

# INFO5990: Professional Practice in IT

## Week 6: Quality Assurance

**Dr. Mafruha Mowrin Hossain**



THE UNIVERSITY OF  
**SYDNEY**

“Quality means doing it right when no one is looking.”

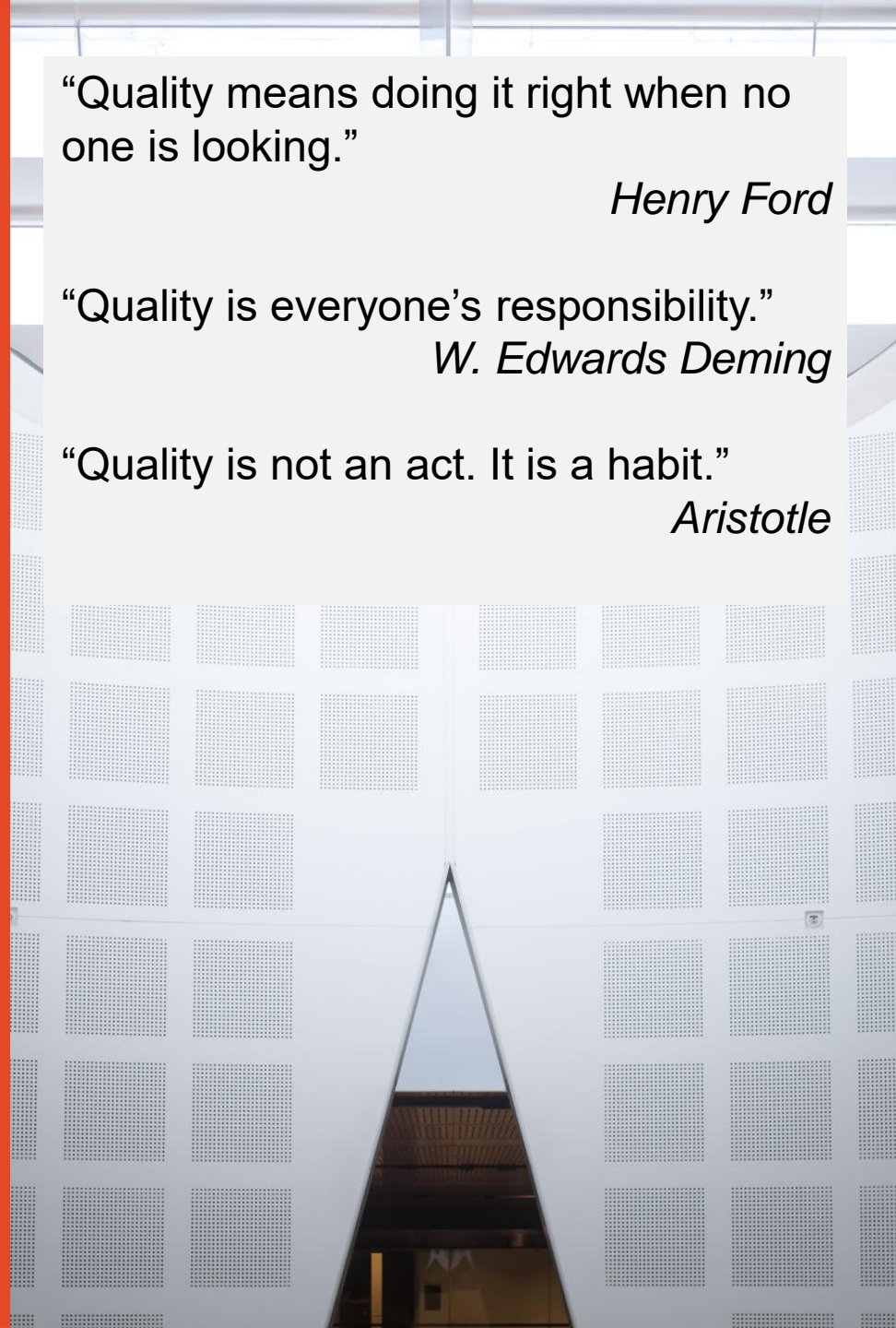
*Henry Ford*

“Quality is everyone’s responsibility.”

