Business Value of Information Technology: An Applied Framework to Assess the Business Value of IT and Maximize the Impact of IT Strategy

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Abstract

Information Technology (IT) is a major enabler of business, yet the most questioned of investments. Time and again, the question asked by senior executives is: What is the business value of IT to our firm? This question is coming in from all directions and bringing to bear enormous pressure on the CIO role. More challenging is the expectation that the business value of IT projects be converted to cash flows, albeit for the sake of easy comparability among projects.

The crux of the issue facing organizations with regard to assessing IT projects derives from the fact that there is now wide variety in the nature of such projects and consequently great differences in the nature and measurability of project benefits. Many organizations would like to reduce all benefits from all IT projects to a comparable financial metric, such as NPV based on investment and cash flows returns. While calculating the dollar value of IT projects may not be realistic, anything that helps managers to get a "sense" of, or better judge, the value of IT projects is money on the table.

The approach to the thesis is to find a methodology to valuate IT projects. The solution that is recommended is a framework that is accompanied by a survey. The survey probes the business project manager and IT project manager of each project to asses the extent of benefits and risks that impact the objectives of both business management and IT management. It also probes the business unit manager to assess the importance each of these benefits and risks to the business strategy of the business unit. Based on the responses of the business unit manager, business project manager, and IT project manager, the survey assigns weights to the benefits, risks, and the responses, and then computes an Expected Business Value score and an Expected Technical Value score for each project.

- *Keywords: Information Technology (IT), Business Value Assessment, Benefits Assessment, Strategy*

Thesis Supervisor: Dr. Cyrus Gibson
Title: Senior Lecturer, Management Science

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I dedicate this thesis to my mother, Sarojini, my father, Venkateswarlu, and my wife, Pramila.

My mother, for her tireless self-sacrifice and patient dedication towards my education. Without her sacrifices, I would never have been inspired to set lofty goals and strive to achieve them. If my mother had stopped and questioned, even for one moment, the remote IRR or the negative NPV of her efforts, none of this would ever be possible! The value of her sacrifice can never be assessed.

My father, for providing the rock-hard, yet invisible, foundation. Upon which everything else rests. He made sure I had the strong foundation to not only build a robust life and career, but also to grow and evolve it over time. He instilled in me a sense for cost/benefit analysis right from my childhood. Indeed, there is *no* substitute for common sense – basic human judgment.

My wife, for putting on hold one year of her life. For looking at uncertainty, discomfort, loneliness, and grass-roots level change squarely in the eye and boldly promising me full support. Without her unending moral and emotional support, I would not be able to attend the MOT program. The alignment of her interests with my goals is impeccable.

I would like to express my deep gratitude to my advisor, Dr. Cyrus Gibson, for his sound, valuable, and timely advice, patience, commitment, support, and flexibility.

Finally, I would like to thank my twin-brother, who has been with me day and night, watching over my shoulders, gently reminding me "*You have lost, only when you have given up*"

Ravi Chivukula
Cambridge, MA
May 2003

1. Introduction

Audience

This thesis is meant for all readers who are familiar with the Information Technology (IT) industry. However, the most value is obtained by readers in the IT industry who are managers with budgetary authority and are seeking effective ways to assess the value of IT investments or projects. For the purposes of safeguarding the identity of the firm at which this thesis was field tested, the real names of the firm, projects, and all people that were involved have been omitted from this thesis.

Purpose

The purpose of this thesis is to develop a framework for the assessment of value of IT investments or projects. The framework will be a methodology/approach which can be used to assess the business value of IT investments or projects.

While calculating the dollar value of IT projects may not be realistic, anything that helps managers to get a "sense" of the value of IT projects is money on the table. This thesis proposes a framework that will capture the best practices and best thinking that is available in the area of assessment of IT value. The results of applying this framework to an IT project or set of IT projects will be in the form of scores for expected business value and expected technical value. These results could be used by the manager to "judge" the value of IT projects.

By way of example, the framework will help assess:

1. Contributions from new products enabled by IT
2. Productivity enhancing initiatives that reduce operating and IT expenses.
3. Both tangible and intangible value contribution of IT

Thesis Structure

Chapter 1 is an introduction to the issues that the IT industry is facing and the state of approaches adopted by the IT industry to resolve these issues. Chapter 2 is a review of all relevant literature that was researched for the purposes of this thesis. Chapter 3 is detailed description of the framework developed in this thesis for the valuation of IT projects. Chapter 4 is a presentation of the results of a field test of this thesis. The framework developed in this thesis is tested at a large financial services company (named FSC for the purposes of this thesis) and the

results are analyzed in this chapter. Chapter 5 is a conclusion with a wrap-up of the thesis and recommendations of how this research can be extended further.

Appendix A contains a glossary of all acronyms used in this thesis, Appendix B contains a snapshot of the survey questionnaire generated from Chapter 3, Appendix C contains the thesis proposal submitted to a financial services company for the purposes of conducting a field test, Appendix D contains the survey responses from the field test for two projects – Project 1 and Project 2, and a Bibliography.

Problems in the IT Industry

IT is a major enabler of business, yet the most questioned of investments. Time and again, the question asked by senior executives is: What is the business value of IT to our firm? This question is coming in from all directions and bringing to bear enormous pressure on the CIO role. More challenging is the expectation that the business value of IT projects be converted to cash flows, albeit for the sake of easy comparability among projects.

The crux of the issue facing organizations with regard to assessing IT projects derives from the fact that there is now wide variety in the nature of such projects and consequently great differences in the nature and measurability of project benefits. Many organizations would like to reduce all benefits from all IT projects to a comparable financial metric, such as NPV based on investment and cash flow returns. The following difficulties arise in trying to evaluate IT projects:

> *Need for critical assessment*: Given the downturn in the economy, now more than ever, most IT organizations are under severe budget limitations and must make critical choices among projects which have benefits of varying measurability. Moreover, due to the intense pressure, the projects are required to be evaluated in dollar figures. This makes the task of evaluation even more difficult.
>
> *Vast variety in projects*: Organizations face a wide spectrum in the nature of IT projects when it comes to assessing value. On one end of the spectrum is a simple project to improve the productivity of computer operators (reduction in key strokes and/or boost transaction speed). Benefits of such projects can be easily measured and converted into cash flows. On the other end of the spectrum are strategic projects like building support for XML or centralizing functionality ahead of market demand. Strategic projects are difficult to assess quantitatively in the short-term or ahead of implementation.
>
> *Inherently complex projects*: Organizations also have to deal with projects that are inherently complex to assess. A good example of such a case is a

project to replace all the monitors with LCD displays. How can one assess the value of such a project? How can one compute the value of reduction in the eye-strain of operators, boosted morale, increased motivation or loyalty?

One approach to circumvent these difficulties is for senior management to recognize that many projects require business judgment and that experienced managers can bring collective judgment to make effective investment choices. IT is too integrated into businesses to be isolatable as a variable and measure its value[1]. Active participation of line managers is required in judging the value of IT investments. This approach is easily adoptable in an economic upturn scenario or when the company is in an expansive mode. But it raises concerns and conflicts in the light of economic downturn and shrunk budgets. However, this approach still does offer a realistic alternative to the effort of finding a single comparable financial indicator for IT project scoring.

So then, in light of the above difficulties, should a firm give up on any endeavors to assess the IT value in terms of comparable cash flows? Instead, should it leave it to the collective judgment of the top managers, and deal with potential conflicts arising from independent agendas and work-place politics? It can be argued that there is a middle ground. While trying to assess the IT value in terms of cash flows is unrealistic and somewhat impossible, it is however possible and strongly recommended to obtain as much information as possible to be able to *judge* the IT value.

State of IT Management Methodology

In a survey conducted by Deloitte and Touche and published in CIO[2], it was found that lack of clear priorities is among the reason why IT executives struggle to articulate the value of IT. It was also found that half the respondents consistently understated the value of IT.

An article published in the McKinsey Quarterly[3] captures best the state of IT management practices: To determine whether an IT investment is worth the while, companies must look at its Total Value of Ownership[1], which is composed of three key strategies:

1. **A Sound Cost/Benefit Methodology:** This is a methodology to evaluate the incremental value created by IT investments.

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[1] Dempsey, J.; Dvorak, R., E.; Holen, E.; Mark, D.; and Meehan III, W., F., "A Hard and Soft Look at Information Technology Investments", *McKinsey Quarterly*, Volume 1, 1998

[2] CIO, *Achieving, Measuring and Communicating IT Value*, April 15th Issue

[3] Farrell, D.; Terwilliger, T.; and Webb, A., P., "Getting IT Spending Right This Time", *McKinsey Quarterly*, Volume 2, 2003

2. **Robust Management Processes**: Management practices that integrate IT into normal business planning. This is a strong case for IT governance.

3. **Maturity of Business Judgment:** This is a case in point for the burning need there is for business managers to take more responsibility for IT investments and decisions. This onus on line managers is necessary to make difficult tradeoffs effectively.

There seems to be agreement in the IT industry for the need for all the three strategies mentioned above for the effective management of the IT function. Firms adopt a combination of one or more of these strategies to manage the IT function. This varies by size of the firm, size of the IT budget, the industry sector of the firm and the IT orientation of the senior management.

Moreover, the three strategies are inter-related. For example, if a firm has a really robust IT management process and the managers are mature in IT decision making, there is very little need for a sound cost/benefit analysis methodology. And, a sound cost/benefit analysis methodology alone is not sufficient to hold water when it comes to effective IT investment. It is up to the senior management to make sure that there is a healthy and *sufficient* mix of all the three ingredients to effectively manage the IT investment function.

The range of approaches for IT investment valuation is wide and deep. Most of these approaches hinge on the accurate estimation of Cost, Risk and Benefits of IT projects. Firms have additional challenges of having to prioritize IT budgets in the range of $100m to $3b that constitute several business units and several thousand projects. Applying IT valuation methodologies across several business units, budgets and projects of this order becomes daunting. Non-compliance of business unit managers and their conflicting/competing interests further exacerbates the situation.

Further, market conditions dictate to what extent a particular methodology is applicable or to what extent IT investment justification is required. When the IT budget is huge enough or the market is bullish and competitors' IT budgets are skyrocketing, justification becomes secondary as firms rush to safeguard their market position if not gain new markets. On the other hand, if market is bearish or the competition is pessimistic at best and the shareholders are vigilant, then IT investment justification rapidly ascends priority.

As a result, most firms adopt a methodology that addresses the unique conditions that exist within their organizations. A brief description of the various methodologies for IT investment valuation and prioritization follows:

1. **Management by consensus**: This a process where the line managers, IT managers and senior management meet and discuss projects and the line

managers argue for or against each project. IT investments are made based on the discussion.

2. **Alignment check**: This is a high-level approach where the projects are tested for alignment with the IT strategy or the business strategy or both. Most projects that pass the alignment check are funded and the rest are either not funded or subject to other valuation techniques like Heuristic or Cost/Benefit analysis.

3. **IT Governance**: This is an indirect method of making sure that IT investments are prioritized. IT governance is defined by Weill and Woodham[4] as "specifying the decision rights and accountability framework to encourage desirable behavior in the use of IT".

4. **Heuristic**: This category could consist of various approaches, from a simple 5-point scale scoring of all projects on risk, benefits and costs to analysis of projects based on their role in business strategy, IT strategy or IT implementations. Most techniques adopted by firms fall in the realm of this category.

5. **Estimated Cost/Benefit analysis**: This is a detailed cost/benefit/risk analysis of each project. As much information as is available is considered for estimating the risk, benefits and costs of each project. These attributes could be quantified either in absolute dollar figures or weight based scores. A payoff period is assumed or computed and then a DCF model is built. Although this process comes closest to estimating the accurate value of an IT investment, it is tedious to apply to all the projects that a firm may be executing and this approach may also overlook many intangible costs and benefits thereby reducing the overall confidence level in the final result.

The purpose of this thesis is to find a methodology to valuate IT projects. The solution that is recommended is a framework that is accompanied by a survey. The survey probes the business project manager and IT project manager of each project to asses the extent of benefits and risks that impact the objectives of both business management and IT management. It also probes the business unit manager to assess the importance of each of these benefits and risks to the business strategy of the business unit. Based on the responses of the business unit manager, business project manager, and IT project manager, the survey assigns weights to the benefits, risks, and the responses, and then computes expected Business Value and Technical Value scores for each project.

The following assumptions were made for the purposes of defining the scope of this thesis as well as to add value to the IT project valuation process:

[4] Weill, P.; Woodham, R., Effective IT Governance, Research Briefing, September 2001, CISR, MIT Sloan School of Management

1) Benefits and costs that can be easily expressed in dollar figures will not be considered in the valuation of IT projects, for example: increase in revenue or income as a direct benefit of IT project, decrease in specific costs like headcount, etc. The assumption is that these figures are straightforward to compute and also would be considered in the computation of the NPV of the project, and therefore do not need special treatment. By leaving these metrics out, the framework in this thesis can focus on those benefits that are not easy to comprehend. The metrics or questions in the survey that relate to financial metrics like increased sales etc. are meant to actually address the indirect nature of contribution to benefits and costs.

2) It is also assumed that IT projects that are mandatory (either by law or by the business sector demands) get the highest priority as they are a legal requirement or an essential part of operations. Therefore, it is assumed that such projects do not need an IT valuation process and will be funded regardless of their inherent value. Therefore, the framework and hence the survey does not consider any IT projects that are of a mandatory nature.

2. Literature Review

This chapter presents the review of all the literature that was researched for the purposes of this thesis. Most of the articles/books that were researched addressed the topic of business value assessment of IT investments. Such articles are reviewed in detail. The remaining articles are reviewed in brief, as they do not have a bearing on the methodology adopted in this thesis to assess the value of IT investments.

1) Six IT Decisions Your IT People Shouldn't Make[5]

This article is describes a set of business decisions related to IT management that are not supposed to be delegated to the IT management but instead should be handled by the business management.

Author's relevant point

The six business decisions that are not supposed to be delegated to the IT management are:

1) How much should we spend on IT
2) Which Business/Process should receive our IT dollars
3) Which IT capabilities should be firm-wide
4) How good do our IT Services need to be
5) What security and privacy risks will we accept
6) Whom do we blame if an IT initiative fails

Implications and Commentary

The implication of this article is that decision making power should be transferred to the business manager but points out that most business managers are not capable of the same.

The IT manager, who actually understands IT and its capabilities and can add business value to the firm, is undermined by the intent of this article. There are better ways to leverage the capabilities of the IT manager.

This can be treated as a governance issue and the decision making powers can be equally shared between the IT manager and business manager.

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[5] Ross, J., W.; and Weill, P., "Six IT Decisions Your IT People Shouldn't Make", *HBR OnPoint*, Product Number 2160

2) Now That the Dust Has Settled, a Clear View of the Terrain[6]

This article is a summary of Index and Hammer's Benefits/Beneficiary Matrix framework. This article introduces a simple tool to assess the position of any IT application on the business value chain.

Author's relevant point

The author's relevant point is the 9-cell matrix indicating the various stages of the business value chain. By using the following grid, an IT application/project can be analyzed in how many areas does it yield benefit and at what level of the firm.

Beneficiary / Benefit	**Individual**	**Functional Unit**	**Firm-level**
Efficiency	Task Mechanization	Process Automation	Boundary Extension
Effectiveness	Work Improvement	Functional Enhancement	Service Enhancement
Transformation	**Role Expansion**	**Functional Redefinition**	Product Innovation

Figure 2.1 Source[6]: Gibson and Hammer

Implications and Commentary

The implications are profound in that having applied this matrix to an IT project one can easily visualize the value yielded by it.

Efficiency: Any project that improves the efficiency of an *existing* operation/function can be categorized as Efficiency. Projects in this category yield direct benefits in the form of reduction in man-hours required to do a specific job. To measure the value of such projects, it is best to identify the cost savings (reduction in man-hours required) and build cash-flows from the cost savings streams. Consider the airline crew scheduling problem as a LOB in an airline company. Moving from a paper-based scheduling system to a computer based scheduling system could be categorized as an Efficiency project. Direct benefits can be computed as the reduction in the time required to schedule crew for a given flight season.

[6] Gibson, C.; and Hammer, M., "Now That the Dust Has Settled, A Clear View of the Terrain", *Indications*, July 1985

Effectiveness: Projects are considered to be effective when they not only result in efficiencies but also better results. 'Better' is subjective to the nature of the business and the IT application in question. For example, extending the airline example, an IT project could improve the automated crew scheduling system. The improvement could be in the form of operating a flight plan with lesser crew (reduction in man-hours) than before. Or schedule existing crew in a more optimal way so as to reduce average time-away-from-base or yield other similar benefits pertaining to airline industry. Such benefits are intangible and are complex to convert to cash flows.

Transformation: Projects are considered transformational when they fundamentally alter the business processes. Again extending the airline example, the crew schedule generated can be used to allow the crew to choose (by bidding or by seniority) a particular schedule to fulfill their professional or personal agenda – thereby yielding a host of benefits ranging from better-trained pilots to more loyal stewards.

