

**Software Engineering**  
**G22.2440-001**

**Session 1 – Sub-Topic 1**  
**Requirements Definition & Management**  
**Processes and Tools**

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**Part I**

***Requirements Definition and***  
***Management Processes***

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## Requirements Best Practices

- A requirement should be:
  - ✓ Unambiguous
  - ✓ Complete
  - ✓ Consistent
  - ✓ Measurable
  - ✓ Testable
  - ✓ Traceable
  - ✓ Design Free
  - ✓ Understandable
  - ✓ Concise
  - ✓ Necessary
  - ✓ Feasible/Attainable
  - ✓ Verifiable
  - ✓ Validatable
  - ✓ Modifiable
  - ✓ Relevant
  - ✓ Correct
  - ✓ Prioritized
  - ✓ Stable
  - ✓ Implementation - independent
  - ✓ Traceable
- Documenting requirements ensures the above.

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## Requirements Best Practices (cont.)

- Peer reviews
  - Test each requirement against attribute standards
  - For example:
    - Traceable - Each requirement must be traceable to a **business** need.
- Baselineing
  - Define a clear scope
  - Lock down
  - Establish and enforce change impact analysis and approval process
- Things to avoid
  - Ambiguous terms (e.g., easy, user-friendly, etc.)
  - Analysis paralysis

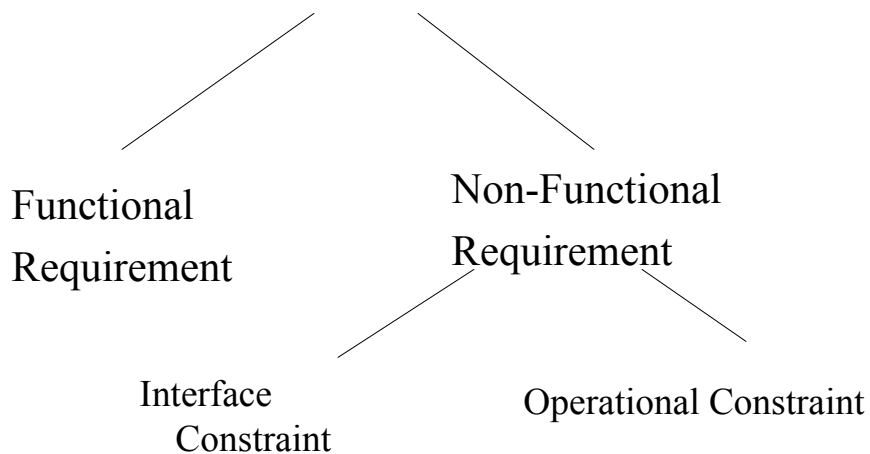
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## Enterprise-Wide vs. Project-Specific

- Enterprise-wide requirements provide Re-Use
- Requirements common to a project can be obtained by referring to enterprise-wide requirements
- Project-specific requirements should be evaluated for re-factoring into enterprise-wide requirements

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## Requirements



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## **The Big Process Picture**

- Requirements Analysis process fits into other processes within Integrated Requirements
- Deliverables output from one process become inputs to other processes
- Integrated Requirements provide the glue between the business side and the technology side

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## **Essential Elements for Requirements Analysis**

- Clarity
- Efficiency
- Priority
- Quality
- Traceability

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# **The Elevator Problem**

## **(a classic)**

A product is to be installed to control elevators in a building with 3 floors. The problem concerns the logic required to move elevators between floors according to the following constraints:

1. Each elevator has a set of 3 buttons, one for each floor. These illuminate when pressed and cause the elevator to visit the corresponding floor. The illumination is canceled when the elevator visits the corresponding floor.
2. Each floor, except the first floor and top floor has two buttons, one to request an up-elevator and one to request a down-elevator. These buttons illuminate when pressed. The illumination is canceled when an elevator visits the floor and then moves in the desired direction.
3. When an elevator has no requests, it remains at its current floor with its doors closed.

