SEI Webinar: How Unstated Customer Needs May Drive Innovation

Robert W. Stoddard II
Ira A. Monarch
Dennis R. Goldenson

December 3, 2009
The Co-Authors

Robert Stoddard
DFSS, VoC
SEI SEMA

Ira Monarch
Text Analysis
SEI ASP

Dennis Goldenson
Group Collaboration
SEI SEMA
Polling Question 1

How did you hear about this webinar?

1. Email invitation from the SEI
2. SEI Website
3. Website with webinar calendar (ie www.webinar-directory.com)
4. Social Media site (LinkedIn, Twitter)
5. Other
Today’s Talk

The Problem

Our Solution

- Voice of the Customer (KJ, Kano)
- Text analysis
- Collaborative processes & tools

The Work thus far

What’s Next?
The Problem: A Requirements Crisis?

It’s not a crisis when the issues have been endemic for many decades...

• Multiple Stakeholders • Stovepiped, organizational boundaries
• Conflicting goals & objectives • Poorly articulated needs
• Unstated requirements • Insufficient V&V criteria throughout the life cycle

Exacerbated by:

• Unprecedented, complex systems • Systems of Systems
• Long-lived systems with changing user needs & system requirements
Polling Question 2

To what degree is your organization experiencing endemic issues related to Requirements Engineering or Elicitation?

1. Significant
2. Above Average
3. Below Average
4. Minimal
5. Don’t know
Similar Issues in Commercial Settings

Clients want to grow their business, not just cut costs!
Business growth is highly correlated with delighted customers!
Delighted customers result from meeting stated and unstated needs!
Analyzing unstated needs leads to a rich source of innovative ideas that spawn customer delighters!
Scope creep is reduced because we capture the full set of client requirements!
A richer set of quality and performance attributes are identified to drive both architecture and product line definition!

So, how do we identify the unstated needs leading to customer delighters???
What is the Solution?

Structured interviews of customers and users with subtle modifications to existing interview techniques

KJ workshops to develop themes and innovative observations within and between themes

Kano analysis to confirm requirements as customer delighters” vs “satisfiers” vs “must-be’s”

Using semi-automated, state-of-the-art text analysis tools and collaborative methods to scale up the above methods for distributed geographic participation by many more people
Polling Question 3

How well does your organization identify the complete requirements including the “unstated” needs?

1. Very well
2. Above Average
3. Below Average
4. Minimal
5. Don’t know
Some Business Results

Enabled Motorola to identify customer delighters for a new cell phone product, thereby transforming a negative customer relationship into a very positive one
  • A product line that wouldn’t otherwise have happened
  • With substantial payoff for the company

Enabled LL Bean, as one of the first US companies using this method, to identify customer delighters which revitalized several product lines

Enabled the identification of customer delighters related to the operation of internal process improvement & quality teams
  • KJ run with senior management at Motorola
  • Focusing on what executives needed from EPG & quality team

Provided compelling experiences in both the product and service space
More about KJ Analysis

Method for Collaborative Processing of Language Data

- Named for Kawakita Jiro, a Japanese anthropologist
- Method for transmuting tacit knowledge into explicit and more & more objective statements

Structured interviews

- Broad, open ended questions, with probes as necessary
  - Clarification asking for examples, asking “how” and “why”
- Focused on positive & negative experience, not solution space

Workshop

- Affinity grouping of concise statements derived from interviews
- Use of those ubiquitous “yellow stickies,” rearranged by workshop participants
The Kano model was developed by Professor Noriaki Kano in the 1980s.

More about the Kano Model (for a given requirement)

<table>
<thead>
<tr>
<th>How the Customer Feels</th>
<th>Level of Functionality Delivered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Unhappy</td>
<td>Low to None</td>
</tr>
<tr>
<td>Somewhat Unhappy</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td></td>
</tr>
<tr>
<td>Moderately Excited</td>
<td></td>
</tr>
<tr>
<td>Very Excited</td>
<td>High</td>
</tr>
</tbody>
</table>

- **Must-Be**
  - (considered obvious; accepted as a given, almost without stating!)

