

# Requirements Inception

Gregor v. Bochmann, University of Ottawa

Based on Powerpoint slides by Gunter Mussbacher  
with material from:

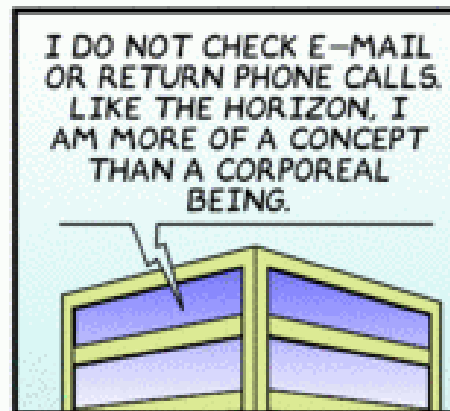
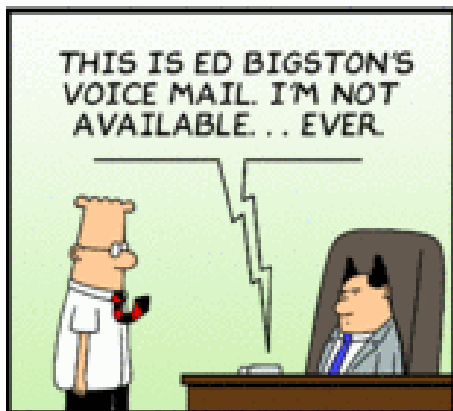
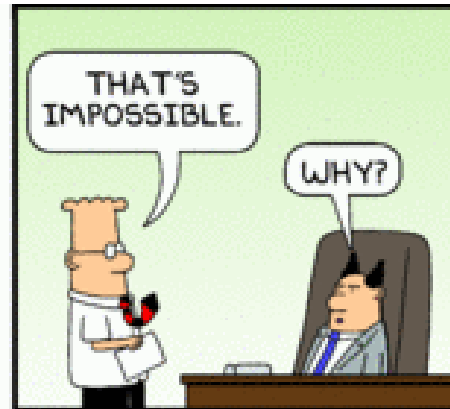
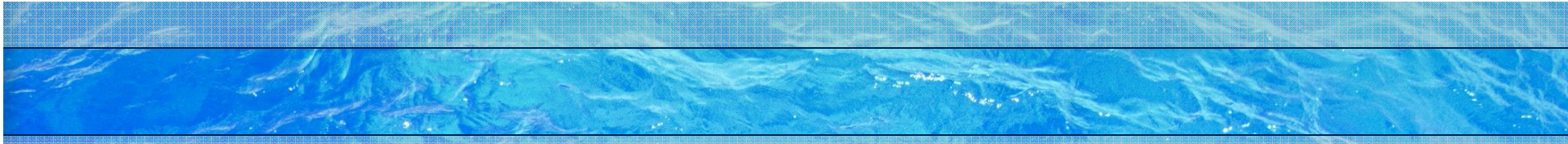
Wieggers: Software Requirements, Chapter 5

Leffingwell & Widrig: Managing Software Requirements..., Chapter 5

# Table of Contents

- Problem Analysis
- Business Requirements
- Five Steps for Problem Analysis
  - Gain Agreement on the Problem Definition
  - Understand the Root Causes
  - Identify the Stakeholders
  - Product Vision and Project Scope
  - Identify the Constraints
- Vision and Scope Document
- The important thing is not to stop questioning. Curiosity has its own reason for existing.<sup>1</sup>

[1] Albert Einstein (1879 - 1955)



# Problem Analysis

- Goal: gain a better understanding of the problem being solved before development begins
  - Identify root cause
  - Identify stakeholders and their needs (or problems)
  - Identify solution boundary
- Uses business requirements obtained from stakeholders
- Results in **Product Vision** and **Project Scope**



# Business Requirements (1)

- **Business Opportunity**
  - Description of market opportunity, competing market, business problem being solved or improved, advantage of proposed solution, problems that will be solved...
- **Business Objective and Success Criteria**
  - Important business benefits the product will provide in a quantitative and measurable way, how success will be measured, factors that have great impact on success...
- **Customer or Market Needs**
  - Problems that customers currently encounter that will be addressed
- **Business Risks**
  - Major risks associated with developing or not developing the product (marketplace competition, timing, user acceptance, implementation issues...)

