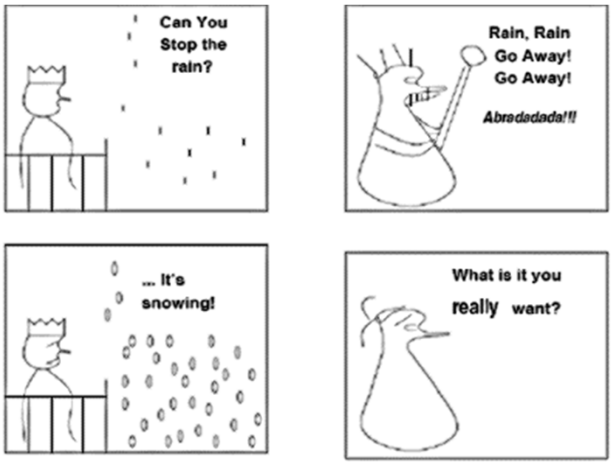
SENG 471

Software Requirements Engineering

Introduction

Getting Started

Once upon a time ……



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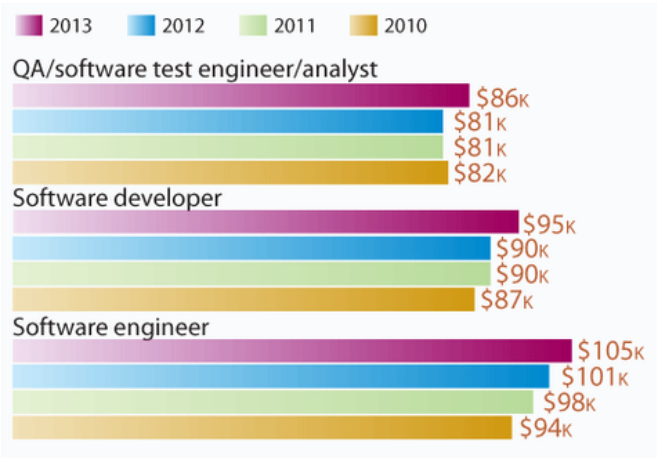
[* IEEE std 610.12-1990]

Software Engineering + Careers

- The application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of **software***.
- Developer
- QA/Testing engineer
- Product management
- Requirements analyst

[www.eetimes.com]

Median Base Salary by Title



[CareerCast.com]

Best 10 Jobs

Year	Job Ranking	Job Title
2017	1	Statistician (Avg. salary: $80,110; job growth: 34%)
	8	**Software Engineer** (Avg. salary: $100,690; job growth: 17%)
2014	1	Mathematician
	7	**Software Engineer**
2013	1	Actuary
	3	**Software Engineer**
2012	**1**	**Software Engineer**
	2	Actuary

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Requirements Engineering (RE)

- Requirements:
  - Conditions or capacities met by a system.
- RE:
  - Acquisition, analysis, specification, validation, and evolution of requirements.
- Objective: ……..

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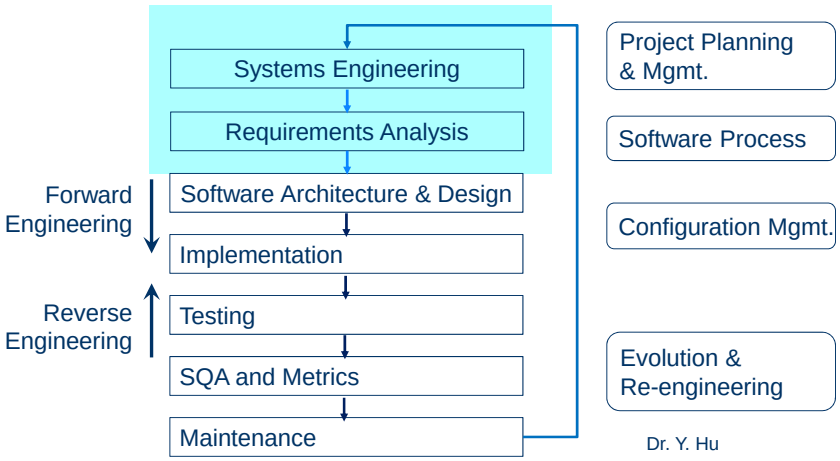
Why RE? – Software Lifecycle



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Why RE? – Erroneous specification

- Bell Labs and IBM studies
  - 80% of all defects are in the requirements phase
- U.S. Air Force projects
  - 36% all defects were due to faulty requirements translation and only 9% of them were resolved
- Voyager and Galileo spacecraft
  - Of the 197 significant software faults founded, only 3 of them were programming errors.