3) IT Portfolio: Leveraging the New Infrastructure[7]

The IT portfolio is a framework to manage the IT investments to balance and optimize risk and returns, just like money managers manage financial portfolios to balance and optimize risk and return. This framework follows the concept of Modern Portfolio Theory which states that there is always a portfolio that will yield maximum returns for a given risk.

Author's relevant point

The projects in an IT portfolio are made of four categories. A brief description follows. Refer to Figure 2.2 for more details:

1. Infrastructure: Projects that provide reliable shared services throughout the firm and coordinated centrally, usually by the IT/IS group. *Example*: Email, Internet, Common Database.

2. Transactional: Projects that provide automation of the basic, repetitive transactions of the firm. *Example*: Inventory control and Order processing.

3. Informational: Projects that provide information for managing and controlling the firm. *Example*: Decision Support tools, Planning and What-If-Analysis tools, etc.

[7] Weill, P; and Broadbent, M., "Leveraging the New Infrastructure: How Market Leaders Capitalize on Information Technology", HBS Press, 1998, Pages 38, 52, 64, and 74

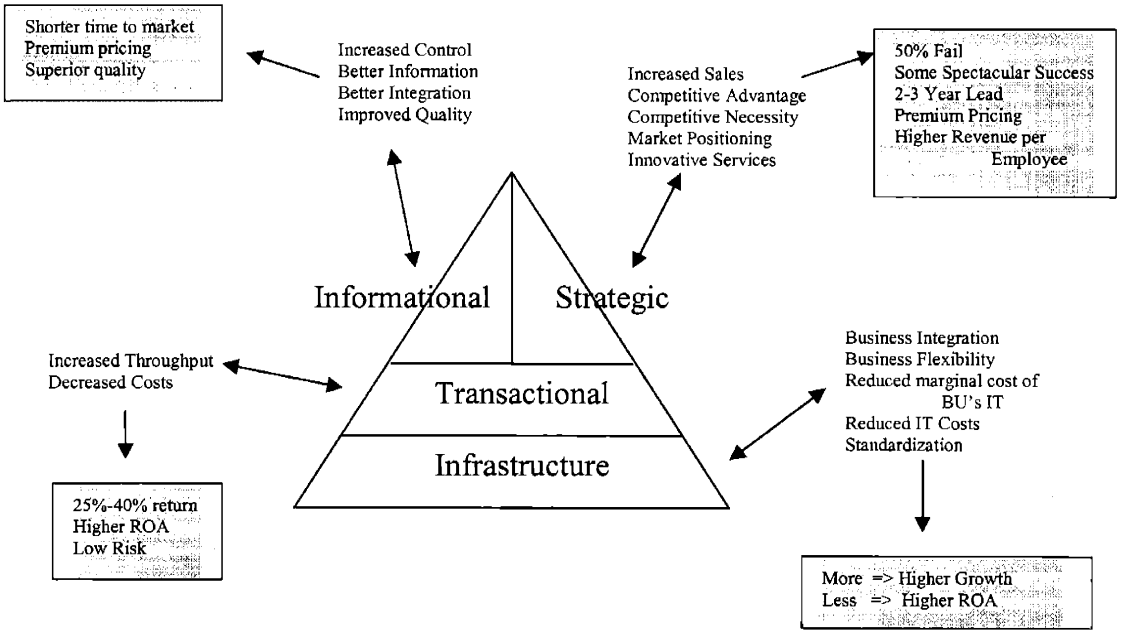

Figure 2.2

Source: *Leveraging the New Infrastructure*, Weill & Broadbent

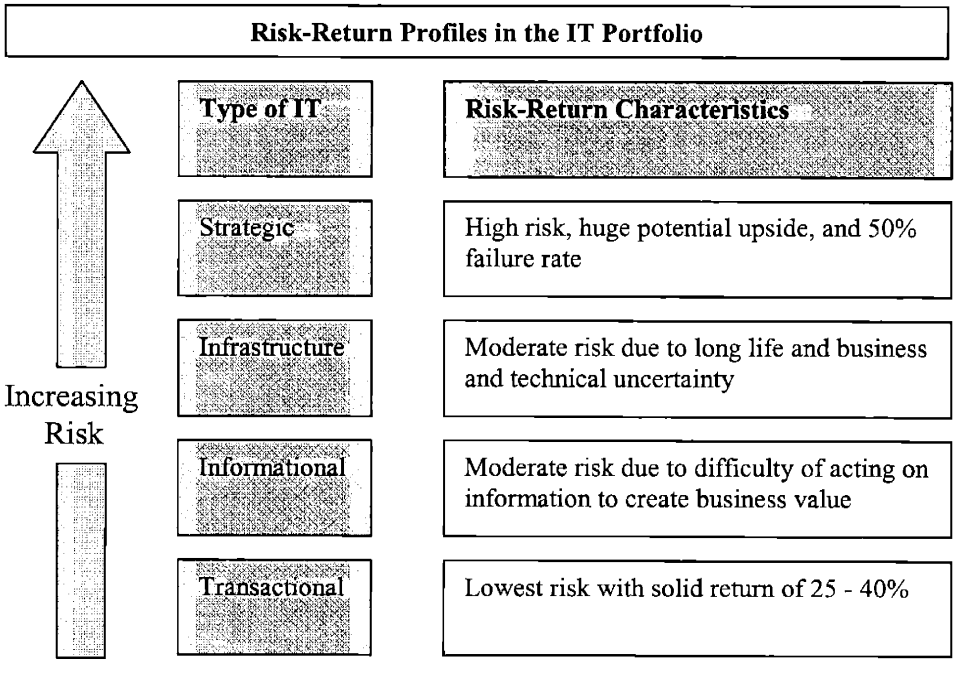

Figure 2.3

Source: *Leveraging the New Infrastructure*, Weill & Broadbent

4. Strategic: These projects are experimental in nature whose goal is to provide competitive advantage or to position the firm strategically in the marketplace. The expected benefit is increasing market share, sales or margins. *Example*: Finance company providing 24x7 services for instant credit-approval.

The IT portfolio framework is a powerful tool to analyze the IT budget. This tool is handy to quickly arrive at the big picture especially when the IT budget is large, and/or the firm has multiple business units with numerous products/projects.

2) Risk Analysis

The risk level grows with each category as shown in Figure 2.3, with the highest risk associated with Strategic category and lowest risk associated with Transactional category.

3) IT Portfolio And Business Strategy

Weill and Broadbent have studied more than 147 firms the results of which have been published in *Leveraging the New Infrastructure*[8]. This study has been updated in a working paper in 2003[9]. The study typified 3 basic business strategies that the firms adopted. The following are the 3 strategies:

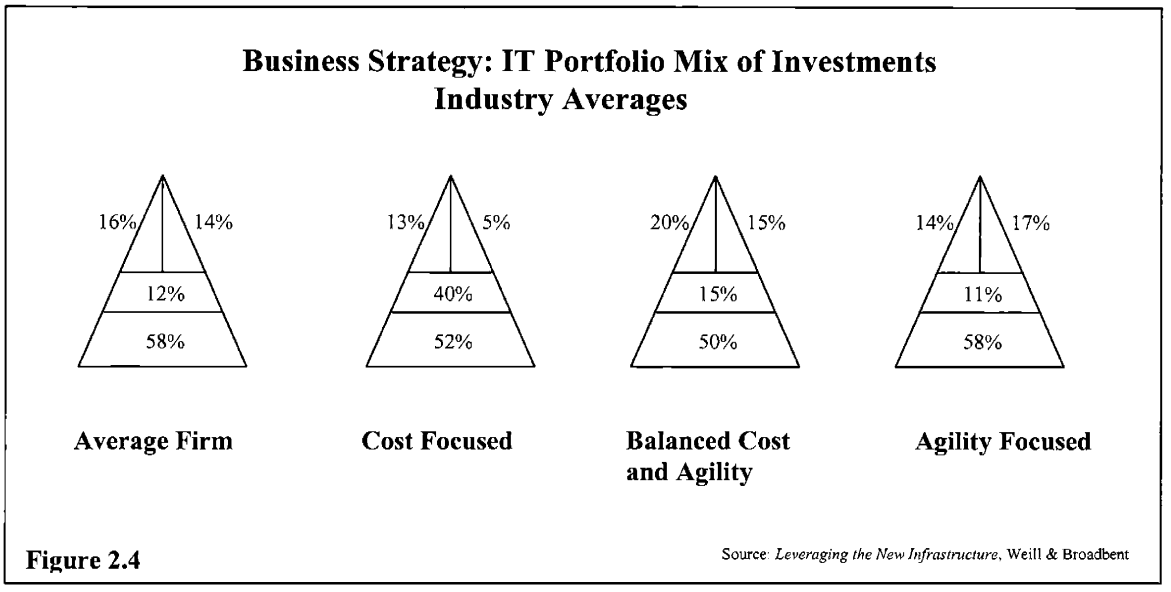

Figure 2.4

Source: *Leveraging the New Infrastructure*, Weill & Broadbent

[8] Weill, P; and Broadbent, M., "Leveraging the New Infrastructure: How Market Leaders Capitalize on Information Technology", HBS Press, 1998

[9] Weill, P.; Aral, S., "Managing the IT Portfolio", *Research Briefing*, Center for Information Systems Research, MIT Sloan School Of Management

1) Cost focused: Firms gaining competitive advantage by lowering costs. These firms invest substantially in Infrastructure and heavily in Transactional systems to get the cost of operation down. Wal-Mart investing in supply chain systems is a good example.

2) Balanced Agility and Cost: Firms trying to balance between lower costs and growing agility (increased market share, new markets and improved margins). These firms invest substantially in Infrastructure and balance their investments in the remaining three categories. Most firms fall in this category.

3) Agility Focused: Firms focusing solely on growing agility (increased market share, new markets and improved margins). These firms invest substantially in Infrastructure and among the remaining 3 categories, they invest more in Strategic. Amazon.com investing in an artificial intelligence system to cater to the unique needs of their customers is a good example.

The study also revealed typical IT portfolios of firms embracing each of these business strategies and is presented in Figure 2.4. This data is the average among the 147 firms researched by the authors.

4) IT Portfolio Investment in the Finance Sector

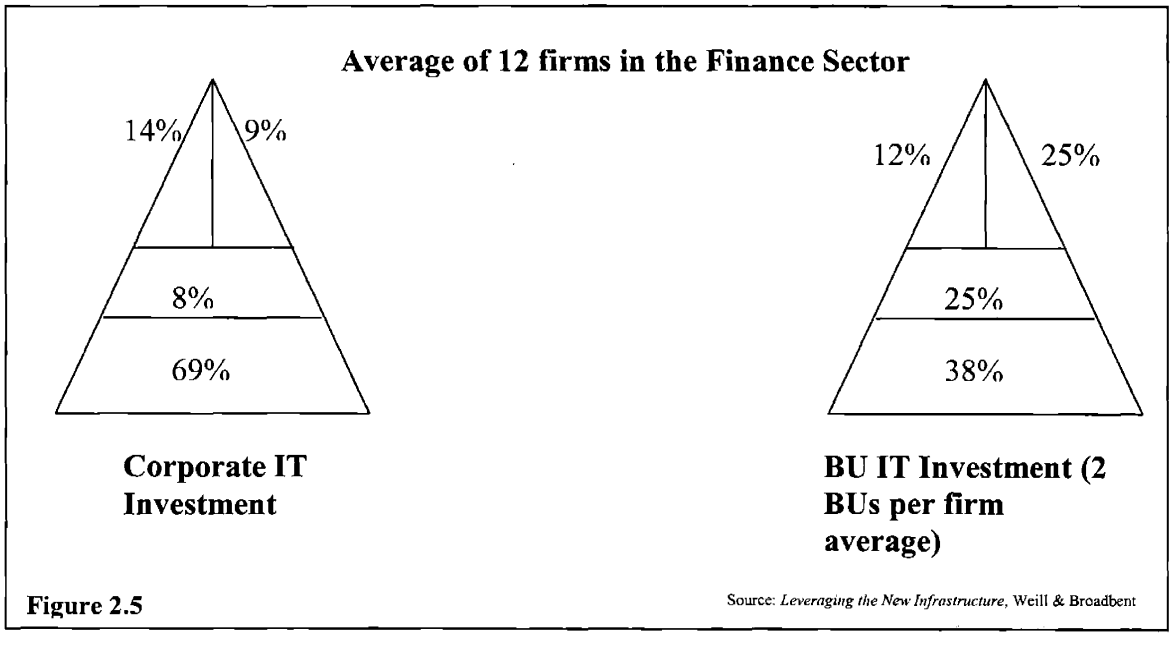

Figure 2.5

Source: *Leveraging the New Infrastructure*, Weill & Broadbent

This is a continuation of the application of the IT portfolio framework. Among the 147 firms that Weill and Broadbent researched, 12 are in the finance sector. Figure 2.5 presents the average IT portfolio among these 12 firms for the following categories:

a) The investment mixes of firm wide corporate IT investment in the finance sector
b) The average investment mix at the business unit level of 12 finance firms. On the average, each firm had 2 business units.

Implications and Commentary

The IT portfolio framework is a powerful tool to analyze the IT budget. This tool is handy to quickly arrive at the big picture especially when the budget is large and/or the firm has multiple business units with numerous products/projects.

4) Impacts and Benefits of IT: Leveraging the New Infrastructure[10]

This is a review of related frameworks from Weill and Broadbent[10] that help to assess the impact and benefits of IT projects. These frameworks describe what types of benefits are yielded by IT projects and at what level of the firm. These frameworks also present sample measures and measurement techniques for benefits of IT projects. Finally a Health-check scorecard is presented that helps to visualize the general health of existing IT projects.

Author's relevant point

4 Levels of IT Impact

This framework illustrates 4 hierarchical levels of tangible IT impact and associated business value measures and IT impact dilution. Refer to Figure 2.6.

The highest impact of any project occurs at the lowest level – Infrastructure (example: increase in uptime) Then the impact trickles down (up) the business unit- or firm-level IT (example: time and cost to implement the new applications), then business unit- or firm-level operations (example: new product sales) and

[10] Weill, P; and Broadbent, M., "Leveraging the New Infrastructure: How Market Leaders Capitalize on Information Technology", HBS Press, 1998, Pages 50,208,211-220, 224

finally business unit- or firm-level Financial (example: ROI and other financial benefits).

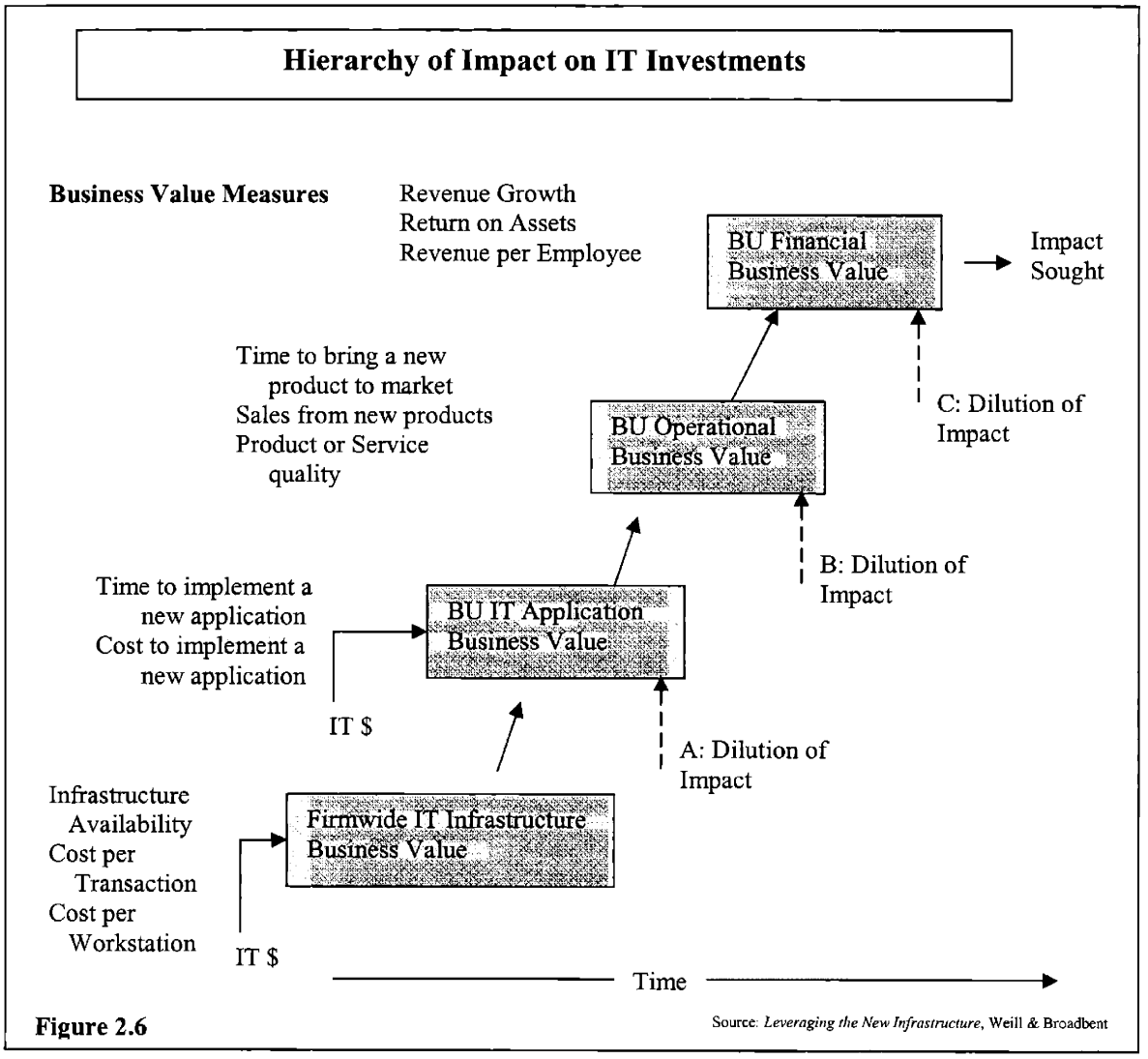

Figure 2.6

From figure 2.6 it can be seen that higher the level of impact, the more lagging the benefit, i.e. the time a benefit takes to manifest itself after the investment. Therefore, the effect of an IT investment could be felt almost immediately at the Infrastructure level while it may take quite a while to manifest at the business unit- or firm-level Financial.

