention over inspection means that quality is planned, designed, and built in rather than inspected in, because the cost of preventing mistakes is generally much less than the cost of correcting them.
- You will need to decide what quality means for your particular project and document this in a quality plan, which is part of the project plan.

3 QUALITY MANAGEMENT TECHNIQUES

There are several techniques that can be used in the quality planning process but it is very unlikely that any individual project manager would be expected to be skilled in using all of them.

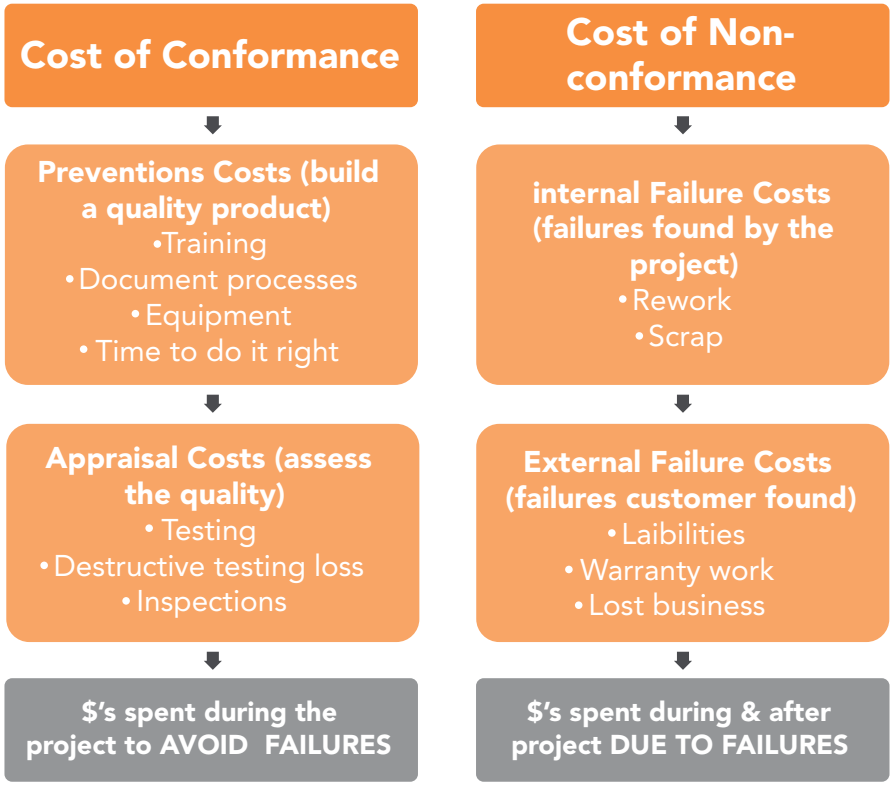


A better approach would be to have an appreciation of what each one involves and then to select those that best suit the project and delegate the work to project team members who have expertise in that technique.

A cost-benefit analysis is by far the most important decision making tool and involves nothing more than common sense and judgment based on experience. All quality management activities have a related cost and that cost must be justified in terms of benefit to the project sponsor and the organization as a whole.

No activities should be performed that would equal or cost more than the expected benefits. It should show that the level of quality is viable from a cost perspective and justify its inclusion in the quality plan.

The cost of quality includes all costs incurred over the life of the product and looks at the costs of conformance to quality standards and the costs of nonconformance.



For example, the proposed quality standard for the production of a metal pressing might mandate a tolerance of 1mm. In other words the finished part can be up to 1mm bigger or smaller than the specification.

The costs of conformance include both the prevention and appraisal costs incurred in conforming to this standard (Training, equipment, additional time, testing and inspections).

The costs of nonconformance include internal and external costs that would be incurred if this quality standard were not achieved. These would include the costs of reworking or scrapping the failed parts (internal cost) and the costs associated with sending out parts that were unacceptable to the customer.

Project decisions can impact operational costs of quality as a result of product returns, warranty claims, and recall campaigns. Therefore, due to the temporary nature of a project, the sponsoring organization may choose to invest in product quality improvement, especially defect prevention and appraisal, to reduce the external cost of quality.

Most of the techniques described here are based on statistical analysis and are most appropriate where the project deliverables are products that can be measured in some way. For example, If parts are being produced on a production line then it will be straightforward to measure dimensions, tolerances, failure rates, etc. However, many project deliverables are not like this and it is not possible to collect this type of data.

For example, anything that provides a user 'experience' can be difficult to measure in this way.

The best approach is to be aware of what tools and techniques exist and to select those that are appropriate for the project you are working on. It may even be possible to adapt some of them in order to provide useful data about quality even if you are not making a product that can easily be measured.

1. Cause and Effect Diagrams

Also called Ishikawa diagrams or fishbone diagrams, they illustrate how various factors might be linked to potential problems or effects. Factors are usually grouped into major categories as shown:

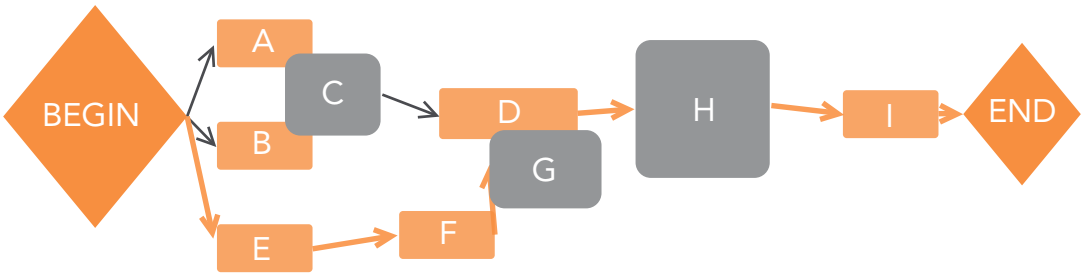
- *People* – Anyone involved with the process
- *Methods* – How the process is performed including: policies, procedures, rules, regulations and laws
- *Machines* – Any equipment, computers, tools, etc. required to accomplish the job
- *Materials* – Raw materials, parts, pens, paper, etc. used to produce the final product
- *Measurements* – Data generated from the process that is used to evaluate it's quality
- *Environment* – The conditions, such as location, time, temperature, and culture in which the process operates

This is not a statistical technique and is therefore applicable to almost all types of project. It does have its critics precisely because is not quantitative and requires a lot of subjective analysis and judgment.

It's strengths are that it can help you to make sense of a situation where there are a lot of variables that are interacting with each other, none of which are quantifiable. It is also a powerful visual tool when you are trying to explain your analysis to others.

2. Flowcharts

This is a graphical representation of a process showing the relationships among process steps. There are many styles, but all process flowcharts show: activities, decision points, and the order of processing.
Flowcharting can help the project team anticipate quality problems that might occur and this awareness can result in the development of test procedures or approaches for dealing with them.



A flowchart is common type of chart that represents an algorithm or process, showing the steps as boxes of various kinds, and their order by connecting them with arrows.

There are many different types of flowcharts, and each type has its own repertoire of boxes and notational conventions. The two most common types of boxes in a flowchart are:

- *A processing step* (usually called an activity) that is denoted as a rectangular box, and
- *A decision*, which is usually denoted as a diamond.

Flowcharts are used in designing and documenting complex processes. Like other types of diagram, they help visualize what is going on and thereby help the viewer to understand a process, and perhaps also find flaws, bottlenecks, and other less-obvious features within it.

