Quality Management and PM Methodologies

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Quality Management and PM Methodologies

PROJECT QUALITY MANAGEMENT

Quality management is the process to make sure that all project activities required to design, plan and implement a project are effective and efficient with respect to the purpose of the objective and its performance.
Project quality management (PQM) is not a separate, independent process that occurs at the end of an activity to measure the level of quality of the output. It is not procuring the most expensive material or services available on the market. Quality and rating are not the same, rating is characteristics of a material or service such as additional features. A product may be of good quality (no defects) and be of low rating (low or no extra features).

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The focus of QM is on improving stakeholder's satisfaction through continuous and incremental improvements to processes, including removing unnecessary activities; it achieves that by the continuous improvement of the quality of material and services provided to the beneficiaries. It is not about finding and correcting errors after the fact, quality management is the continuous monitoring and application of quality processes in all aspects of the project.

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Definition of Quality

Quality has been defined as "the totality of characteristics of an entity that bear on its ability to satisfy stated or implied needs."1 The stated and implied quality needs are the inputs used in defining project requirements from the end user and the stakeholders. It is also defined as the “Conformance to requirements or fitness for use"2; which means that the product or services must meet the intended objectives of the project and have a value to the Stakeholder and end user and that the end uses can use the material or service as it was originally intended. The central focus of quality management is meeting or exceeding stakeholder's expectations and conforming to the project design and specifications.

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The ultimate judge for quality is the end users and represents how close the project outputs and deliverables come to meeting the end users' requirements and expectations

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Quality management is not an event - it is a process; a consistently high-quality product or service cannot be produced by a defective process. Quality management is a repetitive cycle of measuring quality, updating processes, measuring, updating processes until the desired quality is achieved.

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The Purpose of Management of Quality (1)

- The main principle of project quality management is to ensure the project will meet or exceed stakeholder's needs and expectations.
- The project team must develop a good relationship with key stakeholders, specially the end users and the stakeholders of the project, to understand what quality means to them.
- One of the causes for poor project evaluations is the project focuses only in meeting the written requirements for the main outputs and ignores other stakeholder needs and expectations for the project

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The Purpose of Management of Quality (2)

- Quality must be viewed on an equal level with scope, schedule and budget.
- If a project end users is not satisfied with the quality of how the project is delivering the outcomes, the project team will need to adjust scope, schedule and budget to satisfy the end users' needs and expectations.
- To deliver the project scope on time and on budget is not enough, to achieve all stakeholder satisfaction the project must develop a good working relationship with all stakeholders and understand their stated or implied needs

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Inputs	Process	Outputs
WBS	Plan – Define the Quality Standard	Quality Standard
Scope Document	Do – Assurance that quality is adhered to	Quality Plan
Policies	Check – Quality Control Act – Quality Improvements	

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Project Quality management consists of four main processes:

1. Quality Definition
2. Quality Assurance
3. Quality Control
4. Quality Improvements

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Sources of Quality Definition (1)

Quality management implies the ability to anticipate situations and prepare actions that will help bring the desired outcomes. The goal is the prevention of defects through the creation of actions that will ensure that the project team understands what is defined as quality.

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Sources of Quality Definition (2)

One source for definition of quality may come to a common understanding of what the stakeholders defines as quality. The stakeholders may have certain standards of what is expected from the project, and how the project delivers the expected benefits to the beneficiaries. This is in line with the project's ultimate objective that the project outcomes can satisfy the stated or implied needs. come from the stakeholders; the project must establish conversations with the stakeholders to be familiar with and

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Quality Characteristics (1)

All material or services have characteristics that facilitate the identification of its quality. The characteristics are part of the conditions of how the material, equipment and services can meet the requirements of the project and are fit for use by the beneficiaries. Quality characteristics relate to the attributes, measures and methods attached to that product or service

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Quality Characteristics (2)

- **Functionality** is the degree, by which equipment performs its intended function, this is important especially for clinical equipment, that the operation should be behave as expected.
- **Performance**, it's how well a product or service performs the beneficiaries intended use. A water system should be designed to support extreme conditions and require little maintenance to reduce the cost to the community and increase its sustainability

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Quality Characteristics (3)

Reliability, it's the ability of the service or product to perform as intended under normal conditions without unacceptable failures. Material used for blood testing should be able to provide the information in a consistent and dependable manner that will help identify critical diseases. The trust of the beneficiaries depends on the quality of the tests

- **Relevance**, it's the characteristic of how a product or service meets the actual needs of the end users, it should be pertinent, applicable, and appropriate to its intended use or application

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Quality Characteristics (4)

- **Timeliness**, how the product or service is delivered in time to solve the problems when its needed and not after, this is a crucial characteristic for delivering the project on time as well as budget
- **Suitability** defines the fitness of its use, it appropriateness and correctness, e.g. the application must be designed to operate on how the end users will use it on the specific hardware device.

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Quality Characteristics (5)

Completeness, the quality that the service is complete and includes all the entire scope of services. Training sessions should be complete and include all the material needed to build a desired skill or knowledge

- **Consistency**, an application is delivered in the same way for every end users System compliance tests need to be done using the same procedure for every function.

