Financial Analysis For Software Business Decisions

Scott Augé
sauge@amduus.com

Amduus Information Works, Inc.
http://www.amduus.com

Presentation for Profit Making Organizations

About Amduus

Software and knowledge consultancy company.

Pronounced “Ah-m-das”

Generated by a computer program and a working off of BMW.

Introduction

- A lot of decisions presented to decision makers are based on a technology perspective.
- This presentation focuses on examining a technology decision from a financial perspective.
- Provide a means of communicating to the financial people what various proposals really mean financially.

Focus on *Why* and less on *How*

- Business owners and leadership are focused on making money.
- The best way to communicate with fiscal decision makers is with a financial vocabulary.
- For technical workers, just what are managers thinking?
- Technical Myopia

Your Job

To aid the organization in making money through technology.

Translate techno-babble into financial terms understandable to decision makers.

Proposals

Proposals describe:

- A Decision
- Decision Criteria
- And input to meeting the criteria

Decision

The decision describes a goal and a possible means of getting there.

Should we buy e-commerce system “X” to sell on the internet?

Decision Criteria

- Multiple types
  - Cost
  - Delivery Date
  - Pace of payback
  - Return on Investment
  - Technology Skill Set Required
  - Many others!

Decision Input

- Technical Feasibility
- The financial arguments I am about to present to you.

Cash Flows

- A **cash flow instance** is an amount of money flowing *into* and *out of* an organization at a given time. (Tockey, 2005, p. 24)
- A **cash flow stream** refers to a set of cash flow instances over time caused by carrying out some proposal. (Tockey, 2005, p. 24)
- Cash flows are important because they give us our initial investment and our payoff information to compare to other proposals.

Components Of Cash Flows

- **Initial Investment**
  - Equipment
  - Development Tools
  - Hiring of Staff
- **Operation and Maintenance Costs**
  - Support Staff
  - Media for output
  - Floor Space

Components Of Cash Flows

- **Sales Income**
  - Increase Market Share
- **Cost Avoidance**
  - Reduce Expenses
  - Eliminate Fines

