Software Quality Assurance
The Software Quality Challenge

Topics

- The uniqueness of software quality assurance.
- The environments for which SQA. methods are developed.
- Main Characteristics of Environments.

Case study

- In February,1995; opening of the new Denver International Airport (DIA).
- Planed; Serve 110,000,000 passengers/y with 1750 flights daily , 200 gates and 12 runways.

Case study

- Operations were delayed by 16 months.
- Failure of Software-base baggage handing system.

$ 2 billion

Microsoft vs General Motors

At a recent computer expo, Bill Gates reportedly compared the computer industry with the auto industry and stated "If GM had kept up with technology like the computer industry has, we would all be driving $25.00 cars that got 1,000 miles to the gallon. In response to Bill's comments, General Motors issued a press release stating: If GM had developed technology like Microsoft, we would all be driving cars with the following characteristics:

- For no reason whatsoever, your car would crash twice a day.
- Every time they repainted the lines in the road, you would have to buy a new car
- Occasionally your car would die on the freeway for no reason. You would have to pull over to the side of the road, close all of the windows, shut off the car, restart it, and reopen the windows before you could continue. For some reason you would simply accept this.
- Occasionally, executing a maneuver such as a left turn would cause your car to shut down and refuse to restart, in which case you would have to reinstall the engine.
- The airbag system would ask "Are you sure?" before deploying.
- You'd have to press the "Start" button to turn the engine off.

The Difference of QA

These differences can be categorized as follows:

1. Product complexity>>number of operational modes
2. Product visibility. >>visible-easy to detect defect.
3. Product development and production process.
   - Product development >>design , test product prototype
   - Product production planning >>design tools ,machines
   - Manufacturing

The Difference of QA

Factors affecting defect detection in software products vs. other industrial products.

Characteristic	Software product	Other industrial products
Complexity	Usually, very complex product allowing for very large number of operational options.	Degree of complexity much lower, allowing at most a few thousand operational options.
Visibility of product	Invisible product, impossible to detect defects or omissions by sight (e.g. of a diskette or CD storing the software)	Visible product, allowing effective detection of defects by sight

The Difference of QA

Factors affecting defect detection in software products vs. other industrial products.

Characteristic	Software product	Other industrial products
Nature of development and production process	Opportunities to detect defects arise in only one phase, Namely product development.	Opportunities to detect Defects a rise in all phases of Development and production: ■ Product development ■ Product production planning ■ Manufacturing

The uniqueness of the software development process

- High complexity, as compared to other industrial products.
- Invisibility of the product.
- Opportunities to detect defects("bugs") are limited to the product development phase.

The uniqueness of software quality assurance

- Exercise 1 (individual): Read the message of "LIMITED WARRANTY ".
  - What is the main idea?
  - Do you agree? Justify your answer.

The environments for which SQA methods are developed

- Students develop software as part of their education.
- Software amateurs develop software as a hobby.
- Professionals in engineering, economics, management and other fields develop software to assist them in their work, to perform calculations , summarize research and survey activities, and so forth.
- Software development professionals

Main Characteristics of Environments.

1. Contractual conditions.
   - A defined list of functional requirements.
   - The project budget.
   - The project timetable.

2. Subjection to customer–supplier relationship.

Main Characteristics of Environments.

3. Required teamwork
   - Timetable requirements.
   - The need for a variety of specializations in order to carry out the project.
   - The wish to benefit from professional mutual support and review for the enhancement of project quality.

Main Characteristics of Environments.