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## **Why Requirements Definition?**

- Opportunity to improve how requirements are collected and documented
- Guide through the establishing of a Baseline
- Capability Maturity Model Integration (CMMI) initiative
  - Ensure requirements are complete and correct
  - Establish a change control process
  - Ensure requirements are traceable

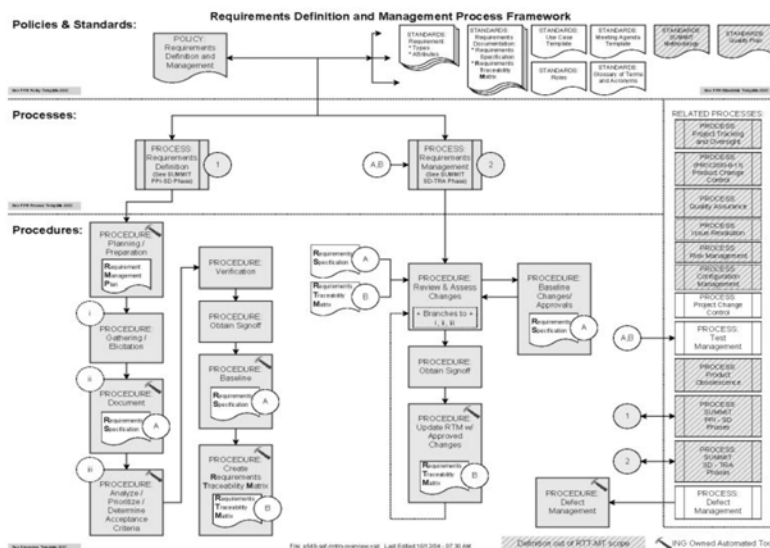
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# What is Requirements Management?

- Opportunity to determine Impact and control changes to Requirements
- A *systematic approach* to eliciting, organizing and documenting the requirements of the system, and establishing and maintaining agreement between the customer and the project team on the changing of requirements of the system
- Most companies rely on a process framework (see samples on next slides)
  - Policies and Standards
  - Processes
  - Procedures
  - Training and Tools
- Guide through the product lifecycle

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# Sample Requirements Definition and Management Framework

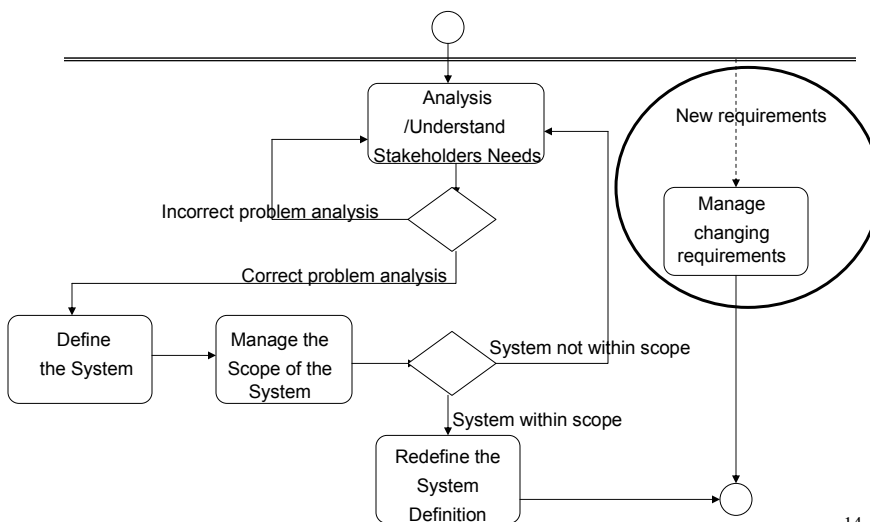


# The Requirements Management Workflow

- What is Requirements Management?
- Requirements management is concerned with:
  - Understanding the goals of the organization and its customers
  - Transformation of these goals into potential functions and constraints applicable to the development and evolution of products and services

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# The Requirements Management Workflow (cont.)



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## **Why Manage Requirements?**

Requirements need to be managed because:

- Change is an inevitable part of a project and in fact desirable at times
- By organizing and tracking your requirements the team improves it's chances of completing the project:
  - on time
  - within budget
  - meeting client expectations

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## **Why Manage Requirements? (cont.)**

Requirements need to be managed because:

- Changing requirements and failure to coordinate these changes to stakeholders is the most common reason for project failures.
- It ensures that the developed product is in conformance with the requirements that have been outlined by the customer.
- It ensures that the product is delivered on time and within budget.

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## **Why Manage Requirements? (cont.)**

- Managing requirements helps in establishing and maintaining an agreement between the customer and the project team on the changing requirements of a system.

