Elicitation Techniques

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Overview

Elicitation involves the actions that are taken to understand the users and discover their needs. Elicitation includes the discovery and some invention, as well as recording those bits of requirements information that customer representatives and subject matter experts (users) offer to the analyst. Elicitation demands iteration. The participants in an elicitation discussion won't think of everything up front, and their thinking will change as the project continues. Requirements development is an exploratory activity.

-Karl E. Wiegers (More About Software Requirements)

Brainstorming

Purpose

Brainstorming is an excellent way of eliciting many creative ideas for an area of interest. Structured brainstorming produces numerous creative ideas about any given "central question" or topic.

Description

In 1939, a team led by advertising executive Alex Osborn coined the term "brainstorm." According to Osborn, "Brainstorm means using the brain to storm a creative problem and to do so "in commando fashion, each stormer audaciously attacking the same objective."

Brainstorming is a technique that promotes diversion type of thinking. Diversion refers to those team activities that produce a broad or diverse set of options. Brainstorms help answer specific questions such as (but not limited to):

- What options are available to resolve the issue at hand?
- What factors are constraining the group from moving ahead with an approach or option?
- What could be causing a delay in activity 'A'?
- What can the group do to solve problem 'B'?

Brainstorming works by focusing on a topic or problem, and then coming up with many radical solutions to it. This technique is best applied in a group as it draws on the experience and creativity of all members of the group. In the absence of a group, one could brainstorm on one's own to spark new ideas.

Process

1. Prepare for Brainstorming
   - Develop a clear and concise definition of the area of interest.
   - Determine a time limit for the group to generate ideas, the larger the group, the more time required.
   - Decide who will be included in the session and their role - participant or facilitator. Aim for participants (ideally 6 to 8) who represent a range of background and experience with the topic.
   - Establish criteria for evaluating and rating the ideas.

2. Conduct Brainstorming session
   - Share new ideas without any discussion, criticism or evaluation.
   - Visibly record all ideas.
   - Encourage participants to be creative, share exaggerated ideas, and build on the ideas of others.
   - Don't limit the number of ideas as the goal is to elicit as many ideas as possible within the time period.
3. Wrap-up the brainstorming

- Once the time limit is reached, using the pre-determined evaluation criteria, discuss and evaluate the ideas.
- Create a condensed list of ideas, combine ideas where appropriate, and eliminate duplicates.
- Rate the ideas. There are many techniques that can be used to prioritize the ideas, e.g. multi-voting.
- Distribute the final list of ideas to appropriate parties.

**Intended Audience**

Ideas generated in a brainstorming session are consumed by any or all of the following:

- Project team
- Stakeholders

**Strengths**

- Able to elicit many ideas in a short time period.
- Non-judgmental environment enables outside-the-box thinking.

**Weaknesses**

- Dependent on participants' creativity.

**Document Analysis**

**Purpose**

Document analysis is a means to elicit requirements of an existing system by studying available documentation and identifying relevant information. Document analysis is used if the objective is to gather details of the "As Is" environment such as existing business rules, entities, and attributes that need to be included in a new system or need to be updated for the current system. This technique would also apply in situations where the subject matter experts for the existing systems are no longer with the organization, or are not going to be available throughout the duration of the requirements elicitation process.

**Description**

Requirements elicitation typically includes analysis of documents such as business plans, market studies, contracts, requests for proposals, statements of work, memos, existing guidelines, procedures, training guides, competing products literature, published comparative product reviews, problem reports, customer suggestion logs, and existing system specifications to list a few. Identifying and consulting all likely sources of requirements will result in improved requirements coverage assuming the documentation is up to date.

**Process**

1. Prepare for Document Analysis:
   - Evaluate which existing system and business documentation are relevant and appropriate to be studied.

2. Analyze the documents:
   - Study the material and identify relevant business details.
   - Document business details as well as questions for follow-up with subject matter experts.

3. Post Document Analysis wrap-up:
   - Review and confirm the selected details with subject matter experts.
   - Obtain answers to follow-up questions.