3. Checksheets

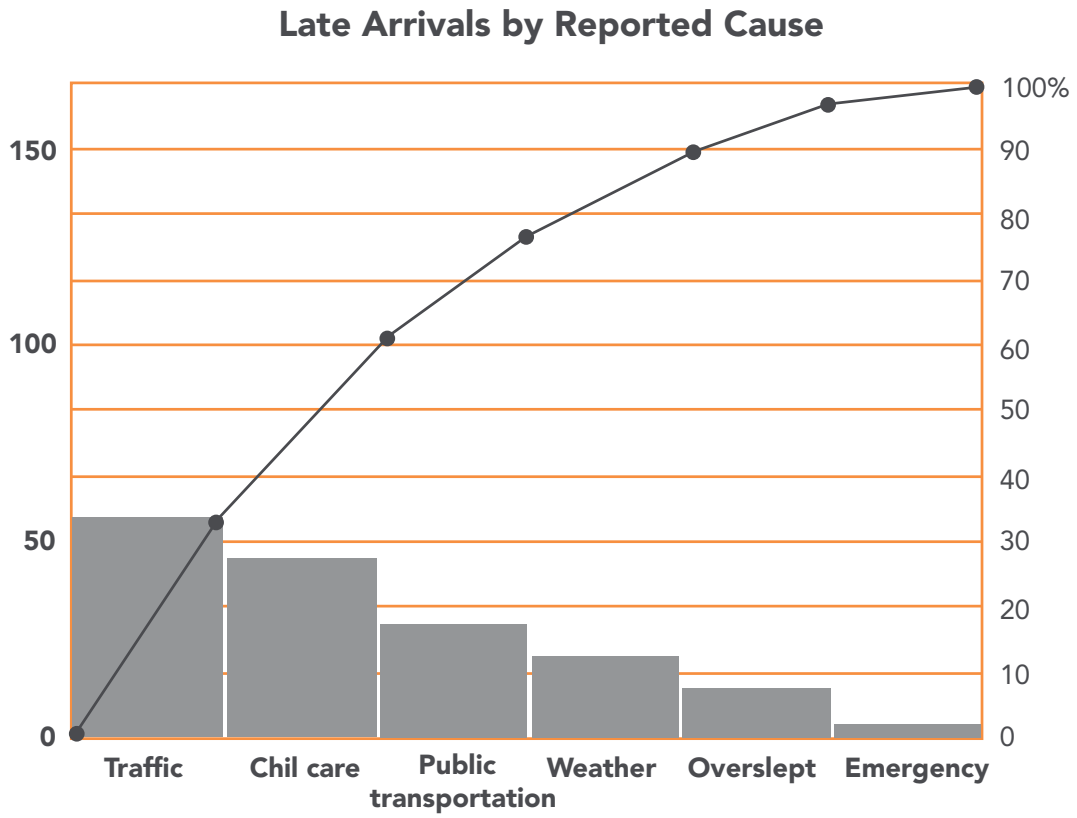
These are also known as tally sheets and may be used as a checklist when gathering data. They are used to organize facts in a manner that will facilitate the effective collection of useful data about a potential quality problem and are especially useful for gathering attributes data while performing inspections to identify defects.

4. Pareto Diagram

This is a special type of histogram where the values being plotted are arranged in descending order. The graph is accompanied by a line graph that shows the cumulative totals of each category.

- Left vertical axis shows the frequency of occurrence, cost or other important unit of measure.
- Right vertical axis is the cumulative percentage of the total.

In quality control, the Pareto chart often represents the most common sources of defects, the highest occurring type of defect, or the most frequent reasons for customer complaints, etc.



The Pareto chart was developed to illustrate the 80–20 Rule, which states that 80 percent of the problems stem from 20 percent of the various causes.

5. Histogram

This is a vertical bar chart showing how often a particular variable state occurred, with the height of each column representing the relative frequency. Histograms are useful when presenting project data to stakeholders as they can give a clear indication of which problems are the most important to tackle.

6. Control Charts

These answer the question: *'Is this process variance within acceptable limits?'* The pattern of data points on a control chart may reveal random fluctuating values, sudden process jumps, or a gradual trend in increased variation. By monitoring the output of a process over time, a control chart can help assess whether the application of process changes resulted in the desired improvements.

When a process is within acceptable limits it is in control and does not need to be adjusted. Conversely, when a process is outside acceptable limits, the process should be adjusted. Seven consecutive points above or below the central line indicate a process that is out of control. The upper control limit and lower control limit are usually set at (plus or minus) three Sigma, where one Sigma is one standard deviation.

Although used most frequently to track repetitive activities required for producing manufactured lots, control charts may also be used to monitor cost and schedule variances, volume, and frequency of scope changes, or other management results to help determine if the project management processes are in control.

7. Scatter Diagram

These use Cartesian coordinates to display values for two variables for a set of data. The data is displayed as a collection of points, each having the value of one variable determining the position on the horizontal axis and the value of the other variable determining the position on the vertical axis. A scatter diagram can suggest various kinds of correlations between variables with a certain confidence level. Correlations may be:

A) Positive (rising) – *If the pattern of dots slopes from lower left to upper right, it suggests a positive correlation.*
B) Negative (falling) – *If the pattern of dots slopes from upper left to lower right, it suggests a negative correlation.*
C) Null (uncorrelated).

A line of best fit can be drawn in order to study the correlation between the variables. One of the most powerful aspects of a scatter diagram is its ability to show nonlinear relationships between variables.

8. Benchmarking

Benchmarking is simply a quality standard reference that is used for the current project. This may be a benchmark used within the performing organization, or one that is used across a specific industry. It involves comparing actual or planned project practices to those of comparable projects to identify best practices, generate ideas for improvement, and provide a basis for measuring performance.

The value of using this technique is to compare the current project's quality standards with those of other similar projects.

9. Quality Meetings

Meetings involve people who are responsible for quality management including the project manager, the project sponsor, selected project team members, selected stakeholders, anyone with responsibility for any of the quality management processes, and others as needed. Collective decision-making is very important area of project management that can make or break this part of the project.

Almost all of the processes that for part of project time management will involve meetings between the project manager, the team and other stakeholders in order to make decisions about the activity definitions and associated estimates. How well these meetings are conducted will have a major impact on how smoothly the project runs.

If you feel as though your project meetings could be improved then you can download the 'Meeting Skills' eBooks from this website. These free eBooks cover all aspects of meetings including how to set an agenda that will ensure that the meeting achieves it's aims and how to chair a meeting so that it is as productive as possible.

Key Points

- A project manager should have an appreciation of what quality techniques are available so that they are able to select those that best suit the project.
- Implementation of the technique can then be delegated to project team members who have the relevant expertise in that technique.
- These techniques include: cause and effect diagrams, flowcharts, check sheets, Pareto diagrams, and scatter diagrams.

4 PROJECT MANAGEMENT & ISO QUALITY MANAGEMENT

The ISO approach to quality management emphasizes the following concepts:

Customer Satisfaction

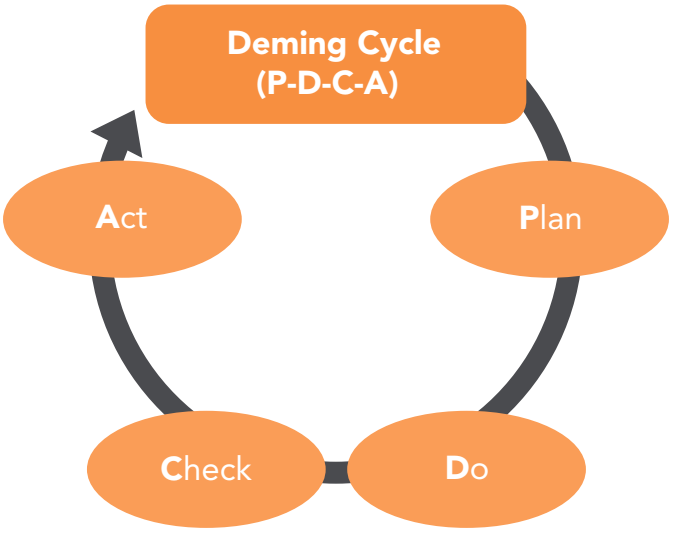
Quality means delivering the product so that its requirements meet the customer's expectations. However, this does not mean gold plating, or adding requirements that the customer did not request.

Prevention over Inspection

Inspection can reduce the probability of defects, but prevention through planning, designing, and building in quality can reduce that probability of defects for a lot less cost than through the inspection process.

Continuous Improvement

The Plan-Do-Check-Act cycle, which is the basis of the concept of continuous improvement, is derived from a business process model developed by Walter A. Shewhart and popularized by W. Edward Deming. This iterative four-step management method is used for the control and continuous improvement of processes and products.



Total Quality Management, Six Sigma, Lean Six Sigma, and the Japanese Toyota Way are modern quality improvement initiatives that improve the quality of project management while improving the quality of the final deliverables. The steps in each successive PDCA cycle are:

Plan – Understand the existing situation and then establish the objectives and processes necessary to deliver results in accordance with the target or goals.

Do – Implement the plan. That is, execute the planned process.

Check – Study the actual results of the previous phase and compare them against the expected targets or goals to discover any differences. Look for deviation from the plan in implementation and also look for the appropriateness and completeness of the plan to enable the execution. Convert the collected data into a form that can be used in the next step.

Act – Where there are significant differences between actual and planned results request corrective actions. Analyze the differences to determine their root causes. Determine where to apply changes that will include improvement of the process or product.