Investments are made at the bottom two levels and performance is measured at all the four levels. As the benefit moves up the hierarchy, it gets diluted by various influencing factors (illustrated by points A, B, and C) like competitor moves, pricing decisions etc. It is easiest to measure performance at the lowest levels and becomes more difficult as one goes up the hierarchy. The complete

payoff picture is built by carefully considering all the benefits and dilution at each level.

The utility of this framework becomes apparent when one tries to enumerate all the possible benefits of an IT project. This framework is a tool to clarify the complexity of benefits assessment.

Approaches to IT Appraisal

Weill and Broadbent lay out the best practices for appraising the benefits of IT projects. The techniques suggested are classified by the size of the IT project and the IT portfolio category of the project i.e. Strategic, Informational, or Transactional. Please refer to figure 2.7.

Any project that is categorized as Transactional lends itself for DCF analysis as most benefits, if not all, are measurable benefits. Informational projects on the other hand yield a mixture of measurable and estimated benefits, while it is difficult to even estimate what types of benefits that the Strategic projects yield.

	IT Appraisal	Type Of Information Technology Project		
Size		**Strategic**	**Informational**	**Transactional**
	Large	**Strategy Driven and Pilot** Appraisal based on informed subjective analysis; pilots reduce risk of these high risk-high return investments with few certain benefits but much potential	**DCF Value Analysis** Structured Technique combining both certain and estimated benefits	**DCF** Positive NPVs based on cash flows using only certain benefits
	Small	**Strategy Driven** Small strategic investing requires seed-funding	**Rules of Thumb** Appraise once in detail and set heuristics to apply across the firm	**DCF** Positive NPVs based on cash flows using only certain benefits

Figure 2.7 Source: *Leveraging the New Infrastructure*, Weill & Broadbent

IT Health Grid

This framework is a tool for comparing and evaluating projects in an IT portfolio on 4 different dimensions or attributes:

1. Business value: This attribute reflects actual strategic business value already delivered by the project. This is a 5-point scale.

2. Technical quality: This attribute reflects the technical quality of the system like data accuracy, reliability, technical support, response times, uptimes, and maturity of development process. This is a 5-point scale.

3. Importance to the firm: This attribute implies the system's potential to generate value. This is a 5-grade scale, illustrated in figure 2.8

4. Size of the project: This is simply the budget for the project

5. Business function supported: This is simply the business function or operation that the application supports, like Sales forecasting, payroll etc.

Please refer to Figure 2.8. By plotting all the projects of an IT portfolio on this grid, one can get rich insights into the state of the health of the IT portfolio.

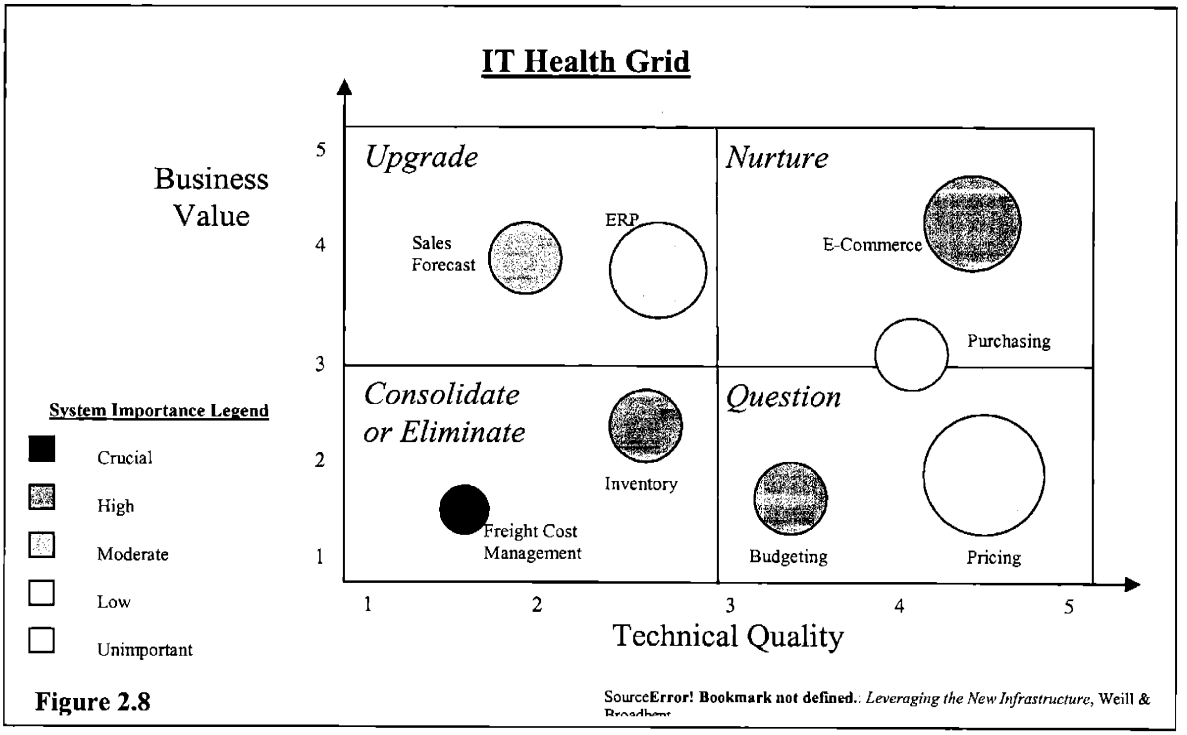

Figure 2.8

Source**Error! Bookmark not defined.**. *Leveraging the New Infrastructure*, Weill & Broadbent

Implications and Commentary

The implications are somewhat direct. These frameworks can be used to assess the benefits of IT projects in the following manner:

1) For each IT project identify what benefits can be expected at each level (i.e. Infrastructure, business unit IT, business unit Operations or business unit Financial)

2) Then, for each IT project, assign a 2-part score that will place it on the Health-check grid – revealing the overall health of the IT portfolio as well as indicating the future action to be taken against each project.

5) Reach and Range: Leveraging the New Infrastructure[11]

Author's Relevant Point

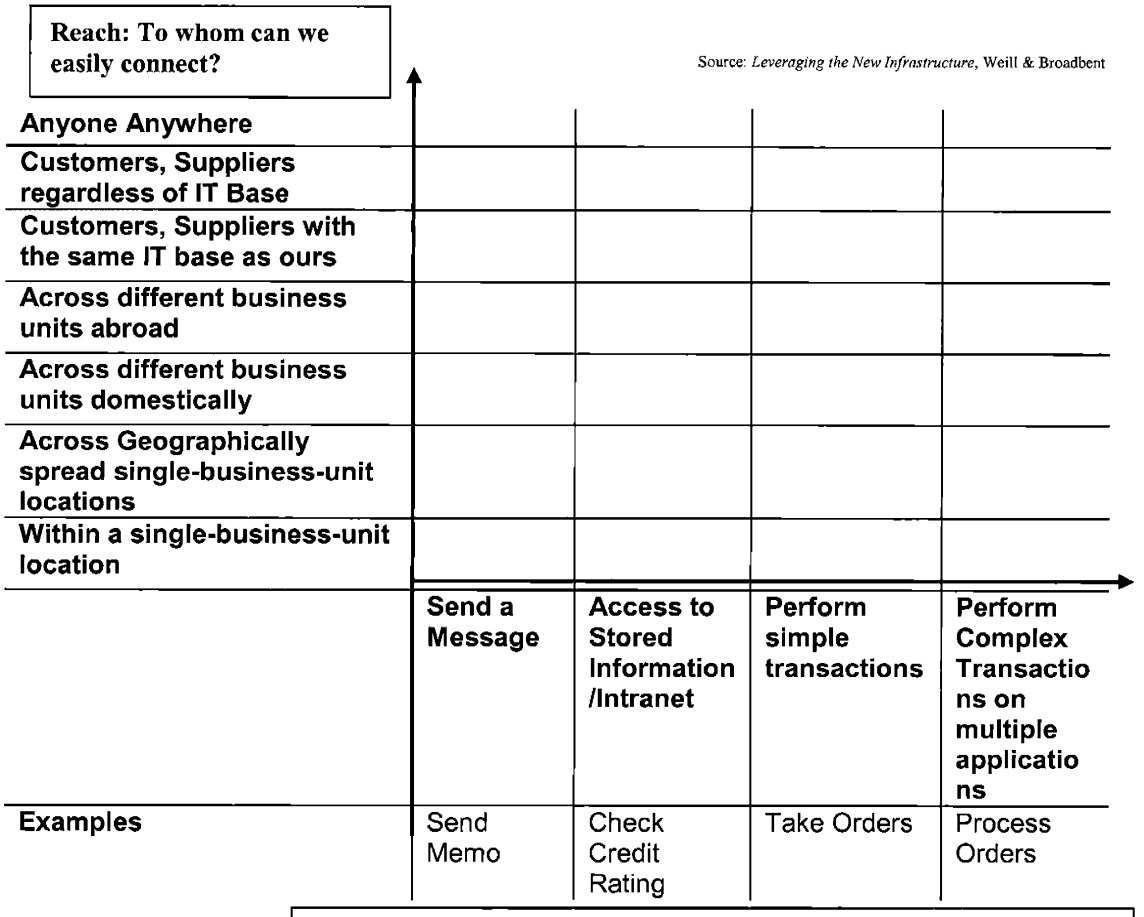

Figure 2.9

[11] Weill, P; and Broadbent, M., "Leveraging the New Infrastructure: How Market Leaders Capitalize on Information Technology", HBS Press, 1998, Pages 91-93

Reach and Range:

The Reach and Range is a framework to gauge the extent of functionality in a IT portfolio. It is a 2-dimensional evaluation of the IT portfolio that reveals the range of functionality and the reach across business entities. See figure 2.9.

Implications and Commentary

This framework helps identify existing and missing firm-level IT capabilities and helps guide the direction of IT strategy.

6) IT Value Drivers: Corporate Information Strategy and Management12

Author's relevant point

The author describes that a business model consists of 3 parts:

1) A concept and a strategy
2) Resources required for exploiting opportunity and executing strategy
3) A value proposition that identifies benefits returned to all stake holders.

Figure 2.10 is a framework that illustrates the author's concept of a business model. This framework captures the performance drivers of a firm and how they contribute precisely towards various financial results.

Implications and Commentary

This framework illustrates the three main categories of financial benefits to a firm, namely:

1) Revenue Increase
2) Cost Reduction
3) Intangible Benefits

This framework also identifies the key intangible benefits, namely:

1) Employee loyalty
2) Customer Loyalty
3) Partner Loyalty
4) Investor Loyalty
5) Branding and Image: This asset generally ties into one of the above intangible assets.

[12] Applegate, L., M.; Austin, R., D.; and McFarlan, F., W., "Corporate Information Strategy and Management", McGraw Hill, 6th Edition, 2003, Page 122

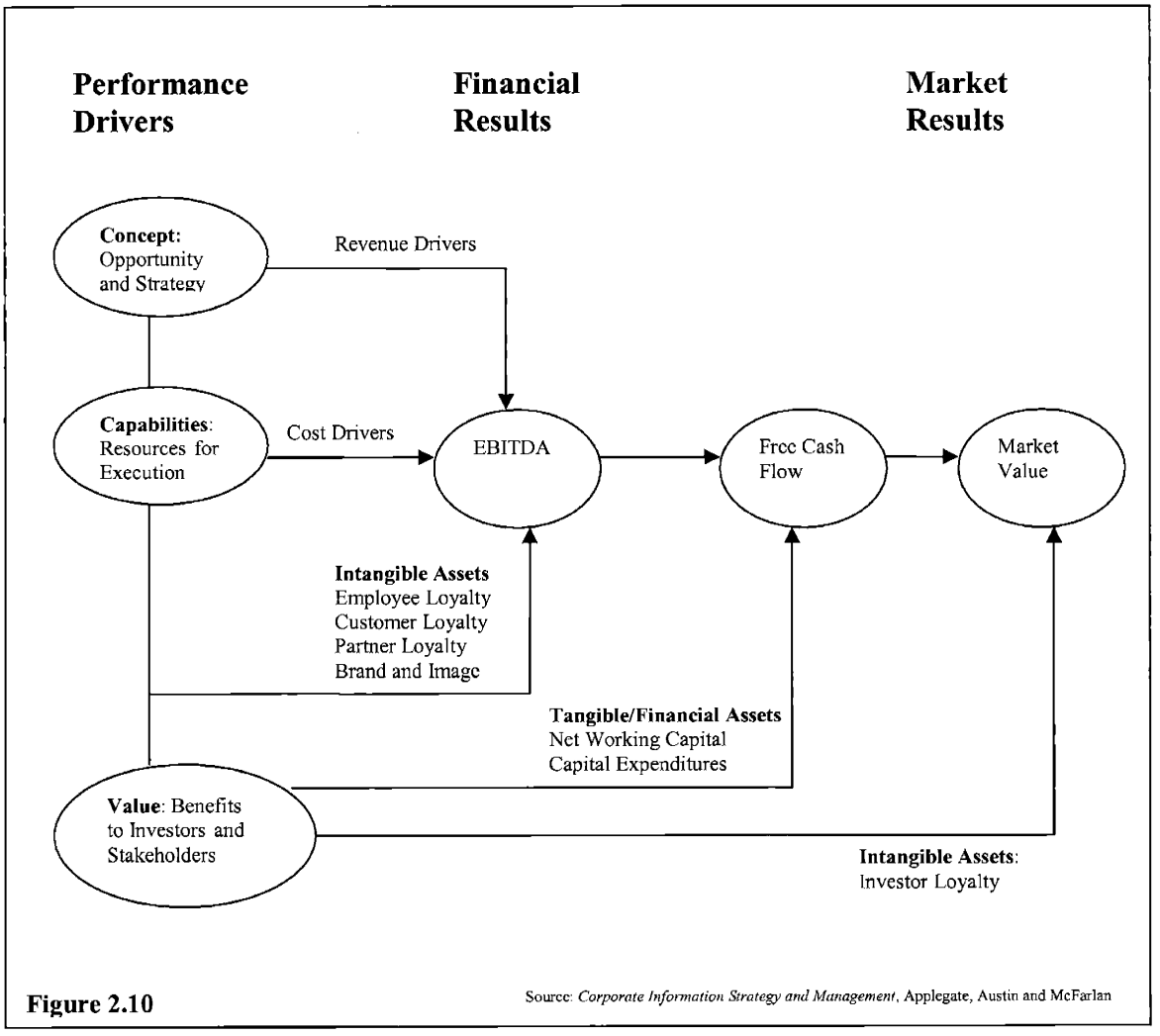

Figure 2.10 Source: *Corporate Information Strategy and Management*, Applegate, Austin and McFarlan

7) Project Risk: Corporate Information Strategy and Management[13]

This framework illustrates how to compute/estimate risk associated with an IT project. As important it is to estimate value, it is as important to understand the associated risk. The assessment of risk is important to understand the inherent success factor of the project as well as to be able to compare multiple projects with similar yields and contending for the same budget dollar.

Author's relevant point

[13] Applegate, L., M.; Austin, R., D.; and McFarlan, F., W., "Corporate Information Strategy and Management", McGraw Hill, 6th Edition, 2003, Pages 272,273

Three factors influence the inherent risk of an IT project:

1) Project Size: The bigger the project size in terms of budget dollars the more risky it is. However, the size is relative to the average IT project in the firm or relative to the annual IT budget of the firm. For example, if the average size of an IT project at a firm is $50k, then a $1m project is very risky. On the other hand, if the average project size is $1m, then a $250k project is not at all risky.