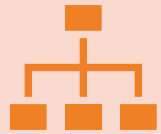
*W. Edwards Deming*

“Quality is not an act. It is a habit.”

*Aristotle*



# Today...



## Project Quality Assurance - Concepts

How do you measure the  
quality of a project?

How do you ensure the  
quality of a project?

# Quality Assurance

## Quality

- “The standard of something as measured against other things of a similar kind; the degree of excellence of something” (*Oxford English Dictionary*)
- Quality refers to how well a product, service, or process meets requirements, expectations, or standards.

## Assurance

- “Certainty about something” (*Oxford English Dictionary*)
- Assurance is the process or set of activities used to ensure that quality standards will be met consistently.

# Definition



**Quality Assurance (QA)** is a **process-centered approach** to ensuring that a company or organization is providing the best possible products or services.



It is related to **Quality Control (QC)**, which focuses on the end result, such as testing a sample of items from a batch after production.

**Quality Assurance** → Process to ensure that the quality is achieved

**Quality Control** → Processes to identify whether the quality is achieved



**Quality assurance focuses on enhancing and improving the process that is used to create the end result, rather than focusing on the result itself.**



Among the parts of the process that are considered in QA are planning, design, development, production and service.



Source: <http://www.wisegeek.com/what-is-quality-assurance.htm>

# How do you define and measure 'quality'? \*

Project quality is a crucial aspect of technical project leadership, but it can be challenging to define and measure it in a consistent and meaningful way.

## Quality criteria

- Specific requirements and expectations that your project stakeholders have for the deliverables and processes of your project.
- Based on various factors customer needs, industry standards, regulatory compliance, best practices or internal policies

## Quality standard

- Quality standards are the benchmarks or guidelines that you use to measure and evaluate the quality of your project deliverables and processes.
- Quality refers to the likelihood of reaching the stated objectives or desired costs, or both.

## Quality metrics

- Quality metrics are the quantitative indicators that you use to track and report the quality of your project deliverables and processes.
- Based on various dimensions, such as functionality, reliability, usability, efficiency, maintainability, or security.
  - Who determines what 'quality is in any given context?

# Comparison of QA vs QC for software

Aspect	Quality Assurance (QA)	Quality Control (QC)
Definition	QA is a process-oriented approach focused on preventing defects in software.	QC is a product-oriented approach focused on identifying and fixing defects in the final product.
Goal	Ensure that the <b>right processes</b> are followed to create quality software.	Ensure that the <b>final product</b> meets the desired quality standards.
Activity Type	<b>Preventive</b> – stops issues before they occur.	<b>Detective</b> – finds and fixes existing issues.
Execution Involvement	QA does not involve executing the software. It focuses on process checks, documentation, and audits.	QC <b>involves executing</b> the software to test for bugs and issues.
Responsibility	Involves <b>everyone</b> in the team (developers, managers, analysts).	Usually handled by the <b>testing team</b> .
Key Activities	Process definition, audits, training, standards, and verification.	Functional testing, validation, bug tracking, and reporting.
Example	<b>Verification</b> – checking design documents, code reviews, etc.	<b>Validation</b> – testing the software with actual data.
Planning vs Action	QA is about <b>planning</b> and defining processes.	QC is about <b>executing</b> and verifying outcomes.
Lifecycle Involvement	Covers entire software lifecycle.	Focused on testing phase.

Or simply

Quality assurance systems  
emphasize avoiding quality problems  
**before**  
they get into the final product.

# Key concepts

- It is a proven management concept
- “Consistently do things right, the first time”
- “Continuous improvement”
- Avoiding mistakes and defects
- **Examples of pioneers in this approach?**
  - Frederick Taylor an American mechanical engineer. He was widely known for his methods to improve industrial efficiency.<sup>[1]</sup> He was one of the first management consultants.<sup>[2]</sup> In 1909, Taylor summed up his efficiency techniques in his book *The Principles of Scientific Management* ([https://en.wikipedia.org/wiki/Frederick\\_Winslow\\_Taylor](https://en.wikipedia.org/wiki/Frederick_Winslow_Taylor))
  - W. Edwards Deming American engineer, statistician, professor, author, lecturer, and management consultant. Educated initially as an electrical engineer and later specializing in mathematical physics, He is known as the father of the quality movement [https://en.wikipedia.org/wiki/W.\\_Edwards\\_Deming](https://en.wikipedia.org/wiki/W._Edwards_Deming)
  - Source: <https://deming.org/explore/fourteen-points/>



# Key concepts

- General view about quality systems is that although people makes mistakes, most errors stem from faulty processes or systems, and training of people ?

