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# Requirements Engineering

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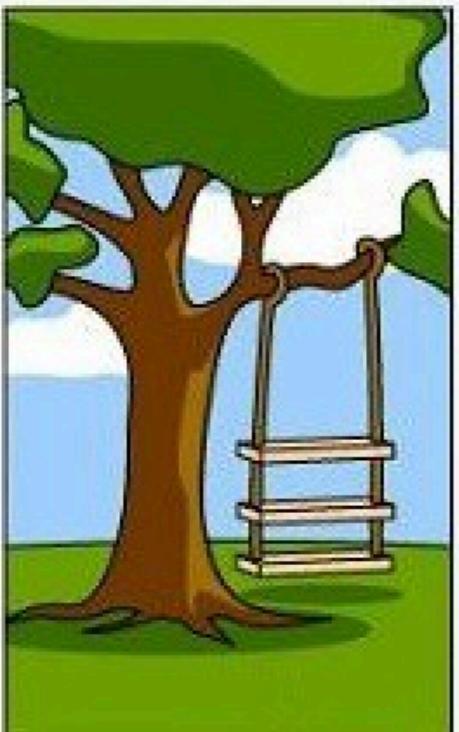
2019/2020  
Course 2

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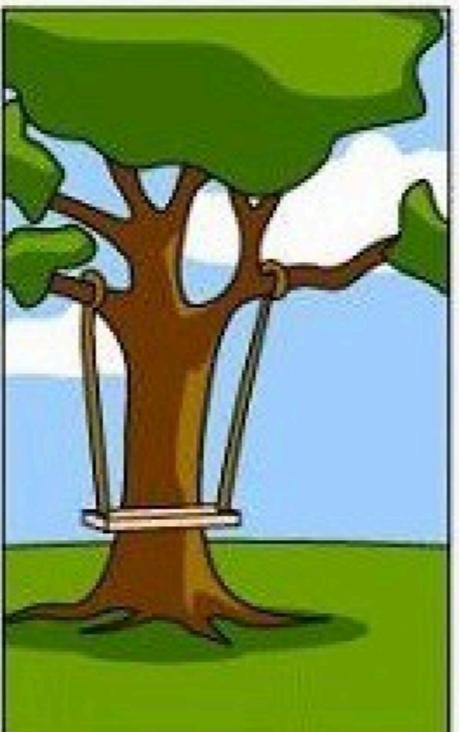
# Course 2 outline

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- ❖ Requirements Elicitation
  - ❖ Techniques
  - ❖ Issues



