White Paper

The Investment Profitability Assurance

Best Practice for Ensuring IT-Enabled Business Value

UST Global[SM]

Date: March 2007

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This white paper presents the UST Global[SM] (UST) *Investment Profitability Assurance (IPA)* best practice. A study of Fortune 500 companies found that only 27 percent of projects intended to make a profit achieved their financial targets. This white paper shows how this trend can be reversed to assure that projects meet their financial goals.

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About UST

UST is a leading provider of end-to-end IT services and BPO solutions for Global 2000 companies. The company has a client-centric, best-shore delivery model that combines local, senior, on-site resources with the cost, scale and quality advantages of offshore operations. With a strong focus on corporate values and culture, UST is committed to long-term strategic partnerships and providing value "beyond the contract" to our customers.

About the Author

Craig Lamont is the Center of Excellence (CoE) Practice Director for IT Strategy, Enterprise and Application Architecture at UST.

During the past 20 years, Craig has held executive level positions in both Big-5 consulting and Fortune 100 companies specializing in architecture and strategy. In 2001, Mr. Lamont founded Turning Point Consulting to develop new industry best practices, methodologies and toolsets for the IT marketplace. Some of these best practices led Craig to being named as keynote speaker for Hewlett-Packard's Worldwide IT Symposium in Bangkok, Thailand in 2003. As keynote speaker Craig presented an evolutionary precision IT investment best practice methodology based on 1997 Nobel-Prize winning economic, financial and accounting work created to ensure that complex and critical IT investments achieve their ROI targets.

Introduction

Studies by leading research firms on the ability of investments in Information Technology (IT) projects[1] to favorably impact the financial results of medium to large corporations[2] indicates that the majority of these projects result in little to no positive effect on annual corporate financial performance, and in many cases, can result in unprofitable outcomes.

A study by Global Logistics on the effectiveness of IT investments shows that only 27 percent of these investments were able to achieve their financial targets. This study also reveals that 23 percent of IT projects were cancelled before completion when it was discovered mid-project that the expected financial targets would not be realized. An additional 50 percent of projects resulted in disappointing or negative financial returns, chiefly caused by budget overruns combined with lower than expected revenues.[3]

Further investigation into a broad set of companies across multiple industries indicates that many companies only experience financial success rates in the single digits.[4] Moreover, projects that could have generated additional corporate income went unfunded because the available annual budget was exhausted on what was eventually shown as unprofitable endeavors or on existing projects that consumed inordinate amounts of ongoing funding.

Nevertheless, it is widely accepted[5] that IT-based projects delivers broad productivity gains without necessarily delivering higher profits or quantified competitive gains for companies. It is also an established belief that the technology industry continues to be innovative and important in the execution of business strategy, management and operations. Therefore, due to the importance of IT for business success, it has become imperative to resolve the gap between IT project investment effectiveness and achieving the financial goals of the corporation.

[1] Business projects where Information Technology is a key component to the execution of the business strategy.
[2] Defined as Fortune 1,000 corporations that have been established for more than 3 years.
[3] Source: Thomas A. Foster, Global Logistics, regarding supply chain based project success, 2001.
[4] Source: Craig Lamont, Turning Point, Inc, 2003.
[5] And agreed with by the author.

The Investment Profitability Assurance

This white paper presents the *Investment Profitability Assurance (IPA)*, an evolution in assuring that the majority, if not all, of IT projects result in successful financial outcomes when they are expected; that the right mix of projects are selected for maximum financial benefit and that senior management is provided the information necessary to achieve greater than expected financial outcomes.

Although the IPA name may appear to be new, the foundation for this methodology draws upon multiple, established practices that have been successful and widely used for several years. However, these practices were not unified into a single discipline until recently. IPA is an extensive adaptation of a methodology that was originally developed in 1973, later refined, and was awarded the 1997 Nobel Prize in Economics.

One of the primary objectives of IPA is to establish a series of investment returns that expand in value over time by compounding the initial link in this investment value chain. The intent is to achieve investment returns significantly beyond what was previously thought possible and recognizable through traditional NPV (Net Present Value) techniques. This methodology positions a company to experience previously unrecognized financial upside potential. The follow-on financial value can be profitably leveraged for additional returns over time – perhaps indefinitely.

The adaptation of the Nobel work, originally created for Wall Street financial instruments, required over 4,000 hours of research, analysis and development to refine IPA specifically for the business and IT consulting marketplace. The objective of this effort was to create a highly-effective approach to justify (if necessary) large and complex business investments in IT.

IPA is effective because it avoids what organizations see as "waste and spoilage"[6] of their available budget. In one example $500 million in IT budgetary resources only contributed $85 million in new revenue. In a post-mortem analysis, the company realized that of the $500 million budget, $55 million contributed to retaining existing profits; however $23 million was responsible for attaining $55 million in new revenue. The remaining $422 million of the budget resulted in neutral to negative investment returns. Of the $422 million, approximately $35 million was in high-risk projects whose value was still considered by the client as worth attempting.

Although more speculative in nature, a follow-on study suggested that had the remaining $387 million been allocated to other projects, additional revenue would have been attained. These projects were then marked as high priority for the following year.

[6] The term used by this client's senior executives

The Inadequacy of Net Present Value

A team of independent researchers examined IT investment performance across several companies applying traditional NPV metrics. The outcome of this analysis showed strikingly inconsistent results. In one illustrative example, the aggregate of NPV forecasts for 2002 indicated the product revenue should have doubled in that year due to project investments. In reality, revenue for this company grew by only three percent in 2002. The lack of precision in project investment expectations caused significant loss of credibility with the Wall Street investment community and resulted in a dramatic loss of stock price and hundreds of millions in corporate market capitalization.

Business judgment, intuition, and risk taking will be, and should always be, a part of the entrepreneurial spirit that a company needs to succeed. However, in the cases examined, even with excellence in business strategy and management execution, aligned with superb employee operational skills, the use of "shotgun"(sic)[7] investment approaches frequently resulted in disappointing financial outcomes.

What is needed is a precision investment approach: a best practice solution matched with an actionable enterprise IT architecture (all cases cited are Service Oriented Architecture (SOA)-based) that recognized and addressed the shortcomings of the traditional NPV project valuation methodologies. The IPA was created out of the evident need to provide a precision IT investment approach which combined best-in-class IT solutions with an actionable IT architecture.

The short-comings of the NPV methodologies and the value-added benefits provided by IPA are as follows:

- **Traditional NPV analysis typically focuses on a single project rather than a portfolio of projects** with related platforms and strategic business impact. As a result, some projects that should have been combined as a project investment portfolio to achieve attractive, combined rates of return did not obtain the funding they deserved. Likewise, select projects that were funded but not complementary projects failed to achieve the maximum investment returns that a portfolio approach provides. Parceling out investment funding to a series of unrelated, largely tactical projects resulted in some success, but had the IT executives known of the greater value that could have been achieved, they would have made significantly different decisions.

  The IPA process acts to identify and leverage project affinity. One of IPA's primary principles is to achieve significantly higher rates of return through efficiencies in business investment that would not be attained any other way.

[7] The term used by the senior executives of this company

- As mentioned above, NPV tends to focus on a single project (usually with a five year, single number NPV projection) while little time is spent defining its applicability to enable additional, follow-on business opportunities. This is one of the main reasons **"silos of automation"** occurred over the past 20 years in many Fortune 1000 companies. The IPA methodology however incorporate specialized steps that examine a project's true value in light of other additional business value if such a project were to be funded. With IPA, organizations are driven to think of projects in very different terms. Organizations are able to leverage projects to achieve greater value when projects are grouped in a portfolio instead of on an individual basis. IPA creates an environment where contributors discover how to leverage the value of their individual projects beyond the project's immediate value.

