Introduction to Requirements Elicitation

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Based on Powerpoint slides by Gunter Mussbacher
with material from:
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- I know that you believe that you understood what you think I said, but I am not sure you realize that what you heard is not what I meant.[1]

[1] Robert McCloskey, State Department spokesman


I'LL GO UP AND FIND OUT WHAT THEY NEED AND THE REST OF YOU START CODING !
SHELTON

Goals, Risks, and Challenges

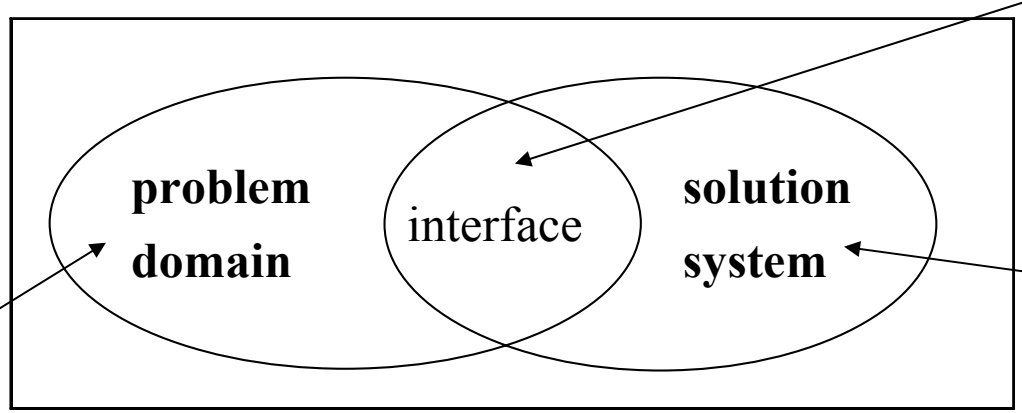
What is Requirements Elicitation?

- Requirements elicitation is “the process of discovering the requirements for a system by communicating with customers, system users and others who have a stake in the system development”[1]
- More than a simple request or collection; should evoke and provoke!
- Elicitation means “to bring out, to evoke, to call forth”
- Human activity involving interaction between a diverse array of human beings

[1] Ian Sommerville and Pete Sawyer

Elicitation Goals

- Determine sources of information & appropriate techniques
- Get information on domain, problem, constraints
  - → requirements → system development
- Determine the scope and feasibility early
- Produce a first document
  - Mainly user requirements and elicitation notes
  - Potentially incomplete, disorganized, inconsistent
  - But we must start somewhere!



- Specification
  - description of Solution System needed to satisfy Problem Domain

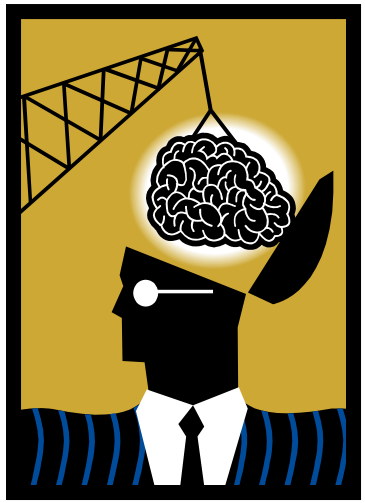
- Domain properties
- Requirements

- Hardware
- Software

Consider the Following Conversation

- Gerhard, a senior manager at Contoso Pharmaceuticals, was meeting with Cynthia the new manager of Contoso's information systems (IS) development group.
- "*We need to build a chemical-tracking information system for Contoso. The system should let us keep track of all the chemical containers we already have in the stockroom and in individual laboratories. That way, maybe the chemists can get what they need for someone down the hall instead of buying a new container from a vendor. This should save us a lot of money. Also, the Health and Safety Department needs to generate some reports on chemical usage for the government. Can your group build this system in time for the first compliance audit five months from now?*"
- Are the above requirements? Are they enough the build the system?

Elicitation Risks and Challenges (1)



- You need to extract information from the brain of your customer without damaging the customer, much less his brain!
  Good technology and good tools can help, but cannot substitute for adequate social interaction!