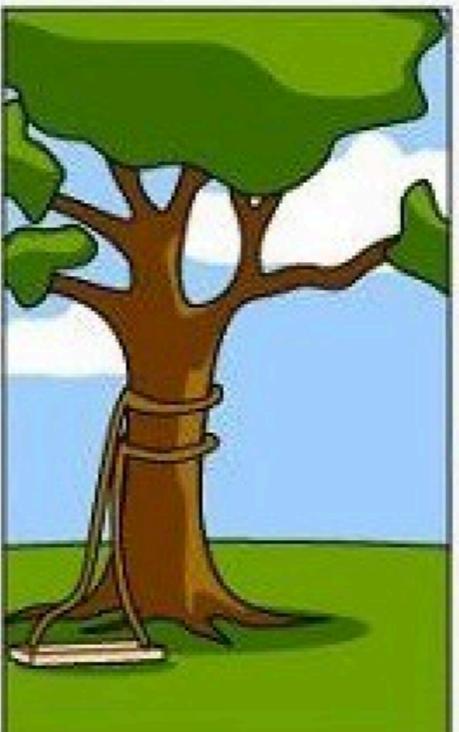
How the customer explained it



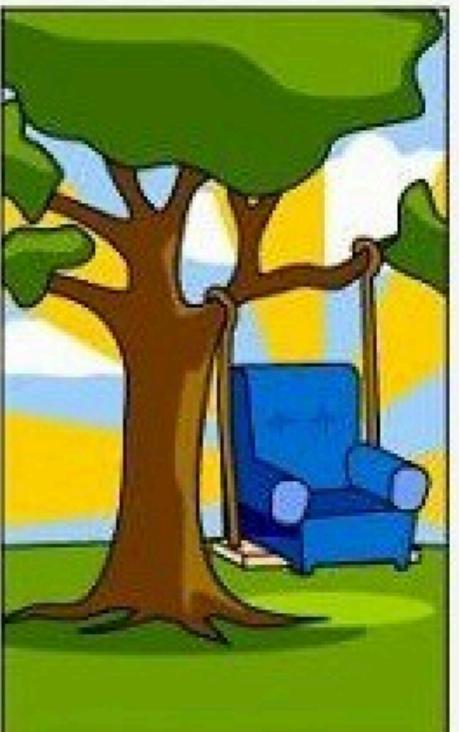
How the Project Leader understood it



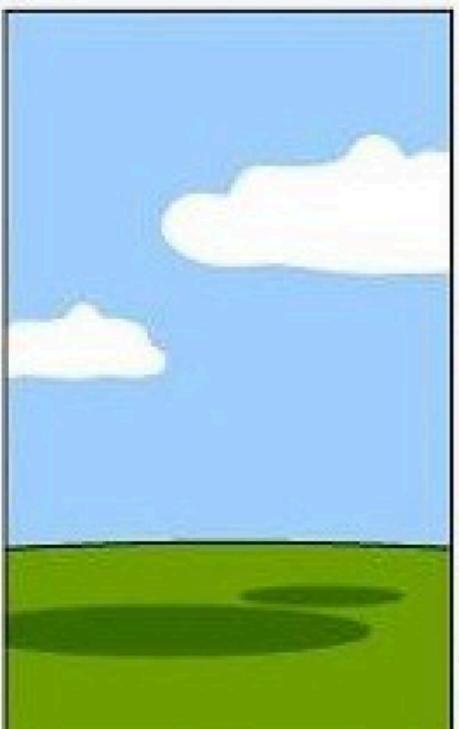
How the System Analyst designed it



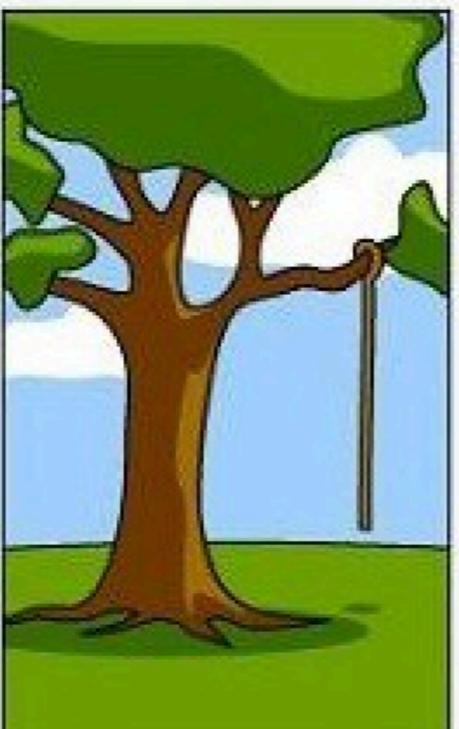
How the Programmer wrote it



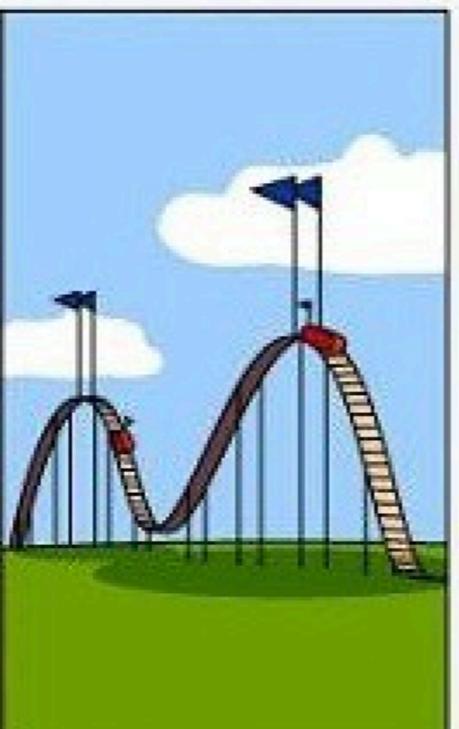
How the Business Consultant described it



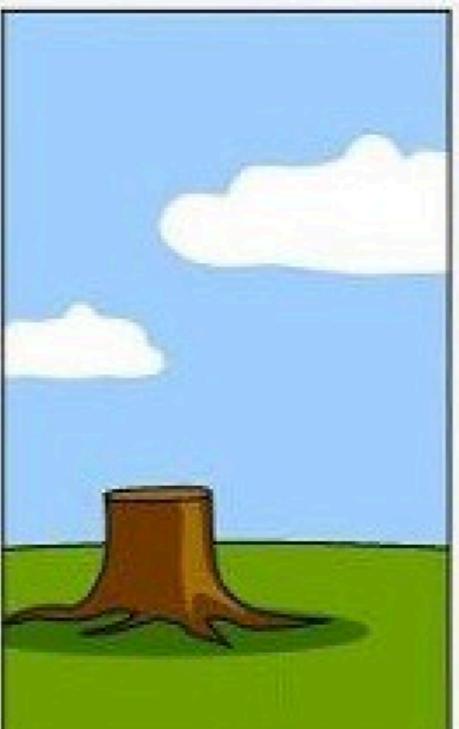
How the project was documented



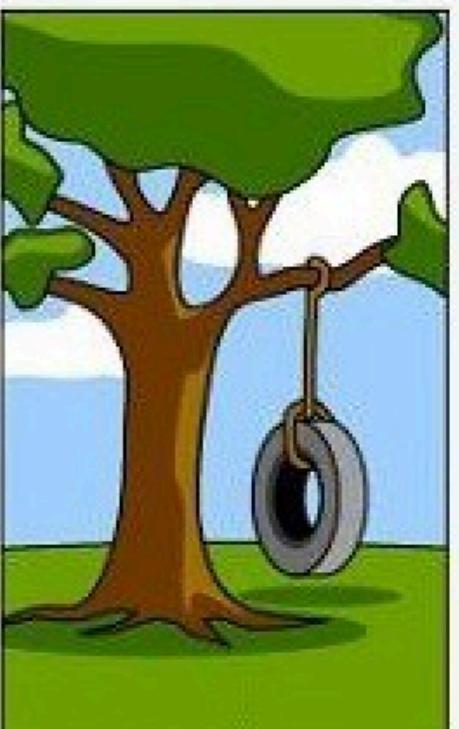
What operations installed



How the customer was billed



How it was supported



What the customer really needed

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# Requirements Elicitation

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- ❖ Requirements elicitation is the process of seeking, uncovering, acquiring, and elaborating requirements for computer based systems.
- ❖ It represents an early but continuous and critical stage in the development of software systems.
- ❖ The process of requirements elicitation is generally accepted as one of the critical activities in the RE process.
- ❖ Elicitation is the initial stage within the RE process (an iterative and integrated one).
- ❖ It is a complex process involving many activities with a variety of available techniques, approaches, and tools for performing them.
- ❖ The relative strengths and weaknesses of these approaches determine when each is appropriate depending on the context and situation.

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# Requirements Elicitation

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- ❖ The requirements for a software system may be spread across many sources, i.e. the problem owners, the stakeholders, documentation, and other existing systems.
- ❖ The techniques for requirements elicitation are derived mostly from the social sciences, organizational theory, group dynamics, knowledge engineering, and very often from practical experience.
- ❖ Requirements elicitation is a multifaceted and iterative activity that relies heavily on the communication skills of requirements engineers and the commitment and cooperation of the system stakeholders.

