Estimating and Measuring Project Risk

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Agenda for Presentation

• My Background
• Understanding components of risk
  – Margin of Error
  – Confidence Intervals
• Application to entire lifecycle
• Risk in requirements phase
• Summary & Question
Clients

• Clients include Banking & Finance, Aerospace, Retailers, Animal Food, Telephony, Consulting Companies, Medical Research, Defense Contractors, Automotive, Universities, Government Agencies and others

• Some clients: MasterCard, Amadeus, Ralston Purina, Lockheed, Transamerica, DirecTV, Biologic, Accenture, Motorola, Nissan, others…
My Metrics

- Over 2 million frequent flyer miles
- Consulted on every continent except Antarctica
- Presented papers at conferences in USA, Europe, Middle East, Asia and Africa
Type of Work

- Productivity Assessments
- Benchmark Studies
- Estimating Models
- Mergers and Acquisitions
- Venture Capital and Initial Public Offerings
- Outsourcing Agreements
- Expert Testimony
Bottom Line

• Help organizations make money!
Learning from organizations (ethology)

- Collect both quantitative and qualitative data
- Observe behaviors, customs, rituals, myths and ways of life
- Examine artifacts and physical evidence
- Build holistic picture of organization
- Trend the industry as a whole
Research

- Dale Jorgenson, Harvard Business School
- Bureau of Economic Analysis
  - Methods of collecting and reporting software productivity rates based upon Function Points.
  - Measuring the IT Economy.
- Securities Exchange Commission
Adjunct Professor
(Avila University MBA Program & Psychology Department)

- Industrial Organization Psychology
- Managerial Economics
- Statistics
- Quantitative Analysis
- E-Commerce
Software Economics

Social Psychology

Organizational Behavior

Economics

Software Development

Statistics
Available Software Titles
(business card titles)

• Software Philosopher
• Software Archaeologist
• Software Paleontologist
• Software Waste Management
There are lies, dammed lies and statistics.

Mark Twain
Hannibal, Missouri
Statistics

• Probability is a numerical measure of the likelihood an event will occur.
• Probability can be used as a measure of the degree of uncertainty and risk
Professional Risk Takers

• Also known as gamblers
  – Calculate probability, odds and payouts
• Statistics was invented to measure risk
Consistency

• Dice, Cards, Slot Machines all are very consistent if played for a long enough time.

• Casino’s are 100 percent certain if you play long enough you are going lose.

• Game results appear as “lucky” or “random” if played in the short run.

• Consistency is the key for prediction and elimination of risk.
A Little Study & Statistics

• Demonstrate luck has nothing to do with it.
Estimate the Surface Area of a
A can of diet coke
Ignore the facts…

- Seldom does Saul become Paul

- Temporal Provincials
  - People who are ignorant of history and proud of it.
Unskilled & Unaware

In actuality
Know

Insecure

Think they don’t know

Confident

Think they Know

Ignorant

In actuality
Don’t Know

Dangerous or Fools
Industrial Revolution Timeline

1860

Assembly Line (division of labor)
Early 1900's
Modern Management Methods
Taylor & Munsterberg

Information Technology Timeline

We are here
Measuring Consistency

• Variations in Productivity or Unit Cost
  • Hours Per Function Point
  • $ Per Function Point
Causes of Variation

- Projects are done inconsistent
- Projects are done differently every time
- Documentation is not similar within a project and especially between projects.
Consistency of Single Project

Consistency of Projects Across Application

Consistency Across Organization
Measuring Consistency

- Select 12 or so projects (sample)
- Standard Deviation
- Average
- Use a tool like Microsoft Excel
Create Confidence Intervals

\[
\bar{x} \pm 1.96 \left( \frac{\sigma}{\sqrt{n}} \right)
\]

- $\bar{x}$ is the mean or average
- $\sigma$ is the standard deviation
- The sample size is $n$
- 1.96 is confidence at 95%
Large Margin of Error

\[ 1.96 \left( \frac{\sigma}{\sqrt{n}} \right) \]

Large risk!
The wider the confidence interval
The less predictable
Example

- Average Hours Per Function = 8
- Standard Deviation is 4
- Sample size is 36

\[ 8 \pm 1.96 \left( \frac{4}{\sqrt{36}} \right) \]
Works out to be...

- 6.7 to 9.3 hours per function
- Mean of 8 hours per function

- This is your estimating interval also!
  - Based upon past performance.

- If interval is too wide, you need to do projects consistently.
Estimate

• New project is 100 function points
  – Estimate is between 670 hours to 930 hours.
  – Just 100 times lower and upper bounds
Accuracy of Estimating

Actual Accuracy

Required Accuracy

Size of Projects

0%
100%

Small
Large

Not Difficult

Difficulty of Estimating

Very Difficult
Industry Guidelines

• For projects less than 1,000 function points
  2 – 15 hours per function point

• Projects between 1,000 – 5,000 function points
  8 – 35 hours per function point

• For projects larger than 5,000 function points
  15 – 60 hours per function point
Review

- Sample several projects
- Calculate Hours Per Function Point
- Calculate Standard Deviation
- Calculate Confidence Intervals
- Oui La! Estimating model.
A different perspective
Consistency in Requirements

• In consistent requirements leads to
  – Missed requirements
  – Incomplete requirements
  – Requirement which can’t be measured
  – Requirements which can’t be tested.

• In consistent requirements is risky business
Example

• Examined a single Requirements/Design document

• Within a single document used 5 different verbs
  • Get, Find, Fetch, Retrieve, Query all meaning the same thing
  • Get alone would have been just fine.
Example for a Client

- Examined 3 projects
- Used 68 verbs to describe a few actions
  - Delete 3 different verbs
  - Add 15 different verbs
  - Change 17 different verbs
  - Inquiry 14 different verbs
  - Output 19 different verbs
- Verbs used inconsistently and redundantly.
No Glossary!

- Inconsistent Requirements
- No acceptance criteria
- High Risk of
  - Project Growth
  - Missed Requirements
  - Misunderstood Requirements
  - Requirements which cannot be measured.
Requirements Standards

• **Get** describes the action of retrieving information from a data base
  – Using another verb to describe this same action would be considered a defect.
  • Determine the frequency of using another verb such as retrieve or fetch.
  • Determine the number of verbs used to describe the same exact action.
Requirement Standards
(Glossary)

• Improved productivity (upto about 8 fold).
• Consistent and Predictable
• Less Risk
Most IT Organizations

• Fabricate estimates
Confidence Intervals

- Requirements 8% to 22%
- Analysis 7% to 11%
- Design 7% to 11%
- Code 25% and 35%
- Testing 28% to 55%
- Implementation 1% to 5%
Relationship

• Those companies who spend the highest percent of time in requirements have the highest productivity rates.
• Spend the least amount of time testing.
Productivity v. Quality

- A direct relationship between productivity and quality.

- Those organizations with high productivity rates also have high quality.
Measuring Risk

• The key to understanding risk is measuring consistency.
• The less consistent the less predictable.
Productivity

• It is difficult (maybe impossible) to reduce productivity by reducing cost.
  • Cost / FP

• In fact, for each $1 reduction in cost increases cost/fp by about $1.18

• Trying to improve productivity by reducing cost has the opposite effect.
Now What

• You don’t have any unit cost figures?
• You still can calculate intervals on phases and/or tasks.
Questions
(don’t worry be happy!)

• I’ll give you my phone number
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• SoftwareMetrics.Com
  • More information than you will ever need on FPA.