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Requirements changes cause:
~ 70% cost growth > 3 times
~ 32% schedule delay > 2 times

(US - 60%, Europe - 25%, Others - 15%)

† Traditional resolution

* Modern resolution - On time, on budget, with a satisfactory result

Why RE? – Implications

CHAOS Resolution By Year

	1999†	2004†	2011*	2012*	2013*	2014*	2015*
Successful	10%	29%	29%	27%	31%	28%	29%
Failed	31%	18%	22%	17%	19%	17%	19%
Challenged	59%	53%	49%	56%	50%	45%	52%

CHAOS Resolution By Project Size*

	Grand	Large	Medium	Moderate	Small
Successful	2%	6%	9%	21%	62%
Failed	17%	24%	31%	17%	11%
Challenged	7%	17%	26%	32%	16%

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Why RE? – Implications

- Standish Group Chaos Report 2016 (U.S.)
  - > $250 billion for about 175,000 projects
  - On average, $2,3 million, $1,3 million, $ 0.4 million →large, medium, small companies
  - 31.1% projects were cancelled before completion
  - 52.7% projects costs 189% of original estimates
  - $81.0 billion on cancelled projects
  - Additional $59.0 billion for completing projects
  - 16.2% projects completed on time and on budget
  - 42% of the originally-proposed features

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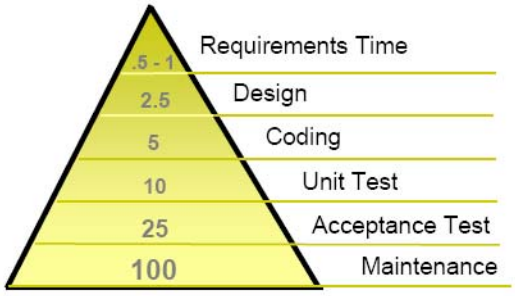
Why RE? – Cost of requirements errors

The 1-10-100 Rule



"All together, the results show as much as a 200:1 cost ratio between finding errors in the requirements and maintenance stages of the software lifecycle."

Relative cost to repair errors
When introduced vs. repaired

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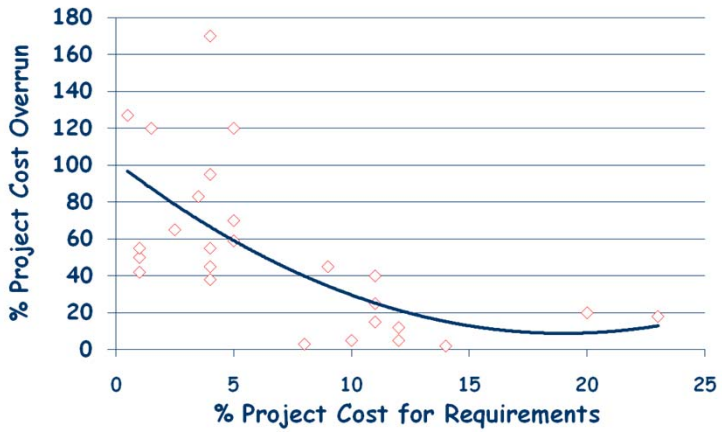
[Forsberg 1996]

Why RE? – Requirements vs. Overrun



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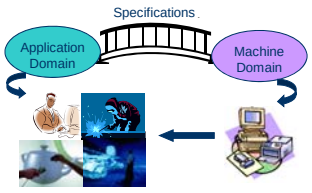
What is RE? – Definition



1.Communication is as important as analysis!

2.Quality means fitness-for-purpose.

3.Need to identify the customers, users, and other constituents.

RE is a set of activities to identify and communicate the purpose of a software system and the contexts in which it will be used. Hence, RE acts as a bridge between the real world needs of the stakeholders affected by the software system and the capabilities and opportunities afforded by software-intensive technologies

4.Not a phase or stage!

5.Need to know how and where the system will be used

6.Requirements are partly about what is needed…

7.…and partly about what is possible

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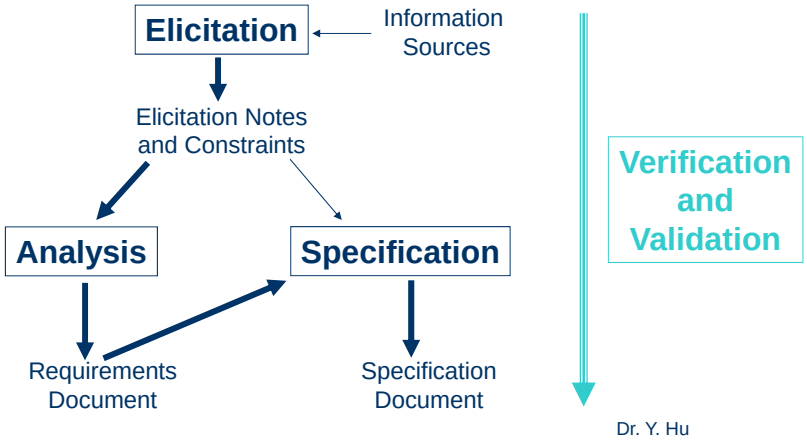
What is RE? – Process



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Course Objectives

- State-of-the-art for practice in RE.
- **Experience** in selected RE techniques.
- Understanding the essential nature of RE.

- RE:
  - ➔ not about how to solve problems using computers.
  - ➔ about how to identify problems worth solving.

Learning Content

- A generic process of RE
- Domain understanding + requirements elicitation
- Modelling for RE
- Requirements analysis and documentation
- Requirements evolution

Info (Additional to Course Outline)

- Assignment 0 (no marks)
  - Team organization (4 students/team)
- 4 assignments (team work)
  - Formal inspection (10%)
  - Feasibility study (10%)
  - Modelling requirements (10%)
  - Requirements specification (10%)

Recap

- RE is an important component of SE.
- Why RE?
- What is RE?
- Additional course information