**Intended Audience**

- Project Team
- Subject Matter Experts
Strengths

- Not starting from a blank page.
- Leveraging existing materials to discover and/or confirm requirements.
- A means to cross-check requirements from other elicitation techniques such as interviews, job shadowing, surveys or focus groups.

Weaknesses

- Limited to "as-is" perspective.
- Existing documentation may not be up-to-date or valid.
- Can be a time-consuming and even tedious process to locate the relevant information.

Focus Group

Purpose

A focus group is a means to elicit ideas and attitudes about a specific product, service or opportunity in an interactive group environment. The participants share their impressions, preferences and needs, guided by a moderator.

Description

A focus group is composed of pre-qualified individuals whose purpose is to discuss and comment on a topic. This is an opportunity for individuals to share their own perspectives and discuss them in a group setting. This could lead participants to reevaluate their own perspectives in the light of others’ experiences. A trained moderator manages the administrative pre-work, facilitates the session and produces the report.

As this elicitation technique is considered a form of qualitative research, the session results are analyzed and reported as themes and perspectives, rather than numerical findings. The report may also include selected quotations to support the themes.

A traditional focus group gathers in the same physical room. An online focus group allows members to be located remotely while participating by a network connection. Each approach has pros and cons in terms of logistics and expenses.

A focus group can be utilized during any life-cycle state: exploratory, under development, ready to launch, or in production. If the group’s topic is a product under development, the group’s ideas are analyzed in relationship to the stated requirements. This may result in updating existing requirements or uncovering new requirements. If the topic is a completed product that is ready to be launched, the group's report could influence how to position the product in the market. If the topic is a product in production, the group’s report may provide direction on the revisions to the next release of requirements. A focus group may also serve as a means to assess customer satisfaction with a product or service.

Process

1. Prepare for the Focus Group

   **Recruit Participants**

   A focus group typically has 6-12 attendees. It may be necessary to invite twice as many individuals in order to allow for no-shows. If many people need to participate, it may be necessary to run more than one focus group.

   The topic of the focus group will influence who should be recruited. If the topic is a new product, it is likely that existing users (experts and novices) should be included. There are pros and cons that should be considered when using homogeneous vs. heterogeneous composition.

   - **Homogeneous** - individuals with similar characteristics. Caution: Differing perspectives will not be shared. Possible solution: conduct separate sessions for different homogeneous groups.
   - **Heterogeneous** - individuals with diverse backgrounds, perspectives. Caution: Individuals may self censor if not comfortable with others’ background resulting in lower quality of data collected.

   **Assign the moderator and recorder**

   The moderator should be experienced in facilitating groups. Typical skills include: promote discussion; ask open questions; facilitate interactions between group members; engage all members; keep session focused; remain neutral; be adaptable and flexible.

   **Create discussion guide**

   The guide includes goals/objectives of the session and five to six open questions.

   **Reserve site and services**

   Select the location for the session. Arrange for technical support to transcribe the session
and, if used, audio/video taping equipment.

2. Run the focus group session

The moderator guides the group's discussion, follows a preplanned script of specific issues and ensures the objectives are met. However, the group discussion should appear free-flowing and relatively unstructured for the participants. A session is typically 1 to 2 hours in length. A recorder captures the group's comments.

3. Produce Report

The moderator objectively analyzes and documents the participants’ agreements and disagreements and synthesizes them into themes.

**Intended Audience**

Depending on the topic of the focus group, the report may be directed to the:

- Stakeholders
- Business analyst
- Marketing.

**Strengths**

- Ability to elicit data from a group of people in a single session saves time and costs as compared to conducting individual interviews with the same number of people.
- Effective for learning people's attitudes, experiences and desires.
- Active discussion and the ability to ask others questions creates an environment where participants can consider their personal view in relation to other perspectives.

**Weaknesses**

- In the group setting, participants may be concerned about issues of trust, or may be unwilling to discuss sensitive or personal topics.
- Data collected (what people say) may not be consistent with how people actually behave.
- If the group is too homogenous the group's responses may not represent the complete set of requirements.
- A skilled moderator is needed to manage the group interactions and discussions.
- It may be difficult to schedule the group for the same date and time.
- If the goal of the focus group is to elicit ideas on a new or changing product, a focus group is not an effective way to evaluate usability.

