Managing a Successful Computing Project

Software Quality

Topics

- What is Software?
- Software Error, Fault and Failure
- Classification of the causes of software errors
- Software Quality
- Software Quality Assurance
- Quality Control
- The objectives of SQA activities

What is Software?

- Software – **IEEE definition**

  Software is Computer programs, procedures, and possibly associated documentation and
  data pertaining to the operation of a computer system.

Institute of Electrical and Electronics Engineers (IEEE)

Software....

- Computer programs
- Procedures
- Documentation
- Data necessary for operating the software system.

ISO, 1997, Sec. 3.11

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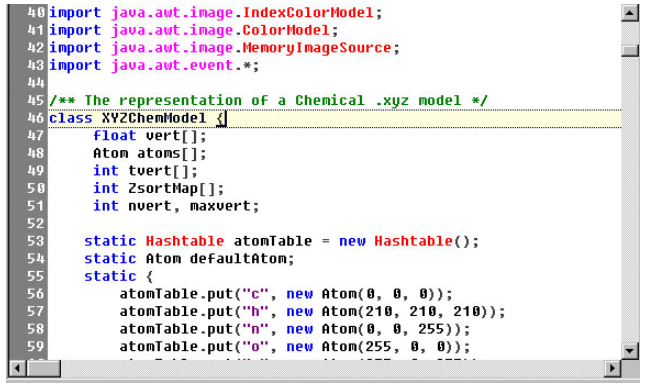

```
40 import java.awt.image.IndexColorModel;
41 import java.awt.image.ColorModel;
42 import java.awt.image.MemoryImageSource;
43 import java.awt.event.*;
44
45 /** The representation of a Chemical .xyz model */
46 class XYZChemModel {
47     float vert[];
48     Atom atoms[];
49     int tvert[];
50     int ZsortMap[];
51     int nvert, maxvert;
52
53   static Hashtable atomTable = new Hashtable();
54   static Atom defaultAtom;
55   static {
56       atomTable.put("c", new Atom(0, 0, 0));
57       atomTable.put("h", new Atom(210, 210, 210));
58       atomTable.put("n", new Atom(0, 0, 255));
59       atomTable.put("o", new Atom(255, 0, 0));
```

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Software....

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- **Procedures**
- Documentation
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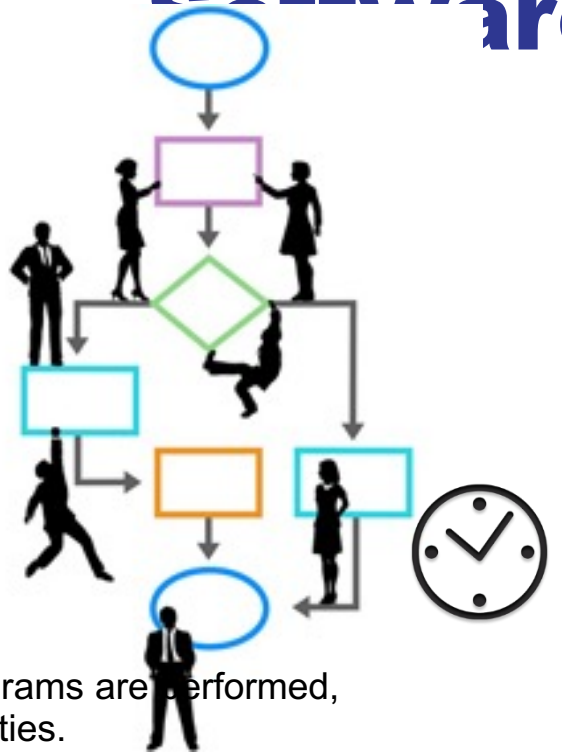

Procedures are required, to define the order and schedule in which the programs are performed, the method employed, and the person responsible for performing the activities.

A **procedure** may refer to any of the following:

1. In computer programming, a **procedure** is a set of coded instructions that tell a computer how to run a program or calculation. Many different types of programming languages can be used to build a procedure. Depending on the programming language, a procedure may also be called a subroutine, subprogram or function.
2. In database programming, a stored **procedure** is a set of programming code (like PL/SQL) that executes a specific query or function. This stored procedure is often used to execute one or more series of commands, search for, insert, update or delete data in a database.

