Requirements Engineering: Processes and Discovery

Requirements engineering processes

Generic activities common to all processes

- Requirements elicitation;
- Requirements analysis;
- Requirements validation;
- Requirements management.

In practice, RE is an iterative activity in which these processes are interleaved.

Requirements elicitation and analysis

Sometimes called requirements elicitation or requirements discovery.

Involves technical staff working with customers to find out about the application business and domain, the services that the system should provide and the system's operational constraints.

May involve end-users, managers, engineers involved in maintenance, domain experts, trade unions, etc. These are called *stakeholders*.

Requirement Analysis

The process of understanding customer requirements and their implications. It comes after requirements discovery

It involves technical staff working on the discovered requirements, iteratively with customers, to understand their *technical implication* and *importance*.

It includes the processes of classifying and organising requirements, negotiating (with customers) and prioritizing them in the order of their importance to the customers.

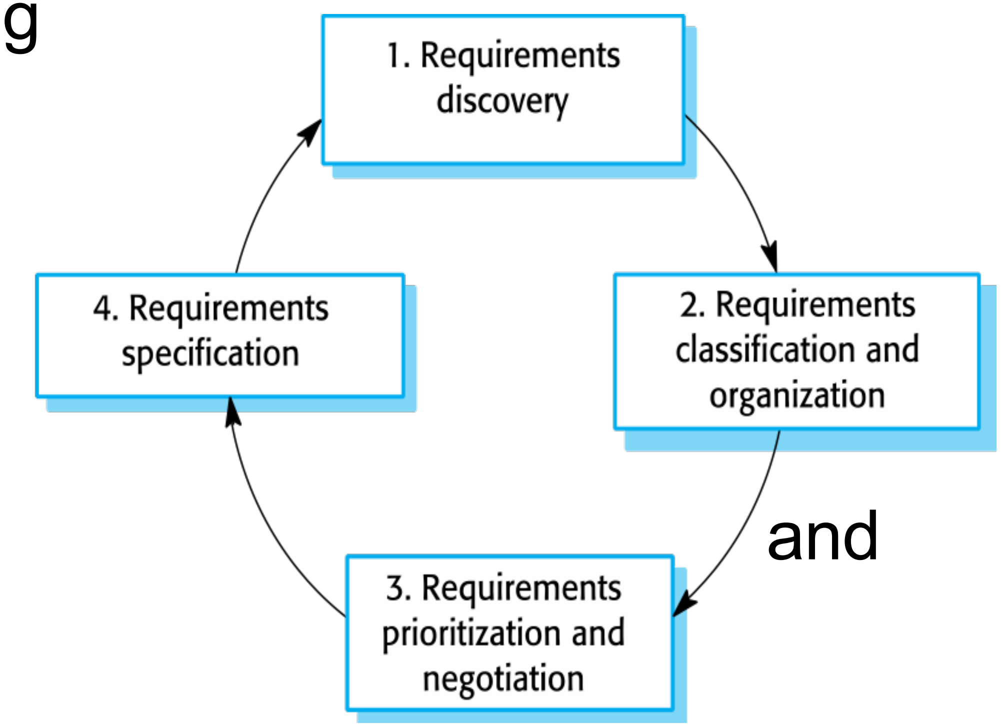
The output of this process is the requirement specification document (SRS) negotiated and accepted with customers.

Problems of requirements analysis

Stakeholders don’t know what they really want.
Stakeholders express requirements in their own terms.
Different stakeholders may have conflicting requirements.
The requirements change during the analysis process

Stages include:

- Requirements discovery,
- Requirements classification and organization,
- Requirements prioritization and negotiation,
- Requirements specification.


1. Requirements discovery
2. Requirements classification and organization
3. Requirements prioritization and negotiation
4. Requirements specification

Stakeholders in the MHC-PMS

Patients whose information is recorded in the system.

Doctors who are responsible for assessing and treating patients.

Nurses who coordinate the consultations with doctors and administer some treatments.

Medical receptionists who manage patients' appointments.

IT staff who are responsible for installing and maintaining the system.

etc

Requirements Elicitation or Discovery Techniques

How to elicit requirements from stake holders? What are the best techniques to discover and define requirements?