*\*Do you agree?*

*Discuss with your neighbour*



# Key concepts

- Implementing quality systems require integrity ethics, training, trust, leadership, teamwork, communication and recognition to be present in an organisation.

*Why?*



# How QA relates to IT



# QA Standards

- QA Standards are a set of guidelines that a company chooses to implement to show to their customers they are committed to delivering quality products and services to their customers.
- ISO 9000 is the most recognised standard used.
  - It is an international standard
  - Conformance to ISO 9000 is said to guarantee that a company can deliver quality products and services.
  - **Example:** A car manufacturer must follow ISO 9000 standards to ensure vehicle safety and performance.



<https://www.iso.org/standard/62085.html>

# What Does ISO 9000 Include?

- **ISO 9000:** Defines the **fundamentals and vocabulary** of quality management.
  - **Why it matters:** It helps everyone use the same language when discussing quality systems.
- **ISO 9001:** Specifies the actual **requirements** for a quality management system (QMS). It's the standard that organizations can **get certified** against.
  - **Why it matters:** This is the main standard that organizations can get certified for. It proves they follow quality processes.
- **ISO 9004:** Focuses on **performance improvement**.
  - **Why it matters:** Helps organizations become more efficient and effective in the long run.
- **ISO 19011:** Provides **guidelines for auditing** quality systems.
  - **Why it matters:** Audits are needed to check if an organization is meeting quality standards. This standard helps ensure audits are done properly.

# Main Components of ISO 9000 Family

## 1. ISO 9000 – Fundamentals & Vocabulary

- Defines **key concepts, principles, and terminology** used across the ISO 9000 family.
- Not certifiable, but essential for a **shared understanding** of quality.
- **Example:**  
A new IT project team reads ISO 9000 to clarify terms like “quality management system”, “customer satisfaction”, and “process approach” before implementing ISO 9001.

# Main Components of ISO 9000 Family

## 2. ISO 9001 – QMS Requirements (Certifiable)

- Most important and the **only certifiable** standard in the ISO 9000 family.
- Provides **requirements** for establishing, implementing, and improving a **Quality Management System**.
- Commonly used across industries, often required for global business.
- **Example:**  
A medical device manufacturer adopts ISO 9001 to maintain product quality, meet regulations, and qualify for global contracts. They document procedures, conduct training, and perform internal audits to keep their certification.

# Main Components of ISO 9000 Family

## 3. ISO 9004 – Performance Improvement

- Goes **beyond ISO 9001** to focus on **long-term success** and **sustainable performance**.
- Not for certification — used by mature organizations seeking **innovation and continuous improvement**.

### – Example:

A software company already certified in ISO 9001 applies ISO 9004 to improve product development cycles, engage employees, and align strategy with long-term goals.



# Main Components of ISO 9000 Family

## 4. ISO 19011 – Auditing Guidelines

- Offers **guidelines for auditing** QMS and Environmental Management Systems.
- Useful for planning, conducting, and reporting both internal and external audits.
- **Example:**  
A logistics company uses ISO 19011 to train its internal auditors. This helps them identify QMS gaps and prepare for external ISO 9001 certification audits.

# ISO 9000

- Based on seven quality management principles (QMP)
  - QMP 1 – **Customer focus:** The primary goal of quality management is to meet customer needs.
  - QMP 2 – **Leadership: Strong leadership drives a culture of quality.**
  - QMP 3 – **Engagement of people:** Employees must be involved in quality processes.
  - QMP 4 – **Process approach:** Quality is ensured by improving processes, not just checking results.
  - QMP 5 – **Improvement:** Companies must continuously evolve to maintain quality.
  - QMP 6 – **Evidence-based decision making:** Data should guide quality improvements.
  - QMP 7 – **Relationship management:** Quality depends on strong supplier and customer relationships.