**Interface Analysis**

**Purpose**

An interface is a connection between two components. Most systems require one or more interfaces with external parties, systems or devices. Interface analysis is initiated by project managers and analysts to reach agreement with the stakeholders on what interfaces are needed. Subsequent analysis uncovers the detailed requirements for each interface.

**Description**

Interfaces types include:

- User interfaces includes human user directly engaged with the system as well as reports provided to the user
- Interfaces to and from external systems
- Interfaces to and from external hardware devices

The users, external systems and systems that own the devices are considered stakeholders.

Interface analysis helps to clarify the boundaries of the system. It distinguishes which system provides specific functionality along with the input and output data needs. By clearly and carefully separating the requirements for each system, while jointly defining the shared interface requirements, a basis for successful interoperability is established.

It is important to look at the requirements across all interfaces. For example, data used for one interface may also be used for other activities and interfaces. Building a comprehensive glossary and data dictionary where all data is captured consistently and non-redundantly is critical. The data can then be referenced, even traced, to all interfaces where it is used.

**Process**
1. Prepare for Interface Analysis:
 Identify the necessary interfaces. An effective means to visualize the interfaces is to draw a Context Diagram. See Chapter 2 for details on the technique "Context/Business Domain Diagram", also Chapter 3 for details on "Stakeholders".

2. Conduct Interface Analysis:
 For each interface:
   - Determine its type: user interface, system-to-system interface, external hardware device interface
   - Elicit specific details about the interface, depending on its type.
     - For an interface where the user directly engages the system, see Chapter 4, Prototyping and Chapter 5 for details on the technique "Usage Models".
     - For an interface where a stakeholder receives a report, see Chapter 5 (reference is yet to be determined)
     - For a system-to-system interface or an interface with an external hardware device see Chapter 5 for details on the task "Define Supplementary Specifications, Interface Requirements".

Intended Audience

- Business Analysts and UI Designers working on detailed User Interface requirements.
- Designers and Data Modelers designing system-to-system requirements.

Strengths

- The elicitation of the interfaces’ functional requirements early in the system life cycle provides valuable details for project management:
  - Impact on delivery date. Knowing what interfaces are needed, their complexity and testing needs enables more accurate project planning and potential savings in time and cost.
  - Collaboration with other systems or projects. If the interface to an existing system, product or device and the interface already exists, it may not be easily changed. If the interface is new, then the ownership, development and testing of the interface needs to be addressed and coordinated in both projects’ plan. In either case, eliciting the interface requirements will require negotiation and cooperation between the owning systems.

Weaknesses

- Does not provide an understanding of the business process since this technique only exposes the inputs, outputs and key data elements related to the interfaces.

Interview

**Purpose**

An interview is a systematic approach to elicit information from a person or group of people in an informal or formal setting by talking to the person - the interviewee, asking relevant questions and documenting the responses. (This section considers the business analyst in the role of interviewer.)

**Description**

In an interview, a business analyst formally or informally directs his/her questions to: a stakeholder / a subject-matter-expert / a potential user to obtain answers that finally take the shape of requirements. One-on-one interviews are typically most common. In a group interview (more than one interviewee in attendance) the interviewer must be careful to solicit responses from all attendees.

For the purpose of eliciting business requirements, interviews are of two basic types:

- Structured interview, where the business analyst has a pre-defined set of questions and is looking for answers.
- Unstructured interview, where, without any pre-defined questions, the business analyst and the interviewee discuss in an open-ended way what the business expects from the target system.

Successful interviewing depends on several factors such as, but not necessarily limited to:

- Level of understanding of the business analyst in that business domain.
- Experience of the business analyst in conducting interviews.
- Skill of the business analyst in documenting the discussions.
- Readiness of interviewee to provide the relevant information.
- Degree of clarity in interviewee’s mind about what the business wants/expects from the target system.
Rapport of the interviewer with the interviewee.