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# The Process of Requirements Elicitation

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- ❖ Requirements elicitation involves activities that are intensely communicative.
- ❖ Five fundamental activities:
  - ❖ Understanding the Application Domain
  - ❖ Identifying the Sources of Requirements
  - ❖ Analyzing the Stakeholders
  - ❖ Selecting the Techniques, Approaches, and Tools to Use
  - ❖ Eliciting the Requirements from Stakeholders and Other Sources



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# Understanding the Application Domain

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- ❖ It is important to investigate and examine in details the situation or “real world” in which the system will ultimately reside (or, the application domain).
- ❖ The current environment needs to be explored including the political, organizational, and social aspects related to the system, in addition to any constraints.
- ❖ Existing work processes and the related problems to be solved by the system need to be described with respect to the key business goals and issues.

# Identifying the Sources of Requirements

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- ❖ Requirements may be spread across many sources and exist in a variety of formats:
  - ❖ *Stakeholders*: the most obvious source of requirements for the system.
  - ❖ *Users and subject matter experts* are used to supply detailed information about the problems and user needs.
  - ❖ *Existing systems and processes*, particularly when the project involves replacing a current or legacy system.
  - ❖ *Existing documentation* about the current systems and business processes including manuals, forms, and reports. They can provide useful information about the organization and environment.
  - ❖ *Requests for the new system* and their supporting rationale and importance.

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# Analyzing the Stakeholders

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- ❖ Stakeholders are people who have an interest in the system or are affected in some way by the development and implementation of the system.
- ❖ Usually, stakeholders include groups and individuals internal and external to the organization.
- ❖ The customer (especially the project sponsor), is usually the most apparent stakeholder of the system.
- ❖ Actual users may be the most important.
- ❖ One of the first steps in requirements elicitation is to analyze and involve all the relevant stakeholders.
- ❖ The process of analyzing the stakeholders also often includes the identification of key user representatives.

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# Selecting the Techniques

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- ❖ It is generally accepted that an individual requirements elicitation technique or approach cannot be suitable for all projects.
- ❖ The choice of techniques to be used is dependent on the specific context of the project and is often a critical factor in the success of the elicitation process.
- ❖ The selection is performed from a variety of reasons:
  - ❖ the technique selected is the only one the analyst knows
  - ❖ the technique selected is the analyst's favorite
  - ❖ the selected technique is the one prescribed by a specific methodology that is being followed for the system development
  - ❖ the choice of technique is decided solely by the intuition of the analyst to be effective in the current context
- ❖ Requirements elicitation is best performed using a variety of techniques.
- ❖ Usually, several methods are employed during and at different stages in the software development life cycle.

# Eliciting the Requirements

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- ❖ After the sources of requirements and the specific stakeholders have been identified, the actual elicitation of the core requirements begins using the selected elicitation techniques, approaches, and tools.
- ❖ During this activity it is important to establish the level of scope for the system and investigate in detail the needs and wants of the stakeholders, especially the users.
- ❖ It is also essential to determine the future processes the system will perform with respect to the business operations, and examine the ways in which the system may support them in order to satisfy the major objectives and address the key problems of the business.

Remark:

Stakeholders requests are not considered requirements until they have gone through a review process and they have been accepted.

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# Requirements Elicitation Process

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- ❖ Typically the process begins with an informal and incomplete high-level mission statement for the project (i.e., a set of fundamental goals, functions, and constraints for the target system, or as an explanation of the problems to be solved).
- ❖ In order to develop this description, stakeholders and other sources of requirements are identified and used for elicitation.
- ❖ These preliminary results form the basis of further investigation and refinement of requirements in a typically iterative and incremental manner.
- ❖ There is no general accepted process model for requirements elicitation.

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# Requirements Elicitation Process

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- ❖ In most cases the process of requirements elicitation is performed incrementally over multiple sessions, iteratively to increasing levels of detail, and at least partially in parallel with other system development activities.
- ❖ In reality its completion is often determined by time and cost constraints rather than achieving the required level of requirements quality and completeness.
- ❖ The result of this process is a detailed set of requirements in natural language text and simple diagrammatic representations with additional information including descriptions of the sources, priorities, and rationales.

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# Requirements Engineer Roles

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- ❖ The requirements engineer (also called systems analyst or business analyst) may play a variety of roles and assume different responsibilities.
- ❖ These responsibilities and roles are dependent on the project, people, context and organization involved.
  - ❖ *Exploring the problem domain* and the requirements that are situated in that domain.
  - ❖ *Facilitator*. In some approaches, they are not only required to ask questions and record the answers, but must guide and assist the participants in addressing the relevant issues in order to obtain correct and complete requirements information. They are also responsible for ensuring that participants feel comfortable and confident with the process, and are given sufficient opportunity to contribute.
  - ❖ *Mediator*. During elicitation, conflicts between elicited requirements and stakeholders themselves often appear. In many cases the prioritization of requirements from different stakeholders groups is a source of debate and dispute. He/she is responsible for finding a suitable resolution through negotiation and compromise.

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# Requirements Engineer Roles

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- ❖ *Documenting the requirements elicited.* This role is important as it represents the production of results from the elicitation process, and forms the foundation for the subsequent project phases.
- ❖ *Various roles of the developer community* during requirements elicitation (system architects, designers, programmers, testers, quality assurance personnel, etc). This is often due to the fact that these stakeholders have not yet been assigned to the project at the requirements elicitation stage.
- ❖ *Validator.* All the requirements elicited must be validated against the other stakeholders, other systems, each other, and then compared with previously established goals for the system.

