Elicitation: An Art of Cold War

Each year Advanced Leadership Initiative covers three solution finding workshops called 'Think Tank' to delve deeper into the nature of social problems their potential solutions, the barriers to change and the ways advanced leaders can make a difference.

While past Advanced leadership initiative Think tanks focused on a particular issue - Education, Health, climate, economic opportunity the decision making for leadership think tank focused on decision making as a leadership skill an essential competency for Advanced leaders.

Addressing the unmet social need or unsolved problem differs from assigning tasks or formulating strategies in Established organizations, or exercising leadership in a domain with existing pathways and institutions.

Even seemingly simple ideas for change require, multiple strategies in Multiple domains, taking various stakeholders into account. Advanced leaders must work within complex and often (poorly) organized social contexts, where authority is diffused resources are dispersed, stakeholders are diverse, and goals are vague, ambiguous or conflicting.

Forging change thus requires a special kind of leadership, when leaders like formal authority over an unbounded system they need to think systematically while mastering relevant subject knowledge. They need highly developed sense of contextual and emotional intelligence to understand stakeholders' motivation and assumption. Finally, they have to find ways to create shared purpose and common ground to get multiple actors to move forward on an issue.

Leading within such a context requires individuals to make innumerable critical strategic, organizational and financial decisions.

"Complex decision making is a uniquely human capability," said Peter Zimmerman. What distinguishes human intelligence with a complex decision making is the inputs, data integrity.

Secondly, we are self-aware, we know what's going on inside, our varied wants and needs. We are able to sense of changes in surrounding what they mean for us and we have the capacity to act purposefully in response to events and actions of other. We have the capacity to deliberately link our actions to intent.

Thirdly we can imagine what other perceive and experience and in effect simulate their reactions to changes in environment. It is features in combination which enable us to know our own interests to imagine how others think and feel and to predict how others will likely react to what we (or yet others) say and do. It is this capacity to predict the consequence of action and events outside our own experience a uniquely human skill that enables complex decision making.

The traditional presentation of decision making begins with problem definition, specification of goals, information gathering, generation and analysis of options, identification of trade-offs, prediction of outcomes with attendant risk and uncertainty and in the end an act of deliberate choice. It is well established and valuable prescription for orderly, analytically rigorous, rational decision making.

Many public and private organizations, including most major co-operations and national governments have established systematic processes and technology to support decision making one of the methodology is requirement elicitation.

The Goal of requirement elicitation is achieving progress in the context dimension, the main goal of the elicitation activity is to elicit all requirement at the required level of detail for the system to be developed.

Diversity of Requirement Sources.
Requirements exists in various forms, e.g. as ideas, intensions or needs in the minds of stakeholders, as documented requirements typically in the form of text in Natural language, or Requirement models, or in existing systems as implemented requirements, there are many diverse sources from which requirements need to be elicited.

The different sources of requirements (e.g. Stakeholders documents, and existing systems) are typically not completely known at the beginning of the requirements engineering process. However, the consideration of all relevant source of requirements during requirement elicitation is essential for the success of the requirement engineering process and the development process. Considering all relevant sources of requirements is not only important for eliciting all the requirements for the system. But in order to support the acceptance of the system, the continuous search for relevant requirement sources is one of the three sub activities of requirement elicitation.

How can leaders motivate and lead organization for a Needful change?
It is with the help of eliciting Requirement that one understands the need, wants, assumption and intensions of the stakeholders. In this article we will learn about Use of Goals and Scenarios in requirement elicitation,
- Sub Activity: Identifying relevant requirement sources.
- Sub Activity: Elicitation existing requirements
- Sub Activity: Developing New and Innovative Requirement.
and the techniques and assistance techniques for elicitation.

The goal of the requirement activity is to:
1) Identify relevant requirement sources
2) Eliciting existing requirements
3) Developing new and innovative requirements,

Use of Goals and Scenarios in requirement Elicitation
Goals enable the stakeholders to document their intentions, for the system to be developed quickly and easily, stakeholders may refine goals and document the goals refinement using for instance, a graphical representation. In principle, goal models are well suited for documenting the purpose of the system at an abstract level.