## Business Requirements – Example

- Business Opportunity
  - Exploit the poor security record of a competing product
- Business Objective and Success Criteria
  - Capture a market share of 80 percent by being recognized as the most secure product in the market through trade journal reviews and consumer surveys
  - Achieve positive cash flow on the product within 6 months

## Business Requirements (2)

- Important for:
  - Ensuring that all project participants work for the same reasons
  - Getting stakeholders agreement on requirements
- User and software requirements must align with the context and objective defined by business requirements
- Requirements that do not help achieve business objective should not be included

## Problem Analysis – Five Steps

- Leffingwell and Widrig propose five steps for problem analysis
  - Gain agreement on the problem definition
  - Understand the root causes – the problem behind the problem
  - Identify the stakeholders
  - Define the solution system vision and boundary
  - Identify the constraints to be imposed on the solution



## Problem Analysis – Gain Agreement

- Document the problem and seek agreement
  - Ask stakeholders to write a problem statement in an agreed format
  - Statement should include
    - What the problem is
    - Who is affected by it?
    - What is the impact?
    - Is there a proposed solution?
    - What are key benefits?

## Problem Analysis – Understand Root Causes (1)

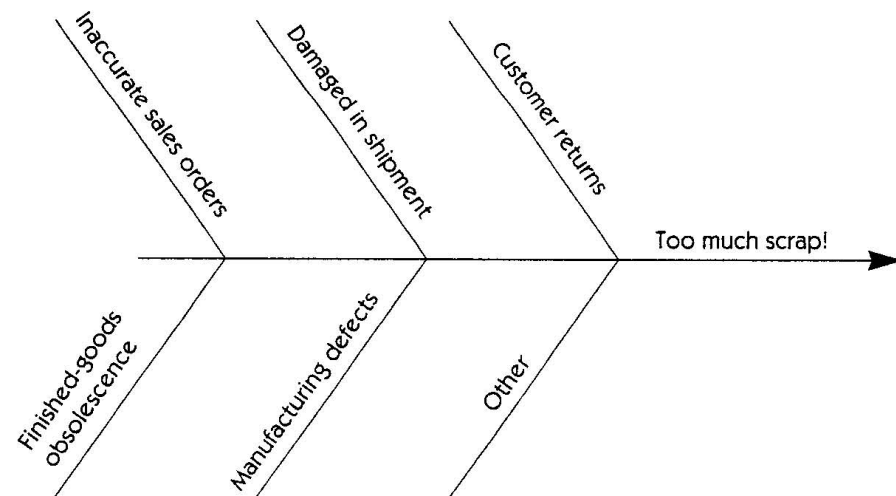
- There is often a problem behind the problem
- **Root cause analysis** consists of finding underlying causes that may not be immediately apparent
  
- Example: Our e-commerce site is not profitable
  - Why is it not profitable?
  - Poor site design?
  - Bad pricing?
  - Poor customer management after the sale?
  - Some or all of the above?

## Problem Analysis – Understand Root Causes (2)

- Root cause analysis can be used to understand root causes
  - Determine what factors contribute to the problem (sub-problems)
  - Recursively determine what factors contribute to these problems
- Decompose until causes are understood (possible solution clear)
- Decomposition can be represented using a **Fishbone diagram**, an itemized list...