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## **Guidelines for Requirements Analysis**

- Problem vs. Solution  
Evolution
- Abstraction
- Iteration
- Modeling
- Re-Use

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# Analyzing the Problem

What is a “problem”?

- In the context of project development, a “problem” is a gap between what the customer wants and how the project team members perceive the customer’s wants.
- Effective solutions to complex problems requires input from a diverse group of “*Stakeholders*”
  - **Stakeholders** are people who are affected by the implementation of the system being developed.

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## Analyzing the Problem (cont.)

- After the problem has been analyzed the system needs to be defined. This involves translating and organizing your understanding of the stakeholders needs into a description of the system to be built.
- As a result, documents are created that define the product. These are the *Requirement Specifications Documents*. They include:
  - **Use-Case Documents** - designed to identify the functional behavior of the system
  - **Supplementary Requirements Specification Documents** – define features of the system in specific terms.

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## Part II

### *Requirements Definition and Management Tools*

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## What is RequisitePro?

- IBM Rational RequisitePro (also know as “ReqPro”) is an easy-to-use *requirements management tool*
- It helps teams to:
  - ✓ Manage project requirements clearly
  - ✓ Organize, prioritize, track, and control changing requirements of a system or application
  - ✓ Promote communication and collaboration among team members
  - ✓ Reduce project risk
  - ✓ Keep stakeholders informed about the most current requirements information
  - ✓ Understand the impact of change which enables team members to manage project efficiently
  - ✓ Identifying the problem correctly to deliver the right product

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## **What is RequisitePro? (cont.)**

- RequisitePro
  - Improves and enhances the software development process.
  - Helps to prioritize requirements, to trace relationships between them, and mostly importantly track changes that affect them.
  - Captures the change history for each requirement.

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## **What is RequisitePro? (cont.)**

- Successful requirements management leads to a quality product:
  - ✓ that meets customer needs
  - ✓ is completed on time
  - ✓ is within budget

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# Sample Requirements Documentation

- Documents may be contained in the set of standard IBM SUMMIT project deliverables:
  - Project Charter
  - System Prospectus
  - Requirements Specification
  - Use Case
  - Requirements Traceability Matrix
- Requirement information contained in these documents is created and maintained in a project throughout the Requirements Definition Process whether or not the **RequisitePro** tool is used

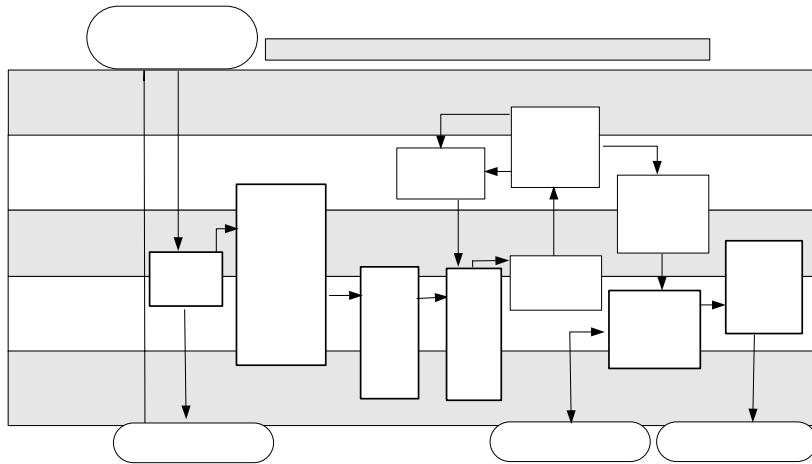
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# Sample Requirements Documentation (cont.)

- Requirements Management Plan
  - Included as a section in the Requirements Specification template
  - Identifies how a project manages requirements listed in the requirements specification, whether using manual or automated processes
  - Provides recommendations and guidelines regarding:
    - Requirements Management roles
    - Requirements documents
    - Requirement types and associated attributes
    - Traceability strategy
  - Serves as the configuration document for the IBM Rational **RequisitePro** tool environment, if elected

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## Sample Requirements Definition Process Flow