Components Of Cash Flows

- **Salvage Value**
  - Resale of equipment
  - Resale of patents

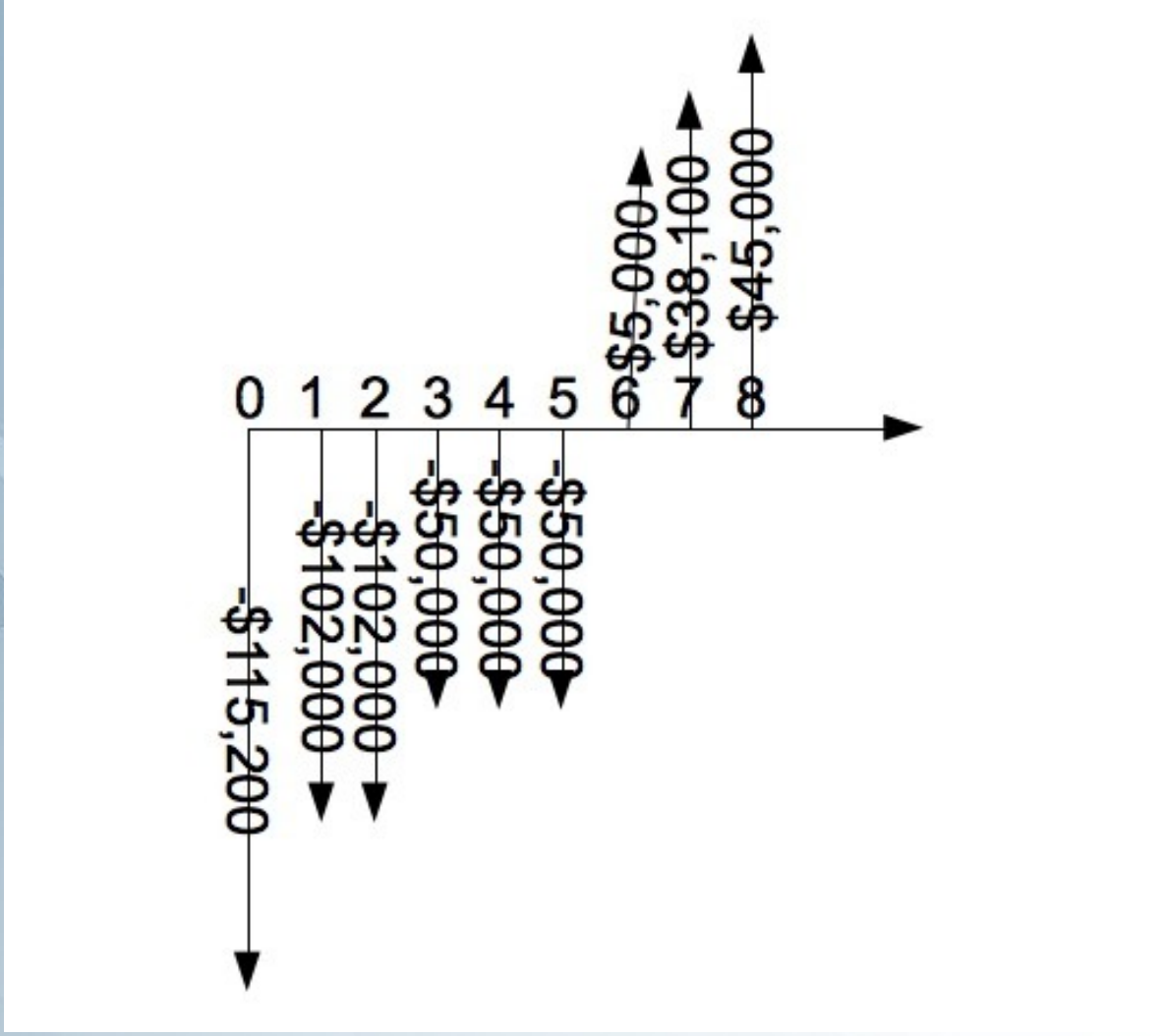
Example Cash Flow Instance

Month One	**Initial Investments**	**-$15,000.00**
	Compilers	-$10,000.00
	Desktop Machines	-$2,500.00
	Server	-$2,500.00
	Operation & Maintenance	**-$100,200.00**
	Staff Salaries	-$100,000.00
	Paper	-$200.00
	Sales Income	**$0.00**
	Cost Avoidance	**$0.00**
	Salvage Value	**$0.00**
	Cash Flow Instance Total	**-$115,200.00**

Example Cash Flow Instance

Month Seven	**Initial Investments**	**$0.00**
	Compilers	$0.00
	Desktop Machines	$0.00
	Server	$0.00
	Operation & Maintenance	**-$20,200.00**
	Staff Salaries	-$20,000.00
	Paper	-$200.00
	Sales Income	**$56,000.00**
	Work Orders	$56,000.00
	Cost Avoidance	**$2,300.00**
	Sales Tax Fines	$2,300.00
	Salvage Value	**$0.00**
	Cash Flow Instance Total	**$38,100.00**

Cash Flow Diagram



Simple Payback Period

Period	Amount	Payback
1	-$10,000.00	-$10,000.00
2	$2,000.00	-$8,000.00
3	$2,000.00	-$6,000.00
4	$5,000.00	-$1,000.00
5	$3,000.00	**$2,000.00**

$$\sum_{t=0}^{n} F_t \geq 0$$

For smallest *n*

Sum series of cash flow instances until the number becomes positive.

(Time value of money not taken into consideration.)

