# Eliciting Requirements

"The hardest single part of building a system is deciding what to build… No other part of the work so cripples the resulting system if done wrong. No other part is more difficult to rectify later." —Dr. Fredrick P. Brooks, Jr.

Elicitation: [is the process of identifying the needs and bridging the disparities among involved communities for the purpose of defining and distilling requirements to meet the needs of an organization or project while staying within imposed constraints. It involves: all aspects of meeting with stakeholders, recording their needs, and classifying them into a manageable set of stakeholder requests that will later, through an analysis process, become requirements]. Different between elicitation and analysis:

- **Elicitation** is the interaction with stakeholders to capture their needs.
- **Analysis** is the refinement of stakeholder needs into formal product specifications.

## 1. Introduction

As Dr. Brooks points out, one of the most difficult parts of the development life cycle is the identification of key requirements. Analysts can sometimes begin working on a project with a predisposition or bias that may impact their work. For example, if software developers are given the task of defining product requirements, they may start with solutions with which they are most comfortable. Analysts must be trained to separate solutions from requirements when transcribing client needs and creating requirements specifications. we discuss approaches that can be used to elicit customer needs along with some metrics that can be used to measure progress.

## 2. Issues and Problems in Requirements Elicitation

Eliciting requirements from stakeholders can sometimes become a painful, drawn-out, and thankless task.

- requirements are reverse-engineered purely for contractual reasons reverse-engineer requirements for a system are needed when:

a) Collecting requirements may be viewed as an afterthought or assigned to junior staff.

b) There are no documented requirements until the project is nearing completion and the staff realizes that requirements are necessary to create test cases.

c) A requirements review is necessary for client acceptance or payment.

## ❖ Typical situations that may impede or otherwise affect the requirements elicitation process are:

- ❖ The Missing Ignoramus
- ❖ The Wrong Stakeholders
- ❖ Untrained Analysts
- ❖ Not Identifying Requirements Level
- ❖ Failure to Accurately Identify Stakeholders
- ❖ Problems to Collect Enough Information
- ❖ Requirements Are Too Volatile
- ❖ System Boundaries Are Not Identified
- ❖ Understanding of Product Needs Is Incomplete
- ❖ Users Misunderstand What Computers Can Do
- ❖ The Requirements Engineering Has Deep Domain Knowledge
- ❖ Stakeholders Speak Different Natural and Technical Language

## 1- The Missing Ignoramus

Elicitation should be led by senior staff members with experience and training in requirements elicitation techniques. An elicitation team composed of a mixture of experienced staff and not-so experienced staff enables the mentoring and training of less-experienced members of the team. It is usually advisable to have someone involved with the elicitation process who has no domain knowledge, e.g., someone who is not afraid to ask "what does that mean?" "smart ignoramus".

What happen if Elicitation does not have smart ignoramus? situations can arise where:

a) Insufficient information is collected.

b) The same term is used to mean different things.

c) You may find legitimate reasons for the need, or you might find out it is "feature folklore.

**Feature Folklore:** is something that has been done on every project, but such features have no value to the customer and nobody knows why they are there. This can result in the elimination of an unnecessary need that turns into a requirement that you implement and the customer does not want.

## Notes:

* Requests are not requirements until they have gone through a review process and been accepted.

- The job of the analyst is to capture organization, project, or product needs, and not to engage in wishful thinking or make solution decisions. For example, database analysts might think of database configurations as they conduct interviews

* Under no circumstances should the "will" statements appear in a requirements specification. Specifications may become part of binding contracts, and it is important to avoid having wishful thinking or expected external behavior contractually guaranteed by a supplier.

* لا ينبغي بأي حال من الأحوال أن تظهر بيانات "الرغبة أو التوصية" في مواصفات المتطلبات .
* قد تصبح المواصفات جزءا من العقود المُلزمة، ومن المهم تجنب وجود تفكير بالتمني أو سلوك خارجي متوقع يضمنه المُوَرد بشكل تعاقدي.

*Because of the difficulty in getting stakeholders and analysts to understand and review each other's work, we recommend wherever possible using visual techniques, including models, diagrams, and tables, to communicate important concepts.

***Requests:** something that the system shall do.

**Context:** might include information about the way the environment will be impacted by the system after installation.

Context might also include background information about the reason the system is being purchased or created; it might include background information describing the environment. We recommend that be kept in separate documents or, at the least, in separate sections of a document.

* we recommend wherever possible using visual techniques, including models, diagrams, and tables, to communicate important concepts.

* Requirements are often captured at different levels of detail (see Figure 3.1)

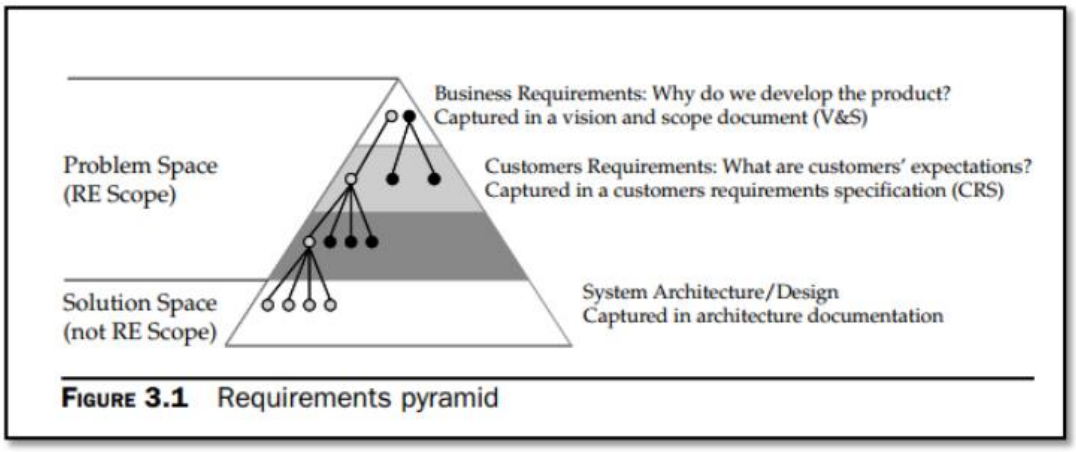


**FIGURE 3.1** Requirements pyramid

## *Stakeholders Omit Important, Well-Understood, Tacit Information

**أصحاب المصلحة يحذفون معلومات مهمة, مفهومة بشكل جيد و ضمنية**

* On occasion, a stakeholder or domain expert may be "too close" to the material he or she is describing and forget to include salient points, assuming that the material is so basic that it does not need to be communicated. You may have been in a situation where you were reading the instructions for doing something, could not get it to work, and then found out that steps were missing from the instructions. The "smart ignoramus can help, but a trained analyst or facilitator is really necessary during elicitation sessions to ensure that every last detail needed to define a product is captured.