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Software Error, Fault and failures

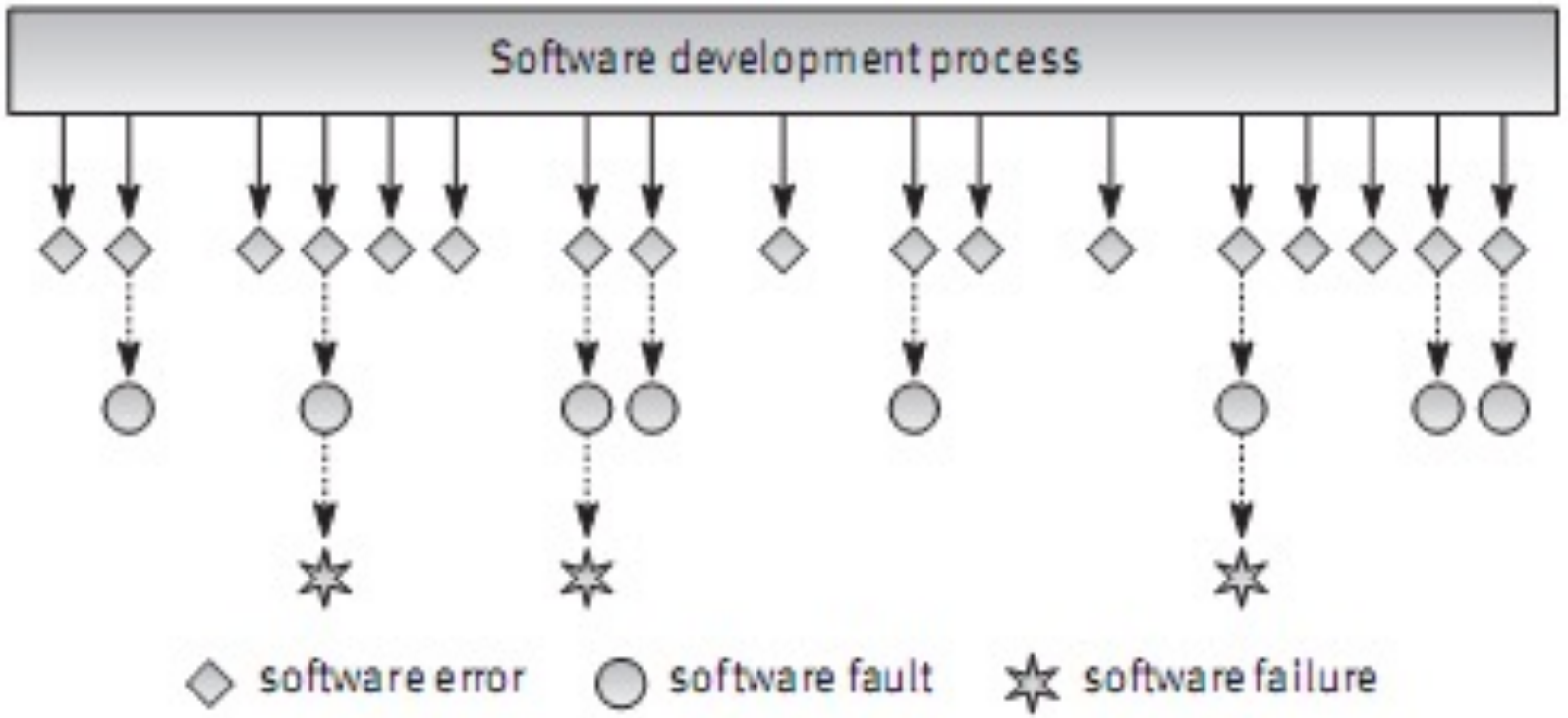
Software failure case study

- "We've used the Simplex HR software in our Human Resources Department for about three years and we have never had a software failure."
- "I started to use Simplex HR two months ago; we had so many failures that we are considering replacing the software package."
- "We have been using the same software package for almost four years. We were very satisfied throughout the period until the last few months, when we suddenly faced several severe failures. The Support Center of the software house from which we bought the package claims that they have never encountered failures of the type we experienced even though they serve about 700 customers who utilize Simplex HR."