Process Provides Answers

Having a process provides a
Work Breakdown Structure

A WBS is a hierarchical decomposition that lists all the work associated with a proposal. (Tockey, 2005, p.28)

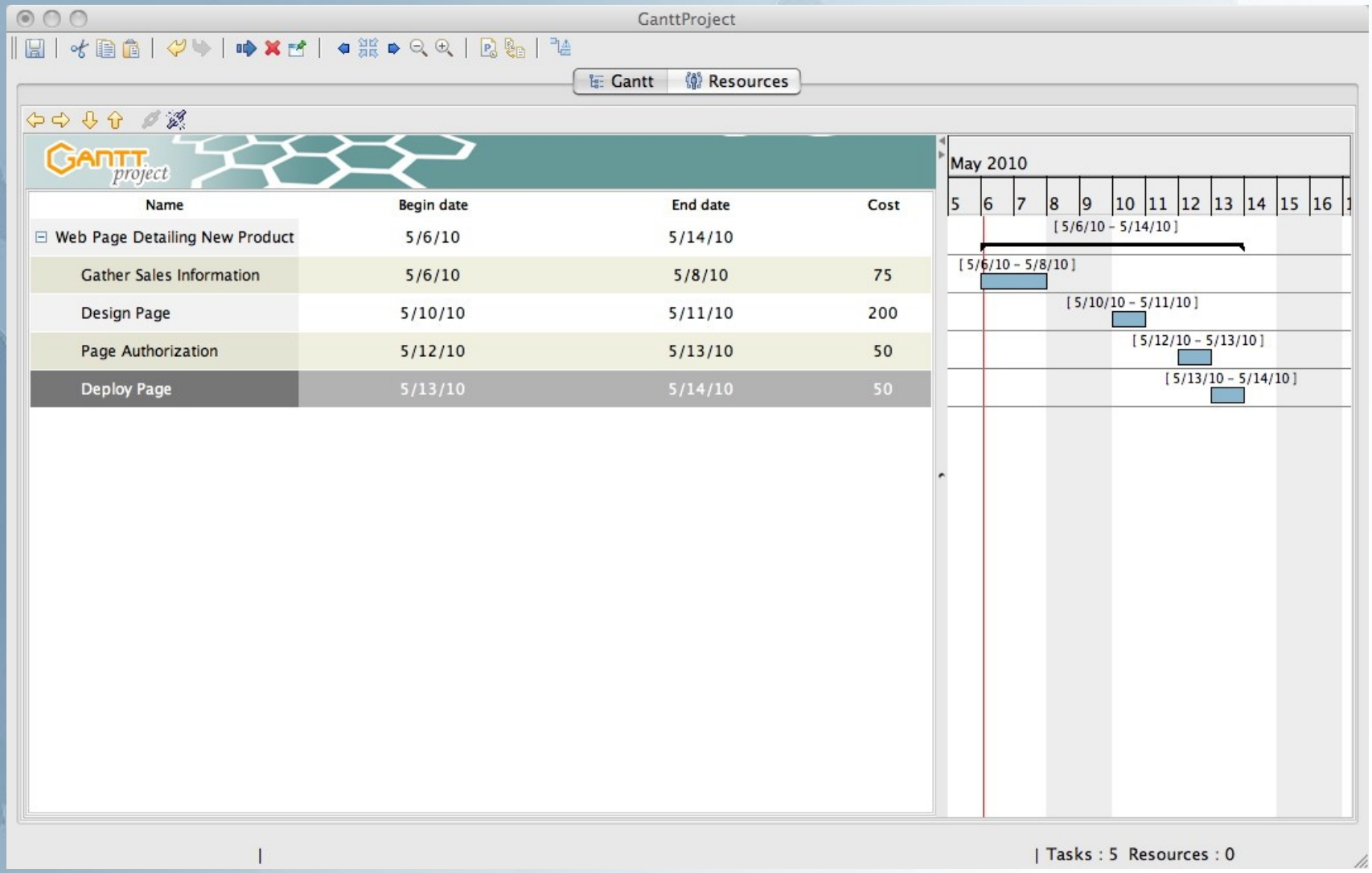
WBS Check List (Tockey, 2005)

- Tasks are necessary and sufficient for completing the software project
- Addresses all perspectives: technical, management, quality, deployment, marketing, sales, end-user engagement
- All relevent sources of expense
- All relevant sources of income

WBS Check List (Tockey 2005)

- No duplications
- Bottom level tasks finely decomposed to schedule from.
- Not so finely decomposed as to create useless work estimating and scheduling.
- Tasks not decomposed when uncertain or unstable.

