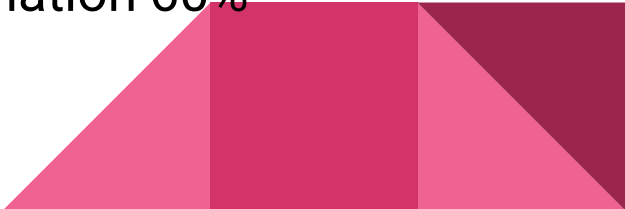


Product Assurance

SE5103

Course Structure

Title	Product Assurance
Code	SE5103
Credits	02
Evaluation (Method of Assessments):	02 Quizzes 20% 02 Assignments 20% End Semester Examination 60%




ILOs


- Explain the quality management process
- Illustrate quality product metrics and measurements
- Identify the current limitations of software measurements



Course Content

- Topic 1: The nature of product assurance
 - Topic 2: Distinctions between assurance and V & V
 - Topic 3: Quality product models
 - Topic 4: Root cause analysis and defect prevention
 - Topic 5: Quality product metrics and measurements
 - Topic 6: Assessment of product quality attributes (eg. Usability, reliability and availability)
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Recommended Reading


- D. Galin, Software Quality Assurance: From Theory to Implementation, 1st ed., Pearson College Div, ISBN-13: 978-0201709452, 2004.
 - D.H. Stamatis, Quality Assurance: Applying Methodologies for Launching New Products, Services, and Customer Satisfaction, CRC Press, ISBN13: 9781498728683, 2015.
 - Hilaire Ananda Perera, Product Assurance, Createspace Independent Publishing Platform, ISBN13: 9781544843889, 2017.
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Topic 01: Product Assurance


What is Product Assurance (PA)?




What is Product Assurance (PA)?

- The prime objective of Product Assurance (PA) is to ensure that products and systems being developed work correctly, first time, every time.
 - That they accomplish their defined objectives in a safe, available and reliable way; minimizing wastage, re-design and re-manufacture.
 - This approach is particularly critical in industries where product integrity is essential, such as aerospace, healthcare, and other areas where reliability is imperative.
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Need for Product Assurance

- Product Assurance is essential to mitigate risks and ensure that each product meets rigorous expectations and regulations.
 - Through a comprehensive approach, it ensures that products not only function correctly but are also safe and compliant with industry standards.
 - Imagine a case study where a Product Assurance team collaborates from the design phase to the delivery of a critical medical device. Their intervention ensures not only the technical quality of the product but also its safety and compliance with strict medical regulations.
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Advantages of Product Assurance [1/2]

- Ensuring that the product **meets or exceeds customer expectations** in terms of functionality, performance, and aesthetics.
 - Ensuring that the product complies with all relevant **safety regulations and standards to prevent harm to users**.
 - Continuously improving manufacturing processes to **reduce the likelihood of defects**.
 - Using advanced monitoring and testing techniques to detect **potential issues before they necessitate a recall**.
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Advantages of Product Assurance [2/2]

- **Minimizing waste** through efficient processes and defect prevention, leading to cost savings in materials and labor.
- Consistently delivering high-quality products builds a **reputation for reliability, encouraging repeat business.**
- Quickly and effectively responding to customer inquiries and concerns shows that the **brand values** its customers.



Key Elements of Product Assurance [1/4]

- Quality Assurance (QA):
 - The quality assurance process helps a business ensure its products **meet the quality standards** set by the company or its industry.
 - Another way to understand quality assurance (QA) is as a company's process for **improving the quality** of its products.
 - A subset of Product Assurance.



Key Elements of Product Assurance [2/4]

- Quality Control (QC):
 - QC involves the testing and inspection of products to identify defects after they have been developed.
 - Detect and correct defects in the finished product before it reaches the customer.



Key Elements of Product Assurance [3/4]

- Reliability Engineering:
 - Reliability engineering focuses on ensuring that products perform consistently over their expected lifetime.
 - Predict and improve product performance and durability.

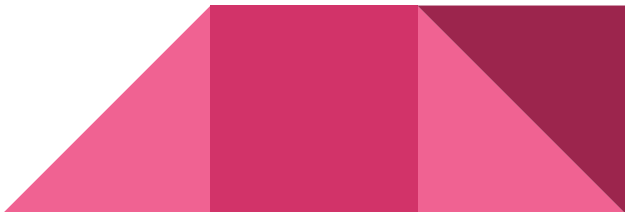


Key Elements of Product Assurance [4/4]

- Compliance and Certification
 - Ensuring that products adhere to industry standards and regulatory requirements.
 - Achieve certification from relevant authorities, ensuring the product is legally compliant and safe for use.