# Advantages of a quality system



Companies strive for a total quality system because quality is what the customer (or regulations, or the need for efficiency) demands.



Ensure that products and services provided meet **organisational goals** and objectives and customer requirements **effectively and efficiently**.



Ensure consistency in the day-to-day operations.



Ensure that processes are repeatable and predictable.



Allow the company to create and retain satisfied customers



**Improve efficiency, reduce operating costs and minimize unproductive time.**



All of these features are important in having a competitive company.

# Quality Audits

- What is auditing?
  - Information Systems are integral to organisations.
  - Key business processes are enabled using information systems
  - The purpose of IS audit is to review and provide feedback, assurances and suggestions.



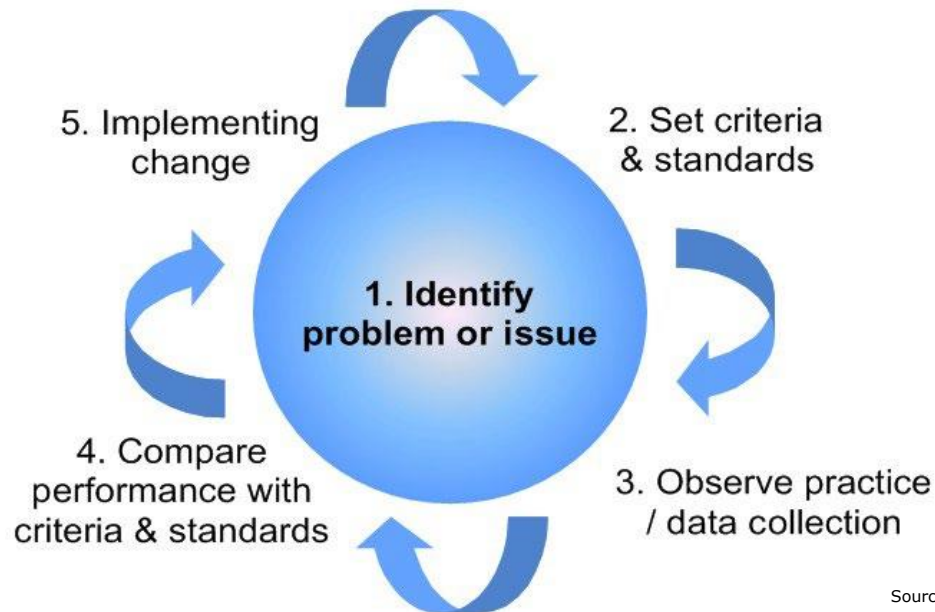
I.T Auditors are paid between \$600-\$1500 per day



# Definition

- “The process of collecting and evaluating evidence to determine whether a computer system (information system) safeguards **assets**, maintains **data integrity**, achieves **organisational goals**\* and consumes resources **efficiently** and **effectively** ”

– Ron Weber



Source: Vital voice and data

# Process improvement and process maturity

- **What is a process?**
- Processes are like cells in the human body, they are the building blocks of everything
- Process management and process maturity
- Deming, CMMI
- Process mining as a form of data mining

Source: <https://www.smartsheet.com/content/process-maturity#:~:text=Process%20maturity%20is%20a%20measure,there%20is%20continuous%20process%20improvement.>

Source: <https://www.ibm.com/au-en/topics/process-mining#:~:text=the%20next%20step-,What%20is%20process%20mining%3F,and%20other%20areas%20of%20improvement>

# The Deming Cycle (Plan-Do-Check-Act (PDCA))

- The **PDCA Cycle**, also known as the **Deming Cycle**, is a **continuous improvement model** that helps organizations improve processes, products, or services. It's a four-step loop used widely in quality management and IT lifecycle.
- Facilitates continuous improvement
  - Requires commitment from leadership
- **Simple yet powerful**
  - Outcomes and solutions coming from PDCA that can have a significant impact

# The Deming Cycle (Plan-Do-Check-Act (PDCA))

- **PLAN**

- Identify a problem or goal
- Analyze the situation
- Develop a plan to address the issue

- **DO**

- Implement the plan on a small scale
- Train staff, gather data, and record results

- **CHECK**

- Review and evaluate the results
- Compare actual outcomes with expectations

- **ACT**

- Standardize successful changes
- Make adjustments or repeat the cycle for further improvement