2) Experience with Technology: If the technology being used in a project is relatively new to the company, then the project is more risky and vice versa. A company with all of its systems on mainframes will face considerable risk if moving to a client/server model.

3) Project Structure: Structure of a project indicates the extent to which the requirements of the project are understood, the extent of affected parties and the extent of certainty of the outcome of the project. The more structured a project is, the less risky the project is. Projects that require little organizational changes are more likely to succeed than projects that require substantial organizational changes.

The following table illustrates the effect of these three issues on the relative risk of an IT project:

Relative Technology	**PROJECT SIZE**	**Low Structure**	**High Structure**
Low Company-Relative Technology	Large Project	Low Risk but very susceptible to Mismanagement	Low Risk
	Small Project	Very Low Risk but very susceptible to Mismanagement	Very Low Risk
High Company-Relative Technology	Large Project	Very High Risk	Medium Risk
	Small Project	High Risk	Medium-low Risk
Figure 2.11	Source: *Corporate Information Strategy and Management*, Applegate, Austin and McFarlan		

The framework also proposes a series of highly relevant questions to assess the magnitude of the risk associated with each of the three causes of risk. The

responses are in the form of High, Med, Low and have scores and weights assigned. There is an example of a firm that mandates all its IT project managers to answer about 42 questions pertaining to risk.

Implications and Commentary

This framework is extremely useful to build a risk-profile of an IT project. Assessment of the value of a project is irrelevant without the accompanying risk-coefficient. This framework fills the gap in this context.

8) Benefits Matrix: Corporate Information Strategy and Management[14]

This is a simple classification of benefits and some measures to quantify the benefits of IT projects.

Author's relevant point

Benefits from IT project are of two categories:

Internal - Internal to company
External - External to the company

Benefits from IT projects are of two types:

Type 1 - Benefits from building (investing in) IT
Type 2 - Benefits from doing business on IT infrastructure

The following grid describes the various categories of benefits and their metrics.

Type 1 : Benefits from building (investing in) IT		
Benefit	**Internal Metrics**	**External Metrics**
Functionality and Flexibility	1) Decrease cost of Internal IT 2) Increase performance of Internal IT 3) Cheaper, Faster, Less risky IT projects 4) Expand of range of IT initiatives	1) Decrease cost of online business (existing or new) 2) Increase performance of online business 3) Lower risk of online business 4) Expand reach and range of IT-enabled business

Type2 : Benefits from doing business on IT Infrastructure		
Benefit	**Internal Metrics**	**External Metrics**
Commerce	1) Improve internal process	1) Improve performance of

[14] Applegate, L., M.; Austin, R., D.; and McFarlan, F., W., "Corporate Information Strategy and Management", McGraw Hill, 6th Edition, 2003, Page 127

	performance 2) Improve work flow 3) Cheaper, better, faster internal process	supply-chain or distribution channel 2) Cost savings/avoidance for firm, customers, suppliers and partners 3) Enable new channels to market 4) Extend reach and range of existing channels
Content/Knowledge	1) Knowledge workers exceed personal performance goals 2) Increase speed and effectiveness of decision making 3) Improve response time of firm to threats and opportunities	1) By providing information to customers, suppliers and partners, enable better decision-making. 2) Price-premium for products and services for information value-add. 3) Launch new information-based products and services 4) Increase revenue per user 5) Add new revenue streams
Community	1) Length of time to fill key positions 2) Attrition rate 3) Average turnover time	1) Customer, Supplier, Partner satisfaction and lifetime value 2) Average revenue per customer 3) Level of personalization available 4) Churn rate
Figure 2.12	Source: *Corporate Information Strategy and Management*, Applegate, Austin and McFarlan	

Implications and Commentary

Type 1 benefits are the direct benefits of IT investment and Type 2 benefits are the payoff. While making an IT investment, it is recommended that both types of benefits be considered.

While it could be straight forward to quantitatively assess the benefits of type 1, it could be difficult to do the same with benefits of type 2 *before* business is done on the IT infrastructure yet to be built. This issue is best resolved by the respective manager estimating the approximate value of each metric in the type 2 category.

Generally, estimation of the value of benefits of IT (type 2) is not sufficiently accurate. By introducing various levels of granularity the overall estimation of IT value is rendered more accurate. Towards this, the framework offers categories and types of benefits to offset any error in estimation.

The Community type of benefits offer a good start to measure intangible benefits of IT projects.

9) The Strategic Grid: Corporate Information Strategy and Management[15]

The Strategic Grid helps assess the impact of IT Strategy. The grid has two dimensions. The vertical axis represents the impact of IT on core operations and the horizontal represents the impact of IT on core strategy.

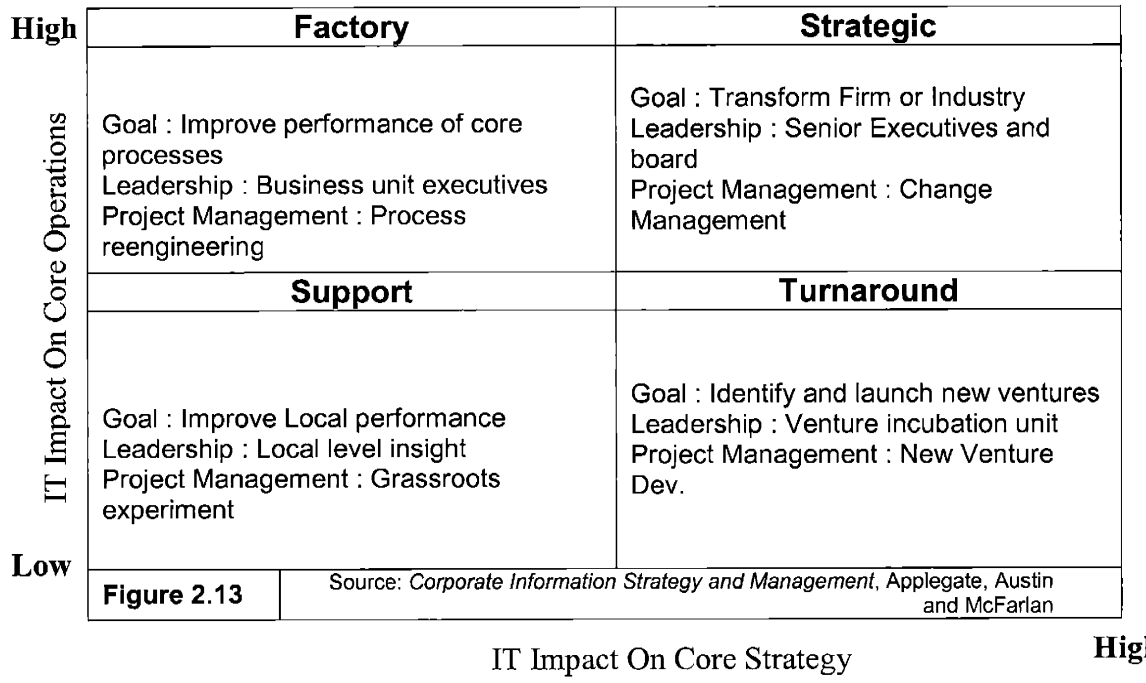

Figure 2.13 Source: *Corporate Information Strategy and Management*, Applegate, Austin and McFarlan

Author's relevant point

The author creates four categories of IT Impact – Support, Transform, Factory and Strategic. These are used to identify opportunities, define and implement IT-enabled business initiatives, and organize and manage IT assets and professionals.

Support: A firm is in the Support quadrant if IT has a very low impact on both core operations and core strategy. The IT investments are controlled by the IT executives/specialists. The goal of IT projects in this quadrant is to build basic firm-wide infrastructure.

Factory: A firm is in the Factory quadrant if IT has a high impact on core operations but low impact on core strategy. The IT investments are mostly controlled by business-unit heads in partnership with the IT executives. The goal

[15] Applegate, L., M.; Austin, R., D.; and McFarlan, F., W., "Corporate Information Strategy and Management", McGraw Hill, 6th Edition, 2003

of IT projects in this quadrant is to build cost-effective and reliable operations at the business unit level.

Turnaround: A firm is in the Turnaround quadrant if IT has a low impact on core operations but has a high impact on core strategy. The IT investments are controlled by New Business Development and Emerging Technologies group. The goal of IT projects in this quadrant is to explore emerging strategic possibilities.

Strategic: A firm is in the Strategic quadrant if IT has high impact on both core operations as well as core strategy. The IT investments in this quadrant are controlled by the top executives of the firm indicating the level of buy-in of IT. The goal of IT projects in this quadrant is to disseminate into core strategy the successful projects from the Turnaround phase.

This framework can be used to understand which quadrant a firm generally is in and to which quadrant it is trying to move to. This process gives the IT investor an idea of the general direction of the firm as well as a valuation method for IT projects.

Implications and Commentary

The strategic grid may not be appropriate for the analysis of IT portfolio since an IT portfolio could consist of IT applications that cause the firm to lie in more than one quadrant of the Strategic grid.

11) IT Value: The great divide between Qualitative and Quantitative and individual and organizational measures[16]

This is a useful article that is more of a literature review in itself. This article reviews an extensive set of literature from sources like ACM, Information Systems Research, Journal of Management Information Systems, and MIS Quarterly, all within the date range of 1993 to 1998. In addition to reviewing, this article also analyses some key concepts from select literature.

Author's Relevant Point

The articles reviewed in this paper are analyzed on topics like treatment of the IT productivity paradox, research objectives and methodologies of the literature set, use of quantitative measures versus qualitative measures, and IT-Value metrics used. Evidence is presented linking research methods used in the papers with

[16] Chan, Y., E., "IT Value: The Great Divide between Qualitative and Quantitative and Individual and Organizational Measures", *Journal of Management Information Systems*, Spring 2000

the use of quantitative and qualitative measures, and various levels of analysis used.

The exhibit of most value to the reader is a table in the Appendix that tabulates each article reviewed under the following columns:

1) Study: Reference to article.
2) Research Methods: The research methodology, is it a Case Study or Secondary data or a Survey.
3) Measures used to assess independent variables: This column presents the various measures used within the article to measure IT value.
4) Quantitative or Qualitative measures: Qualifies each measure whether it is a quantitative or a qualitative measure.
5) Financial or non-Financial: Whether the metrics used are financial or non-financial.
6) Levels of analysis: Whether the analysis was conducted at the levels of Individual, Group, Organizational, National, or International.
7) Results: This is a brief summary of the results obtained by the analysis in each of the articles. This is probably the most valuable piece of information to the reader.

Implications and Commentary

The implication of this article is very little on the thesis except that there is a list of reference articles with description and analysis and summaries. But most, if not all, articles do not address the aspect of IT project valuation on a year-by-year basis, but instead look at a higher level – the overall firm level - impact of IT over a period of more that one year.

12) Technology after the bubble[17]

This article is a best practices guide for firms in the IT sector to survive the post-bubble era. Most of the strategies recommended in this article are not relevant to the thesis except one.

Author's Relevant Point

The authors lay out the traditional input/output Productivity Levers diagram, illustrated in figure 2.14. This diagram illustrates how productivity flows along a value-chain in a firm and how it could result in various benefits. The framework builds a tree of productivity levers starting off with the basic increase in

[17] Manyika, J., M.; and Nevens, T., M., "Technology after the Bubble", *McKinsey Quarterly*, Volume 4, 2002

productivity either through reduced input for a given output or increased output for a given input.

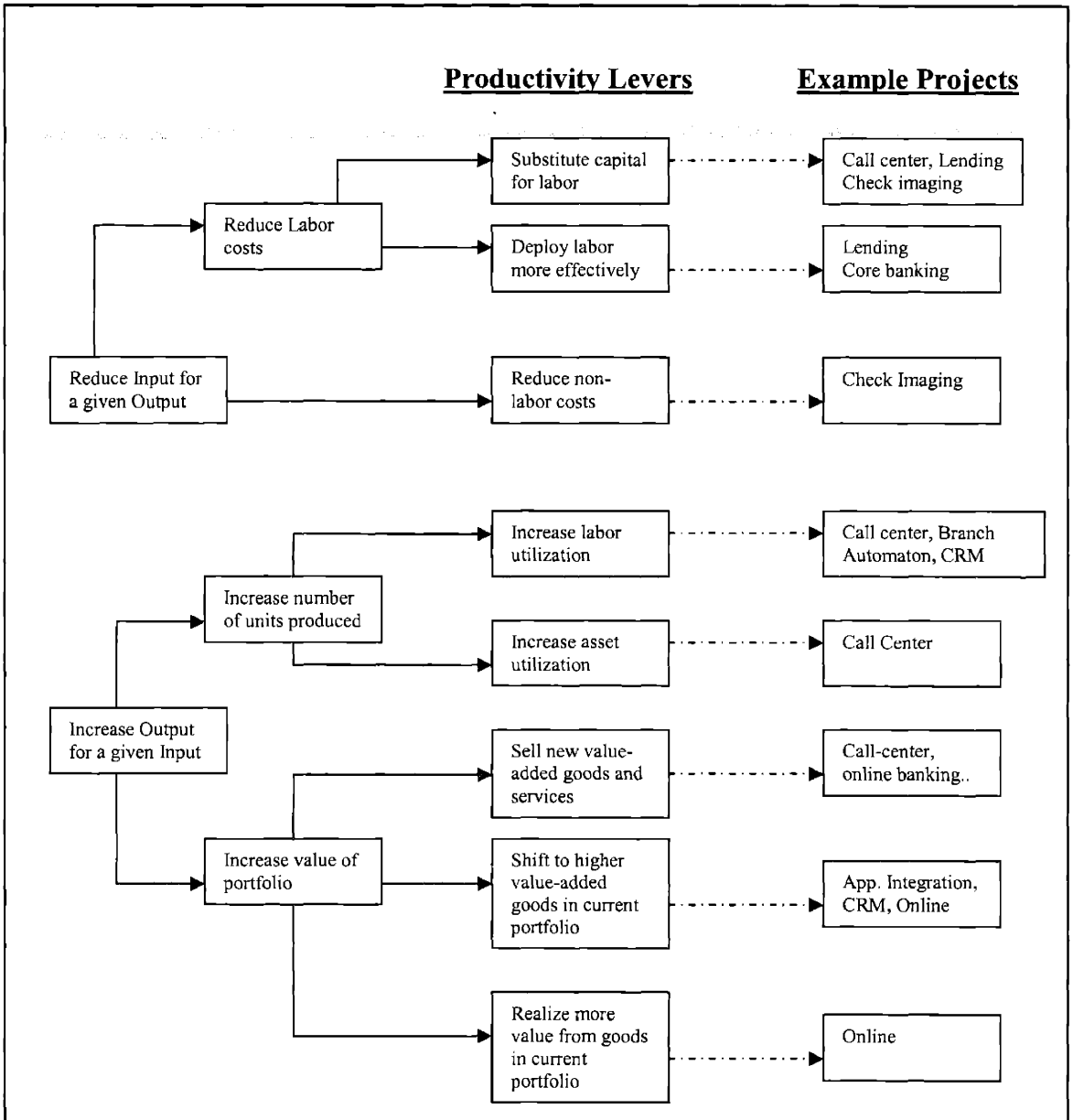

Figure 2.14 Source: *Technology after the Bubble*, McKinsey Quarterly

Implications and Commentary

This framework is a thinking aid to generate additional metrics to measure productivity benefits of IT investments. Figure 2.14 represents a simple analysis of the flow of productivity through a firm. Additionally, the article also provides sample business functions where the productivity can be leveraged, with examples from the Retail banking sector.

13) Building IT Infrastructure for Strategic Agility[18]

Strategic agility is defined by the set of business initiatives a firm can readily implement[19]. This framework represents extensive study of 89 firms conducted by Weill, Subramani, and Broadbent[18]. It depicts data collected by the authors that strongly correlates the strategic agility of a firm to IT Infrastructure capabilities. Three areas of business initiatives and 70 infrastructure service capabilities grouped into 10 clusters are identified. Figure 2.15 reveals the correlation between the IT infrastructure capabilities that a firm may possess and the business initiatives that it can readily engage in.