Scenarios describe concrete system interaction and hence enable the stakeholders to describe concrete examples of satisfying the identified goals. Moreover, scenarios put the requirements in context, which supports the stakeholders understanding of requirement.

Hint 1: Using Goals and scenarios for eliciting detailed requirements.
1.1 Elicit and develop goals jointly with the stakeholder.
1.2 Define scenario for the identified goals by documenting concrete examples of goal satisfying Consider also scenario in which goals are not satisfied.
1.3 Analyse the scenario and identify possible new goals or goal refinements which goal does the scenario fulfil? Are these goals
1.4 Define Scenarios for the newly identified and/or refined goals and thereby establish an iterative goal-scenario development cycle
1.5 Do these goals document solution-oriented requirements based on identified goals and scenarios? Which properties must the system have in order to satisfy the goals as well as the scenarios?
already know? Complement, contradict or refine an already existing goal.

Sub activity - Identifying Relevant requirements sources. The Goal of this sub activity is to identify all relevant requirement sources in the system

context. In each requirement engineering process, there are obvious, well known requirement sources such as the legacy system, various documents (e.g. A user Requirements document, or a vision document) or Already identified stakeholders such as user/vision holder however many relevant requirement sources are initially unknown and must be elicited.

Consequences of missing relevant requirements sources.
If relevant requirement sources are not identified, they obviously cannot be considered during the requirement elicitation. Failing to consider relevant requirement sources during the requirements elicitation typically leads to an incomplete requirement specification leads to a low quality of resulting system.

For example, if important functions and quality requirements are missed. In addition, development cost and time are needed for implementing requirements that have not been identified in the first place due to incomplete consideration the relevant requirement sources.
For identifying unknown but relevant requirement sources we propose a two-step procedure. First potential requirement engineer identifies potential requirement sources. Based on the assessment the relevant requirement sources to be considered during requirement elicitation are selected.

Identifying potential requirement sources.

The Goal of the first step is to identify a large set of potential requirement sources. To identify potential requirement sources, we propose the following iterative procedure.

Step 1: Identify additional, potential requirement sources (Starting with the requirement sources already known) by

- Asking already identified stakeholders for additional, potential requirement sources, e.g. by conducting interviews, questionnaire or brainstorming sessions

- Checking already identified documents for additional, potential requirement sources, e.g. by analysing

references to potential requirement sources contained in the documents.

- Analysing existing systems for additional potential requirement sources e.g. by using a system with the goal in mind to identify and analyse the actors of this system (i.e. The roles of Person and other system who interact with this system)

Step 2: Record the Newly identified, potential requirement sources in a list.

Step 3: For each Newly identified requirement source perform 'Step 1' again.

In Principle all identified potential requirement sources should be considered during requirements elicitation. In practise the number of sources which are considered typically restricted by the resources (Time, cost, availability of experts etc) that can be used for requirement elicitation. Therefore, only a subset of identified sources can be considered during elicitation.

Example 1.1: Types of requirement source for a credit management system.
- Drivers; Actuators, Policy Makers, Front line consumers
- Value Creators: Decision Makers
- Credit System professionals, Government bodies
- Designers (Finance, technical, human welfare etc)
- Regulator Agency

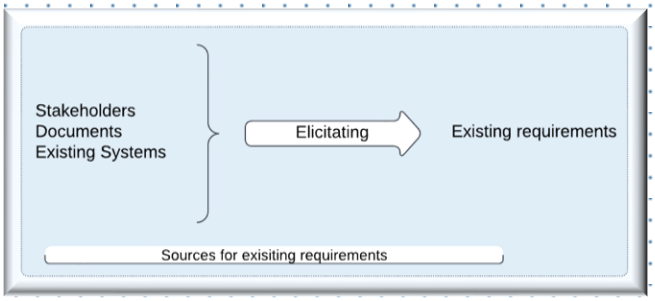
Hint 2 - Consider all four context facets for identifying potential requirement types, Potential requirement sources
- Check the subject facet for potential requirement sources
- Check the usage facet for potential requirement sources
- Check the IT system facet for potential requirement sources
- Check the development facet for potential requirement sources.