- **Satisfier**
  - (normally stated as a need that would make the customer happy!)

- **Delighter**
  - (unstated, innovative, generates excitement!)
The Detailed Method

**Step 1:** Evaluate existing knowledge of stated needs and requirements

**Step 2:** Design the open-ended, probing questions to be used in KJ interviews

**Step 3:** Conduct KJ interviews collecting all possible context information

**Step 4:** Analyze raw output of interviews to form context need / activity statements

**Step 5:** Conduct the KJ Workshop including specialized affinity exercise

**Step 6:** Identify Unstated Needs and subsequent Innovative Requirements

**Step 7:** Conduct Kano analysis to determine must-be’s vs satisfiers vs delighters

**Step 8:** Use AHP weighting and QFD matrix to determine quality and performance measures of delighters
Some VoC Limitations Experienced

The KJ Interviews and KJ Workshop requires participants to truly operate in the “Right Brain” mode rather than the “Left Brain” mode!

<table>
<thead>
<tr>
<th>Left Brain</th>
<th>Right Brain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logical, Sequential</td>
<td>Random</td>
</tr>
<tr>
<td>Rational</td>
<td>Intuitive</td>
</tr>
<tr>
<td>Analytical</td>
<td>Holistic, Synthesizing</td>
</tr>
<tr>
<td>Objective</td>
<td>Subjective</td>
</tr>
<tr>
<td>Looks at Parts</td>
<td>Looks at Wholes</td>
</tr>
</tbody>
</table>

Interview questions must seek context on open-ended questions, rather than discussing solutions.

Workshop affinity requires themes from all the bits of context of yellow stickies rather than simple word matching.
Some VoC Limitations Experienced

Insuring Consistency & Completeness

- A problem, particularly for KJ
  - Which to date has been applied in small, face-to-face & one-day workshops
- Similar issues with other VoC methods

Worry is that results might be quite different if different participants were assembled on a different day.

- Need more confidence that results are complete, repeatable & generalizable
Collaborative computer support tools exist that can

- Capture & assist in analyzing much more & varied information in textual form than can manual methods alone
- Often in far less time

Tools such as GroupSystems have been used to facilitate requirements development as well as other purposes

- Facilitate requirements development
  - Notably Barry Boehm’s Win-Win
- Software inspections (Michiel van Genuchten, Doug Vogel, et al.)
- Agreement on appraisal findings (van Genuchten)
- Strategic discussions planning & tactical decision making by participants on ships at sea

Such tools can allow many more people to be included in VoC activities without having to meet face-to-face
Collaborative Processes & Tools

Several troublesome problems in the manual VoC process can be addressed with collaborative software support

- Manual KJ groups succinct yellow sticky notes into distinct affinity groups
  - It sometimes makes sense to have a single statement map to more than one group to recognize interdependencies
- But KJ statements can be too succinct
  - Such that the intended meaning isn’t clear to workshop participants
  - Collaborative tools can selectively hide or display additional information in a graceful, easy to use manner

Collaborative software’s increased bandwidth can encourage iterative side conversations among workshop participants helping them:

- Think through & harmonize affinity grouping decisions in much less time
- Edit their judgments before solidifying their positions publicly

Yet collaborative tools *do* depend heavily on the skills of the facilitator

- *VoC methods can provide the repeatable process discipline*
Polling Question 4

How well does your organization utilize Group Systems or collaboration tools for strategic planning, portfolio management or requirements engineering?

1. Very well
2. Above Average
3. Below Average
4. Minimal
5. Don’t know
Text Analysis

Computer assisted text analysis methods & tools have improved greatly over the past decade

- Help analysts identify & interpret recurring concepts, themes & inter-relationships in large, otherwise unwieldy text corpora
- Used with multiple related textual sources analyzed for consistency, contention & lack of coverage

Have been used in software & systems engineering for

- Development & management of software & system requirements (by others as well as us)
- Analyses of system requirement specifications, policy, doctrine
- Problem reports, change requests
- Responses to open ended survey questions
- Reviews of voluminous published research
- Rapid classification of appraisal findings & recommendations from interviews (van Genuchten)
Text Analysis

Many powerful text analysis methods & tools now exist

• For natural language processing, thesaurus building & other semantic aids, in addition to automated content analysis algorithms
• In principal could be used for any text analysis captured electronically or conversion of audio to text

While automation makes the analysis practically & intellectually possible

• But interpretation, semantic analysis & validation must be done iteratively in collaboration with domain experts.