**Process**

1. **Prepare for the interview**
   - Define the interview's focus or goal.
   - Identify potential interviewees. The stakeholders identified in the Requirements Planning KA may be the primary interviewees and/or will designate appropriate persons who should be interviewed. The sponsor considers the following questions when identifying who should be interviewed:
     - Who holds the most authentic and the most current information on the subject of interest?
     - What is his/her stake in the project?
     - What is the relative importance of information held by one person vis-à-vis that held by another person? This information is helpful when analyzing conflicting comments across interviews.
   - Design the interview. The business analyst may need to custom-design the interview for each identified interviewee. The interviewee's ability to participate and the desired outcome of an interview govern the design of an interview. In addition, these factors are also considered:
     - The format for the interview, structured vs. unstructured
     - If a structured interview, the type of questions:
       - Closed-ended questions: Questions that are used to elicit a single response such as: yes, no, 3. Example: How many hours does it take for the claim process to be completed?
       - Open-ended questions: Questions that are used to elicit a dialog or series of steps and cannot be answered in a yes or no fashion but need explaining. Example: What does a claim processor do on receipt of a claim form?
     - Organization of the questions: use a logical order or an order of priority/significance. Examples of order would be: general questions to specific questions; start to finish; detail to summary, etc. The actual organization is based on the interviewee's knowledge, the subject of the interview, etc. The goal is to follow a logical order rather than jump around when asking questions.
     - Location of participants. An interview can be conducted in-person or via telephone, or by means of other multi-media tools such as videoconferencing over the Internet or intranet.
     - The interview time and site are convenient to the interviewee.
   - Determine if a scribe is needed and if so, include that person in the scheduling process. Determine if a tape recorder is needed.

2. **Conduct the interview:**
   - Opening the interview
     - The business analyst as the interviewer gives an introduction, states the purpose of the interview, addresses any concerns raised by the interviewee, and explains that notes will be taken and shared with the interviewee after the interview.
   - During the interview:
     - The interviewer maintains focus on the established goals and pre-defined questions.
     - All concerns raised by the interviewee are addressed during the interview or documented for follow-up after the interview or in a subsequent interview.
     - The interviewer practices active listening to confirm what he/she understood from the information offered at various times during the interview.
   - Closing the interview - the business analyst asks the interviewee for areas which may have been overlooked in the session. Lastly, the business analyst summarizes the session, reminds the interviewee of the upcoming review process and thanks the interviewee for his/her time.

3. **Post interview follow-up and review:**
   After the interview is complete, the business analyst organizes the information elicited and sends the notes to the interviewee for review. Documenting the discussion for review allows the interviewer to see all of the information in context. This review may point out items that are incorrect or missing because the interviewer (or scribe) missed documenting them, or because the interviewer (or scribe) documented them incorrectly, or because the interviewee missed discussing them. This review is not intended to address whether or not the requirements are valid nor whether they will ultimately be approved.

**Intended Audience**

The Business Analyst for use in analyzing and documenting the requirements.

**Strengths**

- Encourages participation and establishes rapport with the stakeholder.
- Simple, direct technique that can be used in varying situations.
- Allows the interviewer and participant to have full discussions and explanations of the questions and answers.
- Enables observations of non-verbal behavior.
- The interviewer can ask follow-up and probing questions to confirm own understanding.
- Maintain focus through the use of clear objectives for the interview that are agreed upon by all participants and can be met in the time
Weaknesses

- Interviews are not an ideal means of reaching consensus across a group of stakeholders.
- Requires considerable commitment and involvement of the participants.
- Training is required to conduct good interviews. Unstructured interviews, especially, require special skills. Facilitation/virtual facilitation and active listening are a few of them.
- Depth of follow-on questions may be dependent on the business analyst's knowledge of business domain.
- Transcription and analysis of interview data can be complex and expensive.
- Resulting documentation is subject to interviewer's interpretation.

Observation

Purpose

Observation is a means to elicit requirements by conducting an assessment of the subject matter expert's work environment. This technique is appropriate when documenting details about the current processes or if the project intends to enhance or change a current process.

