NORTHROP GRUMMAN

DEFINING THE FUTURE

Using Voice of Customer to Advance OID – *Giving The Customer a Vote In Improvement*

CMMI Technology Conference
Denver, Colorado

November 11, 2006

Donald R. Corpron
Division Manager – Six Sigma
Northrop Grumman Corporation

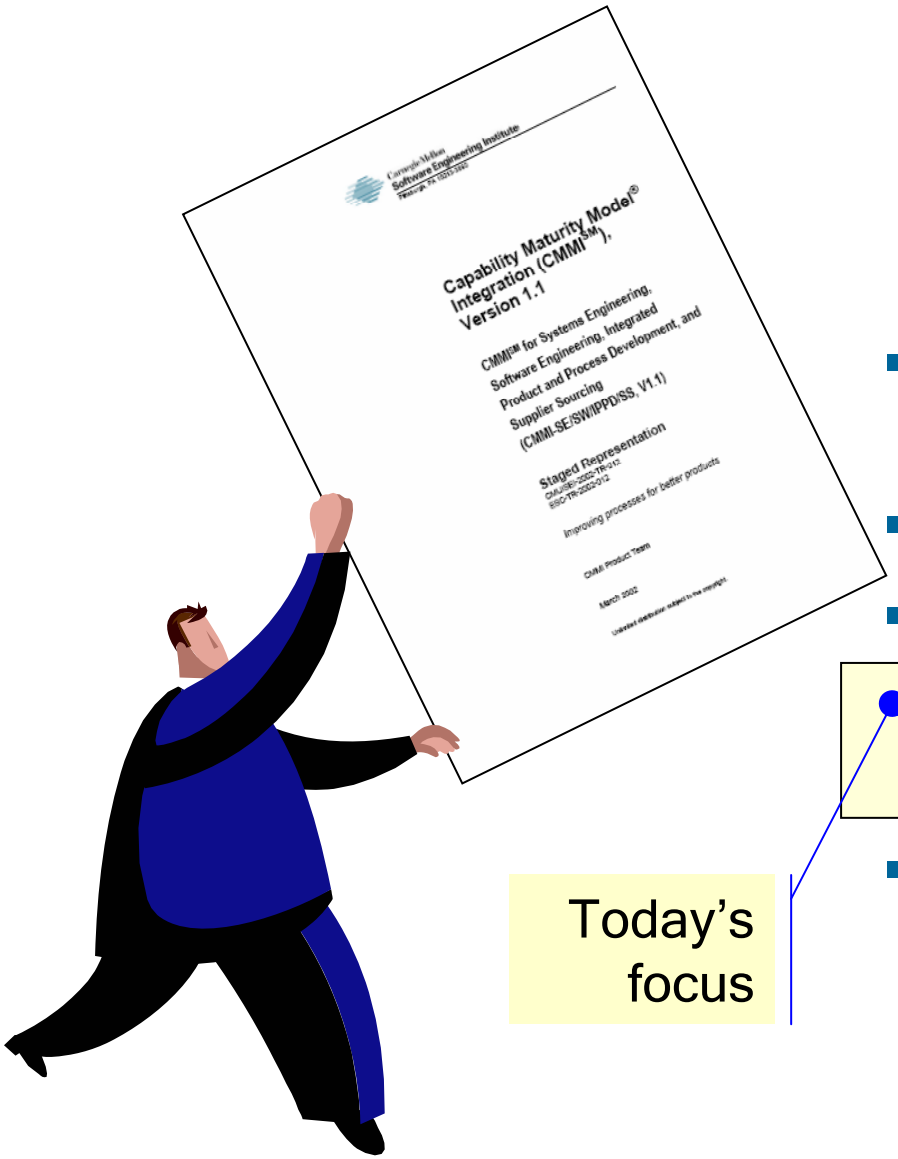
SRD-06/018

Preview…

- Intent of Organizational Innovation and Deployment
- Definition of “Voice of Customer”
- Means to Gather Voice of Customer
- Translating VoC into Criteria to Select Improvement Projects

NORTHROP GRUMMAN

About Organizational Innovation and Deployment…



Quality and process-performance objectives that this process area might address include the following:

- Improved product quality (e.g., functionality, performance)
- Increased productivity
- Decreased cycle time
- **Greater customer and end-user satisfaction**
- Shorter development or production time to change functionality, add features, or adapt to new technologies

Today's focus

CMMI® is a registered trademark of the Software Engineering Institute, Carnegie Mellon University

NORTHROP GRUMMAN

“Voice of Customer” is…

“Voice of the Customer” (VoC) means to describe the wants and needs of our Customers and their perceptions of quality

NORTHROP GRUMMAN

VoC is important because…

- High maturity organizations recognize the tie between high quality and Customer loyalty, referenceability and it's effect on business
- Quality is all non-price attributes of a product or service, tangible and intangible
- Only Customers define quality; should hear what they have to say
- Organizations need process improvements that align to "quality that Customers can see"

NORTHROP GRUMMAN

Understanding quality is difficult…

- Customers don't know all of their needs, or can't articulate what they are, or assume that you know them
- Customers often state their needs in fuzzy terms like, "Easy to Use"
- Customers needs and wants frequently change
- Quality is perceived, and not quantitatively measured

NORTHROP GRUMMAN

Follow six steps…

② Discover Their Needs with Interviews

④ Prioritize Needs

⑥ Choose Improvements Based On Criteria

① Identify Customers/ end-users

③ Categorize Needs

⑤ Survey to Determine What Really Matters

Gather Voice of Customer with Reactive or Proactive Systems…

Two basic types of VoC systems exist…

- Reactive Systems
- Proactive Systems

NORTHROP GRUMMAN

Reactive systems are…

Reactive systems are those where Customer information comes to you whether you want it or not, *e.g.,*

- Customer complaints
- Award Fee Letters
- Help Desk Calls
- Contractor Performance Assessment Reports

NORTHROP GRUMMAN

Proactive systems are…

Proactive systems are those where we seek out information about Customers needs and wants, e.g.,

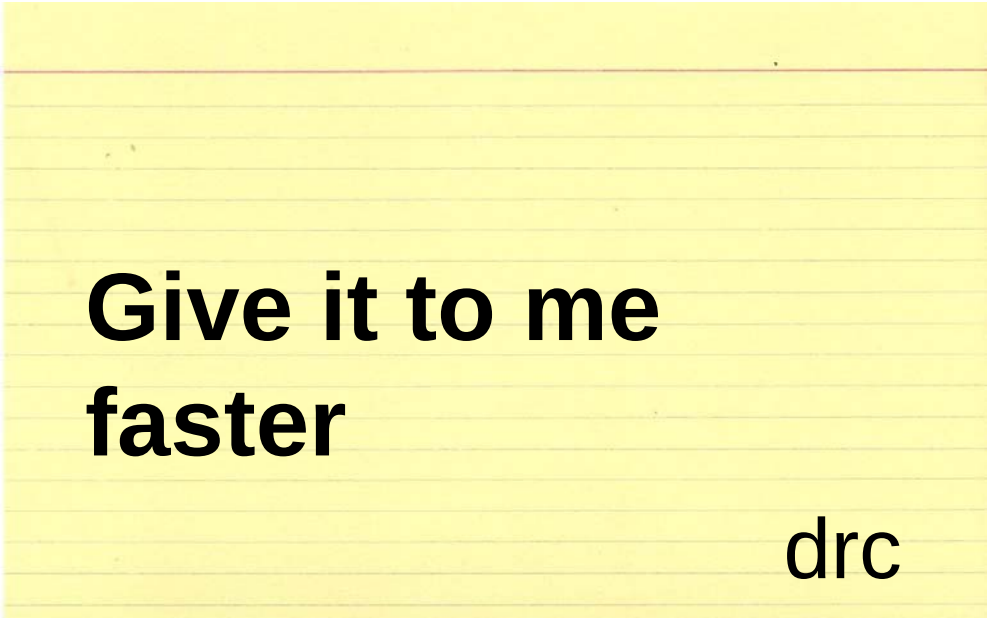
- Interviews
- Surveys
- Focus Groups
- Executive Visits
- Benchmarking

Customer interviews are good to discover needs…

- **Interviews** are proactive systems to discover Customers discover needs or wants
- Capture verbatim comments that describe needs or wants (on index cards or Post-It® notes)