# Techniques for Requirements Elicitation

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- ❖ Many techniques have been borrowed and adapted from other disciplines such as the social sciences, and only a few have been developed specifically for eliciting software requirements.
  - ❖ Interviews, Questionnaires
  - ❖ Task Analysis, Domain Analysis
  - ❖ Introspection,
  - ❖ Repertory Grids, Card Sorting
  - ❖ Laddering
  - ❖ Group Work
  - ❖ Brainstorming, Joint Application Development (JAD)
  - ❖ Requirements Workshops,
  - ❖ Ethnography, Observation, Protocol Analysis, Apprenticing,
  - ❖ Prototyping
  - ❖ Goal Based Approaches, Scenarios, Viewpoints



# Interviews

- ❖ They are probably the most traditional and commonly used technique for requirements elicitation.
- ❖ Interviews are essentially human based social activities, they are informal and their effectiveness depends greatly on the quality of interaction between the participants.
- ❖ They provide an efficient way to collect large amounts of data quickly.
- ❖ The results of interviews, such as the usefulness of the information gathered, can vary significantly depending on the skill of the interviewer.
- ❖ Three types of interviews:
  - ❖ unstructured,
  - ❖ structured,
  - ❖ semi-structured (a combination of the previous two).



## Interviews

- ❖ Unstructured interviews are conversational in nature where the interviewer enforces only limited control over the direction of discussions.
- ❖ This type of interview is best applied for exploration when there is a limited understanding of the domain, or as a precursor to more focused and detailed structured interviews.

Disadvantages:

1. As they do not follow a predetermined agenda or list of questions, there is the risk that some topics may be completely neglected.
2. To focus in too much detail on some areas, and not enough in others.



## Interviews

- ❖ Structured interviews are conducted using a predetermined set of questions to gather specific information.
- ❖ The success of structured interviews depends on knowing what are the right questions to ask, when should they be asked, and who should answer them.
- ❖ Templates that provide guidance on structured interviews for requirements elicitation (i.e., Volere) can be used.
- ❖ Although structured interviews tend to limit the investigation of new ideas, they are generally considered to be rigorous and effective.



## Interviews - Questions

- ❖ Establish Customer or User Profile:

Name:

Company:

Industry:

Job Title:

What are your key responsibilities?

What outputs do you produce?

For Whom?

How is success measured?

Which problems interfere with your success?

What, if any, trends make your job easier or more difficult?



## Interviews - Questions

- ❖ Assessing the Problem:

For which problems do you lack good solutions?

What are they? (Hint: Keep asking, “Anything else?”)

For each problem ask:

- ❖ Why does the problem exist?
- ❖ How do you solve it now?
- ❖ How would you like to solve it?



## Interviews - Questions

- ❖ Understanding the User Environment:
  - Who are the users?
  - What is their educational background?
  - What is their computer background?
  - Are users experienced with this type of application?
  - Which platforms are in use?
  - What are your plans for future platforms?
  - What are your expectations for usability for this type of product?
  - What are your expectations for training time?
  - What kinds of user help do you need?



## Interviews - Questions

- ❖ Recap the Understanding:

You have told me:

(List customer described problems in your own words.)

- ❖
- ❖
- ❖
- ❖



## Interviews - Questions

- ❖ Analyst's Inputs on Customer's Problems:  
(Validate or Invalidate assumptions)  
For each problem ask,
  - Is this a real problem?
  - What are the reasons for the problem?
  - How do you currently solve the problem?
  - How would you like to solve the problem?
  - How would you rank solving these problems in comparison to others you've mentioned?
- ❖ Assessing Your Solution (if applicable)
  - What if you could
    - ❖
    - ❖
  - How would you rank the importance of these?



# Questionnaires

- ❖ Questionnaires are mainly used during the early stages of requirements elicitation and may consist of open and/or closed questions.
- ❖ To be effective, the terms, concepts, and boundaries of the domain must be well established and understood by the participants and questionnaire designer.
- ❖ Questions must be focused to avoid gathering large amounts of redundant and irrelevant information.
- ❖ They provide an efficient way to collect information from multiple stakeholders quickly.
- ❖ They are considered more useful as informal checklists to ensure fundamental elements are addressed early on, and to establish the foundation for subsequent elicitation activities.

Disadvantages:

1. They are limited in the depth of knowledge they are able to elicit.
2. They lack the opportunity to delve further on a topic, or expand on new ideas.
3. They provide no mechanism for the participants to request clarification or correct misunderstandings.

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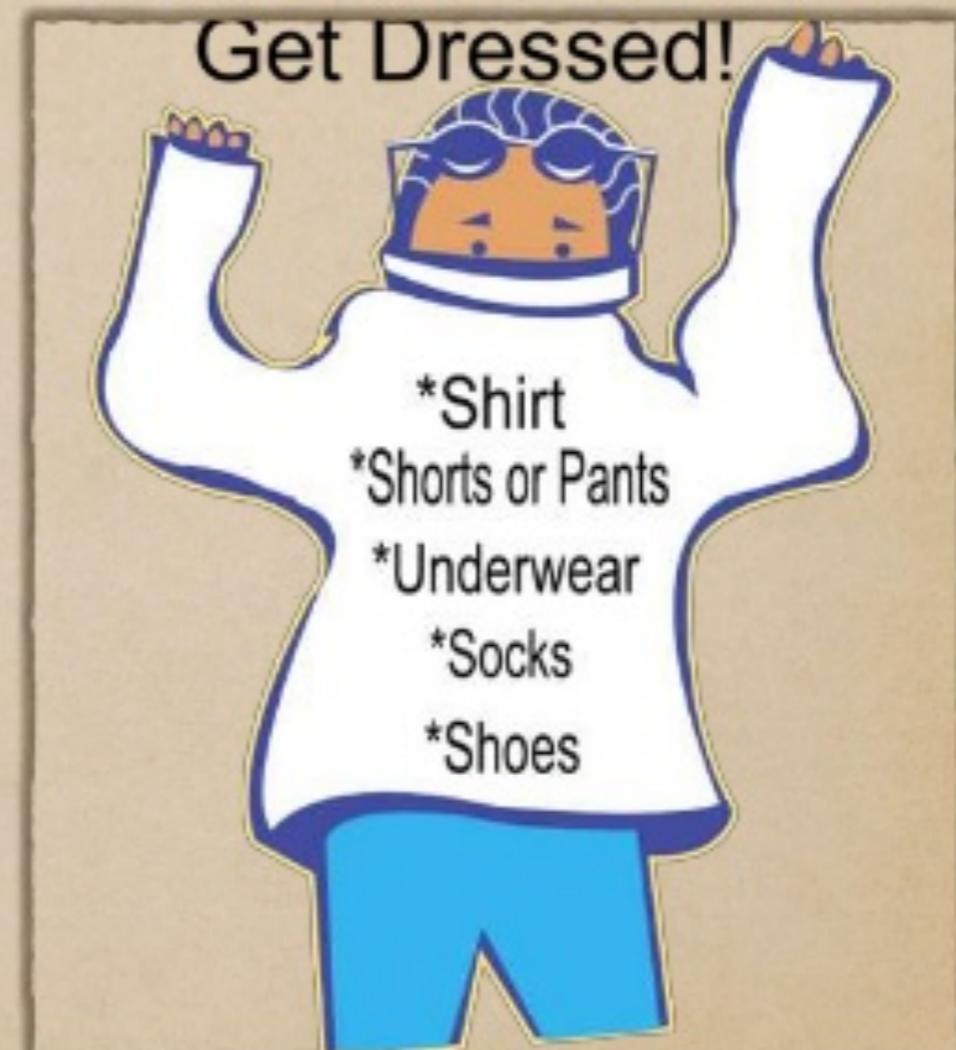
# Task Analysis

