SOFTWARE QUALITY ASSURANCE

Lecture 11

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Switch off mobile phones during lectures, or put them into silent mode

Term Paper

Finalize Group Members	26-Feb-2013
Finalize Topic	12-Mar-2013
Search Papers and Sort Selected (TODAY)	20-Mar-2013
Go Through the Abstract and Introduction of Selected Papers	27-Mar-2013
Submit a Summary and Comments on related papers	09-Apr-2013
Present Your Work till Today	09-Apr-2013
Submit Initial Draft	30-Apr-2013
Final Paper Submission	21-May-2013
Feedback on Final Submission + Plagiarism Report	28-May-2013
Final Presentation	4-June-2013

Please note that Every Phase has Marks

Please cast your Vote

Contents

- Software Inspections
- Inspections Process
- Inspections Follow-Up
- Prevention Meeting
- Data Recording and Reports
- Inspection Process Monitoring
- Roles and Responsibilities
- Qualities of Good Moderators

INSPECTIONS - 1

- An inspection is a rigorous team review of a work product by peers of the producer of the work product
- The size of the team will vary with the characteristics of the work product being inspected; e.g., size, type

INSPECTIONS - 2

- The primary purpose is to find defects, recording as a basis for analysis on the current project and for historical reference and for improvement for future projects, analyzing them, and initiating rework to correct the defects
- Direct fault detection and removal

INSPECTIONS - 3

- Inspections are most effective when performed immediately after the work product is complete, but they can be held any time the work product is deemed ready for inspection

INSPECTIONS - 4

- Inspections are critical reading and analysis of software code or other software artifacts, such as designs, product specifications, test plans, etc
- Inspections are typically conducted by multiple human inspectors, through some coordination process. Multiple inspection phases or sessions may be used

INSPECTIONS - 5

- Faults are detected directly in inspection by human inspectors, either during their individual inspections or various types of group sessions
- Identified faults need to be removed as a result of the inspection process, and their removal also needs to be verified

INSPECTIONS - 6

- The inspection processes vary, but typically include some planning and follow-up activities in addition to the core inspection activity

- Developed by Michael Fagan at IBM and were first reported in public domain in 1976

INSPECTIONS - 7

- Inspections remove software defects at reduced cost
- Inspections enable us to remove defects early in the software life cycle, and it always cheaper to remove defects earlier in than later in the software life cycle