NORTHROP GRUMMAN

Record Customers' verbatim comments on cards…



For capturing comments…

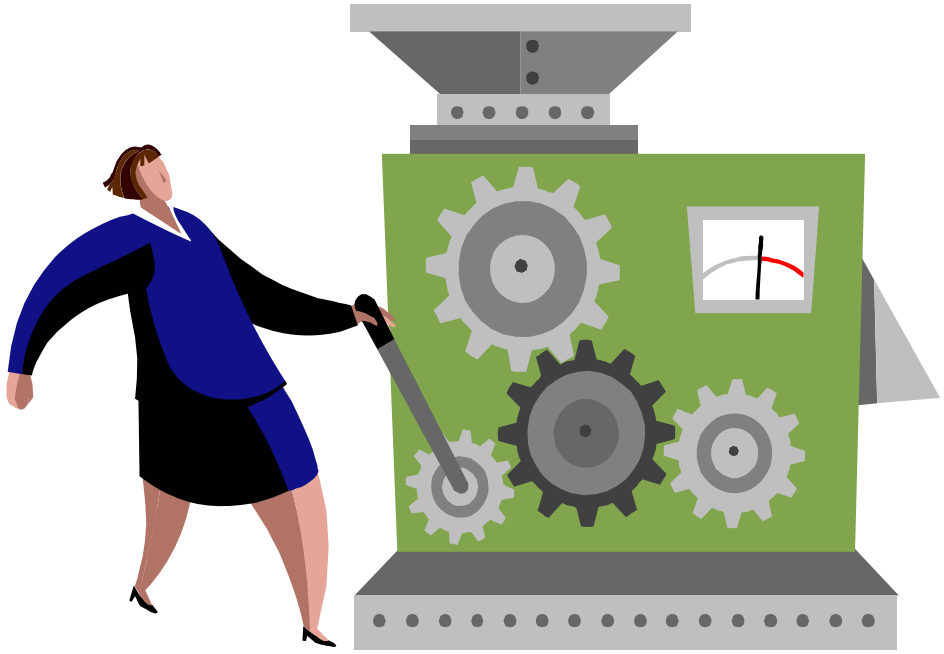
- Cards should have independent thoughts or ideas
- Write large enough so that they can be seen from afar
- Put initials on the card

The approach to interviews…

- Provoke images and listen
- Employ open ended questions that don't imply a right or wrong answer
- Tailor questions to the situation

NORTHROP GRUMMAN

Find out about Customers' current approach…



How do you use the current system?

- Tell us about the last few times.
- How do you get service?
- Who or what provides the service?
- When is the service available?
- How much time to respond?
- What method to respond?

Explore what is working well…

Tell us what works well with the current approach?

- What not to change
- What advantages now

NORTHROP GRUMMAN

Probe problem areas…

Tell us about problems you have with the current system…

- Tell us about problems.
- Which most important to fix? Why?
- Any work-arounds?
- Any costs and negative consequences?

Ask about the ideal solution…

Describe what you see as an ideal system…

- What would it look like?
- How would you interact with it?
- Any other systems you've seen or heard about it?
- Who does it best?

Explore the future…

What changes do you anticipate in the next couple of years? Include changes in…

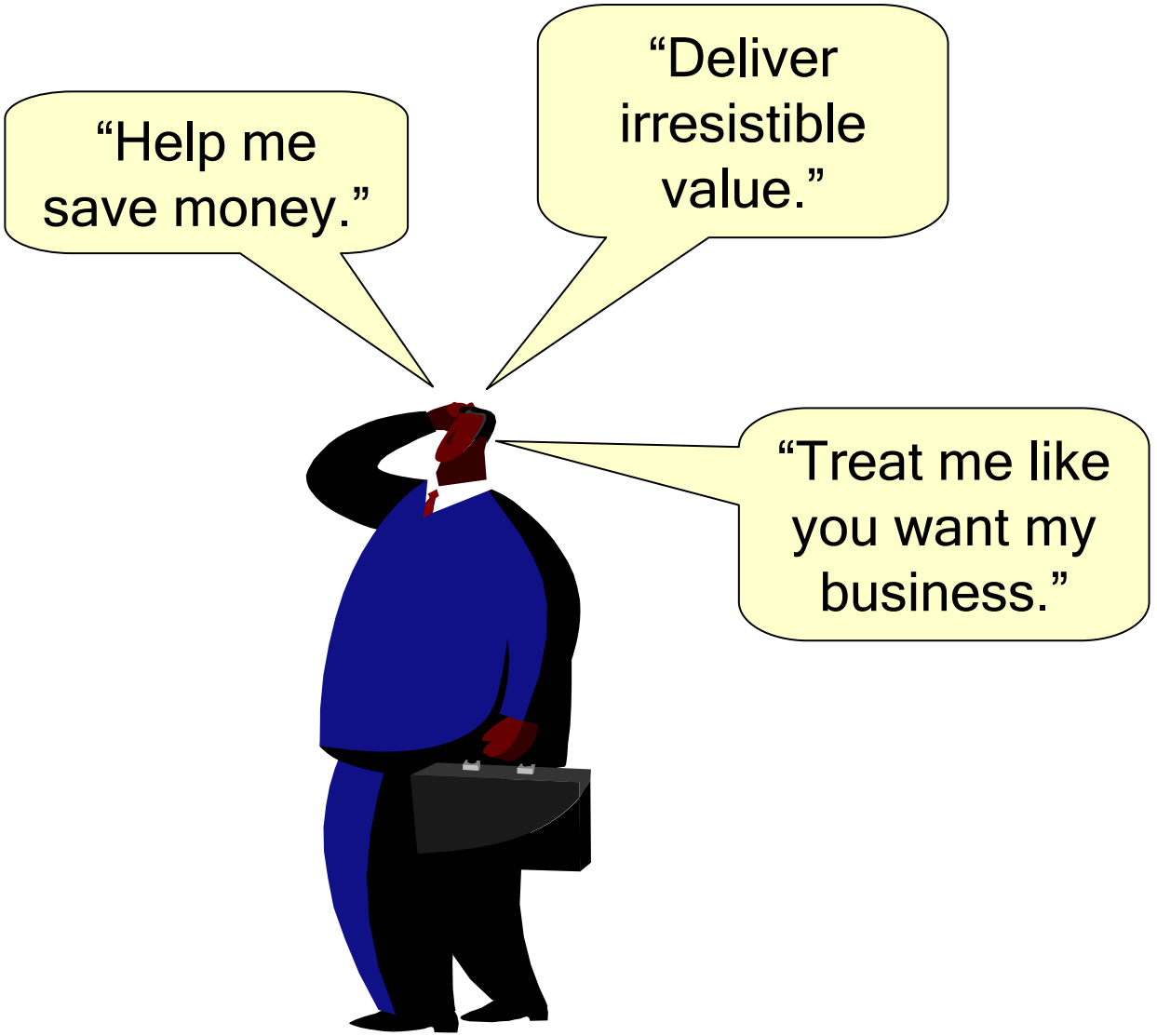
- Technology
- Your work
- Document types
- Presentation types
- Delivery formats
- Client demands or expectations
- World events