* The conflict must be resolved, but not during the elicitation session (unless it is just a matter of a minute or two). Conducting an elicitation session requires the same skill at moderation or facilitation as any other professional meeting, and complex or lengthy discussions need to take place elsewhere to avoid a loss of productivity.

## 3.3 Requirements Elicitation Methods

Requirements elicitation is the interaction with stakeholders to capture their needs. No decisions have been made at this point about which of the needs will become requirements, and which of the requirements will be included in a release of the product that is yet to be built. Furthermore, in many cases the same techniques can be used for both elicitation and analysis (Figure 3.4). As there are so many different ways to capture stakeholder needs, we only mention a few here.

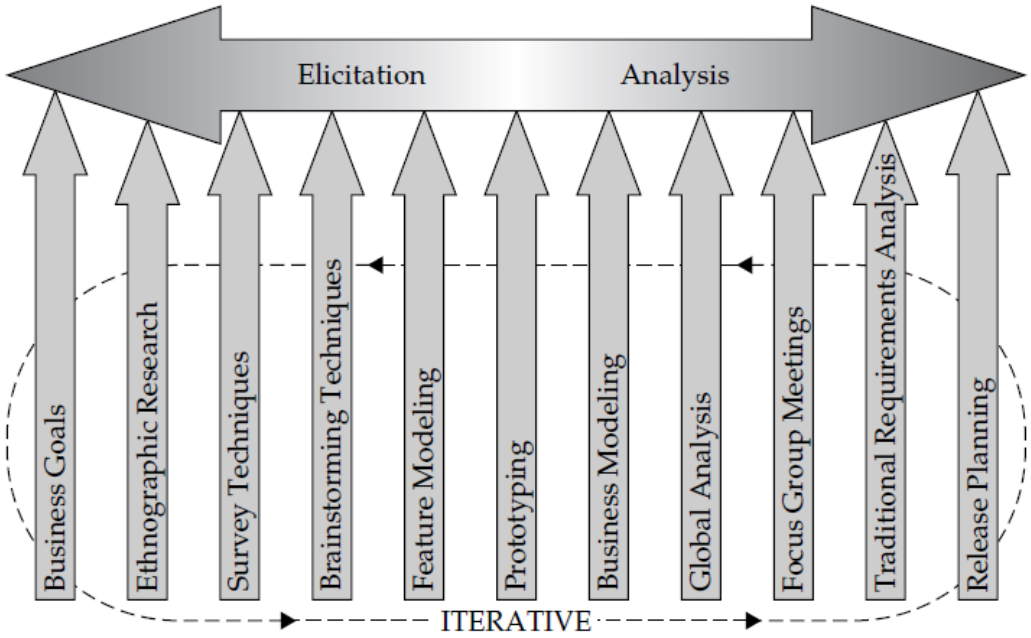


**FIGURE 3.4** Example elicitation and analysis methods

## Eliciting Business Goals

A sometimes overlooked (يتجاهل) aspect of requirements elicitation is the determination of business goals. These goals are associated with the needs of the manufacturing or development organization rather than the needs of the customer or purchaser. For example, sample business goals might be :

- Increase profitability by 5 percent the next fiscal year. زيادة الربح بنسبة 5 في المئة في السنة المالية المقبلة
- Customers should associate our product with high quality. يجب على العملاء ربط منتجاتنا بجودة عالية
- Customers should associate our product with best value. يجب على العملاء ربط منتجاتنا بأفضل قيمة
- Our next product should take advantage of emerging technologies.

ينبغي أن يستفيد منتجنا القادم من التكنولوجيات المستجدة.

One way of visualizing and capturing business goals is a simple graphical technique known as goal modeling. Two of the more popular techniques **are KAOS and I***.

**Goal modeling**: is a nice way to crystallize ideas, to present corporate goals in a simple-to-understand and unambiguous way, and to identify and balance difficult choices.

هو وسيلة جيدة لبلورة الأفكار، لتقديم أهداف الشركة بطريقة بسيطة وواضحة لفهما، وتحديد وتوازن الخيارات الصعبة.

In Figure 3.5, we see a simple goal model fragment, where a plus sign indicates that the lower-level goal contributes to the higher-level goal, and a minus sign indicates that the lower-level goal detracts from the higher-level goal. If the additions and detractions can be quantified, then the selection of the optimal goal set can be calculated.

تشير علامة الجمع إلى أن الهدف من المستوى السفلي يساهم في هدف المستوى الأعلى، وتشير علامة الطرح إلى أن الهدف من المستوى الأدنى ينتقص من هدف المستوى الأعلى. إذا كان بالإمكان قياس الإضافات والانحرافات، فيمكن عندها اختيار مجموعة الأهداف المثلى.

However, the reality is that the contribution of many high-level requirements cannot be calculated for a variety of reasons, including changing demographics, rapid shifts in technology, etc. Sometimes, difficulties associated with conflicting goals are not recognized until the requirements have gone through a complete review cycle. The refinement of nonfunctional requirements can bring to light issues that may otherwise remain hi dden. The importance and impact that nonfunctional requirements can have warrant their consideration and elicitation as early as possible in the product development cycle.

