Software, Errors, Faults and Failures

RMUA Rathnayake

Reference: Software Quality Assurance - From Theory to implementation by Daniel Galin)

How much costly a software failure

- The Explosion of the Ariane 5 (**Cost:** $370 million)
- Soviet Gas Pipeline Explosion
- NASA Mars Climate Orbiter
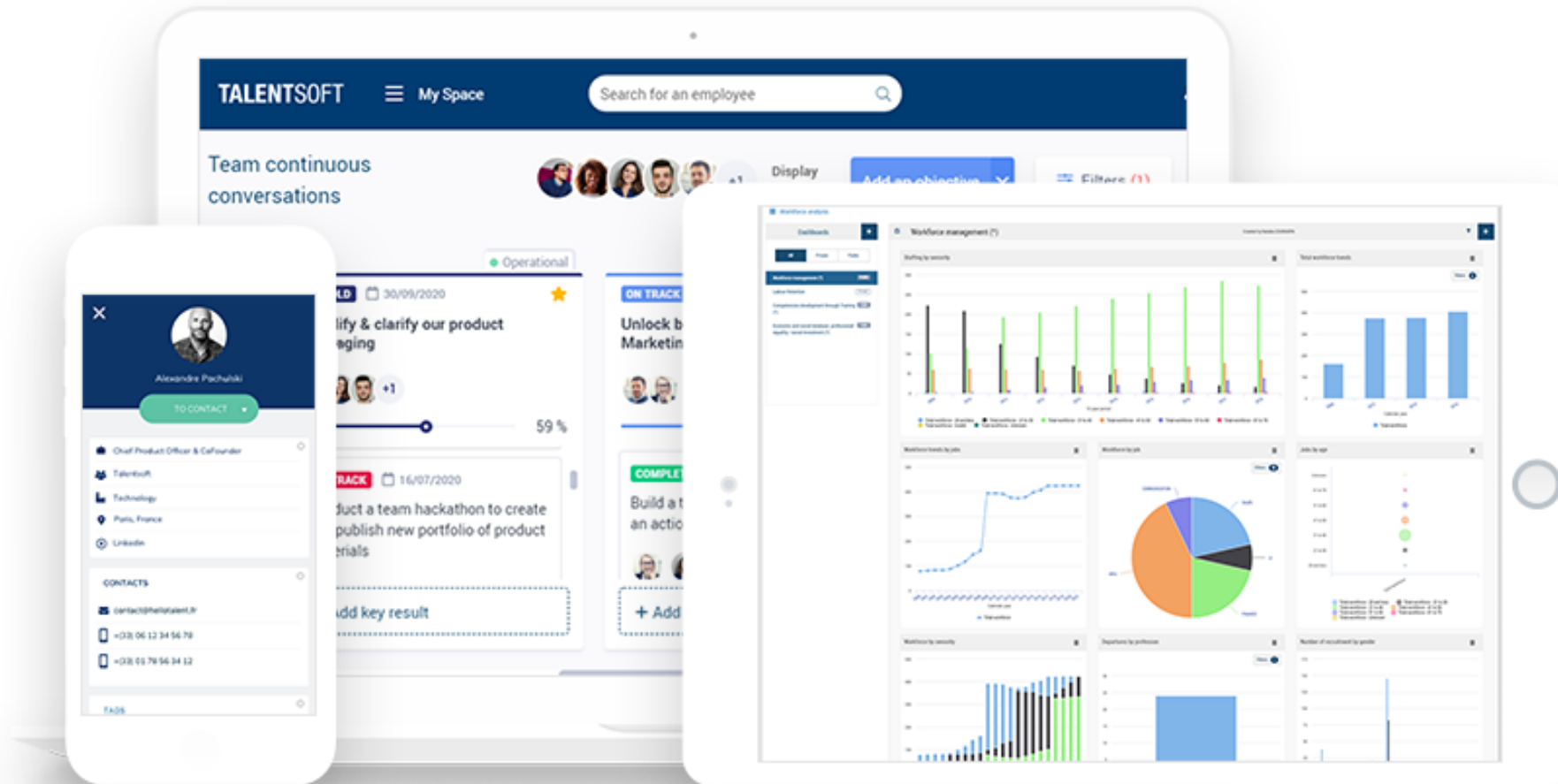- Mariner 1 Spacecraft
- Y2K issue
- Patriot Missile Error

Outline

- The term "software"
- Software errors, faults and failures
  - Software errors
  - Software faults
  - Software failures

Definition of Software

The term - "Software"

Is this software?

The term - "Software" contd.

Frame 2.1 **Software – IEEE definition**

Software is:

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

The term - "Software" contd.