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## Sample Support Tools

- IBM Rational RequisitePro (may be optional)
  - Used as an (optional) requirements management tool to support the Requirements Definition (RD) Process
  - Automates the majority of the Requirements Management (RM) Plan
  - Capture and maintain traceability between the various requirement types defined by the RM Plan
  - Enables scope setting, impact analysis, and all aspects of requirements management from a project perspective
  - Creates a common repository for all requirement artifacts
- IBM SUMMIT Ascendant
  - Defines the Requirements Definition and Requirements Management processes
  - Provides detailed guidance on how to perform the necessary procedures
- Visual Modeling or Drawing Tool (optional)
  - Enables the creation of a graphical use case representation via a UML-based Use Case diagram

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Senior  
Management

Client &  
Stakeholder

Project

# Typical Functions

- Senior Management
  - Ensure policy, process and procedure adherence
- Client and Stakeholders
  - Specify, review and approve the requirements in this document for baseline. Projects using **RequisitePro** for storing data will copy a “snapshot” of the baseline requirements into this document for review and sign-off purposes
- Project Manager
  - Plan and manage requirements documentation activities. Ensure process and procedure adherence and issues resolution
  - Ensure **RequisitePro** updates are timely and accurate, if used
- Business Analyst
  - Document the gathered requirements in the SUMMIT requirements specification document, or in **RequisitePro**, if used. Ensure requirements meet the criteria for good requirements and the entire project team understands and agrees with them,
- Technical Infrastructure
  - Participate in the requirements documentation activities as appropriate
  - TMO, IBM and DBA roles may be required to access requirements in **RequisitePro** for review purposes, if used
- Project Support
  - Assist project team with process, templates and training. Enterprise coaches are part of the Project Management Best Practices (PMBP) team

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# Typical Roles

- Senior Management
  - IT Manager, Business Manager, Sr. Leader
- Client and Stakeholders
  - Approver, Requestor, Stakeholder, End User, Customer
- Project Manager
  - Project Manager
- Business Analyst
  - Business Analyst, Lead Business Analyst, Tester, Lead Tester
- Technical Infrastructure
  - TMO Representative, SMO Representative, IBM Representative, DBS, System Analyst
- Project Support
  - Project Coach

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## Analyzing & Understanding Stakeholder Needs

- A **stakeholder** is someone who has a vested interest in the project/system/contract.
- **Stakeholder needs** can be obtained using various methods, such as:
  - interviews
  - questionnaires
  - requirement workshops
  - brainstorming sessions
  - story boards
  - prototypes
- The result of these interactions can easily be recorded in Rational RequisitePro and/or retrieved from the Project Charter and System Prospectus documents

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## Typical Use of RequisitePro

- Planning/preparation procedure
  - Business Analysts use the Charter and System Prospectus as inputs to create/enter requirements into RequisitePro
- Gathering/Elicitation and Document procedures
  - Business Analysts use standard requirement types and attributes defined within RequisitePro to document their requirements
- Analyze/Prioritize/Determine Acceptance Criteria procedures
  - Business Analysts use RequisitePro Views
- Document and Verification procedures
  - Business Analyst use RequisitePro Hierarchical Requirements to best document and verify requirements
- Verification procedure
  - Business Analyst use RequisitePro Discussions to conduct peer reviews

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## Typical Use of RequisitePro (cont.)

- All Procedures
  - RequisitePro relationship traceability and traceability matrices are used throughout the requirements definition process
- Ongoing Review
  - Technical Infrastructure personnel with proper credentials may review RequisitePro data at all times
- Administration
  - At the end of the Requirements Analysis phase, the RequisitePro administrator applies pre-defined import/export procedures to take a snapshot and create a requirements specification baseline and attaches it to the System Prospectus in preparation for sign-off by clients and stakeholders
  - The RequisitePro administrator is responsible for configuring RequisitePro security using standard groups and permissions, and synchronizing RequisitePro with TestDirector 8.0
- Project Managers are responsible for timely and accurate RequisitePro updates

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## Features of RequisitePro

- Word-Database Integration
  - Uses Microsoft Word to document requirements, but complements Word with a commercial database to organize, track and communicate requirements.
  - A RequisitePro toolbar appears when you open Word in RequisitePro, allowing you to manage requirements documents.
- Commercially Supported Database
  - Supports Microsoft SQL Server 7.0 and 2000; Oracle versions 8. and 9; Access 2000 databases.