Limitations: Crossing the chasm

• Unfamiliar methods, tools & user interface for most systems & software engineers

Our challenge

• Integrate best available language data tools & make them widely accessible & usable in our field
An Text Analysis Example
Scaled Up Step 1

**Step 1**: Evaluate existing knowledge of stated needs and requirements

**Step 2**: Design the open-ended, probing questions to be used in KJ interviews

**Step 3**: Conduct KJ interviews collecting all possible context information

**Step 4**: Analyze raw output of interviews to form context need/activity statements

**Step 5**: Conduct the KJ Workshop including specialized affinity exercise

**Step 6**: Identify Unstated Needs and subsequent Innovative Requirements

**Step 7**: Conduct Kano analysis to determine must-be’s vs satisfiers vs delighters

**Step 8**: Use AHP weighting and QFD matrix to determine quality and performance measures of delighters

Semi-automated text analysis can scan existing documentation and produce themes and concepts to enrich the design of the interviewing questions.
Scaled Up Step 3

Virtual group collaboration tools and environments enable interviewing across physical and time boundaries!

Step 3: Conduct KJ interviews collecting all possible context information

Step 4: Analyze raw output of interviews to form context need / activity statements

Step 5: Conduct the KJ Workshop including specialized affinity exercise

Step 6: Identify Unstated Needs and subsequent Innovative Requirements

Step 7: Conduct Kano analysis to determine must-be’s vs satisfiers vs delighters

Step 8: Use AHP weighting and QFD matrix to determine quality and performance measures of delighters
**Step 1:** Evaluate existing knowledge of stated needs and requirements

**Step 2:** Design the open-ended, probing questions to be used in KJ interviews

**Step 4:** Analyze raw output of interviews to form context need/activity statements

**Step 5:** Conduct the KJ Workshop including specialized affinity exercise

**Step 6:** Identify Unstated Needs and subsequent Innovative Requirements

**Step 7:** Conduct Kano analysis to determine must-be’s vs satisfiers vs delighters

**Step 8:** Use AHP weighting and QFD matrix to determine quality and performance measures of delighters

**Scaled Up Step 4**

Semi-automated text analysis of responses at the individual question level and across questions, provides efficient inputs to the KJ workshop!
Step 1: Evaluate existing knowledge of stated needs and requirements

Step 2: Design the open-ended, probing questions to be used in KJ interviews

Step 3: Conduct KJ interviews, collecting all possible context information

Step 4: Analyze raw output of interviews to form context need/activity statements

Step 5: Conduct the KJ Workshop including specialized affinity exercise

Step 6: Identify Unstated Needs and subsequent Innovative Requirements

Step 7: Conduct Kano analysis to determine must-be's vs satisfiers vs delighters

Step 8: Use AHP weighting and QFD matrix to determine quality and performance measures of delighters

Virtual group collaboration tools and environments enable almost limitless workshop participation across physical and time boundaries!
Scaled Up Step 6

Semi-automated text analysis enables thematic conclusions from the expected voluminous output of the virtual KJ workshop.

Step 6: Identify Unstated Needs and subsequent Innovative Requirements

Step 5: Conduct the KJ Workshop including specialized affinity exercise

Step 4: Analyze raw output of interviews to form context need / activity statements

Step 3: Conduct KJ interviews collecting all possible context information

Step 2: Design the open-ended, probing questions to be used in KJ interviews

Step 1: Evaluate existing knowledge of stated needs and requirements

Step 7: Conduct Kano analysis to determine must-be’s vs satisfiers vs delighters

Step 8: Use AHP weighting and QFD matrix to determine quality and performance measures of delighters

Step 9: Interactions (leverage & conflict)

Step 8: Targets & Gap Analysis

Step 7: Objective

Step 6: Us

Step 5: Client Needs

Step 4: Server “Responses”

Step 3: Relationship Matrix

Step 2: Competitive Analysis

Step 1: Objective

Step 0: Client Needs
Virtual group tools and environments enable unlimited Kano survey participation!