Description

Observation relies on studying people performing their jobs, and is sometimes called "job shadowing" or "following people around." For instance, some people have their work routine down to such a habit that they have difficulty explaining what they do or why. The business analyst may need to watch them perform their work in order to understand the flow of work. In certain projects, it is important to understand the current processes to better assess the process modifications that may need to be made.

There are two basic approaches for the observation technique:

- **Passive / invisible.** In this approach, the business analyst observes the subject matter expert working through the business routine but does not ask questions. The business analyst writes notes about what he/she sees, but otherwise stays out of the way, as if he/she was invisible. The business analyst waits until the entire process has been completed before asking any questions. The business analyst should observe the business process multiple times to ensure he/she understands how the process works today and why it works the way it does.
- **Active / visible.** In this approach, while the business analyst observes the current process and takes notes he/she may dialog with the worker. When the business analyst has questions as to why something is being done as it is, he/she asks the questions right away, even if it breaks the routine of the person being observed. In this approach, the business analyst might even participate in the work to gain an immediate appreciation for how the current process works.

Variations of the observation technique:

- In some cases, the business analyst might participate in the actual work to get a hands-on feel for how the business process works today. Of necessity this would be limited to activity that is appropriate for a non-expert to perform and whose results would not negatively impact the business.
- The business analyst becomes a temporary apprentice.
- The business analyst watches a demonstration of how a specific process and/or task are performed.

Process

1. Prepare for observation

   - Determine what sampling of users (e.g. experts and novices, just experts) to observe and which activities.
   - Prepare questions to ask during or after the shadowing.

2. Observe

   - Observer introduces himself to the person being observed and:
     - Reassures the user that their work is not being questioned but rather the observation of the work and resulting documentation will serve as input to requirements analysis. Informs the user that the observer is present only to study their processes and will refrain from discussing future solutions to any problems.
     - Explains to the user that they may stop the observation process at any time if they feel it is interfering with their work.
     - Suggests to the user that they may "think aloud" while they are working as a way to share their intentions, challenges, and concerns.
   - Conduct observation.
     - Take detailed notes.
     - If using the active observation approach, ask probing questions about why certain processes and tasks are being done.
3. Post Observation wrap-up

- Obtain answers to original questions, or new questions that surfaced during the observations.
- Feedback a summary of notes to the shadowed worker, as soon as possible, for review and any clarification.
- When observing many users, compile notes at regular intervals to identify commonalities and differences between users. Review findings with the entire shadowed group to ensure that the final details represent the entire group, not selected individuals.

Intended Audience

- Business Analysts for analysis of work flow, process modeling, business process reengineering.
- Designers and Human Factors experts designing the detailed interface requirements.

Strengths

- Provides a realistic and practical insight into the business knowledge by getting a hands-on feel for how the business process works today.
- Elicits details of informal communication and ways people actually work around the system that may not be documented anywhere.

Weaknesses

- Only possible for existing processes.
- Could be time-consuming.
- May be disruptive to the person being shadowed.
- Unusual exceptions and critical situations that happen infrequently may not occur during the observation.
- May not well work if the current process involved a lot of intellectual work or other work that is not easily observable.

Prototyping

Purpose

Prototyping, when used as an elicitation technique, aims to uncover and visualize interface requirements before the application is designed or developed. For additional details on prototyping see Chapter 5 Requirements Analysis and Documentation Section 5.14 Usage Models.

Description

Initial prototyping produces "mock ups" of the screens or report layouts for an application. Business users often find prototyping to be a comfortable, concrete means to identify, describe and verify their interface needs.

Prototyping can be categorized in two ways:

The functional scope of the prototype:

- Horizontal prototype: Models a shallow, and possibly wide, view of the system's functionality. Typically does not have any business logic running behind the visualization.
- Vertical prototype: Models a deep, and usually narrow, slice of the entire system's functionality.