Example 1.2 Requirement sources for a Credit management system,

Requirement Sources for a Credit management system.
- Subject Facet: Information technology system facet
- Credit Sanctioning Authority
- Credit Evaluators
- Development Facet, Control Unit Experts

Sub-Activity: Eliciting Requirements Existing.

In the following we describe how existing requirements can be elicited from the relevant requirement sources. i.e. relevant stakeholders, relevant documents, and relevant existing systems.



Existing Requirements can be elicited from stakeholders through conversation, questionnaires or observations.

In a conversation a stakeholder tells the requirement engineer his/her requirements, conversation may take place within interviews or during workshops, example: **Requirement elicitation in an interview.**

Interviewer: "You have said that all customers with arrears shall be consulted with delinquency process, could you draw some sketch to clarify your requirement?"

Stakeholder: "I think of solution in which the customer who have not made payment as per the instalment plan should be charged a fee and to serve them differently and more ethically is required" Stakeholder draws a sketch,
"For the payment missed a warning a letter and call shall be sent to the customer"

Interviewer: "What shall happen if the customer still do not take action and does not make payment?"

Stakeholder: "In this scenario representative role: External debt collector consults the customer"

During the elicitation by means of questionaries, stakeholder writes down requirements themselves, example: **Requirement elicitation in questionnaire.**

"How do you want to differentiate customer who has arrears greater than instalment amount and one with more than 1 instalment?"
Ans: The Credit management system shows number of days in arrears, through this each account shall be given priority for external debt collector.

"In your opinion, how can risk of more severe delinquency process be avoided?"
Ans: First way could be with business decision to allow to extend the recovery period second, by improving the way we allocate the customer to representative role. For example, one with 1 instalment in Arrear can be allocated to telephone caller and more can be allocated to the external collector etc."

Requirements can also be elicited through observation by observing relevant stakeholders, requirements that the stakeholders cannot express directly because they belong to stakeholders everyday routine Beyer and Holzblart 1991.

Requirement elicitation by observation

The requirements engineers observe different drivers, actuators (Value creators, Credit system professionals, Government bodies, designers, regulatory agencies).

example: To elicit requirements for a credit management system.

The requirement engineer observes that the stakeholder is aware of un-willingness or inability of customer to make the payment, so stakeholder wants to channelize the delinquency management process such that the customer with less arrears should be consulted with less severity than one with higher arrears. With this observation the engineers define the requirement that the representative role who will conduct the collection process will look number of days the customer has not made the payment for instalment.

While eliciting requirement from the relevant requirement sources and in particular during interviews with clients the requirements engineer should pay attention to potential acceptance criteria

i.e. measurable requirements that needs to be demonstrated fulfilled in order to pass the system acceptance test.

If a requirements engineers elicit a requirement that is a candidate for an acceptance criteria they should document this requirement and mark it as potential acceptance criteria.

Eliciting existing requirements from documents.

To elicit existing requirements, the requirement engineers must read and analyse the relevant documents.

example: Extract from a law for Credit management system in judiciary.

Section 178 provides the priority of payment of debts. The debt recovery tribunal or debt recovery appellate tribunal has jurisdiction that is not intervened with the civil court once the proceeding is suited for the debt recovery appellate tribunal.

The law from example, must be considered during designing of credit management system. As a result, the requirements engineer may define, for instance the following two goals: "G1: The driver shall be able to override the actions against of the system at any time" and "G2: The system must not disturb any other system even in case of system failure."

When developing a system It is important especially to perform the elicitation of requirements from the relevant documents at an acceptable effort.