Requirements elicitation and analysis: Techniques

There are many requirement engineering techniques for requirement elicitation and analysis, some of the often used ones:

Interviewing
Scenario generation
Use case analysis
Ethnography

Interviewing

Formal or informal interviews with stakeholders are part of most RE processes.

Types of interview

- Closed interviews based on pre-determined list of questions
- Open interviews where various issues are explored with stakeholders.
- Focused interviews, with clusters of stakeholders

Effective interviewing

- Be open-minded, avoid pre-conceived ideas about the requirements and are willing to listen to stakeholders.
- Prompt the interviewee to get discussions going using a springboard question, a requirements proposal, or by working together on a prototype system.

Interviews

Meeting introductory protocol

Ensure cultural introduction protocols are followed

First meeting

Aim: to understand the business and its context with a clear aim to understand business processes and services.

Effective meetings:

Ensure a chair is assigned at the beginning, to keep time-controlled progress

Ensure an agenda is defined with clear objectives of the target outcome of the meeting

Ensure a timescale is set for each agenda item and is kept/controlled by the chair

Ensure clear actions and decisions (and who is responsible for and by when) are identified and reached by the end of the meeting

Ensure the actions and decisions are summarised at the end of the meeting

Interviews in practice

Normally a mix of closed and open-ended interviewing.

Interviews are good for getting an overall understanding of what stakeholders do and how they might interact with the system.

Interviews are not good for understanding domain requirements

- Requirements engineers cannot understand specific domain terminology;
- Some domain knowledge is so familiar that people find it hard to articulate or think that it isn't worth articulating.

Scenarios

Scenarios are real-life examples of how a system can be used.

They should include

A description of the starting situation;

A description of the normal flow of events;

A description of what can go wrong;

Information about other concurrent activities;

A description of the state when the scenario finishes.

Scenario for collecting medical history: Example

Initial assumption: The patient has seen a medical receptionist who has created a record in the system and collected the patient's personal information (name, address, age, etc.). A nurse is logged on to the system and is collecting medical history.

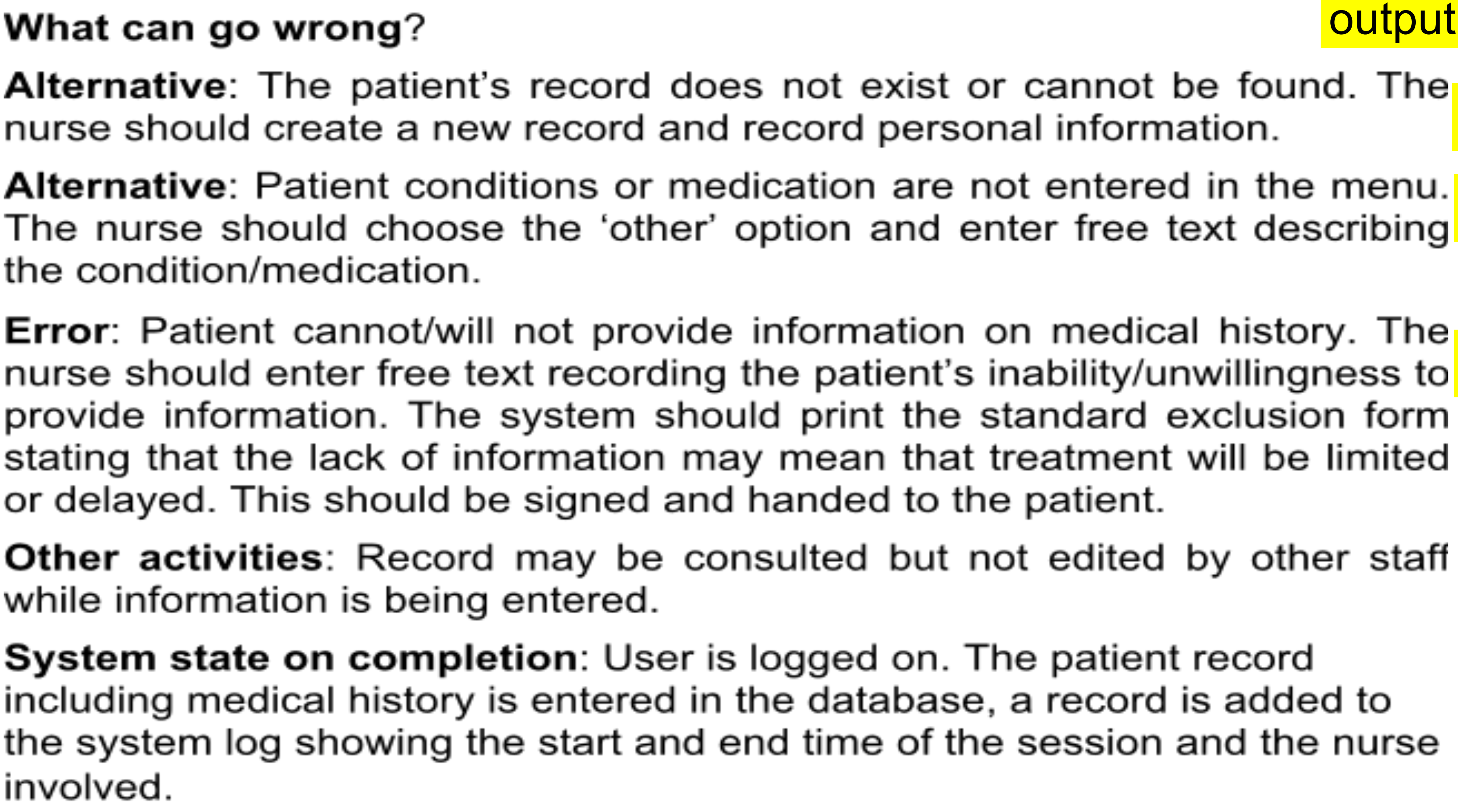
Normal: The nurse searches for the patient by family name. If there is more than one patient with the same surname, the given name (first name in English) and date of birth are used to identify the patient.