  IPA builds compelling business justifications that are unachievable with traditional NPV approaches. IPA examines projects on an individual or collective basis to either decrease overall project cost, increase overall project revenue, or both. IPA quantifies in advance not only the initial savings and increased revenue that can be realized through grouping projects in a portfolio but also quantifies any potential future savings and revenue opportunities that would not be otherwise possible if projects were not combined as a portfolio. Because of this, IPA provides a much clearer understanding of the value of a business investment. Using the *IPA Investment Return Roadmap (IRR)* described later in this document, management gains a comprehensive view of the maximum potential of the investment and what actions they needs to take to achieve it.

  In addition, IPA is designed to communicate this value in terms that are understandable to both technical and non-technical audiences. When executive management receives an IPA presentation, 90 percent of the content is devoted to financial and project plan information even when value is enabled purely by IT. Only ten percent of the content in and IPA presentation involves technical information. This leaves business management free to concentrate on the IT proposal as an investment and not get entangled in the technicalities and complexities of a specific project.

- By design, classic NPV methodology represents a single, point-in-time snapshot of a project's potential value, usually as a five year forecast. Unfortunately, this **snapshot is usually taken at a time when the greatest variance to the accuracy of the NPV forecast occurs – at the project proposal stage**. Forecast variances occur primarily due to faulty assumptions and constraints that originate from across the spectrum of business, economic, technical, and human factors.

  IPA builds in checks and balances to track the validity, completeness and accuracy of these initial assumptions and constraints. In conjunction with the Investment Return Roadmap, IPA is able to identify when variances occur, why they occur (i.e. which assumption was faulty), what to adjust (i.e. the eight IPA management options discussed later) and by what degree management should react.

- **NPV is also inadequate at "joining" best case, expected case and worst case business scenarios into a single view that shows multiple investment outcomes.** NPV usually averages these into a single view with a single outcome. With IPA, the

Investment Return Roadmap combines these three cases into a unified perspective of a project's progress as it passes from inception to maturity, and as the project investment's returns exceeds, meets or is adjusted according to IRR expectations. Because management knows what needs to occur to achieve the maximum rate of return, actions can be taken to achieve it.

- **NPV analysis typically prevents investment decisions from being made in times of perceived business and economic uncertainty; such as in times of recession and economic downturn.** This has significant future implications.

  In a companion study[8], it was found that of the companies that cut costs aggressively in the last recession, 29 percent experienced both reduced profits and sales. Thirteen percent achieved increased profits on reduced sales, and 12 percent experienced reduced profits on increased sales. Only 46 percent were able to achieve increases in both sales and profits. The study concluded that companies that cut cost aggressively during the last economic downturn were not well positioned for the recovery that followed.

- **The NPV methodology is not well adapted to issues involving project, business and economic risk.** Frequently, business investment stalls because there is a perceived need to seek "perfect information" in order to resolve the risk concerns before proceeding.

  IPA is based on the concept that "not all risk is bad and not all uncertainty is risk". As a result, IPA excels at quantifying and adjusting project business value according to risk. A project with greater risk has its value adjusted downward proportionally according to the nature and severity of the risk. However, as the risk is resolved and "perfect information" is obtained, the project's risk is adjusted to where management can approve the investment. This allows projects to proceed even in times of uncertainty. With IPA, no investment is a "bet your company" proposition.

- **IT-driven projects are typically not permitted to take into account the additional sales and revenue growth enabled by the IT organization and cannot build this into an IT business case**. CEOs tend to see this as "double counting" while sales, marketing and financial executives see this as IT taking credit for revenue attainment. These executives typically demand that all revenue be attributed to their individual organizations for personal bonus or incentives.

  IPA is designed to break out and show both IT-enabled investment returns and the revenue that should be attributed to the sales/marketing groups. This cooperative investment return view avoids cross organizational funding disputes that delay decision making and the release of funding.

  By joining and making explicit the relationship between IT-enabled business growth and revenue generation, the CIO is seen by his/her peers as a contributor to revenue attainment, and not a cost and time obstacle to business success, as is often the perception. The IPA IRR shows where IT contributes and where business revenue is

[8] Accenture, "The effect of aggressive cost cutting", 2002

attained in the overall cooperative effort. When multiple projects are joined through the IPA process into a unified portfolio using projects with high IT-enabled affinity, and when these projects come from differing sales/marketing organizations, internal political funding barriers and skirmishes are quickly overcome.

- **Unlike the IPA IRR, the traditional NPV process does not provide management with a decision roadmap** that includes options to expand, contract, hold or reverse investment streams as appropriate.

  IPA provides the following explicit, actionable investment management options:

  1. The option for future growth
  2. The option to expand
  3. The option to wait and see
  4. The option to choose
  5. The option to contract
  6. The option to switch resources
  7. The option for phased and sequential investments
  8. The option to delay

  In the IPA process, the Investment Return Roadmap defines when each of these options should be used. Moreover, one of the primary aspects of IPA is that it provides business leadership the *option, but not the obligation, to invest.*

  This document will explain how, by using the IPA IRR, business leadership can 'hold open' the option to invest, without the obligation. Many in IT have seen projects that should have been denied funding or should have had their funding reduced, drain available investment dollars that could have been invested in other strategic initiatives. This is what the Harvard Business School refers to as, "feeding problems, and starving opportunities".

- **NPV processes suffer from the 'flaw of averages'**. An example of this is when an analyst asks a typical question such as "What is the average revenue per sales region?" Regions 1 through 4 respond: $1 million, $1 million, $1 million, and $2 million respectively. Region 5 reports $50 million. The average of the five regions is calculated as $55 million divided by the five sales regions, equaling $11 million. This is obviously misleading and could lead to faulty investment decisions by the client. Although this example is simplified for illustration, several faulty business cases can be attributed to simplistic math.

  IPA, however, prevents the flaw of averages from occurring by using more sophisticated financial analysis methods such as the Monte Carlo Simulation described later in this document.

- **In cases where cutting-edge concepts and ideas are involved, NPV methodologies are inadequate as they frequently rely on historical data for forecasting.** Historical data is usually unreliable where new business growth concepts such as e–CRM and PRM are being contemplated. Although IPA also uses historical data, it is not dependent upon this data to make accurate forecasts.

As such, IPA has been adapted to justify key programs by expanding business using ideas such as e-CRM and other extended enterprise initiatives through process automation between companies and channel partners. The use of an extranet and Partner Relationship Management (PRM) has the potential to reduce distributor costs by 32 percent and increase channel sales channel by 17 percent in the large manufacturing sector according to John Freeland, author of The Ultimate CRM Handbook (McGraw Hill).

In summary, IPA represents a significant advancement in IT investment decision making that would allow even unilaterally IT-sponsored business operations cost reduction projects and technology refreshment initiatives to compete on an equal basis with revenue generating-sales growth projects. IPA also represents an approach that identifies and communicates the value of IT-enabled chains of compounded, business expansion opportunities which compel business leadership to invest with confidence even in times of uncertainly and economic risk.

Although senior executives look to the NPV for its short term measurements and incentives, they listen keenly if offered convincing evidence that shows how in addition to short term value, an investment has much greater, long term strategic value that can be leveraged for additional, compounded business opportunities. This is as true for an existing project as with a newly-proposed initiative. Recognizing that something is of potential value and knowing in advance what that value is, are two different things and this is what the Investment Profitability Assurance addresses.

