REQUIREMENT ENGINEERING

INTRODUCTION

TABLE OF CONTENTS

COURSE LEARNING OUTCOMES

Knowledge and Understanding

Functional Requirements, Non-functional requirements

01

Intellectual Skills

Apply different solicitation techniques to construct software requirements

02

Professional and Practical Skills

Analyze functional and nonfunctional requirements to create UML, Create software requirement specification document

03

General and Transferable Skills

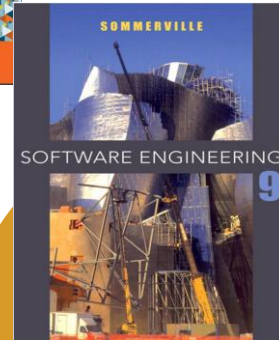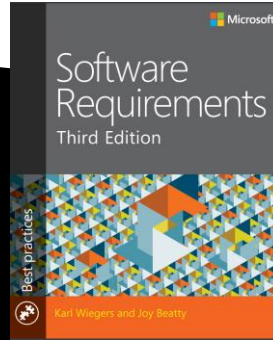Teamwork, solicitation techniques to extrapolate information

04

SOFTWARE REQUIREMENTS
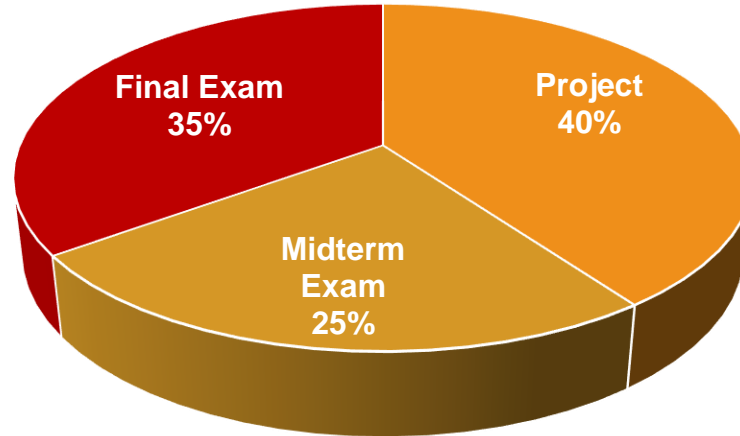**3RD Ed.**

Karl Wiegers & Joy Beatty

SOFTWARE ENGINEERING
9TH Ed.

Ian Sommerville

GRADING

TOPICS & SCHEDULE

Topic	Lec.	Lab
Introduction to RE	2	2
Elicitation	2	2
Use Case Modeling	2	2
Negotiation, Triage, Prioritization	2	2
Requirements Modeling, I	2	2
Requirements Modeling, II	2	2

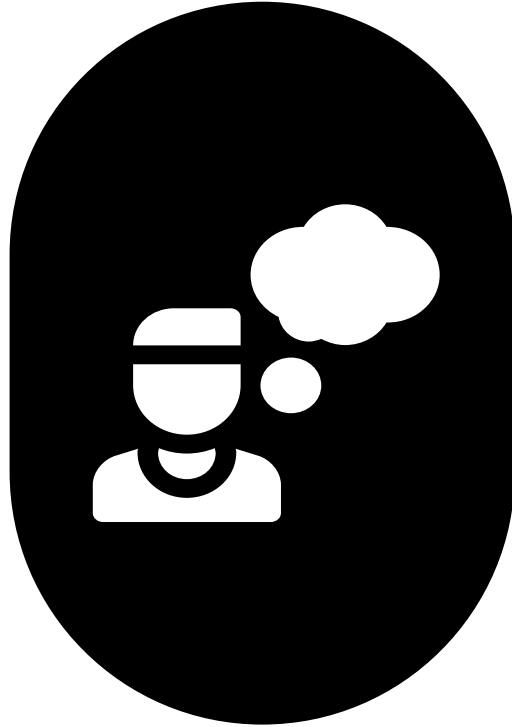| Topic	Lec.	Lab
Requirements Analysis	2	2
Goal Modeling I	2	2
Goal Modeling II	2	2
Specifying Systems	2	2
Functional Modeling	2	2
Verification & Validation	2	2

INTRODUCTION

INTRODUCTION

- **What is RE?**
- **Importance of RE**
- **Cost of bad Req.**
- **RE Types**
- **Software Req. Activities**
- **Intro to Elicitation Techniques**

WHAT IS RE?

