

Elicitation of Unstated Needs

Mary Beth Chrissis
Mike Konrad
Bob Stoddard

Software Solutions Conference 2015
November 16–18, 2015



Copyright 2015 Carnegie Mellon University

This material is based upon work funded and supported by the Department of Defense under Contract No. FA8721-05-C-0003 with Carnegie Mellon University for the operation of the Software Engineering Institute, a federally funded research and development center.

Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the United States Department of Defense.

NO WARRANTY. THIS CARNEGIE MELLON UNIVERSITY AND SOFTWARE ENGINEERING INSTITUTE MATERIAL IS FURNISHED ON AN "AS-IS" BASIS. CARNEGIE MELLON UNIVERSITY MAKES NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED, AS TO ANY MATTER INCLUDING, BUT NOT LIMITED TO, WARRANTY OF FITNESS FOR PURPOSE OR MERCHANTABILITY, EXCLUSIVITY, OR RESULTS OBTAINED FROM USE OF THE MATERIAL. CARNEGIE MELLON UNIVERSITY DOES NOT MAKE ANY WARRANTY OF ANY KIND WITH RESPECT TO FREEDOM FROM PATENT, TRADEMARK, OR COPYRIGHT INFRINGEMENT.

[Distribution Statement A] This material has been approved for public release and unlimited distribution. Please see Copyright notice for non-US Government use and distribution.

This material may be reproduced in its entirety, without modification, and freely distributed in written or electronic form without requesting formal permission. Permission is required for any other use. Requests for permission should be directed to the Software Engineering Institute at permission@sei.cmu.edu.

Carnegie Mellon® is registered in the U.S. Patent and Trademark Office by Carnegie Mellon University.

DM-0003041



Agenda



- KJ Method Overview
- KJ Interviewing Techniques
- KJ Affinitization Technique
- Kano Analysis





Purpose

Provide an overview of the KJ method and Kano analysis and describe the SEI's approach for using these techniques in a virtual (non face-to-face), distributed setting.

This overview is an adaptation of a full-day training session.

For more information about KJ+ and to download the tutorial, see:

<https://www.sei.cmu.edu/measurement/research/eliciting-requirements/>



Overview of SEI Approach



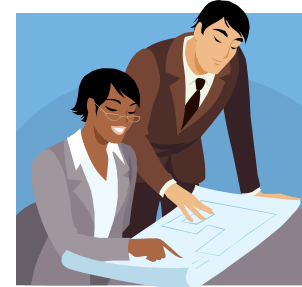
Step 1: Evaluate existing knowledge of stated needs and requirements



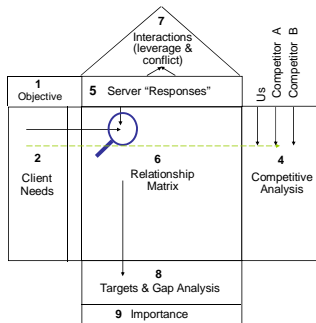
Step 2: Design the open-ended, probing questions to be used in KJ interviews



Step 3: Conduct KJ interviews collecting all possible context information



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



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



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



Step 6: Identify Unstated Needs and subsequent Innovative Requirements



Step 5: Conduct the KJ Workshop including specialized affinity exercise





Traditional Requirements Elicitation Approaches

Interviews of customers/users to elicit problems and usage needs

Inventory of problem reporting systems harboring customer complaints

Solicitation of specification from customers/users to build a system/product/service specification

Specification developed by marketing and/or engineering that reflects their thinking on what the customer/user requirements are

Normally, a specification-driven process!





Our SEI Approach

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 “**delighters**” vs. “**satisfiers**” vs. “**must-be’s**”

Future use of 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



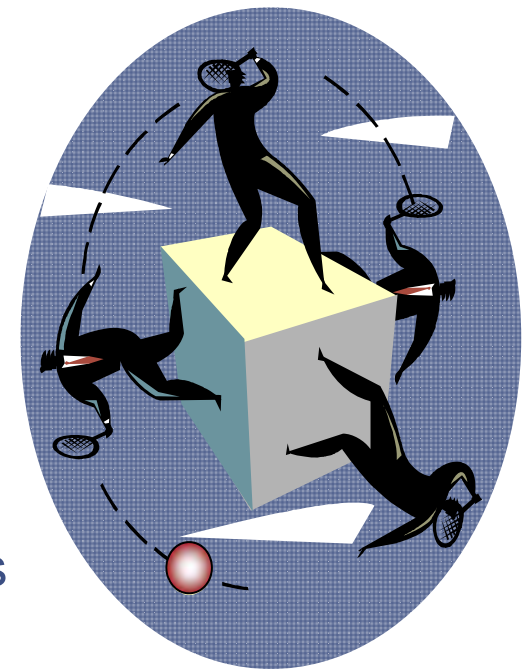
KJ – Origins and Applications



Kawakita Jiro (KJ), a Japanese anthropologist, developed a systematic way to find messages in complex qualitative data.

A KJ can be helpful when

- Issues are **complex**
 - Lots of information available, but many potential interpretations
- Team would benefit by **learning together**
 - Based on facts
 - Developing common understanding and focus
- **Communication and reuse of the information** is important
 - KJ is a powerful way to store and transmit data



KJ Interviewing



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



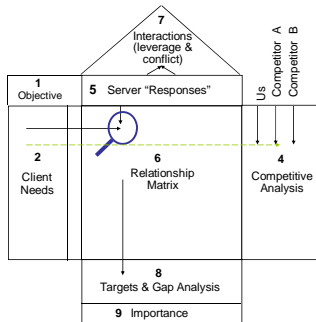
Step 2: Design the open-ended, probing questions to be used in KJ interviews



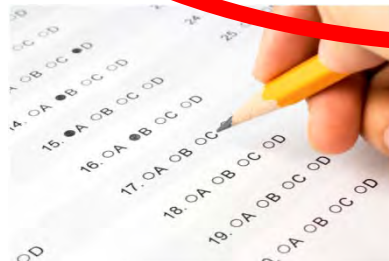
Step 3: Conduct KJ interviews collecting all possible context information



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



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



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



Step 6: Identify Unstated Needs and subsequent Innovative Requirements



Step 5: Conduct the KJ Workshop including specialized affinity exercise





Traditional User Interviewing Approach

Selected customers/users are interviewed either individually or in group settings.