The use of the prototype throughout the system development lifecycle:

- ’Throw-away’ Prototype: This exploratory approach seeks to quickly uncover and clarify interface requirements using simple tools, sometimes just paper and pencil. As the name suggests, 'Throw-away', such a prototype is usually discarded when the final system has been developed. The focus is on functionality that is not easily elicited by other techniques, has conflicting viewpoints, or is difficult to understand.
- Evolutionary Prototype: This rigorous approach extends the initial interface requirements into a fully functioning system and requires a specialized prototyping tool or language. This prototype produces "running" software. It emerges as the actual system downstream in the lifecycle.

Process

1. Prepare for prototyping
   Determine the prototyping approach: throw-away vs. evolutionary; vertical vs. horizontal.

   Identify the functionality to be modeled.
2. Prototype
Build the prototype.

3. Evaluate the prototype
Verify the prototype represents the user's needs.

**Intended Audience**

Designers and Human Factors experts designing the detailed interface requirements.

**Strengths**

- Supports users who are more comfortable and effective at articulating their needs by using pictures, as prototyping lets them "see" the future system's interface.
- A prototype allows for early user interaction and feedback.
- A throw-away prototype is an inexpensive means to quickly uncover and confirm user interface requirements.
- A vertical prototype can demonstrate what is feasible with existing technology, and where there may be technical gaps.
- An evolutionary prototype provides a vehicle for designers and developers to learn about the users' interface needs and to evolve system requirements.

**Weaknesses**

- Depending on the complexity of the target system, using prototyping to elicit requirements can take considerable time if the process gets bogged down by the "hows" rather than "whats".
- Assumptions about the underlying technology may need to be made in order to present a starting prototype.
- A prototype may lead users to set unrealistic expectations of the delivered system's performance, reliability and usability characteristics.

**Requirements Workshop**

**Purpose**

A Requirements Workshop is a structured way to capture requirements. A workshop may be used to scope, discover, define, prioritize and reach closure on requirements for the target system. Well-run workshops are considered one of the most effective ways to deliver high quality requirements quickly. They promote trust, mutual understanding, and strong communications among the project stakeholders and project team and produce deliverables that structure and guide future analysis.

**Description**

A requirements workshop, (also generically referred to as JAD, Joint Application Design), is not a traditional meeting. Instead, it is a highly productive focused event attended by carefully selected key stakeholders and subject matter experts for a short, intensive period (typically one or few days).

The workshop is facilitated by a team member or ideally, by an experienced, neutral facilitator. A Scribe (also known as a Recorder) documents the business requirements elicited as well as any outstanding issues. A business analyst may be the Facilitator or the Scribe in these workshops. In situations where the business analyst is a subject matter expert on the topic, the business analyst may serve as participant in the workshop.

A workshop may be used to generate ideas for new features or products, to reach consensus on a topic, or to review requirements. Other outcomes are often detailed requirements captured in models, such as the business domain model (Chapter 5.3), data and behavior models (Chapter 5.12), process/flow models (Chapter 5.13) and or usage models (Chapter 5.14).

**Process**

1. Prepare for the Requirements Workshop
   - Clarify the stakeholder's needs, and the purpose of the workshop.
   - Identify critical stakeholders who should participate in the workshop.
   - Define the workshop's agenda.
   - Determine what means will be used to document the output of the workshop.
   - Schedule the session(s).
   - Arrange room logistics and equipment.
   - Send materials in advance to prepare the attendees and increase productivity at the meeting.
   - Conduct pre-workshop interviews with attendees.
2. Conduct/Run the Requirements Workshop

- Elicit, analyze and document requirements.
- Obtain consensus on conflicting views.
- Maintain focus by frequently validating the session's activities with the workshop's stated objectives.

The Facilitator has the responsibility to:

- Establish a professional and objective tone for the meeting.
- Enforce discipline, structure and ground rules for the meeting.
- Introduce the goals and agenda for the meeting.
- Manage the meeting and keep the team on track.
- Facilitate a process of decision making and build consensus, but avoid participating in the content of the discussion.
- Ensure that all stakeholders participate and have their input heard.
- Ask the right questions; analyze the information being provided at the session by the stakeholders, and follow-up with probing questions, if necessary.

The Scribe's role is to document the business requirements in the format determined prior to the workshop.