DODGE DART

PORSCHE CAYENNE

THE POLAROID PROJECT

- 2.5 MIN time limit

- Had no sound

- Could not play it on regular TV

F-35 TARGET ERROR

- Fly in formation
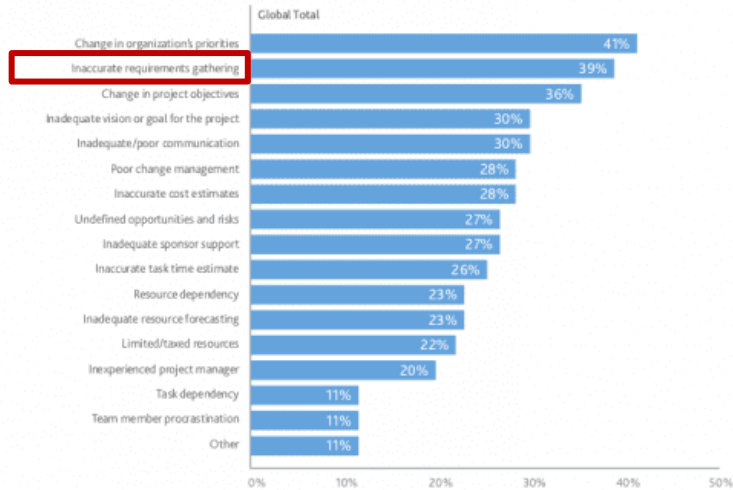
- Target Error

- Seeing Double

- Software Error !!

CareFusion Alaris Pump Recall

- **Pump Overdose when not needed**

- **Pump delay infusion**
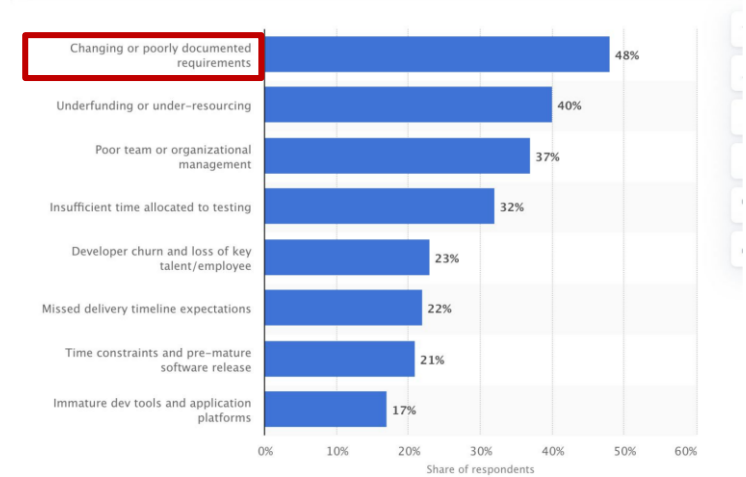
- **Software error ! ! ....**

- **DEADLY ....**

NHS Civilian IT

- **Electronic health records, digital scanning, and integrated IT systems across hospitals and community care.**