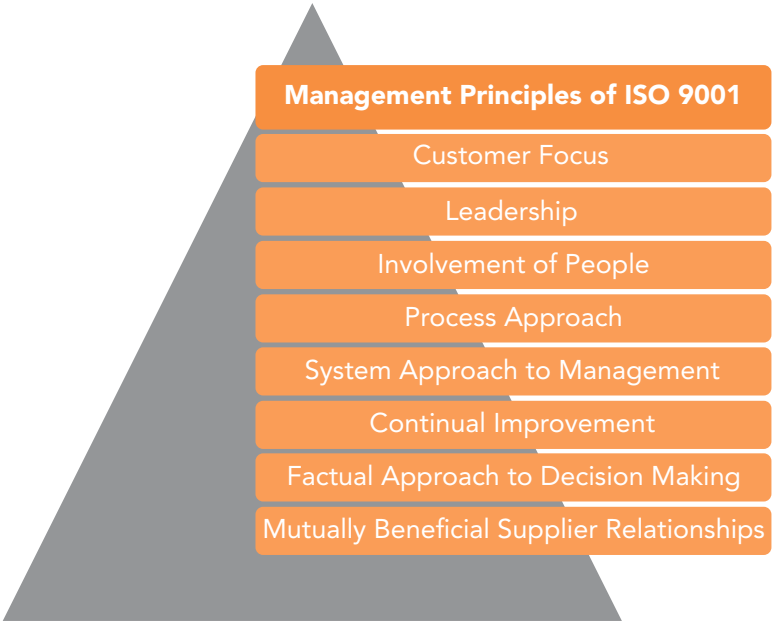
Management Responsibility

Rather than thinking that quality is what job operators do on the factory floor, the modern concept of quality improvement initiatives mentioned in the last paragraph require the approval and active participation of management.

Cost of Quality

This is the cost of implementing quality standards. For example, if the defect is caught before the product gets shipped to the customer, this is an internal cost of nonconformance, and involves scrapping the part or reworking it so that it is in conformance with the quality standards.

However, if the inspection process does not catch the defect, and it goes out to the customer, then the costs could be in terms of the claims the customer makes for replacement or repair under warranty. The cost could potentially involve legal liability, if the customer or a third party is injured.



The International Standard for Quality management (ISO 9001) adopts a number of management principles that can be used to guide organizations towards improved quality.

The principles include:

Customer focus – Since the organizations depend on their customers, they should understand future needs as well as current ones. They also need to meet customer requirements and try to exceed their expectations where possible.
An organization attains customer focus when all people in the organization know what customer requirements must be met to ensure that both the internal and external customers are satisfied.

Leadership – Leaders of an organization establish unity of purpose and direction of it. They should go for creation and maintenance of such an internal environment, in which people can become fully involved in achieving the organization's quality objective.

Process approach – The desired result can be achieved when activities and related resources are managed as processes.

System approach to management – Identifying, understanding and managing all interrelated processes as a system that contributes to an organization's effectiveness and efficiency in achieving its quality objectives. Quality control involves checking transformed and transforming resources in all stages of production process.

Continual improvement – One of the permanent quality objectives of an organization should be the continual improvement of its overall performance.

Factual approach to decision making – Effective decisions are always based on the data analysis and information.

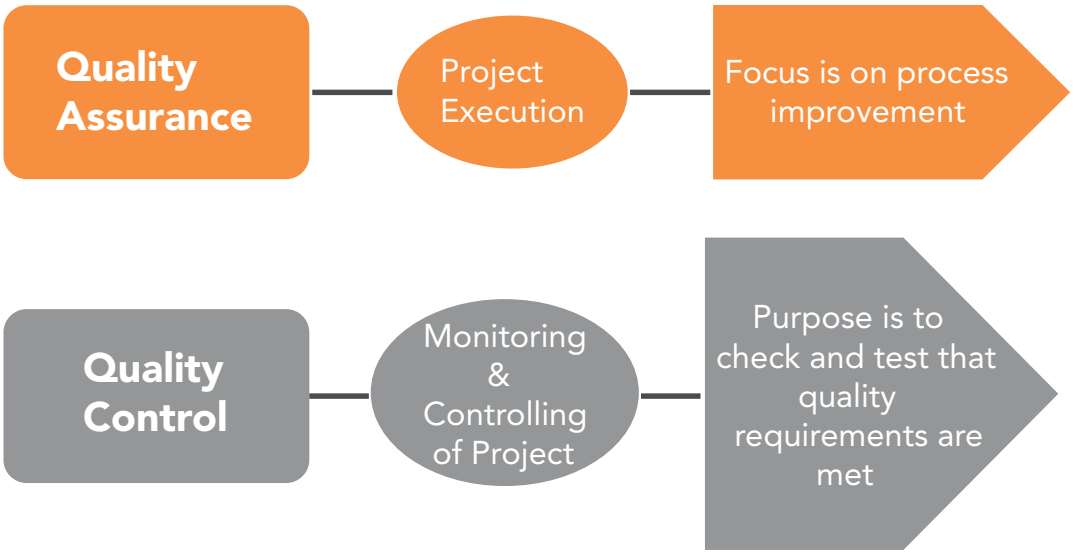
Mutually beneficial supplier relationships – Since an organization and its suppliers are interdependent, a mutually beneficial relationship between them increases the ability of both parties to add value.

Key Points

- The ISO approach to quality management emphasizes: customer satisfaction, prevention over inspection, continuous improvement, management responsibility and the cost of quality.

5 QUALITY ASSURANCE

There is a lot of confusion about quality assurance and quality control. The difference is that quality assurance is part of the executing process and is concerned with making sure that the quality objectives are met. It is focused on process improvement.



Quality control, on the other hand, is part of the monitoring and controlling process and is concerned with checking (by means of measuring and testing) that the quality requirements are being met. This process also provides an umbrella for continuous process improvement, which is an iterative means for improving the quality of all processes so as to reduce waste and eliminate activities that do not add value.

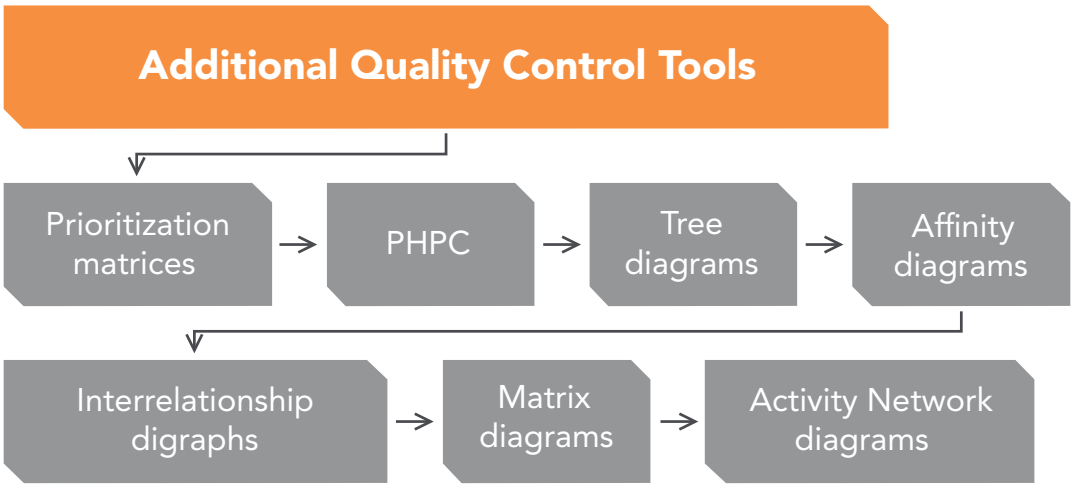
Quality management tools and quality audits can be used to perform quality assurance. Quality management tools include:

Affinity diagrams

The affinity diagram is similar to mind-mapping techniques in that they are used to generate ideas that can be linked to form organized patterns of thought about a problem. Using the affinity diagram to give structure to the decomposition of scope may enhance the creation of the work breakdown structure (WBS).

Process decision program charts (PDPC)

These charts are used to understand a goal in relation to the steps for getting to the goal. The PDPC is useful as a method for contingency planning because it aids teams in anticipating intermediate steps that could derail achievement of the goal.



Interrelationship digraphs

The interrelationship digraphs provide a process for creative problem solving in moderately complex scenarios that possess intertwined logical relationships for up to 50 relevant items. The interrelationship digraph may be developed from data generated in other tools such as the affinity diagram, the tree diagram, or the fishbone diagram.

Tree diagrams

Tree or systematic diagrams may be used to represent decomposition hierarchies such as the:

- WBS (work breakdown structure),
- RBS (risk breakdown structure), &
- OBS (organizational breakdown structure).

In project management, tree diagrams are useful in visualizing the parent-to-child relationships in any decomposition hierarchy that uses a systematic set of rules that define a nesting relationship. Tree diagrams can be depicted horizontally (such as a risk breakdown structure) or vertically (such as a team hierarchy or organizational breakdown structure OBS).