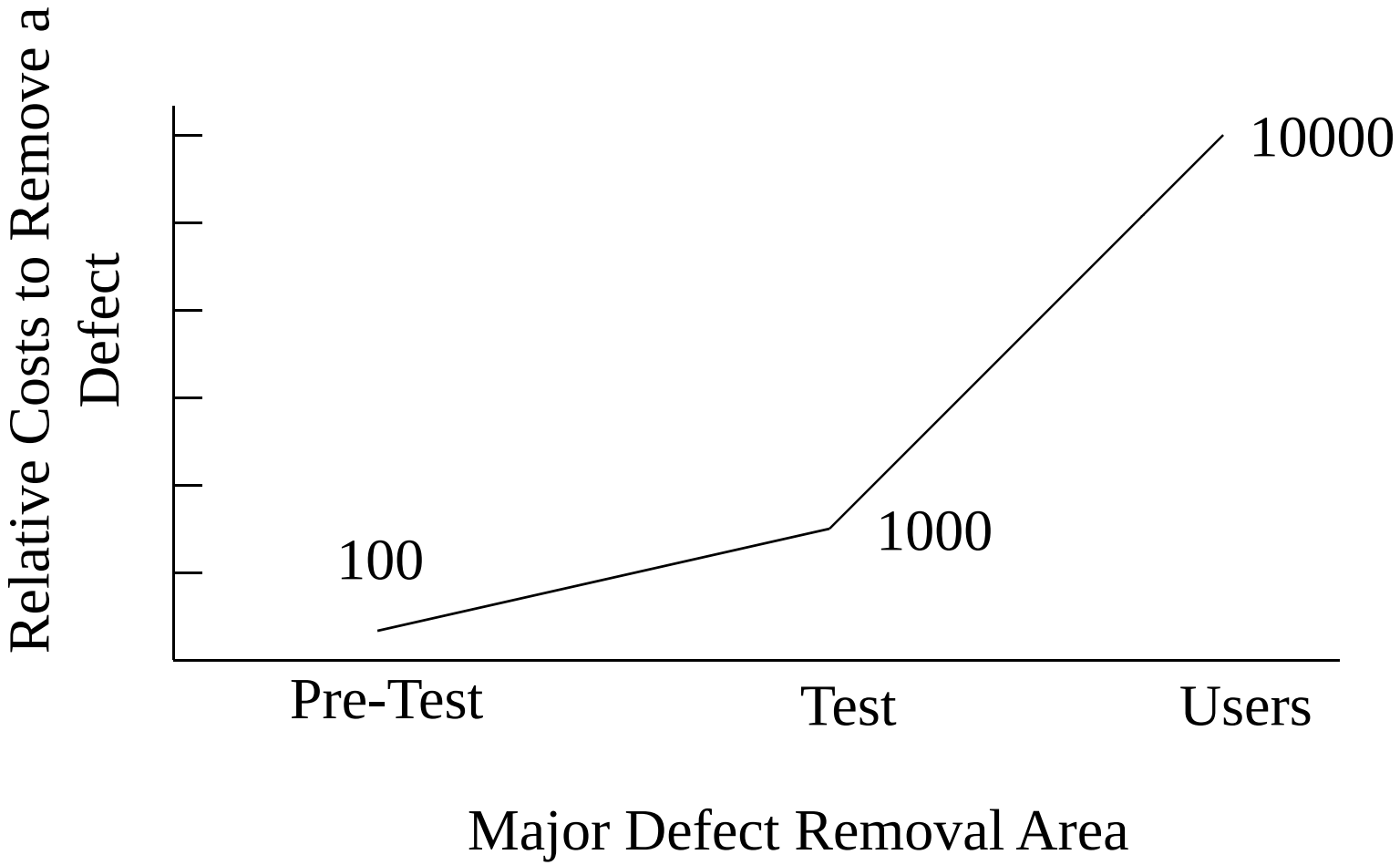
INSPECTIONS - 8

- We know that defects are injected in every software life cycle activity
- We remove some of these defects in testing activities after code is completed
- We also know that all defects are not removed at shipment time, and these are known as latent defects

INSPECTIONS - 9

- We want to eliminate or at least minimize latent defects in the shipped software product
- It is expensive to find and remove defects in the testing phase, and even more expensive after shipment of the software
- We can use inspections to reduce these costs and improve the timelines also