# CMM = Capability Maturity Model

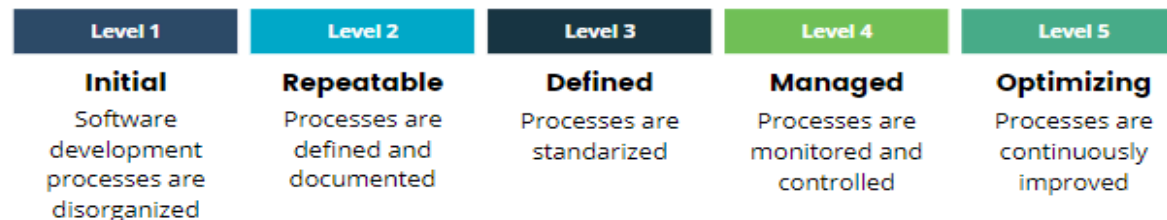
- How can you tell if you are doing a good job of managing your organisation?
- How can you monitor your progress on an ongoing basis?
- How do you manage the interactions of systems and processes that are continually evolving?
- How do poor processes impact interoperability, safety, reliability, efficiency, and effectiveness?

The Capability Maturity Model (CMM) is a framework that helps organizations assess how well their processes are defined, managed, and improved over time.

CMM is a framework that helps organizations evaluate the maturity of their processes and identify areas for improvement.

<https://cmmiinstitute.com/>

## 5 levels of the Capability Maturity Model



Source: <https://www.preplounge.com/en/case-interview-basics/business-concept-library/useful-business-analysis-tools/the-capability-maturity-model-cmm>

# Capability? Maturity? Model?

## Capability?

- The ability to do something
  - Perform an action
  - Carry out a process
  - e.g. drive a car; manufacture a car

## Maturity?

- Characteristics of being advanced or developed
  - e.g. in a human, psychologically or physiologically
  - e.g. in an organisation, a process which is very efficient

## Model?

- A representation of something in the real world which can be used e.g. to understand it, to provide a benchmark to measure it, and to guide actions related to it.
- A model may define measurable levels of maturity

# Maturity Levels 1 & 2

## – **Maturity Level 1: Initial**

- Process are ad hoc, are often are not reliable or repeatable, and outcomes vary in quality
- Example: A new e-commerce company that lacks order tracking and customer support systems leading to inconsistent delivery times.

## – **Maturity Level 2: Managed**

- Requirements are managed and processes are planned, performed, measured, and controlled. The status of the work products and the delivery of services are visible to management at defined points.
- Commitments are established among relevant stakeholders and are revised as needed. Work products are reviewed with stakeholders and are controlled.
- The work products and services satisfy their specified requirements, standards, and objectives.
- Example: An IT service provider starts tracking customer issues and following ticketing procedures, reducing response times.

# Maturity Levels 3 & 4

## – **Maturity Level 3: Defined**

- processes are well characterized and understood, and are described in standards, procedures, tools, and methods throughout the organisation
- Processes for specific projects are tailored from organisational standards
- Processes are managed proactively
- Example: A tech company adopts agile development across all projects, ensuring a consistent approach to software releases.

