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In this lecture we'll discuss some commonly used requirements definition tools and techniques.

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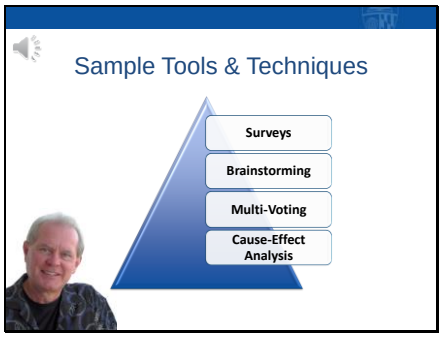

I'm going to discuss four tools and techniques that are commonly used in the requirements definition process: surveys, brainstorming, multi-voting, and cause-effect analysis.

3

I'm sure that everyone listening to this lecture has participated in some type of survey before, so we all know what a survey is. A questionnaire of some sort is used to pose questions to survey respondents.

So…how might a survey be used during the requirements phase of a software engineering project? A survey can be a useful tool to elicit requirements from project stakeholders, under certain conditions, such as:

- When there is a geographically diverse population of stakeholders, making face-to-face contact infeasible.
- When there is a large number of stakeholders that input needs to be solicited from.
- When it is important that most or all stakeholders be given the opportunity to provide input…perhaps for

political reasons.
- When there are time limitations for gathering requirements information.
- Or…when it is desirable to do a quick exploratory study to assess something…like whether or not certain things are problematic.

A fairly common use of surveys is to poll users of existing software products to assess their satisfaction with existing functionality and perhaps to solicit suggestions for product enhancements.

In a project that I was involved with for an airline client, we conducted a survey to do exactly that. Management was interested in finding out what product functionality was being used most frequently, how well the product satisfied end user needs, and also what types of future enhancements the user community would like to see. For political reasons, the entire end user population, well over a thousand people, was given the opportunity to participate in the survey…and it was very successful. There was a very high response rate, and we got some very good feedback on product features that needed to be changed as well as new features that the community desired. It was also fast and cheap. The whole thing was completed in a matter of weeks.

One of the most important things to consider when using a survey, is the design of the questionnaire. There's an art and a science to knowing how to structure questions in just the right way…but it's a relatively easy skill to learn. If the questions are not effective, we won't get useful input…and if the questionnaire is too cumbersome, stakeholders won't take the time to respond.

4

Another very useful technique during the requirements phase is brainstorming. Brainstorming is a group process that can be used in many ways: to generate ideas, to generate possible solutions to problems, to look at alternative ways to accomplish things. It's an excellent technique for getting people to think outside the box. And, it's also quick and very cheap.

Used correctly, brainstorming also has a number of positive side effects: it can get a group of stakeholders working together and foster team-building, and it can help get "buy-in" from the group.

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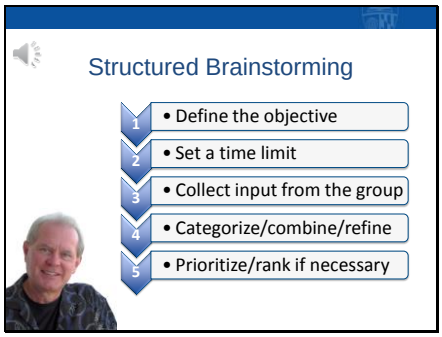

I've used brainstorming for decades in many different ways. In my experience I have found it most effective to use what I call structured brainstorming. One of the advantages of keeping things structured is that you can retain control, and keep the process from deteriorating into a free-for-all that can be a waste of everyone's time.

Here's a five-step structured brainstorming process that I have found to be very effective.

The first step is to clearly define the objective of the brainstorm. For example, maybe the objective is to think of new product enhancements that would solve a particular problem that users are having.

The second step is to set a time limit for people to think about their input. I normally use a pretty short time limit…maybe three to 5 minutes. So…in that time frame I ask people to write down as many ideas as possible. A variation on this would be to break up the group into teams of two and have each team generate ideas. I might also extend the time limit to up to 10 minutes. My experience has been that people will lose focus after 10 minutes.

The third step is to collect input from the group. What I do is to go around the room and have each person

contribute one idea, which I log on a white board or flip chart. If we're doing this in a virtual setting, I'll open up a white board so that everyone can see the ideas. I make as many iterations as is necessary to get everyone's input.

Now…two very important rules that I use for this step is that only one person speak at a time…the person who is providing the input…and that no comments are allowed while someone is providing their input. These two rules help to keep things structured and avoids going off on tangents. It also keeps me in control.

The fourth step involves looking through the ideas, maybe combining ideas that are the same but were stated using different words, maybe rewording things to improve clarity, or developing categories that the ideas belong to. Then, we may decide what the next actions are…perhaps we investigate each idea, or choose several ideas to discuss further.

