SFWR ENG 3A04: Software Design II

Dr. Ridha Khedri

Department of Computing and Software, McMaster University
Canada L8S 4L7, Hamilton, Ontario

Term 1

Outline of Part I

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Outline
**Part I: Review of
Previous Lecture**
Part II: Today's
Lecture

◄ □ ► ◄ 🗗 ► ◄ 🗏 ► ◄ 🗏 ►   🗏   ⩝ ⩝ ⩝

Outline of Part II

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Outline
Part I: Review of
Previous Lecture
Part II: Today's
Lecture

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Overview

Where does
software design sit
in SDLC?

What is meant by
Software
Architecture?

Software
Architecture
Design Guidelines

Questions???

Part I

Review of Previous Lecture

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

Part II

Today's Lecture

- The requirements specification serves as a starting point for the next phase (design)

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

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

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

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

Requirements Highlights   Introduction

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

- 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

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

- We look at those requirements that are there because of the product's fundamental reason for existence

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

**Functional
Requirements**

Functional
Requirements

Non-functional
Requirements

Process
Requirements

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

- 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

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

**Functional
Requirements**

Functional
Requirements

Non-functional
Requirements

Process
Requirements

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

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.

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:

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional Requirements

Functional Requirements

Non-functional Requirements

Process Requirements

Requirements Highlights   Functional Requirements

- Functional requirements are:
  - Specifications of the product's functionality;

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

**Functional
Requirements**

Functional
Requirements

Non-functional
Requirements

Process
Requirements

- Functional requirements are:
    - Specifications of the product's functionality;

    - Actions the product must take - check, calculate, record, retrieve;

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;

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.

Requirements Highlights   Functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

**Functional
Requirements**

Functional
Requirements

Non-functional
Requirements

Process
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

- The functional requirements are a specification of the real work, or business, independent of the way that work will be carried out

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Introduction

Functional Requirements

Functional Requirements

Non-functional Requirements

Process 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

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.

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

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

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

**Functional
Requirements**

Non-functional
Requirements

Process
Requirements

Requirements Highlights Functional Requirements

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

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

**Functional
Requirements**

Non-functional
Requirements

Process
Requirements

Requirements Highlights   Functional Requirements

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

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.

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

**Functional
Requirements**

Non-functional
Requirements

Process
Requirements

Requirements Highlights Functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

**Functional
Requirements**

Non-functional
Requirements

Process
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

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

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

Requirements Highlights   Functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

**Functional
Requirements**

Non-functional
Requirements

Process
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

Requirements Highlights　Functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

**Functional
Requirements**

Non-functional
Requirements

Process
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

Requirements Highlights   Functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

**Functional
Requirements**

Non-functional
Requirements

Process
Requirements

Requirements Highlights Functional Requirements

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

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

**Functional
Requirements**

Non-functional
Requirements

Process
Requirements

Requirements Highlights   Functional Requirements

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".*

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

· · · · · · · · ·

Requirements Highlights   Functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

**Functional
Requirements**

Non-functional
Requirements

Process
Requirements

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 <u>mean</u> 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 <u>median</u> water level over the past 4 seconds was above 100 meters".*

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

. . . .

Requirements Highlights   Functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

**Functional
Requirements**

Non-functional
Requirements

Process
Requirements

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 <u>mean</u> 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 <u>median</u> 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 <u>minimum</u> water level over the past 4 seconds was above 100 meters".*

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

- Look and Feel Requirements

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Introduction

Functional Requirements

Functional Requirements

Non-functional Requirements

Process Requirements

Dr. R. Khedri   SFWR ENG 3A04: Software Design II

- Look and Feel Requirements

- Look and Feel Requirements

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

Requirements Highlights   Non-functional Requirements

- Look and Feel Requirements

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

- Usability Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

Requirements Highlights   Non-functional Requirements

- 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

Requirements Highlights Non-functional Requirements

- 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

Requirements Highlights   Non-functional Requirements

- 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.

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

Requirements Highlights   Non-functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

- 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

Requirements Highlights   Non-functional Requirements

- 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

Requirements Highlights   Non-functional Requirements

- 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.

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

Requirements Highlights   Non-functional Requirements

- 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.

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

Requirements Highlights   Non-functional Requirements

- Performance Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

- Performance Requirements
  - Speed requirements

- Performance Requirements
  - Speed requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

Dr. R. Khedri   SFWR ENG 3A04: Software Design II

Requirements Highlights   Non-functional Requirements

- Performance Requirements
  - Speed requirements

    Any interface between a user and the automated product must have a maximum response time of two seconds.

Requirements Highlights   Non-functional Requirements

- 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

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

Requirements Highlights   Non-functional Requirements

- 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

Requirements Highlights — Non-functional Requirements

- 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.