Semi-automated text analysis enables synthesis of text explanations which can accompany responses to the Kano survey!

**Step 4:** Analyze raw output of interviews to form context need / activity statements

**Step 5:** Conduct the KJ Workshop including specialized affinity exercise

**Step 6:** Identify Unstated Needs and subsequent Innovative Requirements

**Step 7:** Conduct Kano analysis to determine must-be’s vs satisfiers vs delighters

**Step 8:** Use AHP weighting and QFD matrix to determine quality and performance measures of delighters

**Scaled Up Step 7**
Scaled Up Step 8

Virtual group tools and environments enable unlimited, but efficient participation in a tightly controlled Quality Function Deployment (QFD) exercise to translate priorities of the new customer delighters into priorities of implementation quality/performance measures!

Step 4: Analyze raw output of interviews to form context need/activity statements

Step 5: Conduct the KJ Workshop including specialized affinity exercise

Step 6: Identify Unstated Needs and subsequent Innovative Requirements

Step 7: Conduct Kano analysis to determine must-be’s vs satisfiers vs delighters

Step 8: Use AHP weighting and QFD matrix to determine quality and performance measures of delighters
Work Thus Far

Used semi-automated content analysis at a US military maintenance & sustainment organization supporting long-lived systems

- Identified recurring usability issues not recognized previously in case-by-case resolution of problem and change requests
- Opportunities for improvement in scenarios & test cases
- Implications for requirements elicitation & user test

Earlier text analysis of requirements documents, problem reports & associated materials in another military maintenance shop

- Identified recurring integration, modifiability & usability issues

Both done prior to recognition of importance of VoC defined & trainable processes
Work Thus Far

Battle command for ground & air operations

- Text analysis to seed KJ interviews, workshop & limited Kano
- Text analysis extracted references to quality attributes
- Embedded in:
  - future concept documents • doctrine • capabilities
  - requirements documents • information support plans
  - user functional descriptions • software problem reports

Identified issues with respect to interoperability, usability & fitness for use

- Not considered sufficiently or recognized explicitly
  ... prior to the proactive VoC & text analysis
What’s Next?

Currently negotiating engagements with major commercial & defense contractors

- Focus on requirements development, management, evolution & change

Seeking grant funding with academic colleagues

- At Carnegie Mellon & elsewhere

Please contact us if you’re interested in joining in!
Polling Question 5

How much would your organization benefit from our approach of identifying unstated needs leading to innovative customer delighters?

1. Very much
2. Often
3. Somewhat
4. Minimal
5. Don’t know
Thank You for Your Attention!

Robert W. Stoddard
Email: rws@sei.cmu.edu

Dennis Goldenson
Email: dg@sei.cmu.edu

Ira Monarch
Email: iam@sei.cmu.edu

U.S. mail:
Software Engineering Institute
Customer Relations
4500 Fifth Avenue
Pittsburgh, PA 15213-2612
USA

World Wide Web:
www.sei.cmu.edu

Customer Relations
Email: customer-relations@sei.cmu.edu
Telephone: +1 412-268-5800
SEI Phone: +1 412-268-5800
SEI Fax: +1 412-268-6257
SEPG North America 2010
March 22–25, 2010
Savannah, Georgia

www.sei.cmu.edu/sepg/na/2010

SEPG is the premier, global conference series on software and systems process management.
ARCHITECTING FOR CHANGE
May 17-21, 2010
Minneapolis, Minnesota
CERT's Podcast Series: Security for Business Leaders

www.cert.org/podcast/
Want a Closer Connection to the SEI?

Become an SEI Member!

www.sei.cmu.edu/membership
Do you have the knowledge you need?

SEI Training

www.sei.cmu.edu/training