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Quality plan

Part of defining quality involves developing a quality plan and a quality checklist that will be used during the project implementation phase. This check list will ensure the project team and other actors are delivering the project outputs according to the quality requirements.

Once the project has defined the quality standards and quality characteristics, it will create a project quality plan that describes all the quality definitions and standards relevant to the project, it will highlight the standards that must be followed to comply to regulatory requirements setup by the stakeholders, the organization external sub-contractors, and agencies such a the local government and professional organizations (transport, banking etc.)

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QUALITY ASSURANCE

Assurance is the activity of providing evidence to create confidence among all stakeholders that the quality-related activities are being performed effectively; and that all planned actions are being done to provide adequate confidence that a product or service will satisfy the stated requirements for quality.

Quality Assurance is a process to provide confirmation based on evidence to ensure to the donor, beneficiaries, organization management and other stakeholders that product meet needs, expectations, and other requirements. It assures the existence and effectiveness of process and procedures tools, and safeguards are in place to make sure that the expected levels of quality will be reached to produce quality outputs.

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Quality Audits

Quality audits are structured reviews of the quality management activities that help identify lessons learned that can improve the performance on current or future project activities. Audits are performed by project staff or consultants with expertise in specific areas. The purpose of quality audit is to review how the project is using its internal processes to produce the products and services it will deliver to the end users. Its goal is to find ways to improve the tools, techniques and processes that create the products and services.

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The PDCA Cycle

The most popular tool used to determine quality assurance is the Shewhart Cycle. This cycle for quality assurance consists of four steps: Plan, Do, Check, and Act. These steps are commonly abbreviated as PDCA.

The four quality assurance steps within the PDCA model stand for:

- Plan: Establish objectives and processes required to deliver the desired results.
- Do: Implement the process developed.
- Check: Monitor and evaluate the implemented process by testing the results against the predetermined objectives
- Act: Apply actions necessary for improvement if the results require changes.

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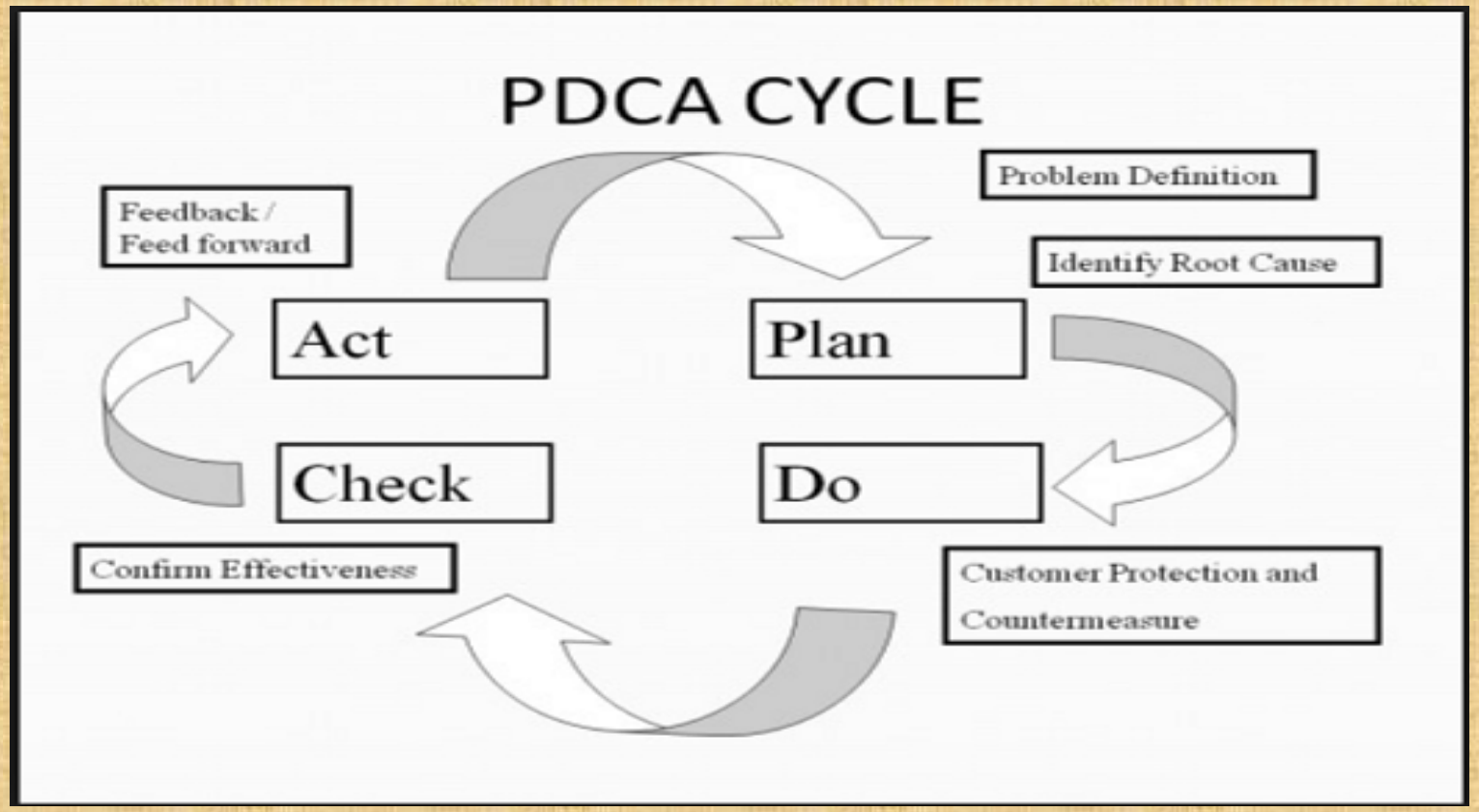