- Problems of scope
  - System boundaries inadequately defined or defined too soon
  - Unnecessary technical details
- Problems of understanding
  - Stakeholder not sure of what is needed
  - Stakeholder has trouble communicating needs
  - Stakeholder does not understand capabilities and limitation of computing environment

Elicitation Risks and Challenges (2)

- Problems of understanding (cont'd)
  - Stakeholder does not have full understanding of domain
  - Stakeholders state conflicting requirements
- Problems of volatility
  - Stakeholders will not commit to a set of written requirements

Elicitation Risks and Challenges (3)

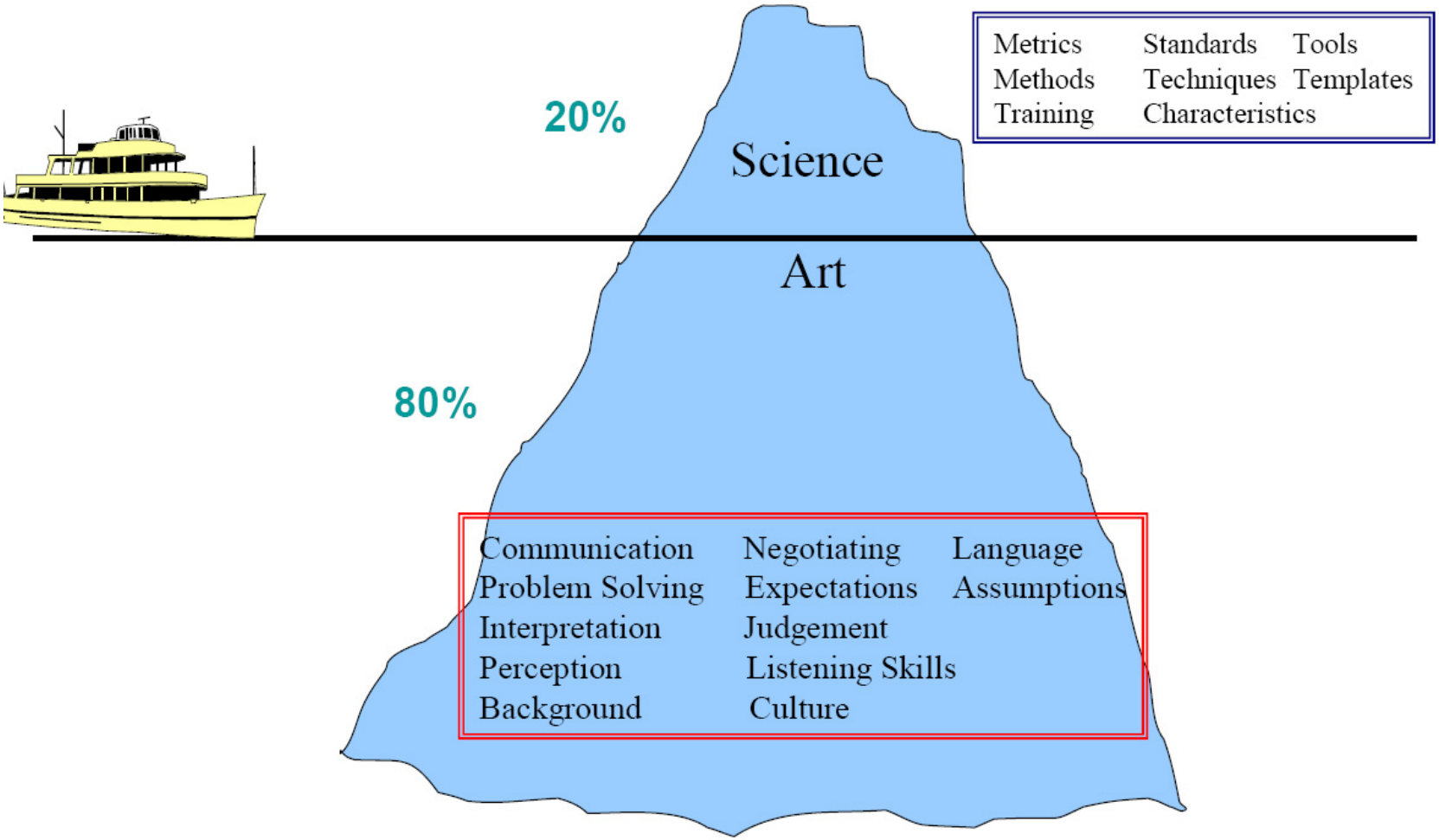
- Other typical issues
  - Experts seldom available
  - Finding an adequate level of precision/detail
  - Common vocabulary often missing
- Requirements do not fall from the sky!
  - Sometimes hidden
  - Sometimes too obvious, implicit, ordinary…
  - Assume == “ass” of “u” and “me”
- Participants often lack motivation and resist to change
- We need much effort and discussion to come up with a common agreement and understanding!