**Factors contributing to defect XXX**

Measurements	Materials	Personnel
Calibration	Alloys	Shifts
Microscopes	Lubricants	Training
Inspectors	Suppliers	Operators
<b>- Defect X:</b>		
	Angle	
Humidity	Engager	Blade wear
Temperature	Brake	Speed
Environment	Methods	Machines



**Figure 5–1** Fishbone diagram of root causes

Source: Leffingwell & Widrig

## Problem Analysis – Understand Root Causes (3)

- Address Root Causes
  - Root causes do not all have same impact
  - Some may not be worth fixing, at least not now
- Estimate relative impact of root causes (e.g., with the help of a Pareto (bar) chart)
- Create **problem statement** for root cause problem identified as worth solving (and with computer solution)

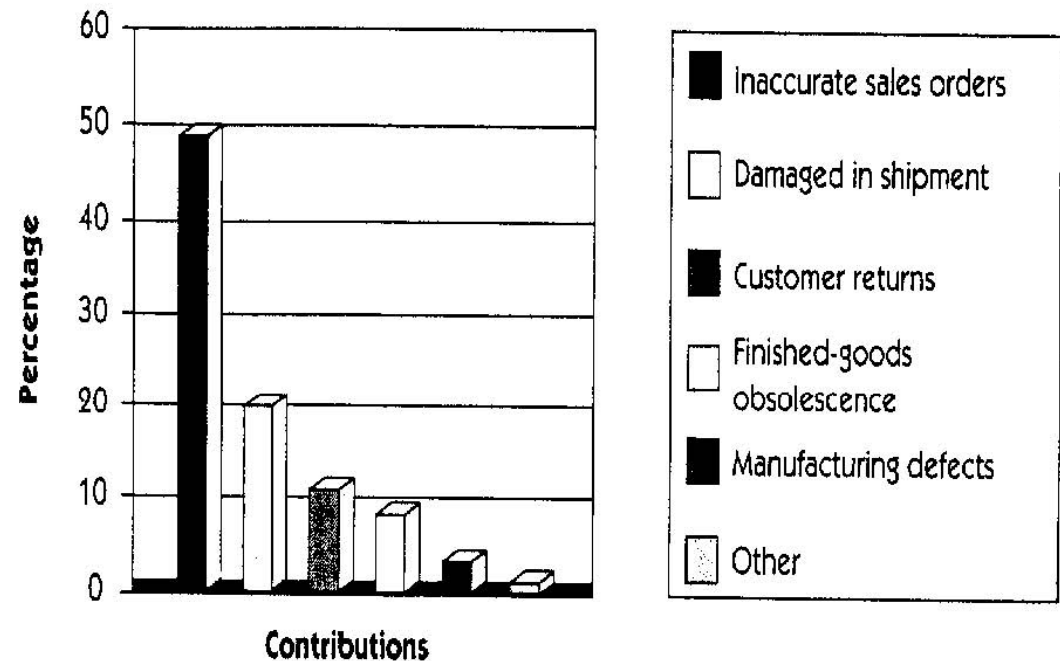


Figure 5-2 Pareto chart of root causes

Source: Leffingwell & Widrig



# Problem Statement

**Table 5-2** Sales Order Problem Statement

Element	Description
The problem of ...	Inaccuracies in sales orders.
Affects ...	Sales order personnel, customers, manufacturing, shipping, and customer service.
And results in ...	Increased scrap, excessive handling costs, customer dissatisfaction, and decreased profitability.
Benefits of a solution ...	That creates a new system to address the problem include <ul style="list-style-type: none"> <li>▪ Increased accuracy of sales orders at point of entry</li> <li>▪ Improved reporting of sales data to management</li> <li>▪ Ultimately, higher profitability</li> </ul>