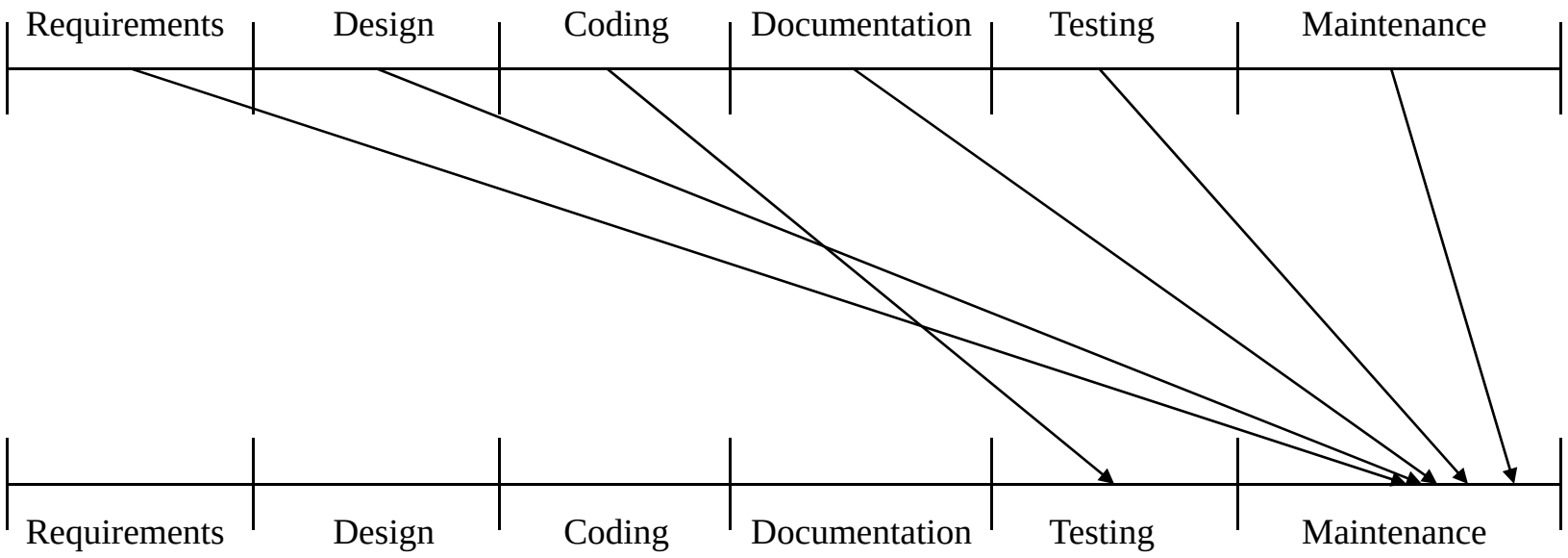
Defect Cost Relationship



- It is interesting to note that this relationship has remain consistent in the last three decades – since the earliest studies when inspections were being first reported
- In addition to the costs on project, there are additional costs to the customer for downtime, lost opportunity, etc., when defects are detected in maintenance

Defect Origins and Discovery Points Without Usage of Formal Inspections

Defect Origins



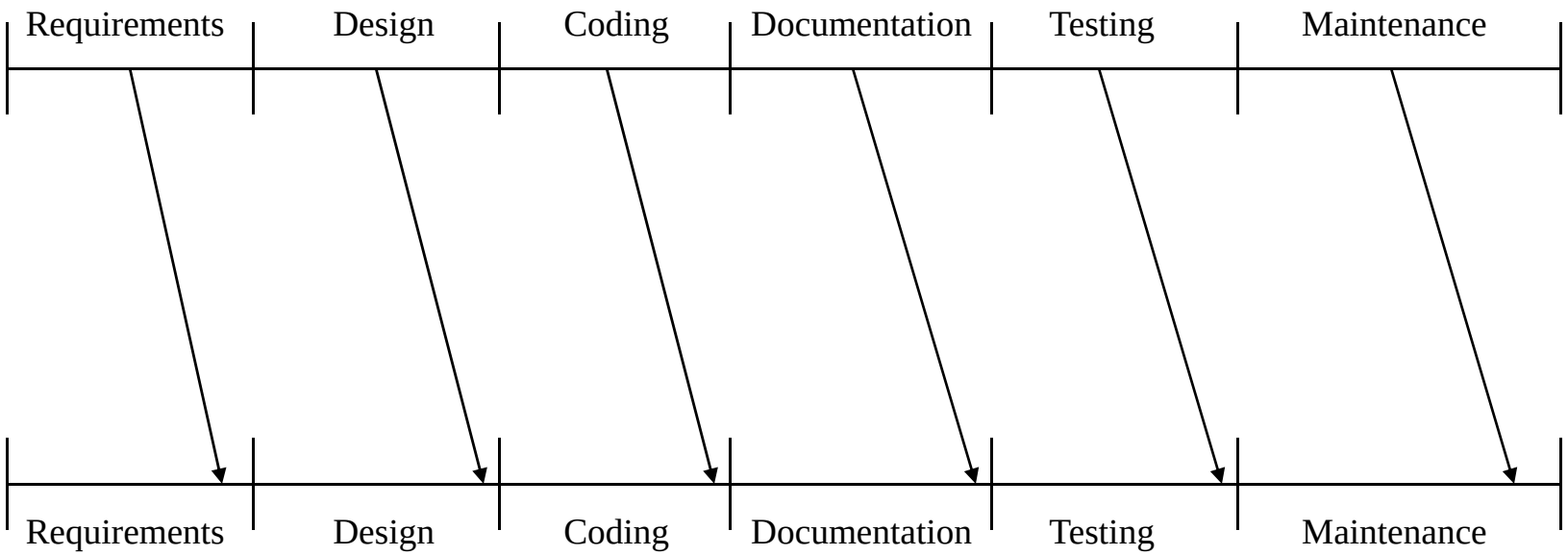
Defect Discovery

Chaos Zone

- This situation is a mess
- If only we were able to detect defects in the same life cycle activity, we can eliminate the chaos zone, and bring some sanity back to the project team and project management
- If we introduce software inspections, we can do that

Defect Origins and Discovery Points With Usage of Formal Inspections

Defect Origins



Defect Discovery

Why Isn't Everyone Using Inspections?

- Now we are convinced that inspections have a clear value independent of any model or standard for software development, so why isn't everyone using it?