The IEEE definition of software, which is almost identical to the ISO definition, lists the following four components of software:

- Computer programs (the code)
- Procedures
- Documentation
- Data necessary for the operation of the system

Software Errors, Faults and Failures

Let's look at an example (3 user views)

① "We have used the Simplex HR software in our Human Resources Department for about three years and we have never had a software failure"

----

② "I started to use Simplex HR two months ago; we had so many failures that we are considering replacing the software package."

----

③ "We have been using the same software package for almost four years. We were very satisfied through out the period until the last few months, when we suddenly faced several severe failures."

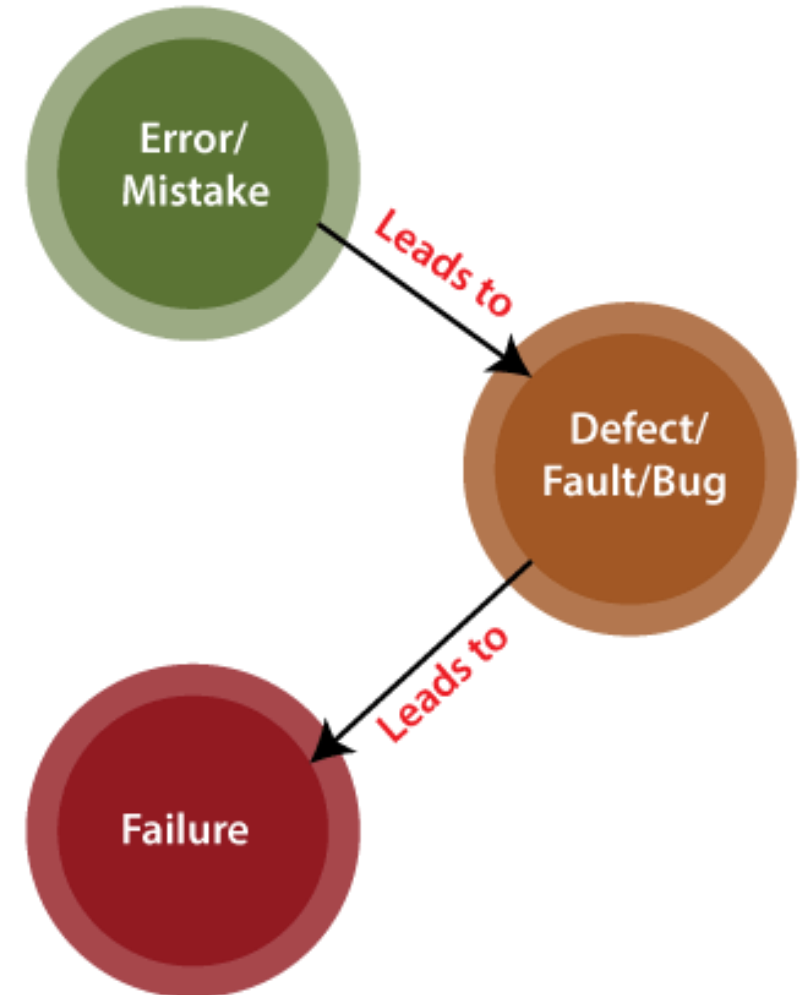# Let's look at an example (3 user views)

For the same Software product, can there be such a variation in the user experience?

YES / NO ??

Software issues that affect to quality

1. Software Errors
2. Software Faults
3. Software Failures

Software errors

Software errors are sections of the code that are partially or totally incorrect as a result of a grammatical, logical or other mistake made by a systems analyst, a programmer, or another member of the software development team

Software errors contd.

- Typically software errors are raised by,
  - Developers
  - Test engineers
- Errors can be of different types
  - Syntactic, flow control, error handling, calculation, hardware, user interface, etc.

What are software faults?

"Anything that threatens the value of the software to some person who matters"

"The **Fault** is a state that causes the software to fail to accomplish its essential function"

Software faults

- Software faults leads to incorrect functioning of the software application
- A software fault occurs as a result of an error that remains in the executing program
- Not all faults however are detected and the software may continue executing without any obvious problems

Software faults contd.

- There are cases where software faults go undetected for many years of a programs existence

Different types of faults that could occur

- Business Logic Faults
- Functional and Logical Faults
- Faulty GUI
- Performance Faults
- Security Faults
- Software/ hardware Faults

Software failures

Software faults become software failures only when they are "activated", that is, when a user tries to apply the specific software section that is faulty

The root of any software failure is a software error.

Software failures

Do all software faults end with software failures?

Not necessarily: a software fault becomes a software failure only when it is "activated".

Software failures

- Many defects lead to the **software's failure**, which means that a loss specifies a fatal issue in software/ application or in its module, which makes the system unresponsive or broken.

- In other words, we can say that if an end-user detects an issue in the product, then that particular issue is called a **failure**.

Software failures

Error   Fault   Failure