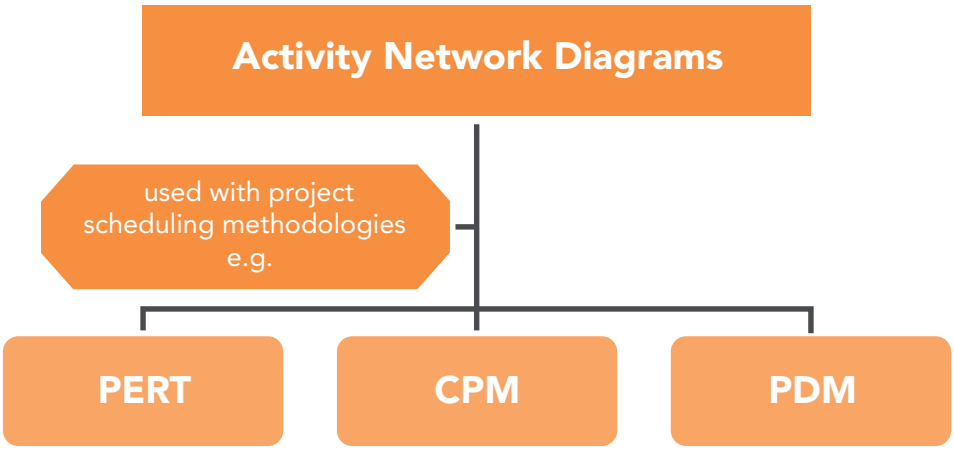
Because tree diagrams permit the creation of nested branches that terminate into a single decision point, they are useful as decision trees for establishing an expected value for a limited number of dependent relationships that have been diagramed systematically.

Prioritization matrices

These are used to identify the key issues and the suitable alternatives to be prioritized as a set of decisions for implementation. Criteria are prioritized and weighted before being applied to all available alternatives to obtain a mathematical score that ranks the options.

Activity network diagrams

In the past activity network diagrams have been known as 'arrow diagrams'. They include both the AOA (Activity on Arrow) and, most commonly used, AON (Activity on Node) formats of a network diagram.



Activity network diagrams are used with project scheduling methodologies such as program evaluation and review technique (PERT), critical path method (CPM), and precedence diagramming method (PDM).

Matrix diagrams

A quality management and control tool used to perform data analysis within the organizational structure created in the matrix. The matrix diagram seeks to show the strength of relationships between factors, causes, and objectives that exist between the rows and columns that form the matrix.

A quality audit consists of structured, independent review to determine whether project activities comply with organizational and project policies, processes, and procedures. The words 'independent' and 'audit' are open to interpretation depending on the requirements of the particular project.

There is no need to use external auditors or to make the process particularly formal or bureaucratic provided that the information fed back from the process is credible to both the project team (who are doing the work) and the sponsor (who is paying for it). The audit should:

1) Identify where the best practices being implemented
2) Identify where they are not being used
3) Share best practices proven in similar projects
4) Help the project team to implement them
5) Assure the project sponsor that work is being done in line with accepted best practices

This process should result in a reduced cost of quality and an increase in sponsor or customer acceptance of the project's product. Quality audits can be carried out whenever necessary for either the whole project or a part of it.

Key Points

- Quality assurance is part of the executing process and is concerned with making sure that the quality objectives are met.
- Quality management tools include: affinity diagrams, process decision program charts, interrelationship digraphs, tree diagrams, prioritisation matrices, activity network diagrams, and matrix diagrams.

6 QUALITY CONTROL

Quality control attempts to answer two questions: Firstly, is the project meeting its quality requirements and if not, how can this be addressed?

The project management team should have a working knowledge of statistical quality control, especially sampling and probability, to help evaluate quality control outputs.

Before looking at the process in detail, make sure you are familiar with the following terms:

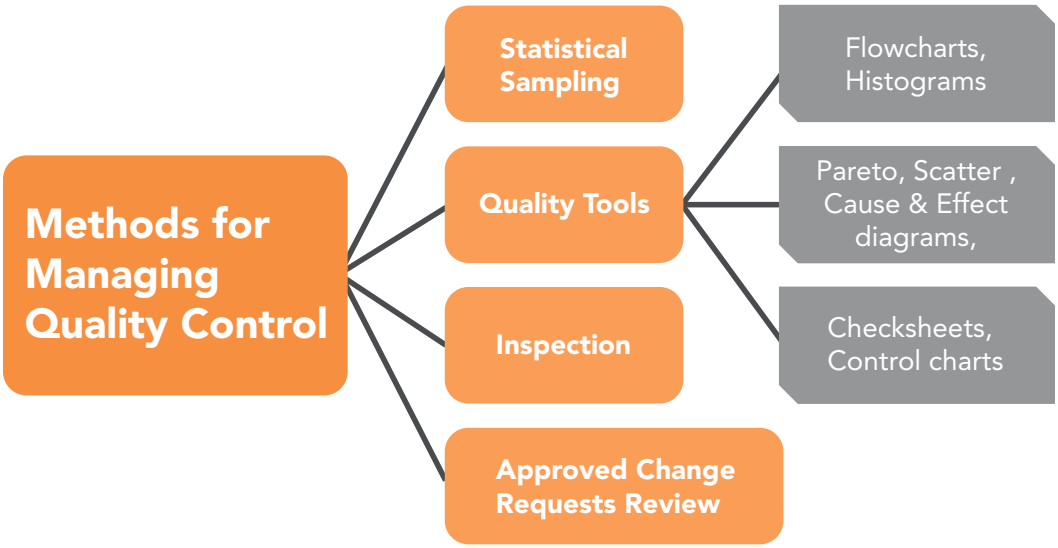
- Prevention – keeping errors out of the process
- Inspection – keeping errors out of the hands of the customer
- Attribute sampling – the result either conforms or does not conform
- Variables sampling – the result is rated on a continuous scale that measures the degree of conformity
- Tolerances – specified range of acceptable results
- Control limits – thresholds, which indicate whether the process is out of control
- Grade – is a category assigned to products or services having the same functional use but different technical characteristics. While a quality level that fails to meet quality requirements is always a problem, low grade may not be.

For example, a software product can be of high quality (no obvious defects, readable manual) and low grade (a limited number of features).

The project manager and the project management team are responsible for managing the tradeoffs involved to deliver the required levels of both quality and grade.

- Precision – means the values of repeated measurements are clustered and have little scatter.
- Accuracy – the measured value is very close to the true value.

The overall project plan contains the quality plan, which describes how quality control will be performed within the project. There are seven basic quality tools that can be used as well as statistical sampling, inspection, and reviewing approved change requests.



1. **Cause and Effect Diagrams**

   These type of diagrams show how different factors may be linked to potential effects or problems. They can be referred to as fishbone or Ishikawa diagrams. This type of diagram can be used on all project types because it is not based on any statistical technique. It is therefore limited if your project needs quantitative assessment because it relies on subjective judgment and analysis.

   It is useful in situations that have numerous interacting variables that can make sense out of this complexity of interactions, none of which are quantifiable. A benefit of this tool is that it is extremely useful when needing to communicate the results of your analysis to other members of the project.

2. **Flowcharts**
   The benefit of flowcharts when explaining your analysis to others is that it is easy to identify the decision points, activities, and the order of processing. It will be show in a graphical form that easily illustrates the relationships among process steps.

3. **Checksheets**
   These are exceptionally useful to a project manager when gathering data as they provide a checklist to follow. They can often be referred to as tally sheets.

4. **Histogram**
   This is bar chart that shows its data in a vertical format rather than a horizontal format. The height of each bar depicts the relative frequency of a specific variable in a situation that occurred. This type of tool is especially helpful when needing to indicate to stakeholders, which of the project problems need to be tackled first and why.

5. **Pareto Diagram**
   Another specialist form of a histogram is the Pareto diagram which has an additional line graph to demonstrate the cumulative totals of each category. This type of histogram shows the plotted values in a descending order.

6. **Control Charts**
   By using a control chart it is easy to show the pattern of data points in such a way that it shows where there are sudden jumps in the process, random fluctuating values occurred or that there is trend of gradual variations. This tool is useful in long-term monitoring as it reveals if and when, the application of process changes resulted in the required improvements.

7. **Scatter Diagram**
   Display the data as a collection of points using Cartesian coordinates to display values for two variables for a set of data. Each point has a horizontal axis value of one variable and another variable to determine its position on the vertical axis.

8. **Statistical Sampling**
   Statistical Sampling involves choosing part of a population of interest for inspection. Sample frequency and sizes should be determined so the cost of quality will include the number of tests, expected scrap, etc. In some application areas it may be necessary for the project management team to be familiar with a variety of sampling techniques in order to chose the most appropriate one.

9. **Product Inspection**
   Product Inspection is the examination of a product to determine whether it conforms to documented standards. The results of an inspection generally include measurements and may be conducted at any level. For example, the results of a single activity can be inspected, or the final product of the project can be inspected. Inspections may be called reviews, peer reviews, audits, or walkthroughs.

All approved change requests should be reviewed to verify that they were implemented as approved.

Key Points

- Quality control is part of the monitoring and controlling process and is concerned with checking (by means of measuring and testing) that the quality requirements are being met.
- Quality management tools include: affinity diagrams, process decision program charts, interrelationship digraphs, tree diagrams, prioritisation matrices, activity network diagrams, and matrix diagrams.

7 TESTING PROJECT DELIVERABLES

Experienced project managers ensure that testing is present throughout their project and not just at the implementation stage. They will carefully plan that sufficient funds and resources are available so that the testing can be thorough.