NORTHROP GRUMMAN

Needs Customers might tell you…

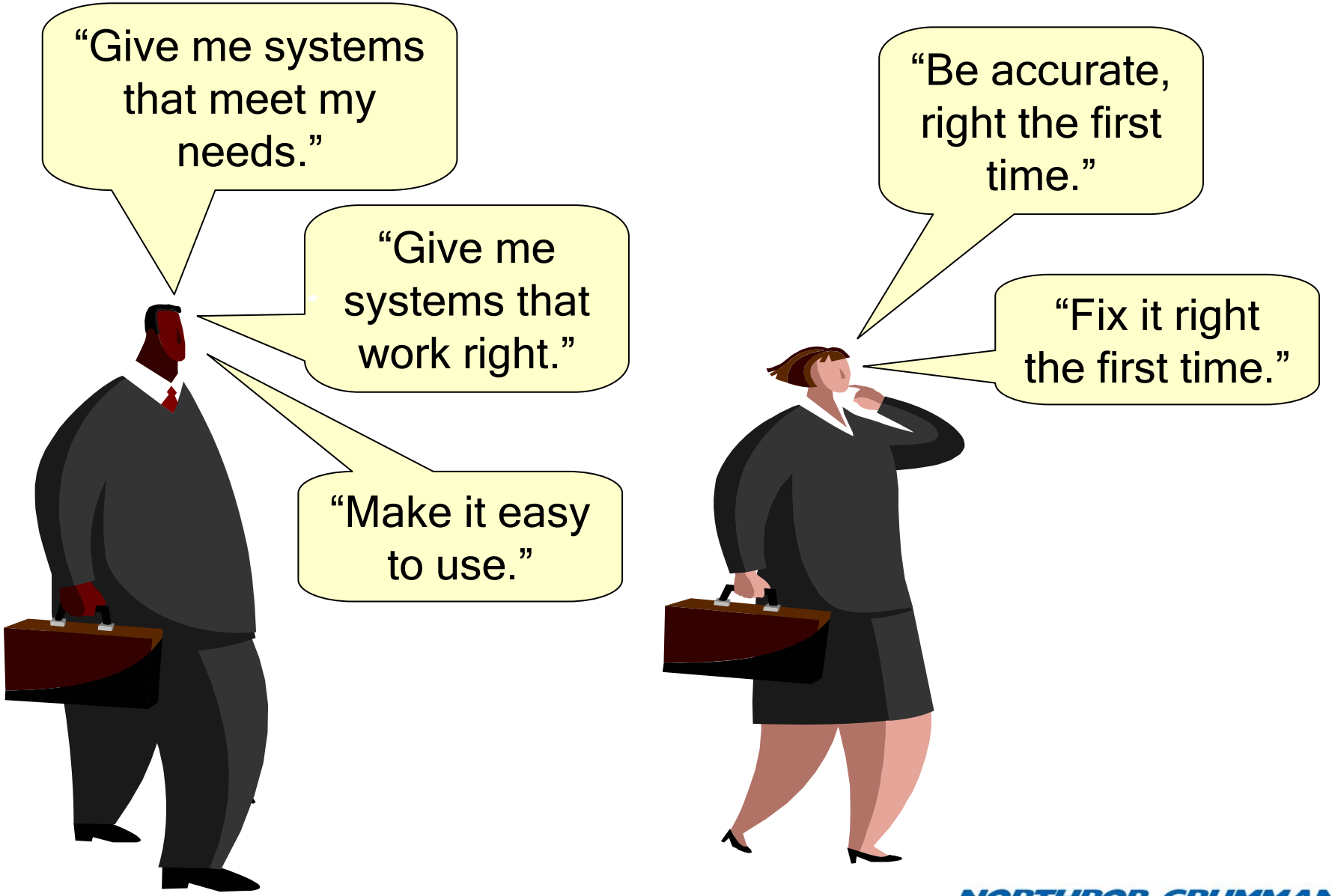
NORTHROP GRUMMAN

More needs Customers might tell you…



NORTHROP GRUMMAN

Even more needs Customers might tell you…



NORTHROP GRUMMAN

About affinitizing needs or attributes…

- The affinity diagram, or KJ method is one of the most widely used of the Japanese management and planning tools
- The affinity diagram was developed to discover meaningful groups of ideas within a raw list
- Important to let the groupings emerge naturally, using the right side of the brain, rather than according to preordained categories

Start by posting all the verbatim comments…

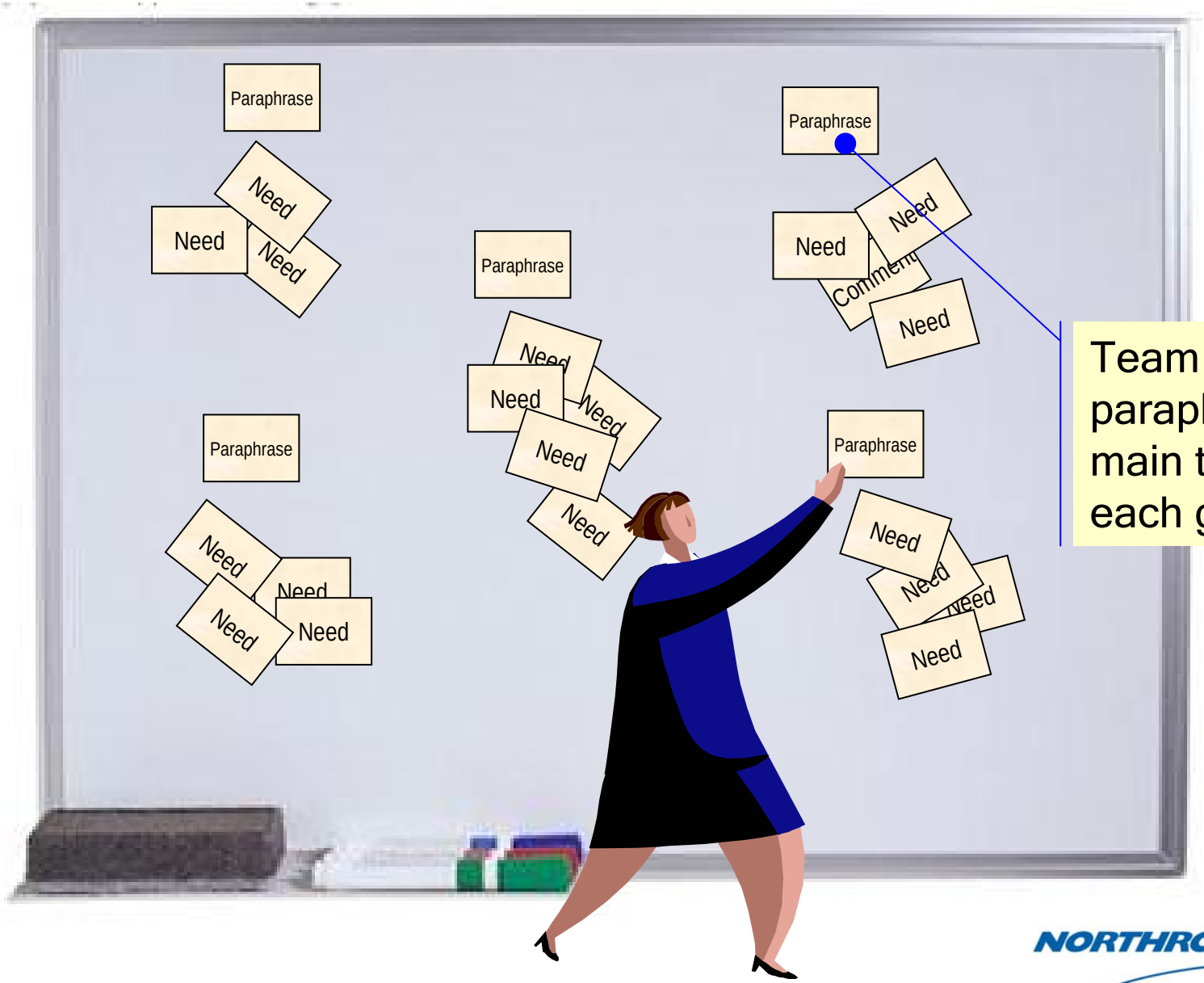
NORTHROP GRUMMAN

Team sorts cards into groups with a common thread...