Source: Leffingwell & Widrig

# Problem Analysis – Stakeholder Profiles (1)

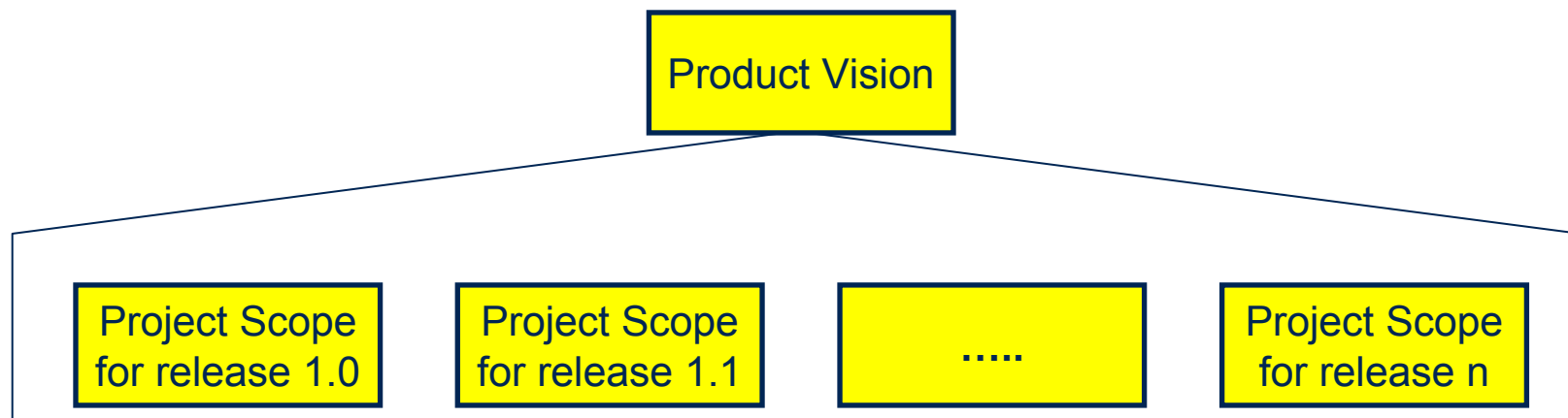
- Stakeholder Profiles
  - Stakeholders are individuals, groups, organizations who are actively involved in the project, are affected by its outcome or are able to influence its outcome
  - Profile should include:
    - Major value or benefit that stakeholder will receive from product (e.g., improved productivity, reduced rework, cost saving, ability to perform new tasks...)
    - Likely attitude toward the product
    - Major features and characteristics of interest
    - Any known constraints that must be accommodated

## Problem Analysis – Stakeholder Profiles (2)

- How to identify Stakeholders?
- Elicitation would ask questions such as
  - Who uses the system?
  - Who is the customer?
  - Who is affected by outputs?
  - Who evaluates/approves system?
  - Other external/internal users?
  - Who maintains the system?
  - Anyone who cares? (e.g., legal/regulatory, etc.)

## Problem Analysis – Product Vision and Project Scope

- Product Vision: describes what the product is about and what it could eventually become
  - Aligns all stakeholders in a common direction
- Project Scope: identifies what portion of the ultimate long-term product vision the current project will address
  - Draws boundary between what is in and what is out





# Vision Statement (1)

- Vision Statement template (according to Moore)
  - **For** [target customer]
  - **Who** [statement of the need or opportunity]
  - **The** [product name]
  - **Is** [a product category]
  - **That** [key benefit, compelling reason to buy or use]
  - **Unlike** [primary competitive alternative, current system, or current business process],
  - **Our product** [statement of primary differentiation and advantages of new product]

## Vision Statement (2)

- Example
  - For scientists who need to request containers of chemicals, the Chemical Tracking System is an information system that will provide a single point of access to the chemical stockroom and vendors. The system will store the location of every chemical container within the company, the quantity of material remaining in it and the complete history of each container's location and usage. This system will save the company 25% on chemical costs in the first year of use by allowing the company to fully exploit chemicals that are already available within the company, dispose of fewer partially used or expired containers and use a single standard chemical purchasing process. Unlike the current manual ordering processes, our product will generate all reports required to comply with government regulations that require the reporting of chemical usage, storage, and disposal.