- **Scope creep**

- **11.4 billion GBP**
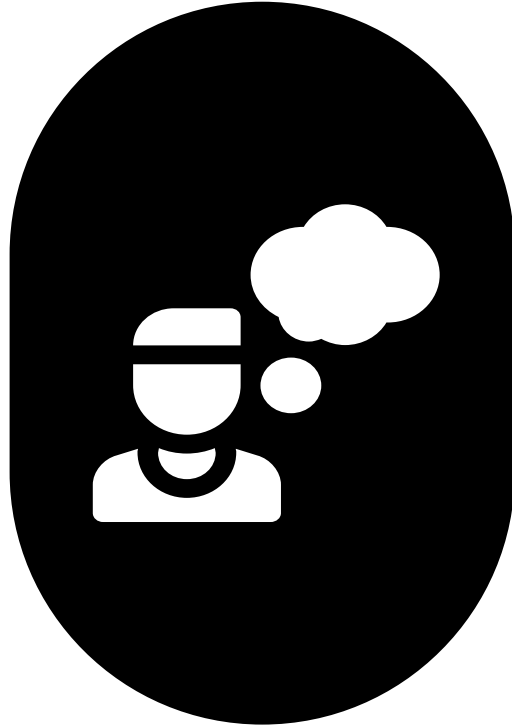
https://project-management.com/wp-content/uploads/2021/03/top-10-causes-of-project-failure-520x377.png

https://www.statista.com/statistics/627648/worldwide-software-developer-survey-project-failure/

What is RE?

Anything that drives design choices

A property that a product must have to provide value to a stakeholder

Requirements encompass both the user's view of the external system behavior & the developer's view of some internal characteristics.

They include both the behavior of the system under specifc conditions and those properties that make it suitable & enjoyable for use

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Requirements are specifications of what should be implemented.
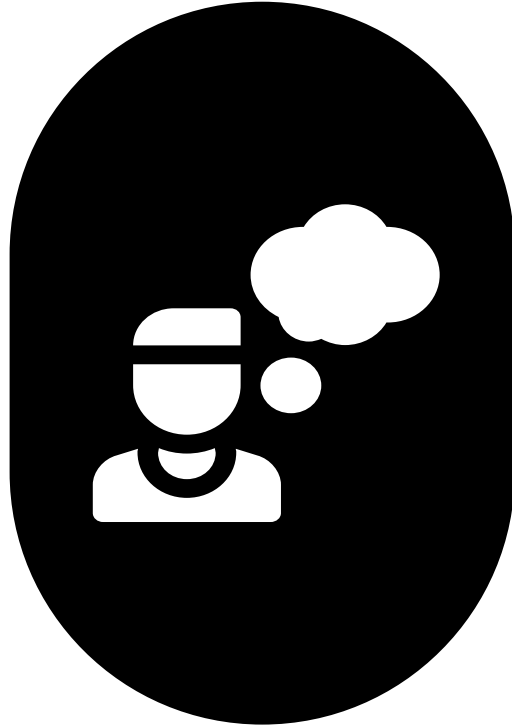
They are descriptions of how the system should behave.

A system property or attribute.

A constraint on the development process of the system.

The activity of

elicitation, specification, analysis, & management

of the stakeholder requirements, which should be met by a new or evolving system

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UNIVERSITY

What is the importance of RE?

TYPES OF REQUIREMENTS

FUNCTIONAL REQUIREMENTS

USER REQUIREMENTS

NON FUNCTIONAL REQUIREMENTS (NFR)

SYSTEM REQUIREMENTS

FUNCTIONAL REQUIREMENTS

Functional "**user requirements**" can be high-level statements of what the system or actors can do.

Explained in natural language & diagrams. It represents the system, its functions, & constraints.

Functional "**system (detailed) requirements**" are more detailed descriptions of what the system should do". Its functions, services, and operational constraints.

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User Requirement Definition

1. The MHC-PMS shall generate monthly management reports showing the cost of drugs prescribed by each clinic during that month.

Client Managers
System End-Users
Client Engineers
Contractor Managers
System Architects

System Requirements Specification

1.1 On the last working day of each month, a summary of the drugs prescribed, their cost, and the prescribing clinics shall be generated.

1.2 The system shall automatically generate the report for printing after 17.30 on the last working day of the month.

1.3 A report shall be created for each clinic and shall list the individual drug names, the total number of prescriptions, the number of doses prescribed, and the total cost of the prescribed drugs.

1.4 If drugs are available in different dose units (e.g., 10 mg, 20 mg) separate reports shall be created for each dose unit.