Do this as a silent activity
Anybody can move any card any number of times

NORTHROP GRUMMAN

Someone works with the team to paraphrase the essence…

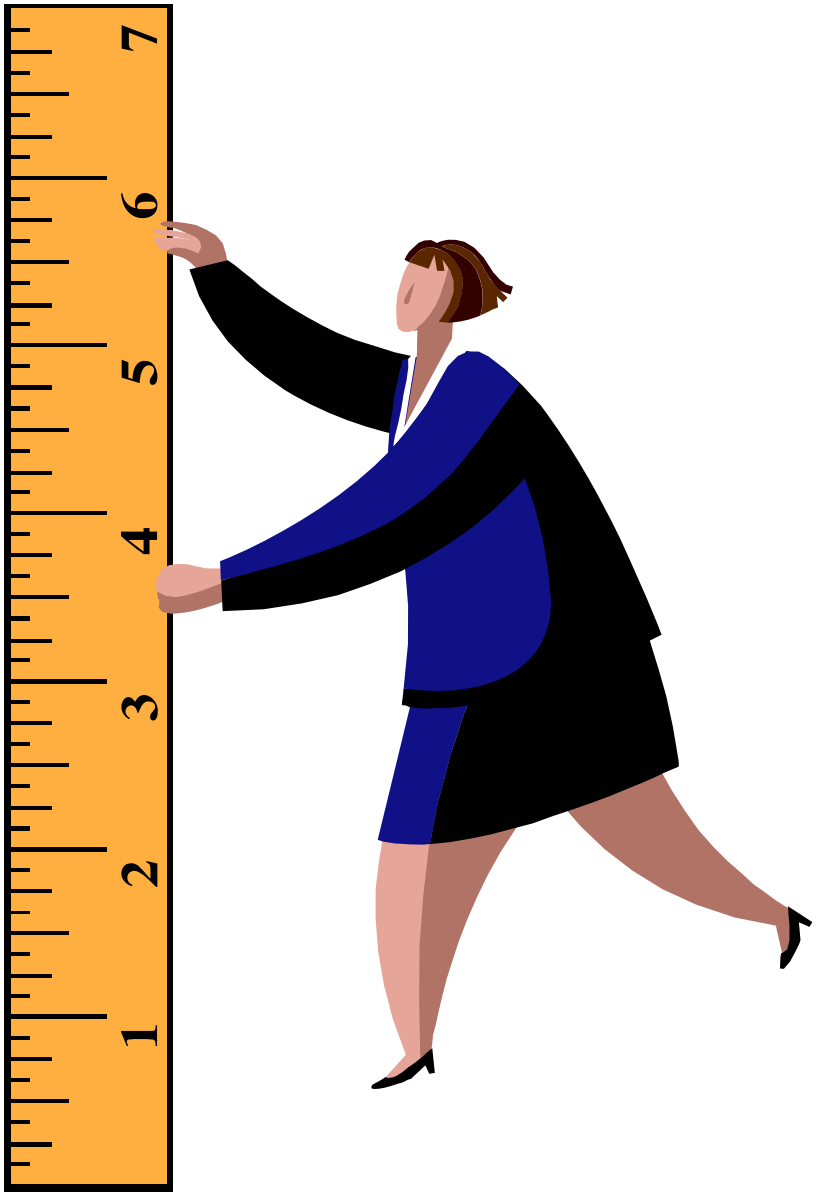


About surveys…

- Surveys are another proactive system to collect information about Customer needs
- Combined with Likert scaling, surveys can prioritize needs

NORTHROP GRUMMAN

A Likert scale is…



A Likert scale is a type of survey question where respondents rate the level at which they agree or disagree with a given statement, e.g.

The system is easy to use.
1. Strongly Agee
2. Agree
3. Somewhat Agee
4. Neutral
5. Somewhat Disagree
6. Disagree
7. Strongly disagree

Likert scales are effective to…

- Measure “soft” things like perceptions, attitudes, or satisfaction
- Capture the state of information about process performance where only notions of performance exist.
- Verify Customer’s perception of differences in “before” and “after”
- Validate that “hard” measures are good predictors of what Customers’ see

NORTHROP GRUMMAN

Especially in software…

- In software evaluation, we can often objectively measure efficiency and effectiveness with performance metrics such as time taken or errors made
- But, Likert scales and other attitudinal scales help get at the emotional and preferential responses people have to the design

NORTHROP GRUMMAN

Steps to survey…

② Compose questions from interviews

④ Analyze with logistic regression

① Determine the “Money Question”

③ Administer the survey

NORTHROP GRUMMAN

Determine the "Money Question"…

The "Money Question" is a question that addresses the overall trait of interest, *e.g.*,

- "Overall, I am satisfied with the systems and services that Northrop Grumman delivers"
- "Overall, this training will help me do my job better"
- "Overall, I am satisfied with Northrop Grumman as a place to work"

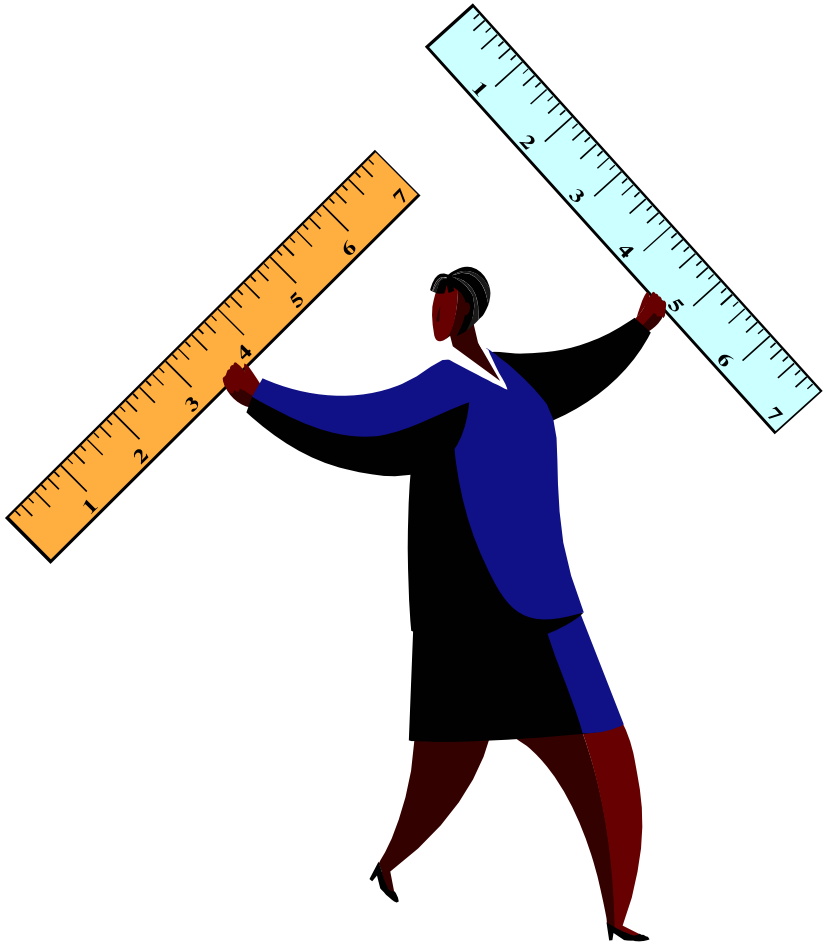
NORTHROP GRUMMAN

Good practices…

- Frame all questions as positive statements even if you are looking for problems
- Use the same scale on all questions
- Choose the number of cells on the scale, that is, five or seven, so that you will get at least five responses in each cell
- More cells are better, subject to the constraint of five in a cell

