Overview

1.0 Requirements Analysis / Requirements Engineering (RE)
   - Definition?
   - Why it is important?

2.0 Requirements Engineering Models

3.0 Activities in Requirements Engineering

4.0 Requirements Evolution

5.0 The desirable Skills for Requirements Engineering

6.0 Requirements Engineering Problems

References
1.0 Introduction

In the early stage of software development,

- capturing, structuring and representing user requirements
- the process of gathering and defining user’s needs
- stakeholders speaks different languages – Business and Technical groups
- possibilities for miscommunication

1.0 Requirements Engineering (RE)?

“Requirements engineering is an activity that involves capturing, structuring and accurately representing the client’s requirements in a manner that can be effectively implemented in a system that will conform to the client’s specifications”

Sawyer, P. and Kotonya [1]

“Requirement Engineering covers all of the activities involved in discovering, documenting and maintaining a set of requirements for a computer-based system”

I.Sommerville [2]

“Requirement Engineering aims at defining the requirements of the system under construction which includes two main activities which are requirement elicitation and analysis”

Bernd Bruegge and Allen H. Dutoit [3]
1.0 Why Requirements Engineering (RE) is important?

In software development projects, the Requirements Engineering Process (REP) can influence the development:

- cost
- time
- effort
- quality

1.0 Major cause of errors in Software development

- Leffingwell and Widrig [4] had stated that one-third of the total defects delivered in software projects are derived from requirements errors by referring to several case studies.
- Requirements processes considered as the source of most (50% or more) critical quality problems in software development [5].
- The top five causes of poor software cost estimation are related to issues with requirements, mainly involving frequent requirements changes, missing requirements, insufficient user communication, poor specifications, and insufficient analysis of requirements [6].
- Embedded real-time software also has the similar error patterns as other types of software. The major source of errors found (36%) are related to requirement issues [7].
1.0 Correcting Requirements Defects

- The cost for correcting requirements defects in later part of the development phase is more expensive compared to Requirements Engineering

![Figure 1: Relative cost to correct a requirement defect depending on when it is discovered [8]](image)

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2.0 Requirements Engineering Models
In the Context of RE Process (REP)

System acquisition

Requirements engineering

System design

Figure 2: Context of Requirements Engineering Process [2]

Waterfall Model

Requirements Elicitation

Requirements Analysis and Negotiation

Requirements Specification and Validation

Requirements Management and Documentations

Figure 3: The Waterfall Model for Requirements Engineering Process [3]
Iterative Model

Figure 4: The Iterative Model for Requirements Engineering Process [2]

Spiral Model

Figure 5: The Spiral Model for Requirements Engineering Process [2]
Agile Requirements Engineering

Figure 6: The Agile Approach for Requirements Engineering Process [9]

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3.0 RE Activities

Requirements Elicitation
→ invokes the task to find out the requirements

Requirements Analysis and Negotiation
→ represents the problem domain which will be built

Requirements Specification and Validation
→ define the right system
   → essence of agreement between the users and developers

Requirements Management and Documentation
→ ensure the software continues to meet the expectations of the users
4.0 Requirements Evolution

Figure 7: Requirements Evolution [10]

Managing Requirements Changes

Figure 8: Requirement Engineering Process Centered at RMD
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5.0 Required Skills for RE [12]

- mathematician (eg argument by elimination)
- historian (eg use of analogies)
- epistemologist (eg insight into what knowledge required by task)
- psychologist (eg appreciation of cognitive load)
- manager (eg selecting appropriate skills)
- learner (eg appropriateness of knowledge)
5.0 Required Skills for RE [12]

- scholar (eg underlying governing principles)
- bookkeeper (eg organizing memory)
- researcher
- negotiator
- tester

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6.0 Requirements Engineering Problems

- Customers don’t (really) know what they want
- Requirements change during the course of the project
- Danger of false assumptions during requirements gathering activities
- Customers have unreasonable timelines
- Communication gaps exist between customers, engineers and project managers

6.0 Requirements Engineering Problems (cnt.)

- the development team doesn’t understand the politics of the customer’s organization.
- are found in organizational contexts, with associated conflicts, expectations and demands of the proposed system
- are dynamic—they change while being solved
- solutions require interdisciplinary knowledge and skills
- the knowledge base of the analyst is constantly evolving
Conclusions

POSSIBLE OUTCOMES FROM EFFECTIVE REQUIREMENTS ENGINEERING PROCESS

Increases the quality of software development process

Reduces development time

Reduces development cost

Reduces the rate of defects in requirements documents

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Thank you for your Attention!

Any Questions?