Discussions center initially on areas of dissatisfaction.

Interviewing questions and discussion then migrate to solutions that might help.

Both interviewers and customers/users provide ideas for improvement.

Discussion may proceed into details of design and implementation.

Side benefits of these interviews include the following:

1. Interviewers are able to test out their own solution ideas.
2. Customers/users are able to put their recommended solutions on the table.
3. Customers/users feel better after “venting” about their dissatisfaction.





KJ Interviewing Approach

Selected customers/users are interviewed either individually or in group settings. Questions and discussion focus on two extremes: **very dissatisfied or very happy**.

Additional open-ended, probing questions are used to collect **maximum context information** surrounding the extremely negative and positive experiences.

It is impossible to know in advance which information will prove actionable until we've identified information from all interviews. Therefore it is important in each interview to carefully probe the context of an experience to collect **sufficient information** by which relevant and reasonable **themes of experience** can later be constructed.

Copious note-taking of the context information is mandatory in these interviews.

The interviews absolutely do not touch on the solution space.

This is a challenging approach to interviewing customers/users.

To the untrained observer, the interview may seem to be a mere “complaint” exercise!



Approaches to Interview Questions

Three generic avenues of discussion may be used to start conversations, then probe and follow intuition to learn in real time.

Experience	Current Practice	Future Trends
<p><i>Gaps in past performance often have clues about future value.</i></p> <p>“Why was this a problem ...?”</p> <p>“What went very well?”</p>	<p><i>How they “do” things can reveal compensatory behavior, waste, etc. – also sources of future potential value.</i></p> <p>“How do you ...?”</p>	<p><i>Where they see things going may hold clues about future value, and tips about robust design or “future-proofing” a solution.</i></p> <p>“Looking ahead...?”</p>



SIX SIGMA ADVANTAGE
The Third Wave™



Gathering Better Data

Sharpening Interview and Discussion Skills



A surface dialogue reveals

- **Stated needs and facts**
 - Complaints
 - Problems
 - Valued Features
 - Constraints

Refined data gathering and probing can reveal...



• **What's it like in the environment? (context data)**

- User-Scenarios
- Observations
- Process Maps

• **Underlying functionality (needs data)**

- "What does that *do* for you?"
- "How and why is it important?"



Understanding Context and Needs Data



SIX SIGMA ADVANTAGE
The Third Wave™

	Needs Data	Context Data
Definition	Statements about what is needed (solution free)	Scenarios that describe what it's like in the environment
Examples	<p><i>"We need to get materials in and finished goods out of our warehouse much more quickly than we do now."</i></p> <p><i>"We need to better monitor contract compliance."</i></p> <p><i>"We need to get data into the system...then out to the right people faster and more accurately."</i></p>	<p><i>"There seems to be a lot of turnover in the shipping department, which means we're constantly training new people."</i></p> <p><i>"Members will increasingly contract directly with medical groups."</i></p> <p><i>"Our biggest challenge is overly complex HMO contracts."</i></p>
How it is helpful	Specifies functionality that would be valuable	Provides clues and facts about latent requirements and operating conditions
How we use it	Capture must-be's and satisfiers	Identify delighters ; inform robust design

Interview: an Example - 1

Key:
Questions
~~Extraneous Information~~
Emotional, superficial response
Need
Context that Goes With Need

B: Can you tell me about your experiences about using a laptop at home.

MB: *I've had horrible experiences using my laptop at home.*

B: Can you elaborate on why this was such a horrible situation.

MB: *I always worry that something is going to happen to it and I will have to replace my laptop.*

B: I need you to elaborate even more. Please describe some situations at home where use of your laptop was stressful or frustrating.

MB: I spend most of my time in the kitchen and so I often use my laptop in the kitchen. I use it first thing to check my email, I keep all of my recipes on my laptop and use it while I'm cooking but I often *get stressed out* that someone either me or my kids are going to spill something on it. It seems like I'm always using it for something.



Interview: an Example - 2

Key:

Questions

~~Extraneous Information~~

~~Emotional, superficial response~~

Need

Context that Goes With Need

B: Can you elaborate a little more about frustration in using your laptop to store your recipes?

MB: ~~I started to do this after I was visiting a friend, we were having coffee and she was fixing a quiche. I noticed that she kept looking at her laptop. I realized that she was reading the recipe when I saw her looking over. I asked her to send it to me and then I started to keep a file on my computer with recipes. I often get recipes from friends and on the Internet so I LOVE that it is so very easy to store these recipes. However, initially I was keeping them in an unorganized folder and it sometimes took me a long time to find the recipe I needed.~~

B: Tell me more about your actual frustration.

MB: I would get very frustrated because my recipe box has the various tabs that help me to organize my recipes. Once I started to name the recipes with how I refer to them, I just use the “sort by name” feature and I don't have the problem anymore. My biggest complaint about having recipes on my computer is that I have a window in my kitchen above my sink and my stove is near there. I've found that at different times of day, the glare from the window makes the screen hard to read so depending if I'm in a rush, I print out the recipes. I hate doing this because I am concerned about the environment and I have enough clutter. I don't need another piece of paper lying around the house to be thrown away.