Simple WBS


GanttProject
Gantt
Resources
GANTT project
Name
Begin date
End date
Cost
Web Page Detailing New Product
5/6/10
5/14/10
Gather Sales Information
5/6/10
5/8/10
75
Design Page
5/10/10
5/11/10
200
Page Authorization
5/12/10
5/13/10
50
Deploy Page
5/13/10
5/14/10
50
May 2010
5
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[5/6/10 - 5/14/10]
[5/6/10 - 5/8/10]
[5/10/10 - 5/11/10]
[5/12/10 - 5/13/10]
[5/13/10 - 5/14/10]
| Tasks : 5 Resources : 0

Time Value Of Money

An amount of cash invested today will earn income and therefore has value over time. (Warren, 2008)

Time Value Of Money (TVM)

Which investment yields the greatest income?

TVM Example

- Proposal One
  - Software upgrade
  - Cash flow shows $20,000 investment
  - Cash flow shows pay off of $23,000 over two years
- Proposal Two
  - Credit Instrument for customers
  - Allocate $20,000
  - Studies show willing to pay 11% over two years
  - Pay off of $26,642

TVM Compounding Interest

Credit Instrument Calculation

$$F = P(1+i)^n$$

$$26{,}642 = 20{,}000(1+0.11)^2$$

TVM Compounding Interest

Software Upgrade Calculation
(Discover interest from cash flow using compounding formula aka F/P).

$$i = \left(\sqrt[n]{\left(\frac{F}{P}\right)}\right) - 1$$

$$0.07 \approx \left(\sqrt[2]{\left(\frac{23{,}000}{20{,}000}\right)}\right) - 1$$

TVM Compounding Interest

Future Value $23,000 versus $26,642

7% versus 11%

Software upgrade delayed at least two years!

Different Formula To Calculate Present Worth and Future Worth

And how they apply to different scenarios you may encounter with your technology proposals.

Single Payment Compound Amount

$$F = P(1+i)^n$$

How much is a given amount of money today going to be worth at some future point in time? (Tockey, 2005)

Application

Our previous example of software upgrade vs customer credit instrument.

Single Payment Present Worth

$$P = F\left[\frac{1}{(1+i)^n}\right]$$

How much is needed today to grow to some known, desired amount at a future point in time? (Tockey, 2005)

Application

Can we afford the initial cost?

What kind of financing will be needed to start rolling out the project?

(Based on payback period of cash flow estimate.)

Equal Payment Series – Compound Amount

$$F = A\left[\frac{(1+i)^n - 1}{i}\right]$$

How much will the total amount be worth at the end of a series of equal payments that are made at regular intervals?
(Tockey, 2005)

Application

This can be applied to the maintenance and operation of a technology solution.

Each month (or period) there is a cash flow instance based on staff, licenses, etc.

Average out the cash flow instances to apply to this formula.

Use to justify continued operation of the technology.

Equal Payment Series – Sinking Fund

$$A = F\left[\frac{i}{(1+i)^n - 1}\right]$$

If you want to end up with a known desired amount at some future point, how much do you need to pay at fixed intervals to finish with that amount?
(Tockey, 2005)

Application

This can be applied to the maintenance and operation of a technology solution.

If the number is greater than the cash flow instances for operation of the technology, there may be an economic problem applying the money to this purpose.

Equal Payment Series Capitol Recovery

$$A = P\left[\frac{i}{1-(1+i)^{n-1}}\right]$$

If you borrow a known amount today, how much do you have to pay back as a series of equal payments to pay off the loan?
(Tockey, 2005)

Application

The most straight forward application is how much profit is produced over a series of cash flow instances on the technology to pay off the allocation of money at a given interest rate.

Equal Payment Series Present Worth

$$P = A\left[\frac{(1+i)^n - 1}{i(1+i)^n}\right]$$

How much money is needed today to be worth the same as a known series of equal payments in the future?

(Tockey, 2005)

Example

Money is not worth the same in the future as the present.