Software Error, Fault and failures

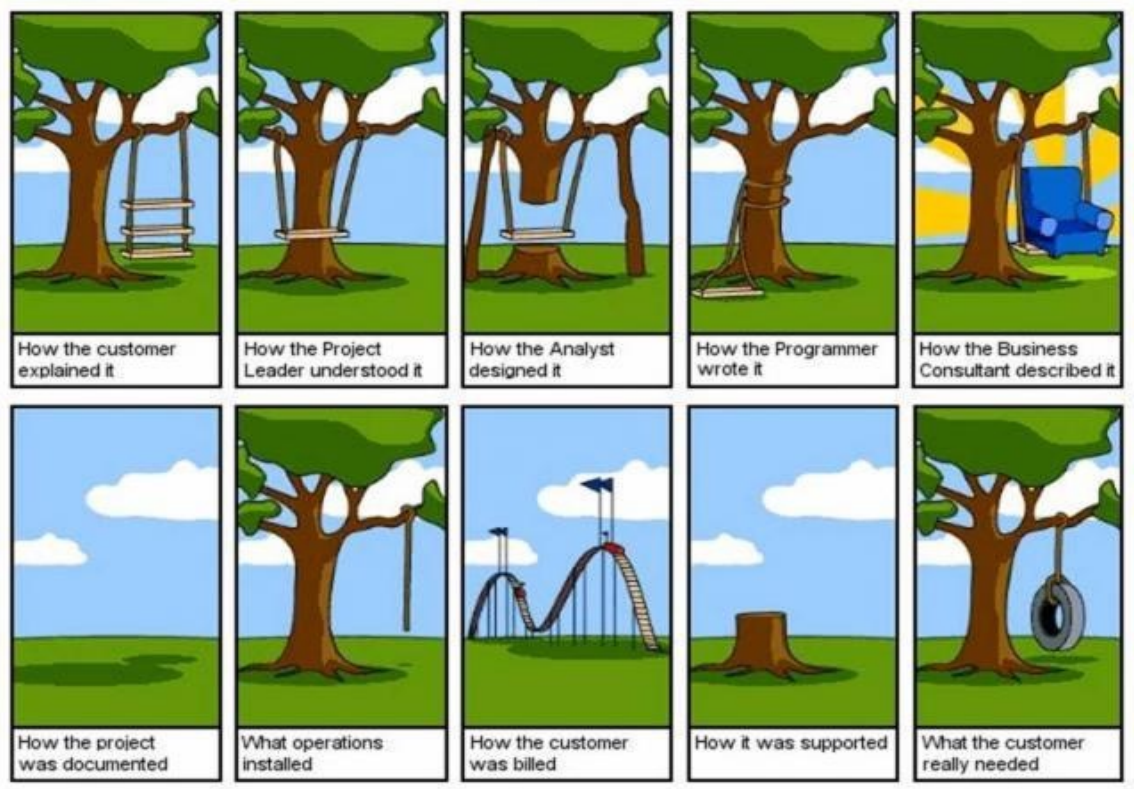
- Software error: made by programmer.
  - Syntax error
  - Logical error
  - Run-time error
- Software fault: defect in product.
  - An incorrect step, process, or data definition in a computer program
- Software failure: software fault is activate
  - Result of a fault