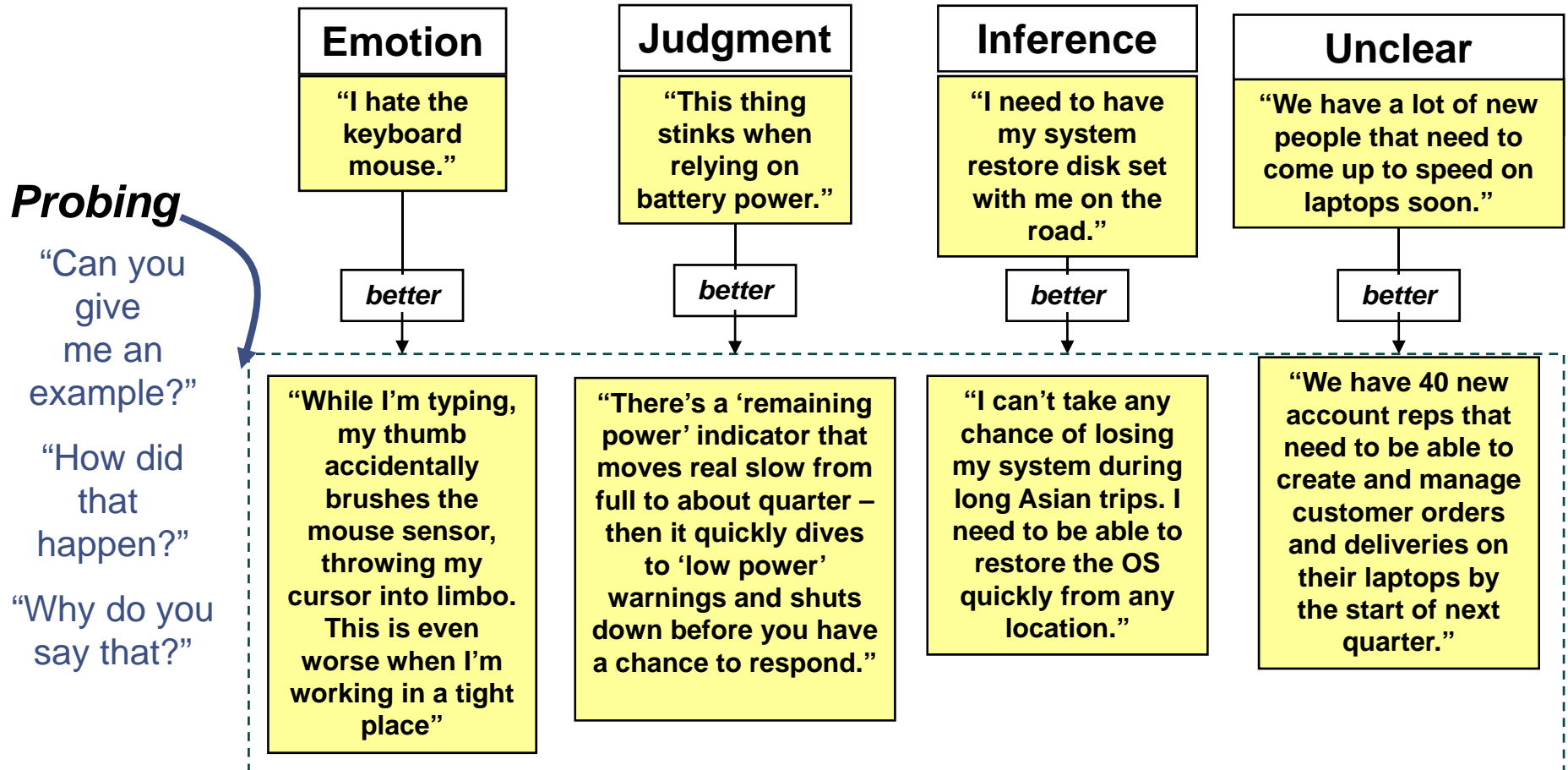


Gathering Better Data

Probing



Language *as we find it* often is the least usable – it may contain...



Language *as we need it*, scrubbed to "report language" – just the facts





Example Generic KJ Interview Questions

1. What were some of your most negative experiences in the past regarding...?
2. What were some of your most positive experiences in the past regarding...?
3. What do you wish you could also do when performing...?
4. Who else would you like to be able to interact with when performing...?
5. How do you feel when something specific such as ... occurs?
6. How do others around you feel about...?
7. How could you be more effective? productive? efficient?
8. In what ways would you be happier or more fulfilled in performing...?
9. What increases your stress or frustration in performing...?
10. When and where do you use?

(All of these questions would be followed by probing questions of context surrounding the experience! Alternatively, keep asking why?)

KJ Affinitization



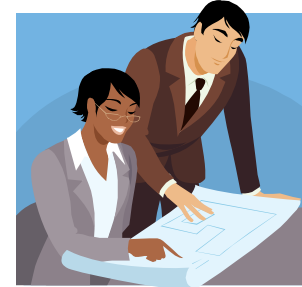
Step 1: Evaluate existing knowledge of stated needs and requirements



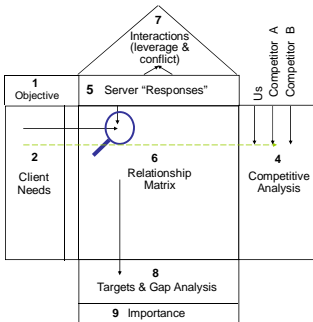
Step 2: Design the open-ended, probing questions to be used in KJ interviews



Step 3: Conduct KJ interviews collecting all possible context information



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



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



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



Step 6: Identify Unstated Needs and subsequent Innovative Requirements



Step 5: Conduct the KJ Workshop including specialized affinity exercise



KJ Elements



WHAT HAS BEEN PREVENTING US FROM SERVING THE CHANGING NEEDS OF BUSINESS CUSTOMERS?

Theme Question

Pivotal – everything else on the KJ is a full-sentence, factual answer to this question.