	Position on the Value Net						**Type of Exchange**				**Type of Innovation**			
IT Capability Cluster	Supply		Internal		Demand		B2B		B2C		Products		New Markets	
	Firm	BU	Firm	BU	Firm	BU	Firm	BU	Firm	BU	Firm	BU	Firm	BU
Channel Management				✓		✓						✓		
Security and Risk Management					✓			✓	✓				✓	
Communications		✓		✓										
Data Management		✓		✓	✓				✓					
Application Infrastructure		✓		✓				✓						
IT Facilities Management					✓			✓	✓				✓	
IT Management		✓		✓				✓	✓					
IT Architecture & Standards	✓		✓		✓									
IT Education											✓			
IT R&D						✓	✓			✓		✓		
Figure 2.15	Source : *Building IT Infrastructure for Strategic Ability,* Weill; Subramani; Broadbent													

Author's Relevant Point

Classifying IT Infrastructure Services

[18] Weill, P.; Subramani, M.; and Broadbent, M., "Building IT Infrastructure for Strategic Agility", *MIT Sloan Management Review*, Fall 2002

[19] Prahalad, C., K.; and Krishnan, M., S., "The Dynamic Synchronization of Strategy and Information Technology", *MIT Sloan Management Review*, Summer 2002

Cluster 1: Channel management – Firms link to customers, suppliers and business partners through electronic channels. These can be a combination of email, web-sites, EDI interfaces, extranets or VPN. Most firms maintain multiple channels that are not integrated. A typical example is a travel agent booking not showing up on the airline reservation system. How well these channels are integrated and managed reflect how well the firm's services can be differentiated.

Cluster 2: Security and risk-management – Security and risk-management services provide digital protection for data and systems through firewalls; policies for remote access, encryption, password protection; and disaster planning and recovery. These services protect a firm's brand, reputation, data, equipment and revenue streams.

Cluster 3: Communications – Services that support electronic interactions between any two entities. These include networks, gateways, and supporting software and hardware.

Cluster 4: Data management – Data is a key asset in the new economy. This includes data representing information about customers, products, partners, suppliers, employees etc. Managing data assets independently of applications and making it available to the whole enterprise in a coherent way so as to enable new products or new markets is a challenge all firms face. Large storage area networks, knowledge management applications, data warehouses, and web services for decentralized databases are examples of data management services.

Cluster 5: Application infrastructure services – These are the infrastructure that are standard across the enterprise and support areas like accounting, human resources, payroll, etc. The aim to optimize these resources is reduce costs, increase reliability, enable standardization and encourage the integrated operation of multiple business units.

Cluster 6: IT facilities management services – This set of services represents the physical infrastructure like servers, large-scale processing systems, and laboratory facilities for special purposes like network isolation, high-performance testing etc.

Cluster 7: IT management services – These services co-ordinate the integrated infrastructure and manage its relationships with the business units. Typically these services include information-systems planning, project management, service-level agreements, and negotiations with vendors.

Cluster 8: IT architecture and standards services – This cluster comprises the core policies that govern the use of IT and that determine how future business will be done. This cluster needs constant review to meet strategic needs.

Cluster 9: IT education services – IT education and training, neglected in most firms, is the key to leveraging the IT investments. IT is only as good as it is used. As such, training has to be imparted in the use of enterprise-specific technologies and managers have to be trained about how to envision, invest in and use IT to create business value. The study conducted by Weill, Broadbent and Goh[20] has found that firms that spent higher percentage of their budget than industry average on IT training had lower total IT costs per workstation and enjoyed superior business-process performance.

Cluster 10: IT R&D Services – These services represents the firm's search for new ways to use IT to create business value. These services are typically industry or firm-specific.

Classifying Strategic Initiatives

Position on the Value Net – The idea of a conventional Value Chain is extended to the new economy to create the idea of a Value Net[21] where IT has created a richly interconnected system having lowered transaction and sourcing costs. This model causes the IT initiatives to fall into 3 overlapping categories (an initiative can fall into 1, 2, or all 3 categories), namely:

1. Demand-side initiatives - Example: A manufacturer or distributor monitoring the retail sales to reduce lead time and inventory.
2. Supply-side initiatives – Example: FDA's website for submission of clinical trials results of drugs under discovery.
3. Internally-focused links – Example: Cisco's intranet for paperless operations.

The Type of Exchange B2B or B2C – This initiative refers simply to the channel initiatives. The channels could be for either business customers (B2B) or for consuming customers (B2C). The factors governing B2B channels are limited small customer set with regular transactions, large transaction volumes per customer, periodic consolidated payments. In contrast, the factors governing the B2C channels are large numbers of individual customers with intermittent transactions, lower dollar values per transaction, and online electronics payments linked to each transaction.

Type of Innovation: For Products or Markets – Is the business initiative for creating new products or for creating new markets?

Implications and Commentary

This framework is an alignment tool and can be useful for the following reasons:

[20] Weill, P.; Broadbent, M.; and Goh, A., "Client Infrastructure Services: A Study of the Management Value of PC and LAN Infrastructure", Research report, Center for Management of IT, University of Melbourne Business School, Melbourne, Australia, October 1997

[21] Brandenberger, A.M.; Nalebuff, B.J., "Co-opetition", New York, Doubleday, 1997

1. To identify where a firm is positioned with respect to IT infrastructure and business initiatives and capabilities. i.e. what are its strengths and weaknesses

2. To identify what infrastructure capabilities does a firm need to acquire in order to build capabilities for future business initiatives

14) The Dynamic Synchronization of Strategy and IT[22]

This framework is an alignment tool as well as an aid for discussion between business and IT managers. It specifies 7 questions to be asked of each IT project. The answers to the questions for each IT project should be documented in a table and will set the stage for interaction between the IT team and the business team.

Author's Relevant Point

A brief description of the questions and the possible answers are as follows:

1. The application's role in strategy: For each application in the portfolio, the business managers need to determine whether the business processes encompassed in that IT project are core to business strategy or not.

2. The application's Evolving v/s Stable knowledge: Do the business processes that are encompassed in that project belong to a stable business domain or an evolving business domain? Knowledge about how the business process operates in a stable domain is clear and available whereas if the domain is evolving, then the knowledge is embryonic, and therefore the risk is high.

3. Degree of Change implemented/required in the application: This is an indication of how much the project has been adapted to changing business functionality and quality-related issues. This is an important measure of how the IT infrastructure reflects and influences business strategy.

4. The application's sourcing information: This captures the sourcing information of the application. This information reveals the capability constraints and risks involved in a firm's quest for rapid development and external expertise. If applications are sourced from 3rd party vendors with off-the-shelf products, the firm has to be cognizant of the sustainability of the vendor as well as the inter-operability, flexibility and scalability of the application. On the other hand, if the application is outsourced, the issues

[22] Prahalad, C., K.; and Krishnan, M., S., "The Dynamic Synchronization of Strategy and Information Technology", *MIT Sloan Management Review*, Summer 2002

to contend with are lack of in-house expertise, loss of control over core operations, partner lock-in, etc.

5. The data's relative public or proprietary nature: This question reveals the sensitive nature of the data, if any, thereby signaling that caution is required.

6. The application's Freedom From Conformance-Defects: This is the extent to which the application conforms to the requirements without defects.

7. The Application's budget: The application's budget indicates the size of the project and what is at stake.

Implications and Commentary

This framework resolves to a survey with 7 questions, but one that asks very important questions and probes effectively. The answers to these questions will form the basis for rich discussion among the business and IT managers. These questions will be incorporated in this thesis, although some of the questions have an overlap with other questions in the survey.

15) Considering Social Subsystem Costs and Benefits in IT Investment Decisions[23]

This is a Cost/Benefit framework. It highlights social subsystem costs and benefits of IT investing. Social subsystem means human-related or employee related. This article is primarily a survey of 50 IT executives from a broad variety of industries who were interviewed to gain insight into what, when and how often social subsystem considerations are included in IT investment-decision processes.

Author's Relevant Point

According to the authors, the Socio-Technical Systems Theory states that "Organizations will maximize impact only if the interdependence between social and technological systems is recognized". This is a case in point that all intangible benefits ought to be considered.

In the study, the authors list various intangible benefits and costs. The categories most relevant to the thesis are listed below:

Social Subsystem Benefits:

[23] Ryan, S., D.; and Harrison, D., A., "Considering Social Subsystem Costs and Benefits in IT Investment Decisions", *Journal of Management Information Systems*, Spring 2000

1) Productivity improvement
2) Improved decision-making ability
3) Improved communications

Social Subsystem Costs:

1) Training costs
2) Change management: costs associated with planning, overseeing, and communicating information to the end users about IT-induced change.
3) Morale
4) Loss of control
5) Job satisfactions
6) Learning curve

Implications and Commentary

The benefit categories can become cost categories if they decrease instead of increasing, and cost categories can similarly become benefit categories if they decrease instead of increasing.

The benefit and cost categories identified in the sections above should be considered in designing the IT investment valuation framework to assess the value of IT projects. These will constitute some of the intangible benefits *and* costs.

16) A Hard and Soft Look at IT Investments[24]

This is an article from McKinsey quarterly that outlines a best practices approach to IT investment and IT valuation. It describes some of the challenges IT managers face in valuing and prioritizing investments and the limitations that exist in current industry practices.

The article further proposes a concept called TVO – Total Value of Ownership. This concept basically assumes that for maximum ROI on an investment the value of such an investment should be viewed or measured along 3 dimensions:

1) Cost/Benefit Methodology
2) Management Process
3) Maturity of business judgment

[24] Dempsey, J.; Dvorak, R., E.; Holen, E.; Mark, D.; and Meehan III, W., F., "A Hard and Soft Look at Information Technology Investments", *McKinsey Quarterly*, Volume 1, 1998

Author's Relevant Point

Among the 3 dimensions proposed for the TVO framework, the first dimension, namely, Cost/Benefit Methodology is relevant to this thesis but the authors provide only best practices for cost/benefit evaluation.

Implications and Commentary

1) While trying to assess the value of an IT project or trying to prioritize IT investments, it is best to narrow down the huge list of IT projects by a simple heuristic approach:
    a. All projects with clearly low-risk and high-value are a definite go.
    b. All projects with clearly high-risk and low value are a definite no-go.
    c. Projects with high-risk and high-value should be analyzed carefully for all hidden risks and hidden, soft and intangible benefits.
    d. Projects with low-risk and low-value are sure bets but should be considered cautiously as they soak up management and developer time.

2) Infrastructure investment decisions are divided into three types:
    a. Addition of capacity: Decision criteria include a robust business case and an accurate estimation value of flexibility that the added capacity will bring.
    b. Upgrading technology: Decision criteria include identification of all transition costs, assessing the value of greater flexibility, evaluating technical risks, and selecting an appropriate time-frame for analysis – lest the technology become obsolete.
    c. Adding new capability: This is a project of a strategic nature. For an investment like this, a firm has to first decide on how much of the benefits and costs to consider.

17) Productivity, Business Profitability, and Consumer Surplus: Three Different Measures of Information Technology Value[25]

This article explains the relevance of the following theories to IT value assessment:

[25] Hitt, L., M.; and Brynjolfsson, E., "Productivity, Business Profitability, and Consumer Surplus: Three Different Measures of Information Technology Value". *Management Information Systems Quarterly*, June 1996

1) Theory of Production: The output of a firm is the sum of the input to the firm and the value-add of the firm. IT contributes directly to the value-add.
2) Theories of Competitive Strategy: Competitive advantage in a marketplace is dictated by the barriers to entry. IT contributes in various ways towards erecting the barriers to entry.
3) Theory of Consumer: Consumer surplus is the additional value that a firm offers in its products beyond that commanded by the market price of the product. IT contributes directly in increasing the consumer surplus.

It mainly argues that Productivity, Consumer Value, and Business profitability (benefits of IT) are all distinct and not related. This article is a broad-based industry/sector level econometric analysis based on secondary data covering hundreds of firms over decades of observation. This paper does not offer any frameworks, concepts or models to aid the valuation, assessment or the prioritization of IT projects or portfolios.

18) Paradox Lost? Firm Level Evidence on the Returns to Information Systems Spending[26]

This article proceeds to present evidence that IT has yielded benefits at the firm level. It uses data based on five annual surveys of several hundred large firms over the period of 1987-1991. Then the paper performs econometric analysis on the data to correlate IT spending with productivity improvements at these firms. This paper also does not offer any frameworks, concepts or models to aid the valuation, assessment or the prioritization of IT projects.

19) Information Technology Value through Different Normative Lenses[27]

This paper presents evidence of value derived from IT investments. It uses secondary data on hospitals from Washington State Department of Health, spanning 18 years from 1976 to 1994. It then performs statistical analysis using parametric and nonparametric techniques to link IT spending with productivity and value. Again this paper does not offer any techniques to valuate or assess or prioritize IT projects.

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[26] Hitt, L., M.; and Brynjolfsson, E., "Paradox Lost? Firm Level Evidence on the Returns to Information Systems Spending", *Management Science*, April 1996

[27] Lee, B.; and Menon, N., M., "Information Technology Value through Different Normative Lenses", *Journal of Management Information Systems*, Spring 2000

3. An Approach to Assess the Value of IT Investments

Introduction

This chapter presents an approach to assess the value of IT investments or projects. The approach is laid out in the form of a framework. The intent is for the reader or user to apply the framework to a project or a set of projects following the directions in the Usage section and then use the Results and Interpretation section to make a judgment of the benefits of the projects under consideration.

Basis for Framework Development

In designing the framework, several works of literature were considered. Chapter 2 presented a review of each of the literature article considered for this thesis. This section presents an evaluation of each of the articles and the relevance of their applicability to the framework being proposed in this chapter.

Chan [*see section 2.11*] provides a review of extensive set of literature addressing the topic of understanding value of IT but not IT investments. While this article is useful for further extensive research in the area of IT value, it offers very little towards the purpose of this framework.

Manyika and Nevens [*see section 2.12*] illustrate a simple benefits flow using the Productivity Levers framework. The lever 'Increase Value of Portfolio' suggests ways of assessing benefits that could come out of IT investments, with a relevant example being sales of new value-added goods and services.

Gibson and Hammer [*see section 2.2*] provide a clear view of potential business benefits by categorizing them by their effect on the firm and by what level of the firm the effect can be felt at. This work is not used in the development of the framework because the actual benefits are not enumerated; instead, only sub-categories of benefits are enumerated.

Weill and Broadbent [*see section 2.3*] specify the portfolio view of IT investment with categories based on management objectives. The IT portfolio categories i.e. Strategic, Informational, Transactional, and Infrastructure, tie into various different management objectives and require different evaluation techniques It is suggested by Weill and Broadbent [*see section 2.4*] that for the evaluation of Strategic IT investments, the appraisal should be based on informed subjective analysis.

Weill and Broadbent [*see section 2.3*] further present industry average IT portfolio mix of investments for firms following different business strategies and

firms in the finance industry. While these averages are useful for a firm to compare its IT portfolio investments against those of its peers, it means that the firm has to *first* prioritize *all* of its IT investments and categorize them along the four IT portfolio categories suggested by Weill and Broadbent [*see section 2.3*]. The Reach and Range framework presented by Weill and Broadbent [*see section 2.5*] is a tool to gauge the extent of functionality of an IT portfolio. It provides a mechanism to identify existing and missing firm-level IT capabilities, and helps guide the IT strategy of the firm. Since the purpose of this thesis is to provide a methodology for assessing the IT investments, firm-level peer comparison or development of IT strategy is beyond the scope of this effort.

Weill, Subramani and Broadbent [*see section 2.13*] present research in this article that depicts data collected by the authors after extensive research of 89 firms. This study, based on the data from the 89 firms, suggests correlation between the strategic agility of a firm and IT infrastructure [*see section 2.3*] capabilities. While this study can be used by firms to identify the required IT infrastructure capabilities for a specific IT strategy, it does not provide any criteria to evaluate the benefits or risks of IT investments.

Prahalad and Krishnan [*see section 2.14*] have designed a sound framework that helps check for alignment between the goals of IT and Business. This framework is in the form of 7 questions, the answers to some of which can throw some light on the inherent risks of an IT project. For example, asking whether the domain knowledge of an IT application is stable or evolving definitely indicates the risk-level involved in executing that IT project.

The impact of IT investments on the social subsystem, i.e. human related issues, is examined closely by Ryan and Harrison [*see section 2.15*]. This article highlights human-related benefits that come out of IT investments. Benefits like job satisfaction and employee productivity add up to intangible benefits like employee loyalty.

Dempsey et all [*see section 2.16*] provide a sound treatment of the best practices for the management of IT investments in an article published in McKinsey Quarterly. This article addresses more the overall management of IT investments than the valuation of IT investments. Moreover, any concepts addressing the topic of IT investment valuation are in the form of best practices and of little value to the development of this framework.

Some articles that were reviewed have a purpose and an approach that is of little value to the development of this framework. These articles devout their attention to sector-level or industry-level productivity enhancements, IT spending, and gains in IT value. Hitt and Brynjolfsson rely on secondary data and econometric analysis [*see section 2.17*]. In yet another work [*see section 2.18*], Hitt and Brynjolfsson rely on data from 5 annual surveys (1987 to 1991) from several hundred large firms and econometric analysis. Lee and Menon [*see section*

2.19] analyze the value of IT on hospitals by performing statistical analysis on secondary data spanning 18 years (1976 to 1994). The results of these works is the statistical proof that IT has yielded value over a period of time, rather than the identification of methodologies to assess the value of IT investments.

The Strategic grid depicted in Austin, Applegate, McFarlan [*see section 2.9*] is a tool to assess the impact of IT strategy on the organization and as such does not offer much in terms of assessing the value of IT investments.