Figure 2.1: Software errors, software faults and software failures



2.3 Classification of the causes of software errors

1. Faulty definition of requirements



2.3 Classification of the causes of software errors

2. Client–developer communication failures

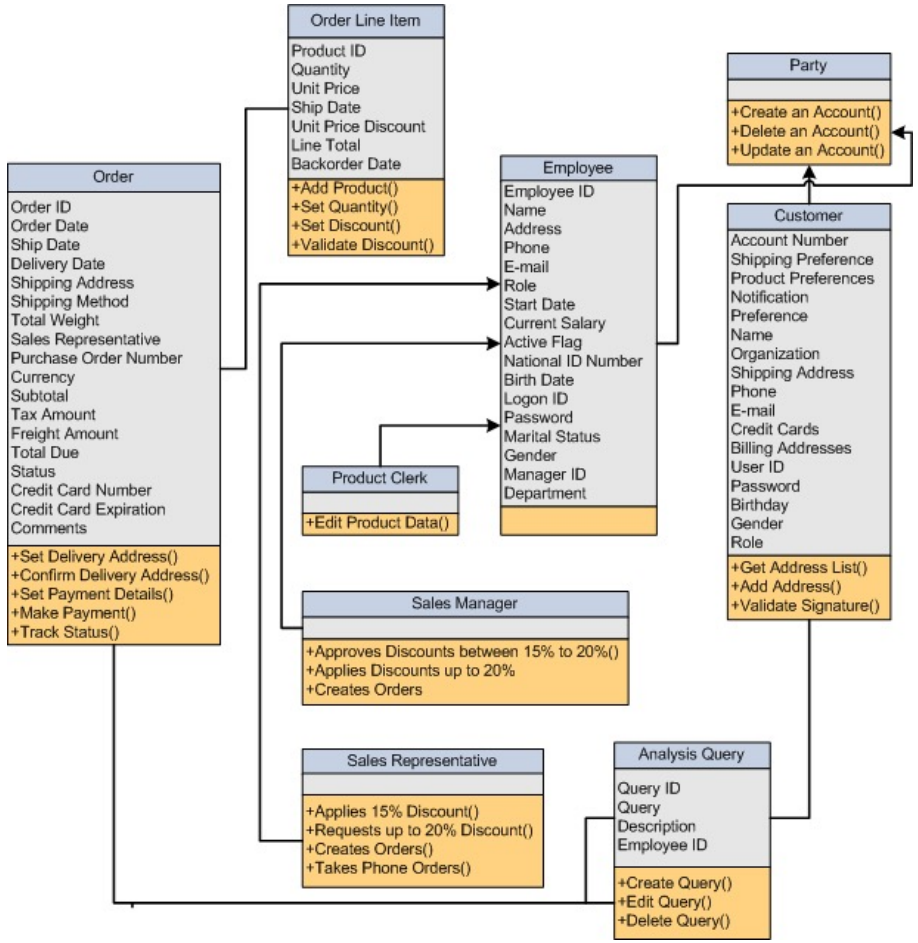
- Misunderstanding requirement, change, design,…,etc.

2.3 Classification of the causes of software errors

3. Deliberate deviations from software requirements
   - The developer reuses software modules taken from an earlier project without sufficient analysis of the changes and adaptations needed to correctly fulfill all the new requirements.
   - Due to time or budget pressures, the developer decides to omit part of the required functions in an attempt to cope with these pressures.

2.3 Classification of the causes of software errors

4. Logical design error.



2.3 Classification of the causes of software errors

5. Coding error.

2.3 Classification of the causes of software errors

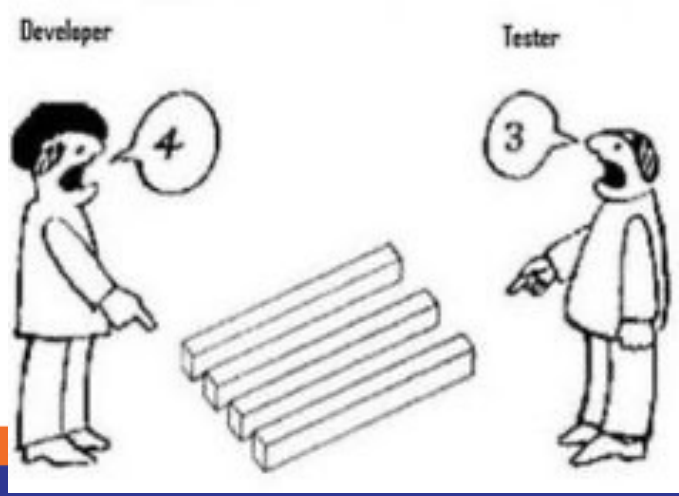
6. Non-compliance with documentation and coding instructions.