4. Cooperation and coordination with other software teams.

5. Interfaces with other software systems.

Figure 1.1: A cooperation and coordination scheme for a software development team of a large-scale project

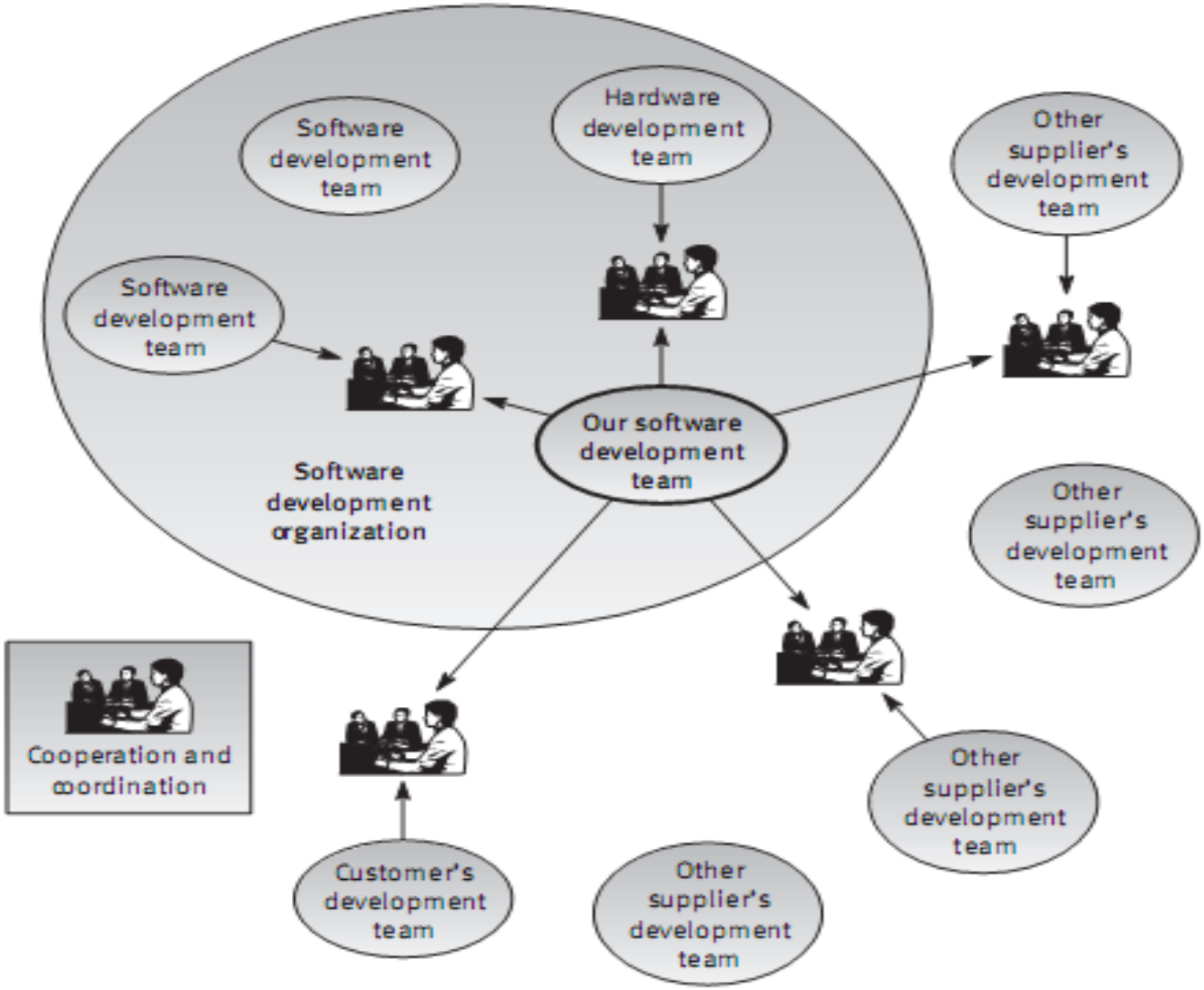
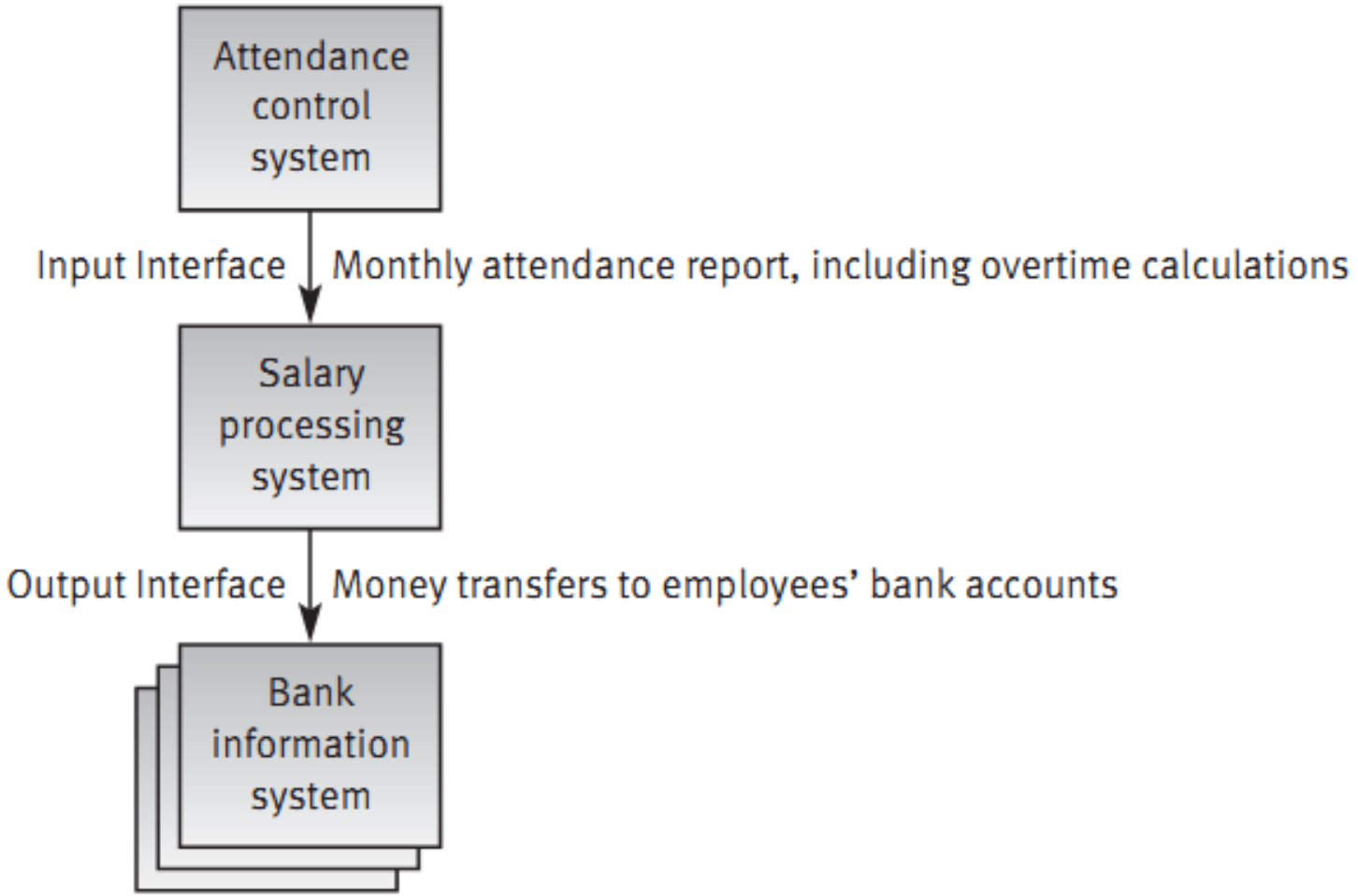


Figure 1.2: The salary software system an example of software interfaces



Main Characteristics of Environments.

6. The need to continue carrying out a project despite team member changes.

7. The need to continue carrying out software maintenance for an extended period.

Summary of the main characteristics of SQA environment

1. Being contracted
2. Subjection to customer–supplier relationship
3. Requirement for teamwork
4. Need for cooperation and coordination with other development teams
5. Need for interfaces with other software systems
6. Need to continue carrying out a project while the team changes
7. Need to continue maintaining the software system for years

Assignment

Exercise

- Work as a team(3-5 students).
- There are three major differences between software products and other industrial products.
  (1) Identify and describe the differences.
  (2) Discuss the ways in which these differences affect SQA