NORTHROP GRUMMAN

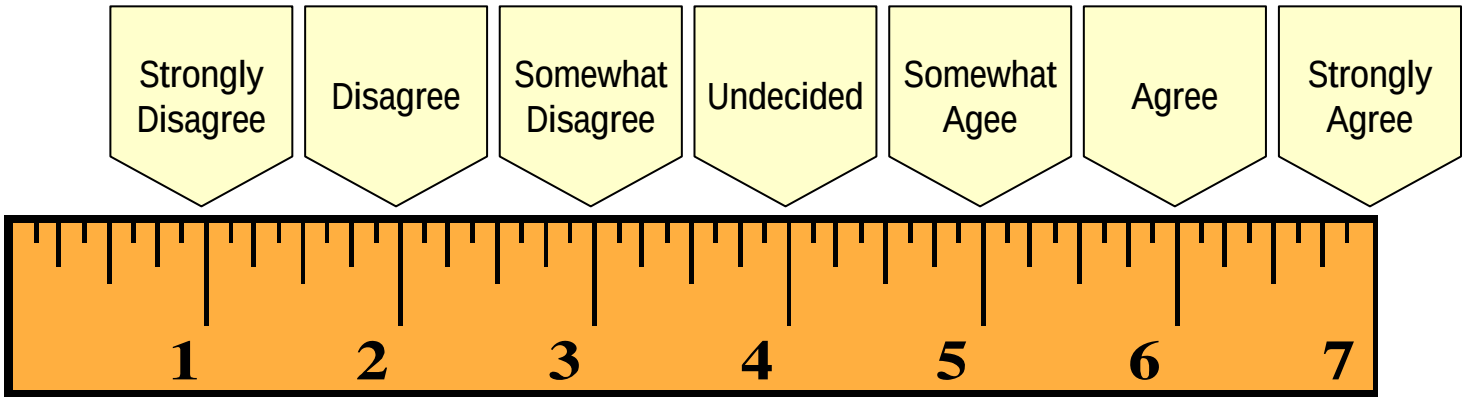
Several types of Likert scales exist…

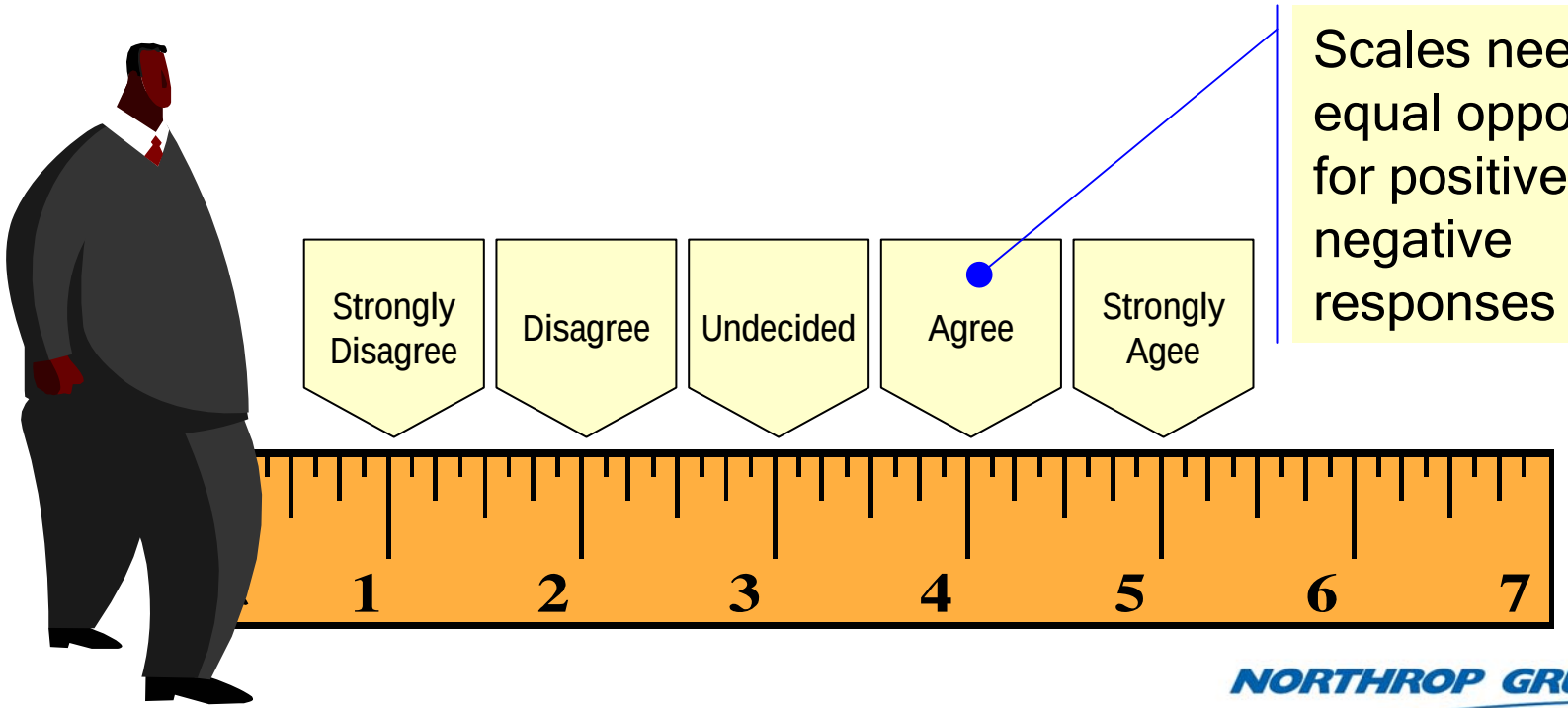


Likert scales exist for…

- Quality
- Importance
- Agreement
- Frequency
- Likelihood

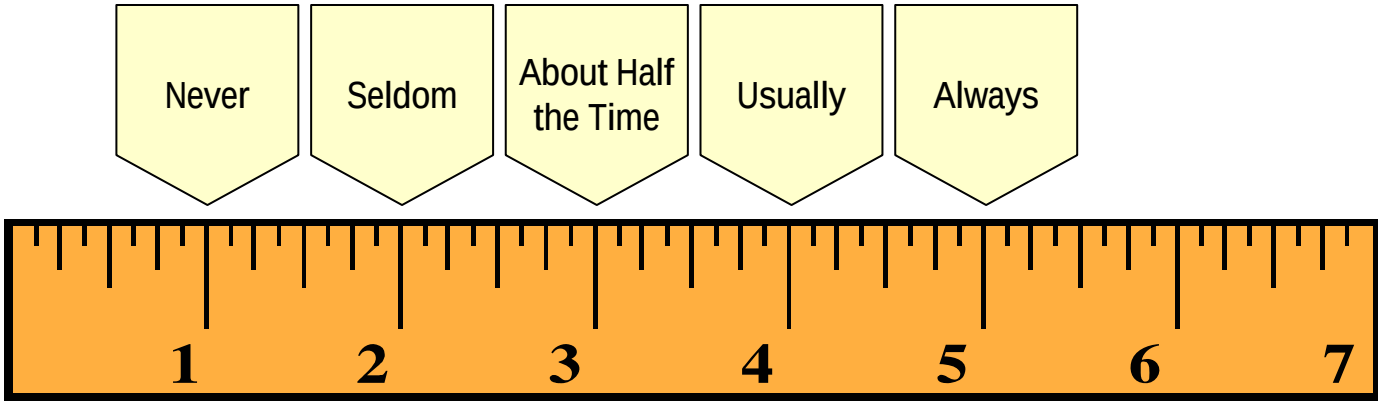
Scales for agreement…

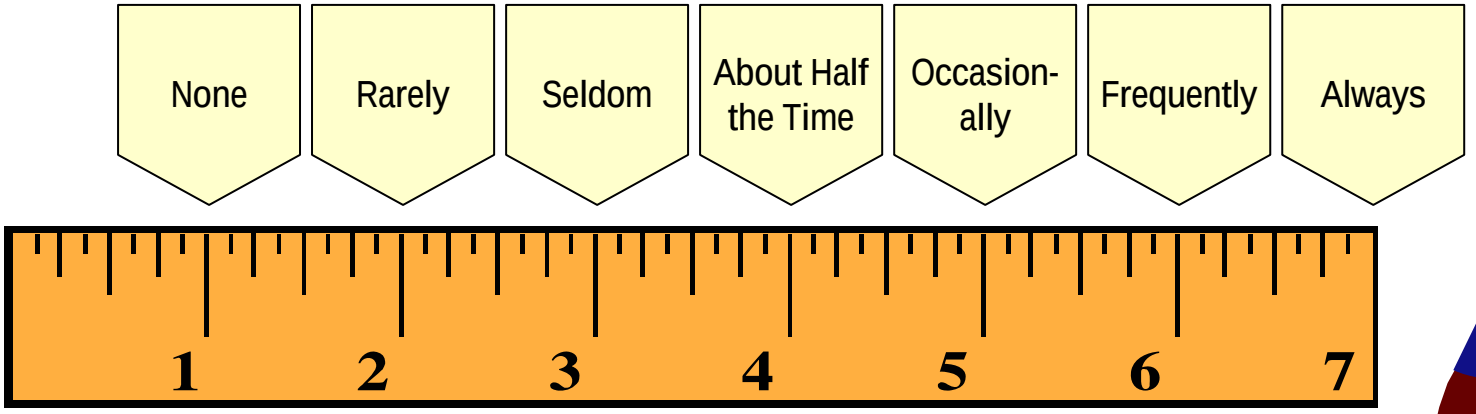


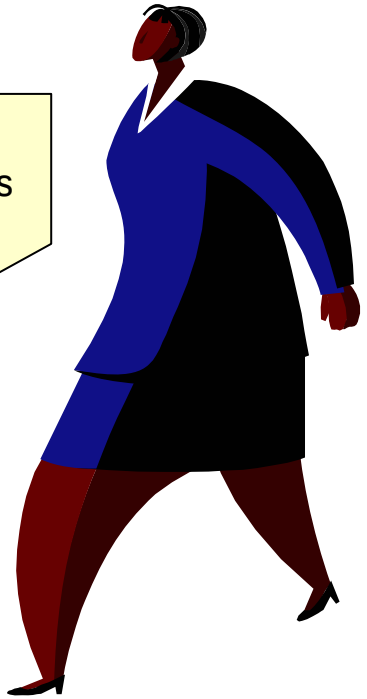


Scales need equal opportunity for positive and negative responses

Examples of scales for frequency…

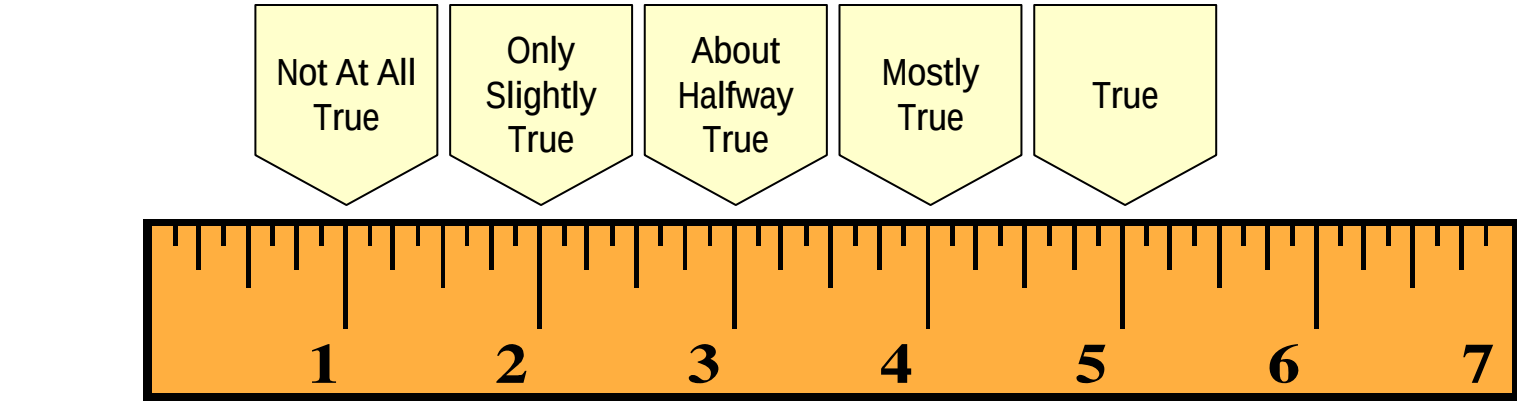


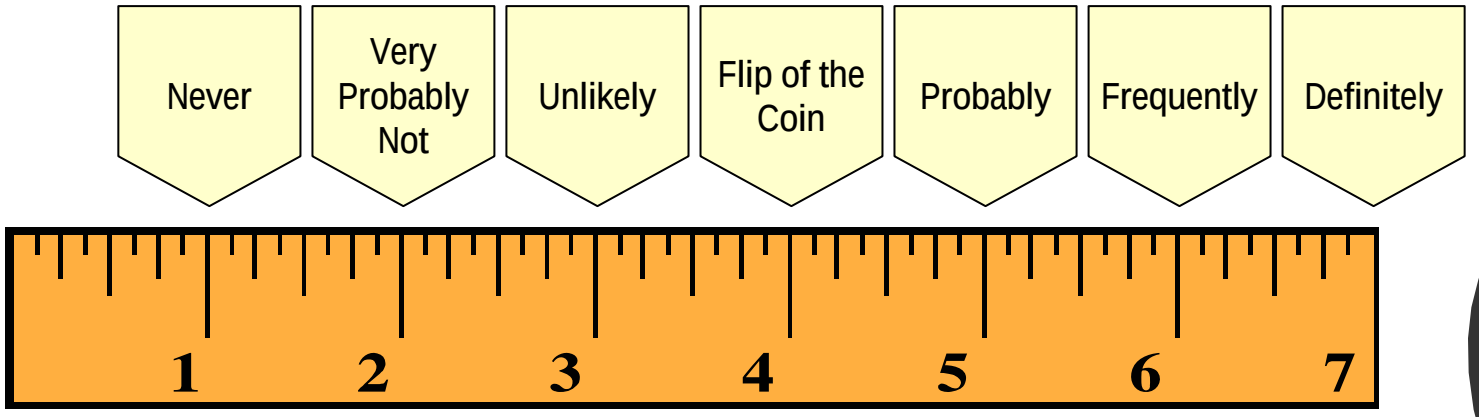


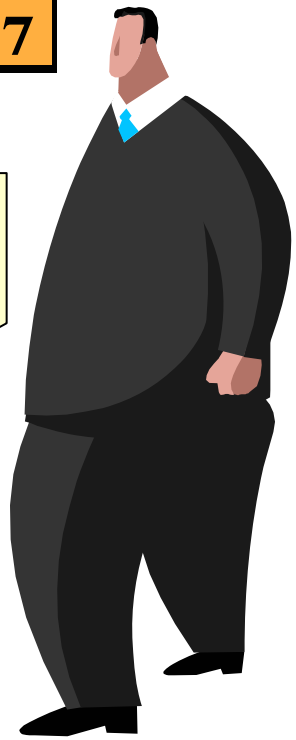


NORTHROP GRUMMAN

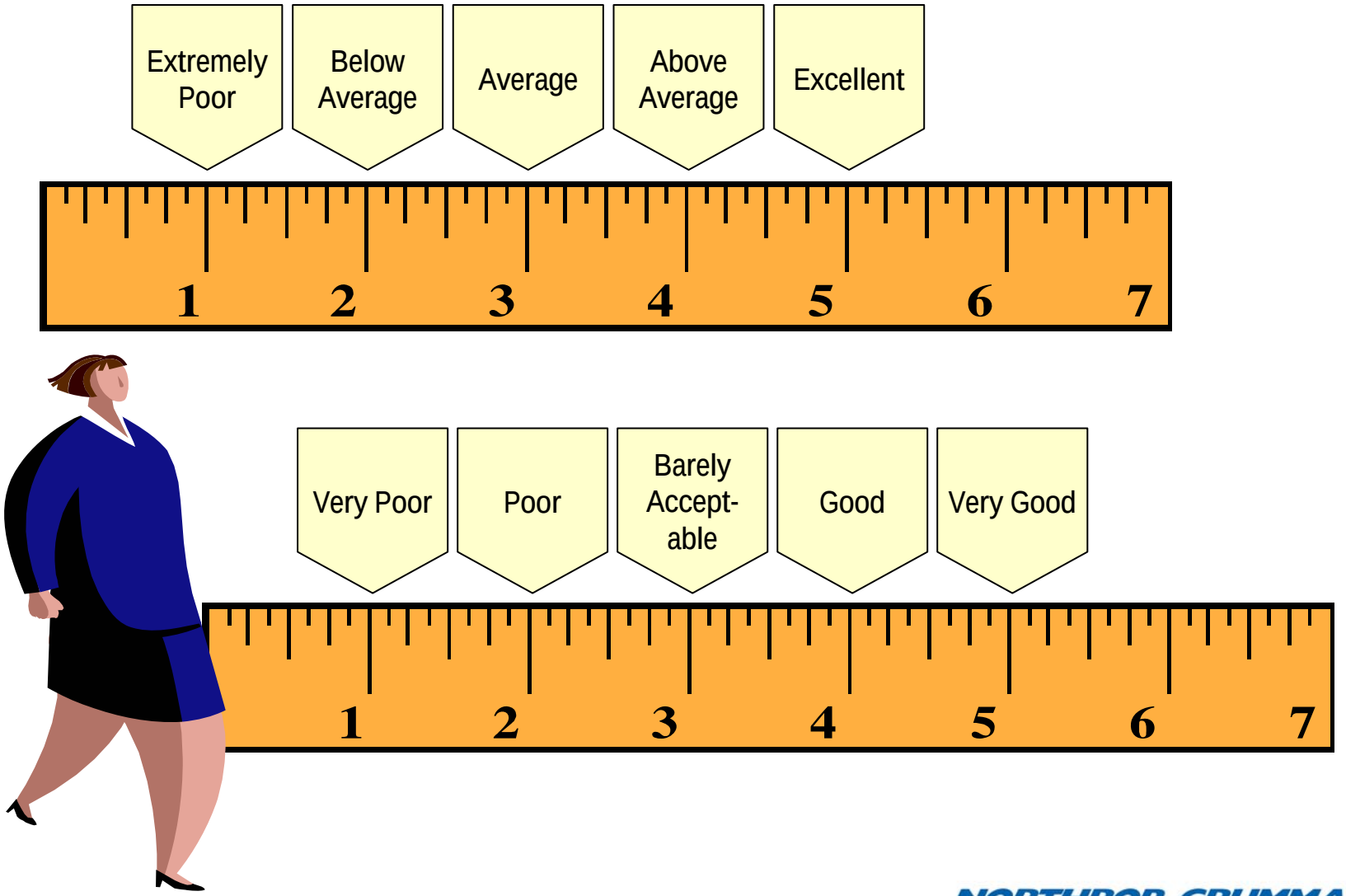
Examples of scales for likelihood…





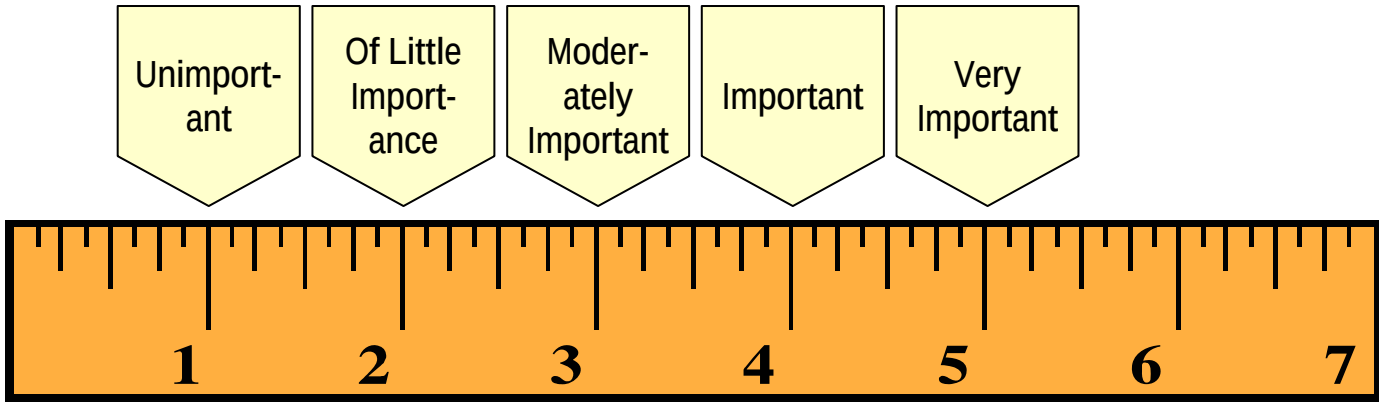


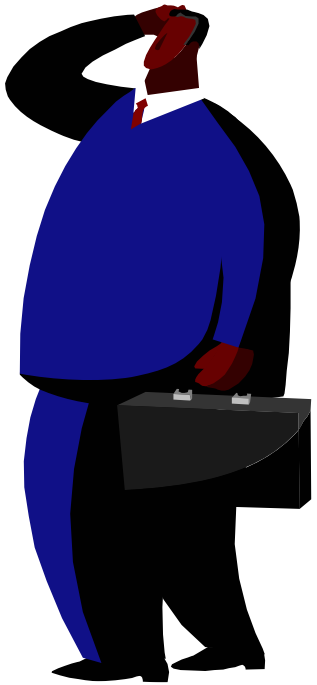
Example of scales for quality…



NORTHROP GRUMMAN

Example for importance…





Sample survey…

Customer Satisfaction Survey Exit this survey >>

1. Northrop Grumman provides systems that are easy to use.

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Agreement:	○	○	○	○	○

2. All in all, I am satisfied with the products and services that I receive from Northrop Grumman.

	Strongly Disagree	Disagree	Undecided	ee	Strongly Agree
Agreement:	○	○	○		○

3. Northrop Grumman makes commitments that meet my ne