Eliciting Existing Requirements from existing systems.

Requirements that are implemented in an existing system can be elicited directly from the existing system. From stakeholders who are familiar with system or from documents about the existing system
(Such as user documentation or error reports)

The requirement engineers can elicit existing requirements that are implemented in a system by using the system or by observing the system for example, requirements for the new system can be derived from the stakeholder statement about necessary improvement of existing system.

Finally, requirements may be elicited from the document about the existing system in particular the requirement engineer should analyse error reports as well as maintenance reports of legacy systems. By analysing these documents, the stakeholders can avoid making the same error during the development of the new system or that the same defect occur in new system, once again.

Eliciting existing requirements from error reports.

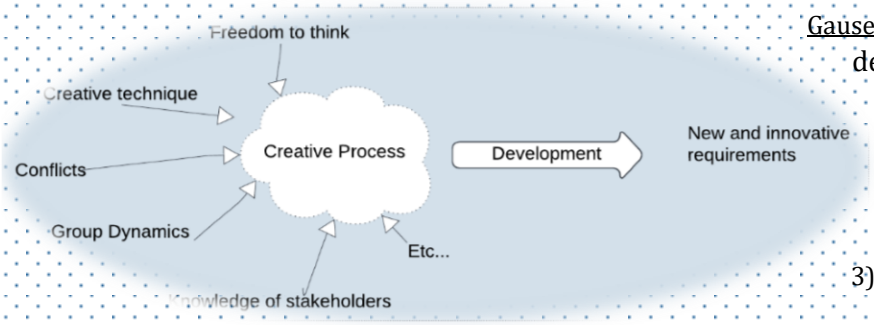
example, Error 'STL.PL.CashLoan.CashLoanApplication.PopulateScreen(CashLoanQualificationresponse' dot net application requires the value of parameter within specified range it checks the qualification (credit score) if the score lies within the range only then the function will work properly'.

Error correction: Install a file to make the information available or make the improvement in the code (See correction report KB 2003-4-12-K5) In an error report of a legacy system the following error has been recorded.

Sub-Activity: Developing new and innovative requirements.

New and Innovative requirements cannot be elicited in the same way as existing requirements are elicited i.e. by interviewing stakeholders, analysing documents and observing existing systems. Rather New and innovative requirements have to be developed in a creative process. The elicitation of new and innovative requirement can be supported to some extent by creativity technique such as brainstorming or the Osborn checklist.

According to experience innovative requirement emerge from bringing together different stakeholders with different views from generating ideas (that may be very vague initially) and even from requirement that appear to be conflicting but can be realised by means of new innovative solution. However a pre-requisite for successful creation of new and innovative requirements is successful cooperation of the different stakeholders.



Gause and Weinberg 1989 describe the development of requirements as follows, developing requirements is actually a process of developing a team of people who,

1) Understand the requirement
2) Mostly stay together to work on the project
3) Know how to work effectively as a team.

Requirement Engineering is a process to inspect the changes, it allows to nurture them. Changes can be devastating at some times, elicitation of requirement as per the requirement engineering ensure gradual approach to the new environment. To demonstrate requirement needs an insight, a clear vision of the future state. A motivated person is ready to act-how is influenced of the situation.

Our emotions may influence decisions through multiple mechanisms, The consequences of changes could be counterbalance with emphasis on

1) Context of thought
2) Depth of thought
3) Context of implicit goals.

Changes we adapt takes place because of needs, Maslow's hierarchy of needs is helpful for analysing the need, with proper approach this need can take place into a requirement and thus to an actual state.

Maslow's hierarchy of needs.