The Foundation for IPA

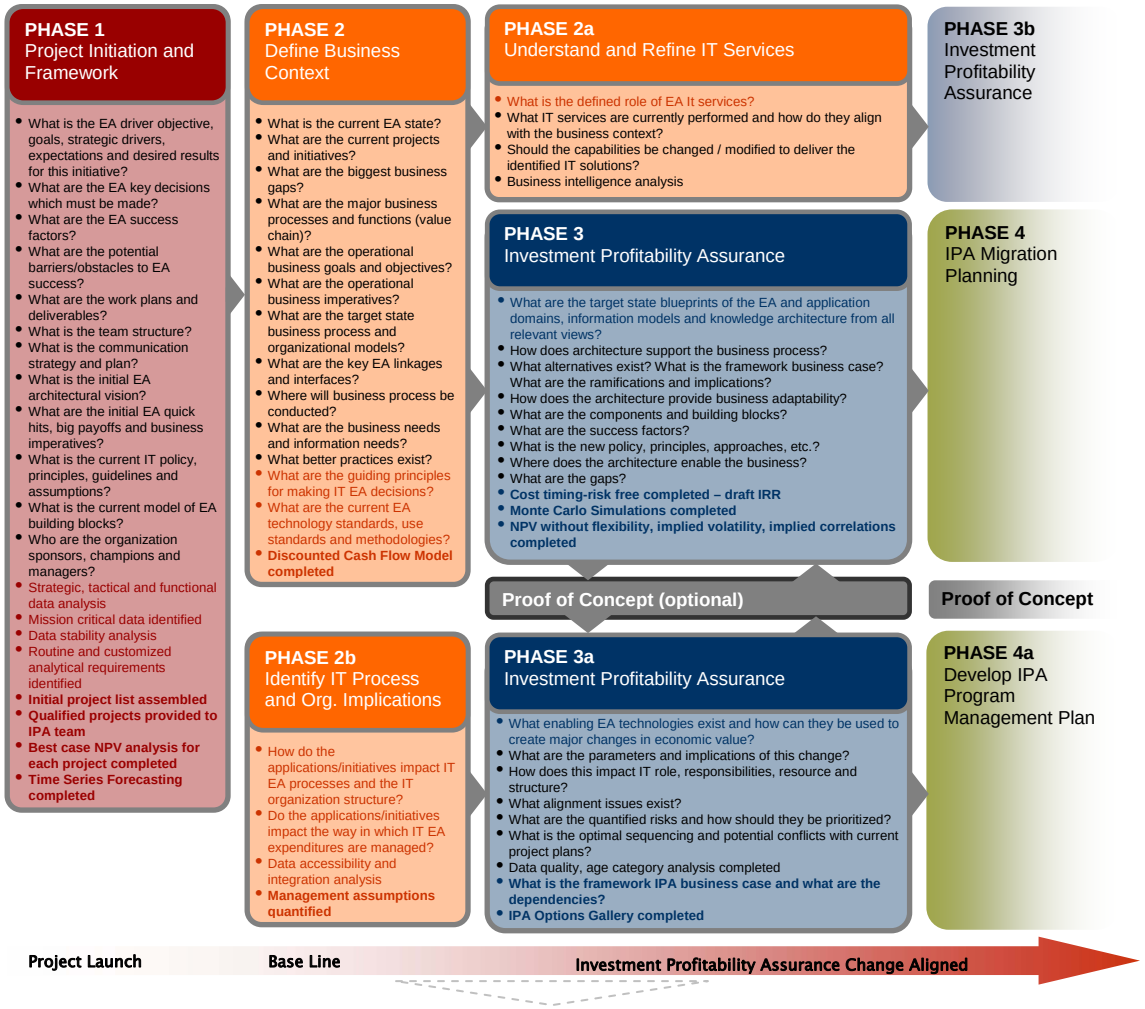
During the past 24 months, more work has been done in addition to the previous five years of research and analysis of over 100 information sources (see Appendix B) to refine IPA for today's IT marketplace. Particular emphasis was placed on how IT practices can create IT-enabled business value by merging the disciplines of enterprise Service Oriented Architecture, advanced project management, organizational dynamics and competitive marketing strategy combined with precision economics into a unified approach. This unified approach enabled the mutual success of UST working together with our clients in ways not possible with traditional methodologies.

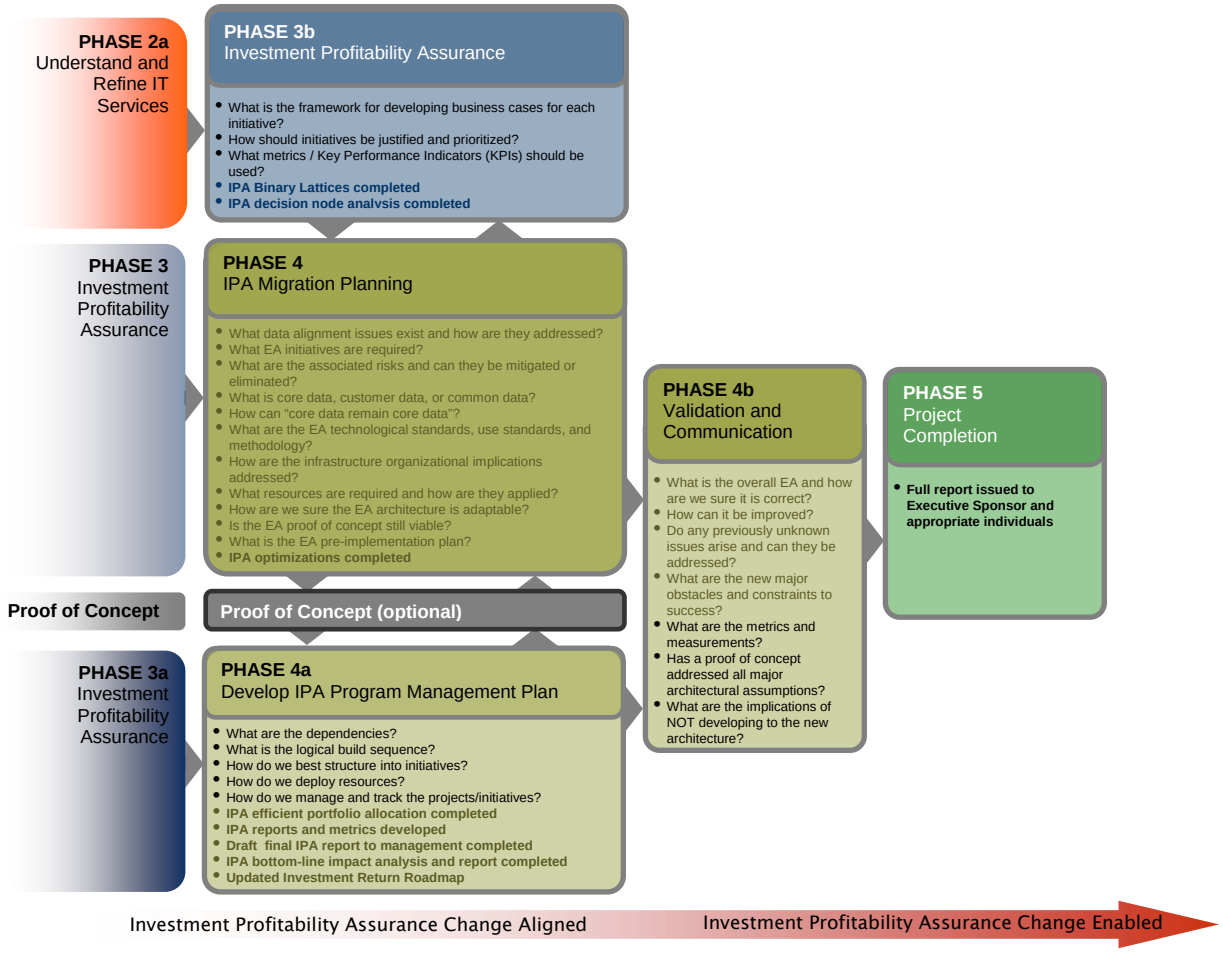
Enterprise Service Oriented Architecture examines all projects under consideration for investment utilizing the IPA criteria and matches projects that have high architectural and technological affinity. Advanced project management methodologies align proposed project plans in a way such that each individual project's critical path remains intact, yet the projects themselves are aligned as a project portfolio rather than a collection of unrelated, individual efforts.