   – Document standard.
   – Coding standard.

2.3 Classification of the causes of software errors

7. Shortcomings of the testing process.

- Incomplete test plans
- Failures to document and report detected errors and faults.



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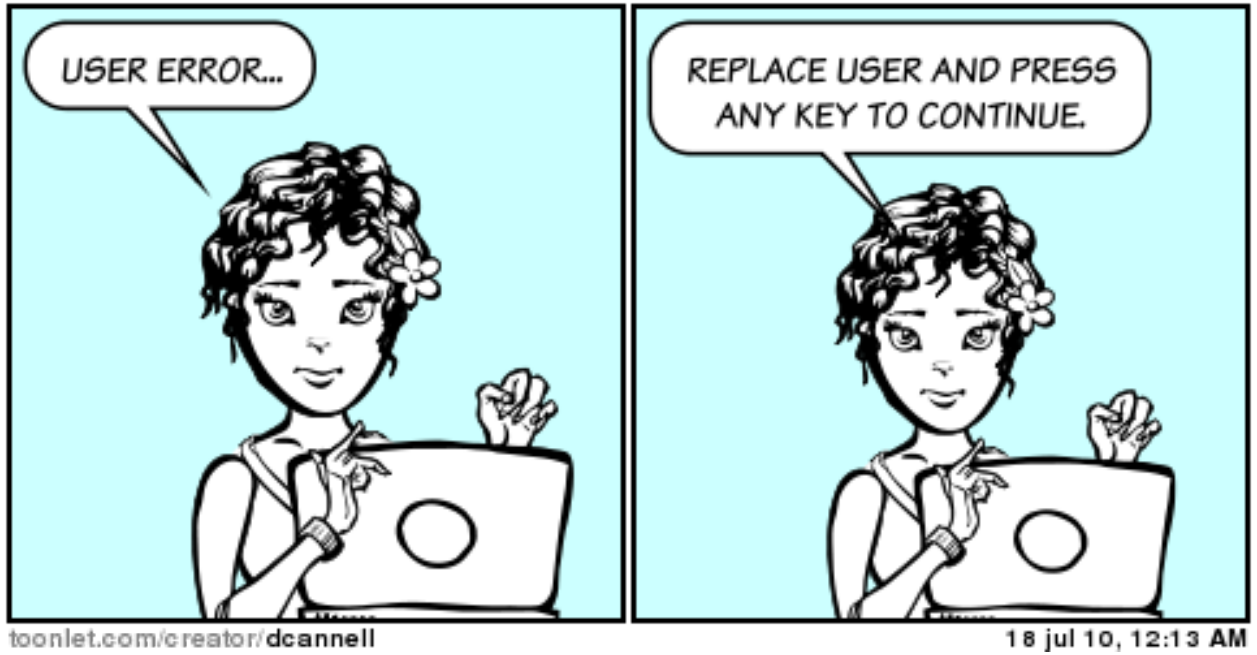
8. Procedure errors :User error



2.3 Classification of the causes of software errors

9. Documentation errors.

- Omission of software functions.
- Errors in the explanations and instructions given to users, resulting in “dead ends” or incorrect applications.
- Listing of non-existing software functions, that is, functions planned in the early stages of development but later dropped, and functions that were active in previous versions of the software but cancelled in the current version.

2.3 The 9 causes of software errors

1. Faulty requirements definition
2. Client–developer communication failures
3. Deliberate deviations from software requirements
4. Logical design errors
5. Coding errors
6. Non-compliance with documentation and coding instructions
7. Shortcomings of the testing process
8. Procedure errors
9. Documentation errors

Exercise

- 3-5 students/team.
- Among 9 causes, choose 3 causes that in your opinion are the most reasons of software errors.
- Discuss 3 causes, give examples
- Justify why they are the most reasons of software errors