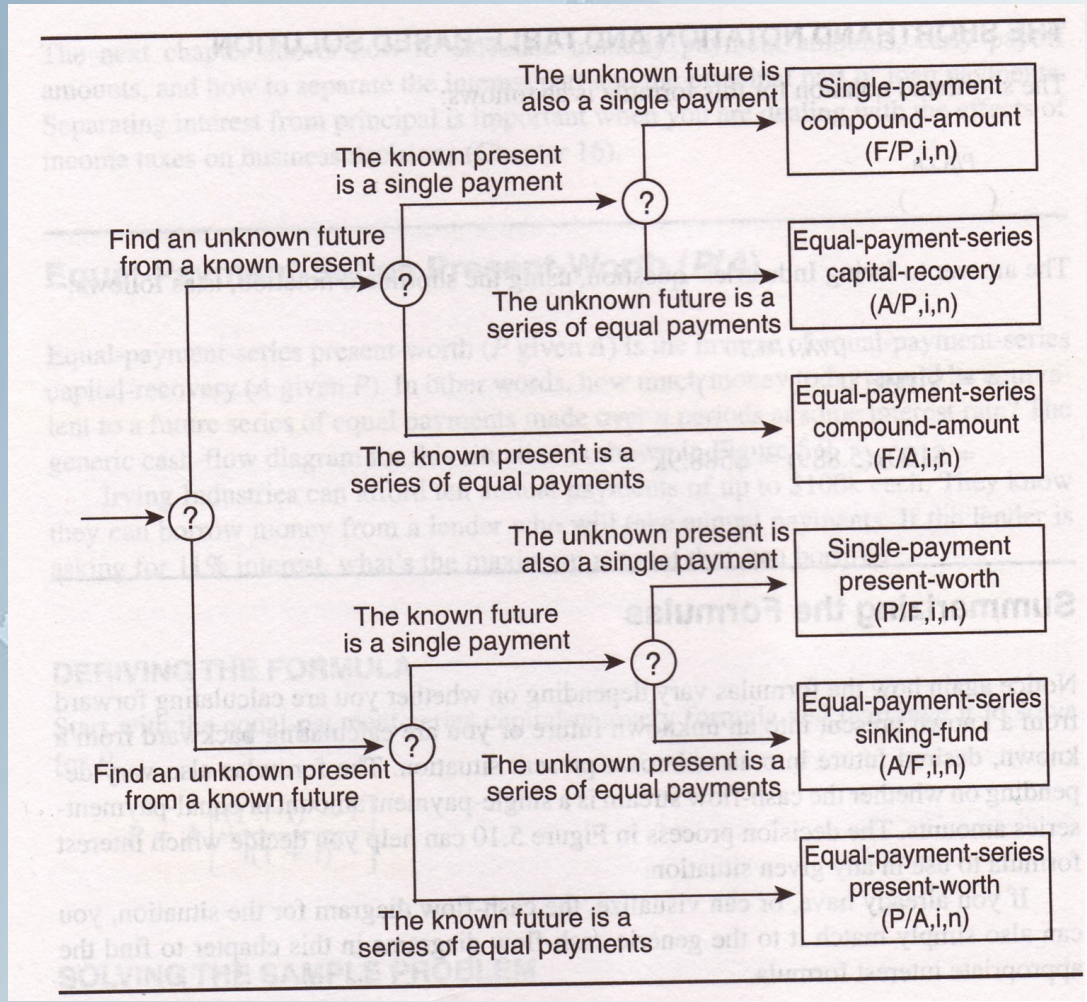
Option:

$7500 now
or
$10,000 over $1,000 payments over 10 years?

$$\$6{,}710 = \$1{,}000\left[\frac{(1+0.08)^{10}-1}{10(1+0.08)^{10}}\right]$$

Not a good deal even at 8%!

Which Formula For What?



(Tockey, 2005)

Basis for Comparisons

- Present Worth
- Future Worth
- Annual Equivalent
- Internal Rate Of Return
- Payback Period
- Capitalized Equivalent Amount

Basis For Comparisons
Present Worth over Cash Flow Stream

$$PW(i) = \sum_{t=0}^{n} F_t (1+i)^{-t}$$

For a set of future (unequal) cash flows at interest *i*, what is the present worth of the money at time *t*?