This has two implications, first in making sure that the project performs the task or function asked of it and secondly that accurate and complete documentation is produced for the end user. If the project deliverable is a physical product then the testing regime will usually be quite straightforward and involve a predetermined set of measurements that are compared to the original specification.

If the deliverable is a piece of complex software then testing and the associated rework can account for up to 50% of the total project budget. This is because it can be as difficult to test a system as it is to build one, something that non-IT specialists find difficult to understand. This figure may seem to be unreasonably high but large software projects do have a history of going significantly over budget and analysis of why this happens will usually show that the management underestimated the cost of integration, testing and rework.

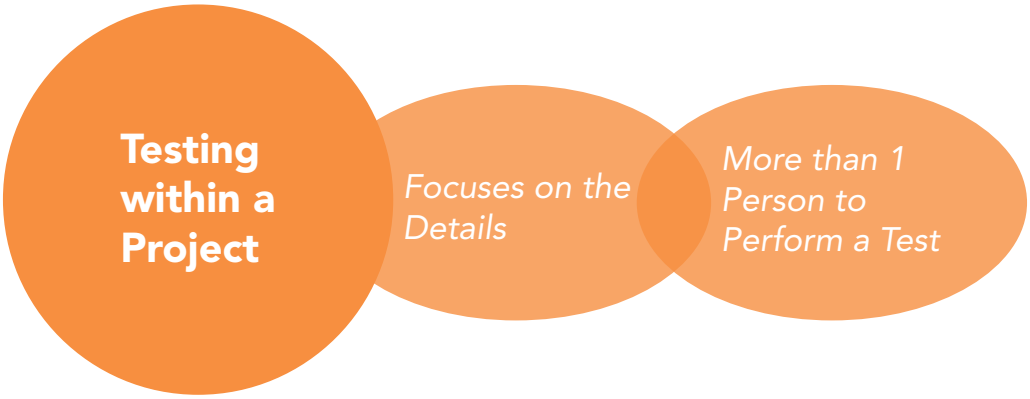
The complexity of software testing also has implications for the project manager in terms of who is tasked with doing it. There is a strong argument for having a dedicated test team rather than allowing software developers to test their own work. There are two reasons for this.

> Firstly, few people who are good at development are good at testing because the skill sets required are quite different.
>
> Secondly, when developers are under pressure to deliver more work packages, the first thing to be sacrificed is likely to be thorough testing of those they have already completed.

You can prevent most software testing problems by:

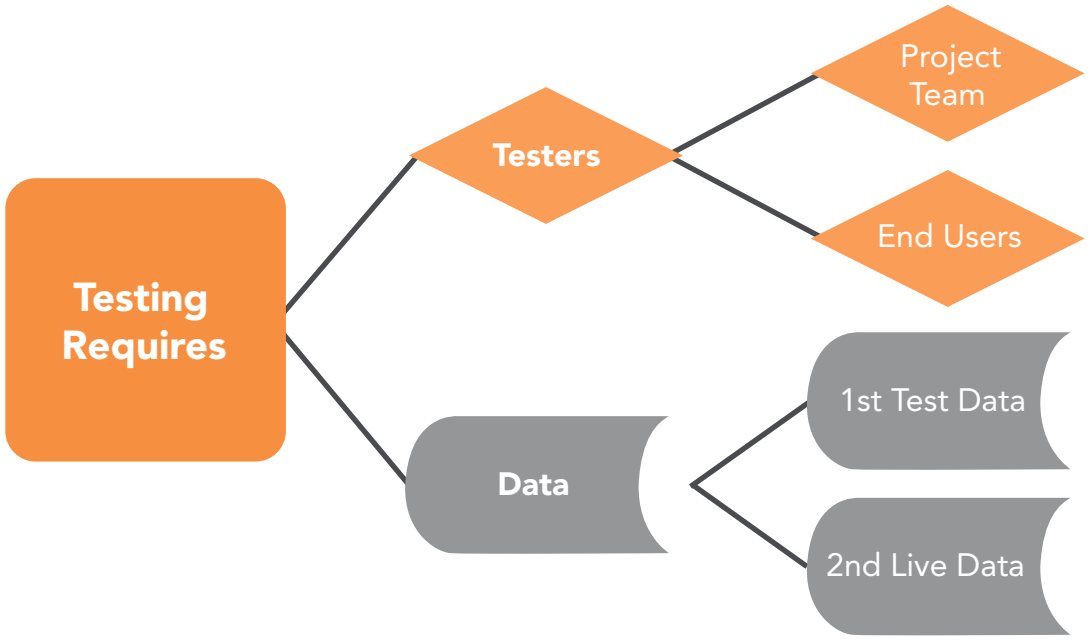
1) Creating a specialist test team.
2) Designing the software for 'testability'.
3) Making testing an integral part of software development.
4) Ensuring requirement traceability to and from tests.
5) Automating as much of the testing process as possible.
6) Integrating testing with the change management processes.

As the requirements for software to work across multiple platforms increases, you should expect software testing to become even more complicated and expensive. This means that manual testing by the developers themselves is becoming less viable and the need to create specialist test teams with their own personnel, budget and dedicated software is growing.



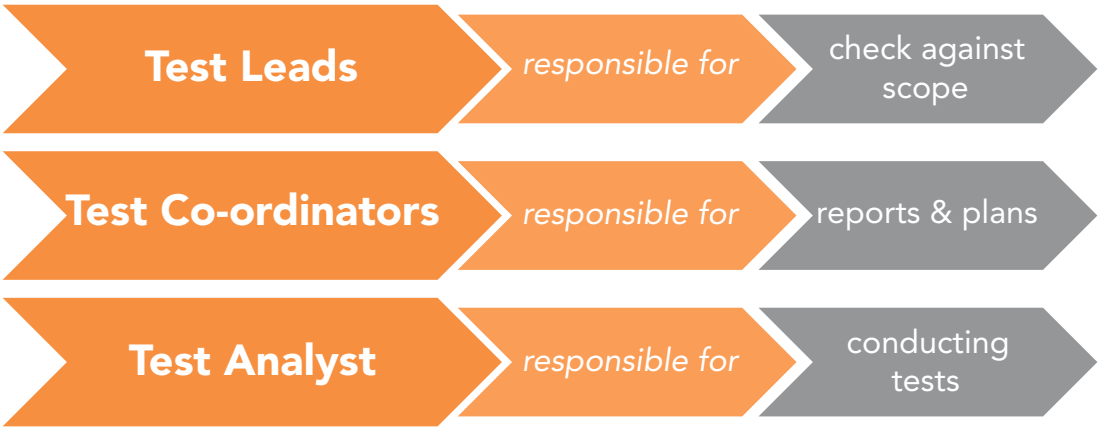
Testing is all about looking at the details of how each work package performs individually and as part of the whole product. It is also important to make sure that it works as required so that the end users can perform their tasks as stated in the original project business case. A significant part of any testing activities is the data that is used to check that the anticipated outcome of any task asked of the product or service is exactly as specified.

Many organizations have over the years created a bank of 'customer or end user' data that is specifically kept for the purposes of testing. This enables the project team to test work packages at any stage of the life cycle with data specifically designed for that purpose without compromising 'real' customer data or confidentiality. At some point in the project plan 'real or live' data will have to be used in the final stage of project testing to ensure that it meets all the standards as defined in the quality management plan.



It is important that each item to be verified is tested several times and by different individuals. If resources and budget allow it is often beneficial to have someone outside of those who produced actively test it because they will bring a fresh set of eyes to it and may reveal nuances that could be over looked by someone familiar with the work package. A critical aspect of testing is the writing of test cases or test sets that test the functionality of each work page in terms of the:

1) Number of ways the data is presented, including the way it can be output.
2) Boundaries/Areas where two independent systems communicate.
3) Processes that copy or transfer data.
4) Additional programs or third party providers needed to perform task.
5) Organization's most critical processes.



Another significant benefit of well-performed testing is the ability to use the findings of this process within your communications plan to maintain the support and manage the expectation of the project sponsor and the stakeholders.

There are certain actions you can take to ensure that your testing process and procedures are effective and efficient.

Create an Independent testing team. Each member has a clearly defined role and responsibility within the testing process. Some of the typical testing roles are shown in the diagram above.