1) Self Actualization: Desire to become the most that one can be.
2) Esteem: Respect, self-esteem, status, recognition, strength, freedom
3) Love and Belonging: Friendship, intimacy, family, sense of connection
4) Safety Needs: Personal Safety, Employment, resources, health, Prosperity
5) Psychological Needs: Air, water, shelter, food, sleep, clothing, reproduction

In this chapter, we explain

- Our template for the description of elicitation techniques
- Six techniques for requirements elicitation

For each technique, we present:

- The benefits of the technique for the elicitation sub-activities
- An effort estimation for the technique
- Critical Success factors of the techniques
- A checklist with important hints for applying the technique

In this chapter we present the following six techniques for requirements elicitation

1) Interview
2) Workshop
3) Focus Groups
4) Observation
5) Questionnaire
6) Perspective-based reading

Effort and suitability for the three elicitation sub-activiites.

The sic techniques differ with regard to the effort needed for applying each technique and their suitability for supporting the three sub-activities of requirements elicitation, identifying requirement sources, eliciting existing requirements, Developing new and innovative requirements. Below table characteristics the suitability for each technique.

Suitability of the technique for the sub- activities		Developing new and innovative requirements	Eliciting existing requirements	Identifying requirement sources
Gathering Technique	Effort			
Interview	Medium to high	✓	✓	✓
Requirements workshop	High to very high	✓	✓	✓
Focus group	Medium to high		✓	✓
Observation (CI, field, apprenticing)	High to very high		✓	
Questionnaire	Low to medium	✓	✓	
Perspective-based reading	Medium to high		✓	

Template for describing the techniques,

The template eases access to these techniques and supports their comparison. The template consists of the following sections:
1) Preparation: This section describes the necessary actions for preparing the execution of a technique.
2) Execution: This section describes the essentials of performing the technique if applicable, steps of technique are presented and explained.
3) Follow up: This section describes necessary actions to be executed after having performed the technique, such as required follow-up work
4) Checklist for applying the technique: This section sums up the actions for preparation, execution and follow-up work of the technique in a comprehensive list.
5) Benefit for the requirements engineering activity (e.g., requirements elicitation): This section describes in which way the technique supports the particular requirements engineering activity such as requirement elicitation activity.
6) Effort: In this section, a rough estimation of the effort for the application of the technique is given based on the effort categories.

7) Critical Success Factors: This section describes critical factors that need to be considered for successful application of the technique. (with respect to preparation, execution, and/or follow-up, as appropriate)

Interview
The goal of conducting an interview in requirements engineering is to elicit requirements and context information for the system to be developed from a stakeholder or group of stakeholders. Basically, three kinds of interviews can be distinguished: Standardised interviews, exploratory interviews, and unstructured interviews.

During a standardised interview, the interviewer asks the interviewee prepared questions concerning an issue of interest. Independently of the answers given, the interviewer does not deviate from the prepared questions. The standardised interview is appropriate when the opinions of many stakeholders concerning the same issue shall be canvassed. The results of standardised interviews are easier to compare due to the standardised list of questions.

An exploratory interview is a conversation by means of which the interviewer elicits information about the opinion or view of the interviewee with respect to some issue. The interview is based on a list of prepared questions that the interviewer poses to the interviewee. The interview is based on a list of prepared questions that the interviewer poses to the interviewee. During an exploratory interview, the interviewer may deviate from the prepared questions, for instance, for a further enquiry regarding some answer given by the interviewee. The results of such an interview are qualitative. Hence results of different exploratory interviews concerning the same issue are difficult to compare with each other.

Unstructured interviews typically do not make use of a prepared question catalogue. The interviewer freely asks broad questions and allows the interviewee to lead he conversation in a direction at his/her own discretion. The results of different unstructured are very difficult, if not impossible to compare. We hence recommend applying standardised or exploratory interview for requirement elicitations.

Furthermore, one can differentiate between individual and group interview,
- Individual interview: During an individual interview, a single stakeholder answers the questions. The results of an individual interview hence reflect the opinion of one stakeholder.
- Group interview: The answers of different stakeholders to a question influence each other they develop from the participants' conversations. The results of a group interview hence reflect the opinion of the group.

The preparation, execution and follow-up actions of an interview are, in principle, the same regardless of the kind of interview (exploratory or standardised) and the number of participants (individual interviewee or group of interviewees). Hence we describe the differences with regard to the kind of interview and the number of participants where necessary.