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Assurance vs. Control

Quality assurance is often confused with quality control; quality control is done at the end of a process or activity to verify that quality standards have been met. Quality control by itself does not provide quality, although it may identify problems and suggest ways to improving it. In contrast, quality assurance is a systematic approach to obtaining quality standards.

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QUALITY CONTROL (1)

Quality control is the use of techniques and activities that compare actual quality performance with goals and define appropriate action in response to a shortfall. It is the process that monitors specific project results to determine if they comply with relevant standards and identifies different approaches to eliminate the causes for the unsatisfactory performance.

The goal of quality control is to improve quality and involves monitoring the project outputs to determine if they meet the quality standards or definitions based on the project

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The goal of quality control is to improve quality and involves monitoring the project outputs to determine if they meet the quality standards or definitions based on the project stakeholder's expectations. Quality control also includes how the project performs in its efforts to manage scope, budget and schedule

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QUALITY CONTROL (2)

Acceptance; The end users, the other key project stakeholders accept or reject the product or service delivered. Acceptance occurs after the end users or stakeholders have had a chance to evaluate the product or service

- **Rework**; is the action taken to bring the rejected product or service into compliance with the requirements, quality specifications or stakeholder expectations. Rework is expensive that is why the project must make every effort to do a good job in quality planning and quality assurance to avoid the need for rework. Rework and all the costs associated with it may not be paid by the end users and the organization may end up covering those costs.

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QUALITY CONTROL (3)

- **Adjustments;** correct or take the necessary steps to prevent further quality problems or defects based on quality control measurements. Adjustments are identified to the processes that produce the outputs and the decisions that were taken that lead to the defects and errors. Changes are taken to the Change Control processes of the project

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Quality Control Tools

There are a couple of good tools that can be used to control quality on a project, these are cause and effect diagrams, Pareto charts and control charts:

- **Cause and Effect Diagram**, also known as fishbone diagrams or Ishikawa diagrams (named after Kaoru Ishikawa, a Japanese quality control statistician, who developed the concept in the 1960s, and is considered one of the seven basic tools of quality management) It is named fishbone diagram because of their fish-like appearance, it is an analysis tool that provides a systematic way of looking at effects and the causes that create or contribute to those effects.

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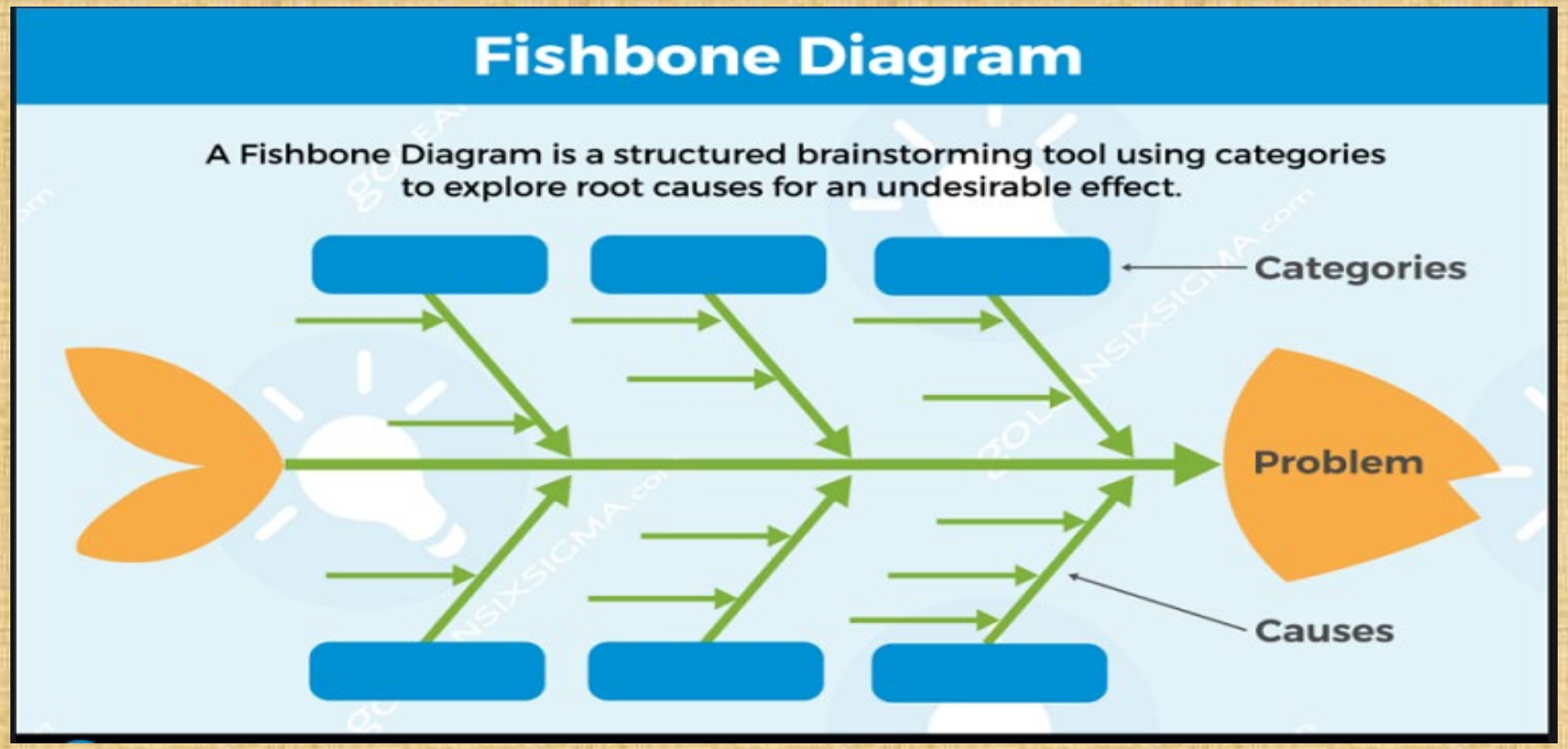