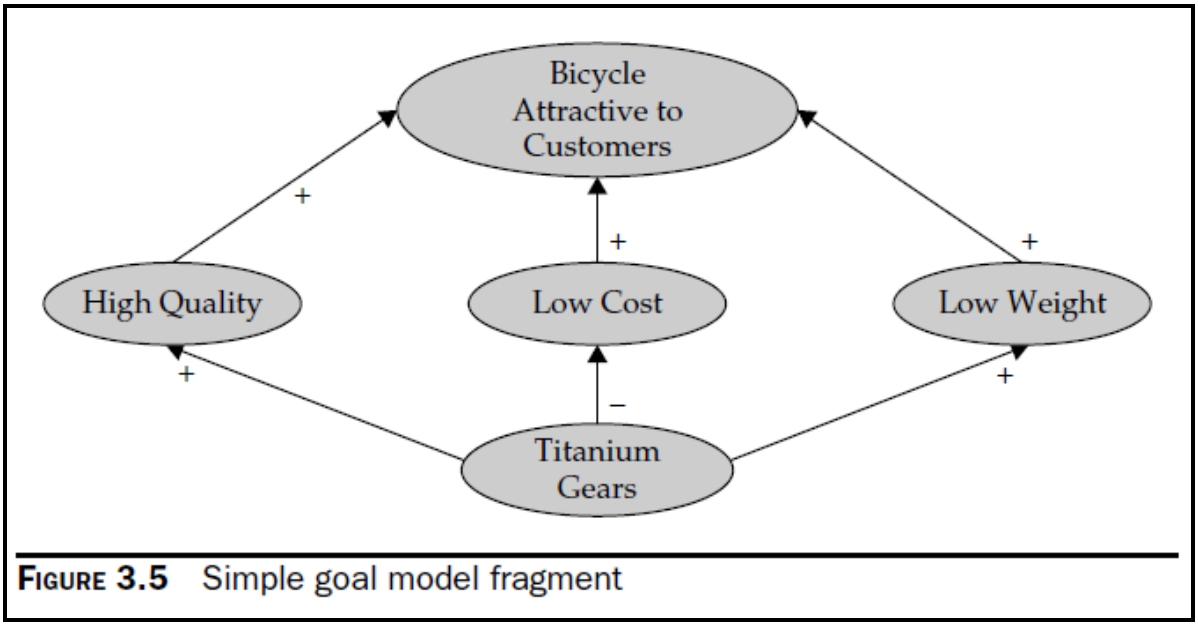


**FIGURE 3.5** Simple goal model fragment

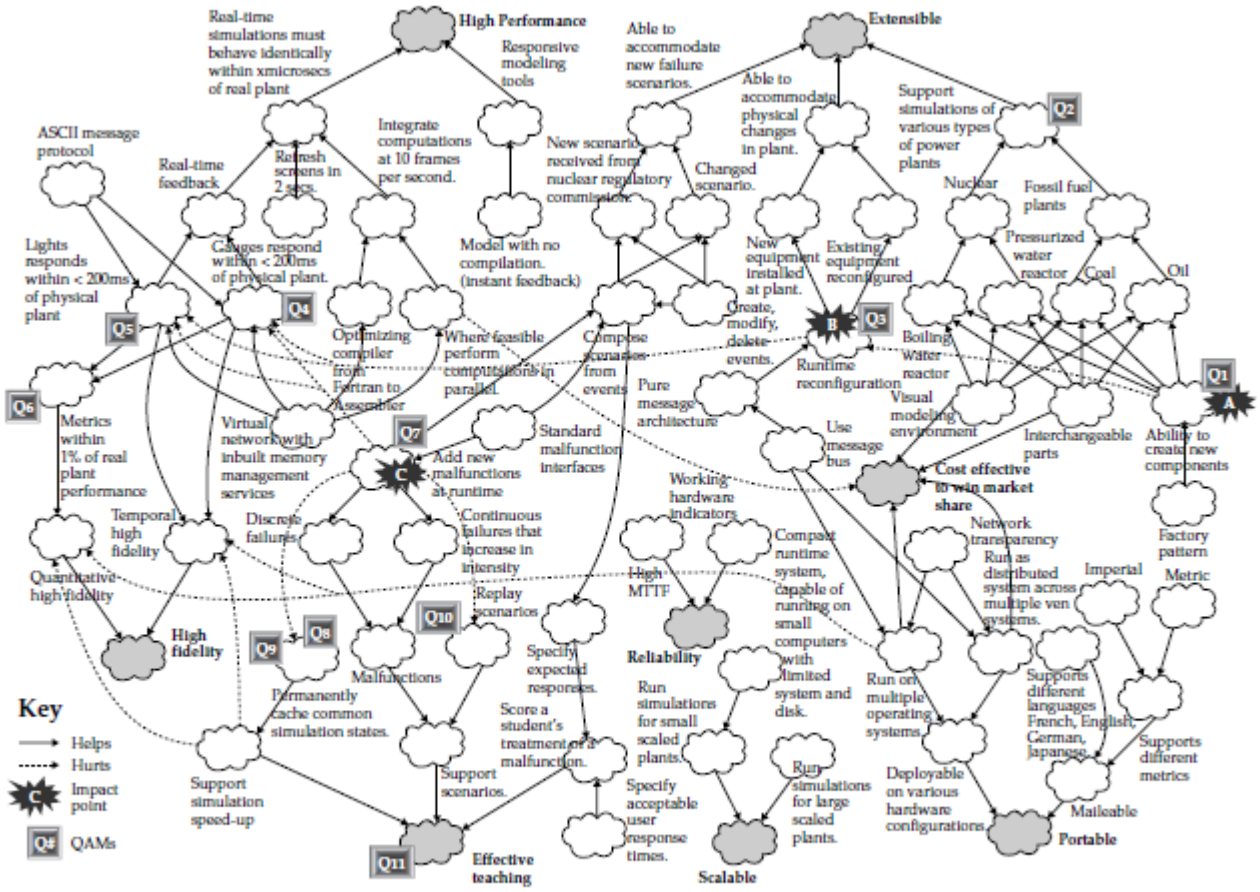


**FIGURE 3.6** Partial goal model for a nuclear power plant simulator (Picture courtesy of Professor Jane Cleland-Huang, DePaul University, 2005)

جزءمن نموذج الهدف لمحاكاة محطة الطاقة النووية

Goal models can be as simple or as complex as necessary. Figure 3.6 shows some of the goals for a nuclear power plant simulator. Such simulators, mandated by regulation, are used to train the operators of nuclear power plants and must have high fidelity and reliability. The figure shown identifies quality assessment methods, or **QAMs**, that are used to determine how well the business goals meet the desired quality. For example, QAM 5 states that when any action is taken, the simulator indicator light response shall be within 200 milliseconds of the response in the real plant. That is, if a button is pressed in the power plant closing a valve and an indicator light comes on in three tenths of a second, then in the simulator, that light must come on within three to five tenths of a second. The actual QAM was evaluated by randomly connecting an oscilloscope to button/light pairs (there were thousands of such pairs) in the simulator and determining that the response was within specification by measuring the step wave on the oscilloscope.

