GROUP 4: (<mark>Paper2</mark>)

Instruction: In your own words, review and summarize the following paper with a Title: The Software Quality Economics Model for Software Project Optimization You are expected to cover the following:

1. Engineering Rules for Cost Of Defect Removal
2. Techniques to analyze return on the testing investment (ROI)
3. Schedule Benefits, and calculate the reductions in the development schedule

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TOPIC: The Software Quality Economics Model for Software Project Optimization

Introduction

The Software Quality Economics Model evaluates the cost, benefit, and schedule impacts of improving software quality. Early investment in quality measures like reviews and

testing can prevent costly post-release defects. This model assists in optimizing software projects by balancing quality, cost, and schedule considerations.

1. Engineering Rules for Cost of Defect Removal (CoDR)

Defect removal costs escalate as the software development cycle progresses:

    a. **During coding phase**: Detecting and fixing a bug is relatively inexpensive.
    b. **During system testing**: The same bug becomes more costly due to the increased effort required.
    c. **After deployment**: Costs can be significantly higher, including:
        i. Customer dissatisfaction
        ii. Emergency patches
        iii. Downtime
        iv. Reputational damage

Key Rule: The earlier a defect is caught, the cheaper it is to fix.

Solution:

    i. Encourage inspections, walk-throughs, static code analysis, and early prototype reviews.

Insights:

    i. Quality is not achieved only through testing; it requires upstream activities such as peer reviews and design validation.
    ii. Models like CMMI® and ISO 9001 support process-driven quality enhancement.
    iii. Agile methods promote early collaboration and continuous testing.
    iv. A defect found during design may cost significantly less than one discovered after release.

2. Techniques to Analyze Return on Testing Investment (ROI)

Financial ROI Formula: ROI = (Total Cost of Quality Savings - Testing Investment) / Testing Investment

Case Studies:

Case 1: Low Quality Results

i. Project Size: 251 function points
ii. Defect Removal Efficiency: 75%
iii. Cost of Quality: ₦750,000
iv. Bugs Found by Customers: 750
v. High cost due to numerous customer-found bugs.

Case 2: Good Quality Results

i. Investment in Testing: ₦70,000
ii. Defect Removal Efficiency: 85%
iii. Bugs Found by Testers: 600
iv. Customer Bugs: 150
v. ROI: 571%

Case 3: High Quality Results

i. Investment in Test Automation and Inspections: ₦12,500
ii. Defect Removal Efficiency: 95%
iii. Bugs Found by Testers: 950
iv. ROI: 575%

ROI Example:

a. Without Quality Measures:
    i. Bugs Found by Customers: 750
    ii. Cost per Bug: ₦1,000
    iii. Total Loss: ₦750,000
b. With Quality Measures:
    i. Bugs Found by Testers: 600 (Cost: ₦60,000)
    ii. Customer Bugs: 150 (Cost: ₦150,000)
    iii. Testing Investment: ₦70,000
    iv. ROI = (₦750,000 - ₦280,000) / ₦70,000 = 357%

3. Schedule Benefits & Reductions

Delays in software projects are often due to poor quality.

Benefits of Quality Improvements:

i. Early bug detection reduces time spent on fixes.
ii. Less rework and better planning streamline development.

COCOMO II-Based Example:

i. Original Estimated Effort: 100 person-months
ii. After Defect Reduction: 85 person-months
iii. Schedule Reduction (SCEDRED): 5–10%

Conclusion & Key Takeaways

The Software Quality Economics Model demonstrates that quality is not just a technical concern but also a financial and business imperative.

Key Messages:

i. Early detection of defects is crucial for saving money and time.
ii. Investment in quality assurance leads to high ROI.
iii. Quality improvements can reduce delays and shorten delivery schedules.

Summary Table:

Practice	Impact
Early Inspections	Lower defect costs
Testing Investments	High financial ROI (357%)
Efficient Debugging	10–15% faster delivery