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Pareto Charts;

A Pareto chart, named after Vilfredo Pareto, is a type of chart that contains both bars and a line graph, where individual values are represented in descending order by bars, and the cumulative total is represented by the line. based on Pareto's rule, which states that 80 percent of the problems are often due to 20 percent of the causes. The assumption is that most of the results in any situation are determined by a small number of causes and helps identify the vital few contributors that account for most quality problems. The chart is a form of histogram that orders the data by frequency of occurrence; it shows how many defects were generated by a type of category of identified cause.

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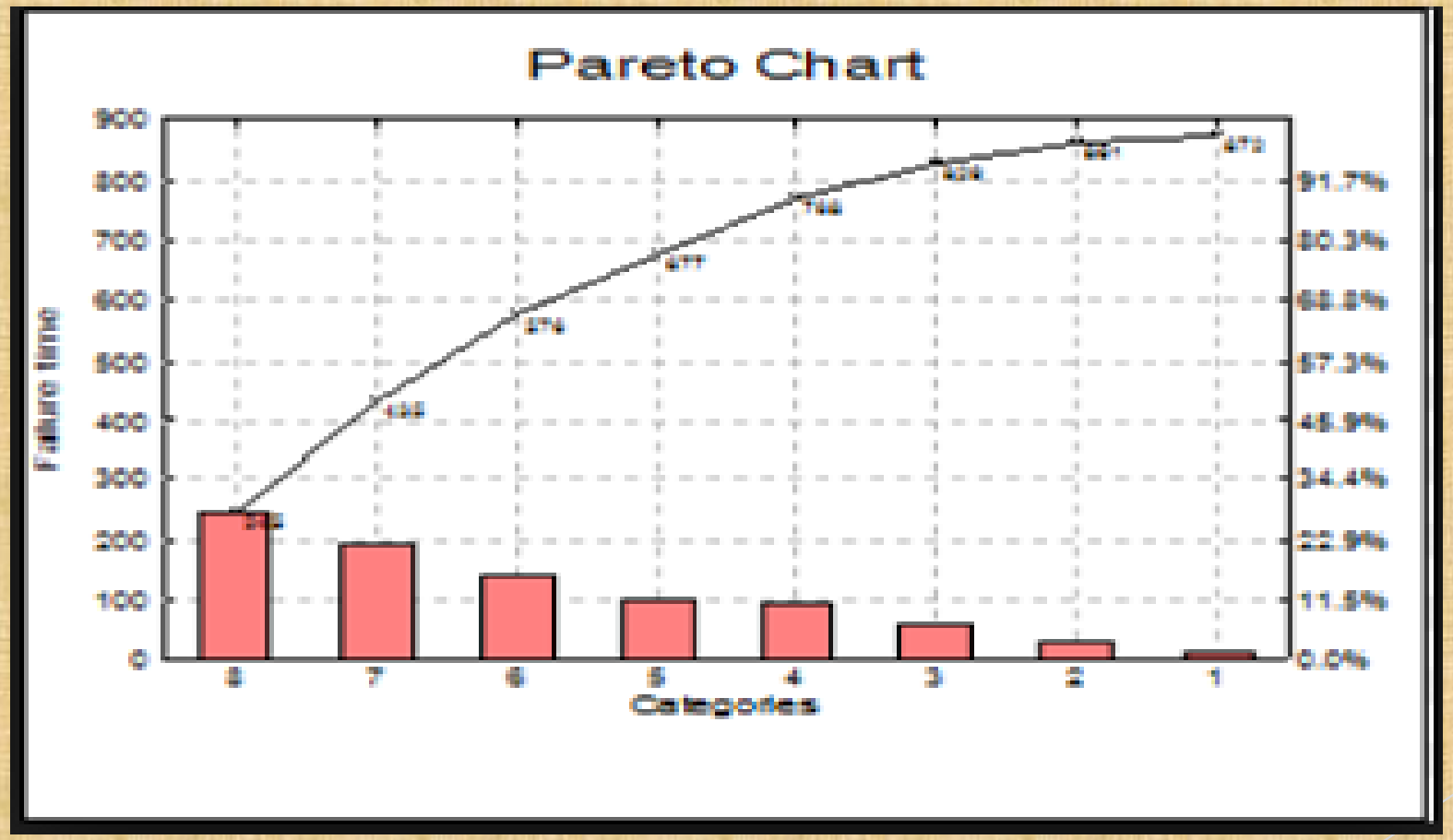