Goal models with QAMs can be used as checklists to ensure that important nonfunctional requirements have not been overlooked. If a QAM cannot be defined for a nonfunctional requirement, then it may not be possible to test that the requirement has been met, and the requirement should then not be part of a contract or requirements specification, as it may not be feasible to implement.

## Ethnographic Techniques

Ethnographic research tends to focus on a particular community or culture. Typical collection methods are interviews and surveys. These are techniques not normally thought of as being a part of requirements engineering, yet some survey methods are heavily used to:

1- Evaluate market demands.

2- Possible interest in a product and even emotional content.

3- Furthermore, where there is a large customer base to draw on, it is possible to perform statistical analyses on surveys to measure customer interest or the emotional appeal of product features.

One of the most common survey methods for analyzing customer interest in features is **Kano modeling**, named after its inventor, Professor Noriaki Kano.

Kano modeling provides three variables to measure customer interest: one-dimensional, expected, and attractive quality.

**One dimensional or linear quality:** applies where the potential value of a product feature increases linearly with some aspect of the feature. A good example of this is refrigerator energy efficiency. The more efficient the refrigerator is, the greater the likelihood it will attract purchasers.

**Expected quality:** is a feature that is mandatory for a product to succeed in the marketplace.

**Attractive quality:** is a feature that is not expected but would add to the emotional appeal of a product.

Product features can have different types of Kano quality variables, depending on locale, targeted market, and time. For example, a camera in a cell phone would have been an attractive quality several years ago but is now an expected quality in most markets.

**One interesting** aspect of Kano modeling is that measurements can be culturally sensitive. For example, in the United States most automobile customers would expect to purchase a car with an automatic transmission, while in Europe, a manual transmission is the norm. Kano modeling is widely accepted; some commercial requirements engineering management software tools come with Kano analysis facilities built in. **Another interesting** use of survey and interview techniques is the measure of the emotional appeal of a product feature. Engineers and software developers are often not aware of or interested in the emotional appeal of their products, yet such factors can have important consequences for product sales. One extreme example of failing to take emotional appeal into consideration is the case of the Ford Edsel. The Washington Post called it the “The Flop Heard Round the World. After the car was introduced, customer response was extremely negative, including comments such as “an Oldsmobile sucking a lemon” and “a Pontiac pushing a toilet seat.

## Prioritization and Ranking of Requirements

While prioritization and ranking of requirements typically occur after analysis (or even later), the topic is worth mentioning here, as customer priorities are best captured during elicitation. First, we should mention the difference between the two, as there tends to be some confusion regarding the use of the two terms.

**Prioritization:** is the assignment of importance to a requirement using a tag or label. For example,
- "The base engine sold with the car shall be a 1.8 liter turbocharged engine"—priority high.
- "18 inch wheels shall be offered as an option with the car"— priority medium.

Priorities are usually defined at the start of a project, using either a numerical or verbal ranking; e.g., 1 means most important and 5 means least important (a numerical ranking has the advantage of being sortable).
When priorities are assigned to requests and requirements by stakeholders, only one of the defined values is acceptable.

**Ranking:** is the assignment of a unique order to each requirement in a group, such that no two requirements have the same rank. For example,

| | |
|---|---|
| Under $100 street price | 1 (the lower number is more important) |
| Built-in camera | 2 |
| Operable with one hand | 3 |
| LCD panel can be seen in daylight | 4 |

When deciding which features will be in a product release, a ranking technique is normally used, whereas prioritization is used more for initial scoping. When questionnaires or surveys are sent out to customers, they will typically be asked to assign a priority to a feature (e.g., more likely to buy the product, no difference, less likely to buy the product).

A common problem can occur when customers label their stakeholder requests as being of high," "medium," or "low" priority, since to some customers, every request will be of "high" priority. An effective approach when scoping a product or planning schedules or releases is to use **pairwise ranking**. Pairwise ranking, sometimes called the **Analytic Hierarchy Process**" **(AHP)**, is where the stakeholder or analyst ranking the requirements looks at only two requirements, compares them, and ranks them; e.g., the more important of the two is placed higher in a list. This process is done iteratively until all the requirements have been ranked. While the approach may work well for small requirements sets, as the number of requirements N increases, the number of rankings that must be done increases quadratically تربيعيا **(N(N – 1)/2)**. Since different stakeholders may rank the same requirements set differently, an approach must be formulated to merge the different sets of ranked requirements. We

therefore recommend that a pairwise ranking prioritization be restricted to stakeholder requests or product features (near the top of the pyramid), to reduce the ranking effort.
Another technique used to prioritize requirements is the "**planning game**," or **PG**, approach, popularized with extreme programming. In the PG approach, stakeholder requests, features, or requirements (depending on when prioritization takes place) are partitioned into three sets that align with Kano qualities:

1- Needed for the system to function.
2- Add real value.
3- Nice to have but not necessary.

An informal risk analysis is done to determine the ease of implementation effort, and a final decision is made as to which features or requirements to implement. Ranking cannot take place In a vacuum; e.g., the cost and risk associated with implementation must be known. Furthermore, in some industries additional factors such as hazards (to the consumer) and technology shifts must be considered. For example, a novel technique for opening and closing car windows is evaluated that uses a light sensor; i.e., no physical contact with the switch is required. The cost to implement is low, customers evaluate the feature very highly, and it seems to have high positive emotional value. However, the hazard analysis indicates the potential for an unsafe condition, as a child can be hurt or injured when the window rises accidentally. As a result, the feature is not included in the next year's car model.