## – **Maturity Level 4: Quantitatively managed**

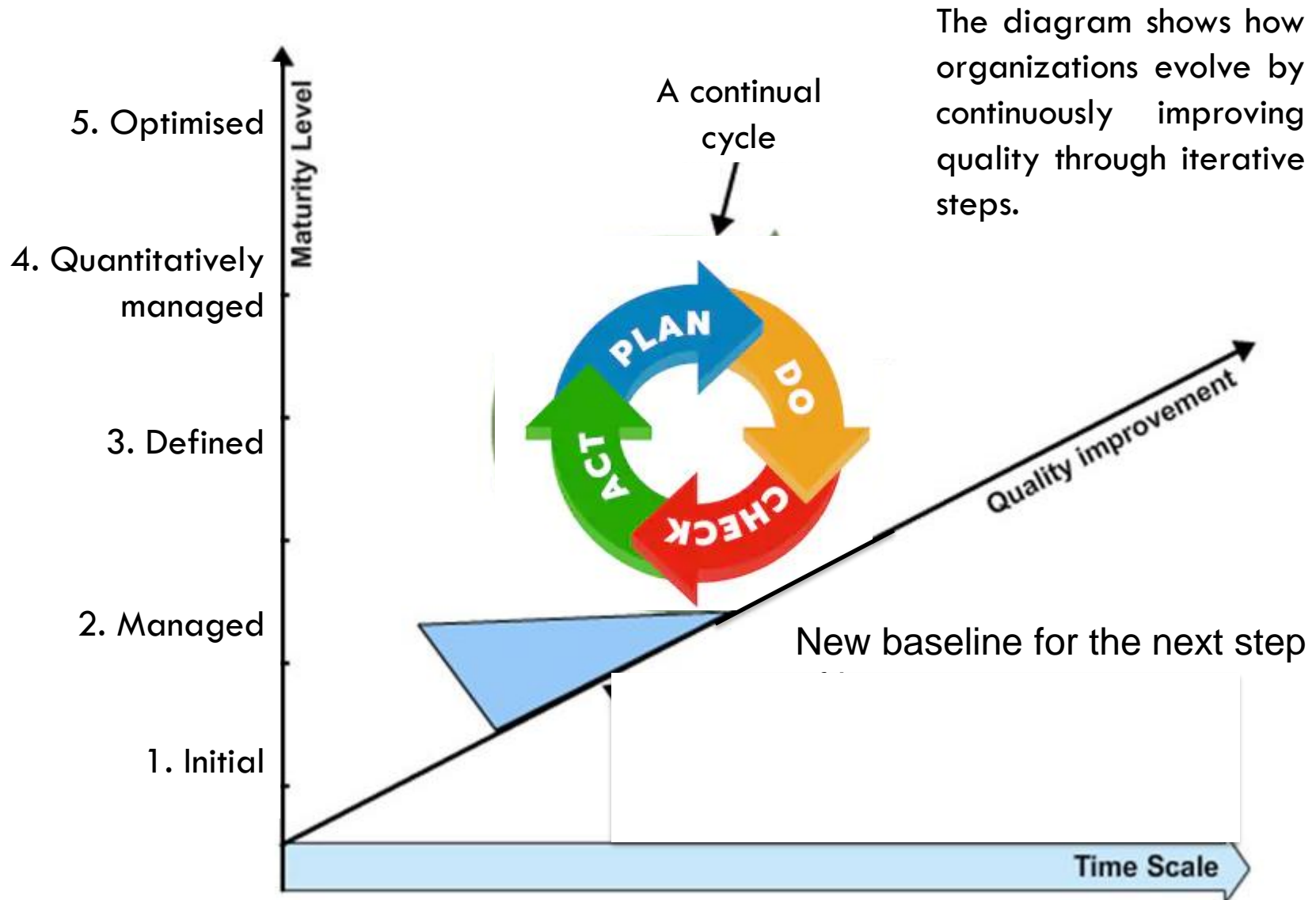
- Quantitative objectives for quality and process performance are established and used as criteria in managing the processes.
- Quantitative objectives are based on the needs of the customer, end users, organization, and process implementers.
- Quality and process performance are understood in statistical terms and are managed throughout the life of the processes.
- Example: A bank uses real-time fraud detection analytics to measure security risks and prevent financial fraud.

# Maturity Level 5

## – Maturity Level 5: Optimised

- Processes are continually improved based on a quantitative understanding of the common causes of variation inherent in processes.
- This level focuses on continually improving process performance through both incremental and innovative technological improvements.
- The quantitative process-improvement objectives for the organization are established, continually revised to reflect changing business objectives, and used as criteria in managing process improvement.
- Example: Amazon's AI-powered warehouse management system constantly improves order fulfillment using real-time data.

# The Deming Cycle and CMMI maturity levels



## Why Audit – 3 areas

S.Anantha Sayana (2002) outlines 3 key areas of concerns that IS Audits need to address:

Availability	Will systems be available for the business at all times when required? Are systems well protected against all types of losses and disasters?
Confidentiality	Will information in the system be disclosed only to those who need it?
Integrity	Will the information provided in the system always be accurate, reliable and timely? What ensures that no unauthorized modifications?



