# Voice-Over-Internet Protocol (VOIP) Cost Efficiencies And The Decision To Implement

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**ABSTRACT**

*The following study will discuss the quantitative and non-quantitative methodologies applicable to the cost and profitability of VoIP in the business environment. Furthermore, the study will examine recent regulation topics surrounding VoIP technology and provide examples of current applications.*

## INTRODUCTION

Like many improved efficiencies in the business environment, Voice-over-Internet Protocol (VOIP) technology can be measured both quantitatively and non-quantitatively. The best way to measure the quantitative function of cost efficiencies remains through Activity-Based Costing (ABC). ABC has become a prevalent cost method for many manufacturing and production industries since its inception. In addition, it has gained exposure in the service industry over the last decade. Despite popular opinion, service companies are ideal candidates for ABC due to their minimal amount of direct materials. They maintain a high level of fixed costs based on personnel who provide indirect support to products and customers.[1] Fortunately, cost efficiencies from VoIP implementation apply to both manufacturing and service organizations.

Non-quantitative attributes are harder to measure than quantitative. As a result, they tend to provide confusing conclusions. Improvements not significantly increasing companies bottom-line are viewed as a poor investment decision when in fact they may improve efficiency. Such capital expenditures are best measured with a scorecard approach which reflects "cause and effect" relationships.

The following study will discuss the quantitative and non-quantitative methodologies applicable to the cost and profitability of VoIP in the business environment. Furthermore, the study will examine recent regulation topics surrounding VoIP technology and provide examples of current applications.

## VOIP SYSTEMS AND ABC METHODOLOGY

After weighing the initial application issues, it is time to compare numbers. The most efficient method to ascertain the total cost of traditional PBX (Private Branch eXchange) networks compared to VoIP systems is through ABC. The ABC methodology singles out cost structures per task allowing a net result from numerous tasks to be identified. Through this identification process, efficient and effective operations are determined. As a result, only profitable decisions are implemented.

This paper will focus on the decision to implement VoIP and the best techniques used to measure its efficiencies. An objective must be established in order to implement an activity based system followed by the appropriate steps.

When implementing a VoIP system, management's goals are normally as follows:

- Establish an effective process to calculate the overall cost of the current PBX network and compare to the expense of implementing a VoIP network.
- Core segments traceable to the PBX network include: total number of employees engaging in long-distance calls, average long-distance charge per call, and the average number of long-distance calls made on an annual basis.
- Supporting activities applicable to PBX long-distance calls include: annual labor costs, additional hardware expenses and the tax shield provided from high capitalization costs from a traditional PBX network.
- Core segments traceable to a VoIP network include: total number of users and the annual cost per user for an IP telephone.
- Supporting activities applicable to a VoIP installation include the opportunity cost associated with giving up additional depreciation from the traditional PBX system and the assumption that technology obsolescence will occur faster in VoIP installations than in more established traditional networks.
- The objective of the analysis is to compute the cost and profitability ramifications associated with scrapping the current PBX system for a VoIP network.
- Note: assume no other capital expenditures will occur in the given year.[2]

General steps utilized in this problem include: (1) identify cost drivers; (2) monitor and record all material activities and time allocated to each cost; (3) implement strategy; and (4) measure results and develop conclusions.[2]

Due to the elimination of long-distance phone charges, many companies see an immediate benefit to their net income. Obviously, results very depending on the structure and logistical position of company locations. Firms spread out in different states, regions, and/or countries achieve savings through inter company communications, whereas, other firms with high volume long-distance calls associated to sales may reap more benefits from daily business operations.

Why are all companies not jumping on the VoIP bandwagon? After all, the savings from the reduction of long-distance calls provides adequate justification. One of the most challenging problems companies face with the decision to implement VoIP technology deals with the high level of sunk costs already associated with their PBX network.

Many companies feel they need to fully depreciate their traditional PBX systems before incurring additional expenses on a new system.[3] Exhibit One exemplifies the decision affecting many companies today. Furthermore, Exhibit Two provides a general picture of an investment in VoIP as opposed to circuit-based telephony.