"Ignorance is a bliss"[1]

- According to Dan Berry, ignorance of a domain is a good thing!
- Ignorance (not stupidity !) allows one to expose hypotheses and some implicit facts
- Berry even suggests that one day, requirements engineers may advertise their domains of ignorance (rather than their domains of expertise) to find a job!

[1] The Matrix, 1999

RE: More an Art than Science



- PMI, http://www.kcpmichapter.org

Sources of Requirements

Sources of Requirements

- Various stakeholders
  - Clients, customers, users (past and future), buyers, managers, domain experts, developers, marketing and QA people, lawyers, people involved in related systems, anyone who can bring added value!
- Pre-existing systems
  - Not necessarily software systems
- Pre-existing documentation
- Competing systems
- Documentation about interfacing systems
- Standards, policies, collective agreements, legislation
- …

Stakeholder – Customer/Client

- Person who pays for the software development

- Ultimately, has the final word on what will be the product
- For an internal product, the client is probably a product manager
- For the consumer market, the customer may be the marketing department

Stakeholder – Buyer

- Person who pays for the software once it is developed
- Possibly a user or a business owner buying a product for his employees
- What features is he willing to pay for?
  - Which are trivial or excessive?
- Must participate actively in the project (or have a representative)

Stakeholder – User

- ... of the current system or future systems

- Experts of the current system: indicate which functions to maintain or improve
- Experts of competitors' products: suggestions on designing a superior product
- May have special needs or requirements
  - Usability, training, online help ...
- Do not neglect interest groups
  - Expert users, or with disabilities or handicaps
- Select users with care
  - Different seniority
  - Must speak with authority and be responsible and motivated

Stakeholder – Domain Expert

- Expert who knows the work involved
- Familiar with the problem that the software must solve. For example:
  - Financial expert for finance management software
  - Aeronautical engineers for air navigation systems
  - Meteorologist for weather forecasting system, etc…
- Also knows the environment in which the product will be used

Stakeholder – Software Engineer

- Expert who knows the technology and process
- Determines if the project is technically and economically feasible
- Specifically estimates the cost and time of product development
- Educates the buyer/client on the latest and innovative hardware or software, and recommends new features that will benefit from these technologies

Stakeholder – Other

- Inspector
  - An expert in governmental rules and safety relevant to the project
  - Examples: safety inspectors, auditors, technical inspectors, government inspectors
- Market research specialist
  - Can play the role of the customer if the software is developed for the general public
  - Expert who has studied the market to determine trends and needs of potential customers

Stakeholder – Other

- Lawyer
  - Familiar with laws and legal aspects
  - Standards relevant to the project
- Expert of systems that interact with the system to be built
  - Knows the interfaces of the interacting systems
  - May be interested in product features (if the product can help the interacting system to perform its tasks)
- Others that bring added value
  - People who will use your product as a basic building block

On Stakeholders Availability…

- Stakeholders are generally busy!
  - Have priorities other than you
  - Are rarely entirely disconnected from their daily routine and tasks
  - See their participation in the elicitation process as a supplementary task
- Hence, you must have the support and commitment of managers (especially theirs!)
- You must also avoid being perceived as a threat:
  - Loss of jobs caused by the improved system
  - Loss of autonomy, powers, or privileges
  - To the recognition and visibility of their work

Requirements Elicitation Tasks

Tasks Performed as Part of Elicitation (1)

- Planning for the elicitation
  - Why? Who? When? How? Risks?
- During the elicitation
  - Examine the viability of the project (is it worth it?)
  - Understand the problem from the perspective of each stakeholder
  - Extract the essence of stakeholders' requirements
  - Invent better ways to do the work of the user
- Following the elicitation
  - Analyse results to understand obtained information
  - Negotiate a coherent set of requirements acceptable by all stakeholders and establish priorities
  - Record results in the requirements specification

Tasks Performed as Part of Elicitation (2)

- Repeat as needed
- Elicitation is incremental
  - Driven by information obtained
  - You always do a bit of elicitation – analysis – specification – verification at the same time

