

Decision Making with Data It's not what you think



Perry K. Parendo
651-230-3861
Perry@PerrysSolutions.com

Current Condition

- **The emphasis on Six Sigma has led many to desire “data based decisions.”**
- **Lean has countered with “so many of our solutions and improvements are obvious, and already known.”**
 - **Prioritization, focus**
 - **Low hanging fruit is created from growth**
- **But there are situations where balance is required with data and thinking. That is our goal today.**

Not everything can be quantified ahead of time. Not everything is obvious.

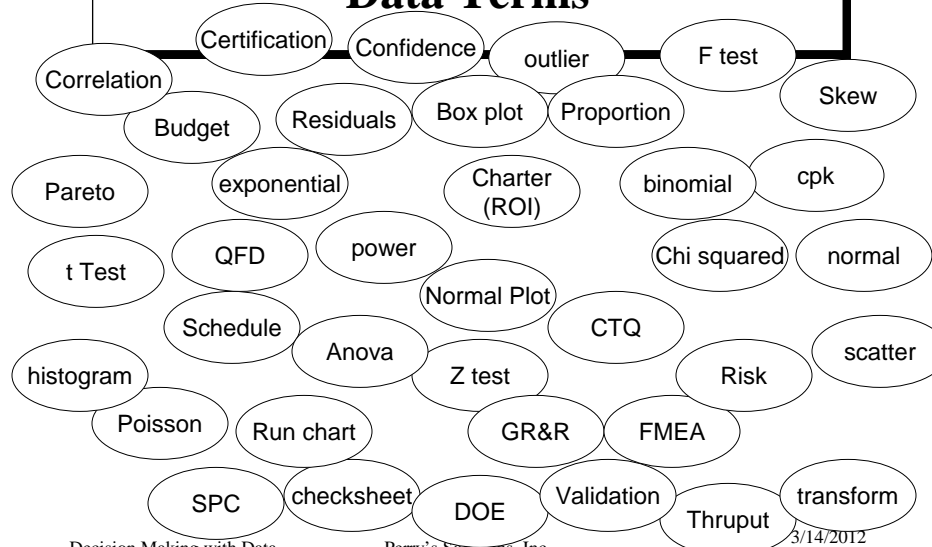
Have You Heard...

- “We create all of these cpk reports, but we don’t act... even if they are good.”
- “Well, that is what the data shows...”
- “The inspection went fine...”
 - Apparently meaning, the test executed – though my parts failed
- “We are still gathering data...”
- Manipulate tools to get answer desired
- Or “we don’t have time for a science project”

Based on an understanding of the best available information at the time...

Intent of tool is most important

Data Terms



Agenda

- **How are decisions made**
- **Considering the data to be used**
 - Good, hard, bad
- **What tools can help with tough decisions**

- **This fits into Business Excellence Category 4: Measurement, Analysis and Knowledge Management**
 - **Core Values include: Management by fact, Focus on results and creating value**

A Balance

- **Yes – data is good. Data is needed. But to an extreme, we are lacking something.**
- **Many people dislike or distrust those that “fly by the seat of their pants.”**
- **Equally, we should distrust those that only look at the numbers.**
 - Read as “Enron”
- **We need “The Smell Test”**
 - Don't use data to avoid thinking for yourself
- **“Knowledge based decision making”**

Balance at 62.7% to be most effective

What are Decision Steps You Use

- Talk in a group or at your table
- We will compile a process together
- List no more than 7 steps

Decision Making Process

- State problem (or opportunity)
- Identify alternatives
- Evaluate alternatives (funnel down # of choices?)
 - Existing knowledge
 - Design and conduct experiments
- Make decision
- Implement
 - Does not need to be all or nothing, phased implementation is also an alternative (gathering more data)

* handout

Good Data

- **Objective results/ measurements are good for a business and a foundation for improvement efforts**
- **Information that leads to understanding and action (knowledge)**
- **Windows of possibilities, with probabilities**
- **Statistics... with thinking and summary comments**
- **Product performance**

Important but Hard Data

- **Requirements**
- **Sales (the result of many, complex actions)**
- **Budgets**
- **Schedules**
 - Which one do you want? 90% or 10%
- **QFD/ prioritization scoring**

Bad Data

- **Point solutions**
 - My gun testing was +/- 100%
- **Only data, without thought or logic support**
 - A table or graph is data, but not knowledge
- **FMEA risk numbers viewed as absolutes**
- **Process is out of control – what is the action?**
 - Recent out of control process report from a vendor... with conclusion that all is well since they are in specification!
- **ROI on something that never existed before**
 - iPod? Not a raw numbers decision is my guess

Emotional decisions – even when data is available (inspection)

Decision Making Process – Data Examples

- **State problem (or opportunity)**
- **Identify alternatives**
- **Evaluate alternatives**
- **Make decision**
- **Implement**

Good, hard, bad

Decision Making Process – Data Options

- **State problem (or opportunity)**
 - Data – yield issues, performance shift, market opportunity, requirements expectations (criteria for acceptance)
- **Identify alternatives**
 - Budget, schedule, performance, capability
- **Evaluate alternatives**
 - Lots of data possible, what is needed
 - Development data
- **Make decision**
 - Scoring methods available, yet not everything can be measured
- **Implement**
 - Track key inputs and key outputs