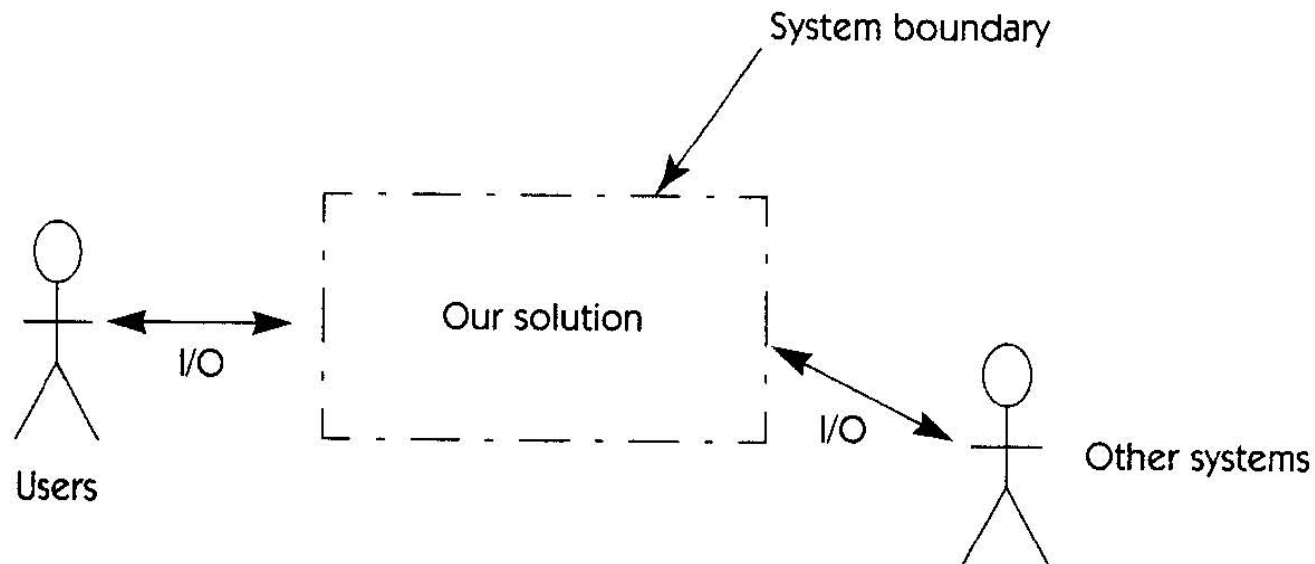
## Problem Analysis – Definition of Scope (1)

- Definition of solution system boundaries
- Requirements baseline is defined according to the release scope
- New requirements during development are evaluated according to the scope
  - New in-scope requirements can be incorporated if they are of high priority relative to the other requirements in the baseline
    - Usually implies deferring or canceling other requirements or negotiating a new schedule
  - Out-of-scope requirements should be deferred to a following release

## Problem Analysis – Definition of Scope (2)

- **Context Diagram**

- Top-level view of a system that shows the system's boundaries and scope
  - Identifies terminators outside the system
  - Data, control, and material flow between terminators and the system



**Figure 5-5** System boundary

Source: Leffingwell & Widrig



# Problem Analysis – Identify Constraints

- Restrictions on the solution space
  - Put limitations on the ability to deliver a solution as envisioned
  - Usually non-functional requirements that impose major restrictions on the system
  - Sources of constraints include:
    - Economics (e.g., costs, licensing issues)
    - Politics (e.g., internal or external, interdepartmental issues)
    - Technology (e.g., choice of technology/platform)
    - Systems (e.g., existing system, compatibility issues)
    - Environment (e.g., legal/environmental/security/standards)
    - Schedule and resources (e.g., fixed schedule, team)

# Vision and Scope Document (1)

- Contents:
  - Business requirements
  - Vision of the solution
    - Vision statement
    - Major features (numbered list of major features or user capabilities unique to the new product)
    - Assumptions (made while developing vision and scope)
    - Major dependencies to external factors outside of the project's control (e.g., pending industry standards, government regulations, other projects, third party suppliers, development partners)
  - Scope and limitation (for initial and subsequent releases)
  - Business context

## Vision and Scope Document (2)

- Contents – Scope and limitations:
  - Concept and range of proposed solution
    - What the system is
  - Limitations
    - Capabilities that the product won't include (what the system is not)
    - Record rejected requirements with the reason for rejecting them
  - Scope of initial release
    - Major features planned for initial release
    - Acceptable quality characteristics of initial release
  - Scope of subsequent releases

## Vision and Scope Document (3)

- Contents – Business context:
  - Project Priorities
    - Stakeholders must agree on the project priorities
    - Help effective decision making
  - Operating Environment
    - Environment in which system will be used (e.g., distributed environment)
    - Vital availability, reliability, performance and integrity requirements linked to operating environment