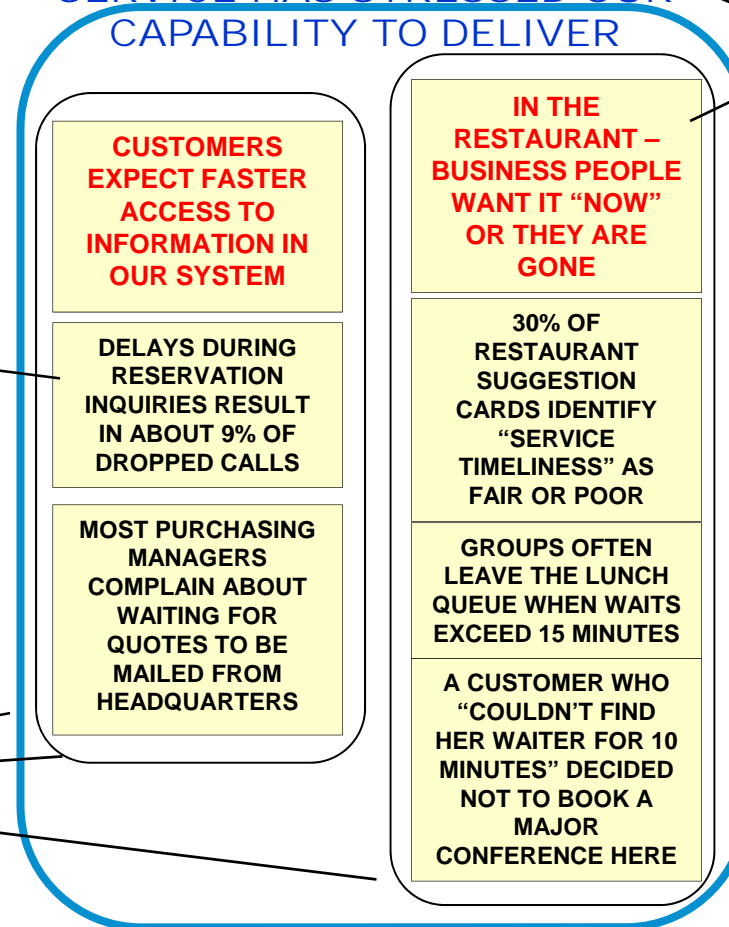
DEMAND FOR SPEEDIER SERVICE HAS STRESSED OUR CAPABILITY TO DELIVER

Titles (red, blue)

that precisely abstract the story that unites their group

Facts (Black)
traceable to reality (not “ideas”)

Groups
whose story (not keywords) unites the members



Now You Try It -- Group two or more of these...



WHAT SCENES AND IMAGES DESCRIBE
THE RECENT SUMMER VACATION?



SIX SIGMA ADVANTAGE
The Third Wave™

Up at 5 AM –
digging worms

Checking my
email at work

Quiet time –
Reading on
the front porch

On the
computer
games with
the kids

Out in the boat
together -
fishing

Snoozing in
the hammock

Chopping
Firewood

All of us
around the
campfire –
telling stories
and singing





TV at Bedtime Exercise

Watching TV at night helps me go to sleep.

I get stressed out when I must keep a checklist of things to do before falling asleep.

I usually fall asleep with the TV still on.

I find myself easily distracted.

My electricity bill is too high! I need to cut down.



