SFWR ENG 3A04: Software Design II

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Term 1

Outline of Part I

1. Overview
2. Where does software design sit in SDLC?
3. What is meant by Software Architecture?
4. Software Architecture Design Guidelines
5. Questions???

Outline of Part II

6. Introduction
7. Functional Requirements
8. Functional Requirements
9. Non-functional Requirements
10. Process Requirements

Part I

Review of Previous Lecture

Part II

Today's Lecture

Requirements Highlights Introduction

- The requirements specification serves as a starting point for the next phase (design)
- In the design phase, the architecture of the system is devised
- Requirements analysis and design generally cannot be strictly separated in time
  - the requirements specification is very formal and can be viewed as a high-level design specification of the system to be built
  - Often, a preliminary design is done after an initial set of requirements has been determined

Requirements Highlights Functional Requirements

- We look at those requirements that are there because of the product's fundamental reason for existence
- The functional requirements specify what the product must do
- They relate to the actions that the product must carry out in order to satisfy the fundamental reasons for its existence The product shall determine which road sections pass through areas that are predicted to freeze.
- It describes an action that the product must take if it is to carry out the work for which it is intended.

Requirements Highlights Functional Requirements

- Functional requirements are:
  - Specifications of the product's functionality;
  - Actions the product must take - check, calculate, record, retrieve;
  - Derived from the fundamental purpose of the product;
  - Not a quality - for example, 'fast' is a quality, and therefore it is a non-functional requirement.
- Think of the functional requirements as the business requirements

Requirements Highlights Functional Requirements

- The functional requirements are a specification of the real work, or business, independent of the way that work will be carried out
- The functional requirements must fully describe the actions that the intended product can perform
- So a requirement for the requirements is that the product's builder be able to use them to construct the product desired by your client.
- At their discovery stage they are not necessarily rigorous nor complete

- The writing activity formalises each requirement

Requirements Highlights Functional Requirements

The product shall show the weather for the next twenty-four hours.

The product shall show all roads predicted to freeze.

- Anything has the potential to be ambiguous
- Continually minimise that risk by clarifying the context

Shut off the pumps if the water level is above 100 meters for 4 seconds

Shut off the pumps if the water level is above 100 meters for 4 seconds. There are several reasonable interpretations

1. *"Shut off the pumps if the mean water level over the past 4 seconds was above 100 meters".*

$$\left[\left(\int_{T-4}^{T} WL(t)dt\right) \div 4 > 100\right]$$

2. *"Shut off the pumps if the median water level over the past 4 seconds was above 100 meters".*

$$(Max_{[t-4,t]}(WL(t)) + Min_{[t-4,t]}(WL(t))) \div 2 > 100$$

3. *"Shut off the pumps if the minimum water level over the past 4 seconds was above 100 meters".*

$$\ldots\ldots\ldots \qquad Min_{[t-4,t]}(WL(t)) > 100$$

- Look and Feel Requirements

  The product shall have the same layout as the district maps that the engineering department uses now.

- Usability Requirements

  - Ease of use The product shall be easy for 11-year-old children to use.
  - Ease of learning The product shall be easy for an engineer to learn.

- Performance Requirements
  - Speed requirements Any interface between a user and the automated product must have a maximum response time of two seconds.
  - Safety critical requirements The product shall not emit noxious gases.
  - Precision requirements All monetary amounts must be accurate to two decimal places.
  - Reliability and availability requirements The product shall be available for use 24 hours per day, 365 days per year.

- Capacity requirements The product must be able to cater for 300 simultaneous users within the period from 9:00 a.m. to 11:00 a.m. Maximum loading at other periods will be 150.

- Operational Requirements
  - Expected physical environment The product is to be used by a worker, standing up, outside in cold, rainy conditions.
  - Expected technological environment
  - Partner applications We must be able to interface with any HTML (Hyper-Text Mark-up Language) browser.

- Maintainability and Portability Requirements
  - How easy must it be to maintain this product? New MIS (Management Information System) reports must be available within one working week of the date the requirements are agreed.
  - Are there special conditions that apply to the maintenance of this product? The maintenance releases will be offered to end-users once a year.
  - Portability requirements The product is expected to run under Windows 95 and UNIX.

Requirements Highlights Non-functional Requirements

- Security Requirements
  - Is the product confidential? Only direct managers can see the personnel records of their staff.
  - File integrity requirements
  - Audit requirements + Prevention, detection and recovery policies
- Cultural and Political Requirements
- Are there any special factors about the product that would make it unacceptable for some political reason?

  The product shall not use icons that could be considered offencive in any of our market countries.

- Legal Requirements
  - Does the product fall under the jurisdiction of any law? Personal information must be implemented so as to comply with the Data Protection Act.
  - Are there any standards with which we must comply? The product must comply with the appropriate MilSpec (Military Specification) standards.
- Open Issues

  Issues that have been raised and do not yet have a conclusion

Our investigation into whether or not the new version of the processor will be suitable for our application is not yet complete.

- Off-the-Shelf Solutions
  - Is there a ready-made product that could be bought?
  - Can ready-made components be used for this product?
  - Is there something that we could copy?

Another electricity company has built a customer service system. Their hardware is different from ours but we could buy their specification and cut our analysis effort by approximately 60%.

- New Problems
  - What problems could the new product cause in the current environment? Any change to the scheduling system will affect the work of the engineers in the divisions and the truck drivers.
  - Will any of our existing users be adversely affected by the new development?
  - What limitations exist in the anticipated implementation environment that may inhibit the new product? The planned new server is not powerful enough to cope with our projected growth pattern.
  - Will the new product create other problems?

- Tasks
  - What steps have to be taken to deliver the product?
  - Development phases
- Cutover
  - What special requirements do we have to get the existing data, and procedures to work for the new product?
  - What data has to be modified/translated for the new product?
- Risks
  - What risks do you face when you develop this product?
  - What contingency plans are you making?

- Costs
- User Documentation
  - The plan for building the user documentation
- Waiting Room
  - requirements that will not be part of the agreed product
  - These requirements might be included in future versions of the product