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- ❖ It employs a top-down approach where high-level tasks are decomposed into subtasks and eventually detailed sequences until all actions and events are described.
- ❖ The primary objectives of this technique is to construct a hierarchy of the tasks performed by the users and the system, and determine the knowledge used or required to carry them out.
- ❖ Task analysis provides information on the interactions of both the user and the system with respect to the tasks as well as a contextual description of the activities that take place.
- ❖ In most cases considerable effort is required to perform through task analysis, and it is important to establish what level of detail is required and when components of the tasks need to be explored further.

# Example

- Overall task: Get dressed
- Subordinate Task: Put on pants
- Subordinate Task: Put on shirt
- Subordinate Task: Put on socks
- Subordinate Task: Put on shoes



# Domain Analysis

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- ❖ Examining the existing and related documentation and applications is a very useful way of gathering early requirements as well as understanding and capturing domain knowledge, and identification of reusable concepts and components.
- ❖ These types of investigations are particularly important when the project involves the replacement or enhancement of an existing legacy system.
- ❖ Types of documentation that may be useful for eliciting requirements include design documents and instruction manuals for existing systems, and hardcopy forms and files used in the current business processes.
- ❖ Application studies often also include looking at both upstream and downstream systems, as well as competitive or like solutions.
- ❖ In most cases these studies involve other elicitation techniques such as observing the existing system in use and interviewing the current users.

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# Introspection

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- ❖ The technique of introspection requires the analyst to develop requirements based on what he or she believes the users and other stakeholders want and need from the system.
- ❖ This technique is mainly used only as a starting point for other requirements elicitation efforts.
- ❖ Introspection is only really effective when the analyst is not only very familiar with the domain and goals of the system, but also expert in the business processes performed by the users.
- ❖ In cases where the analyst is forced to use this technique more (for example when the users have little or no previous experience with software systems in their work environment), a type of facilitation introspection should take place via other elicitation techniques such as interviews and protocol analysis.

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# Repertory Grids

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- ❖ Repertory grids involve asking stakeholders to develop attributes and assign values to a set of domain entities.
- ❖ The system is modeled in the form of a matrix by categorizing the elements of the system, detailing the instances of those categories, and assigning variables with corresponding values to each one.
- ❖ The aim is to identify and represent the similarities and differences between different domain entities.
- ❖ These represent a level of abstraction unfamiliar to most users.
- ❖ This technique is typically used when eliciting requirements from domain experts.
- ❖ They are somewhat limited in their ability to express specific characteristics of complex requirements.

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# Card Sorting

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- ❖ Card sorting requires the stakeholders to sort a series of cards containing the names of domain entities into groups according to their own understanding.
- ❖ The stakeholder is also required to explain the reasons for the way in which the cards are sorted.
- ❖ It is important for effective card sorting that all entities are included in the process.
- ❖ This is possible only if the domain is sufficiently understood by both the analyst and the participants. If the domain is not well established then group work can be used to identify these entities.
- ❖ As entities represent a high level of system abstraction, the information obtained from this technique is limited in its detail.



## Group Work

- ❖ Group work such as collaborative meetings is a very common and often default technique for requirements elicitation.
- ❖ Groups are particularly effective because they involve and commit the stakeholders directly and promote cooperation.
- ❖ These types of sessions can be difficult to organize due to the number of different stakeholders that may be involved in the project.
- ❖ Managing these sessions effectively requires both expertise and experience to ensure that individual personalities do not dominate the discussions.
- ❖ Key factors in the success of group work are the makeup of participants and the cohesion within the group.
- ❖ Stakeholders must feel comfortable and confident in speaking openly and honestly.
- ❖ Group work is less effective in highly political situations.