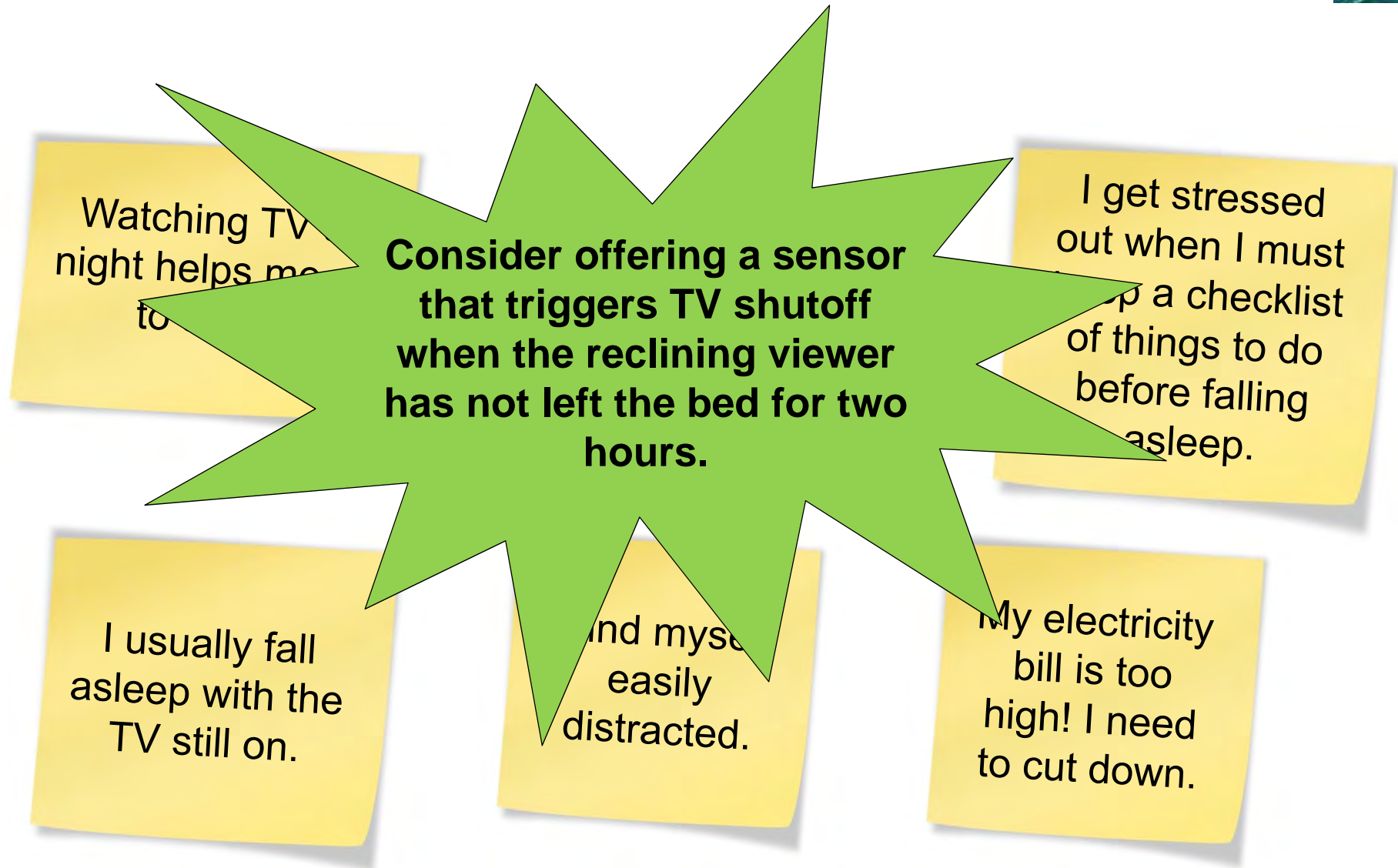


TV at Bedtime Exercise





TV at Bedtime Exercise



Example of Traditional Affinity Grouping (Hotel)



ID#	Traditional Interviewing Statement	Checkin / Checkout Affinity	Room Quality Affinity	Room Service
1	Clean Room		X	
2	Reliable Room Service Delivery			X
3	No-Hassle Check-In/Out	X		
4	Friendly Staff	X		X
5	Room Service Food Fresh & Hot			X
6	Don't Lose Reservation	X		
7	Room Service Available			X
8	Nice Towels		X	
9	New Bathroom		X	
10	Good Room Service Selection			X
11	Mini-Refrigerator in Room		X	
12	Attractive Furnishings		X	
13	Big TV		X	
14	Express Checkout	X		
15	Quiet Heater/Air Conditioning		X	
16	Non-Smoking Room Available	X		
Taken from affinity website - https://www.moresteam.com/toolbox/affinity-diagram.cfm				



Traditional Responses with Added KJ Contextual Data

ID#	Traditional Interviewing Statement with Added KJ Context from Probing
1	<i>Prefer a Clean Room with a fresh smell to give my hotel stay a pleasant start</i>
2	<i>Expect Reliable Room Service Delivery so I don't have to keep calling on status</i>
3	No-Hassle Check-In/Out <i>helps me avoid tracking a lot of detail during a business trip</i>
4	Friendly Staff <i>pick up my spirits when I am tired on a business trip</i>
5	<i>If my Room Service Food is not Fresh & Hot, I have to spend time finding a local restaurant</i>
6	Don't Lose Reservation <i>is a message I don't want to hear because I do not have access to my travel agent</i>
7	<i>I like it when Room Service is Available because I can avoid worrying about logistics</i>
8	Nice Towels <i>put me in a good mood when I have to get up early in the morning</i>
9	New Bathroom <i>gives me a clean feeling and adds energy to my day</i>
10	Good Room Service Selection <i>keeps my stress level down and reduces anxiety about my diet</i>
11	Mini-Refrigerator in Room <i>gives me choices as I decide about food and snacks while working in my room</i>
12	Attractive Furnishings <i>put me in an energetic mood, enabling me to get more work done in my room</i>
13	Big TV <i>helps me see hotel area traffic, whether I am in bed or on the hotel room balcony</i>
14	Express Checkout <i>helps me a lot as I am forgetful about the time and logistics to check out</i>
15	Quiet Heater/Air Conditioning <i>enables me to think creatively on hard problems without distraction</i>
16	Non-Smoking Room Available <i>is a must or I will have a headache while trying to work in my room</i>





Example 1 with KJ Affinitization (Hotel)

ID#	Traditional Interviewing Statement	<u>One theme of experience could be:</u>
2	<i>Expect</i> Reliable Room Service Delivery <i>so I don't have to keep calling on status</i>	As a very busy traveler, I need help in looking up information, contacting remote agencies and tracking a lot of detail, without human assistance or delay. <u>An innovative solution could be:</u> A free application on a smart phone (or hotel issued device), which enables precise SIRI-like queries, and which also communicates with my TV and interactive displays throughout my room, balcony and other areas of the hotel, taking advantage of sensing my location.
3	No-Hassle Check-In/Out <i>helps me avoid tracking a lot of detail during a business trip</i>	
5	<i>If my</i> Room Service Food <i>is not</i> Fresh & Hot, <i>I have to spend time finding a local restaurant</i>	
6	Don't Lose Reservation <i>is a message I don't want to hear because I do not have access to my travel agent</i>	
7	<i>I like it when</i> Room Service <i>is</i> Available <i>because I can avoid worrying about logistics</i>	
13	Big TV <i>helps me see hotel area traffic, whether I am in bed or on the hotel room balcony</i>	
14	Express Checkout <i>helps me a lot as I am forgetful about the time and logistics to check out</i>	

Adapted from affinity website - <https://www.moresteam.com/toolbox/affinity-diagram.cfm>





Exercise

In the following slide, we will practice KJ affinitization with a list of KJ report statements regarding user experiences with laptops.

Identify at least two themes of experience. For each theme

- Provide KJ report statement ID numbers.
- Provide a brief title phrase reflecting the unstated theme of experience.
- Provide a 1-3 sentence rationale.
- If possible, identify solution to meet this unstated theme.

Remember:

1. There is no one correct answer to groupings.
2. Focus on the non-obvious, take a chance, think out-of-the-box.
3. We want maximum ideas!



Identify at Least Two Themes of Experience

ID#	KJ Report Statements on Home Computer Use
1	I use my laptop everywhere: in bed, on couch, at Starbucks. I take it everywhere.
2	I want to be able to monitor contents of fridge for snacks.
3	I use a wireless mouse but it is just another accessory that I must track and set-up.
4	I like to use my laptop while sitting on my favorite couch watching 60" screen TV.
5	I communicate with others in the house via computer. It's easier than yelling.
6	My mouse is great, helping me easily follow links, surf web, and do look-ups.
7	When using laptop on my lap, it gets unacceptably hot on my legs.
8	I like to prepare lunch and do other tasks at home while working on my laptop.
9	I often forget to turn my wireless mouse off, resulting in depleted batteries that often need to be replaced or requiring me to use my touchpad instead.