In summary, initial prioritization of stakeholder requests should take place as early in a product life cycle as possible. Several prioritization activities may be needed, one just for the stakeholders, another when the architect or designers evaluate the cost and risk of implementation, and possibly additional sessions prior to the build/ no build decision. Prioritization should be accomplished as far up the requirements pyramid as is feasible, with ranking taking place once the requirements are sufficiently finalized such that the cost and resource impact of implementation is understood. Furthermore, some techniques such as pairwise ranking may not be feasible with a large number of requirements, e.g., rank at the feature level and not at the system level. Prioritization (and the ranking of small sets of requests) can be combined with the stakeholder review process where the determination is made as to whether a request is "in" or "out"; i.e., will or will not become part of the approved requirements set.

## Quality Function Deployment (QFD) Method

QFD was developed by Drs. Shigeru Mizuno and Yoji Akao in an effort to integrate customer needs into product designs. According to the QFD Institute, the QFD method:

1. Seeks out spoken and unspoken customer needs from the fuzzy voice of the customer verbatim.
2. Uncovers "positive" qualities that wow the customer.
3. Translates these into design characteristics and deliverable actions.
4. Builds and delivers a quality product or service by focusing the various business functions toward achieving a common goal—customer satisfaction.

As QFD is well documented, it will not be described here. QFD is often part of a Six Sigma program. The **"house of quality" matrix** (so named because the matrix shape resembles a house) is a widely used technique for capturing unspoken customer needs and then correlating them with requirements.

## Brainstorming Sessions

Brainstorming sessions are widely used to elicit initial stakeholder requests for products. They tend to take place with multiple stakeholders or customers, and the sessions are usually managed by experienced facilitators in one session over one or two days maximum.

**The objective of a brainstorming session** is to come up with new and innovative ideas or product features in a very rapid period of time. A brainstorming session tends to have a set of discrete, well-defined activities. A capable facilitator is essential to the success of the session. When defining ideas, it is important to avoid conflicts: e.g., one participant disparaging the ideas of another. Since very senior people can be in the session, it is important that they not intimidate the other,less senior-level participants.

An interesting story was told to one author during his military service. Military schools for senior officers often teach brainstorming techniques. At one such class, an Air Force captain, who was a friend of the author, engaged in a heated discussion with one of the other participants. After the session was over, the captain went over to the other participant to review their in-class discussion, only to find out to his dismay that the other officer was a lieutenant general.

The general explained to the captain that when he went in to class, he always hid his rank as best he could to avoid intimidating the other students, as he wanted their unbiased opinions. In business, it is the **role of the facilitator** to prevent intimidation or speech making from occurring, and to keep the session moving smoothly. The objective and duration of the brainstorming session must be agreed upon by all the participants. This should ideally be determined prior to the start of the session.

**The session starts with:** a free flow of ideas, creating an unsorted set of product suggestions. Often "sticky notes" are used to record the ideas, and they are placed on a board (see Figure 3.7). Some general brainstorming protocols include allowing duplicates or similar ideas to be recorded, and discouraging filtering or censorship; e.g., allow "extreme" ideas.

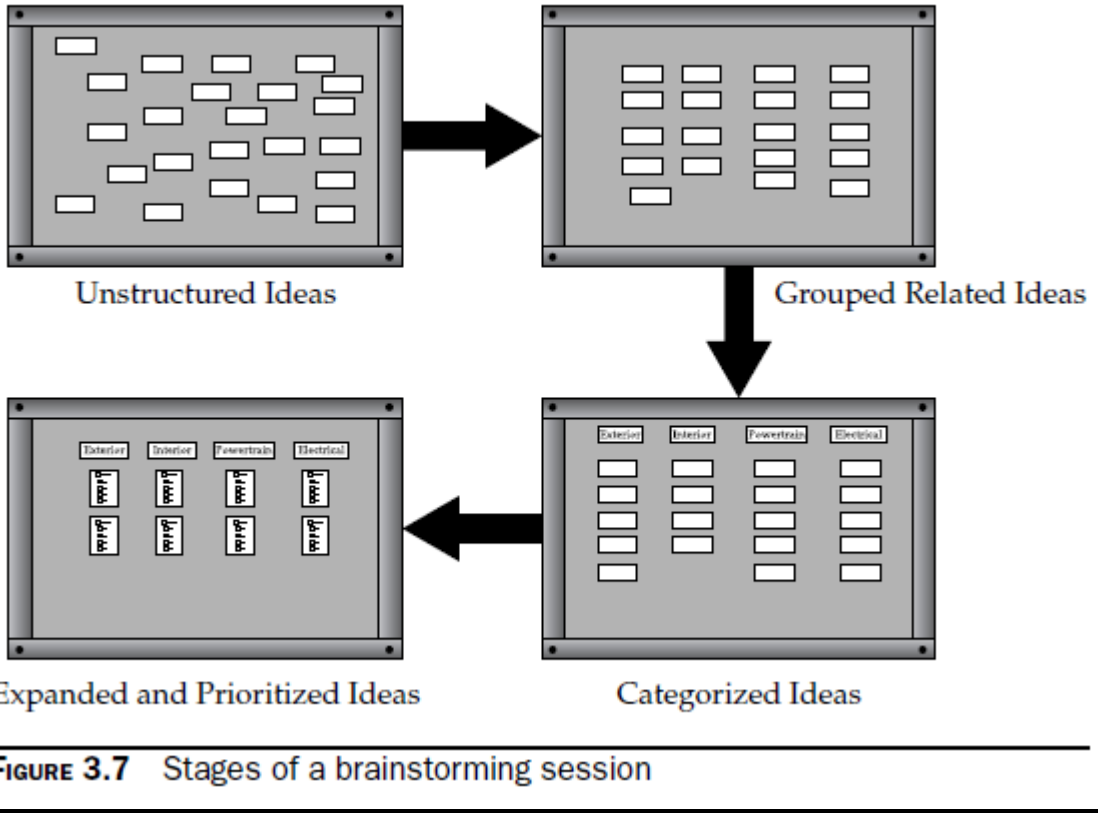


FIGURE 3.7 Stages of a brainstorming session

The next activity in brainstorming is the condensation of the ideas to group related concepts and eliminate redundancy. The third activity is to formally assign the ideas to categories.

Next, the group breaks up into small teams that assess the ideas and expand upon them. Within each group, the ideas are then ranked (pairwise ranking).