Reasons for Not Using Inspections - 1

- There is resistance to Inspections because people view them as if they are not easy to do well
- Management often views Inspections as an added cost, when in fact Inspections will reduce cost during a project
- Development of new tools and environments

Reasons for Not Using Inspections - 2

- Inspections are not the most enjoyable engineering task compared to designing and coding
- Inspections are labor intensive and low-tech
- Programmers/designers are possessive about the artifacts they create

Inspection Preconditions

- Clear and visible management support
- Defined policy
- Good training for all
- Effective procedures
- Proper planning
- Adequate resources

SUCCESS FACTORS - 1

- Kept to the basics
- Trained teams rather than individuals
- Established a policy that inspections are safe
- Followed the proven method, before adapting or tailoring it
- Gave proper time for inspections to take root

Success Factors - 2

- Analyzed and used the data resulting from inspections
- Built on their own successes
- Learned what was not necessary to inspect
- Rewarded the performance of inspections
- Shared the success
- Allocated budget and time for inspections

Work Products

- Requirements specifications
- Design specifications
- Code
- User documentation
- Plans
- Test cases
- All other documents

Inspection Steps - 1

- Overview
  - Provides the inspection participants a background and understanding, when warranted, of the scheduled inspection material
- Preparation
  - Allows time for the inspection participants to sufficiently prepare for the inspection meeting and list potential defects

Inspection Steps - 2

- Inspection meeting
  - Identifies defects before work product is passed into the next project stage
- Rework
  - Fixes identified defects and resolves any open issues noted during the inspection
- Follow-up
  - Verifies that all defects and open issues have been adequately fixed, resolved, and closed out

Other Inspection Steps - 1

- Planning and scheduling
  - To ensure adequate time and resources are allocated for inspections and to establish schedules in the project for work products to be inspected, to designate the inspection team, and to ensure the entry criteria are satisfied
- Data recording
  - To record the data about the defects and conduct of the inspection

Other Inspection Steps - 2

- Analysis meeting
  - Which is held after the inspection meeting, to begin defect prevention activities
- Prevention meeting
  - Which is held periodically after sets of inspections have been performed to determine probable causes for selected defect types, instances, or patterns

ETVX

- This technique is known as Entry-Task-Validation/Verification-eXit (ETVX) technique

ETVX Representation

- The model expressed as a set of interconnected activities each of which has four sets of attributes
  - Entry (E)
  - Task (T)
  - Validation/Verification (V)
  - Exit (X)

Entry

- The Entry section defines the entry criteria that must be satisfied for the process to be initiated, and list the work products that must be available as inputs to the process

TASKS

- The Task section defines work to be carried in performing the process. The order of the task is generally, but not strictly sequential. Some tasks may be concurrent with other tasks

VALIDATION/VERIFICATION

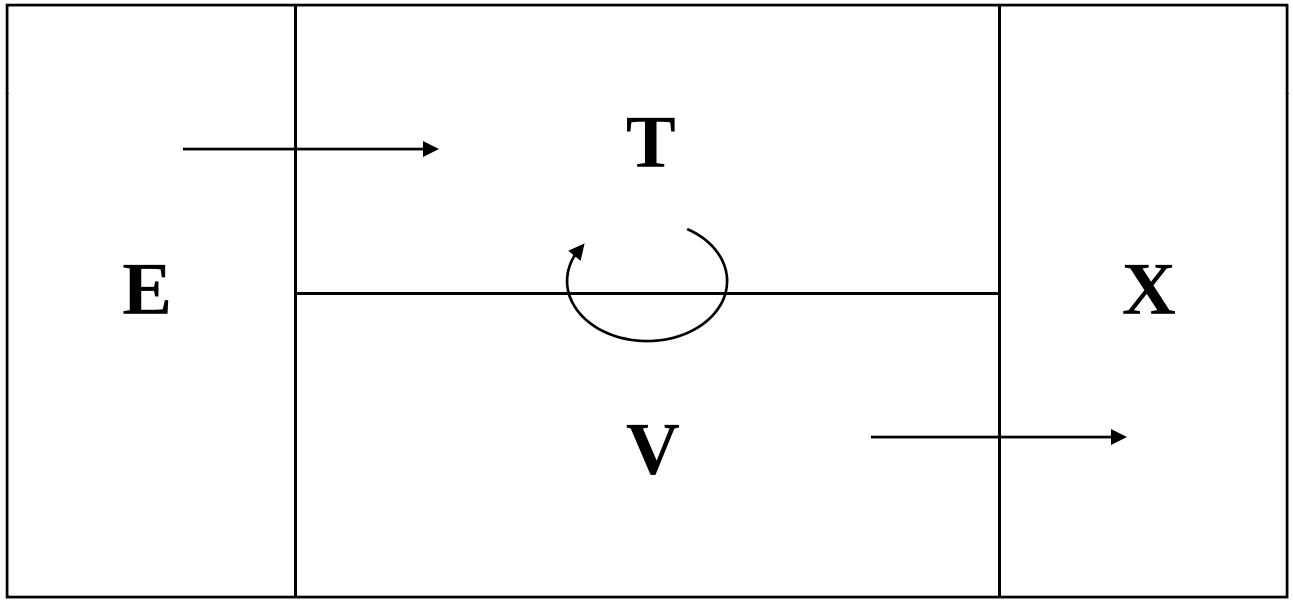
- The validation/verification section defines steps for validating/verifying that the process has been properly executed, and that the associated work products meet project objectives