Ross and Weill [*see section 2.1*] argue that IT management should not be in charge of determining what IT investments ought to be made. Instead it should be the Business management that should make this decision. This indicates that IT investments have to be evaluated on criteria that meet the objectives of the business management.

A concept of high relevance to this framework, developed by Austin, Applegate and McFarlan [*see section 2.6*] suggests that all intangible benefits of an IT investment can be reduced to a single measure of loyalty – loyalty of employees, customers, partners, investors, and strengthening of the firm's brand and image. Additionally, Austin, Applegate and McFarlan suggest that there are three sources of technical risks for IT projects, namely Project Size, Experience with Technology and Project Structure [*see section 2.7*]. Austin, Applegate and McFarlan further suggest some sources of tangible benefits from IT investments [*see section 2.8*] that are highly relevant to this framework to be able to identify and assess the various benefits resulting from an IT investment. All of these ideas are useful in designing the framework to assess the value of IT investments as they reveal the sources of tangible and intangible benefits and technical risks.

Weill and Broadbent [*see section 2.4*] suggest the IT Health Grid, which is a powerful tool to visualize the health of IT projects on 5 different dimensions: Business value, Technical quality, system importance of the project, budget of the project and the business function of the project. This concept forms the basis of the framework being proposed in this thesis and is enhanced to incorporate additional factors as described in the Framework Synthesis section below.

Framework Synthesis

The framework being proposed in this thesis picks up the IT Health Grid proposed by Weill and Broadbent [*see section 2.4*] as a basis and, synthesizing from some of the articles as mentioned in the previous section, modifies it in the following ways:

1) The primary deviation of the framework is that the IT Health Grid is designed to be used for existing IT projects while the framework in this thesis is designed for new IT projects.

2) This framework extends the IT Health Grid to consider even Infrastructure IT projects.

3) This framework changes the metric on the vertical axis from Business Value to Expected Business Value in order to assess the expected benefits that align with business management objectives.

4) This framework changes the metric on the horizontal axis from Technical Quality to Expected Technical Value in order to assess the expected benefits that align with IT management objectives.

5) This framework eliminates the original attribute 'System Importance' as this information is determined by the attributes Technical Value and Business Value.

6) This framework eliminates the original attribute 'Business Function of the project' as this information is not relevant to the task of assessing the value of IT investments.

7) This framework replaces the original attribute 'Budget of the project' with the attribute 'NPV of the project'. The idea is that, NPV is an accurate reflection of the financial value of the project at hand and it could be combined with business value and technical value to yield a comprehensive 3-dimensional view of the value of IT projects. But the NPV value is treated as optional data.

8) This framework seeks to assess the Expected Business value by asking questions that are derived from Weill and Broadbent [*see sections 2.3, 2.4*] and from Applegate, Austin, and McFarlan [*see section 2.6*]; and then assigning weights to the questions and responses and finally computing an Expected Business Value Score for each IT project. This is a deviation from the IT Health Grid which seeks to establish the business value by relying on the business managers to simply assign raw scores for the IT project on a scale of 1-5.

9) The framework seeks to assess the Expected Technical value by asking questions that are derived from Weill and Broadbent [*see sections 2.3, 2.4*] and from Applegate, Austin, and McFarlan [*see section 2.6*]; and then assigning weights to the questions and responses and finally computing an Expected Technical Value Score for each IT project. This is a deviation from the IT Health Grid which seeks to establish the technical quality by relying on the technical managers to simply assign raw scores for the IT project on a scale of 1-5.

10) A major improvement over the IT Health Grid is the consideration given to risk. With the assumption that assessment of value without considering inherent

risk does not yield an accurate sense for value, expected risk is factored into the computation of the Expected Business Value Score and Expected Technical Value Scores. A series of questions, mainly derived from Applegate, Austin and McFarlan [*see section 2.7*], are designed to probe the expected risk involved along both the Business and Technical dimensions. Then the resulting risk-based scores are used to discount the Expected Business Value Score and Expected Technical Value Score.

Framework Usage

The framework proposed by this thesis consists of two main components, a survey – that asks all the relevant questions to be able to assess the value of IT projects and the results grid – a 2-dimensional plot of the Expected Business Value Score and the Expected Technical Value Score of each project. These scores are obtained by filling out the survey completely for each project. In the context of this survey, the prefix 'Expected' is used to qualify the terms Business Value and Technical Value to indicate not only the risk-adjusted nature of the value score, but also that the benefit value is an estimate and is expected to occur in the future. The following two sub-sections provide more details of each of the components of this framework.

The Survey

The survey is essentially a spreadsheet with a list of questions that need to be answered for each IT project being valued. The survey has five parts – Instructions, BU Profile (Business Unit Profile), Project Profile, Business Value Profile, and Technical Value Profile. The complete survey is listed in Appendix B.

Instructions: This part consists of complete instructions to fill out the survey. The BU Profile has to be filled out only once for each business unit by the respective business unit head. See the section below for more information about filling-in the BU Profile. For each IT project being evaluated, the following have to be filled-in: the Project Profile, Business Value Profile and the Technical Value profile. Please see below for further explanations of each of the profiles.

BU Profile: This section should be filled by the business unit head only once for each business unit. The BU profile basically captures the strategic importance of the questions in the survey to the respective business unit. It requires the business unit head to look at each question that is later presented in the Business Value Profile and Technical Value Profile, and then grade the importance of the question to the business strategy of the respective business unit. This process basically assigns weights to the questions based on their importance to the business strategy of the business unit.

Project Profile: This section has to be filled up by the business manager of the project. Only the names of the business and technical managers and that of the project have to be filled up. The NPV field is optional.

Expected Business Value Profile: This profile determines the benefits and risks that impact objectives of business management. This section has to be answered by the business manager of the project. The answers to all the questions have only four possible choices: None, Low, Medium and High. The business manager has to simply choose the answer that is most appropriate for each question.

Expected Technical Value Profile: This profile determines the benefits and risks that impact objectives of IT management. This section has to be answered by the technical or IT manager of the project. The answers to all the questions have only four possible choices: None, Low, Medium and High. The technical or IT manager has to simply choose the answer that is most appropriate for each question.

Scoring

This section describes the process of converting the survey responses to a numerical score.

In the survey, all responses have only four possible grades: None, Low, Medium, and High. The weight for each of the responses is illustrated by the table in figure 3.1:

Possible Response Grades	Weights
None	1
Low	2
Medium	3
High	4

Figure 3.1 : Weights for Responses

BU Profile Scoring: Each response in this profile should be converted to a numerical score by directly using the weights in figure 3.1, i.e. a response of 'None' converts to a score of 1, a response of 'Low' converts to a score of 2, and so on. The score that is generated for each question is called the **Strategic Importance Score (SIS)**.

The following discussion of scores relates to the Expected Business Value profile, but it applies equally the Expected Technical Value profile as the process of scoring is the same for both.

Expected Business Value Profile Scoring: The response to each of the questions in this profile is converted to a score by the following steps:

1. Convert the response to its weight using figure 3.1
2. Multiply the weight of the response with its corresponding SIS from the BU profile.
3. The above value yields the score for each response

Expected Business Value Score (EBVS): This is the sum total of scores for all the questions in the Expected Business Benefits section (both tangible and intangible benefits).

Expected Business Risk Score (EBRS): This is the sum total of scores for all the questions in the Expected Business Risks section.

Total Expected Business Value Score (TEBVS): This is obtained by dividing EBVS with EBRS.

Therefore, Total Expected Business Value Score = [Sum of Expected Business Value Scores] / [Sum of Expected Business Risk Scores].

And similarly, Total Expected Technical Value Score = [Sum of Expected Technical Value Scores] / [Sum of Expected Technical Risk Scores].

Results and Interpretation

As explained in the Usage section above, a copy of survey template should be used for collecting data for one project. Therefore, each survey will have the results of only one project. The Expected Business Value and Expected Technical Value scores are computed as explained in the previous section and entered in the Project Profile tab. It should be emphasized that the scores in the Project profile are project specific and are applicable only to the project to which the survey has been applied. In order to obtain a collection of scores for all the projects in a business unit or a firm, individual scores should be collected from the various survey documents and stored onto a different document or a spreadsheet for easy visibility. This part of the results-collection is not performed by the survey instrument.

Once the survey is answered for all the required projects (typically all the IT projects in a business unit or a firm) the two-part scores (Expected Business Value Score and Expected Technical Value Score) for each project is collected. Along with the two-part score, if a project has an NPV entry, this should be collected as well.

Then, using the two-part score for each project, the projects should be plotted on a two-dimensional grid, the vertical axis reflecting the Expected Business Value and the horizontal axis reflecting the Expected Technical Value. The NPV of the project, if available, should be marked against the plot as a label. A sample plotting is illustrated in figure 3.2.

After the projects have been plotted, the results could be interpreted using the table provided in figure 3.3.

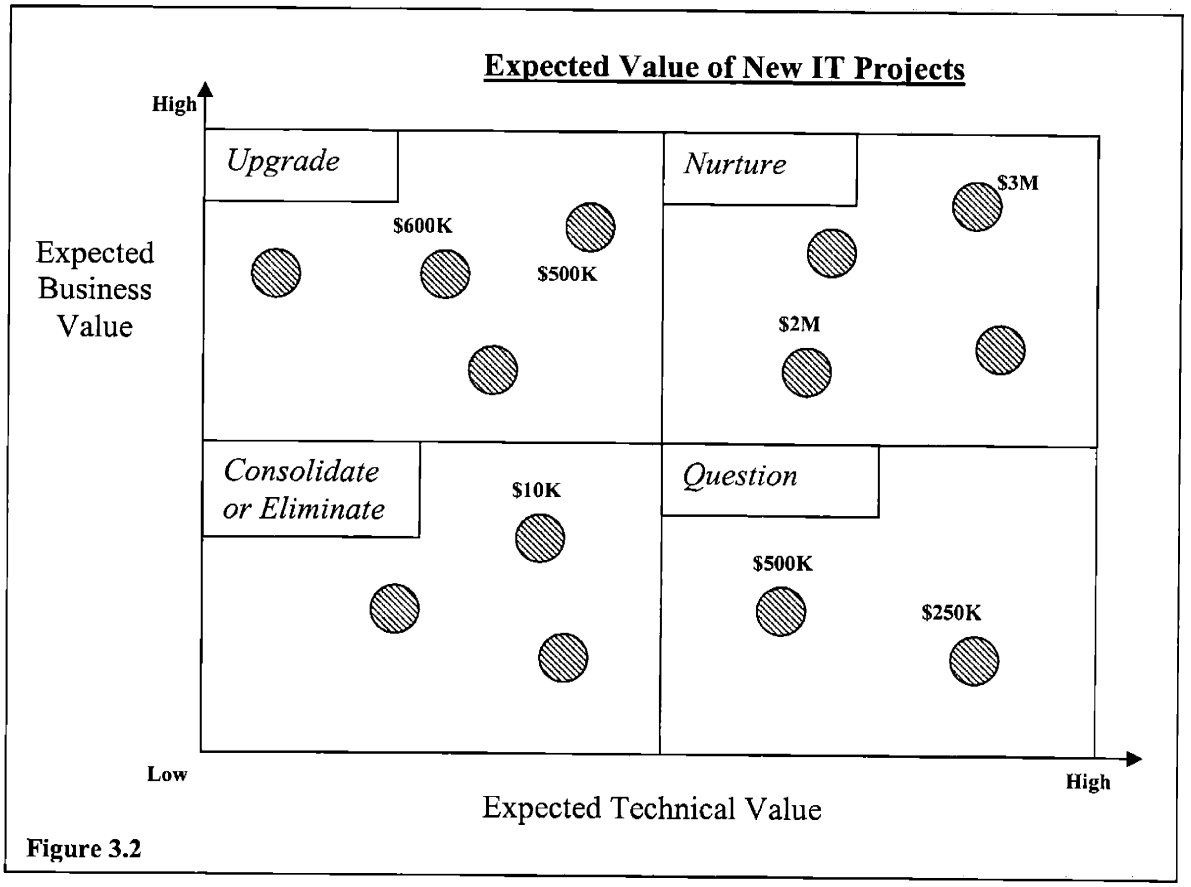


Figure 3.2

Quadrant	Interpretation
Nurture	Projects in this quadrant are high in both expected business value and expected technical value. As such, all projects in this quadrant should be given highest priority for investments.
Upgrade	Projects in this quadrant are high in expected business value and low in expected technical value. Projects in this quadrant should be judged for investment based on the NPV if possible. If projects do not have an NPV, then it may be worth computing

	the NPV for such projects depending on budget.
Question	Projects in this quadrant are high in expected technical value but low in expected business value. These projects should be questioned seriously before making investments.
Consolidate or Eliminate	Projects in this quadrant are neither high in expected business value nor high in expected technical value. These projects should be funded last, if at all.

Figure 3.3

4. A Field Test

Introduction

The survey instrument developed in Chapter 3 (and presented in Appendix B) was actually field tested at a firm, which will be called FSC (financial services company) for the purposes of this thesis. Prior to the commencement of this thesis, a thesis proposal was prepared and submitted to FSC. The version of the proposal that was accepted by FSC is presented in Appendix C (with FSC substituted for the company name in the proposal). The thesis followed the plan laid out in the proposal and accordingly, the survey was tested at FSC for two IT projects. The results of this field test for the two projects are presented in this chapter.

Survey Administration

The survey was administered by simply e-mailing to FSC the version presented in Appendix B. The survey was e-mailed in its entirety as a spread-sheet file. No additional directions were issued as the survey contained instructions in the first tab of the spread-sheet.

Survey Results

The original survey responses are displayed in Appendix D. The constraints imposed by the thesis time-line and the university imposed deadlines rendered it impossible for FSC to submit responses for more than 2 projects. The summary of results obtained is presented below:

FSC Projects	Expected Business Value Score (EBVS)	Expected Technical Value Score (ETVS)
Project 1	13.44	6.44
Project 2	13.88	7.75

From the table above we observe that Project 2 scores only slightly higher on the Expected Business Value profile and noticeably higher on the Expected Technical Value profile. This indicates that for a given business strategy (the business strategy of the Business Unit is specified by the survey responses in

the BU Profile of the Survey – please see Appendix D) Project 2 is considerably stronger than Project 1 in meeting the objectives of IT management. However, Project 2 is only slightly better, if not similar, to Project 1 in meeting the objectives of Business management. With the limited data (i.e. only two projects surveyed), it is unclear if Project 2 is significantly better than Project 1 for the purposes of funding.

In the case where there are significantly more projects that are surveyed, the results should be plotted on a two-dimensional grid as described in the *Results and Interpretation* section of *Chapter 3*. Then, it would also be possible to determine more clearly which projects should be given priority for funding.

Lessons from the Field Test

Lessons from FSC Feedback

The only feedback (apart from the survey responses for the two projects) received from FSC was the following:

"My projects primary goal is to drive out cost by making the employees more productive. Most deals in FA are made based on pricing. These documents do not put much weighting on operational efficiencies."

This comment captures the crux of the valuation problem. Assigning a higher weight to those attributes that are actually the strengths of a particular project defeats the purpose of a fair evaluation effort, because it affords unfair advantage to the project in question.

However, the survey instrument is effectively designed to solve problems like these. If a particular attribute, say Operational Efficiency, is deemed important to the business strategy – not just to a project – then the strategic importance of Operational Efficiency should be increased in the BU Profile (Business Unit Profile). This is done by increasing the strategic importance of the question on line 20 on the BU Profile tab. This would cause all the projects within the business unit to be subject to the added strategic importance of Operational Efficiency. This process would then select those projects for funding that align with the business strategy of increased Operational Efficiency, rather than only select those that are just good at whatever it is that they do.

The lesson learnt here is that the BU Profile should be carefully filled out by the business unit head before any copies of the template are made for the rest of the business unit. The responses in the BU Profile should be well thought out and carefully made.

Additionally, FSC was able to submit the survey responses for only two projects due to timing constraints. While this limited usage and data did prove the usability of the survey and feasibility of its application, it was lacking enough data to be able to successfully evaluate all the projects in a business unit, which is the primary purpose of the thesis. In order to achieve this, the survey should be applied to all the projects in a business unit and thereafter the scores plotted on the two-dimensional grid as illustrated in figure 3.1.

Other Lessons Learnt from the FSC Field Test

One of the key lessons learnt is that while planning such an open-ended research activity as this thesis, sufficient time should be allocated for the survey to be submitted to the field test firm, to allow the firm to understand and assimilate the survey, and then to respond in a well thought out fashion to yield meaningful results.

The design of a survey should always consider how many respondents are required as a minimum to make the results meaningful. Also, identification of the respondents should be done early enough so that they can be kept informed.

5. Conclusion

IT Landscape

The CIO continues to face the dilemma of how to deliver – and be recognized for delivering – greater IT value. This dilemma gives rise to a host of issues out of which IT project valuation is just one. The other issues being, but not limited to, IT project prioritization, alignment of IT strategy with business strategy, IT portfolio management, peer comparison and IT governance.