Conduct Kano Analysis



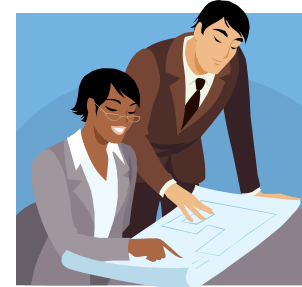
Step 1: Evaluate existing knowledge of stated needs and requirements



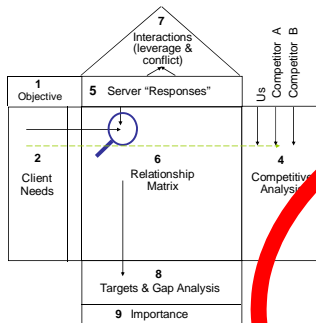
Step 2: Design the open-ended, probing questions to be used in KJ interviews



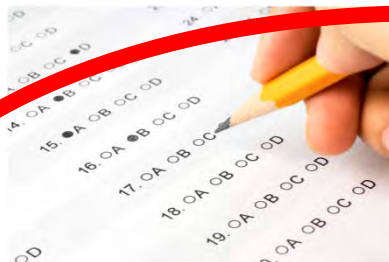
Step 3: Conduct KJ interviews collecting all possible context information



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



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



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



Step 6: Identify Unstated Needs and subsequent Innovative Requirements

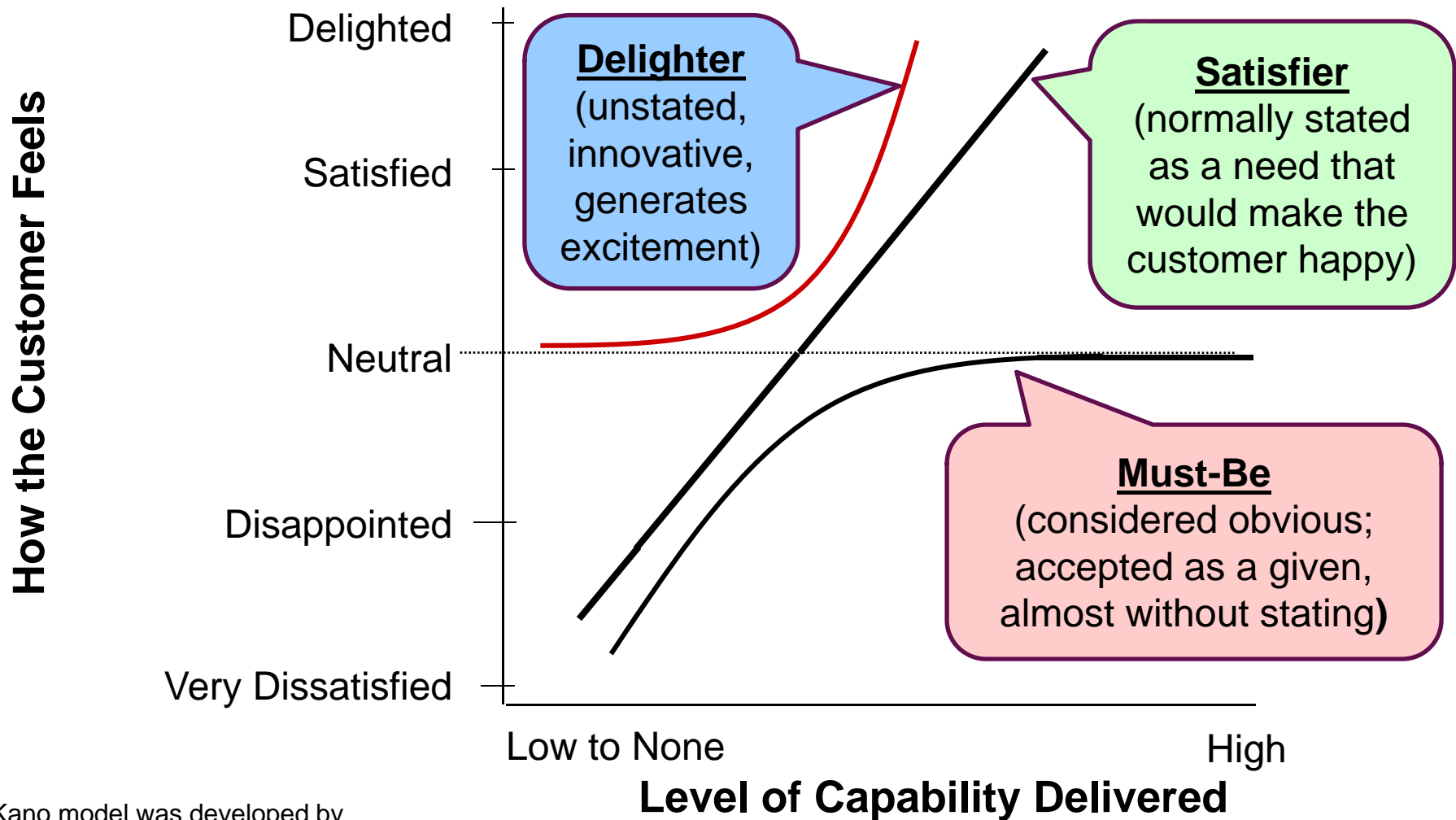


Step 5: Conduct the KJ Workshop including specialized affinity exercise





Kano Model Classifies the Unstated Need Solutions



The Kano model was developed by Professor Noriaki Kano in the 1980s.