The nurse chooses the menu option to add medical history.

The nurse then follows a series of prompts from the system to enter information about consultations elsewhere on mental health problems (free text input), existing medical conditions (nurse selects conditions from menu), medication currently taken (selected from menu), allergies (free text), and home life (form).

Scenario for collecting medical history: Example

Successful output?



What can go wrong?

Alternative: The patient's record does not exist or cannot be found. The nurse should create a new record and record personal information.

Yes

Alternative: Patient conditions or medication are not entered in the menu. The nurse should choose the 'other' option and enter free text describing the condition/medication.

Yes

Error: Patient cannot/will not provide information on medical history. The nurse should enter free text recording the patient's inability/unwillingness to provide information. The system should print the standard exclusion form stating that the lack of information may mean that treatment will be limited or delayed. This should be signed and handed to the patient.

No?

Other activities: Record may be consulted but not edited by other staff while information is being entered.

System state on completion: User is logged on. The patient record including medical history is entered in the database, a record is added to the system log showing the start and end time of the session and the nurse involved.

Use cases

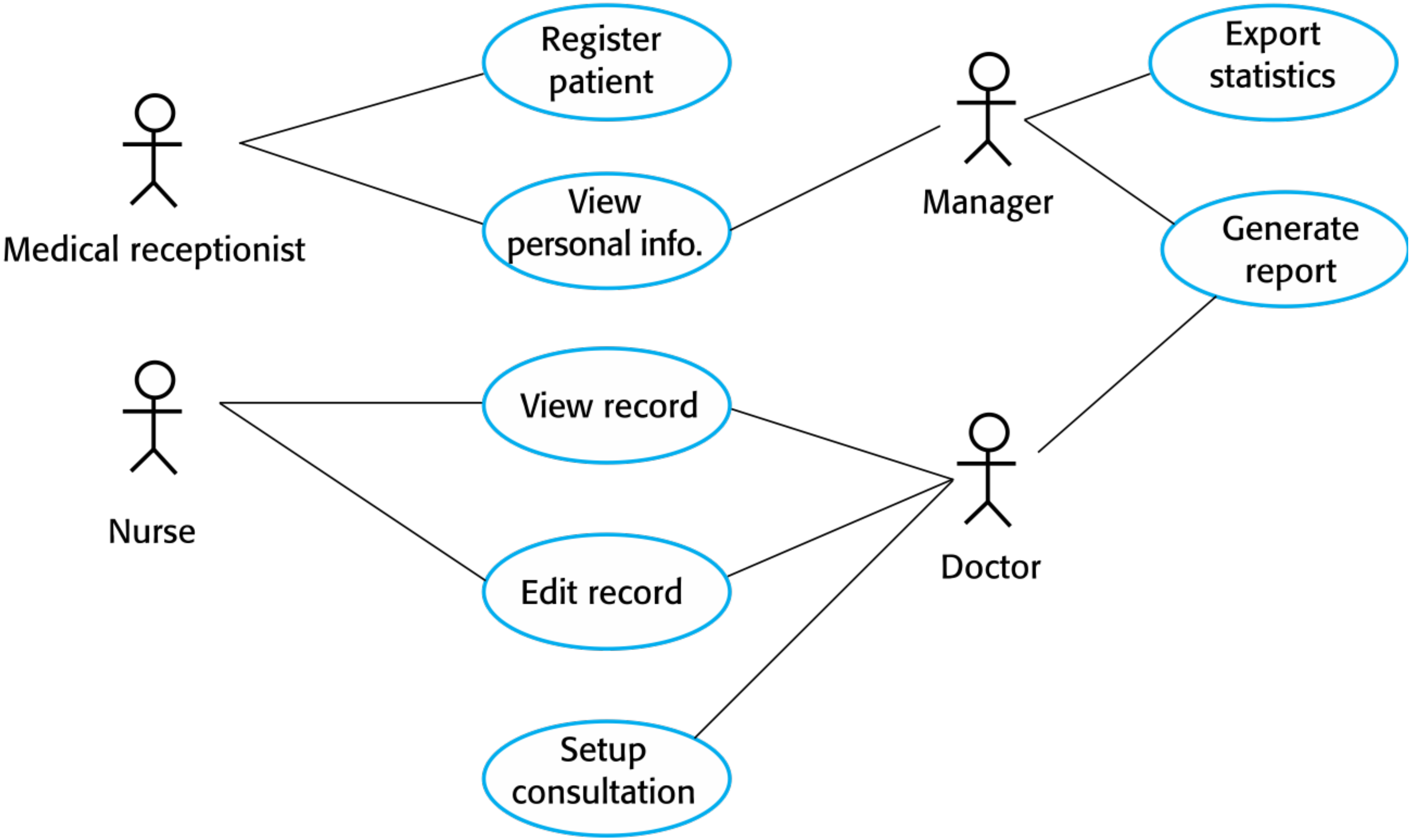
Use-cases are a scenario based technique, in the UML, which identifies the actors in an interaction and describes the interaction itself.

A set of use cases should describe all possible interactions with the system.

High-level graphical model supplemented by more detailed structured or tabular description.

Sequence diagrams may be used to add detail to use-cases by showing the sequence of event processing in the system.

Use cases for the MHC-PMS



Ethnography

A social scientist spends a considerable time observing and analysing how people actually work.

People do not have to explain or articulate their work.

Social and organisational factors of importance may be observed.

Ethnographic studies have shown that work is usually richer and more complex than suggested by simple system models.

Requirements Validation Techniques

How to valid that requirements define the system that the customer really wants?

Requirements validation

Concerned with demonstrating that the requirements define the system the customer really wants.

Requirements error costs are high so validation is very important

Fixing a **requirements error** after delivery may cost up to **100 times** the cost of fixing an implementation error.

Requirements checking

Correctness/Validity. Does the system provide the functions which best support the actual customer's needs?

Consistency. Are there any requirements conflicts?

Completeness. Are all functions required by the customer included?

Traceability/Verifiability. Can the requirements be verified/validated?

Realism/Feasibility. Can the requirements be implemented within specified time given available budget and technology

Requirements validation techniques

Requirements reviews

Systematic manual analysis of the requirements.

Prototyping

Using an “executable model” of the system to check requirements.

Test-case generation

Developing tests for requirements to check testability.