3. Post Requirements Workshop wrap-up done by Facilitator

- Follow up on any open action items that were recorded at the workshop.
- Complete the documentation and distribute it to the workshop attendees and the sponsor.

### Intended Audience

Project team

### Strengths

- A workshop can be a means to elicit detailed requirements in a relatively short period of time.
- A workshop provides a means for stakeholders to collaborate, make decisions and gain a mutual understanding of the requirements.
- Workshop costs are often lower than the cost of performing multiple interviews. A requirements workshop enables the participants to work together to reach consensus which is typically a cheaper and faster approach than doing serial interviews as interviews may yield conflicting requirements and the effort needed to resolve those conflicts across all interviewees can be very costly.
- Feedback is immediate, e.g. facilitator's interpretation of requirements is fed back immediately to the stakeholders and confirmed.

### Weaknesses

- Due to stakeholders availability it may be difficult to schedule the workshop.
- The success of the workshop is highly dependent on the expertise of the facilitator and knowledge of the participants.
- Requirements workshops that involve too many participants can slow down the workshop process thus negatively impacting the schedule. Conversely, collecting input from too few participants can lead to overlooking requirements that are important to users, or to specifying requirements that don't represent the needs of majority of the users.

### Reverse Engineering

#### Purpose

In situations where the software for an existing system has little or outdated documentation and it is necessary to understand what the system actually does, reverse engineering is an elicitation technique that can extract implemented requirements from the software code.

#### Description

Forward engineering is the traditional process of moving from high level abstractions to physical implementation. Reverse engineering is a process of analyzing a subject system/product to identify underlying business processes, data and rules. Based on the identification work, representations of the system/product may be created at a higher level of abstraction.

There are two general categories of reverse engineering:

- Black Box Reverse Engineering: The system/product is studied without examining its internal structure.
- White Box Reverse Engineering: The inner workings of the system/product are studied.

The results of reverse engineering can provide:
An understanding of how a product works more comprehensively than by merely observing it.
A means to investigate errors and limitations in existing programs and a help in correcting them.
Details to help make products and systems compatible.
Details to help evaluate a product and understand its limitations.
Determining whether someone else has literally copied elements of one's own technology.
Documentation of a product whose manufacturer is unresponsive to customer service requests.
Details to help transform obsolete products.

Process

1. Prepare for reverse engineering:
   - Determine the scope of the functionality that needs to be reverse-engineered.
   - Evaluate the cost-benefit. As reverse engineering can be time-consuming and expensive, consider whether the financial investment is warranted by evaluating the potential benefits gained from improved documentation and/or derived abstraction in terms of maintenance of the existing system or development of a new system/product.

2. Perform reverse engineering:
   - Disassemble or decompile the original system.
   - Document the results in a manner that can be reviewed and verified by a business subject matter expert. These can serve as baseline details to elicit requirements for extending the existing system.

Intended Audience

Project team

Strengths

- Protects investment in existing system/product by enabling the analysts to 'buildup' existing functionality/business implementation.
- Provides detailed, current, information that can be used to update documentation of an existing system/product.

Weaknesses

- Expensive and time-consuming.
- Often restricted by copyright laws when a system/product of another manufacturer is involved.
- Existing tools that support reverse engineering have limited capabilities and require training to use.
- Requires specialized skills:
  - Ability to abstract from 'specific' to 'general'.
  - Ability to draw inferences, especially, when documenting business rules.
  - Ability to co-relate the functions of component(s) of a system with the current and/or intended business processes.

Survey / Questionnaire

Purpose

A survey is a means of eliciting information from many people, anonymously, in a relatively short time. A survey can collect information about customers, products, work practices and attitudes. A survey is often referred to as a questionnaire.

Description

A survey administers a set of written questions to the stakeholders and subject matter experts. Their responses are analyzed and distributed to the appropriate parties.