Just as many firms are struggling with the decision to implement VoIP technology (Exhibit Three), many businesses struggle with the decision not to implement VoIP. For these companies, VoIP is an excellent solution to old PBX systems needing expensive replacement and hefty maintenance contracts. For them, the new technology costs only a fraction of the technology it is replacing.[16]

## THE BENEFIT OF VOIP (BALANCED SCORECARD APPROACH)

Additional benefits from VoIP implementation occur from reduced administration costs as a result of employee moves, additions, and changes. Although these are more subjective and less quantitative in nature, they are equally as important as other tangible capital expenditures. Like many non-quantitative features, VoIP can be measured best with a balanced scorecard approach (BSC). The process enables users to identify and measure factors critical to business needs not easily measured under traditional cost accounting methods. It examines lead and lag indicators by measuring drivers and outcomes. Some research suggests future profit (lag indicator) is actually greater when performance drivers (lead indicator) are expressed in non-financial terms.[17]

**Exhibit One**
**Assumptions of an Investment in VoIP**

**General Assumptions**

Four offices/locations
$\Sigma$ of 400 employees
Ave. long-distance charge per call is $0.40
Ave. duration per call approx. 12 minutes
Each employee averages 60 calls per month
Ave. VoIP network costs $1,000 per user

**Implementation Assumptions**

| | | |
|---|---|---|
| PBX | **Fixed Costs** | |
| | Initial Cash Outlay $200,000 | Depreciation = $35,000 + additional depreciation |
| | Labor Cost $120,000 | associated with a PBX system. |
| | Hardware Cost $40,000 | |
| | **Variable Costs** | |
| | 400 employees x 45 calls per month x $0.40/call = $7,200/month or $86,400 annually | |
| | Total cash outlay = $446,400 | |
| VoIP | **Fixed Costs** | |
| | Initial Cash Outlay $120,000 | Depreciation = $35,000 (no additional depreciation |
| | Labor Cost $50,000 | is associated with VoIP system. |
| | Hardware Cost $15,000 | |
| | **Variable Costs** | |
| | $1,000 cost per user x 400 employees = $4,000 annually | |
| | Total cash outlay = $189,000 | |
| Othe Variables | Perpetual Revenues = | Problem assumes no additional debt; therefore, |
| | Corp Operating Exp = $65,000 | no additional tax shield occurs from debt/equity |
| | Company Tax Rate = 34% | capital structure changes. |
| | Discount Rate = 5% | |
| | Inflation = 3%. | |
| | Life of Traditional PBX = 10yrs | |
| | Life of VoIP = 4yrs | |
| | No salvage values reflected | |
| | PBX systems are usually capitalized over 10 yrs. | |

15 & 13

Like traditional budget goals, the scorecard approach maintains incentives. The difference between the two lies in the measuring stick. Under the scorecard approach, goals are met by maximizing key performance indicators (KPI). These can be based on industry benchmarks, cost-to-income ratios, free cash flow, economic value added, and return on capital. This aspect differs from traditional budgets because they are not based purely on financial performance.[18]

**Exhibit Two**
**The Financial Aspect of an Investment in VoIP**

| Yrs | Cash Outlay | Gross Profit | Operating Expenses | After Tax NCF | PVIF 5% | P | PBX Purchase | CCA Tax Rate @ | Tax Shiel |
|---|---|---|---|---|---|---|---|---|---|
| 0 | (446,400) | | | | 1.0000 | (446,400 | 446,40 | 111,600 | 37,944.00 |
| 1 | | 125,000 | 65,000 | 60,000 | 0.9524 | 57,144 | 334,800 | 83,700 | 28,458.00 |
| 2 | | 125,000 | 65,000 | 60,000 | 0.9070 | 54,420 | 251,100 | 62,775 | 21,343.50 |
| 3 | | 125,000 | 65,000 | 60,000 | 0.8638 | 51,828 | 188,325 | 47,081 | 16,007.63 |
| 4 | | 125,000 | 65,000 | 60,000 | 0.8227 | 49,362 | 141,244 | 35,311 | 12,005.72 |
| 5 | | 125,000 | 65,000 | 60,000 | 0.7835 | 47,010 | 105,933 | 26,483 | 9,004.29 |
| 6 | | 125,000 | 65,000 | 60,000 | 0.7462 | 44,772 | 79,450 | 19,862 | 6,753.22 |
| 7 | | 125,000 | 65,000 | 60,000 | 0.7107 | 42,642 | 59,587 | 14,897 | 5,064.91 |
| 8 | | 125,000 | 65,000 | 60,000 | 0.6768 | 40,608 | 44,690 | 11,173 | 3,798.68 |
| 9 | | 125,000 | 65,000 | 60,000 | 0.6446 | 38,676 | 33,518 | 8,379 | 2,849.01 |
| 1 | | 125,000 | 65,000 | 60,000 | 0.6139 | 36,834 | 25,138 | 6,285 | 2,136.76 |
| | | | | Total Present Value of Cash Flows | | 16,896 | | | |
| | | | | Total 10yr Tax Shield from Depreciation | | | | | 145,365.72 |

**Exhibit Three**
**The Decision to Implement VoIP Technology**

**Cumulative 10 yrs effect on earnings**

**Ignoring the Tax Shield from the PBX System by adopting a VoIP Network**

| | |
|---|---|
| Gross Profit | 1,250,000 |
| Less: | |
| Operating Exps | (650,000) |
| Depreciation Exp | (350,000) |
| Interest Exp | (150,000) |
| NI Before Tax | 100,000 |
| NI After Tax | 66,000 |
| Cash Flow | 566,000 |
| NPV | 16,896 |
| EAC | (1,921) |