1.5 Access to all cost reports shall be restricted to authorized users listed on a management access control list.

System End-Users
Client Engineers
System Architects
Software Developers

USERS

Software Engineering book (Ian Sommerville) : Ch.4, P.84

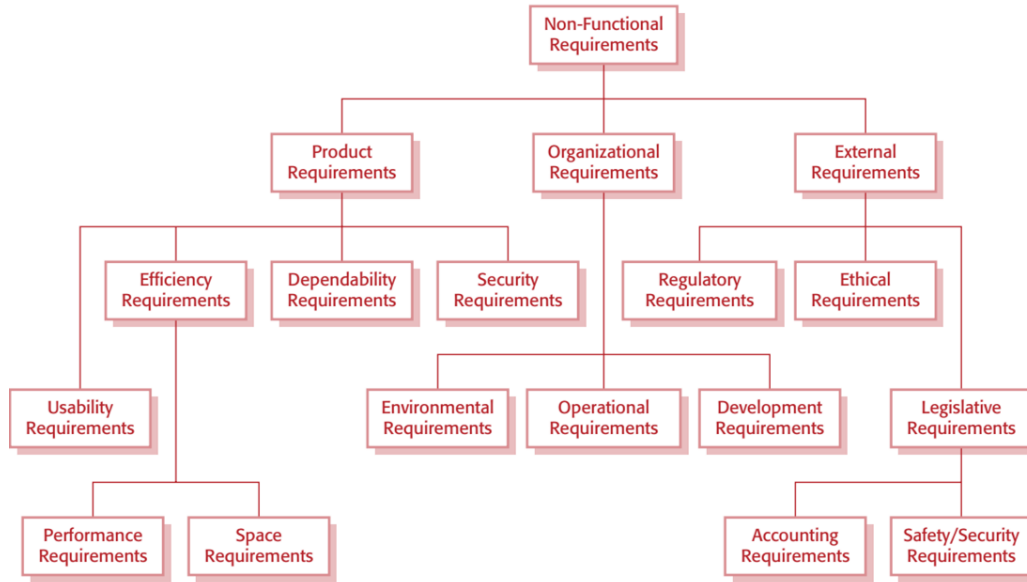**System related** NOT **feature related**.
describe the constraints

Ex.
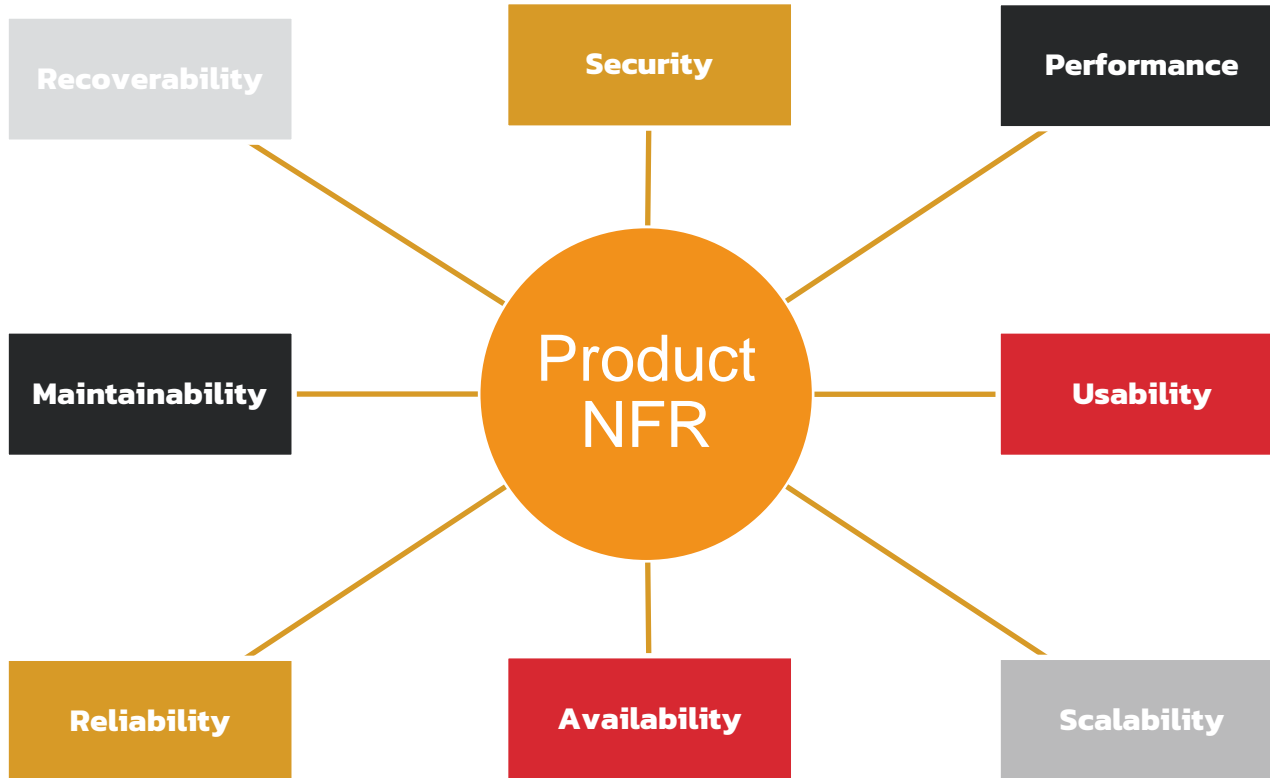Include security, reliability, usability,
performance, ...etc