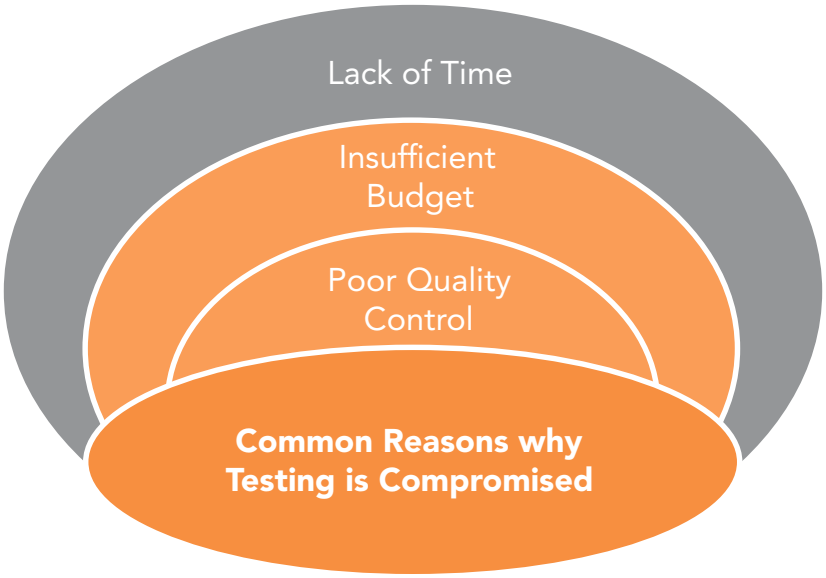
Produce regular testing reports that are included in the project test calendar. This enables stakeholders and other key personnel to be kept informed of any issues or risks that occur and provides an opportunity to show how they were or will be resolved.

Write detailed test cases and test sets to ensure that there is a seamless flow of data between the necessary third party suppliers and the organization. This may have to take into account the different time zones where the project testing is for a global organization.

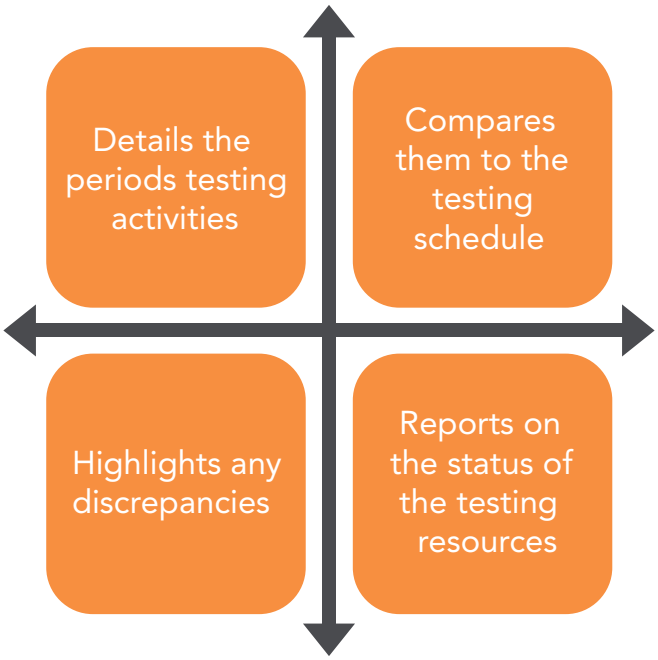
Design tests that assess how well the project performs under a variety of situations and workloads e.g. can efficiency requirements still be meet at peak times and on the busiest days?

In some more complex projects it will be necessary to create 'super users', these are individuals who have a high-level of expertise in a specific area of the organizations operation and will be able to test the project from an end-to-end perspective. They perform a valuable role in any testing team because they bring knowledge of how data needs to flow and be processed within the organization. Super users will also be able to offer valuable insights into how best to meet the training needs of the end users and may advise that key trainers act as testers to help them develop practical training programs.

Projects often fail because insufficient funds or resources are not available at the time testing should be being performed. This results in the testing function of the project becoming squeezed in an attempt to bring costs and the project schedule back into line with the plans. When testing is pushed into a time allocation that is too small the end user will be given a product or service that is filled with bugs and requests re-work will be a constant drain on an organizations resources.



Testing is a significant part of the quality management plan and the roles and responsibilities of the team within the organization assigned this task will be defined. It will also define how to report the testing activities and how often they will be produced in accordance to the project testing schedule. The contents of each project testing report are shown in the diagram.



The testing report will be a vital communication tool in the project execution and monitoring phase. The test cases and sets bring the project's aim into the forefront of the testing teams mindset and they will quickly be able to assess which areas of the project plan are contentious or require closer attention.

In terms of organizations being able to learn from previous projects and avoid making similar mistakes the testing report is an excellent library of testing discussions, responsibilities, agreements and sign-off's. It is also a significant tool in offering evidence and justification for change requests to the project scope.

Key Points

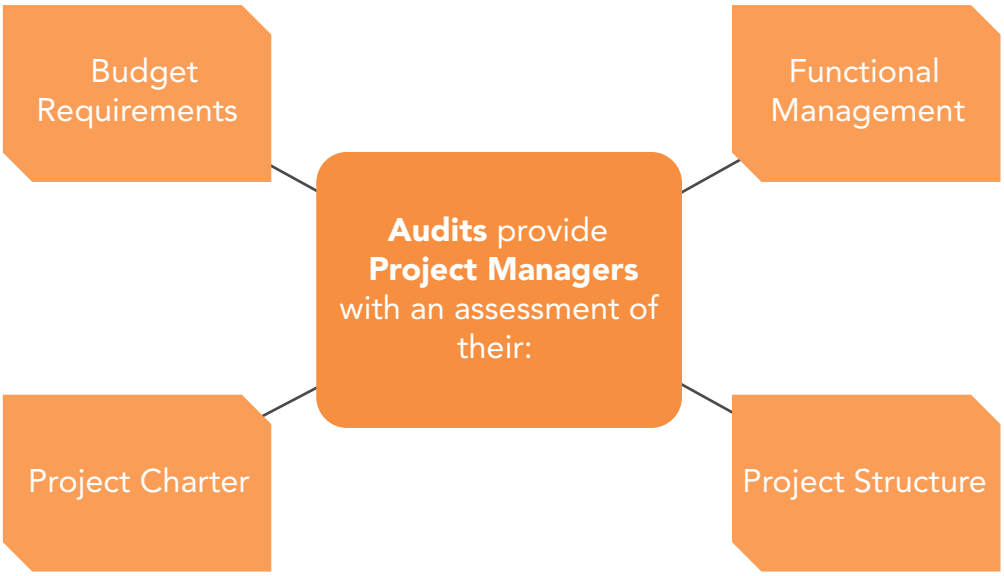
- Testing will be an ongoing activity throughout the project.
- The time and money required should be allocated at the planning stage.
- Testing and the associated rework can account for up to 50% of the total budget of a software project.
- The move to mobile and multiple platforms is increasing the cost of software testing.
- Testing results can be used within the communications plan to keep stakeholders informed of progress.
- Test data must be as realistic as possible without breaching customer confidentiality.
- Testing reports are important documents that can help future projects to learn from previous ones and avoid making similar mistakes.

8 QUALITY AUDITS

The rationale behind project audits is to assess whether the chosen methodology provides the project manager with all the procedures and processes that will ensure project success. The audit report will identify the major concerns of the project stakeholders, its sponsor and its team members and then present recommendations of how flaws, issues and concerns could be overcome to keep the project on track.

Uncovering project concerns, challenges and issues is one of the most critical tasks a project manager has to perform. This audit report is one of the key documents that you can use when making such decisions and is a document that can, and should, be produced throughout the entirety of your project. This report is most frequently used in industry sectors where legislative compliance is extensive and in those where heavy penalties are used to ensure project completion is on-time. The project audit is a flexible tool and our audit report template can be easily adapted to suit your project environment.

At any point in time a project manager needs to be able to provide evidence and reasoning to his or her stakeholders as to how well the project is performing according to it's various management plans. Acquiring such data is difficult and often involves sifting through thousands of communications to find out the true circumstances of your project.

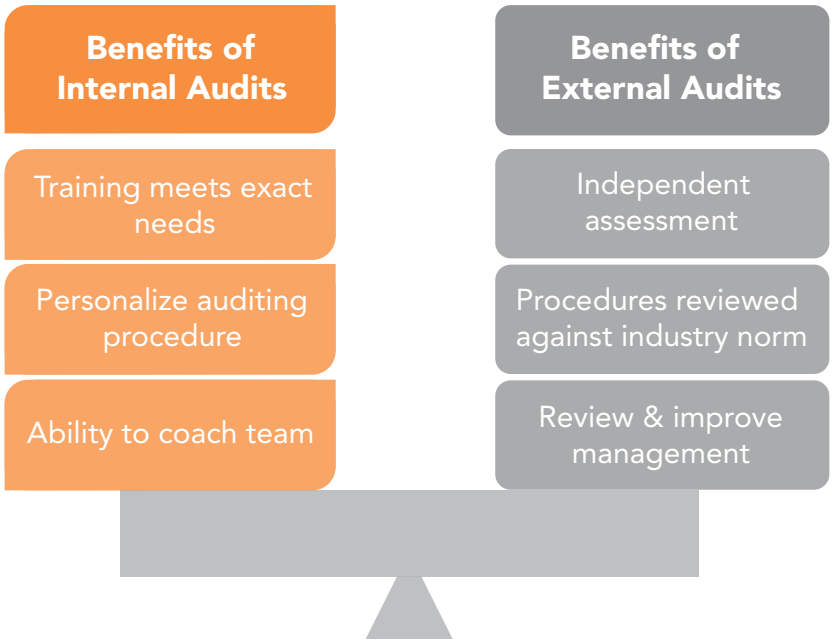


There are many instance where a project can be progressing smoothly right up until the moment that a cost, quality, contract, resource or schedule issue becomes apparent. The key to project success is identifying such issues well before they become obvious because once this happen it is virtually impossible to meet the original requirements.