Tools and Techniques in Product Assurance

- Statistical Process Control (SPC):
 - Monitoring and controlling processes using statistical methods.
 - Failure Mode and Effects Analysis (FMEA):
 - Identifying potential failure points and their impacts.
 - Root Cause Analysis (RCA):
 - Determining the underlying causes of defects.
 - Total Quality Management (TQM):
 - Organization-wide approach to continuous improvement.
- 

Statistical Process Control (SPC)

- SPC is a method of quality control which employs statistical methods to monitor and control a process.
- Use Control charts to plot data points over time to identify any signals that indicate process variation.
- Monitoring production lines to ensure products meet quality standards.



Statistical Process Control (SPC)

- Benefits –
 - Identifies issues before they result in defective products.
 - Provides data for continuous process improvement.
 - Minimizes waste by maintaining process control.




Failure Mode and Effects Analysis (FMEA)

- FMEA is a systematic approach for identifying potential failure points within a process or product and analyzing their impacts.
- Ensuring new products are designed with potential failure points in mind.
- Enhancing existing processes by addressing identified failure modes.



Root Cause Analysis (RCA)

- RCA is a method used to identify the underlying causes of defects or problems.
 - Analyze the data to pinpoint the fundamental cause of the problem.
 - Addresses the root cause to prevent recurrence of the issue.
 - Enhances overall quality by eliminating sources of defects.
 - Reduces costs associated with recurring problems and defects.
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Total Quality Management (TQM)

- TQM is an organization-wide approach focused on continuous improvement of processes, products, and services by involving all employees.
- Total quality management (TQM) is the continual process of detecting and reducing or eliminating errors in manufacturing.



Challenges in Product Assurance

- Complexity of Modern Products
 - Modern products often involve advanced technologies and intricate designs, making it challenging to ensure all components and systems function correctly and cohesively.
 - Ensuring that different parts and systems work together seamlessly requires thorough testing and validation, which can be difficult to manage.



Challenges in Product Assurance

- Global Supply Chain Management
 - Maintaining consistent quality across a network of global suppliers can be challenging, as different suppliers may have varying standards and practices.
 - Effective communication and coordination with suppliers around the world can be complex and time-consuming, potentially leading to delays and quality issues.




Challenges in Product Assurance

- Regulatory Compliance
 - The need to stay updated with evolving industry standards and regulatory requirements demands continuous monitoring and adaptation.
- Cost Management
 - Achieving high-quality standards while keeping production and assurance costs under control is a constant balancing act.
 - Implementing advanced quality assurance tools and providing necessary training to employees requires significant financial investment.



Strategies to Overcome Challenges

- **Use automation and AI tools** to streamline repetitive tasks, enhance data accuracy, and identify patterns or anomalies that may indicate quality issues.
 - Conduct **regular audits and assessments** of suppliers to ensure they adhere to the required quality standards and practices.
 - Build strong, collaborative relationships with suppliers to improve **communication, coordination**, and quality control.
 - Establish a dedicated compliance team to **continuously monitor changes** in regulatory requirements and industry standards.
 - **Provide regular training to employees** on regulatory requirements and compliance procedures to ensure everyone is aware of their roles and responsibilities in maintaining compliance.
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Activity 01

Compare and contrast the followings

- Quality Assurance and Product Assurance.
- Quality Assurance and Quality Control.

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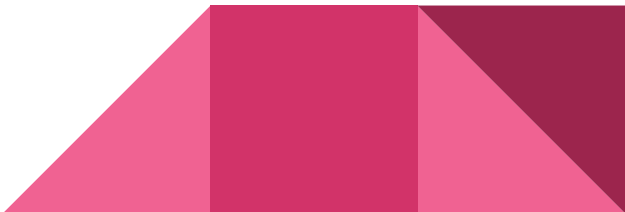


Steps for an Effective Product Assurance (1/3)

1. Risk Analysis and Requirements

- Identify and document critical risks associated with the system.
- This includes security threats, potential failures, and any factor that may affect the integrity of the critical system.

2. Strategic Planning

- Establish clear goals for Product Assurance in line with critical system requirements.
 - Determine and allocate necessary resources, including trained personnel and appropriate technological tools.
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Steps for an Effective Product Assurance (2/3)

3. Development of Quality Protocols

- Develop specific **standards and regulations** that adapt to the characteristics of the critical system.
- Establish quantifiable metrics to assess system performance and safety.

4. Implementation and Testing

- Implement continuous integration practices to detect and proactively correct issues.
- Conduct comprehensive tests addressing all aspects of the critical system, from functionality to security and fault tolerance.



Steps for an Effective Product Assurance (3/3)

5. Audits and Reviews

- Conduct regular audits and reviews of the Product Assurance process to ensure its ongoing effectiveness.
- Correct any deviation or non-compliance identified during audits.

6. Documentation and Transparency

- Maintain detailed records of all activities related to Product Assurance.
- Encourage open and transparent communication between development, quality, and management teams.

7. Post-Implementation Evaluation

- Evaluate the system's performance after implementation, identifying any gaps or areas for improvement.
 - Use the evaluation results to continuously learn and improve the Product Assurance process.
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