EXIT

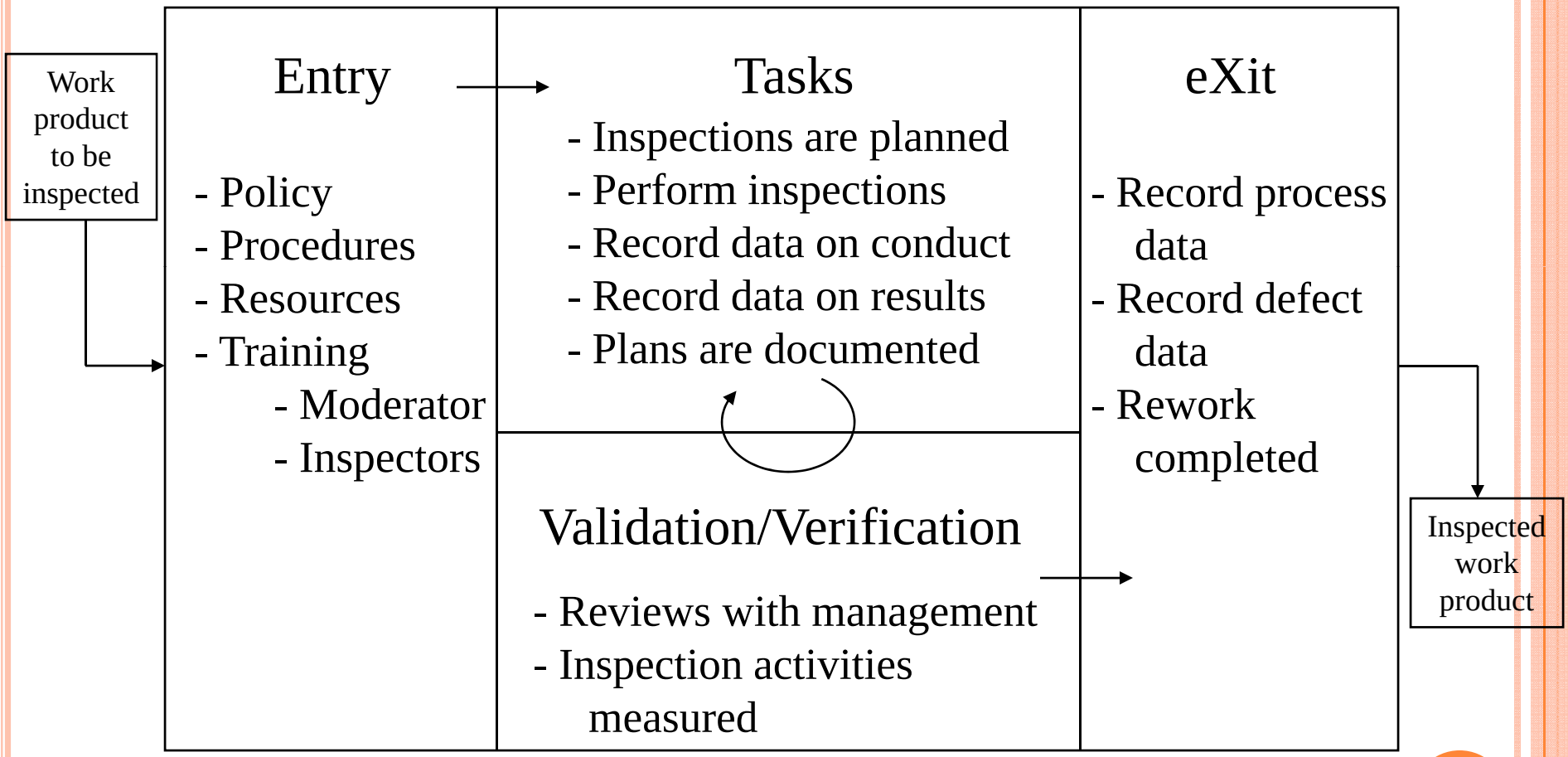
- The Exit section defines the exit criteria that must be satisfied for the process to be terminated. The exit criteria usually define completion and verification work products, in terms of qualitative aspects of the products