Good project managers ensure that they constantly receive pertinent data on the 'true' state of their project. It is only through sound project 'knowledge' that a project manager can retain the right level of control over his or her project. The project audit and its associated report provide the evidence that forms the basis of such knowledge on a project.

The audit on project progress is especially useful for individuals who are new to project management or those who find themselves performing the role without any training or coaching. It is an effective technique for the individual to learn how to adapt methodologies to suit the unique project environment. This report also enables him or her to identify their own development and training needs so that they can be come more effective project managers.

Project audits also enables organizations to assess how well their project management procedures work in practice. An audit can indicate where lack of training, poor governance and guidelines can be the cause of poor project performance or management. Many corporations who make extensive use of project and matrix management may wish to develop the auditing skills internally, but medium or small organizations may prefer to use external agencies.



Whichever style of audit your organization prefers it will shown them at that point in time how well managed the project is in relation to its plan and the likelihood of success. The importance of project audits has a direct correlation to the level of compliance your industry sector requires any project to meet and the level of risk associated with it. For many organizations the project audit has three functions, to assess the quality of: project procedures, project purchases & tendering, and third-party management.

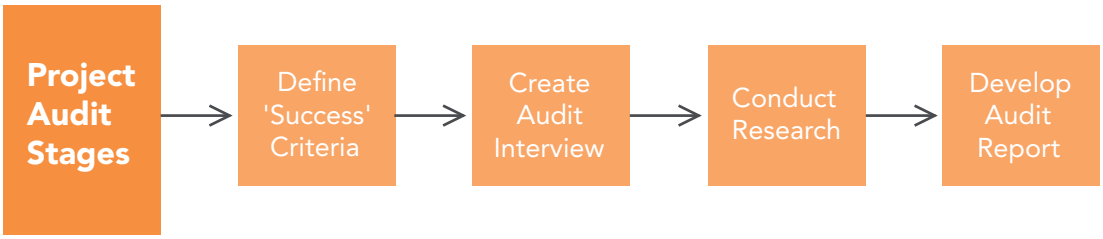
The overall benefit of these audits is the ability to avoid mistakes that would otherwise have gone undetected until the point where they become grave or catastrophic. They are often conducted midway through a project and then repeated in its final phase so that the project manager, its sponsor and the project team can easily identify what has gone well and where improvements need to be devised to keep the project on schedule and within budget.

The success of the project audit relies heavily on the professionalism and expertise of the auditor so as project manager you need to feel confident that your auditor has the necessary skills or support to perform the role effectively. You must also ensure that the project auditor and his or her team have appropriate and timely access to all the facilities, individuals and documentation they need to perform the audit.

It is essential that audit resources, roles and responsibilities are clearly identified so that the audit team and everyone involved in the project clearly understand their remit and co-operate throughout the project audits. These details need to be referenced in the resource, budget and schedule management plans, as well as the organizational breakdown structure (OBS).

Most project audits follow four simple steps. First the 'success criteria' of the project must be established. The individual, responsible for the auditing process, interviews the sponsor and project manager to define such criteria that meet the project and their own needs.

Using the success criteria a questionnaire is developed that will be used in all audit interviews. It is often more effective to have these interviews conducted by an individual outside the project environment. Experience has shown that respondents will be more open and blunt than they would be with a member of the project conducting the interview.



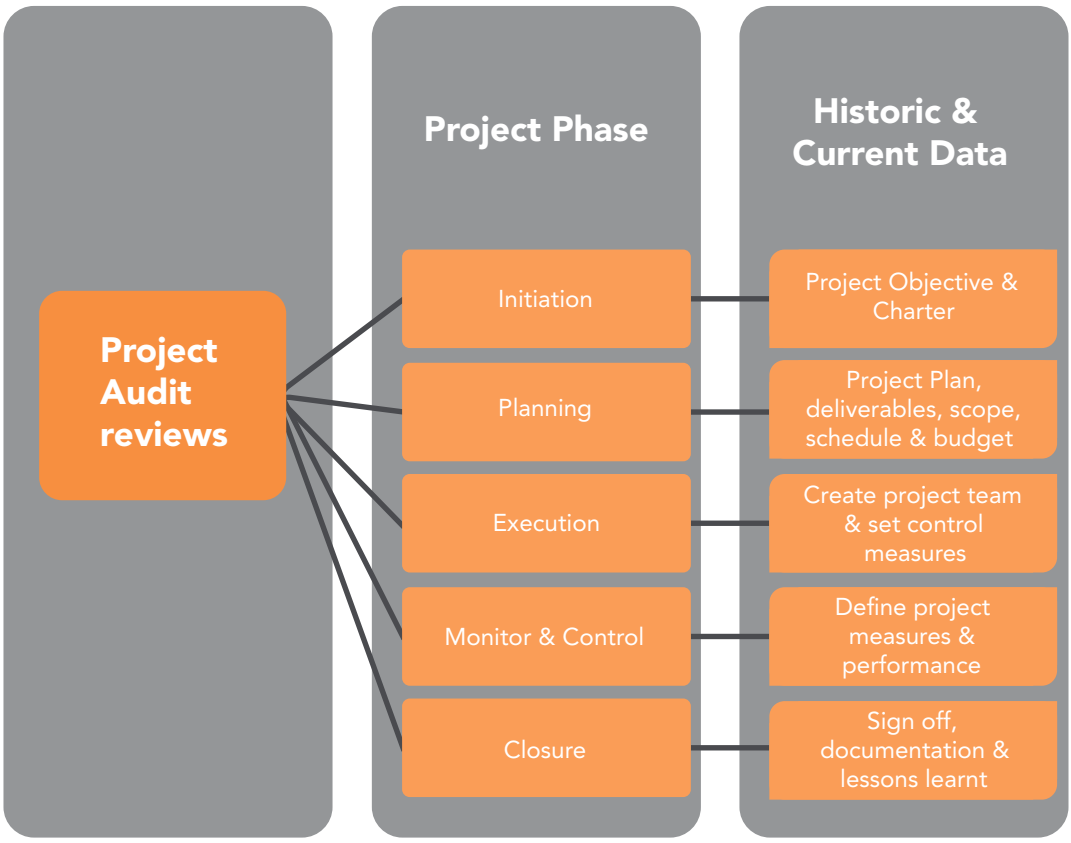
Once all the interviews have been completed it is the responsibility or the person in charge of the audit to oversee the compilation of the research findings into the audit report. This report is then circulated to the project sponsor, manager and key stakeholders to assess what impact it has on the project plan. The benefits organizations can achieve are:

1) Project members can 'vent' their emotions and thoughts in a safe and controlled manner.
2) Lesson learnt can be incorporated into organizational procedural documents.
3) Protection of project investors funds by minimizing re-work and scope creep.

Part of the audit procedure includes the design of a questionnaire that will be answered by core members of the project team and selected stakeholders. Its purpose is to tease from the recipients the issues, problems, challenges and successes that the project is facing as it progresses.

The questions used need to ensure that they draw objective answers from these individuals and not emotive ones. This can be achieved by using a variety of questioning styles the use of 'open questions' is often favored because it provides the recipient with the opportunity to explain the reasoning behind their answer.

Many project auditors distribute their questionnaires prior to audit interview. This allows individuals time to think about the questions asked and to present an objective and well thought out response. In some circumstances they may be able to provide evidence to support their answer. The questionnaire is extremely useful in auditing large multi-site projects situations because it allows a wider and more diverse number of respondents to be included with the interviews being conducted by conference calls.



Once all the questionnaires and interviews have been completed they are statistically analyzed and detailed in the audit report. Part of the project auditor's role is to present practical solutions to the main concerns that are highlighted in the report.

This will often follow each of the project phases and assess specific items relevant to that phase as shown in the diagram above. The report will outline the lesson's learnt at each phase and recommend ways in which project performance within the organization can be improved. This may require an organization to develop strategies that encourage project management.