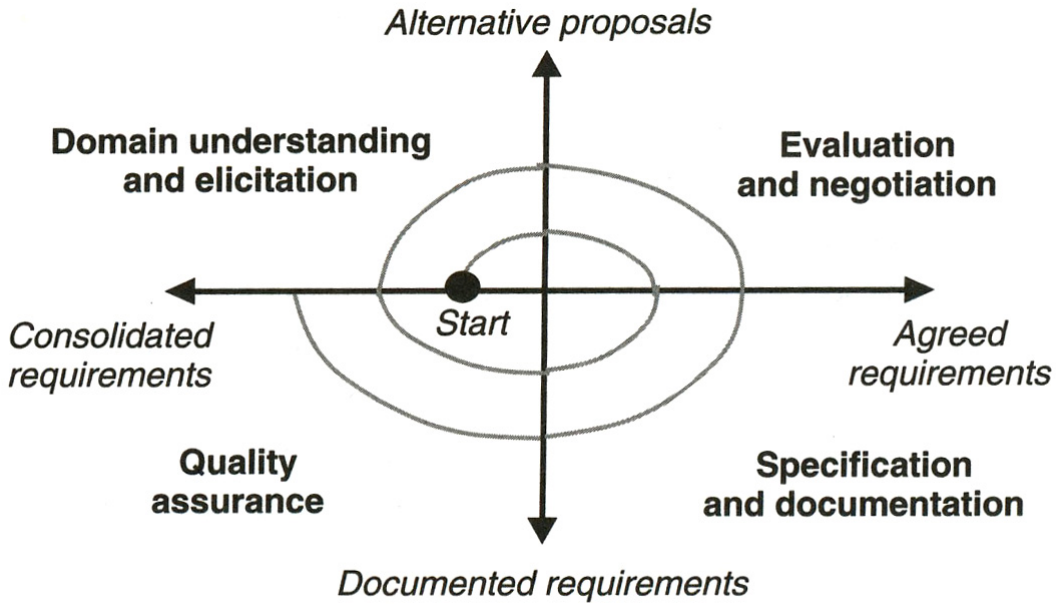


Figure 1.6 *The requirements engineering process*

Planning for Elicitation

- Elicitation Plan should include:
  - Objectives
  - Strategies and processes
  - Products of elicitation efforts
  - Schedule and resource estimates
  - Risks

Elicitation Plan – Objectives / Strategies & Processes

- Objectives: Why this elicitation?
  - Validate market data
  - Explore usage scenarios
  - Develop a set of requirements, etc..
- Set elicitation strategies and processes
  - Approaches used
  - Often a combination of approaches depending on the types and number of stakeholders
  - Examples: Surveys (questionnaires), workshops, interviews…

Elicitation Plan – Products

- Usually set of rough requirements
  - Written, audio, video notes
  - Documentation
- Deliverables depend on objective and technique, e.g.
  - Notes
  - Goals
  - List of use cases, scenarios
  - A set of high-level requirements
  - Detailed Software Requirements Specification (SRS)
  - Analysis of survey results
  - Performance attribute specification
  - ...
- Generally: un-organized, redundant, incomplete

Elicitation Plan – Estimates

- Identify development and customer participants in various elicitation activities
- Estimate of effort for elicitation
- Scheduling of resources

Elicitation Plan – Risks

- Factors that could impede completion of elicitation activities
  - E.g., hostile stakeholders
- Severity of each risk
- Likelihood of occurrence for each risk
- Mitigation strategy for each risk

Examine Project Viability

- Does-it make good business sense ?
  - It's very difficult to cancel a project once started
- Based on:
  - Product's purpose
  - Business advantage
  - Costs vs. benefits
  - Feasibility
  - Scope
  - Required resources
  - Requirements constraints
  - Risks

Project Viability – Purpose & Business Advantage

- Purpose
  - *What is the product? What does the product do?*
  - Highest-level customer requirement
  - Business need
  - All other requirements must contribute in some way to the purpose
- Business advantage
  - *Why build the product?*
  - The purpose of the product should be not only to solve the problem, but also to provide a business advantage
  - How will the product help the work?
  - A problem can be expressed as a difficulty that customers or users are facing or as an opportunity to produce some benefit, e.g., increased productivity or sales
  - Solving the problem leads to software development (or purchase)