Questions in a survey are of two types:

- **Closed:** The respondent is asked to select from available responses. Useful when the issues are known but the range of user responses to them is not. The responses to closed questions are easier to analyze than those gained from open-ended questions.
- **Open-ended:** The respondent is free to answer the questions as they wish. Useful when the range of users' responses is pretty well understood, but the strength of each response category needs to be determined. The responses to open-ended questions may provide more detail and a wider range of responses than those gained from closed-ended questions but open-ended questions are more difficult to quantify and summarize.
Process

1. Prepare
A survey requires detailed preparation to ensure the needed information is obtained while minimizing the responders’ time to complete it.

- Define the purpose of the survey and the target survey group: Identify the objectives and the likely user group to be surveyed. Confirm with the sponsor.
- Choose the appropriate survey type: Initial steps of a survey are the same as for interview design (see Section 4.7.2 Interview), keeping in mind that semi-structured interviews are similar to 'open-ended' surveys; and structured interviews are similar to 'closed-ended' surveys.
- Select the sample group: Consider both the survey type ('open-ended' or 'closed-ended') and the number of people in the identified user group to determine if the entire group should be surveyed. For example: When the sample group is small, it may be practical to survey all members of the group. When the sample group is large and the desired survey type is 'open-ended', it may be necessary to identify a subset of users. For such situations use of a statistical sampling method will help ensure that survey results are not biased.
- Select the distribution and collection methods: For each sample group determine the appropriate communication mode - surface mail; e-mail; web-based; telephone.
- Project the desired level of response: Determine what response rate would be acceptable. If the actual response rate is lower then the use of the survey results may be limited. Offering an incentive can raise the response rate to 80% and above but the cost of the incentive must be justified and budgeted.
- Determine if the survey should be supported with individual interviews: As a survey does not provide the depth of data that can be obtained from individual interviews consider:
  - Pre-survey interviews may provide ideas for survey questions.
  - Post-survey interviews can target specific survey responses or themes to elicit a greater level of detail.
- Write the survey questions:
  - Communicate the purpose: Explain the objectives of the survey. If the stakeholders can see the reason for completing the survey, they are more likely to do so.
  - Be cognizant of the group's characteristics: Understand the background of the target group including their environment and specific terminology. Use this information when writing the questions. If there is significant diversity in the group's background it may be useful to divide a large group into smaller and homogenous groups during the preparation stage and then produce variations of the survey that fit each group's background.
  - Focus on the requirement: All questions should be directed towards the stated objectives and the objectives should be supported by a comprehensive set of questions.
  - Keep the survey short. Less than 10 items is preferable limit in terms of the content.
  - Make the survey easy and fast to complete, ideally no more than five or 10 minutes.
  - Make sure that the question wording is clear and concise.
  - Avoid double questions in a single question.
  - Avoid questions involving negatives.
  - Avoid complex branching structures.
  - Avoid asking questions that make respondents feel uncomfortable.
  - Trying to elicit information that is restricted by regulations is likely to put respondents on the defensive.
- Test the survey: Perform a usability test on the survey. Use the results to fine-tune the survey.

2. Distribute the survey

3. Communicate survey results

- Collate the responses. For the responses to 'open-ended' questions, evaluate the details and identify any emerging themes.
- Analyze and summarize the results.
- Report findings to the sponsor.

Intended Audience

The survey questionnaire may be directed at any or all of the following:

- Marketing
- Project team
- Subject matter experts
- Primary and secondary stakeholders
- Current/potential users of a system.

Strengths

- When using 'closed-ended' questions, effective in obtaining quantitative data for use in statistical analysis.
- When using open-ended questions, the survey results may yield insights and opinions not easily obtainable through other elicitation techniques.
- Does not typically require significant time from the responders.
- Effective and efficient when stakeholders are not located at one place.
- May result in large number of responses.
- Quick and relatively inexpensive to administer.
Weaknesses

- Use of open-ended questions requires more analysis by the business analyst.
- To achieve unbiased-results, specialized skills in statistical sampling methods are needed when the decision has been made to survey a sample subset.
- Some questions may be left unanswered or answered incorrectly due to their ambiguous nature.
- May require follow up questions or more survey iterations depending on the answers provided.
- Not well suited for collecting information on actual behaviors.