The issue of IT project valuation, which is the focus of this thesis, has to do with being able to assess the value of IT projects prior to making investment decisions. This gives rise to questions like should the valuation rely on traditional DCF evaluation; or should the valuation rely on managerial judgment; how to deal with the complexity of DCF evaluation, especially when evaluating intangible benefits or indirect benefits (for example increase in product sales could be due to either the efforts of IT or marketing campaign); in the case of managerial judgment, how to document the decision process and more importantly how to prove or verify the validity of the judgment process?

There is no one-methodology-fits-all solution to the problem of IT project valuation. The IT industry (the CIOs) is employing a wide spectrum of techniques ranging from hiring consulting companies to deliver customized, detailed, complete IT management solutions to a governance-based management styles. This thesis addresses the tiny spec of IT project valuation in the myriad landscape of IT management issues.

Thesis Summary

An exhaustive set of articles on the topic of IT project valuation was researched for the purposes of this thesis. The literature falls into three categories. The first category is the set of literature that provides best practices and general guidelines for IT project valuation, IT portfolio management and IT general management. The second category is the set of literature that seeks to prove the value of IT (not IT projects, but just IT in general) at the sector-level or industry-level by conducting extensive surveys or using secondary data over multiple years and then performing statistical or econometric analysis of the data. Both of these categories of literature have not been very influential on the development of this thesis. However, the last category of literature offers relevant ideas that can be used to develop the concepts laid out in this thesis. The articles provide handles to think about various tangible and intangible benefits of IT projects being captured at various stages of the firm. They also provide handles to think about inherent risks that come with IT projects. However, the number of articles

or books in this category is limited. Hopefully, this thesis will trigger more thought in the research community and provide a fertile ground to conduct more research.

The approach to the thesis is to find a methodology to valuate IT projects. The solution that is recommended is a framework that is accompanied by a survey. The survey probes the business project manager and IT project manager of each project to asses the extent of benefits and risks that impact the objectives of both business management and IT management. It also probes the business unit manager to assess the importance of each of these benefits and risks to the business strategy of the business unit. Based on the responses of the business unit manager, business project manager, and IT project manager, the survey assigns weights to the benefits, risks, and the responses, and then computes an Expected Business Value score and an Expected Technical Value score for each project.

The following assumptions were made for the purposes of defining the scope of this thesis as well as to add value to the IT project valuation process:

1) Benefits and costs that can be easily expressed in dollar figures will not be considered in the valuation of IT projects, for example: increase in revenue or income as a direct benefit of IT project, decrease in specific costs like headcount, etc. The assumption is that these figures are straightforward to compute and also would be considered in the computation of the NPV of the project, and therefore do not need special treatment. By leaving these metrics out, the framework in this thesis can focus on those benefits that are not easy to comprehend. The metrics or questions in the survey that relate to financial metrics like increased sales etc. are meant to actually address the indirect nature of contribution to benefits and costs.

2) It is also assumed that IT projects that are mandatory (either by law or by the business sector demands) get the highest priority as they are a legal requirement or an essential part of operations. Therefore, it is assumed that such projects do not need an IT valuation process and will be funded regardless of their inherent value. Therefore, the framework and hence the survey does not consider any IT projects that are of a mandatory nature.

Future Research

While the prevalent literature suggests that there is no straight-forward methodology to evaluate IT projects and then prioritize the IT projects, the pressure on CIOs to demonstrate the value of IT continues to build. Demonstration of the value of IT starts at the project level with proper justification and validation of each IT investment. Towards this goal, the following research projects are suggested as extensions to this thesis.

The most relevant extension is a thorough application of this framework to all the IT projects within a firm or a business unit of the firm. The data resulting from this activity will demonstrate the applicability of this framework and then set the stage for further research.

Further, the approach of this thesis should be compared with industry-standard approaches to IT project valuation proposed by firms like Gartner, Alineon, Working Council of the CIOs, etc. The comparison should highlight strengths, weaknesses and possibilities for enhancements. This will either prove or disprove the validity of this framework and then make sound recommendations for improvements.

Some work could also be done in the area of statistical modeling of the survey instrument. This activity would comprise of accurately assigning weights or ranges of weights to the response choices and questions.

A research activity of significant value would be to develop a methodology or a model that will validate the framework developed in this thesis and prove the accuracy of the data collected by the application of this framework.

A research project that should be of great value to the industry, but perhaps too ambitious, would be the development of a mathematical model that will take as input standard IT project related data, that one would expect most firms to maintain, and then output the dollar value of the IT project. The rich benefit of this project would be that the model could be plugged into existing databases, without requiring surveys and surveying processes thereof, to directly compute the dollar value of IT projects.

Appendix A – Glossary of Acronyms

The following is a list of acronyms used in the thesis.

BU	Business Unit
CIO	Chief Information Officer
DCF	Discounted Cash Flow
EBRS	Expected Business Risk Score
EBVS	Expected Business Value Score
EBTS	Expected Technical Value Score
FSC	Financial Services Company
LOB	Line of Business
IT	Information Technology
ITP	Information Technology Portfolio
ROA	Return on Assets
ROI	Return on Investment
SIS	Strategic Importance Score
TEBVS	Total Expected Business Value Score
TEBRS	Total Expected Business Risk Score

Appendix B – Survey

1. Instructions for Filling the Survey

This section is a guide to filling the survey.	
General Usage	The survey has 4 profiles and should be filled as described below.
Business Unit Profile	To be filled by the business unit head once for **each business unit.**
Project Profile	To be filled by the Business/Technical Manager for **each IT project**
Expected Business Value Profile	Expected Business Value is an indicator of the extent of benefits that a project is expected to yield that will satisfy business management objectives. This section has to be filled by the business project manager for **each IT project**
Expected Technical Value Profile	Expected Technical Value is an indicator of the extent of benefits that a project is expected to yield that will satisfy IT management objectives. This section has to be filled by the IT or technical project manager **for each IT project**

1. Instructions for Filling the Survey - Continued	
General Instructions	1) All fields in yellow and all fields in the column under the heading of RESPONSE have to be filled, except where noted.
	2) All survey questions have to be answered by filling in only one of the values – None, Low, Medium, or High – in the corresponding cell under the RESPONSE column.
	3) The "Special Instructions" below and the "Survey Questions Explanations" further below provide detailed additional information about this survey.
Scoring	For scoring instructions, refer to the *Scoring* section in *Chapter 3: An Approach to Assess the Value of IT Investments*.
Special Instructions	
BU Profile	1) This worksheet contains details pertaining to the Business Unit.
	2) It also contains a complete list of the questions that are asked in the rest of the survey.
	3) The BU Head should rate each question based on the relative importance of the question to the business strategy of the BU.
	4) A response of NONE means the specific question has no bearing on the business strategy of the BU and a response of HIGH means the question is very important to he business strategy of BU.

1. Instructions for Filling the Survey - Continued

Business / Technical Value Profile	1) This worksheet contains questions to assess the expected business / technical value of the project.
	2) There are 2 sets of questions: Expected Benefits and Expected Risks.
	3) Expected Benefits: Each question highlights a source of expected benefit and prompts the manager to input the extent of the benefit that would be captured by executing the project.
	4) Expected Risks: Each question highlights a source of expected risk and prompts the manager to input the extent of the risk that would be incurred by executing the project.
	5) Each response has four possible grades: None, Low, Medium and High.
Survey Question Explanations: Below is a table that further explains the survey questions with examples where applicable. The left side column has all the Survey Questions, the right-side column has all the respective explanations.	
Survey Questions	**Explanations**
What is the Positive Impact of the Project on the following tangible and intangible Expected Business Benefits:	
Expected Tangible Business Benefits (Other than Financial)	
Increased sales	To what extent will this project contribute towards increased sales. For example, offer services that will attract more business from clients.

1. Instructions for Filling the Survey - Continued	
Competitive advantage	To what extent does the project enable the firm to gain competitive advantage. For example, leveraging the customer information to offer a new product for a niche market
Market positioning	To what extent does the project enable the firm to gain new market share, or increase market size, or enter new markets or create new channels to market.
Creation of innovative products and services	To what extent does the project provide the basic capability to create innovative products and services.
Time to market for innovative products and services	To what extent does the project reduce the time to market for innovative products and services.
Operational control	To what extent does the project allow better control of operations - for example, reduce data-entry operator errors, create repeatable business processes, etc.
Information for better decision-making	To what extent does the project cater better information for better decision-making by the senior management
Improved quality of processes, products, or services	To what extent does the project improve the quality of existing business processes, products or services
Business integration	To what extent does the project improve business integration - for example, common business processes, reuse of business practices, cross-business unit visibility of customer and product profiles, etc.
Business flexibility and agility	To what extent does this project add to business flexibility and agility - for example, how quickly can it address new markets or offer innovative solutions
Intangible Business Benefits	
Customer loyalty	To what extent does this project increase customer loyalty - for example, provide value-added service to meet key customer needs.

1. Instructions for Filling the Survey - Continued	
Partner loyalty	To what extent does this project increase partner loyalty - for example, provide a service that has significant value to the partner.
Brand and Image strength	To what extent does the project add value to the Brand or Image - for example, add innovative functionality to a flagship product that major clients use
Investor loyalty	To what extent does the project increase investor loyalty - for example, serve a client of interest to the investor
Employee loyalty	To what extent does the project increase employee loyalty - for example, bring in technologies that motivate employees.
What is the extent of Business Risk arising from the following sources:	
Business Risks	
Business process is new	To what extent is the business process being enabled or supported new to the firm
Dependency on other projects	To what extent is this project dependent on other projects either under development or under consideration.
Management capability for implementation and operation of the project	To what extent is the senior management not disposed towards the implementation and operation of the project
Users' culture and receptiveness to the project	To what extent does the user community not reciprocate to the project or have a culture that conflicts with the goal of the project.
Scope and complexity of business change required for the project	To what extent does an existing business process need to change for implementing this project.
What is the Positive Impact of the Project on the following Expected Technical Benefits:	
Expected Technical Benefits	

1. Instructions for Filling the Survey - Continued	
Ability to launch new information-based products and services	To what extent will this project enable the basic capability required to launch new information-based products and services. For example, can we securely let customers transact online
Faster implementation of a new project	To what extent will this project reduce the time to implement other projects.
Cheaper implementation of a new project	To what extent will this project reduce the cost to implement other projects.
Less risk to implement a new project	To what extent will this project reduce the below-mentioned risks for other projects.
Expansion of the range of possible IT initiatives	To what extent will this project enable new IT initiatives. For example - will we be enabled for J2EE deployment
Improved product stability	To what extent will this project contribute towards improving stability of products/services.
Increase in operational uptime	To what extent will this project contribute towards the uptime of data and application services.
Reuse across other products	To what extent can this project be reused across multiple products/services
Reuse across other clients	To what extent can this project be reused across multiple clients.
Standardization of IT products	To what extent does this project move a product or products towards established IT standards
What is the extent of Technical Risk arising from the following sources:	
Technical Risks	
Project size	The larger the project in monetary terms, staffing levels, duration, and number of departments affected, the greater the risk.

1. Instructions for Filling the Survey - Continued	
Experience with technology	To what extent is there risk emerging from the project team, business unit or the firm lacking familiarity with the hardware, operating systems, database systems, and other project-related technologies.
Project structure	To what extent is there risk emerging out of projects that do not have inherently stable requirements, or require considerable organizational change.
Project source	To what extent is there risk emerging from the project being outsourced or using tools from vendors with questionable sustenance.

2. Business Unit Profile		
Business Unit Name		
Business Unit Head		
Business Information Officer		

2. Business Unit Profile - Continued	
Survey Questions	**Strategic Importance Score (SIS)** (None =1, Low = 2, Medium = 3, High = 4)
What is the Strategic Importance to the Business Unit for the following Expected Business Benefits:	
Expected Tangible Business Benefits (Other than quantitative)	
Increased sales	
Competitive advantage	
Market positioning	
Creation of innovative products and services	
Time to market for innovative products and services	
Operational control	
Information for better decision-making	
Improved quality of processes, products, or services	
Business integration	
Business flexibility and agility	
Intangible Business Benefits	
Customer loyalty	
Partner loyalty	
Brand and Image strength	
Investor loyalty	
Employee loyalty	

2. Business Unit Profile - Continued	
What is the Strategic Importance to the Business Unit for Business Risk to a project arising from the following sources:	
Business Risks	
Business process is new	
Dependency on other projects	
Management capability for implementation and operation of the project	
Users' culture and receptiveness to the project	
Scope and complexity of business change required for the project	
What is the Strategic Importance to the Business Unit for the following Expected Technical Benefits:	
Expected Technical Benefits	
Ability to launch new information-based products and services	
Faster implementation of a new project	
Cheaper implementation of a new project	
Less risk to implement a new project	
Expansion of the range of possible IT initiatives	
Improved product stability	
Increase in operational uptime	
Reuse across other products	
Reuse across other clients	
Standardization of IT products	

2. Business Unit Profile - Continued	
What is the Strategic Importance to the Business Unit for Technical Risk to a project arising from the following sources:	
Technical Risks	
Project size	
Experience with technology	
Project structure	
Project source	

3. Expected Business Value Profile		
	Response (None = 1, Low = 2, Medium = 3, High = 4)	**Expected Business Value Score** (Response x SIS)
What is the Positive Impact of the Project on the following tangible and intangible Expected Business Benefits:		
Expected Tangible Business Benefits (Other than quantitative)		
Increased sales		
Competitive advantage		
Market positioning		
Creation of innovative products and services		
Time to market for innovative products and services		
Operational control		
Information for better decision-making		
Improved quality of processes, products, or services		
Business integration		
Business flexibility and agility		
Intangible Business Benefits		
Customer loyalty		
Partner loyalty		
Brand and Image strength		
Investor loyalty		
Employee loyalty		
What is the extent of Business Risk arising from the following sources:		

Business Risks		
3. Expected Business Value Profile - Continued		
Business process is new		
Dependency on other projects		
Management capability for implementation and operation of the project		
Users' culture and receptiveness to the project		
Scope and complexity of business change required for the project		

4. Expected Technical Value Profile		
	Response (None = 1, Low = 2, Medium = 3, High = 4)	**Expected Technical Value Score** (Response x SIS)
What is the Positive Impact of the Project on the following Expected Technical Benefits:		
Expected Technical Benefits		
Ability to launch new information-based products and services		
Faster implementation of a new project		
Cheaper implementation of a new project		
Less risk to implement a new project		
Expansion of the range of possible IT initiatives		
Improved product stability		
Increase in operational uptime		
Reuse across other products		
Reuse across other clients		
Standardization of IT products		
What is the extent of Technical Risk arising from the following sources:		
Technical Risks		
Project size		
Experience with technology		
Project structure		
Project Source		

5. Project Profile		
Project		
Business Manager		
Technical Manager		
What is the NPV of the Project?		*NPV of the project should be filled in only if it is available.*
Total Expected Business Value Score [(Sum of Expected Business Value Scores) / (Sum of Expected Business Risk Scores)]		
Total Expected Technical Value Score [(Sum of Expected Technical Value Scores) / (Sum of Expected Technical Risk Scores)]		

Appendix C – Thesis Proposal

15.THG MOT THESIS PROPOSAL – 2003

Development and Testing of a Framework to assess the value of IT
March 10, 2003

CONTEXT

IT is a major enabler of most businesses, yet the most questioned of investments. Time and again, the question asked by senior executives is: What is the business value of IT to our firm? This question is coming in from all directions and bringing to bear enormous pressure on the CIO role. More challenging is the expectation that the business value of IT projects be converted to cash flows, albeit for the sake of easy comparability among projects.

The crux of the issue facing organizations with regard to assessing IT projects derives from the fact that there is now wide variety in the nature of such projects and consequently great differences in the nature and measurability of project benefits. Many organizations would like to reduce all benefits from all IT projects to a comparable financial metric, such as NPV based on investment and cash flows returns. The following difficulties arise in trying to attach cash flows to IT projects:

Need for critical assessment: Given the downturn in the economy, now more than ever, most IT organizations are under severe budget limitations and must make critical choices among projects which have benefits of varying measurability.

Vast variety in projects: Organizations face a wide spectrum in the nature of IT projects when it comes to assessing value. On one end of the spectrum is a simple project to improve the productivity of computer operators (reduction

in key strokes and/or boost transaction speed). Benefits of such projects can be easily measured and converted into cash flows. On the other end of the spectrum are strategic projects like building support for XML or centralizing functionality ahead of market demand. Strategic projects are difficult to assess quantitatively in the short-term or ahead of implementation.

Inherently complex projects: Organizations also have to deal with projects that are inherently complex to assess. A good example of such a case is a project to replace all the monitors with LCD displays. How can one assess the value of such a project? How can one compute the value of reduction in the eye-strain of operators, boosted morale, increased motivation or loyalty?