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- **Control Charts**;

is a graphical display of data that illustrates the results of a process over time, the purpose of a control chart is to prevent defects, rather than detect them or reject them, the chart allows the determine whether a process is in control or out of control over specified length of time. Control charts are often used to monitor the production of large quantities of products but can also be used to monitor the volume and frequency of errors in documents, cost and schedule variances and other items related to project quality management.

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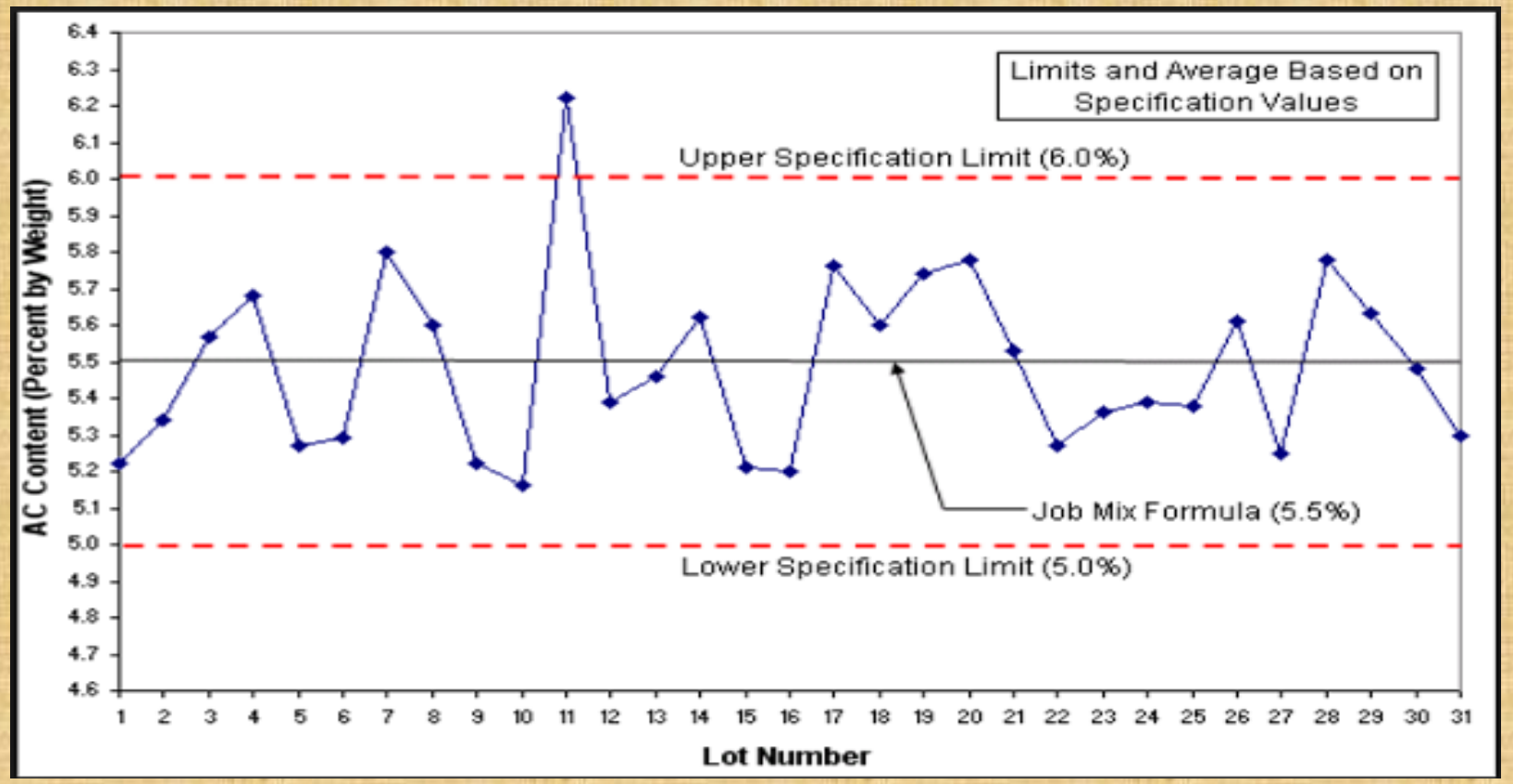

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QUALITY IMPROVEMENT

It is the systematic approach to the processes of work that looks to remove waste, loss, rework, frustration, etc. to make the processes of work more effective, efficient, and appropriate.

Quality improvement refers to the application of methods and tools to close the gap between current and expected levels of quality by understanding and addressing system deficiencies and strengths to improve, or in some cases, re-design project processes.