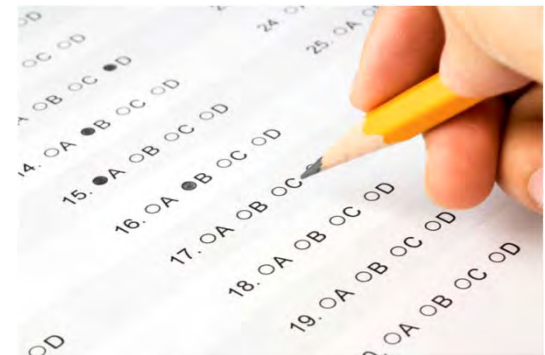
How Kano May Be Used Within Requirements Elicitation Process

Kano Analysis is an approach that categorizes needs and requirements into one of three categories (“Must-Be” vs. “Satisfier” vs. “Delighter”).

All needs and requirements, whether stated or unstated, may be categorized using Kano analysis.

We will show Kano analysis conducted using a survey in which a pair of questions are asked for each unstated need.

Confirmed “Delighters” are then typically translated into requirements statements based on the rich-implementation Kano question.





Kano Analysis

For each innovative solution to an unstated need, develop a pair of questions that express the need as satisfied at two extreme levels of solution implementation.

Unstated Need: Without training, new users enter eligibility data correctly.

Low

a. If the system alerts the user when a data entry error occurs, how do you feel?

- 5) Delighted
- 4) Satisfied
- 3) Neutral
- 2) Disappointed
- 1) Very dissatisfied

High

b. If, additionally, the system recommends remedial steps and logs the status to the system manager's report, how do you feel?

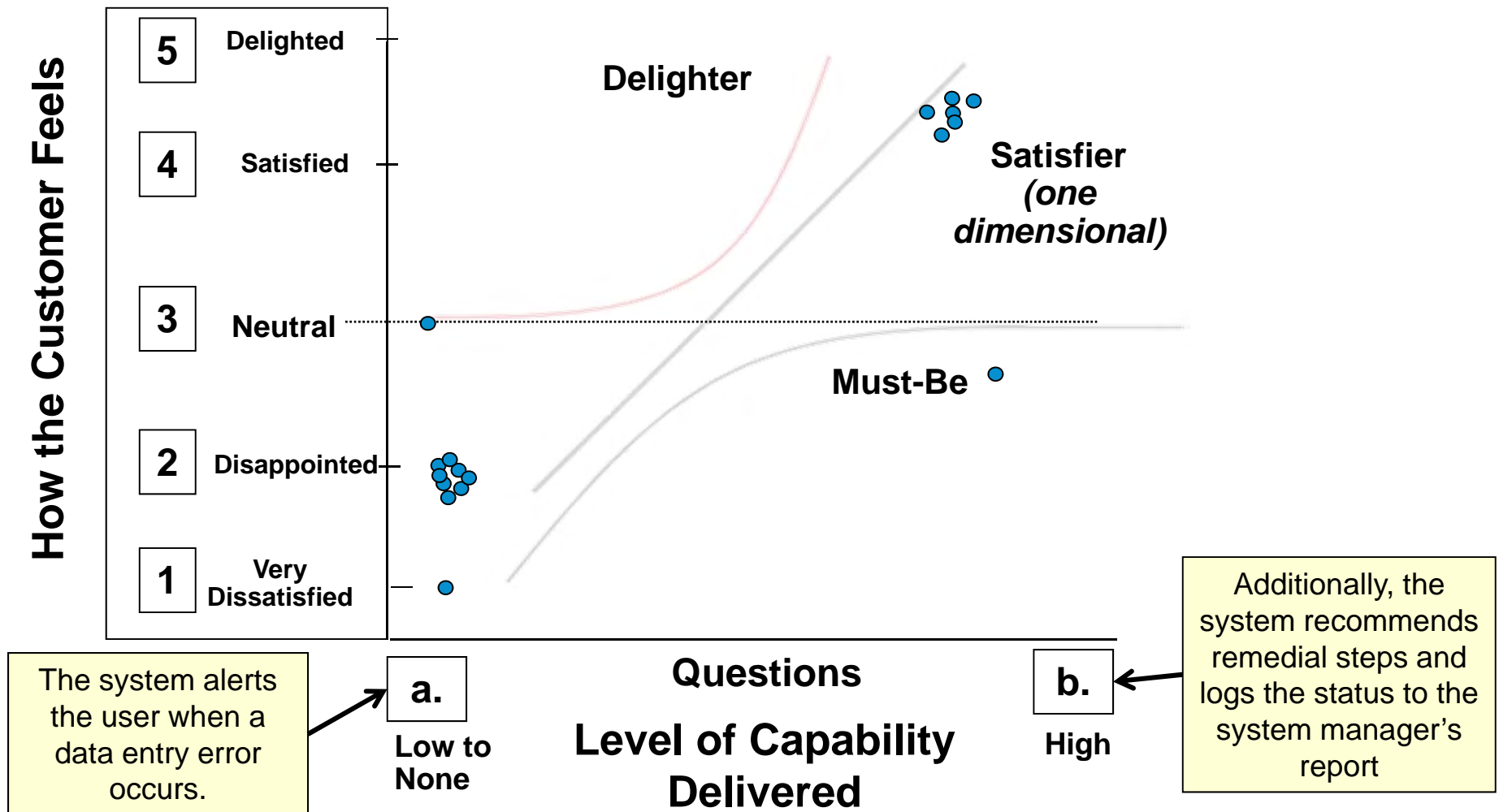
- 5) Delighted
- 4) Satisfied
- 3) Neutral
- 2) Disappointed
- 1) Very dissatisfied



Interpreting Kano Responses



Unstated Need: Without training, new users enter eligibility data correctly.