**Note that: an NFR could lead to
the development of an FR.**

**In reality, FR & NFR requirements
are not clear cut.**

**NON-
FUNCTIONAL
REQUIREMENTS**

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NON–FUNCTIONAL REQUIREMENTS

Product NFR

- Recoverability
- Security
- Performance
- Maintainability
- Usability
- Reliability
- Availability
- Scalability

Recall, the patient management system .....

PRODUCT REQUIREMENT
The system shall be available to all clinics during normal working hours (Mon–Fri, 08.30–17.30). Downtime within normal working hours shall not exceed five seconds in any one day.

ORGANIZATIONAL REQUIREMENT
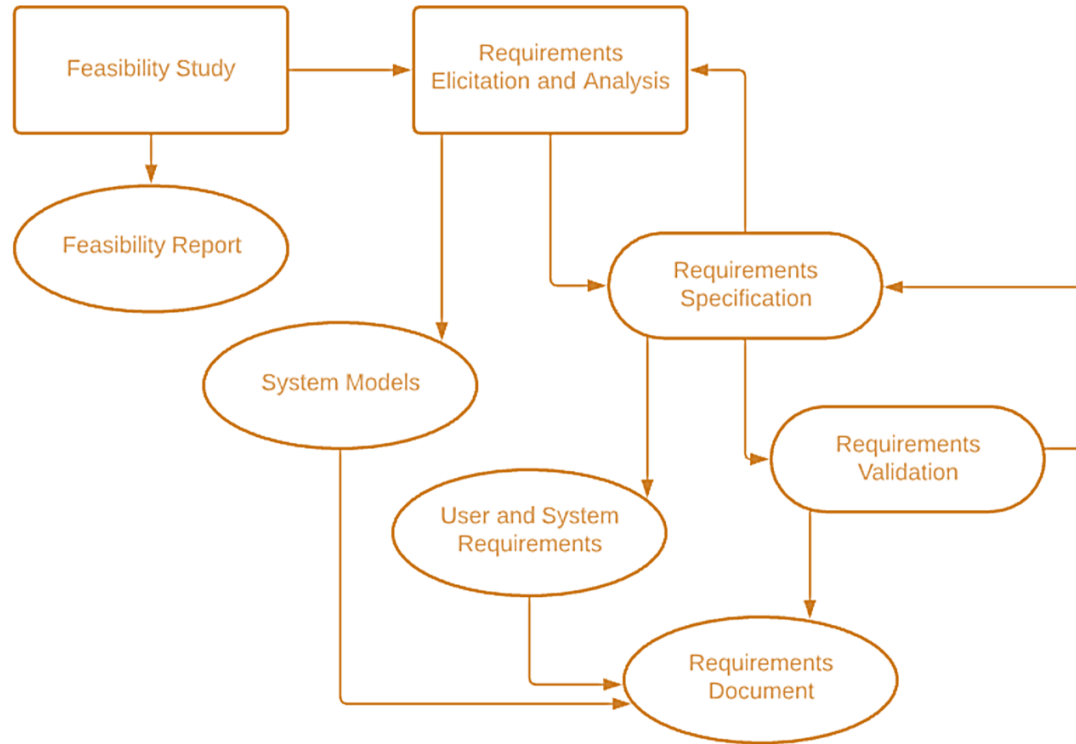Users of the system shall authenticate themselves using their health authority identity card.