One approach to circumvent these difficulties is for senior management to recognize that many projects require business judgment and that experienced managers can bring collective judgment to make effective investment choices. This approach is easily adoptable in an economic upturn scenario or when the company is in an expansive mode. But it raises concerns and conflicts in the light of economic downturn and shrunk budgets. However, this approach still does offer a realistic alternative to the effort of finding a single comparable financial indicator for IT project scoring.

So then, in light of the above difficulties, should a firm give up on any endeavors to assess the IT value in terms of comparable cash flows? Instead, should it leave it to the collective judgment of the top managers, and deal with potential conflicts arising from independent agendas and work-place politics? It can be argued that there is a middle ground. While trying to assess the IT value in terms of cash flows is unrealistic and somewhat impossible, it is however possible and strongly recommended to obtain as much information as possible to be able to *judge* the IT value.

PURPOSE:

The purpose of this thesis is to develop a framework for the assessment of business value of IT and then to test it at a financial services company that is a subsidiary of a $5b bank. For the purposes of safeguarding the identity of this company, it will be referred to as FSC. The framework will be a methodology/approach and will comprise of relevant and actionable qualitative metrics which will be used to assess the business value of IT.

While calculating the dollar value of IT projects may not be realistic, anything that helps managers to get a "sense" of the value of IT projects is money on the table. This thesis proposes a framework that will capture the best practices and best thinking that is available in the area of assessment of IT value. This framework will be tested on a project or a set of projects at FSC. The outcome of applying the framework to the project or set of projects will be in the form of pictorials, graphs, and scores. These results could be used by the manager to "judge" the value of IT projects.

By way of example, the framework will help assess:

1) Contributions from new products enabled by IT
2) Productivity enhancing initiatives that reduce operating and IT expenses.
3) Both tangible and intangible value contribution of IT

OBJECTIVES:

- To perform thorough review of current literature
- To distill from the literature reviewed, industry's best thinking and practices in the subject of IT value assessment
- To design a framework to assess IT value that captures the best practices and best thinking that is already available in this area.
- Demonstrate the feasibility of the framework by testing it against a line of business at FSC.

APPROACH AND DELIVERABLES:

The methodology employed is a combination of:

1. Method/Framework Design
2. Case study

A combination approach is adopted to allow the practical testing of the framework. The testing of the framework will yield outcomes that will provide a basis for IT project prioritization.

The approach would start with a thorough literature research. This phase is required to maintain the Sloan academic standards for thesis. Then a framework will be designed that captures the industries best thinking and best practices. Additional insights that arise

out of cross-fertilization of literature will be distilled. Then the framework will be tested and the results presented at FSC.

The deliverables will be:

1) Literature reviews
2) Complete description of the framework along with process and analysis
3) Results of testing the framework at the FSC: qualitative information about IT projects to be able to better assess their value

It should be emphasized that the value of this thesis lies mostly in the thorough research into the most current literature on the subject of IT Value assessment and the subsequent distillation of Industry's best thinking and best practices. While this thesis may not be the silver bullet for the FSC, it will definitely yield rich dividends over the long-term in the form of enhanced decision-making ability.

TASKS AND TIMETABLE

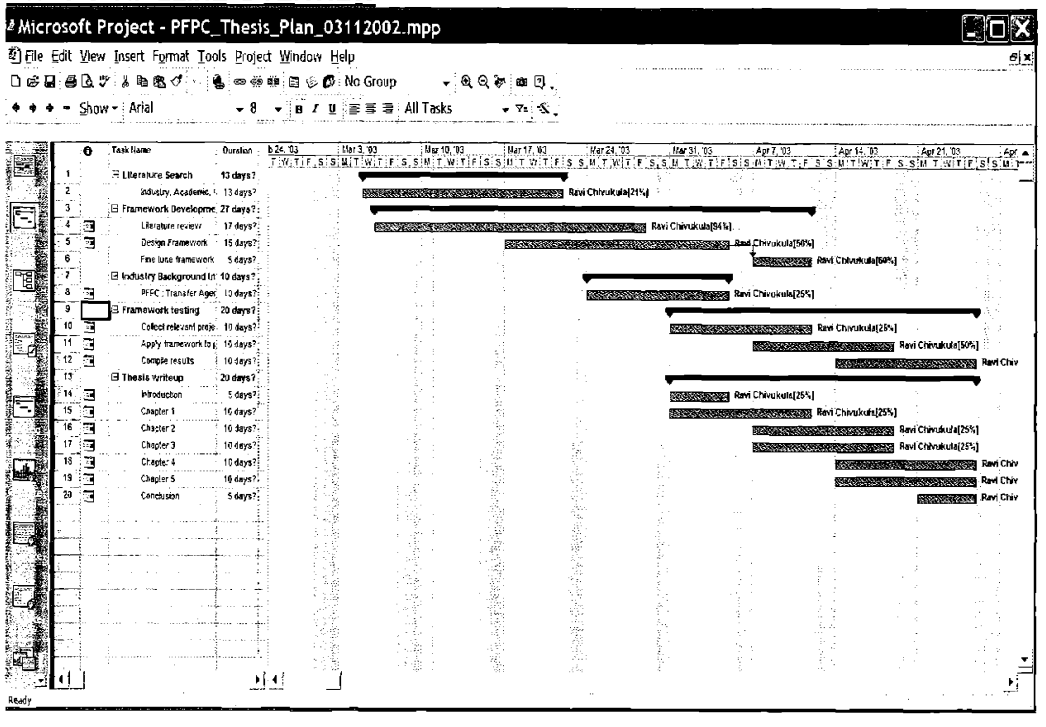
1) Literature Search:
- Industry journals
- CIO Magazines and website
- Academic documents from MIT and other institutions

2) Framework Development:
- Review literature – At least 10 articles of very high relevance
- Design framework to assess IT value
- Fine tune framework

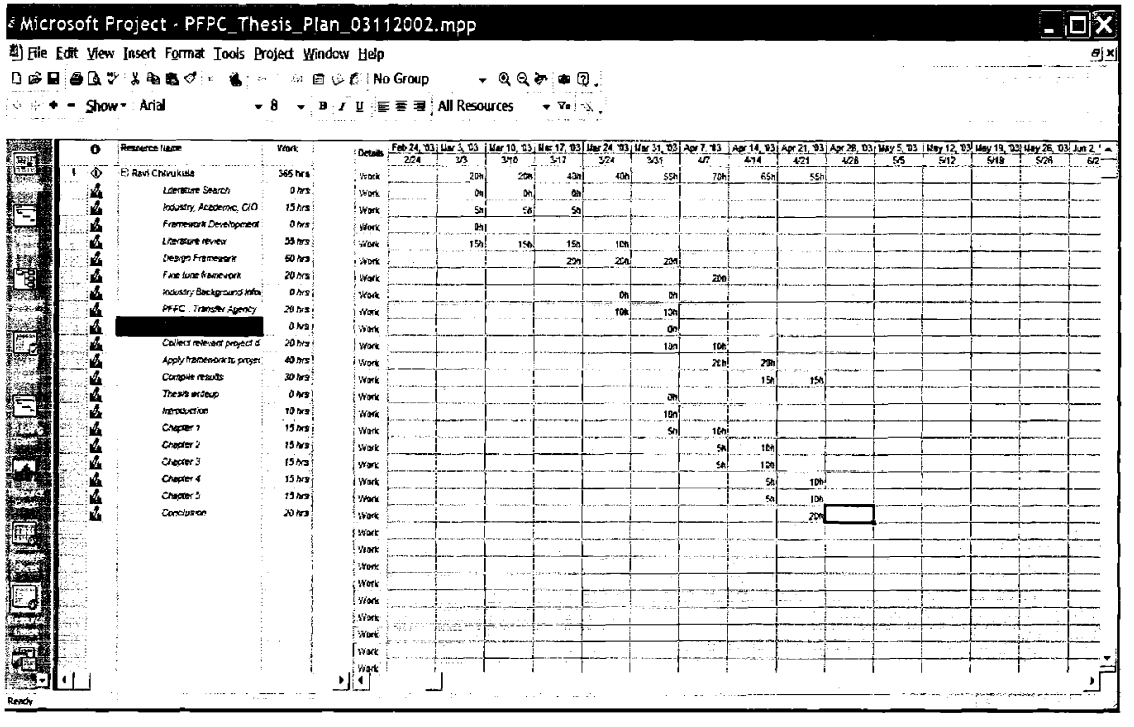
3) Framework testing:
- Collect project data relevant to framework (projects from the Transfer Agency LOB)
- Apply framework to projects
- Compile results

4) Thesis write-up

THESIS TIMELINE OVERVIEW



WEEKLY TIME PER TASK



Critical Success Factors

1) Timely approvals and feedback from CISR and FSC
2) Data availability in a timely manner
3) Access to key FSC financial/operation and IT executives/managers

Assumptions and Exclusions

1) The timetable is subject to modification based on unforeseen discovery of risks and facts as the thesis progresses.

2) All Thesis-specific documents will be live artifacts that will be continuously updated during the life of the thesis.

Appendix D – Field Test Survey Reponses

BU Profile – Business Unit Profile – Project 1 and Project 2

Business Unit Profile			
Business Unit Name			
Business Head			
Business Information Officer			
		Strategic Importance Score(SIS) (None = 1, Low = 2, Medium = 3, High = 4)	
Survey Questions			
What is the Strategic Importance to the Business Unit for the following Expected Business Benefits:			
Expected Tangible Business Benefits (Other than quantitative)			
Increased sales		4.00	
Competitive advantage		4.00	

Market positioning	4.00
Creation of innovative products and services	3.00
Time to market for innovative products and services	3.00
Operational control	4.00
Information for better decision-making	3.00
Improved quality of processes, products, or services	4.00
Business integration	3.00
Business flexibility and agility	3.00
Intangible Business Benefits	
Customer loyalty	3.00
Partner loyalty	3.00
Brand and Image strength	4.00
Investor loyalty	3.00
Employee loyalty	3.00
What is the Strategic Importance to the Business Unit for Business Risk to a project arising from the following sources:	
Business Risks	
Business process is new	3.00
Dependency on other projects	2.00
Management capability for implementation and operation of the project	2.00
Users' culture and receptiveness to the project	2.00
Scope and complexity of business change required for the project	3.00

What is the Strategic Importance to the Business Unit for the following Expected Technical Benefits:	
Expected Technical Benefits	
Ability to launch new information-based products and services	3.00
Faster implementation of a new project	3.00
Cheaper implementation of a new project	3.00
Less risk to implement a new project	3.00
Expansion of the range of possible IT initiatives	3.00
Improved product stability	3.00
Increase in operational uptime	3.00
Reuse across other products	2.00
Reuse across other clients	3.00
Standardization of IT products	3.00
What is the Strategic Importance to the Business Unit for Technical Risk to a project arising from the following sources:	
Technical Risks	
Project size	3.00
Experience with technology	3.00
Project structure	3.00
Project source	3.00

Business Profile – Project 1

Expected Business Value Profile		
	Response (None = 1, Low = 2, Medium = 3, High = 4)	**Score** (Response x SIS)
What is the Positive Impact of the Project on the following tangible and intangible Expected Business Benefits:		
Expected Tangible Business Benefits (Other than quantitative)		
Increased sales	Low	8.00
Competitive advantage	Low	8.00
Market positioning	Low	8.00
Creation of innovative products and services	Low	6.00
Time to market for innovative products and services	Low	6.00
Operational control	High	16.00
Information for better decision-making	Low	6.00
Improved quality of processes, products, or services	High	16.00
Business integration	Low	6.00
Business flexibility and agility	Low	6.00
Intangible Business Benefits		
Customer loyalty	Low	6.00
Partner loyalty	Low	6.00
Brand and Image strength	Low	8.00
Investor loyalty	Low	6.00
Employee loyalty	Medium	9.00
What is the extent of Business Risk arising from the following		

sources:		
Business Risks		
Business process is new	Low	2.25
Dependency on other projects	Low	1.50
Management capability for implementation and operation of the project	Low	1.50
Users' culture and receptiveness to the project	Low	1.50
Scope and complexity of business change required for the project	Low	2.25

Total Scores	
Expected Business Benefits (Sum of Expected Business Value Scores)	121.00
Expected Business Risks (Sum of Expected Business Risk Scores)	9.00
Total Expected Business Value [(Sum of Expected Business Value Scores)/ (Sum of Expected Business Risk Scores)]	13.44

Technical Profile – Project 1

Expected Technical Value Profile		
	Response (None = 1, Low = 2, Medium = 3, High = 4)	**Score** (Response x SIS)
What is the Positive Impact of the Project on the following Expected Technical Benefits:		
Expected Technical Benefits		

Ability to launch new information-based products and services	Low	6.00
Faster implementation of a new project	Low	6.00
Cheaper implementation of a new project	Low	6.00
Less risk to implement a new project	Low	6.00
Expansion of the range of possible IT initiatives	Low	6.00
Improved product stability	Low	6.00
Increase in operational uptime	Low	6.00
Reuse across other products	Low	4.00
Reuse across other clients	Low	6.00
Standardization of IT products	Low	6.00
What is the extent of Technical Risk arising from the following sources:		
Technical Risks		
Project size	Low	2.25
Experience with technology	Low	2.25
Project structure	Low	2.25
Project source	Low	2.25

Total Scores	
Expected Technical Benefits (Sum of Expected Technical Value Scores)	58.00
Expected Technical Risks (Sum of Expected Technical Risk Scores)	9.00
Total Expected Technical Value [(Sum of Expected Technical Value Scores)/ (Sum of Expected Technical Risk Scores)]	6.44

Project Profile – Project 1

Project Profile		
Project		
Business Manager		
Technical Manager		
What is the NPV of the Project?		*NPV of the project should be filled in only if it is available.*
Total Expected Business Value [(Sum of Expected Business Value Scores) / (Sum of Expected Business Risk Scores)]	**13.44**	
Total Expected Technical Value [(Sum of Expected Technical Value Scores) / (Sum of Expected Technical Risk Scores)]	**6.44**	

Business Profile – Project 2

Expected Business Value Profile		
	Response (None = 1, Low = 2, Medium = 3, High = 4)	**Score** (Response x SIS)
What is the Positive Impact of the Project on the following tangible and intangible Expected Business Benefits:		
Expected Tangible Business Benefits (Other than quantitative)		
Increased sales	Low	8.00
Competitive advantage	Medium	12.00
Market positioning	Low	8.00
Creation of innovative products and services	Low	6.00
Time to market for innovative products and services	Low	6.00
Operational control	High	16.00
Information for better decision-making	Low	6.00
Improved quality of processes, products, or services	High	16.00
Business integration	Low	6.00
Business flexibility and agility	Low	6.00
Intangible Business Benefits		
Customer loyalty	Low	6.00
Partner loyalty	Low	6.00
Brand and Image strength	Low	8.00

Investor loyalty	Low	6.00
Employee loyalty	Medium	9.00
What is the extent of Business Risk arising from the following sources:		
Business Risks		
Business process is new	Low	2.25
Dependency on other projects	Low	1.50
Management capability for implementation and operation of the project	Low	1.50
Users' culture and receptiveness to the project	Low	1.50
Scope and complexity of business change required for the project	Low	2.25

Total Scores	
Expected Business Benefits (Sum of Expected Business Value Scores)	125.00
Expected Business Risks (Sum of Expected Business Risk Scores)	9.00
Total Expected Business Value [(Sum of Expected Business Value Scores)/ (Sum of Expected Business Risk Scores)]	13.88

Technical Profile – Project 2

Expected Technical Value Profile		
	Response (None = 1, Low = 2, Medium = 3, High = 4)	**Score** (Response x SIS)
What is the Positive Impact of the Project on the following Expected Technical Benefits:		
Expected Technical Benefits		
Ability to launch new information-based products and services	Low	6.00
Faster implementation of a new project	Low	6.00
Cheaper implementation of a new project	Low	6.00
Less risk to implement a new project	Low	6.00
Expansion of the range of possible IT initiatives	Medium	9.00
Improved product stability	Low	6.00
Increase in operational uptime	Low	6.00
Reuse across other products	Low	4.00
Reuse across other clients	Medium	9.00
Standardization of IT products	Low	6.00

What is the extent of Technical Risk arising from the following sources:		
Technical Risks		
Project size	Low	2.25
Experience with technology	Low	1.50
Project structure	Medium	2.25
Project source	Low	2.25

Total Scores	
Expected Technical Benefits (Sum of Expected Technical Value Scores)	64.00
Expected Technical Risks (Sum of Expected Technical Risk Scores)	8.25
Total Expected Technical Value [(Sum of Expected Technical Value Scores)/ (Sum of Expected Technical Risk Scores)]	7.75

Project Profile – Project 2

Project Profile	
Project	
Business Manager	
Technical Manager	

What is the NPV of the Project?			*NPV of the project should be filled in only if it is available.*		
Total Expected Business Value [(Sum of Expected Business Value Scores) / (Sum of Expected Business Risk Scores)]	**13.88**				
Total Expected Technical Value [(Sum of Expected Technical Value Scores) / (Sum of Expected Technical Risk Scores)]	**7.75**				

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