- The ETVX technique indicates the relationship and flow among the four aspects of an activity and between activities
- The notion of formal entry, exit, and criteria go back to the evolution of the waterfall development process
- The idea is that every process step, **inspection**, function test, or software design has a precise entry and exit criteria

The ETVX Process Definition Paradigm



Practices in the Inspection Process



Back-Up/Replacement Capability - 1

- Many organizations have high turnover rates, and in many cases only a few people (or even one person) has the required knowledge of a product or key parts of a product
- Where turnover is high, knowledge can literally walking out of the door
- To mitigate this risk, some organizations have elected to inspect 100% of all work products

Back-Up/Replacement Capability - 2

- To be successful for in these inspections, the author of the work product has to be present
- "Inspections broaden the knowledge base of the project in the group, create potential backup programmers for each module, and better inform the testers of the functions they are to test"
  - Norris

Cost of Inspections

- Time spent on inspections is an investment. You inspect now, you invest now, and then you reap the benefits down the line
- Concern should only be when the inspections are performed for the first time
- Once the cost question is removed from management's thinking, the time needed up front in a project is no longer a concern

What Inspections Are Not - 1

- A review of the style of a work product
- A review of the producer, and especially not a means to evaluate the producer by management
- An spontaneous meeting; it is a scheduled meeting with resource considerations to enable effectiveness

What Inspections Are Not - 2

- A casual or informal meeting; there is structure and rigor for a purpose
- Typically the time or place to fix defects or discuss possible solutions
- Free! But they do yield a high return on investment

What Inspections Are Not - 3

- A vehicle for shifting responsibility to inspectors for quality of the work product
- Quality assurance performed at the end of development

Roles and Responsibilities

MODERATOR - 1

- The moderator is a key role in successful inspections
- He/she ensures that the inspection procedures are followed, that the inspectors fulfill their responsibilities within their defined roles, and that the inspection is performed successfully

MODERATOR - 2

- A moderator must be trained in the process, principles, and practices of software inspections
- It is not a full-time job, but a part-time assignment, mostly given to senior and experienced programmers, designers, analysts, and writers who have active roles in a project

MODERATOR - 3

- They should be recognized for the extra time it takes to moderate, whether on their own project or other projects
- The moderator has to play many other tasks including working as a coordinator, facilitator, coach, mediator, manager
- He/she is not a representative of the management

MODERATOR - 4

- Moderator best serve when they are objective and do not have a vested interest in the work product
- It should be rare to have such a situation
- Moderators best serve when they have technical or domain knowledge of the work product under inspection

MODERATOR - 5

- The moderator should pace the inspection meeting to ensure the participants are not overtaxed, working too long without breaks
- Inspection meetings should not be scheduled for more than two hours
- Moderators must also help in finding defects effectively and efficiently

Qualities of Good Moderators

Qualities of Good Moderators

- Independent and objective
- Leader
- Coach
- Technically astute
- Communication skills
- Trained

Independent and Objective

- Moderator should not be the part of the team that worked on the work product under inspection
- Sometimes, this cannot be avoided

Leader

- Moderators serve best when they have management and leadership abilities
- They will manage the inspection once it has been scheduled
- Some organizations have viewed how well a moderator leads as an indication of management ability on future projects

Coach

- Good manager/leaders are also good coaches also

Technically Astute

- The moderator does not have to be an expert in the domain of the work product, but the moderator should be able to understand the technical aspects
- When the moderator is not technically knowledgeable, the team may discount them and they are less able to control the technical discussions

Communication Skills

- The moderator must listen and hear; the moderator must give directions and explain so the participants understand the value of inspections

TRAINED

- The moderator must be trained
- Never never have someone serve as a moderator who has not been trained in inspections and the requirements of a moderator

- A moderator should have sense of humor, because that helps when situation gets tense during inspection meetings

Problems with Moderators

- Is aggressive
- Cannot control the meeting
- Moderator is treated as a secretary
- Biased moderator

Activities to be Performed by the Moderator

- Inspection scheduling
- Overview
- Preparation
- Inspection meeting
- Data recording
- Analysis meeting
- Rework
- Follow-up

INSPECTION SCHEDULING - 1

- Determine the need for an overview
- Determine the inspection team
  - Remember that the primary purpose of an inspection is to find the maximum number of defects that may exist in the work product, so pick team members who have the best knowledge and skill to help find defects
- Ensuring availability of materials