EXTERNAL REQUIREMENT The system shall implement patient privacy provisions as set by law.
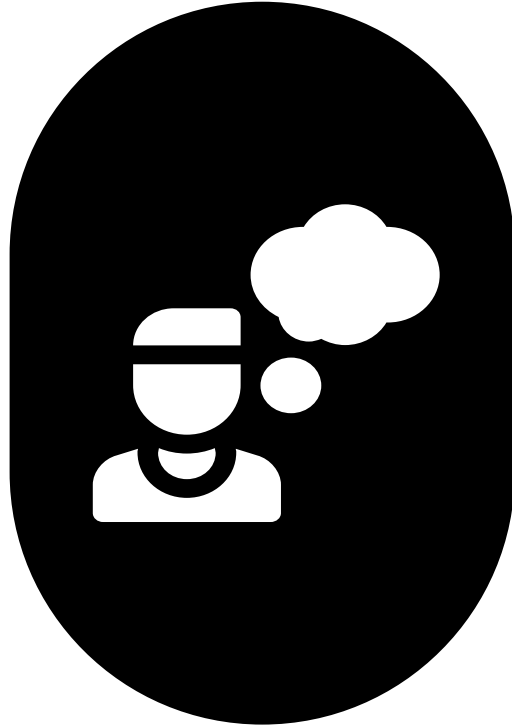
NFR is more critical than FR, Why?

RE ACTIVITES

This is the first phase of the requirements engineering process.
Understand the business, the market, develop the business case & feasibility study

Effective communication is very important in this stage
Talk to different stakeholders, managers, marketing, end users, se, sd ...etc

Understand nature of the solution
Develop a preliminary solution

How?
Brainstorming, joint application development meeting...

ELICITATION

This is the 2nd phase of the requirements engineering process.
Define the scope, identify user req., define constraints, hold elicitation interviews, observe users in their jobs..

Some problems
Volatility, ill defined or too detailed req., no understanding between developers & customer.

Collect from different sources
Stakeholders, documentation, existing systems, domain experts

How?
Brainstorming, interviews, observation, use cases, scienarios, prototyping...

ELABORATION

This is the 3rd phase of the requirements engineering process.
Refine what was done in the previous 2 phases, expanding and looking deeper, …

Indulge in modeling activities
Prototyping, analysis models

NEGOTIATION

This is the 4ᵗʰ phase of the requirements engineering process.
Negotiate needs & wants, what to eliminate, prioritize the req., risk factored in

Discussions around
Availability of resources, delivery time, cost, scope of requirements & remove conflicts.

This is the 5th phase of the requirements analysis process.
Written specifications (SRS), set of models, use cases, prototype, UML, UI/UX

Document functions, features, or constraints.
Talk to different stakeholders, managers, marketing, end users, se, sd ...etc

Submit the document to the customer
Written in a language that he/she understands.

How?
UML, ERD, Figma, Invision,...etc

VERIFICATION AND VALIDATION

This is the 6th phase of the requirements engineering process.
Technical review, missing information, checking errors, built according to standards,

How?
Simple sanity check, test-case generation, inspection, requirement review, coded prototypes, design prototypes

Verification: built the product right….
Validation: built the right product…

REQUIREMENT MANAGEMENT

This is the last phase of the requirements engineering process.
Identify, control, and track the req. for successful and smooth implementation.

Requirements change over time

SUMMARY

01   **COURSE LOGISTICS**

02   **What is RE, its importance?**

03   **Req. Types (FR, NFR)**

04   **RE activities**

THANK YOU