The integration of the Nobel Prize winning financial analysis foundation with organizational dynamics and the concepts of competitive marketing strategy completed the IPA process design. IPA also employs concepts and approaches from the book, The New Strategic Selling, by Srephen E. Heiman and Diane Sanchez with Tad Tuleja (Warner Books).

The result is an *IPA Process Framework* that is comprised of five primary phases (see figure on next page), including 12 optional sub-phases for a total of 109 potential steps. While comprehensive in its design, the IPA framework is also customizable to adapt to differing business conditions, client needs, client geographical disbursement (i.e. globalized companies), and desired investment outcomes.

The IPA Process Framework





How the IPA Works

One of the best ways to understand how IPA works is by first seeing how it is an improvement on traditional NPV formulas and techniques. A traditional NPV calculation appears below:

$$\text{NPV} = \text{Initial outlay} + \frac{\text{Income stream}}{(1 + \text{cost of capital})} \quad \textbf{1 to n} \text{ where n is the number of periods}$$

For example if an investment of $1M is made with successive revenue achieved in years 1 through 5 of $.5M, $.6M, $.7M, $.8M and $.9M with a 20 percent cost of capital, the result is:

$$\text{NPV} = -\$1\text{M} + \left[\frac{\$.5\text{M}}{(1 + .2)^1} + \frac{\$.6\text{M}}{(1 + .2)^2} + \frac{\$.7\text{M}}{(1 + .2)^3} + \frac{\$.8\text{M}}{(1 + .2)^4} + \frac{\$.9\text{M}}{(1 + .2)^5} \right] = \$.985\text{M}$$

This does not appear to be a good investment because the value of the revenue stream achieved at the end of the fifth year ($0.985M) is less than the initial outlay of $1M. However revenue streams seldom occur in a lump sum at the end of the year and if they occur mid year, the project would be profitable by an additional $.190M.

$$\text{NPV} = -\$1\text{M} + \left[\frac{\$.5\text{M}}{(1 + .2)^{.5}} + \frac{\$.6\text{M}}{(1 + .2)^{1.5}} + \frac{\$.7\text{M}}{(1 + .2)^{2.5}} + \frac{\$.8\text{M}}{(1 + .2)^{3.5}} + \frac{\$.9\text{M}}{(1 + .2)^{4.5}} \right] = \$1.175\text{M}$$

This type of analysis show why more precise financial analysis is needed and why there is a difference in outcomes between projects that receive funding with IPA than with traditional NPV methodologies.

To accomplish favorable outcomes IPA uses a wide variety of techniques to achieve a comprehensive view of an investment's strategic value. These techniques still use and begin with NPV analysis but go beyond by including:

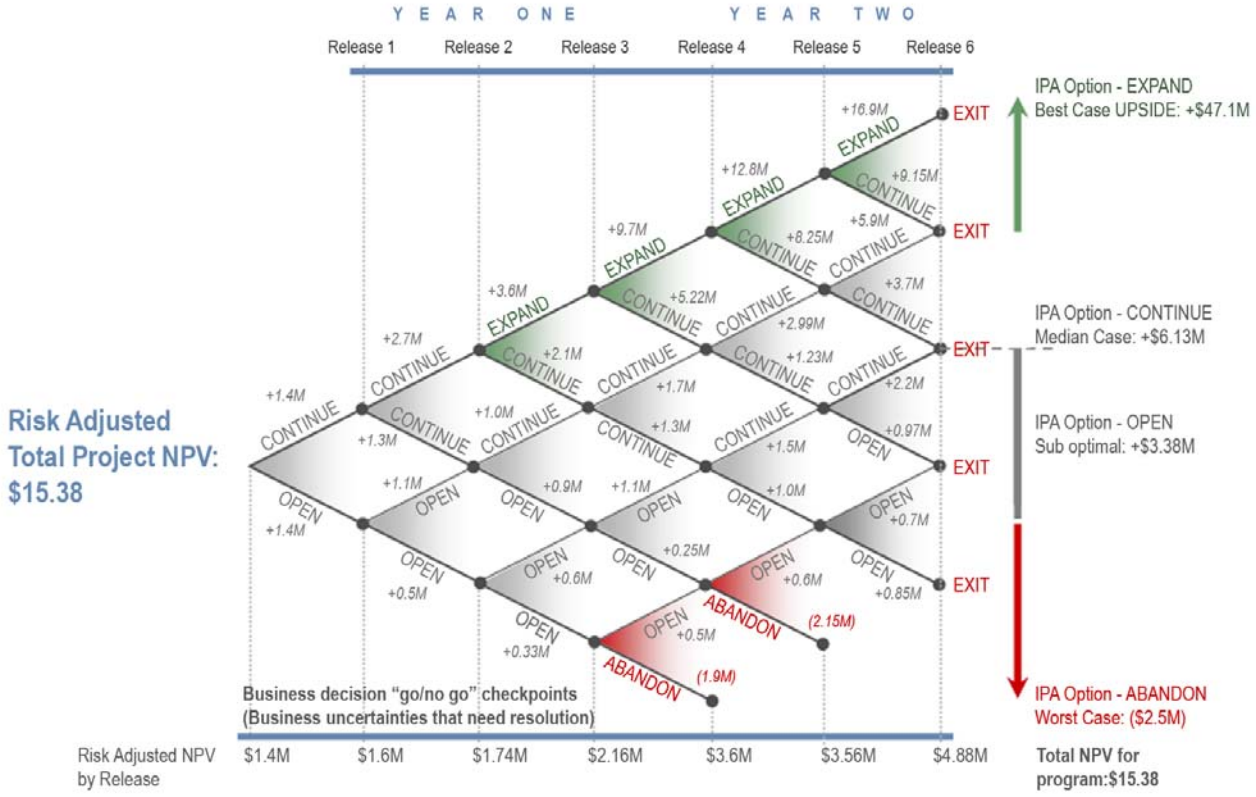
- Project review, prioritization, architectural-technological affinity analysis and initial portfolio selection

- Time series forecasting
- Discounted cash flow models
- Option selection through volatility analysis and sensitivity analysis
- Cost time, risk free analysis
- Monte Carlo simulation (to eliminate the flaw of averages problem)
- Portfolio optimization, final results verification and advanced management presentations
- Binomial lattice (IPA Investment Return Roadmap – seen below)

Not all these IPA techniques are necessarily used in every case, but they are used depending on the complexity of the business assumptions, risks and general business environment.

The IPA Investment Return Roadmap

A valuable technique in the IPA is the Investment Return Roadmap. Also called a "binomial lattice", the IRR is a visual representation of all relevant decision paths an investment can take as the investment expands and compounds over time. Each branch of the lattice is an explicit, previously identified decision point for business leadership to take the appropriate action and maximize investment value. A brief glance of the sample IPA IRR below is indicative of the way investments are communicated when compared to traditional NPV methods.



The binomial lattice is occasionally constructed using formulas derived from the Nobel awarded work of Dr Black and Dr Scholes (Source: See Appendix B). One of these formulas, otherwise known as an "Option to wait", appears below:

$$\text{Call} = S\Phi\left[\frac{\ln(S/X) + (rf + \sigma^2/2)\,T}{\sigma\sqrt{T}}\right] - XE\,\sigma^{-rf(T)}\,\Phi\left[\frac{\ln(S/X) + (rf + \sigma^2/2)\,T}{\sigma\sqrt{T}}\right]$$

Although it is not the intent of this paper to discuss in detail the extensive collection of formulas adapted for the IPA methodology, it is important to note that the simple use of spreadsheets is inadequate to achieve the objectives of IPA.