Project Viability – Cost vs. Benefits

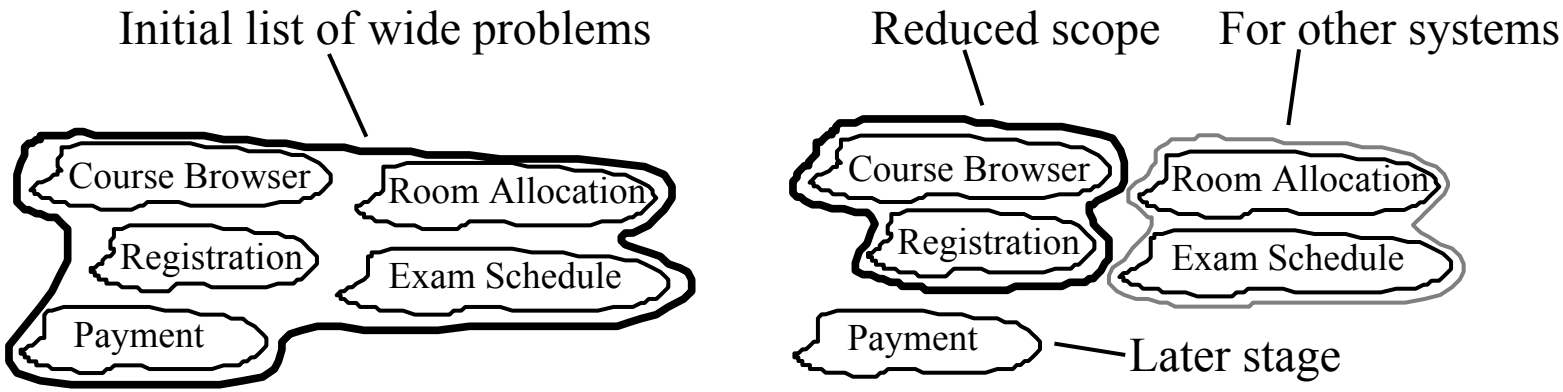
- Cost vs. benefits
  - *How much will the product help our work?*
  - *How much will it cost to develop and operate the product?*
  - Are the expected benefits greater than the anticipated costs?
    - Demonstrate! If not, stop the project!

Project Viability – Feasibility

- Feasibility
  - One reason for describing measurable requirements as soon as possible is to answer questions about feasibility
  - Technical feasibility
    - *Does the organization have the skills needed to build and operate the product?*
    - If not, stop the project
  - Economic feasibility
    - *Does the organization have the resources (time, money, staff) to construct the product?*
    - If not, stop the project

Project Viability – Scope (1)

- Scope: product's purpose and the system's boundaries
  - *How much of the work will be done by the system-to-be-developed?*
  - *How much of the work will be done by interacting systems?*
- Information needed for cost and time estimates
- Define more precisely the problem to solve
  - List all the things the system should have to do
  - Exclude as much as possible to reduce the complexity of the problem
  - Establish broader goals if the problem is too simple
  - Example: an automated system for university registration



Project Viability – Scope (2)

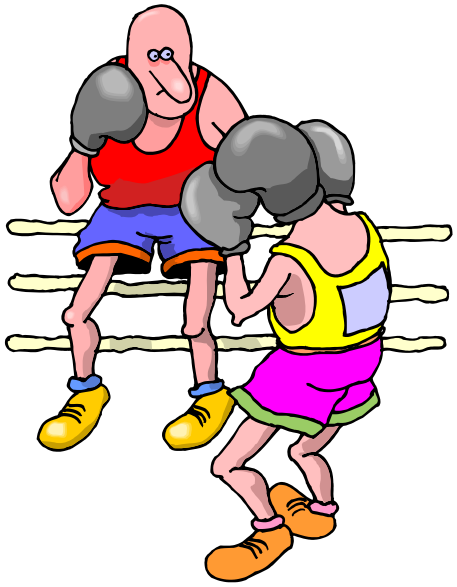
- The product vision for the kind of product it should be - may affect multiple projects
  - Point of view of customer, business
  - Evolves relatively slowly
- The scope for a single project, defining and communicating clear limits on what to implement
  - Important for the Project Manager
  - More dynamic vision
  - Can be found in a requirements document
- The requirements provide an understanding of what is needed to meet business objectives
  - Many changes!

Project Viability – Required Resources

- Required resources
  - *What are the required resources, i.e., money, time, and personnel?*
  - *How do they compare with available money, time, and personnel?*
- If the latter are smaller than the former, we should not even start the project

Project Viability – Constraints

- Requirements Constraints: *Are there constraints that will restrict the system's requirements or how these requirements are elicited?*
  - Solution constraints:
    - Mandated designs
    - Mandated interacting systems
    - Mandated COTS (commercial off-the-shelf) components
  - Time constraints
  - Budget constraints



- Warning! Fight to not impose constraints on the process, platform, or language unnecessarily or prematurely!