	Never	Seldom	About Half the Time	Usually
Frequency:	○	○	○	○

4. When my system goes down, Northrop Grumman restores it quic

	Never	Seldom	About Half the Time	Usually
Frequency:	○	○	○	○

5. Northrop Grumman provides systems with the functionality need.

	Never	Seldom	About Half the Time	Us
Frequency:	○	○	○	

6. Northrop Grumman delivers on their commitments.

	Never	Seldom	About Half the Time	Usually	Always
Frequency:	○	○	○	○	○

7. Northrop Grumman provides us with systems that work as they should.

	Never	Seldom	About Half the Time	Usually	Always
Frequency:	○	○	○	○	○

8. Northrop Grumman provides us good value with their systems and rvices.

	Not At All True	Only Slightly True	About Halfway True	Mostly True	True
ikelihood:	○	○	○	○	○

Northrop Grumman treats me like they want my business.

	Never	Seldom	About Half the Time	Usually	Always
quency:	○	○	○	○	○

When I need help, Northrop Grumman responds quickly.

	Not At All True	Only Slightly True	About Half True	Mostly True	True
ood:	○	○	○	○	○

Done >>

* Survey created on SurveyMonkey.COM

NORTHROP GRUMMAN

Sample Results…

Surveyee	Q1	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q2
1	1	4	3	1	4	4	5	5	3	5
2	5	4	1	2	2	1	4	4	2	4
3	3	3	3	3	1	5	4	3	4	3
4	5	4	5	1	1	1	2	4	2	4
5	1	4	1	2	4	1	4	4	2	4