Reading the Sample IRR

This Investment Return Roadmap shows that this sample investment has a maximum potential value of $47.1M, an expected value of $6.13M and a potential loss of $1.9M. However a singularly unique aspect of the IPA approach is the "Risk Adjusted Total Project NPV" with a value of $15.38M.

A Risk Adjusted NPV is an expression of the combined values of all the options in the IRR. These values are weighted according to their probable outcomes with the weighted average amounting to $15.38M. This sum is differentiated from the Median Case of $6.13M, which is an overall (as opposed to weighted) average of the value of the most probable continue, open and abandon options. As a result, the true potential value of this project is significantly greater than the median case *if* business leadership acts to maximize the full potential of the project. Furthermore, the value target of $47.1M provides business leadership a significant incentive to make the decisions necessary to achieve the greatest financial outcome.

To illustrate some of the additional benefits of the IPA approach, the IRR sample indicates that Release 1 of this IPA investment is expected to achieve a return of $1.4M. Because this forecast was designed with near 100 percent certainty in the business assumptions (primarily because the time period involved is less than a year, the risks within this period were low), the probability would be very high that this investment will achieve its $1.4M, Period-1 target. As the project moves forward, the stage is set (i.e. the company is "pre-positioned") for obtaining additional, follow-on upside value.

Next, as "perfect information" concerning the higher-risk, future business assumptions is obtained and resolves the risk issues, business leadership will have four additional, high-value IPA options to consider and act upon as defined in the IRR. These are:

1. A "Continue Option" worth $2.7M
2. A "Continue Option" worth $1.3M
3. An "Open Option" worth $1.1M
4. An "Open Option" worth $5.M

A Continue Option is where an additional investment of a predefined amount continues to achieve additional investment margin. An Open Option is where management has the "right, but not the obligation" to continue to make the investment. This means that management has the option not to make an additional investment, but still continues to receive an attractive return. Therefore, the difference between a continue option and an open option can be thought of as the *premium attained from additional investment return created by the incremental funding of the Continue Option*.

The way to use this IRR is to determine if the business risk assumptions and constraints are sufficiently clarified so that management would be wise to select IPA Option 1 (A Continue Option worth $2.7M). If the business assumptions are not sufficiently clarified, management might be wise to select IPA Option 4 (An Open Option worth $5.M). With option 4, there is no incremental investment required and management still obtains a return of $.5M. The business management is also free to choose the second and third options accordingly.

As successive releases of this project are accomplished the IPA IRR defines the expected returns based on predefined actions that are adjusted with the clarification of business assumptions.

The Use of Risk to Create Trust in Investment Options

Not all risk is uncertainty and not all risk is bad. As such, the way risk is defined in the IPA process is to express it as a set of predefined outcomes with associated probabilities. Each outcome and probability has a defined range of values that can occur (for example, the percentage of sales growth for every new sales office opened).

Although it is unfeasible to extensively document all the individual steps of the IPA process in this paper, it is beneficial to understand the way risk is accommodated, and why management can have increased confidence in an IRR even when significant business and economic uncertainty exists.

Consider a new case. If there is a 30 percent probability that sales will increase between $5M and 10M; a 50 percent probability that sales will increase between $3M and $4.9M; and 20 percent chance that sales will increase only between $0M and $2.9M, then the IPA Monte Carlo Simulation, a method of statistical sampling, is used to compute all the possibilities that can occur.

In another instance, suppose a business has defined three outcomes as follows:

- **Branch 1:** 15 percent probability that investment will exceed expectations and be in the range of $3.3M and $8.9M.
- **Branch 2:** 70 percent probability that investment will meet expectations and be in the range of $1.9M and $3.2M
- **Branch 3**: 15 percent probability that investment will not meet expectations and be in the range of $-1.4M and $1.8M.

The IPA simulation performs a weighted average based on all the combinations and all their associated ranges of probable outcomes. Therefore, the risk adjusted, total value of this IPA case is $2.73M, given that the project has a maximum investment potential of $8.9M and a minimum of $-1.4M.

This leads into a short discussion of management's ability to affect positive outcomes of IPA projects and to maximize their value by knowing in advance best case, expected, or worse than expected investment returns scenarios. If the business leadership knows in advance that to achieve the maximum return of $8.9M they need to develop and deploy IT capabilities to expand into global business markets through a Web-based CRM channel strategy, then business leadership would be well advised to make this occur.

This highlights one of the real-life uses of IPA. Instead of parceling out investments through a series of tactical programs that limit the possibility of delivering sustained market-relevant results, IPA is adept at justifying projects that affect the bottom line. These involve projects, programs and initiatives that affect the business in a broad and sweeping manner where uncertainty and risk are present.

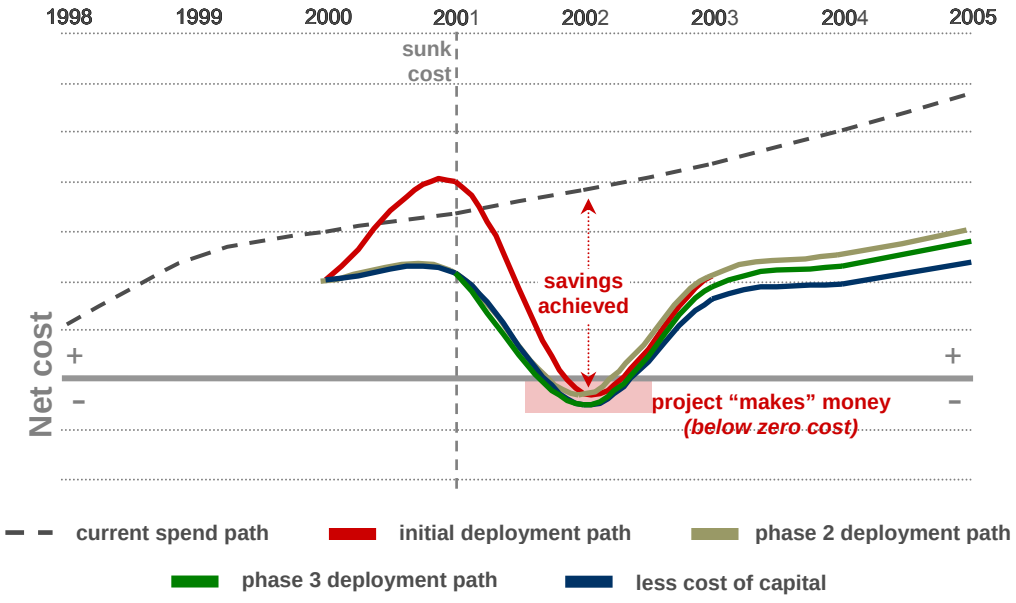
The IPA at Work:

Radical Cost Reduction through an SOA-based Enterprise Architecture Initiative

A large multi-national company sought to implement a comprehensive enterprise Service Oriented Architecture (SOA) to increase the reliability of project success while reducing the cost of deployment and operations of business applications. The architecture group was chartered with creating the architecture. However, there was a constraint on the size and scope of the architecture group as additional funding was not approved for the project to proceed beyond the planning stage until a compelling business case was developed.

Using the IPA methodology this architecture group discovered that 65 percent of the $800K annual IT development and maintenance budget involved interfaces between 1,200 systems. As such, the architecture developed was designed in part to radically reduce the need for a complex number of interfaces in addition to addressing the strategic need for legacy system "webification", new business channel development through the use of intranet/extranet business, and response time reduction between key business systems. In addition, reliability of key interfaces on the critical business process paths was also addressed by providing five-nines of reliability.