# Why is an audit done?



Corporate  
Governance

Regulatory  
Requirements

Asset Owner  
Request

Operations  
Review



# Scope of an audit

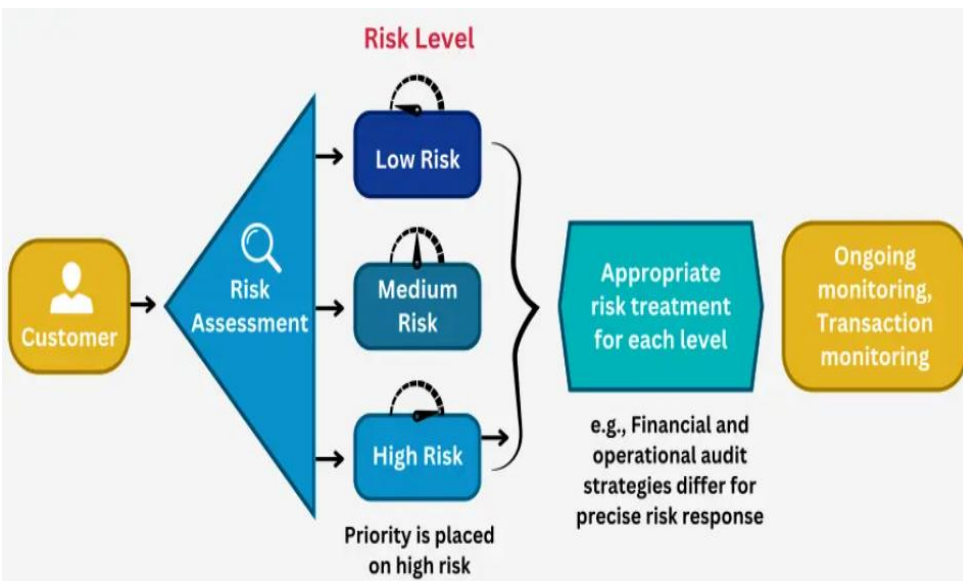
- Physical and environmental review
- System Administration review
- Application software review
- Network Security review
- Business continuity review
- Data Integrity review
- **Could depend on the client sometimes**

# Audit risk based approach

- Audit risk refers to the chance that financial or operational errors go undetected.
- Risks can affect each system differently
- **Example 1:** Non availability of a system
  - Restaurant booking system Vs Company Blog
- **Example 2:** Unauthorised access to system
  - Online Banking V Hair Salon booking system