Preparation

Defining the Goal of the Interview
The definition of the goal of an interview should include the reason for performing the interview and indicate the expected results. The explicit definition of the goal of the interview supports the preparation and execution of the interview. We recommend, in addition, including in the definition of the goal the type(s) of requirements to be elicited during the interview, e.g. goals or scenarios.

Example: The goal of the interview is to define the vision "accident-free driving". For the purpose, the intentions and ideas of the interviewees regarding the vision shall be elicited. The result of the interview shall be a set of goals which refine the vision. In addition, a few basic scenarios for accident-free driving shall be developed during the interview.

Selecting and inviting Participants
Based on the goal of the interview, the participants for the interview are selected from the group of potential stakeholders (if applicable, by determining their relative importance using the technique of selecting relevant stakeholders for requirement elicitation)

The participants should be invited to the interview in due time (approximately 3 weeks in advance), In order to ensure the availability of the participants for the interview. The earlier the participants are invited, the higher the probability that hey will be available for the interview.
In the context of invitation, the participants should be informed about the goal of the interview. This motivates the participants and allows them to prepare for the interview and, if applicable, to provide the interviewer with relevant materials such as documents.
We recommend informing the participants additionally about the status and rationale of the system development as well as the planned use of the results of the interview. From this background information, the stakeholders can recognise what contributions to the system development process are expected from them.

Choosing the interview Location
For conducting an interview, an undisturbed environment is needed, so that the interview participant(s) may concentrate completely on the interview. An interview at a participant's workplace has the advantage that documents can be easily accessed. However, conducting an interview at the participant's workplace should still be avoided because unplanned interruptions are very likely to occur.
For group interviews, the location should offer sufficient space for all participants.

Defining the interview Questions
Based on the goal of the interview, the requirements engineers have to develop appropriate questions that the interviewees shall answer. This especially holds for the standardised interview, where only predefined questions are posed.

Example: Excerpt from an interview questionnaire for the subject "Car safety system"
- What dies the term 'Safety in the car' mean for you?
- Which threats in traffic do you regard as critical?
- Which driver activities can be influenced by a car safety system?

Two basic kinds of interview questions can be distinguished:
- Closed questions: For each question, different response options are provided. The interviewee can choose one or multiple responses.
- Open questions: The interviewee is not provided with predefined response options. He answers the question in his own words.

Closed questions provide either a defined number of response options (Alternative A, B or C) or an interval within which the answers shall fall ("How old are you?" 1-99 years), closed questions can be applied to investigate an issue that is well understood and where the possible answers are known in advance. Since the available communication channels for the navigation system to be developed are known, the requirements engineers employ a closed question for the interview,

Example: Closed question for requirements elicitations
The car navigation system shall be able to exchange data with other end devices such as mobile phones. Which means of communication shall be supported for the exchange of data with these devices?
- Serial Interface
- Universal Serial Bus (USB) interface
- Infrared Interface
- Bluetooth
- Wireless local area network (LAN

Closed questions may be answered quickly and easily. The answers are directly comparable, since the interviewee can also choose between the given alternatives. This simplifies the analysis of the results. The

disadvantage of closed question is that no new answers or new ideas can be elicited.

A special type of closed question is a Boolean question. A Boolean question can be answered with 'Yes' or 'No'. Answers to these questions rarely allow deeper insight into the topic of the question. If the goal of the interview is to explore a topic in depth it is important to minimise the use of Boolean questions. However, Boolean question can be a useful tool to disambiguate answers of the interviewee. For instance, when the interviewee is asked a potentially uncomfortable question, he or she may answer evasively. Rephrasing the question in a way that requires, a concrete answer (i.e., "Yes" or "No") can help in this case.

Open questions allow the interviewee to answer in his own words. Therefore, open questions are well suited for investigating issues that are not yet well understood open questions inspire the interviewee to express