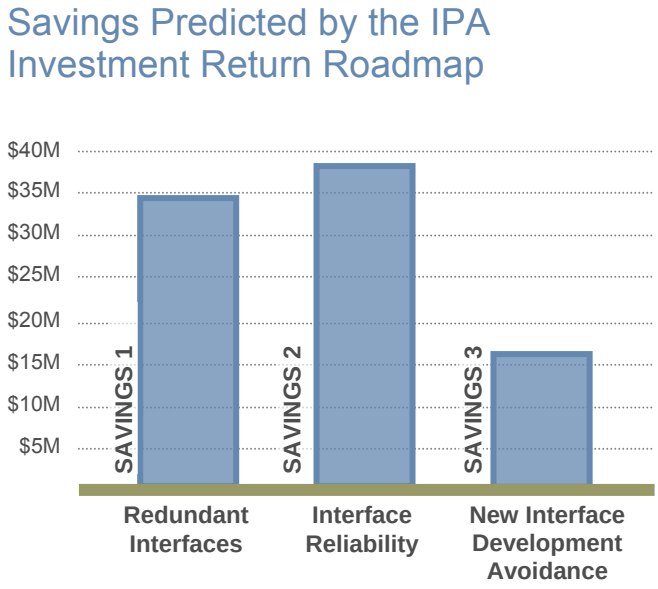
Illustrative Real-Life Example



The result was an initial development effort to replace 31 key interfaces to the business' mission critical systems that was approved and funded over a two-year period. The chart below shows the trend of increasing costs (blue line) both using historical data as well as IPA forecasts if the old interfaces remained in place.

The IPA business case for the Service Oriented Architecture's leveraged compounded value is reflected in the succession of wave-shaped lines. The first line in red shows the initial cost savings (actual amounts are being held confidential). The remaining green, pink and purple lines reflect successive reductions in cost enabled by the company pre-positioning itself with this investment for additional follow-on value. In 2002 the lines dip below the horizontal light green line, signifying that the *project goes below zero cost* and actually return 'real money' to the company.

However this was not the end of follow-on, leveraged compounded value. The chart below shows the next wave of value created by this IPA investment (not shown on the previous graph) as predicted by the IPA Investment Return Roadmap. With the prerequisite initial interfaces in place, this company was now pre-positioned to achieve an additional $95M in annual operational cost reductions on a one-time investment (held confidential). This was to be achieved by increasing interface reliability ($40M), eliminating redundant interfaces ($35M), and by preventing new redundant interfaces that would have been developed ($20M).



Soon additional annualized, follow-on value was available for investment consideration. This included savings achieved by eliminating "screen scraping" to the business legacy systems, and by the convergence of business information that was enabled because the IPA common interfaces existed. In addition, encapsulation of legacy code in an object format was being considered. This means that common code currently embedded and trapped in legacy systems can be made available for wide-spread, shared use among multiple projects, thus avoiding the cost to develop these business functions from scratch.

Summary

The IPA adaptation of the Nobel Prize winning work was developed to justify the business case for large and complex IT programs, integration projects, consulting services and technology refreshment initiatives that would otherwise have gone unfunded due to a company's inability to deliver a concrete, compelling business investment justification to senior management, or due to the significant uncertainty that exists in business and economic conditions.

IPA acts to create compounded investment expansion opportunities for enterprises and to be able to communicate the value of these expansion opportunities so that funding is approved without lengthy debate and political skirmishing. IPA works not just for an initial investment but for a series of follow on investments in the years ahead.

With IPA, once the first link in the investment chain is set, the whole chain is established, creating an annuity-based approach to project management. It is then up to the project team to make sure this chain never breaks.

The key principle of IPA is to create business value with attractive short-term investment returns while *pre-positioning* businesses with a program providing explicit, actionable, compounded strategic options leveraged for significant follow-on value, if not unlimited upside future potential.

APPENDIX A

List of Companies Who Have, or Are Using the 1997 Nobel Prize Winning Approach

A

Abacon Telecommunications
ABB
Abbot Laboratories
Adaptive Optics Assoc.
Aetna
AIG
Air Products & Chemicals
Alcan Aluminum (Brazil)
ALCOA
Allied Signal
Allstate Insurance
Alumax
American Capital Access
Amerada Hess
American Electric Power Albertson's
American Express
American Family Insurance
American Standard
Ameritech
AMP
Anadarko
Anheuser Busch
Apache
Apple Computer
Applied Materials
The Archinomics Group, Inc.
ARCO Alaska Inc.
Argon Ex Inc.
AsGa S.A. (Brazil)
Ashland
Asset Guaranty
ATC Environmental
AT&T
AT&T Broadband Labs
Avery Dennison
Avon Products
Ayco Company

B

BAE Systems
B.F. Goodrich
Baltimore Gas & Electric
Banco Bamerindus de Brasil S.A. (Brazil)
Banco International
Banco Investimentos Garantia S.A. (Brazil)
Banc One Corp.
Banker's Trust
Bankhaus Lampe KG (Germany)
Battelle
Baxter International
Bear Stearns
Becton Dickinson
Bell Atlantic
BellSouth
Bergen Brunswig Corp.
Bethlehem Steel
Beverly Enterprises
Binhai Wastewater Disposal Consultants, Ltd.
Black & Decker
The Blue Leaf Strategy Group
BMG Banco Comercial (Brazil)
Bobikiewiez & Partner
Boeing
Boise Cascade
Boliden AB
Bombardier Corp.
Bon Accourd (Scotland, U.K.)
Boston Consulting Group
BPAmoco
Bristol Myers Squib
British Borneo Exploration Inc.

C

Cable & Wireless (London, U.K.)
Campbell Soup
Capital Market Risk Advisors, Inc.
Carolina Power & Light
Case
Caterpillar
Ceco Door Products
Centex

Central & Southwest
Cexec
Champion International
Chase Manhattan
Chase Securities, Inc.
Chen Enterprise
ChevronTexaco
CIBC World Markets
Cigna
Cinergy
Cisco Systems
CitiCorp
City Financial Ratings
Clariant
Clear Thinking Ltd.
CMC Electronics (Canada)
Coastal
Coca Cola Co.
Coca Cola GMBH (Germany)
Colgate-Palmolive Corp.
Columbia Energy Group
Columbine Insurance Consulting
CompUSA
Computer Sciences
Consolidated Natural Gas
Cooper Industries
Coral Energy
Cordis
CoreStates Financial Group
Corning
Corporate Express
CNH Consulting
Crosscurrents Research
CSX
Cummins Engine Co.
Cyprus Amax Minerals

D

Dames & Moore
Datacolor International
DataTech Business Solutions
Decision Support Assoc.
Dell Computer
Deloitte Consulting
Delta Airlines
Devon Energy
Digital Equipment Co.
DNV (Norway)
Dow Chemical
Dresser Industries
Duke Energy
DuPont

E

Eastman Chemical
Eastman Kodak
Eaton Corp.
EBA, Inc.
E.D.S.
EG & G Instruments
Eland Energy, Inc.
Electronic Data Systems
Eli Lilly
Elkem Metals Company
Emerald Energy PLC
Emerson Electric
Engelhard
Enogex Inc.
Entergy
Epcor (Canada)
EPFL DA (Switzerland)
Ernst & Young
Exxon

F

Farmland Industries
Fina Exploration Norway S.C.A.
Fluor
Ford Motor Co.
Forest Oil
Foster Wheeler

G

GB Biosciences
General Dynamics
General Electric
General Mills
General Motors
General Re
Georgia Pacific
Gillette
Glaxo Wellcome
Goodyear
Griffith Management Group
GSIA
GTE

H

H.J. Heinz
Hach Company
Halliburton
Harnischfeger Industries
Harris
Hasbro Co.