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## **Features of RequisitePro (cont.)**

- **Ease of Use**
  - Simple user interface and tight integration with Microsoft Word allows users to quickly & effectively document their project requirements
- **Integrated with other lifecycle tools**
  - Integrated with Rational Rose®, Rational® XDE®, Rational® ClearCase®, Rational® ClearQuest®, Rational® SoDA®, Rational Unified Process, Rational® TestManager, and other products

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## **Features of RequisitePro (cont.)**

- **Traceability**
  - You can easily set up and track relationships between requirements
- **RequisiteWeb**
  - Anyone who has Web access can view and modify requirements quickly and efficiently without having Rational RequisitePro loaded on their machine

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## **Word-Database Integration Approach**

- RequisitePro offers the power of a database and Microsoft Word.
- It maintains live requirements documents that are dynamically linked to a database for powerful sort and query capabilities.
- RequisitePro uses Microsoft Word for creating requirements documents.
- A RequisitePro toolbar appears when you open Word in RequisitePro, allowing you to manage requirements documents.

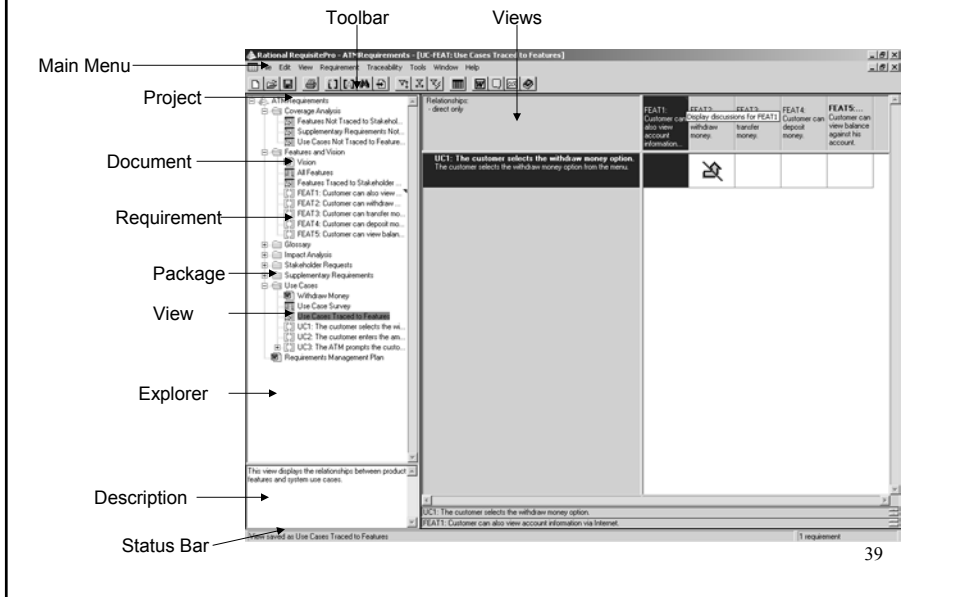
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## **Word Database Integration Approach (cont.)**

- A RequisitePro project includes a database.
- Included in the database are:
  - Document types
  - Requirement types
  - Descriptors (attributes)
  - Discussions
  - Information about requirement traceability
  - Information about user and group security

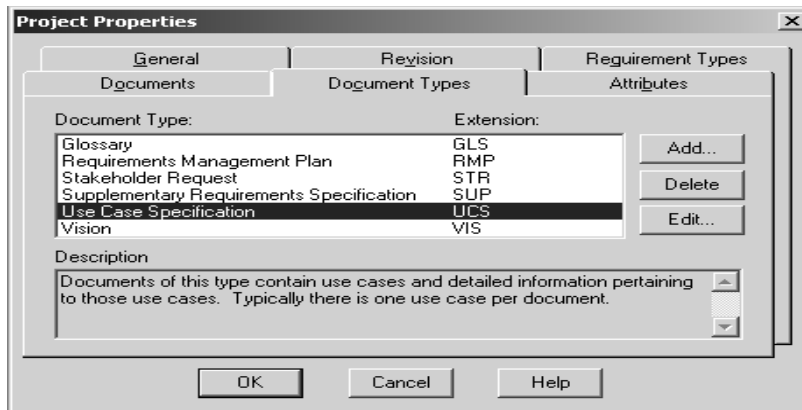
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# Basic Tool Navigation



# Basic Tool Navigation (cont.)

## The Project properties dialog box



# ReqPro Demo

- Also refer to
  - Session 1 – SubTopic 1 Presentation on Rational Tools