# Risk-based approach



<https://www.sprintzeal.com/blog/risk-based-internal-auditing-approaches>

## Key Steps in the Risk-Based Approach:

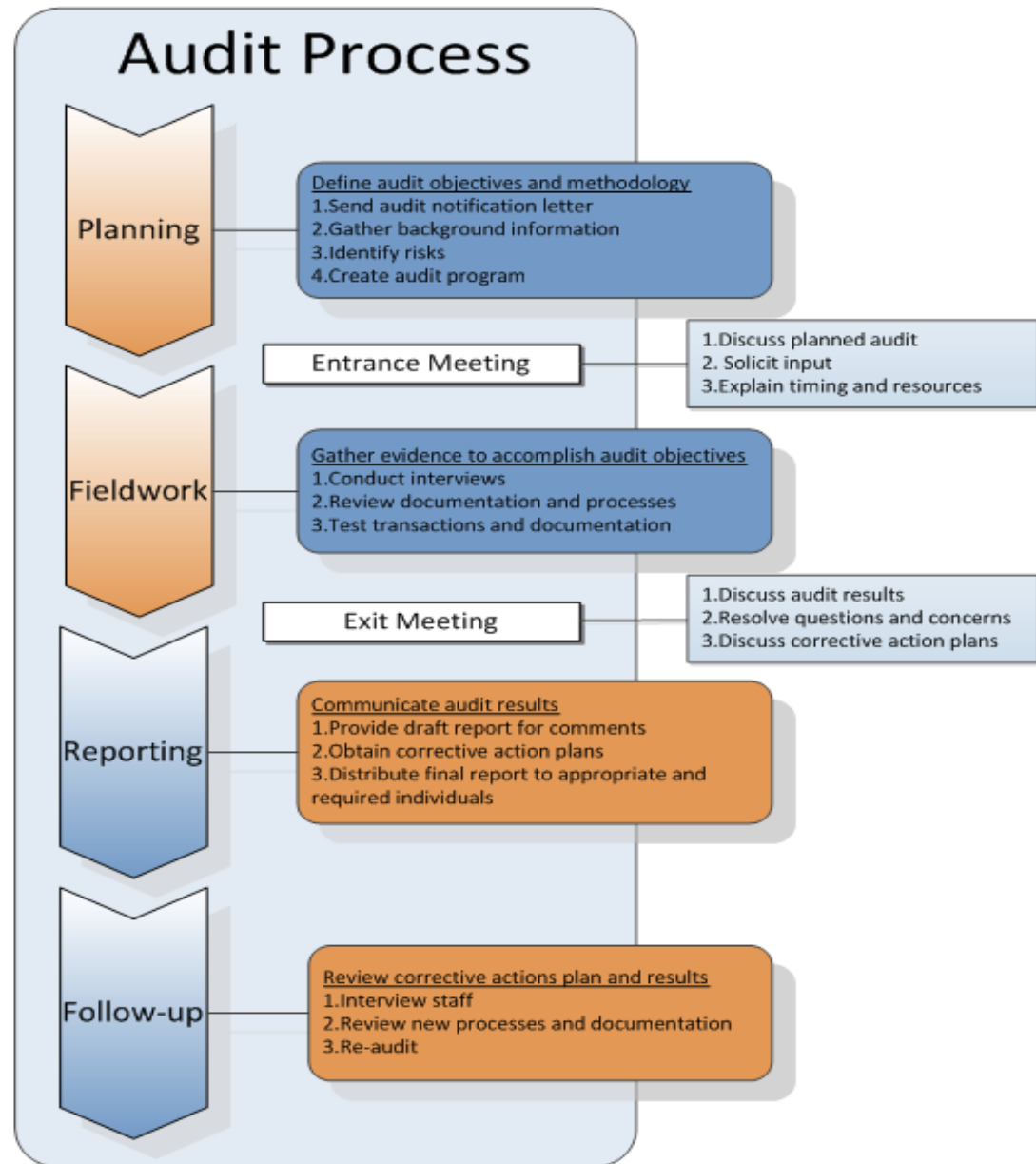
- 1. Inventory of Information Systems:**  
Identify all systems and categorize them based on importance.
- 2. Identifying Critical Functions:**  
Determine which systems are essential for business operations and security.
- 3. Risk Assessment:** Analyse and assign a **severity rating** (low, medium, or high) to each system.
- 4. Prioritization of Audit:** Rank systems based on the level of risk and allocate resources accordingly.

## Benefits - Risk-based approach

- Align with strategic objectives
- Improve efficiency and effectiveness
- Enhance stakeholder satisfaction
- Support continuous improvement
- Facilitate risk management

# The audit process

- Planning
- Fieldwork
- Reporting
- Follow-up
- What else ? Certification in some cases





# Auditing an Orchestra: a cautionary tale



# A Consultant's audit of Schubert's Unfinished Symphony

**After attending a rehearsal of this work we make the following observations and recommendations:**

1. We note that the twelve first violins were playing identical notes, as were the second violins. Three violins in each section, suitably amplified, would seem to us to be adequate.
2. Much unnecessary labour is involved in the number of demisemiquavers in this work; we suggest that many of these could be rounded up to the nearest semiquaver thus saving practice time for the individual player and rehearsal time for the entire ensemble. The simplification would also permit more use of trainee and less-skilled players with only marginal loss of precision.
3. We could find no productivity value in string passages being repeated by the horns; all tutti repeats could also be eliminated without any reduction of efficiency.
4. In so labour-intensive an undertaking as a symphony, we regard the long oboe tacet passages to be extremely wasteful. What notes this instrument is called upon to play could, subject to a satisfactory demarcation conference with the Musician's Union, be shared out equitably amongst the other instruments.
5. Conclusion: if the above recommendations are implemented the piece under consideration could be played through in less than half an hour with concomitant savings in overtime, lighting and heating, wear and tear on the instruments and hall rental fees. Also, had the composer been aware of modern cost-effective procedures he might well have finished this work.

END