Project Viability – Risks

- Project Risks
  - *Are there any high-probability or high-impact risks that would make the project infeasible?*
  - For example:
    - Lack of clear purpose
    - Fragile agreement or disagreement on goals / requirements
    - Unmeasureable requirements,
    - Unstable requirements (rapidly or constantly changing)
    - …

Understand Problem

- Understand problem from each stakeholder's point of view (only the last few skills do not require social interaction!)
  - Observe current system
  - Interviews
  - Apprenticeship
  - Brainstorming
  - Facilitation
  - Make people open up to you
  - Manage expectations
  - Review documentation
  - Questionnaires
  - Identification of context
  - Detection of ambiguities and noise

Extract Essence

- Extract the essence of the stakeholders' requirements
  - Interpret stakeholders' descriptions of requirements
  - Possibly build models (may be part of your documentation!)
  - Gaps in the model behavior may indicate unknown or ambiguous situations
    - Models help focus our efforts
    - Should be resolved by asking the stakeholders (especially users)

Invent Better Ways

- Invent better ways to do the user's work
  - Ask why documented requirements so far are desired
  - The client/user's view can be limited by past experiences...
  - Consider whether the system should give the user more control over its transactions
  - Brainstorm to invent requirements the stakeholders have not yet thought of

Purpose of Vision and Scope Document

- The Vision and Scope Document is an intermediate document during the elicitation process.

- The idea is to do just enough investigation to form a justifiable and rational opinion of overall feasibility and the potential of the new system, and decide whether it is worth investing in further development[1]

[1] C. Larman

Elicitation Problems

Elicitation Problems

- According to Dean Leffingwell and Don Widrig:
  - The "Yes, But" syndrome stems from human nature and the users inability to experience the software as they might a physical device
  - "Undiscovered Ruins": the more you find, the more you realize still remains
  - The "User and Developer" syndrome reflects the profound differences between the two, making communication difficult
  - "The sins of your predecessors" syndrome where marketing (user) and developers do not trust each other based on previous interactions, so marketing wants everything and developers commit to nothing

Elicitation Problems – "Yes, But"

- When first time users see the system, the first reaction is either, "wow this is so cool" or "*Yes, but*, hmmmmm, now that I see it, what about *this*…? Wouldn't it be nice…?"
- Users' reaction is simply human nature
- Need to employ techniques that get the "yes, buts" out early
- Anticipate that there will be "yes, buts" and add time and resources to plan for feedback
- Tends to be user interface centric, tends to be the touch points of the system for the users

Elicitation Problems – "Undiscovered Ruins"

- Teams struggle with determining when they are done with requirements elicitation
  - Are we done when all the requirements are elicited or have we found at least enough?
  - Like asking an archaeologist "how many undiscovered ruins are there?"
- First scope the requirements elicitation effort by defining the problem or problems that are to be solved with the system
- Employ techniques that help find some of those ruins and have the stakeholders buy-into the requirements

Elicitation Problems – "User and Developer"

- Characteristic
- Users do not know what they want, or they know what they want but cannot articulate it
- Users think they know what they want until developers give them what they said they wanted
- Analysts think they understand user problems better than users do
- Everybody believes everybody else is politically motivated

- Response
- Recognize and appreciate the user as domain experts; try different techniques
- Provide alternative elicitation techniques earlier; storyboard, role playing, prototypes…
- Put the analyst in the users place; try role playing for an hour or a day
- Yes, its part of human nature, so lets get on with the program

Elicitation Problems – "Living with the Sins…"

- Like it or not, your users (marketing) and developers remember what happened in the past
  - Quality programs that promised things would be different
  - The last project where requirements were vague and/or were delivered short of expectations
  - The team "unilaterally" cut important features out of the last release
- Need to build trust, slowly
- Do not over-commit to features, schedule, or budget
- Build success by delivering highest priority features early in the process

Elicitation Problems – Other Factors (1)

- Social and organizational factors

- "No system is an island unto itself"
  - All software systems exist and are used within a particular context (technical AND social)
  - Social and organizational factors often dominate the system requirements
  - Determining what these are can be difficult and time-consuming
    - Developers are (usually) outsiders
    - People don't always tell the truth
    - Awareness of one's own "culture" can be hard

Elicitation Problems – Other Factors (2)

- These factors tend to cut across all aspects of the system:
  - E.g., a system that allows senior managers to access information directly without going through middle managers
    - Interface must be simple enough for senior managers to be able to use
    - Middle managers may feel threatened or encroached upon, be resistant to new system
    - Lower-level users may concentrate on activities that impress senior managers, which is not necessarily what they ought to be doing
    - Users may not like "random spot checks"; may devise ways of hiding what they're doing