Healthsouth
Heeremac
Heerman Marine (Netherlands)
Hercules Inc.
Hewlett-Packard
Honeywell
Household International
Howard Johnson & Company
HSB Industrial Risk Insurers
HSWMR, Inc.
HTE, Inc.
Huges Space & Com
Hulseberg Consulting

I

I.B.M.
IESE
IFG Companies
Image Technology LTDA (Brazil)
IMC Global
Inacom
Income Property Specialists
Ingersoll-Rand
Innovative Engineering Solutions
Insurance Corporation of Hannover
Intecap
Intel
Inverness Council Inc.
Invisitain
IPEX a.s.
ISCOR Mining
Islandsbanki FBA (Iceland)
ITT Industries

J

J & H Marsh & McLennan, Inc.
J & J Clinical Diagnostics
Jacques Whitford Environment Ltd.
J. Duncan & Associates, P.S.
Japan Chemical Industry Assoc.
Japex (U.S.) Corp.
J.P. Morgan & Co.
JC Penney
John Deere
John Hancock Real Estate Investment Grp
Johnson & Johnson
Johnson Controls, Inc.

K
Kansas City Power & Light
Kellogg
Kennecott Greens Creek Mining Co.
Koch Industries
KPMG LLP

L

Leggett & Platt
Lehman Bros.
LG & E Energy
Liberty Mutual Insurance
Light Path Technologies
Limno Tech
Lilly Deuschland GMBH
Lockheed Martin
London Economics
LPC, Inc.
Lucent Technologies
Lyondell Petrochemical

M

Machetta and Associates
Magna Interior Systems
Maple Leaf Foods (Canada)
Marathon-Ashland Petroleum LLC
Mariner Energy
Marriott Corp.
Martin Marietta
Maxim Technologies
Maxserv
Maxtor Corporation
MBNA
McDonald's Corp.
McDonnell Douglas
McGraw Hill
McKinsey & Co.
Mclaron/Hart
MCI
Mead
MedCath
MEDCO Containment Svc.
Meg Tec
Menzie-Cura & Associates, Inc.
Merck & Co.
Mercy Care
Merrill Lynch
MFL, Inc.
MicroAge
Microsoft
Mindset, Inc.
Mineradora de Minas (Brazil)
Mobil
Moffatt & Nichol Engineers
Monsanto

Morgan Stanley Dean Witter
Motorola

N

NASA
Nations Bank
National Institute for Working Life
Nationwide Insurance
Navistar International
NCR
NetCreations, Inc.
Netherland Sewell
Newmont Goldmining
New York Life
NIA
Niagra Mohawk Power
Nike
Nobex
Noranda
Nordic Power Invest.
Nordstrom
Northeast Utilities
Northern States Power
Northrop Grumman
Northwest Airlines
Novacor Chemicals
NRG Energy
NS Vastgoed (Netherlands)
NYU Telecom

O

Objective Insights
Occidental Petroleum
Odgen EES
Oil Hunters (WA) Pty Ltd.
Oklahoma Gas & Electric
Owens-Corning

P

Paccar
Pacific Gas & Electric
PacifiCare
Pacific Western Paine-Webber
Parker Hannifin
Parsoz Engineering Science
Parthenon
Peco Energy
Pepsico
Petro Brasil (Brazil)
Petro-Canada
Pfizer
PGE Energy Services
Phamis Inc
Pharmacia & Upjohn
Philip Morris
Phillips Petroleum Co.
Phoenix Management, Inc.
Pilsbury
Pitney Bowes
Plexus Corp
Politichig di Milano
Powerwave Technologies
PPG Industries
Praxair
PRC Environmental Management, Inc.
PriceWaterHouseCoopers
Principal Financial
Procter & Gamble
Progressive
Project Analysis & Evaluation, Inc.
Provident Personal Credit Ltd.
Prudential Insurance

Q

QSM, Inc.
Quaker Oats
Quantas Airways
Quantum

R

R.R. Donnelley & Sons
Raychem Corp.
Raytheon
Reader's Digest
RCJ Consulting
REG Associates
Reliance Industries (India)
Reliance Water Controls
Remec Wireless
Republic New York Corp.
Reynolds Metals
Ricoh
Rio Alto Exploration (Canada)
RIVM
RJR Nabisco
Rockwell International
Rohm & Haas
Rol-Co Direct
Ross Laboratories
Ryder Scott

S

Salomon Brothers
Samedan

Sandia National Labs
Sangstat Medical Corp
Sasol (South Africa)
SBC Warburg
Schlumberger
Scientific Atlanta
Seagate Technology
Sears Roebuck
Senasa
Shell
Silicon Graphic
Simulation Support, Inc.
Six Sigma Adventures
Solectron
Sonat
Sonoco Products
Southern California Edison
Southwest Research Institute
Southwest Royalties, Inc.
Sprint
The STAR Group
Statoil
Sterling Strategic Solutions
Stern Stewart & Co.
Stokes Consulting
StorageTek
Strassmann, Inc.
Strategic Planning Associates
Sun Microsystems
Sun Trust Banks
Swedish Geotechnical Institute

T

TCI
Technology Strategies & Alliances
Tenet Healthcare
Tenneco
Texas Instruments
Texas Utilities
T.I.
Tintagel AB
Trafina Privatbank AG
Trane Company
TransCanada Pipelines (Canada)
Triton Energy
TRW
Tumlinson Consulting

U

Ultramar Diamond Shamrock
Union Camp
Union Carbide
Union Pacific
Unisys
United Parcel Service
United Technologies
Unocal
URS Corporation
U.S. Air Force
U.S. EPA
U.S. Geological Survey
U.S. Postal Service
US West
USF&G
USPCI

V

VALCORP
Versar, Inc.
Vinylex Corp.
Visteon

W

W.R. Grace
Walgreen
Walt Disney
Warner Lambert
Wells Fargo
Western Atlas
Western Digital
Weyerhauser
Whirlpool
Williams Energy
Woodward Clyde
Woodward Governor
Worth Technical Services Ltd
World Financial News Network

X

Xerox

APPENDIX B

List of Information Resources used in this White Paper

Internet Resources

1. http://finance.wharton.upenn.edu/~benninga/mma/MiER64.pdf
2. http://www.orie.cornell.edu/seminar/node14.html
3. http://web.mit.edu/ioanid/www/black-scholes.pdf
4. www.stanford.edu/~japrimbs/BlackScholes2.ppt
5. http://www.math.duke.edu/vigre/pruv/studentwork/malone.pdf
6. http://jfi.uchicago.edu/~scvenkat/math/finmath03/black_scholes.pdf
7. http://galton.uchicago.edu/~lalley/Courses/390/Lecture7.pdf
8. http://bradley.bradley.edu/~arr/bsm/model.html
9. http://www.math.toronto.edu/almgren/finmath/pde-01/notes1.pdf
10. http://www.math.utah.edu/~zhu/notes1.pdf
11. www.montegodata.co.uk/Consult/BS/bsm.htm
12. http://www.optionanimation.com/
13. http://www.mathfin.com/nicolas/Q35.pdf
14. http://dybfin.wustl.edu/research/papers/riskman.bs.html
15. http://www.blobek.com/black-scholes.html
16. http://www.ams.org/new-in-math/nobel1997econ.html
17. http://invest-faq.com/articles/deriv-black-scholes.html
18. http://finance.bi.no/~bernt/gcc_prog/algoritms/algoritms/node8.html
19. http://home.online.no/~espehaug/SayBlackScholes.html
20. http://www.margrabe.com/OptionPricing.html
21. http://www.wspc.com/books/economics/4955.html
22. http://www.quickmba.com/finance/black-scholes/
23. http://www.nobel.se/economics/laureates/1997/press.html
24. http://risk.ifci.ch/00010552.htm
25. http://invest-faq.com/articles/tech-an-black-scholes.html
26. http://www.numa.com/bookshop/books/3685.htm
27. http://www.investorwords.com/cgi-bin/getword.cgi?487
28. http://www.option123.com/ourmodel.htm
29. http://www.warp9.org/nwsoft/bscholes.html
30. http://www.optimizemag.com/issue/009/financial_side3.htm
31. http://www.in-the-money.com/presentation/sld083.htm
32. http://www.nag.com/numeric/CL/Financial/StdBlack-Scholes.asp
33. http://www.investopedia.com/terms/b/blackscholes.asp
34. http://www.schaeffersresearch.com/option/advanced/bscholes.asp
35. http://www.riskbook.com/titles/chriss_n_(1997).htm
36. http://finance.bi.no/~bernt/gcc_prog/algoritms/algoritms/node56.html
37. http://www.sjsu.edu/faculty/watkins/blacksch.htm
38. http://www.fintools.com/doc/options/optionsBlackScholes_Models.html
39. http://www.nag.com/numeric/CL/Financial/ExtBlack-Scholes.asp
40. http://www.defaultrisk.com/bk_mdl_opbsme.htm
41. http://www.mathworks.com/support/books/book1323.jsp?category=4
42. http://econ.uwindsor.ca/mispricing.pdf
43. http://www.reboltech.com/library/html/black-scholes.html
44. http://www.erieri.com/scripts23/blackscholes/blackscholes.exe/main
45. http://www.hoadley.net/options/bs.htm
46. http://ray.steele.org/options.html