INSPECTION SCHEDULING - 2

- Assigning roles
- Chunking the materials
  - In situations where multiple meetings are required, split the work product to be inspected into reasonable chunks. This can be done in two ways:
    - By form
    - By function

INSPECTION SCHEDULING - 3

- Chunking the material (cont'd)
  - Function chunking, when it is obvious, is easier to do
  - Form chunking is not so obvious, we seek different points of view within documents
    - Standards
    - Code versus other documentation
    - Efficiency
    - User interfaces
    - Maintainability
    - Operating convenience

Inspection Scheduling - 4

- Defining the inspection activities schedule
  - Overview, when required
  - Preparation effort
  - Inspection meeting duration
  - Analysis meeting
  - Logistics

OVERVIEW - 1

- Introducing the producer and material for the overview
- Guiding, facilitating, and managing the meeting
- Ensure identified defects that were discovered at the overview are recorded
- Ensure any open issues are recorded

OVERVIEW - 2

- Concluding the meeting and asking the participants if the meeting met the objectives

- Overview is conducted by the producer

PREPARATION

- The moderator as inspector prepares for the inspection meeting just as any other inspection participant

Inspection Meeting - 1

- The moderator has two roles during all inspection meetings
  - Moderator
  - Inspector
- The moderator must always maintain objectivity when serving as an inspector, and there is ample evidence that it can be done

Inspection Meeting - 2

- If moderators hold a mini lessons-learned session at the end of each inspection meeting and ask these questions
  - What worked well
  - What could have been improved
- The inspections process can be improved for future inspection meetings

Data Recording

- The moderator must review the defect report created by the recorder and then complete this report during the follow-up activity for the required contents of the inspection report

Analysis Meeting

- The moderator is both a facilitator and participant in this meeting, in which a causal analysis is done on the identified defects

REWORK

- The moderator works with the producer during the rework activity to address any open issues or to help in defect classification

Follow-Up

- Complete the defect report as provided by the recorder to show that the inspection is closed
- Verify all rework (defects and open issues)
- Schedule a re-inspection, if warranted

Code of Conduct for Moderators - 1

- Always remain professional and objective
- Prepare well in advance for all meetings
- Enable the team members for a successful inspection

Code of Conduct for Moderators - 2

- Keep each meeting focused to its specific objectives; e.g.,
  - Learning at the overview
  - Finding and agreeing to defects at the inspection meeting
  - Performing causal analysis at the analysis meeting
- Ensure all data is captured and recorded
- Always maintain confidentiality

Code of Conduct for Moderators - 3

- Use effective meeting practices: e.g.,
  - Properly notify all participants well in advance
  - Restate the purpose of the meeting, especially for first time participants
  - Monitor time and keep the meeting moving forward
  - Allow discussions that help meet the objectives
  - Solicit input at the end of the meeting

Code of Conduct for Moderators - 4

- Be a team player; participate as another inspector
- Remember that the moderator is accountable for the quality of the inspection
- Ensure appropriate behavior by all attendees

Code of Conduct for Moderators - 5

- Enforce and adhere to inspection entry and exit criteria
- Get the consent of the participants to continue the meeting, if it is clear that the inspection meeting will take longer than the scheduled time

Other Roles

PRODUCER - 1

- The individual who produced or modified the work product to be inspected
- Also known as author
- Producer should be the person who will make changes to the work product as a result of the inspection
- Producer participates in planning, overview, preparation, inspection meeting, rework, and follow-up for an inspection process

Possible Problems with Producers

- Is defensive
- Does not participate
- Was not the producer
- Responds in a hostile manner to identified defects
- Begins to make repairs at the meeting
- Biased producer
- Unprepared

Reader

- The reader is the inspector who will lead the inspection team through the material during the inspection meeting.
- The purpose of reading is to focus on the inspection material and to ensure an orderly flow for the inspectors
- Reader participates in preparation and inspection meeting during the inspection process

Possible Problems with Readers

- Reads too fast for the team
- Reads as if the material is right
- The reader is not used

RECORDER - 1

- The recorder is the inspector who will record the data for defects found and data about the conduct of the inspection
- Recorder participates in the preparation and inspection meeting activities during the inspection process

Possible Problems with Recorders

- Records too slowly
- Interprets the defect or records incorrectly
- Records something not understandable
- Does not record

INSPECTOR - 1

- All participants are trained to be inspectors
- An inspector participates in preparation, inspection meeting, and analysis meeting activities during the inspection process

Possible Problems with Inspectors

- Is not prepared
- Does not actively participate
- Comes late to meetings
- Not focused

Criteria for Selecting Inspectors

- Domain knowledge in the work product under inspection
- Experience and expertise
- Language knowledge
- Assignment of inspector with work product
- Time availability
- Trained in inspections
- Team player

Timing Issues

- Preparation and inspection meetings
- Reasonable length
- Subsets
- Enforcing time limits
- Breaks during inspections
- Scheduled times

When is an Inspection Finished?