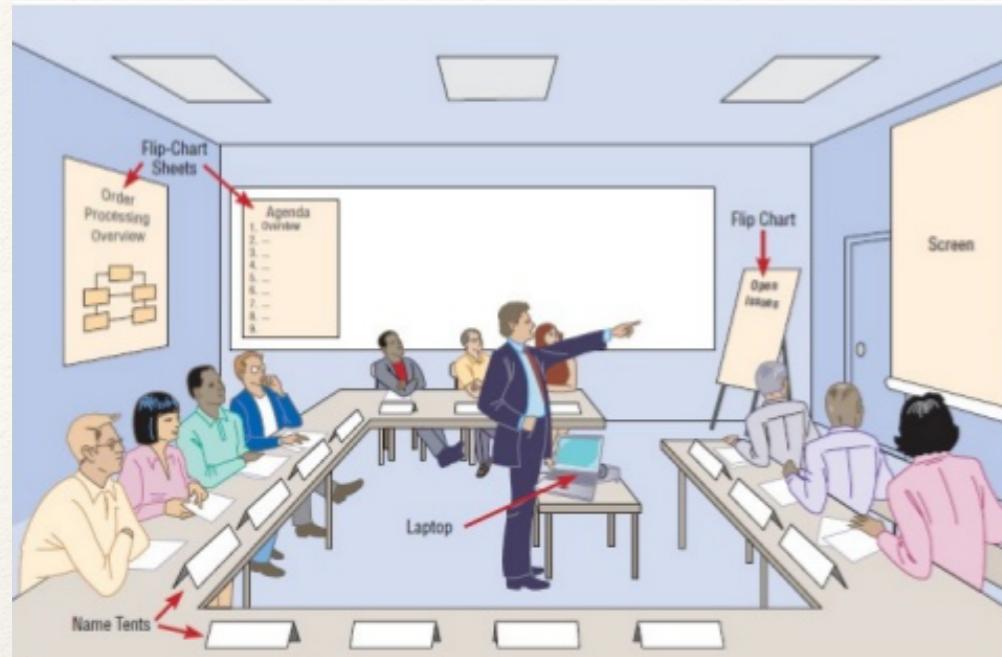


# Brainstorming

- ❖ Brainstorming is a process where participants from different stakeholder groups engage in informal discussion to rapidly generate as many ideas as possible without focusing on any one in particular.
- ❖ It is important when conducting this type of group work to avoid exploring or critiquing ideas in great detail.
- ❖ It is not usually the intended purpose of brainstorming sessions to resolve major issues or make key decisions.
- ❖ This technique is often used to develop the preliminary mission statement for the project and target system.

## Advantage:

It promotes freethinking and expression, and allows the discovery of new and innovative solutions to existing problems.



# Joint Application Development (JAD)

- ❖ Joint Application Development (JAD) involves all the available stakeholders investigating through general discussion both the problems to be solved, and the available solutions to those problems.
- ❖ With all parties represented, decisions can be made rapidly and issues resolved quickly.
- ❖ A major difference between JAD and brainstorming is that typically the main goals of the system have already been established before the stakeholders participate.
- ❖ JAD sessions are typically well structured with defined steps, actions, and roles for participants (including a specialist facilitator).
- ❖ The focus of this type of meeting tends to often be on the needs and desires of the business and users rather than technical issues.



# Requirements Workshops

- ❖ Requirements workshop is a generic term given to a number of different types of group meetings where the emphasis is on developing and discovering requirements for a software system.
- ❖ There are many different forms of requirements workshops:
  - ❖ cross functional which involves different types of stakeholders from various areas of the business,
  - ❖ Co-operative Requirements Capture (CRC) where like JAD, there is a defined set of activities and the development community is especially involved,
  - ❖ Creativity which encourages innovative thinking and expression.



# Ethnography

- ❖ Ethnography (the study of people in their natural setting), involves the analyst actively or passively participating in the normal activities of the users over an extended period of time while collecting information on the operations being performed.
- ❖ These techniques are especially useful when addressing contextual factors such as usability, and when investigating collaborative work settings where the understanding of interactions between different users with the system is paramount.
- ❖ In practice, ethnography is particularly effective when the need for a new system is a result of existing problems with processes and procedures, and in identifying social patterns and complex relationships between human stakeholders.



# Observation

- ❖ Observation is one of the more widely used ethnographic techniques.
- ❖ The analyst observes the actual execution of existing processes by the users without direct interference.
- ❖ This technique is often used in conjunction with others such as interviews and task analysis.
- ❖ Ethnographic techniques such as observation are very expensive to perform and require significant skill and effort on the part of the analyst to interpret and understand the actions being performed.
- ❖ The effectiveness of observation and other ethnographic techniques can vary as users have a tendency to adjust the way they perform tasks when knowingly being watched.

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# Protocol Analysis

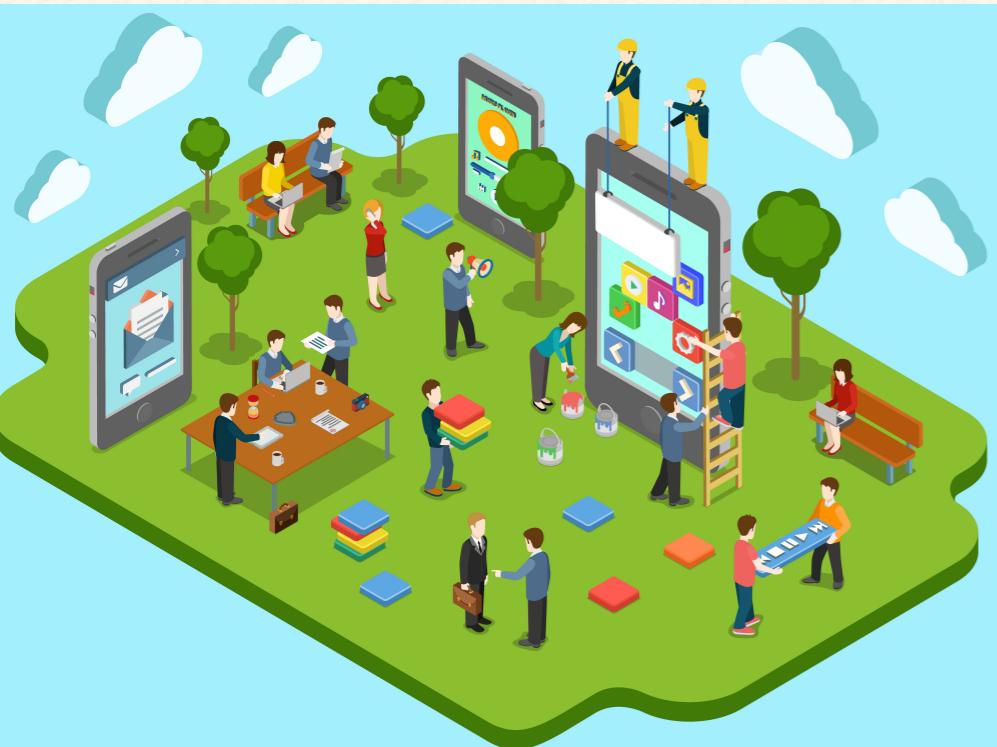
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- ❖ Protocol analysis is where participants perform an activity or task while talking it through aloud, describing the actions being conducted and the thought process behind them.
- ❖ This technique can provide the analyst with specific information on and rationale for the processes the target system must support.
- ❖ In most cases however talking through an operation is not the normal way of performing the task, and as a result may not necessarily represent the true process completely or correctly.
- ❖ Also, minor steps performed frequently and repetitively are often taken for granted by the users, and may not be explained and subsequently recorded as part of the process.