From Themes to Unstated Needs and Requirements

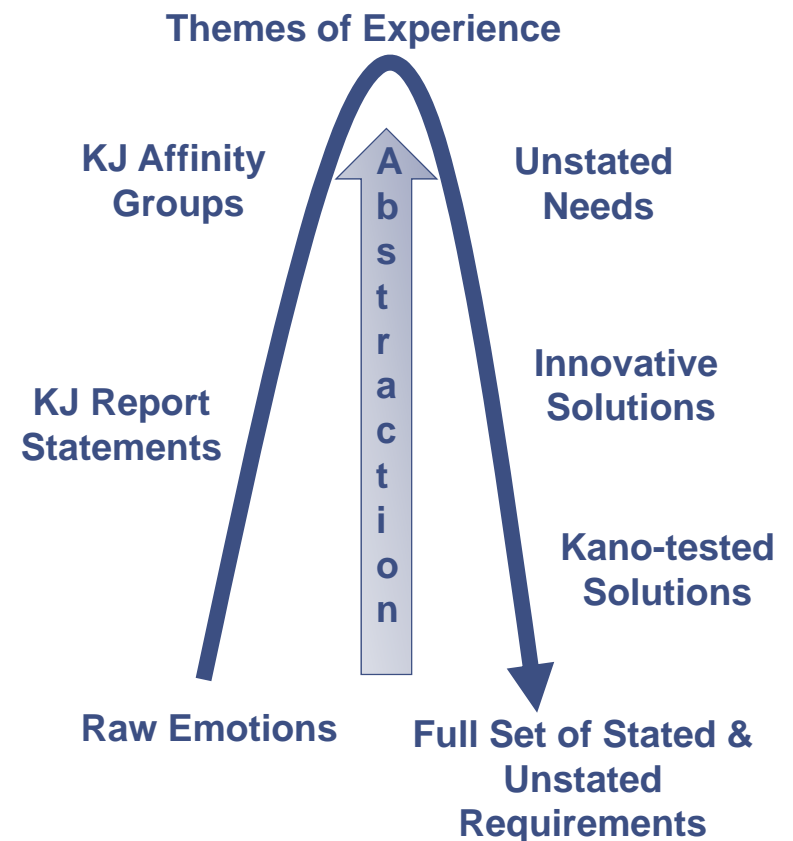
Theme: I want to eat and drink without damaging my laptop.

Rationale: KJ report statements imply the presence of food and drink near the laptop.



Unstated Need: Home laptops are resistant to damage from food and drink.

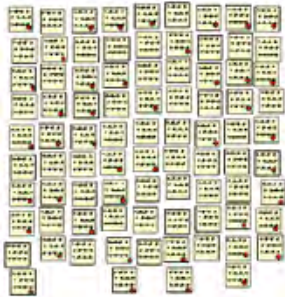
Unstated Need: Home laptops recognize when food and drink are nearby and go into a safe mode.





KJ Summary

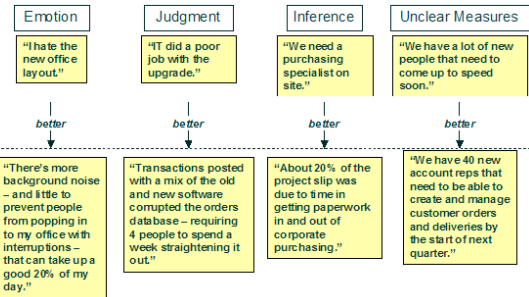
KJ is a method for transmuting *tacit* into *explicit* knowledge consisting of objective statements ...



Structured Interviews

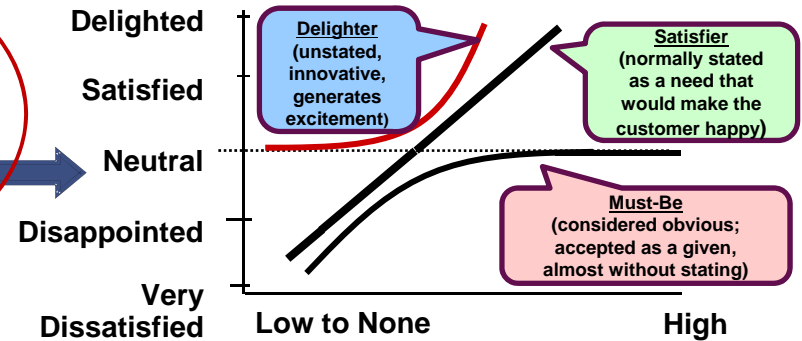
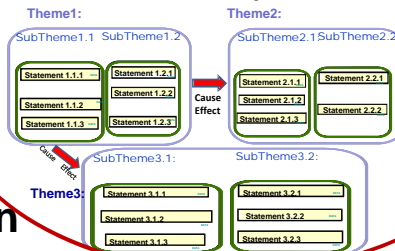
Theme Question

Probing
"Can you give me an example?"
"How did that happen?"
"Why do you say that?"



... and refining a collection of these statements that conveys context information and themes of experience.

Theme Question KJ thematic hierarchies: Each affinity group has a theme. Affinity groupings can be combined under themes of higher abstraction level.



Adapted from David Hallowell, "Language Data: The 'Other Data' of Six Sigma: Parts 1 & 2," <http://www.isixsigma.com/library/content/c040303b.asp>





Questions





Thank You for Your Attention!

Michael Konrad
Principal Researcher
Software Engineering
and Acquisition Practices
+1 412-268-5813
mdk@sei.cmu.edu



Nancy Mead
SEI Fellow, Principal Researcher
Cyber Security Foundations
+1 412-268-5756
nrm@sei.cmu.edu



Robert Stoddard
Principal Researcher
Software Engineering and
Acquisition Practices
+1 412-268-1121
rws@sei.cmu.edu



Mary Beth Chrissis
Sr. Member of the Technical Staff
Client Technical Solutions
+1 412-268-5757
mb@sei.cmu.edu



Claire Dixon
Senior Writer/Editor
Communication Services
+1 412-268-3624
cdixon@sei.cmu.edu



Michele Falce
Project Administrator
Software Engineering and
Acquisition Practices
+1 412-268-5722
mbaker@sei.cmu.edu