- Planned
  - Includes any time during the project's life cycle where the schedule has been defined for a required inspection; it concludes with the inspection meeting start
- Performed
  - Includes all times from the start of the inspection meeting through rework
- Closed
  - Is only after follow-up when closure has been achieved and signed-off

Best Place to Start First

- Requirements specifications
- Design
- Code
- User documentation

Can Some Work Products Not be Inspected?

- Yes, but the decision requires data that demonstrates minimal risk and good data requires time in practice
- For safety-critical or life-critical software, you should not take the risk lightly, if at all

WHO ARE THE RIGHT INSPECTORS? - 1

- A domain expert will be far more effective in finding defects than a novice. Experts, however, are not always available when we want then
- Less capable inspectors may only be able to find a certain class of defects, while experts can find deeper defects, but they all can contribute to finding defects

WHO ARE THE RIGHT INSPECTORS? - 2

- The decision should be based on risk and criticality of the work product. Here criticality is not just safety-critical or life-critical situations, but work products critical to the success of the project
- Re-inspection may have to be done when experts are available, in case they were not available for the inspection meeting

Inspections Don't Make People Warm and Fuzzies

- Inspections are rarely the most exciting task for programmers, but they are necessary and useful. They should be made as comfortable as possible

Helping Programmers to Learn from Their Errors - 1

- If we allow the programmers to learn in a safe environment, they generally will learn
- Not all programmers are equal in capability, but all can contribute to the project's success
- We may have to provide additional training to some

Helping Programmers to Learn from Their Errors - 2

- As programmers learn, they will become more effective, and this will show in their work products
- The will take pride in their work and work environment

If You Find a Defect, Fix It

- Inspections find defects but producer do not fix them correctly
- Most common reasons for this sort of unprofessional behavior are:
  - The inspection data was lost
  - The author didn't understand the inspection data
  - There wasn't time in the schedule

Inspections Waste Time

Redundancy with the Test Processes - 1

- Inspections are intended to remove defects as early as possible. They are quality control mechanism
- Testing is intended to
  - Find the defects that leaked through the inspection process
  - Revalidate that the delivered solution satisfies the needs of the customer

Redundancy with the Test Processes - 2

- Tests are both quality control and quality assurance mechanism
- With analysis of data from the inspection and test results, both processes can be tuned to maximize efficiency and minimize redundancy, while maintaining effectiveness

Arbitrary Style Viewpoints during Inspections

- If an organization has not defined or agreed to an accepted style for specifications, design, code, or for other documents, then it is possible that inspection participants may have different viewpoints. This can lead to useless discussions
- Agreements on these issues is a prerequisite for effective and efficient inspections

Less Efficient than Debugging during Execution - 1

- (1) Some people believe that debugging within a test execution environment is faster and cheaper. The literature consistently has suggested otherwise
- Try a controlled study

Less Efficient than Debugging during Execution - 2

- (2) There may be languages where execution of the code during the inspection would be more beneficial. For example, the visual type of languages may be best inspected in permutation of the traditional inspection using both the code and viewing the performance of the code by looking at the screens during the execution

Design Knowledge is Required to do Code Inspections

- Absolutely, but they do not have to have as much domain knowledge as the producer
- Know code and design sufficiently
- Design and specification documents can be helpful in understanding

Some Inspectors Don't Contribute

- This will happen and can be for a number of reasons

Deadly Sins of Inspections - 1

- Superficial commitment from management
- Not enough time in the schedule
- Resources are not allocated
- Insufficient preparation
- Wrong people assigned
- Not using the data

Deadly Sins of Inspections - 2

- Treating inspections as a rubber stamp
- Using the checklist without thinking beyond it
- Not training the inspectors
- No entry/exit criteria
- Wrong pace
- Believing all review types are the same

References

- Software Inspections by Ronald A. Radice, Tata-McGraw Hill, 2003

- Software Engineering: A Practioner's Approach by Roger S. Pressman

References

- Inroads to Software Quality by Alka Jarvis and Vern Crandall, PH 1997 (Ch. 7)
- Software Engineering: A Practioner's Approach by Roger S. Pressman (Ch. 8)


Thanks!