6	4	5	3	5	4	3	3			5
7	3	5	3	3	4	5	2			5
8	2	4	3	2	3	4	3			4
9	3	5	3	1	1	4	1			5
10	3	4	3	3	2	4	4			4
11	5	5	2	2	5	5	3			4
12	1	4	1	3	5	5	2			4
13	3	5	2	4	5	5	2			5
14	3	4	5	4	3	3	1			4
15	2	5	5	1	3	1	5			5
16	1	4	1	4	5	5	4			4
17	5	5	3	4	3	2	1			5
18	2	4	1	5	5	5	4			4
						1	1			4
						1	4	4	1	5
						3	4	4	4	4
						5	4	3	2	3
						2	1	3	3	4
						5	5	5	3	5
						2	5	2	2	2

These are dummy data for purposes of illustration

NORTHROP GRUMMAN

Analyze with ordinal logistic regression…

Response Information

Variable	Value	Count
Q2	2	1
	3	2
	4	13
	5	9
	Total	25

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P
Const(1)	25.2405	14.2487	1.77	0.076
Const(2)	31.5295	16.0354	1.97	0.049
Const(3)	41.4778	20.1191	2.06	0.039
Q3	-8.36040	3.95140	-2.12	0.034
Q4	-0.841817	0.847503	-0.99	0.321
Q5	0.296463	0.775667	0.38	0.702
Q6	0.127389	0.742109	0.17	0.864
Q7	0.401630	0.750945	0.53	0.593
Q8	-1.35140	1.35373	-1.00	0.318

* Regression is performed with Minitab® Release 14.2

- Conventional least squares regression doesn't work on this kind of data
- Question #2 is set as the response variable, i.e., the y-variable
- All others are set as predictor variables, i.e., the x-variables
- Question #3 shows a significant relationship as its p-value is less than .05; all others are "noise."