Finally, the brainstorming session is concluded with action items where appropriate for participants in the session. If the session was attended by customers not involved in analysis, then the post-session activities are usually done internally by project team members and company stakeholders.

## Tabular Elicitation Techniques

The use of tables can provide a compact, unambiguous method for capturing stakeholder requests. Two types of widely used tabular techniques are **decision tables** and **state tables**.

Decision tables: are most often used where there are discrete sets of conditions that can be determined with a "yes" or "no," actions to take if the conditions are met, and a set of rules, where each unique set of conditions and the action to take is one rule.

Most of us have seen or used decision tables at one time or another. A very common form of decision table is the tax table shown in Figure 3.8.3 Each row represents a condition, in this case the taxpayer's income. Each column represents a rule; i.e,. a condition (single, married filing jointly, etc.) and a set of actions, where the actions in this case determine what tax should be paid. When eliciting draft requirements from stakeholders, a decision table can be an efficient, compact, and unambiguous technique for capturing business rules.

| If line 43 (taxable income) is— | | *rule* | And you are— | | |
|---|---|---|---|---|---|
| At least | But less than | Single | Married filing jointly | Married filing separately | Head of a household |
| | | | Your tax is— | | |
| 1,300 | 1,325 | 131 | 131 | 131 | 131 |
| 1,325 | 1,350 | 134 | 134 | 134 | 134 |
| 1,350 | 1,375 | 136 | 136 | 136 | 136 |
| 1,375 | 1,400 | 139 | 139 | 139 | 139 |
| 1,400 | 1,425 | 141 | 141 | 141 | 141 |
| 1,425 | 1,450 | 144 | 144 | 144 | 144 |
| 1,450 | 1,475 | 146 | 146 | 146 | 146 |
| 1,475 | 1,500 | 149 | 149 | 149 | 149 |

**FIGURE 3.8** Example decision table

State tables are different than decision tables in that they are used where the object under consideration can be in various states at different times, and well-defined, simple events trigger the change from one state to another. An object that transitions only on discrete events and has a predefined number of known states is called a **state machine**. In the case of a taxpayer, a state table would not be appropriate, as there is only one state: "about to pay taxes."

State tables, which show the behavior of a state machine, usually have a single start state, and then a set of states that an object transitions to, and finally either a successful exit state or one or more "error" states where activity stops because an error of some kind has occurred. Each state change is associated with one or more events that cause the change, and one or more actions that take place as the object transitions from one state to another.

As an example, consider the design of a simple CD player with three buttons (Figure 3.9). The only states that the player can be in (assuming the power is on) are open, closed and loaded, closed and empty, and playing (which is only possible if the player is closed and loaded). There are also well-defined events that determine what state the player is in, and clear actions to take

for any given event. On an event (in this case pressing a button), one or more actions are taken, and the player transitions to a different state or stays in the same state. The particular state table shown is nondeterministic because if the state is "Open" and the "Open/Close" button is pressed, there are two possible transitions. If there is a CD in the tray, the player will transition to state 2 (closed and loaded), whereas if the tray is empty, the player will transition to state 3 (closed and empty), depending on whether a CD is detected in the tray. In general, deterministic state machines, where an event can have only at most one transition from a given state, are preferred because design and testing is simplified.

However, it is sometimes possible to make a nondeterministic machine deterministic by adding intermediate states.

| State Number | State | Open/Close | Play | Stop |
|---|---|---|---|---|
| 1 | Open | Close Tray<br>{if No Disc<br>Display "No Disc"<br>go to 3<br>else Display "Ready"<br>go to 2} | No action | No action |
| 2 | Closed Loaded | Open Tray<br>{Display "Open"}<br>Go to 1 | Start Playing<br>{Display "Playing"}<br>Go to 4 | No action |
| 3 | Closed Empty | Open Tray<br>{Display "Open"}<br>Go to 2 | {Display "No Disc"}<br>No action | No action |
| 4 | Playing | Stop Playing<br>Open Tray<br>{Display "Open"}<br>Go to 1 | {Display "Playing"}<br>No action | Stop Playing<br>{Display "Stop"}<br>Go to 2 |

**FIGURE 3.9** Simple CD player

## 3.4 Customer-Specific Business Rules

**Business rules:** are a special category of customer requirements. They are different in that rather than defining a fixed customer need, they describe the implementation of a customer policy that may be changed by the customer after delivery of a product or system. Hence they describe a special category of user-implemented extensibility.

A business can enact, revise, and discontinue the business rules that govern and guide it. A **Business policy**: is an element of governance that is not directly enforceable, whose purpose is to guide an enterprise. Compared to a business rule, a business policy tends to be less tructured; i.e., less carefully expressed in terms of a standard vocabulary and not directly enforceable.
For example, a banking business policy might be: "Bank customers should not be able to make too many bank withdrawals in a single day or withdraw more than a certain amount of money in a fixed period of time; the maximum amount being based on their total account value and history."

## Why Are Customer-Specific Business Rules Important?

Customer-specific business rules must be kept separate from regular requirements (at least logically, using database tags or attributes), since they are not requirements. However, customer requirements can be derived from the business rules; the requirements may look different than the rules that they derive from.

## What Are Their Characteristics?

Customer-specific business rules are implementations of the customer's company policies, where the business rules may change after system or product delivery. It is mandatory that the customer have the ability to alter the rules without system or product modification.

## Example Customer-Specific Business Rules

A sample business policy, rules, and some derived requirements are shown here:

- **Policy** The hospital shall be able to define the difference between adult and child patients for check-in and medical records purposes.

- **Rule** Any patient under the age of 14 checking in shall be considered a child.

  When a child checks into the hospital, depending on the hospital's business policy, a parent or guardian may have to accompany the child and sign all the admission forms. Detailed rules explain under what circumstances (e.g., an accident, emergency, or life-threatening situation) a child may be checked in without a parent's or guardian's consent.

- **Requirement** A facility shall be provided with the system such that the hospital check-in process for adults and children can be changed by hospital administrators without the need for system or software modifications.

Note in the preceding example, the hospital may, at any time, change the age at which a patient is considered a child, as well as the rules governing the emergency check-in of a child without parental consent. The relationships among business policies, rules, and requirements are illustrated in Figure 3.13.