What is this cash flow worth today?

Comparing proposals, one wants the one with the greatest present value.

Basis For Comparisons
Future Worth over Cash Flow Stream

$$FW(i) = \sum_{t=0}^{n} F_t (1+i)^{n-t}$$

How much is this proposal worth at the end of the proposal time frame (in today's dollars)?

How much is today's $100 (unequal cash flows) worth t periods in the future?

One wants the greatest future value.

Basis For Comparison
Internal Rate of Return aka ROI

$$0 = PW(i) = \sum_{t=0}^{n} F_t (1+i)^{-t}$$

Converts cash flows into an interest rate.

To compute (find i) requires:

- First non-zero net cash flow is an expense
- There on there are further expenses and net incomes
- The cash flow stream is profitable over all
- More than one IRR? Can't use it as a comparison.
- Need an algorithm, it will be an iterative calculation.

MARR

- Minimum Attractive Rate Of Return
- Lowest internal rate of return the organization would consider to be a good investment (Tockey, 2005)
- You are competing against not only other proposals, but Interest Bearing Checking/Savings Account, Certificates of Deposit, Bonds, etc.

Basis For Comparison
(Discounted) Payback Period

Period	Cash Flow	Discounted	Payback
1	-$10,000.00	-$10,000.00	-$10,000.00
2	-$1,000.00	-$970.87	-$10,970.87
3	$250.00	$235.65	-$10,735.22
4	$800.00	$732.11	-$10,003.11
5	$5,000.00	$4,442.44	-$5,560.68
6	$2,500.00	$2,156.52	-$3,404.15
7	$2,300.00	$1,926.21	-$1,477.94
8	$2,200.00	$1,842.47	**$364.52**
Total	***$2,050.00***	***$364.52***	

3% Interest

$$\sum_{t=0}^{n} F_t(1+i)^{-t} \geq 0$$

For smallest *n*

Sum series of cash flow instances using time value of money until the number becomes positive.

Warning: Discriminates against proposals with slow payback but high profits.

Other Elements Not Accounted For In This Discussion

- Usually handled by financial decision maker using multiple proposals
- Inflation/Deflation on value of dollar in future cash flow stream.
- Taxes over the future cash flow stream.
- Depreciation
- Other Comparison Techniques
  - Differential Cash Flow Stream Analysis
  - Present Worth on Incremental Investment

Tracking The Investment

Create the computed tables for expected cash flows and apply real cash flows to those tables.

Note the difference to determine if on track (better or worse!)

Software Estimation

Covering a couple of methods.

To provide good estimates, you really need to keep metrics.

Estimation by Expert

- Usually most unrealistic
- Ego
- Software is complex and getting more so
- Good as a second method for “sanity check”

Estimation by Analogy

- Based on something we already know
- Still pretty fuzzy based on unknowns

Bottom Up Estimation

- Pretty much a WBS
- Functional Decomposition
- Can be dependent on previous history data

Statistical Estimation

- Based on metrics
- Build a body of knowledge about an organizations capabilities
- Formula and data oriented
- Easiest on the user
- Worthy of a presentation on it's own

Statistical Estimation

$$Estimate_{fp}(NNF) = \left\{ \sum_{i = fp_{architecture},\ fp_{integration},\ fp_{ui},\ \cdots} (Cost_i \times w_i \times NNF) \right\}$$

Estimate for creating a number of new fields (NNF).
For a given function point (schema).
For user interfaces (programming).
For machine interfaces (integration).
Weight, w, helps correct.
Cost helps correct.
Can be for money and for time.

Work With Other Departments

- Sales and marketing to get forecasting and history
- Accounting and finance to aid with computations and likely available money to work with and cost avoidance.
- Legal for cost avoidance.
- Your system's data will yield a great deal of information – other parts of the company are using it – you should too!

References

Tockey, Steve (2005). *Return On Software: Maximizing the Return on Your Software Investment*, ISBN 0-321-22875-8

Warren, Carl (2008). *Survey of Accounting,* ISBN 0-324-65827-3

Questions?

Additional Items To Include?