# Apprenticing

- ❖ Apprenticing involves the analyst actually learning and performing the current tasks under the instruction and supervision of an experienced user.
- ❖ The analyst is taught the operations and business processes by observing, asking questions, and physically doing, rather than being informed of them, as is the case with protocol analysis.
- ❖ Apprenticing is very useful when the analyst is inexperienced with the domain, and when the users have difficulty in explaining their actions.



# Prototyping

- ❖ Prototyping is an effective way to gather detailed information and relevant feedback.
- ❖ It is common that prototypes are used in conjunction with other elicitation techniques such as interviews and JAD.
- ❖ Prototypes are typically developed using preliminary requirements or existing examples of similar systems.
- ❖ This technique is particularly useful when developing human-computer interfaces, or where the stakeholders are unfamiliar with the available solutions.
- ❖ There are a number of different methods for prototyping systems such as storyboards, executable, throwaway and evolutionary, with varying levels of effort required.
- ❖ In many cases prototypes are expensive to produce in terms of time and cost.
- ❖ An advantage of using prototypes is that they encourage stakeholders, and more specifically the users, to play an active role in developing the requirements.

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# Goal Based Approaches

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- ❖ The fundamental premise of goal modeling and goal based approaches is that high-level goals that represent objectives for the system are decomposed (e.g. usually using AND and OR relationships) and elaborated (e.g. with “Why” and “How” questioning) into sub goals and then further refined in such a way that individual requirements are elicited.
- ❖ The result of this process is significantly more complicated and complete than the traditional methods of representing system goals using tree structure diagrams.
- ❖ These approaches are able to represent detailed relationships between domain entities, requirements, and the objectives of the system.
- ❖ One of the risks when using goal based approaches is that errors in the high-level goals of the system made early on can have a major effect, and that changing goals are difficult to manage.

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# Scenarios

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- ❖ Scenarios are narrative and specific descriptions of current and future processes including actions and interactions between the users and the system.
- ❖ Like use cases, scenarios do not typically consider the internal structure of the system, and require an incremental and interactive approach to their development.
- ❖ It is important when using scenarios to collect all the potential exceptions for each step.
- ❖ Scenarios are also very useful for understanding and validating requirements, as well as test case development.

# Scenarios

## Michael's Journey - Summary



Michael



- Michael is a 58-year-old living alone.
- He suffers from anxiety attacks, has poorly managed diabetes requiring insulin. He drinks excessively.
- His mental health team intervene when Michael's anxiety is mistaken as aggression.
- The Diabetic specialist, supported by primary and community care and the local pharmacist, implement a plan to improve Michaels medication conformance.
- Without medical support, Michael decides to stop drinking, resulting in a visit to OOHs, where he has a seizure.
- Taken by ambulance to A&E, Michael is admitted to THE Acute Medical Unit. The Ward Sister updates the consultant on the medication Michael has taken, before implementing their alcohol withdrawal protocol.
- Due to severe hallucinations a psychiatric assessment is requested before discharge, with a request to link in with the community mental health team, to ensure Michael receives ongoing care in the community.
- The discharge team are made aware of Michael's history and domestic circumstances to ensure safe discharge and handover back to primary care GP and community nurse to review his foot ulcer.
- LFT's show potential liver damage, Michael is referred to an outpatient liver clinic and agrees to enrol on a liver study.
- A Social Care referral is triggered as there are concerns about Michaels finances and living conditions.
- Patients apps are used to support to Michael in relation to his medication conformance and lifestyle.

# Scenarios

## Michael's Journey – System Users

In order to play my part in Michael's care, I need to:-



Mrs Banerjee  
MHT

- Access Michael's record
- View Prescribing history
- Push out special alert to all Michael's other health records



Outpatients  
Dr Singh

- Access Michael's record from primary care; outpatients & pharmacy.
- View a graphical correlation of data in relation to HBA1C results; medication history; blood sugar, weight and encounters.
- Send electronic referral to community pharmacy
- Enrol Michael on Telehealth scheme



Jacky  
Ward Sister

- Access Michael's existing records
- Pull relevant data to create Medical Admissions Unit record
- Create medicines management list for duration of hospital stay and TTO's
- Send task to discharge team & Mental Health liaison to attend the ward
- Send note to all other HCPs to alert them that Michael is on the ward
- Create appointment into Liver specialist clinic and Social Care referral.



Dr Lowndes  
Liver  
Specialist

- Access Michael's record from inpatients; primary care & Mental Health
- Venlafaxine & Liver Disease - Caution
- Review prescribing history
- Alert MHT of this encounter and decisions regarding prescribing.
- Enrol Michael on Telehealth scheme



GP Practice

- Co-ordinate all the resources and services available to Michael.  
To do this I need to receive real time relevant data from all sources.