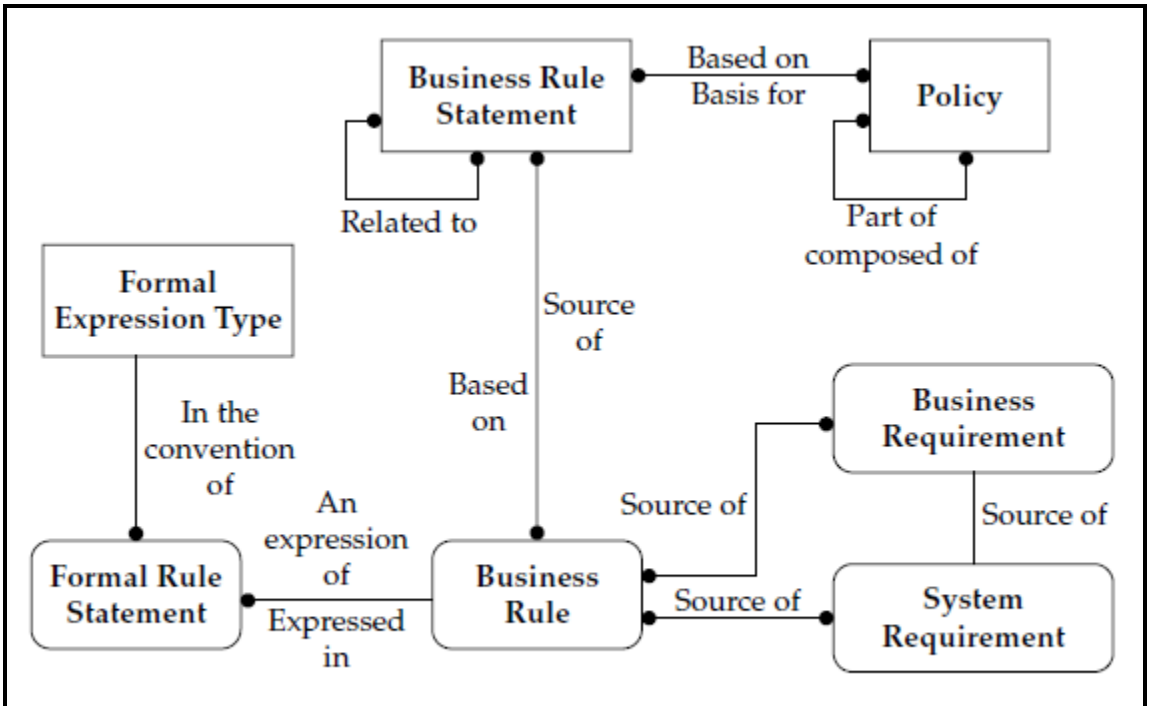


**FIGURE 3.13** Business policies, rules, and derived requirements

## 3.6 Planning Elicitation Sessions

In order for elicitation sessions to be successful, they must be planned. Planning includes: setting up the framework for conducting the sessions, managing the output of the sessions, defining completion. We offer these suggestions:

1. Set up a schedule of elicitation sessions. Since diverse domain expertise may be needed, sessions need to be defined for capturing needs based on the expertise needed for each domain that is in scope. For example, in sessions to define a new insurance system, it might be necessary to capture the needs of marketing, sales, underwriting, accounting, etc. Since the people who would be participating are usually critical to the operation of an organization and access to them may be limited, the schedule may need to be carefully defined.

2. Define the venue and the media. This includes where the sessions will be held, as well as any audiovisual techniques used (e.g., whiteboard, stickies, RGB projector). The format for capturing the results of each elicitation session needs to be defined. Capture mechanisms may

include a requirements database (viewed using a browser or the database screens), Excel spreadsheets, modeling tools, or other electronic capture mechanisms.

3. Define standards, schemas, and processes prior to the start of the elicitation sessions. When capturing stakeholder requests, they may be at very different levels (see the earlier section "Not Identifying Requirements Level"). It is important that any information captured be properly identified (including the stakeholder), partitioned (level), and identified as to type or other project characteristics, at the time of capture. Once the requests start to be added, it will be very difficult to go back and revisit the tagging of requirements. In order to have an electronic system set up to properly capture the relevant request or requirement attributes (e.g., priority, stakeholder, level, type), the database schema or model attributes need to have already been planned and defined in the toolset being used. Furthermore, having guidelines for conducting elicitation sessions will help in soliciting the cooperation of stakeholders or domain experts to provide the needed information at the time of elicitation.

4. Provide a clearly defined agenda for each elicitation session, with the role of each attendee clearly understood. The agenda should be feasible and reasonable given the duration and the people present. Finally, action items should be recorded and assigned with short due dates and careful follow-up.

5. Arrange for a senior manager (on the customer side) to participate in the elicitation sessions. While it may be difficult to convince clients or customers to have one of their senior stakeholders participate, it may be the only way to ensure that customer-provided domain experts actually show up at the meetings and cooperate. Not that they will be unwilling to participate, but the priorities of the manager of a domain expert may be quite different than those of the project manager for the product under design; they may be in different organizations or companies. Consequently, when pulling in domain experts, their presence may not be guaranteed without the participation of a senior manager in their organization.

6. If necessary, arrange for someone on the customer side (the senior manager mentioned above may suffice) to set up the schedule and manage it. The analyst in charge of requirements elicitation may not have access to the scheduling system of the domain experts or may not have the authority to request their presence at elicitation sessions.

7. Hold sessions in the morning, if feasible, and schedule them to last half a day. People tend to tire a bit over time, and about four hours or less is best for sustaining high productivity. In addition, work will be generated outside of the elicitation session (see the next item), and it is recommended that assigned work be completed the same day that the session was held.

8. If heavy writing is assigned during an elicitation session, have it done offline, preferably the afternoon that the session was completed. This includes definitions, descriptions of processes, and so on. Text can then be reviewed the following morning or offline at a later date.

9. Preferably, find a venue where everyone can see the same thing at the same time. Whether looking at text or graphics, all the attendees should be seeing the same information. If you are able to have the relevant stakeholders in the room during the elicitation session, the requirements review process can be shortened, since the reviewers were present during the elicitation session.