47. http://library.wolfram.com/infocenter/Articles/1226/
48. http://swopec.hhs.se/lunewp/abs/lunewp2001_005.htm
49. http://www.in-the-money.com/glossarynet/Black-Sc.htm
50. http://www.optionsmart.com/blackscholes.htm
51. http://www.maths.ox.ac.uk/~hambly/PDF/O10/lecture10.pdf
52. http://www.physics.uci.edu/~silverma/bseqn/bs/bs.html
53. http://www.spreadsheetmodeling.com/Black%20Scholes%20Option%20Pricing%20-%20Dynamic%20Chart.htm
54. http://citeseer.nj.nec.com/context/12314/0
55. http://www.physics.uci.edu/~silverma/bseqn/bs/node3.html
56. http://www.wachovia.com/corp_inst/page/0,,44_47%5E2%5Elist%5EB_837,00.html
57. http://netec.mcc.ac.uk/WoPEc/data/Papers/wpawuwpfi9904004.html
58. http://daytrading.about.com/library/weekly/aa091601a.htm
59. http://www.spreadsheetmodeling.com/Black%20Scholes%20Option%20Pricing%20-%20Basics.htm
60. http://www.fenews.com/fen24/pricing.html
61. http://www.mathpoint.ca/cantrisk.pdf
62. http://www.blobek.com/ubb/ubbhtml/Forum4/HTML/000001.html
63. http://www.lifelong-learners.com/opt/SYL/s4node10.php3
64. http://business.queensu.ca/qfe/docs/Bin_Change_Thesis.pdf
65. http://www.inria.fr/rrrt/rr-3767.html
66. http://www.segalco.com/sibson/publications/articles/Empirical_Black-Scholes_results.pdf
67. http://dybfin.wustl.edu/teaching/compufin/slides/cfinl5.html
68. http://www.capdm.com/demos/software/html/capdm/finance/blackscholes/usage.html
69. http://www.cob.vt.edu/finance/Faculty/dmc/Courses/TCHnotes/tn97-12.pdf
70. http://www.ingber.com/markets00_exp.pdf
71. http://www.glennshafer.com/courses/downloads/pflec5.pdf
72. http://www.sceaonline.net/Events%20and%20Conferences/Conference%202000/Warr_Pricing-Marston.pdf
73. http://www.maa.org/devlin/devlin_11_97.html
74. http://www.fmv.com/Article_BlackScholes.htm
75. http://econpapers.hhs.se/paper/wpawuwpfi/0207008.htm
76. http://pluto.huji.ac.il/~efr/3/3_3bermin.pdf
77. http://www.gold-eagle.com/editorials_01/pmtrader110501.html
78. http://www.capdm.com/demoapplets/blackscholes.html
79. http://www.webrisk.net/bs_source.htm
80. http://www.myoptionvalue.com/relatedlinks/vt/blackscholes.html
81. http://www.sal.hut.fi/Teaching/Mat-2.194/Johdannaiset/homework3.pdf
82. http://www.fintools.com/doc/optiontracker/OptionTrackerBlackScholes_Models.htm
83. http://www.option123.com/

Books

1. http://www.amazon.com/exec/obidos/tg/detail/-/0786310251/002-6021084-2969664?vi=glance
2. http://www.amazon.com/exec/obidos/tg/detail/-/0786310251/qid=1051630537/sr=8-1/ref=sr_8_1/002-6021084-2969664?v=glance&s=books&n=507846
3. http://www.wileycanada.com/cda/product/0,,0471436410,00.html
4. http://books.global-investor.com/books/4557.htm
5. http://mathforum.org/epigone/sci.math.num-analysis/braufoatwol
6. http://s1.amazon.com/exec/varzea/ts/exchange-glance/Y03Y5052662Y5334409/qid=1051630537/sr=1-1/002-6021084-2969664
7. http://s1.amazon.com/exec/varzea/ts/exchange-glance/Y04Y2280161Y8447649/qid=1051630537/sr=1-2/002-6021084-2969664
8. http://s1.amazon.com/exec/varzea/ts/exchange-glance/Y01Y1367239Y9250022/qid=1051630537/sr=1-3/002-6021084-2969664
9. http://www.amazon.com/exec/obidos/tg/detail/-/0471430013/qid=1051630789/sr=8-1/ref=sr_8_1/002-6021084-2969664?v=glance&s=books&n=507846

10. http://www.amazon.com/exec/obidos/tg/detail/-/047125696X/qid=1051630789/sr=8-2/ref=sr_8_2/002-6021084-2969664?v=glance&s=books&n=507846
11. http://www.amazon.com/exec/obidos/tg/detail/-/0945343086/qid=1051630789/sr=8-3/ref=sr_8_3/002-6021084-2969664?v=glance&s=books&n=507846
12. Enterprise Architecture Planning, Steven H. Spewak, Wiley-QED, ISBN: 0-471-59985-9
13. Managing Software Reuse, Wayne C. Lim, Prentice Hall, ISBN: 0-13-552373-7
14. Framing Software Reuse, Paul G. Bassett, Yourdan Press Computing Series, ISBN: 0-13-327859-X
15. Confessions of a Used Program Salesman, Will Tranz, Addison-Wesley, ISBN: 0-201-633-69-8
16. The Capabilities Maturity Model. Carnegie Mellon University, Software Engineering Institute, ISBN: 0-201-54664-7
17. Software Reuse, Ivar Jacobson, Martin Griss, Patrik Jonsson, Addison-Wesley, ISBN: 0-201-92476-5
18. Object Oriented Metrics, Brian Henderson-Sellers, Prentice Hall, ISBN: 0-13-239872-9
19. Object Oriented Software Metrics, Mark Lorenz, Jeff Kidd, Prentice Hall, 0-13-179292-X
20. Measuring Software Reuse, Jeffrey S. Poulin, Addison-Wesley, ISBN: 0-201-63413-9
21. Domain Analysis and Software Systems Modeling, Ruben Prieto-diaz, Guillermo Arango, IEEE Computer Society Press (*Currently out of print*), ISBN: 0-8186-8996-X
22. The Art of Systems Engineering, Eberhardt Rechtin, Mark W. Maier, CRC, ISBN: 0-8493-7836-2
23. ISO 9000 Malcolm Baldridge and the SEI CMM for Software, Michael O. Tingey, Prentice Hall, ISBN: 0-13-376260-2
24. The Unified Software Development Process, Ivar Jacobson, Grady Booch, James Rumbaugh, Addison-Wesley, ISBN: 0-201-57169-2
25. Building Enterprise Information Architectures, Melissa A. Cook, Prentice Hall, ISBN: 0-13-440256-1
26. Component Software, Clemens Szyperski, Addison-Wesley, ISBN: 0-201-17888-5