Throwing out all the “noise” leaves a prediction equation based on Q3…

Response Information

Variable	Value	Count
Q2	2	1
	3	2
	4	13
	5	9
	Total	25

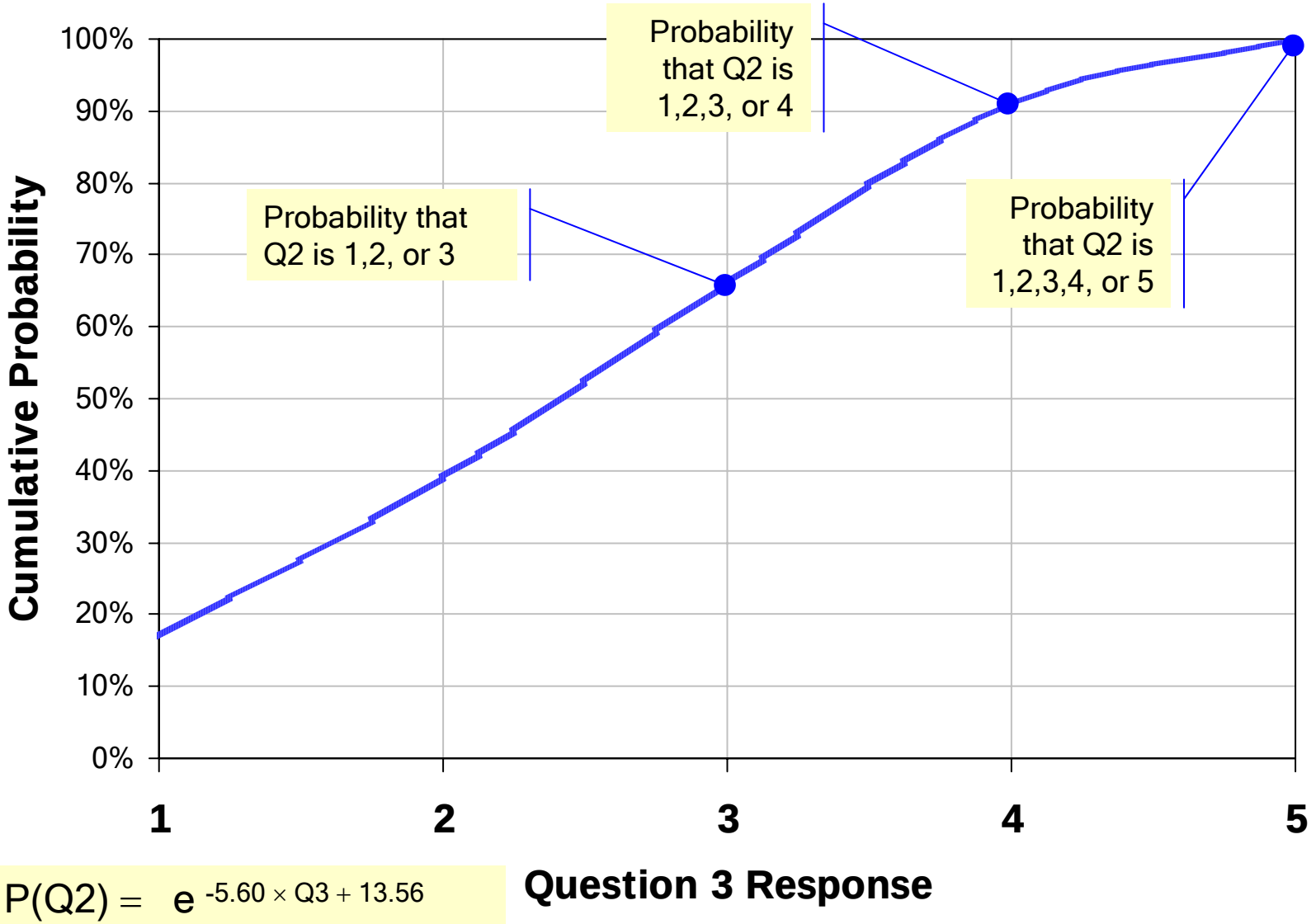
Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Const(1)	13.5565	4.46888	3.03	0.002			
Const(2)	18.6461	5.32721	3.50	0.000			
Const(3)	25.4195	6.58253	3.86	0.000			
Q3	-5.60258	1.45034	-3.86	0.000	0.00	0.00	0.06

Log-Likelihood = -7.642

Test that all slopes are zero: G = 36.648, DF = 1, P-Value = 0.000

Q3 proves to be a good predictor of the response to Q2…



$$P(Q2) = \frac{e^{-5.60 \times Q3 + 13.56}}{1 + e^{-5.60 \times Q3 + 13.56}}$$

Choose improvements with a Pugh concept selection matrix...

Concept Selection		
Better	+	1.0
Same	☆	0.0
Worse	-	-1.0

Direction of Improvement		
Maximize	↑	1.0
Target	✹	0.0
Minimize	↓	-1.0

		Direction of Improvement	Importance	Status Quo	Proposal #1	Proposal #2	Proposal #3	Proposal #4
		1	2	1	2	3	4	5
Addresses Commitment Fidelity	1	↑	9	☆	+	☆	+	☆
People to Implement	2	↓	3	☆	-	-	☆	+
Difficultly to Implement	3	↓	3	☆	-	-	-	-
Cost to Implement	4	↓	3	☆	-	-	-	-
Weighted Score	1			0.0	0.0	-9.0	3.0	-3.0
Sum of Sames	2			18	0	9	3	9
Sum of +'s	3			0	9	0	9	3
Sum of -'s	4			0	9	9	6	6
Sum of Correlation Values	5			0	-2	-3	-1	-1
				1	2	3	4	5

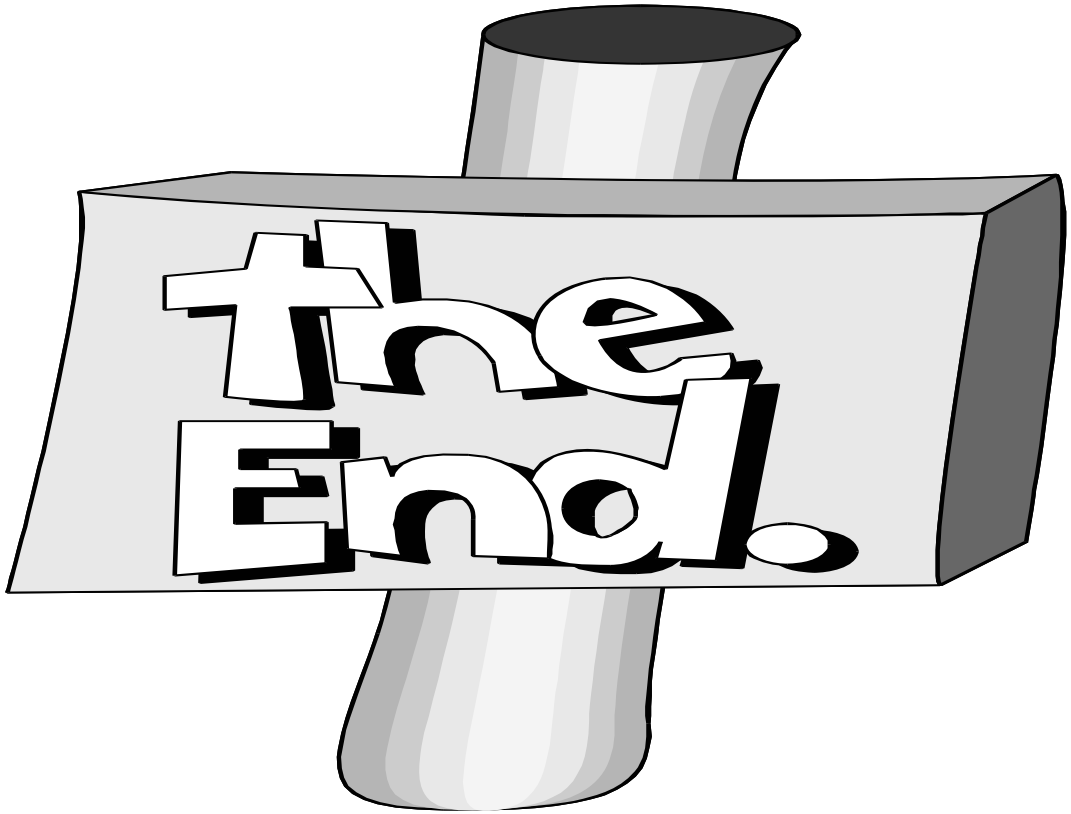
Best choice

* Pugh Matrix is produced with QFD/Capture Professional Edition

Summary…

- Since Customers are the only ones that define quality, it's useful to get their "Voice" in selecting improvement projects
- Statistic methods like logistic regression can be used to infer Customer's importance from survey responses
- Combine VoC with other factors in a Pugh matrix to aide selections

NORTHROP GRUMMAN



NORTHROP GRUMMAN