Group Exercise 2

- **Think of a recent “bad” decision**
 - Did you use data?
 - Where did it come from?
 - Good, hard, bad
 - What was your gut telling you ahead of time?
 - What happened?
 - How did your process compare to what we presented?
 - What quick and easy steps could you do different next time to improve?
- **Discuss in the groups from earlier**

Data Thoughts

- **Why collect the data? What questions to answer?**
- **Create an analysis plan?**
 - Test with random data (Trial analysis)
 - Ideas of what you want to look at – tables and graphs
- **Data needs interpretation**
 - Analysis, summary, interpretation
- **Do the best with what you have**
- **Being right and late is worse than close enough on time.**
- **Don't throw it away because the data is not right – all data is wrong somehow. How is it useful? How is it potentially wrong or misleading?**

* handout

Can't improve what you can't measure but not all that is measured is important...

Data Required To Make Decision

- **Some times decisions are made based on the available data – or analysis methods available**
- **What we could do instead, consider what data is required to be GENERATED to make the decision at hand.**
 - This would also include the success criteria
- **Know how you are going to use the data...**
- **Navy Example**
 - And Dick Vermeil

Decision Thoughts

- **There are no perfect decisions**
- **Consistency is important**
 - Though there are times to change your mind
 - Make decisions fast, and change them slow
 - Toyota says to make them slow
- **Things you worry about seldom come true**
 - But things you don't, might!
- **All numbers are wrong**
 - All numbers are distorted
- **Any measure rewarded will be abused to achieve the award**

* handout

Decision Making Tools

- **A couple of biggies**
 - Paired comparison matrix (prioritization)
 - Pugh Concept Selection
 - Design of Experiments (understanding)

Start of Comparison Matrix

| | A | B | C | D | Total |
|---|--|---|---|---|-------|
| A | - | | | | |
| B | (how much more important than A?) 2 | - | | | |
| C | 1/2 | 4 | - | | |
| D | 3 | 3 | 2 | - | |

Complete Comparison Matrix

| | A | B | C | D | Total (sum the row) |
|---|-----|-----|-----|-----|---------------------|
| A | - | 1/2 | 2 | 1/3 | 2.83 |
| B | 2 | - | 1/4 | 1/3 | 2.58 |
| C | 1/2 | 4 | - | 1/2 | 5 |
| D | 3 | 3 | 2 | - | 8 |

*

Other side is just the reciprocal value

Pugh Example – For Decision Making

Concepts

| | A | B | C | D | E | F | G | H |
|---------------|---|---|---|---|---|---|---|---|
| Requirement 1 | + | + | + | 0 | + | + | + | 0 |
| Requirement 2 | - | + | 0 | + | - | + | - | + |
| Requirement 3 | + | 0 | + | + | 0 | - | + | + |
| Requirement 4 | + | - | 0 | + | - | + | + | - |
| Requirement 5 | + | + | - | + | + | + | + | + |
| Total +'s | 4 | 3 | 2 | 4 | 2 | 4 | 4 | 3 |
| Total -'s | 1 | 1 | 1 | 0 | 2 | 1 | 1 | 1 |

Now what???

↑
Winner but fails
with requirement 1

DOE is...

■ **Design of Experiments**

- An efficient technique to collect an adequate amount of usable data with the least amount of effort
- Can be used with hardware or computer simulations
 - Product or process development

■ **DOE organizes the collection of development test data to determine the most statistically confident relationship between inputs and outputs.**

- Complexity of the relationship is chosen by the user.

Provides understanding
 - equation
 - priority
 - area of interest

TYPICAL DOE TEST TABLE

| Test # | Variable | | | Response | | | |
|--------|----------|---|---|----------|---|---|---|
| | A | B | C | 1 | 2 | 3 | 4 |
| 1 | - | - | - | | | | |
| 2 | + | - | - | | | | |
| 3 | - | + | - | | | | |
| 4 | + | + | - | | | | |
| 5 | - | - | + | | | | |
| 6 | + | - | + | | | | |
| 7 | - | + | + | | | | |
| 8 | + | + | + | | | | |

What Can DOE Do For Me?

- **Basic Project Benefits**
 - Reduce schedule – months
 - Can save money – typically about \$40k for new users
 - Save “at risk” projects from being cancelled
 - Improve product throughput

- **Resolve long term unsolvable problems**
 - Meet challenging/ competing requirements, complex development
 - Can solve problems in manufacturing or in the field
 - Identify stable process settings, even on brand new equipment

- **Competitive analysis, competitive edge**
 - Range of settings and operating conditions

An “advanced” data tool – where Perry has coached 100s of projects

Summary

- **Know intent of the tool**
- **Know history of raw data**
 - Explain the raw data
- **Know intangibles (or the unknowable)**
- **Intuition and gut feel (trust your heart)**
- **Unintended consequences**

Questions

- **If you have questions or thoughts, feel free to share them with us**
 - 651-230-3861
 - Perry@PerrysSolutions.com
- **If interested, email us to be on our quarterly newsletter where we share recent trends and learning.**
 - They are all archived on our publications page