We also may choose to complete a fifth step and prioritize or rank the ideas…or maybe come up with a short list of N ideas that will be further explored.

Another thing that I often incorporate into the process is to tell people that they should assume there are no constraints for the problem at hand…even though there may be constraints. That will generate many more ideas and sometimes results in some very clever ideas…and it allows people to be more creative.

Another thing I might do is to take five minutes at the beginning and do a practice brainstorm. I pick a topic that is not work-related and may be humorous…like how can we raise a million dollars by the end of the day? This serves as an ice-breaker, it gets people familiar with the process, and it energizes the creative side of their brains. When people come to business meetings they usually focus on the left side of the brain…the logical side. Doing something fun helps them involve the right side, which is the creative side.

6

Multi-voting is a group technique that narrows a large list of items to a smaller list of high priority items or to a final selection. It can be used after a brainstorming session to narrow the list of items down to a smaller list, or when decisions must be made by a group.

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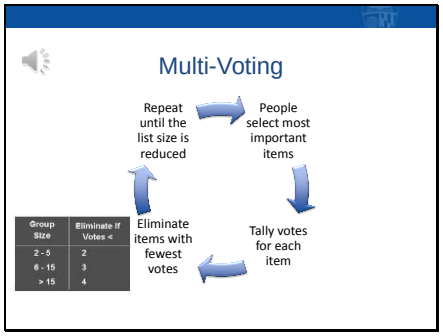

Let's suppose we want to narrow down a list of items to the top ten most important.

The first step is for each person in the group to select the most important items on the list. Each person can select 1/3 of the items as being most important. So…if there are 30 items on the list, each person can select the 10 most important. The criteria one uses to decide which are most important is up to each person. They don't have to defend their choices or share the basis of their prioritization.

The next step is to tally the votes for each item on the list. For in-person meetings, post-its or colored adhesive dots are often used. People just come up to a white board or flip chart and stick the post-its or dots next to

the items they vote for. Whoever is facilitating the process then just counts the votes.

The third step consists of eliminating the items with the fewest votes. This is done according to the decision table. As an example, if there are 4 people in the group, any item with fewer than two votes is eliminated from further consideration. In our example, if we've reduced the list to the top ten, we're done. Otherwise, we conduct another round of voting. The process repeats until we've reduced the list to the desirable size.

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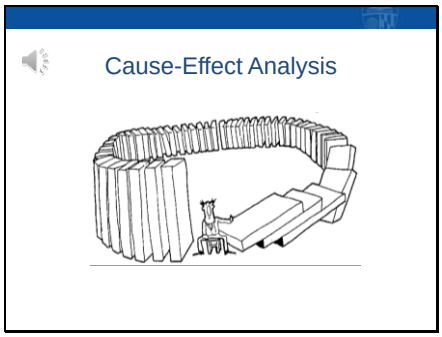

Cause-effect analysis is a technique that can be used to analyze the possible causes of a problem, to analyze what can be done to mitigate a problem, or to identify and understand the factors that impact a problem, solution, or process.

It's a graphical technique that uses something called a cause-effect diagram. It's easy to apply, and it also works nicely in group situations. It can even be used in conjunction with brainstorming.

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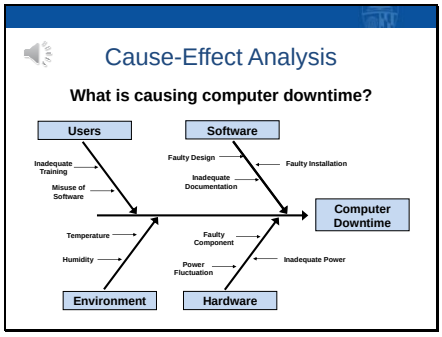

Here's an example of using cause-effect analysis to identify possible root causes for a problem…which is unsatisfactory computer downtime.

To construct the cause-effect diagram, we draw a box that contains a summary of the effect. In this example, the effect is the problem we want to find the root causes for…computer downtime. Then, we draw a horizontal arrow that points to the box.

Next, we draw four to six slanted arrows that point to the horizontal one. These represent what are called causal categories. In this example, the causal categories are users, software, hardware, and the computing environment.

Then, we try to identify specific causes that contribute to the effect, and add them under the appropriate causal categories. As an example, temperature or humidity might be contributing to downtime. They would be added to the environment causal category. Inadequate user training might be causing computers to crash…and so forth. Brainstorming might be used to help identify the specific causes.

The next step might be to prioritize or otherwise select some of the specific causes and investigate them further.

By the way, cause-effect diagrams are sometimes called fishbone diagrams…for obvious reasons. They are also sometimes referred to as Ishikawa diagrams after the Japanese engineer who came up with them.