10. Chunk reviews of work. Imagine being sent an e-mail containing the following request: "Please review this paragraph [or page] and send your comments by tomorrow." Contrast that with "Please review this 200-page requirements specification and send your comments within the next two days." Clearly the former is likely to happen, and the latter may result in the reader hitting the Delete button. Reviews are best done online, with everyone reviewing a reasonably small amount of material together. When that is not feasible, the review of material should be partitioned, so that only the relevant stakeholders see the material they need to review, and the amount of material to be reviewed is kept small.

11. Keep reviews of elicitation sessions short and immediate. When reviewing the output of an elicitation session, we normally conduct the reviews the same afternoon, not later than one or two days after the session (before the domain experts vanish back into their environments).

12. Keep attendance at an elicitation session (as contrasted with a brainstorming session, where everyone possible is in the room) small, no more than six to eight people.

**A typical session might consist of:**

1- A facilitator or lead analyst.

2- One or two other analysts (including the designated "smart ignoramus").

3- Participating stakeholders at the management level.

4- One or two domain experts. It is always better to have two domain experts than one. Two experts can check each other's work as the session progresses, minimizing the need for post-session reviews. Three subject matter experts in the same session may or may not be effective, depending on their interpersonal dynamics.

To summarize, conducting elicitation sessions may require a significant planning effort, depending on the scope of the project. Furthermore, if any needed standards, procedures, and tools are in place prior to the start of the elicitation sessions, rework will be minimized and the sessions will proceed more smoothly.

## 3.7 Tips for Gathering Requirements

The following set of tips was learned through trial and error and was based on input from SCR staff members and some of our academic colleagues. It is not intended to be inclusive, but rather to provide a starting point.

- Add a "smart ignoramus" to your requirements analysis team.
- Include stakeholders in requirements elicitation sessions who can speak with authority for the organization, and be sure to differentiate the "user" from the "customer" when describing stakeholders.
- Record the level of information and the stakeholder source of requirements during elicitation sessions.
- Separate context and background from stakeholder requests.
- Plan a project such that access to subject matter experts is scheduled.
- Where appropriate, start a project by creating marketing literature, a user manual, or lightweight specification sheets for the product to help clarify incomplete or undefined customer needs.
- Force requirements engineers with deep domain expertise to communicate with external stakeholders, especially for a domain where technology is changing.
- Wherever possible, use visual techniques, including models, diagrams, and tables, to communicate important requirements concepts.
- Prioritize stakeholder requests as early in a product life cycle as possible. Several prioritization activities may be needed, one just for the stakeholders, another when the architect or designers evaluate the cost and risk of implementation, and possibly additional sessions prior to the build/no build decision. If possible, have key stakeholders participate in any ranking activity.
- Keep the customer up-to-date on RE progress, demonstrate features, and elicit comments or suggestions.
- Plan elicitation sessions to include the schedule, session agenda, equipment, and tools needed; the types of information to be captured; and the stakeholders who should be present.
- Include a senior manager from the customer's organization in requirements elicitation sessions.
- Schedule elicitation sessions in the morning, and then use the afternoon for miscellaneous activities such as writing definitions and descriptions and correcting diagrams and documents.

• Whether looking at text or graphics, assure that all the participants in a requirements elicitation session see the same information.

• Organize requirements reviews into small chunks with small amounts of material together. When that is not feasible, the review of material should be partitioned, so that only the relevant stakeholders see the material they need to review, and the amount of material to be reviewed is kept small, short, and immediate.

• Keep elicitation sessions small, no more than six to eight people. Three subject matter experts in the same session may or may not be effective, depending on their interpersonal dynamics.

## 3.10 Summary

There are many different techniques for eliciting customer needs and business goals. Whatever methods are used, the analysts eliciting the needs, goals, or requirements should be trained in the techniques they will be using. Furthermore, the elicitation process will be more productive and execute more smoothly if process, methods, and capture mechanisms are well defined, documented, and communicated to the participating stakeholders prior to the start of the elicitation sessions.

Those responsible for the elicitation of requirements should be cognizant of the techniques needed, as well as of the issues and problems described in this chapter. Furthermore, being a project lead analyst or facilitator is an art in itself, requiring the ability to get diverse stakeholders to follow an agenda without deviation, and drive the elicitation process smoothly to completion in the allotted time (Figure 3.14).

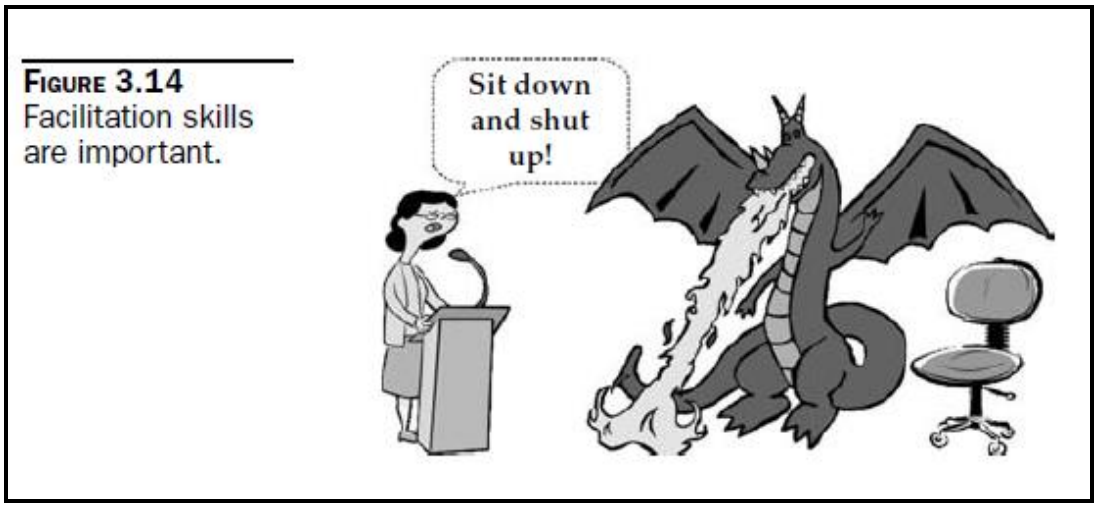


**FIGURE 3.14** Facilitation skills are important.

With Best Wishes