Requirements Highlights   Non-functional Requirements

- 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

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

Requirements Highlights   Non-functional Requirements

- 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

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

Requirements Highlights   Non-functional Requirements

- 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.

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

- 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

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

Requirements Highlights   Non-functional Requirements

- 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

Requirements Highlights   Non-functional Requirements

- 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.

Requirements Highlights   Non-functional Requirements

- 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

Requirements Highlights   Non-functional Requirements

- Capacity requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

Requirements Highlights   Non-functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

- 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.

Requirements Highlights   Non-functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

- 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

Requirements Highlights   Non-functional Requirements

- 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

Requirements Highlights Non-functional Requirements

- 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

Requirements Highlights   Non-functional Requirements

- 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.

- 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

Requirements Highlights   Non-functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

- 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

- 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

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

Requirements Highlights   Non-functional Requirements

- 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.

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

Requirements Highlights   Non-functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

- 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.

Requirements Highlights   Non-functional Requirements

- Maintainability and Portability Requirements
  - How easy must it be to maintain this product?

- Maintainability and Portability Requirements
  - How easy must it be to maintain this product?

Requirements Highlights   Non-functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

- 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.

Requirements Highlights   Non-functional Requirements

- 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?

Requirements Highlights   Non-functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Non-functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

- 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?

Requirements Highlights   Non-functional Requirements

- 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.

Requirements Highlights   Non-functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

- 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

Requirements Highlights   Non-functional Requirements

- 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

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

- 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.

- Security Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

Dr. R. Khedri   SFWR ENG 3A04: Software Design II

- Security Requirements
  - Is the product confidential?

Requirements Highlights   Non-functional Requirements

- Security Requirements
  - Is the product confidential?

- Security Requirements
  - Is the product confidential?

    Only direct managers can see the personnel records of their staff.

- Security Requirements
    - Is the product confidential?

        Only direct managers can see the personnel records of their staff.

    - File integrity requirements

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Introduction

Functional Requirements

Functional Requirements

Non-functional Requirements

Process Requirements

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

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

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

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?

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?

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.

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

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

- Legal Requirements
  - Does the product fall under the jurisdiction of any law?

Requirements Highlights   Non-functional Requirements

- Legal Requirements
  - Does the product fall under the jurisdiction of any law?

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

- 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.

Requirements Highlights — Non-functional Requirements

- 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?

Requirements Highlights   Non-functional Requirements

- 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?

Requirements Highlights   Non-functional Requirements

- 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.

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

Requirements Highlights   Non-functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

- 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

Requirements Highlights   Non-functional Requirements

- 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

Requirements Highlights Non-functional Requirements

- 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.

Requirements Highlights   Non-functional Requirements

- 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.

Requirements Highlights   Non-functional Requirements

- Off-the-Shelf Solutions

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

Requirements Highlights   Non-functional Requirements

- Off-the-Shelf Solutions
  - Is there a ready-made product that could be bought?

Requirements Highlights Non-functional Requirements

- Off-the-Shelf Solutions
  - Is there a ready-made product that could be bought?

  - Can ready-made components be used for this product?

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

- 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?

Requirements Highlights   Non-functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

- 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?

Requirements Highlights   Non-functional Requirements

- 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%.

- 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

- New Problems
  - What problems could the new product cause in the current environment?

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

Requirements Highlights   Non-functional Requirements

- New Problems
  - What problems could the new product cause in the current environment?

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Introduction

Functional Requirements

Functional Requirements

Non-functional Requirements

Process Requirements

- 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.

- 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?

Requirements Highlights   Non-functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

- 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?

Requirements Highlights   Non-functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

**Non-functional
Requirements**

Process
Requirements

- 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?

Requirements Highlights   Non-functional Requirements

- 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.

Requirements Highlights Non-functional Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

- 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

- Tasks
  - What steps have to be taken to deliver the product?

- Tasks
  - What steps have to be taken to deliver the product?
  - Development phases

- Tasks
  - What steps have to be taken to deliver the product?
  - Development phases
- Cutover

Requirements Highlights   Process Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

**Process
Requirements**

- 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?

- 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?

- 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

Requirements Highlights   Process Requirements

- 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?

Requirements Highlights   Process Requirements

- 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

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

Requirements Highlights   Process Requirements

- Costs

- User Documentation

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

Requirements Highlights   Process Requirements

- Costs

- User Documentation

  - The plan for building the user documentation

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

Process
Requirements

- Costs

- User Documentation

  - The plan for building the user documentation

- Waiting Room

  - requirements that will not be part of the agreed product

Requirements Highlights   Process Requirements

SFWR ENG 3A04:
Software Design II

Dr. R. Khedri

Introduction

Functional
Requirements

Functional
Requirements

Non-functional
Requirements

**Process
Requirements**

- 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