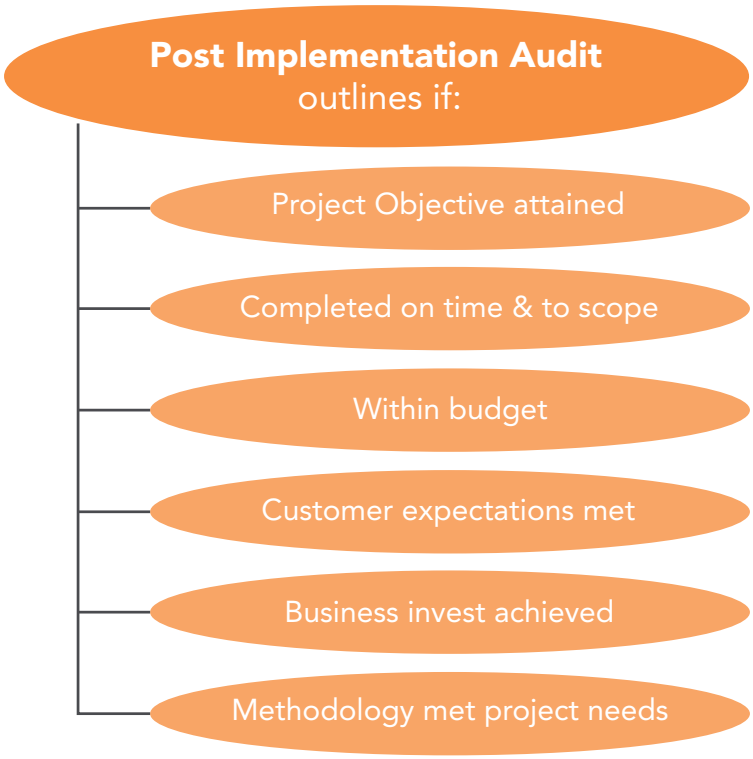
Key Points

- Uncovering project concerns, challenges and issues is one of the most critical tasks a project manager has to perform.
- Project audits enable organizations to assess how well their project management procedures work in practice.
- An audit is a four-stage process that involves: defining success criteria, creating an interview format, conducting the research and then writing a report.
- The audit report will identify the major concerns of the project stakeholders and present recommendations to address them.
- The audit can be done by the organisation's own staff or by a specialist company.
- The benefits of a project audit include: project team members can give an honest account of their experience, lesson learnt can be incorporated into procedural documents, and project investors can be reassured that the project is on-track.

9 POST IMPLEMENTATION AUDITS

One of the most important audits for highlighting improvements to an organization is the post implementation audit. Unfortunately, it is often overlooked due to it being at the end of the project when people are keen to move onto new projects, or return to their previous role.

It is slightly different to 'lesson's learnt' because it looks at how project objectives and activity attainment compares to what was written in the overall project plan and its functional area plans e.g. cost, scope, quality etc. The diagram below shows the key questions a post implementation audit is designed to answer.



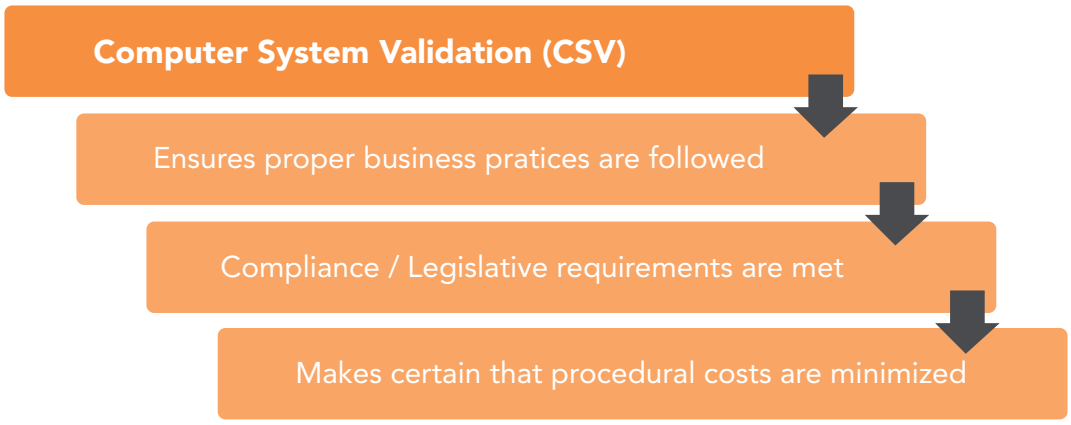
For many organizations it enables them to review their approach and expertise in identifying and managing risks so that they are better able to develop contingency plans. For more complex projects the findings of the audit report will cover such issues as managing change, improving contract management and development of effective working relationships, which is especially important in organizations using matrix management.

In the circumstances where a project has a significant compliance and regulatory content any project audit will need to demonstrate independent validation has been conducted on the required project management plans. This is often referred to as CSV (Computer Systems Validation) and is a vital facet of this type of project's success. Identifying a project that requires CSV is relatively straight-forward because such words as those listed below will be common in the specification and other project documentation.

1) Compliance
2) Regulatory requirement
3) Comply to standard / legislation 'XXX'
4) Validate system

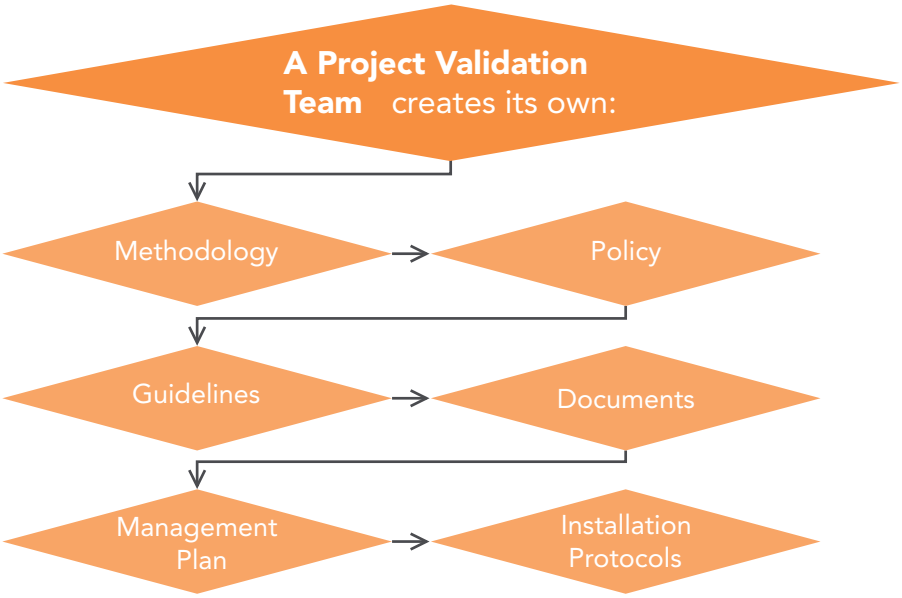
If your project has one or more of these terms then you will need to plan for validation in the project plan and those of its functional management areas. Each project requiring a validation will have its own set of requirements that go further that the usual quality assurance because the system must match the exact end user needs otherwise it will not be useable.

The comprehensive testing that CSV requires is a critical part of validation. This is needed to guarantee that the proper business practices are followed and to make certain that compliance and/or legislative requirements are met. It also ensures that the costs of such procedures are minimized.



This sort of requirement is on the increase because more and more IT systems are essential to the business processes and the implications of it not working correctly could be disastrous, even ruinous for the organization. Without using CSV user acceptance becomes a long and drawn out, costly process. The documentation that the CSV procedure creates provides the end user the evidence they require to show the project has been subjected to the highest level of quality assurance.

Correcting errors once the project has been handed over is extremely expensive and CSV is designed to catch such errors early on in the project cycle. This means that the composition of the validation team must include several experts – e.g. developers, suppliers, project members, quality, operations, legislation experts – to ensure it is effective in its role.



With such a diverse group an organization must allow for the cost of training the validation team to guarantee they understand their role and how to execute it. They are several issues this specialist team need to address to ensure the project's success. They are to create a:

1) Validation methodology
2) Validation policy
3) Validation guidelines and required documentation
4) Validation management plan
5) Installation protocols

The use of validated projects will only increase as the need to projects products and services to meet strict regulatory and compliance standards becomes as essential part of organizations responding to the changes in their environment and marketplace.

Key Points

- The post implementation audit enables the management team to review their approach and expertise in identifying and managing risks so that they are better able to develop contingency plans.
- It is often overlooked because people are keen to move onto new projects, or return to their previous role.
- The findings of the audit report will cover such issues as managing change, improving contract management and the development of effective working relationships.

SUMMARY

Project management is a complex activity that requires a structure, procedures and processes that are appropriate to your project. This will enable you to manage the inevitable changes that occur throughout a project's lifespan in a professional manner to ensure success. Each project function describes the expertise, skills and tools needed for your project.

So much work is now run as projects and so few people have the necessary skills to manage them properly that there is a huge demand for good project managers and that demand is increasing all the time.

The other project management skills eBooks available from Free Management eBooks provide you with an opportunity to read a more in-depth description of each functional area.

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- Project Management Processes
- Managing a Project Team
- Managing the Project Scope
- Managing the Project Schedule
- Managing the Project Budget
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