A variety of quality improvement approaches exists, ranging from individual performance improvement to redesign of entire project processes. These approaches differ in terms of time, resources, and complexity, but share the same four steps in quality improvement

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Four steps in quality improvement

- **Identify** what you want to improve; the project using the data found in the quality control process identifies the areas that need improvement.
- **Analyze** the problem or system, the team then investigates the causes for the problem and its implications to the project, the causes may be internal or external to the project.
- **Develop** potential solutions or changes that appear likely to improve the problem or system, the team brainstorms ideas and potential solutions to the problem, taking in consideration its impact to the project schedule and budget. After careful considerations the team decides and chooses the best alternative.
- **Test** and implement the solutions. The team may decide to test the solution on a small scale to verify that it is capable of fixing the problem, its tests for the initial assumptions made about the problem and once it confirms that the solution is a viable alternative, it then proceeds to implement in a full scale the solution.

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Cost of Quality (1)

The cost of quality is the sum of costs a project will spend to prevent poor quality and any other costs incurred because of outputs of poor quality. Poor quality is the waste, errors, or failure to meet stakeholder needs and project requirements. The costs of poor quality can be broken down into the three categories of prevention, appraisal, and failure costs:

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Cost of Quality (2)

Prevention Costs: These are planned costs an organization incurs to ensure that errors are not made at any stage during the delivery process of that product or service to a beneficiary. Examples of prevention costs include quality planning costs, education and training costs, quality administration staff costs, process control costs, market research costs, field testing costs, and preventive maintenance costs. The cost of preventing mistakes are always much less than the costs of inspection and correction.

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Cost of Quality (3)

- **Appraisal costs:** These include the costs of verifying, checking, or evaluating a product or service during the delivery process. Examples of appraisal costs include receiving or incoming inspection costs, internal production audit costs, test and inspection costs, instrument maintenance costs, process measurement and control costs, supplier evaluation costs, and audit report costs.
- **Failure costs**: A project incurs these costs because the product or service did not meet the requirements and had to be fixed or replaced, or the service had to be repeated

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Capability Maturity Models (CMM)

Another approach to improve quality is the use of capability maturity models, which are frameworks for helping organizations and projects improve their processes. The model includes a method for assessing the projects maturity levels as a first step to determine the improvements needed to increase the capacity of the project to deliver the project outputs as promised.

The Capability Maturity Model is a development model created after a study of data collected from organizations that contracted with the U.S. Department of Defense, who funded the research.

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Capability Maturity Models (CMM) (1)

A project quality capability maturity usually consists of five levels:

Level 1. Informal level, there is no defined processes for quality practices or standards. The organization may be in the initial stages of considering how projects should define quality, but most efforts are informal and had-oc.

- **Level 2.** Defined level, the organization has defined some basic quality standards and project quality policies that are being adopted. But not all projects are using it in a consistent manner.
- **Level 3.** Repeatable level, the quality process is well documented and is an organizational standard. All projects are using it and producing consistent and repeatable results.

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Capability Maturity Models (CMM) (2)

- **Level 4.** Controlled level, all projects ire required to use quality planning standard processes. The organization has a unit or roles that coordinate quality standards and assurance and quality audits are done on a regular basis.
- **Level 5.** Optimized level, the quality process includes guidelines for feeding improvements back into the process. Metrics are used as key criteria for quality decisions and quality results are predictable.