Michael

- Access patient on-line services to book appointments & order prescriptions
- Access telehealth services to prompt me to eat and medicate in line with my care plan
- Share daily measurements with my clinicians
- Access patient information and on-line help
- Share information about me with my family and carer.



Michael





# Viewpoints

- ❖ Viewpoint approaches aim to model the domain from different perspectives in order to develop a complete and consistent description of the target system.
- ❖ Example: a system can be described in terms of its operation, implementation and interfaces. In the same way systems can be modeled from the standpoints of different users or from the position of related systems.
- ❖ These types of approaches are particularly effective for projects where the system entities have detailed and complicated relationships with each other. Viewpoints are also useful as a way of supporting the organization and prioritization of requirements.

Disadvantage:

They do not enable non-functional requirements to be represented easily, and are expensive to use in terms of the effort required.

# Techniques and Elicitation Activities

# Techniques Comparison

	Interviews	Domain	Group work	Ethnography	Prototyping	Goals	Scenarios	Viewpoints
Interviews		C	A	A	A	C	C	C
Domain	C		C	A	A	A	A	A
Group-work	A	C		A	C	C	C	C
Ethnography	A	A	A		C	C	A	A
Prototyping	A	A	C	C		C	C	C
Goals	C	A	C	C	C		C	C
Scenarios	C	A	C	A	C	C		A
Viewpoints	C	A	C	A	C	C	A	

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# Tools for Requirements Elicitation

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- ❖ A wide variety of tools exist that have been developed and used to support requirements elicitation.
- ❖ So far the mainstream software engineering community has not largely adopted any of these:
  - ❖ Objectiver for goal based modeling
  - ❖ ART-SCENE for scenario elicitation
  - ❖ The Requirements Apprentice,
  - ❖ ACME/PRIME, and AbstFinder

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# Issues in Requirements Elicitation

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## ❖ The Missing Ignoramus.

- ❖ Elicitation should be led by senior staff members with experience and training in requirements elicitation techniques.
- ❖ It is usually advisable to have someone involved with the elicitation process who has no domain knowledge, e.g., someone who is not afraid to ask “what does that mean?” (called smart ignoramus)
- ❖ Without such people present, situations can arise where insufficient information is collected, the same term is used to mean different things.
- ❖ It is beneficial to have the elicitation team also ask the question “why?” When a need is identified, by asking why, you may find legitimate reasons for the need, or you might find out it is “feature folklore” (something that has been done on every project, but such features have no value to the customer and nobody knows why they are there).

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# Issues in Requirements Elicitation

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- ❖ Untrained Analysts.
  - ❖ An untrained analyst may be a very senior, skilled person (e.g., software developers or database staff).
  - ❖ It can be very difficult for an untrained person to separate need from solution.
  - ❖ Database analysts might think of database configurations: “**There shall be a table for storing customer names and addresses**” rather than “**The new system shall store customer names and addresses.**”
  - ❖ Developers try to design as they capture needs or define requirements: “**The customer names shall be cached to ensure rapid retrieval**” as opposed to “**The new system shall be able to rapidly retrieve customer names and addresses.**”

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# Issues in Requirements Elicitation

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- ❖ Failure to Accurately Identify Stakeholders
  - ❖ It is very important to record stakeholder information when collecting requests (name, position, organization).
  - ❖ The information might be important for prioritization and release scheduling.
  - ❖ Eg.: One stakeholder suggests a product feature that would allow patients or doctors to schedule appointments for medical services over the web.
  - ❖ Another stakeholder feels that it is a good idea, but not as urgent as having doctors schedule appointments and services from their PDAs.
  - ❖ It is determined that both requests cannot be satisfied in the first release of the hospital scheduling system. One of the requests came from a ten-thousand-people health care network, and the other request came from a small, one-hundred-people hospital.

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# Issues in Requirements Elicitation

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- ❖ Understanding of Product Needs Is Incomplete
  - ❖ Analysts are often asked to help define requirements for products where the stakeholders are uncertain of their needs.
  - ❖ Sometimes they are even uncertain as to what the business goals are.
  - ❖ Techniques for clarifying needs:
    - ❖ Prototyping
    - ❖ eliciting requirements with several stakeholders
    - ❖ creating marketing literature, a user manual, or lightweight specification sheets for the product.

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# Issues in Requirements Elicitation

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- ❖ Users Misunderstand What Computers Can Do
  - ❖ Stakeholders may assign virtues to computer systems that are futuristic, wishful thinking, or simply impractical.
  - ❖ “We would like the new payroll system to automatically detect the employee’s marital status from public records.”
  - ❖ Analysts must adjust the phrasing of stakeholder requests so that a reasonable discussion can be held on whether to make the requests requirements or not.



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# Issues in Requirements Elicitation

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- ❖ The Requirements Engineer Has Deep Domain Knowledge
  - ❖ If a requirements analyst has strong domain knowledge, there may be a tendency to minimize communication with stakeholders.
  - ❖ The analyst may try to do it all himself or herself without seeking outside validation or views.
  - ❖ Failure to communicate with external stakeholders can be especially dangerous in a domain where technology is changing rapidly.

# Issues in Requirements Elicitation

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- ❖ Stakeholders Omit Important, Well-Understood, Tacit Information
  - ❖ A stakeholder or domain expert may be “too close” to the material he or she is describing and forget to include salient points, assuming that the material is so basic that it does not need to be communicated.
  - ❖ E.g. **“To drive a stick-shift car, start the engine, put the car in gear, and go!”**
  - ❖ Missing steps: putting the key in the ignition and making sure that the clutch is pressed in order to start the engine.
  - ❖ A driver who uses such a car every day might take for granted putting the key in the ignition and pressing down on the clutch, while someone who has never driven before might realize that some steps had been left out.