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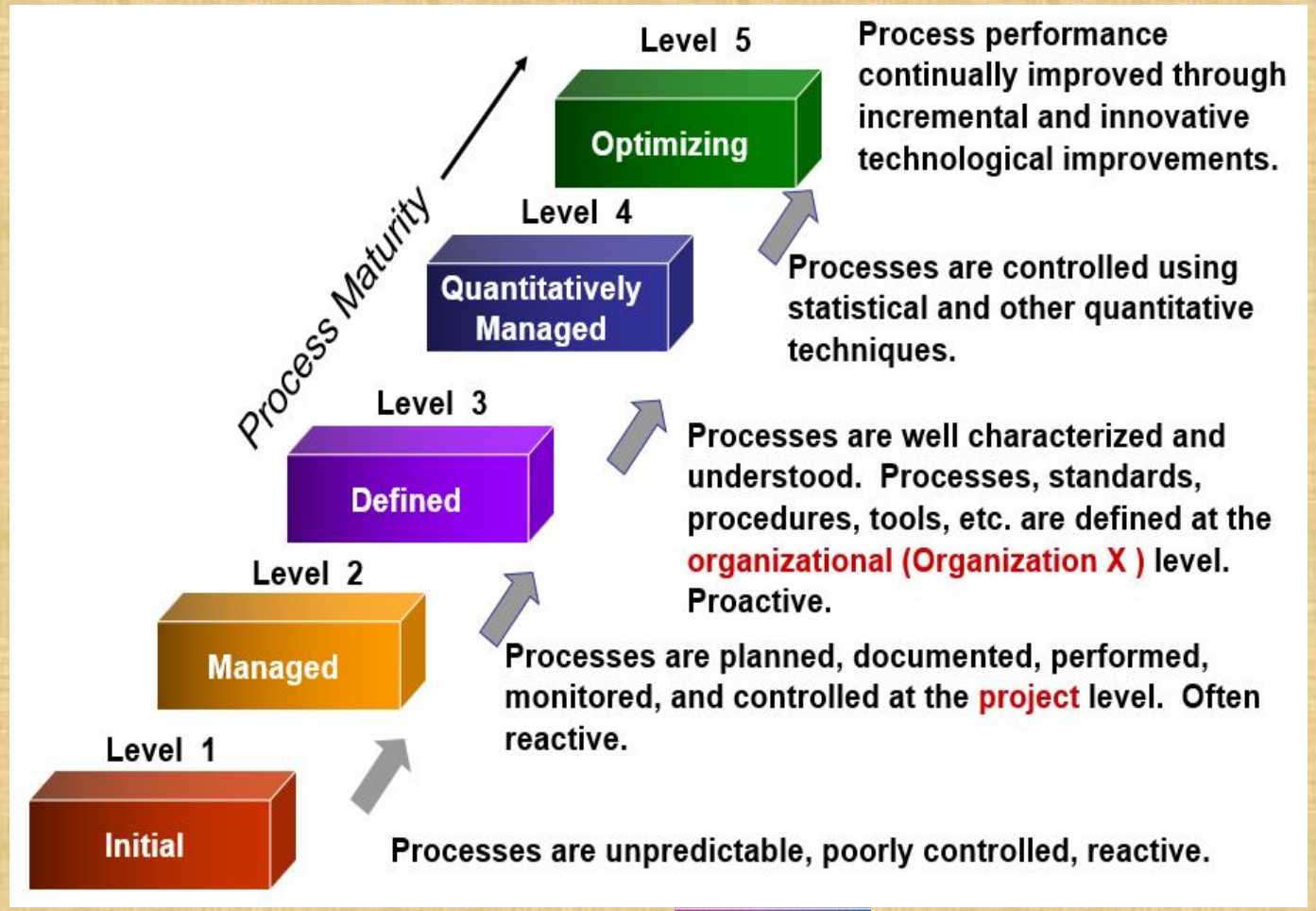

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Continuous Improvement

Quality is not something that is done at the end of a phase or at the end of the project, is a continuous process to ensure quality is performed in all aspects of the project. The goal is to continuously improve based on the lessons learned and new insights provided by the project. To be effective it should happen during all activities of the project.

Continuous improvement, regarding project quality always focuses on improving stakeholder satisfaction through continuous and incremental improvements to processes, including the removal of any unnecessary activities.

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ISO 9001:2015 AND THE 8 QUALITY MANAGEMENT PRINCIPLES TO DELIVER A CONSISTENT PRODUCT

For more than 50 years, the International Standard for Organizations (ISO) has been developing standards to enable business to produce various outcomes without a non-conformances or potential errors occurring. The original ISO standard was introduced in 1990 and underwent a major revision in 2008 as the Quality Management System standards model, ISO 9001:2008.

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Ensuring Compliance

The raison d'etre of the 2015 upgrade was to ensure that ISO 9001 remained relevant, and to reflect changes in the international as well as local environment, and ensure it continues to bring "confidence in an organization's ability to consistently provide product that meets client and applicable statutory and regulatory requirements."

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The ISO's Technical Committee ISO/TC 176/SC 2 stated that the revised standard should:

1. Continue to be generic, and relevant to all sizes and types of organization operating in any sector;
2. Maintain the current focus on effective process management to produce required outcomes;
3. Take account of changes in quality management systems practices and technology since the last major revision in 2008;
4. Reflect changes in the demanding and dynamic environments which are becoming increasingly complex in which organizations operate;
5. Apply Annex SL of the ISO Directives to enhance compatibility and alignment with other ISO management system standards;
6. Facilitate effective organizational implementation and effective conformity assessment by first, second and third parties;

Use simplified language and writing styles to aid understanding and consistent interpretations of its requirements; and

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A Basic Understanding of the Need for Total Quality Management

THE EIGHT PRINCIPLES ARE:

Involvement of people

Organizations succeed by retaining competent employees, encouraging continuous enhancement of their knowledge and skills, and empowering them, encouraging engagement and recognizing achievements.

Process approach

Organizations enhance their performance when leaders manage and control their processes, as well as the inputs and outputs that tie these processes together.

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- **Involvement of people**

  Organizations succeed by retaining competent employees, encouraging continuous enhancement of their knowledge and skills, and empowering them, encouraging engagement and recognizing achievements.

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- **System approach to management**

  Organizations sustain success when processes are managed as one coherent quality management system.

- **Continuous improvement**

  Organizations will maintain current levels of performance, respond to changing conditions, and identify, create and exploit new opportunities when they establish and sustain an ongoing focus on improvement.

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- **Factual approach to decision making**

  Organizations succeed when they have established an evidence-based decision-making process that entails gathering input from multiple sources, identifying facts, objectively analyzing data, examining cause/effect, and considering potential consequences.

- **Mutually beneficial supplier relationships**

Organizations that carefully manage their relationships with suppliers and partners can nurture positive and productive involvement, support and feedback from those entities

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Overview of the Software Development Life Cycle (SDLC)

The software development life cycle (SDLC) is a conceptual model, it was developed many years ago to enable users to develop project management plans for the development of software applications to describe the stages and tasks involved in each step of a project to write and deploy software.

A software development life cycle is the long-term view of software as a deliverable product, from initial planning through maintenance and finally the replacement of the completed application. SDLC *phases* or *steps* enabled Organizations strive to quickly and efficiently produce high-quality software through intricate planning, on time and budget

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Standard SDLC phases

SDLC has several phases which vary depending on the organisation and its software product goals, generally about five and seven steps. At the lowest level, software is designed, developed, tested and then released. Upon release, the software is maintained until it is replaced

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Usually, the SDLC process follows these six phases:

1. **Evaluate the existing system.** If there is existing software in place, first any shortcomings in that software must identified before its replacement. This is usually carried out by interviewing the corporate users and consulting with support personnel, as well as by reviewing metrics gathered through application performance monitoring tools. This step will provide insight on the strengths and weaknesses of the current software and what can be implemented in the new software. In fact, a SWOT analysis is recommended to ensure the upgrade to the application does remove any deficiencies

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- **Define the new system requirements**. Deficiencies in the existing software must be addressed; moreover, specific proposals will be made for improvement, for example new features and functionality. If this is a project to create a new application, this phase will then define the requirements for proposed software. Requirements will include hardware, operating systems, programming languages to be used and cyber security.

- **Design the proposed system.** The design phase turns the software specifications into a design plan. Plans will be created defining the architecture, hardware, operating systems, programming languages, communications and cyber security issues.

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- **Develop the new software.** During the development phase, the code is built, tested, integrated into a library and managed. The developers obtain and install new components and programs. The code's structure determines which tests are specified and carried out. For example, the software could be built as a set of routines instead of a large monolithic structure, which means the software would not have to be regression tested with further updates or iterations. Software testing is a large step in the SDLC, and some models count it as a separate phase from development.
- **Put the system into use.** Deployment can be accomplished in various ways. Some new software is phased in, according to application or location, to gradually replace an old product. In instances, the old system is shut down, and users may cut over to the new system all at once. However, it is recommended that initially during the cutover that the two systems are run in parallel to ensure continuity of the output as well as ensuring identical results

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Monitor the software. The new software must be exhaustively evaluated for performance and stability. Organizations should use logs, as well as various testing tools and other metrics-gathering tools, for monitoring. All non-conformances should be reported to the development team for remediation by patches or ongoing software maintenance efforts

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Creating SDLC

SDLC MODELS

Various SDLC models exist, and choosing the right one depends on any given project:

- Waterfall model, which was the original SDLC method;
- rapid application development (RAD);
- Joint Application Development (JAD);
- spiral model;
- build-and-fix model;
- synchronize-and-stabilize model;
- V-model; and
- Agile model.

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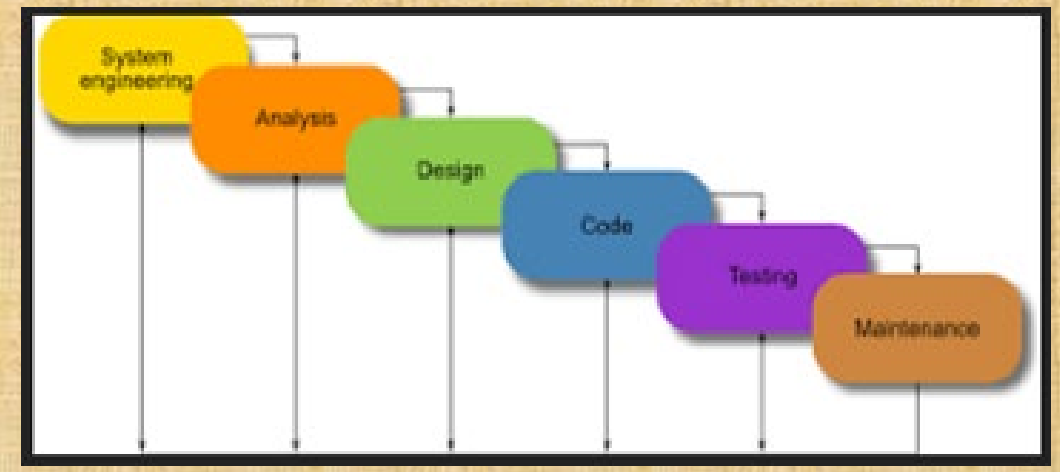
Waterfall

Waterfall is a traditional linear and sequential approach to SDLC. The Waterfall model moves through the well-defined stages of SDLC only when a stage works as intended. This model can be very effective when the project is small and there are not too many unknowns in direction. In the past few years Waterfall has fallen out of favour for SDLC advocates, due to the need for software development to be fast and flexible.



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Agile

Agile is a much more utilized SDLC approach. Agile is an SDLC model that approaches software development in incremental but rapid cycles, commonly referred to as *sprints*. Each sprint builds upon the last. These sprints compose the project quickly with higher flexibility, as new changes in scope and direction can be implemented in each sprint. Agile can mean less time spent in the planning phases, and a project can diverge from original specifications. Documentation is crucial, regardless of the type of SDLC model for a given application and is usually done in parallel with the development process

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