**Utilizing the Tax Shield from the PBX System**

| | |
|---|---|
| Gross Profit | 1,250,000 |
| Less: | |
| Operating Exps | (650,000) |
| Depreciation Exp | (495,366) |
| Interest Exp | (150,000) |
| NI Before Tax | (45,366) |
| NI After Tax | (29,941) |
| Cash Flow | 615,425 |
| NPV | 274,304 |
| EAC | (72,739) |

The tax shield from the additional PBX depreciation is not utilized if the company elects to scrape the PBX system and adopt the VoIP system. This attribute not only affects NI, but also plays an important role on cash flows and tax liabilities.

If adopted, the VoIP system would be treated as a substitution acquisition. Since we assume the traditional system possesses little or no salvage value, the difference between the old equipment's basis and accumulated depreciation would result in a loss. As a result, the depreciation would not serve as a continuous annual tax shield. [29]

Another aspect companies must examine deals with the unequal lives of each system. The PBX network will undoubtedly function longer than the VoIP network because of the traditional technology already utilized. We will assume the following:

- The PBX system has a zero salvage value but will last for 10 more years.
- Due to the fast pace nature of change in the IP telephony industry, the VoIP system will only last 4 yrs.

Real Discount Rate = 1.055% - 1 = 2.40%
1.030%

Per financial comparison only (excluding non-quantitative benefits) the effective annual cost of the PBX system remains a better deal even though it's implementation costs are higher. The company can utilize the system six additional years compared to the VoIP. Obviously, this example depends greatly on the forecast of future change in both networks and the IP industry in general.

The following charts compile non-quantitative benefits of IP telephony deployments realized through the measurement of KPI's. Further considerations of these benefits are examined in the paragraphs following the chart displays. The data originated from respondents to a 2003 Sage Research survey and a 2003 IDC survey of Siemens customers on contact center and mobility costs.

**Exhibit Four**
**Non-Quantitative Benefits of IP Telephony Deployments**

| Realized Benefits | % of Respondents Receiving Benefits | Aveerage Benefit Experienced |
|---|---|---|
| **IT Benefits** | | |
| Time saved in moves, adds & changes. | 72% | 1.5 hrs/ move |
| Time saved in opening new office. | 55% | 3.8 weeks/ new office |
| IT staff time saved due to reduced user training. | 43% | 5.5 hrs/ week/ IT employee |
| Time saved from eliminating IT travel. | 42% | 13 hrs/ mth/ IT employee |
| **Non-IT Benefits** | | |
| Easier moves, additions & changes/ employee move. | 71% | 3 more moves/ year |
| Time savings from advanced voice mail features. | 50% | 3.9 hrs/ week/ emplyee |
| Time savings by extending system features to remote office employees. | 48% | 4.3 hrs/ remote employee |
| Time savings by extending system features to telecommuters. | 47% | 5 hrs/ week [15] |

| Contact Center Results | Average (%) |
|---|---|
| Agent/supervisor productivity increase | 15% |
| Network-related expenses savings | 5% |
| Customer satisfaction/loyalty increase | 8% |
| Sales from cross-selling and up-selling increase | 10% [28] |

| Mobile Office Results | Average (%) |
|---|---|
| Savings from executive accessibility during travel | 2% |
| Employee productivity increase | 10% |
| Teleworker productivity increase | 18% |
| Employee retention rates increase | 20% [28] |

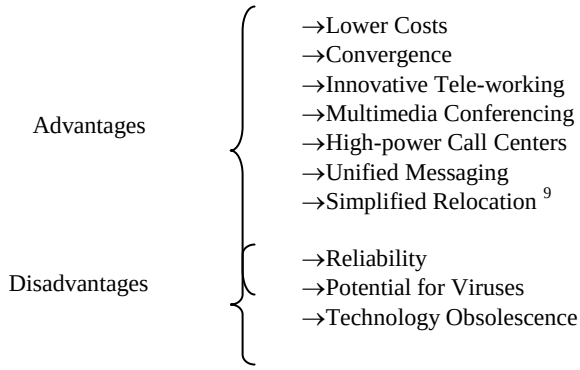
The following KPI's possess characteristics which enable companies to measure them quantitatively and non-quantitatively. Lower costs and convergence pertain strictly to dollar reductions from long-distance charges and consolidated networks. However, the remaining positive and negative aspects associated with VoIP implementation can be measured based on the reduction of employee hours, logistical costs, training expenses and the elimination of administrative technical aid. As a result, a BSC approach in addition to financial estimates remains the best way for businesses to value a VoIP implementation.

**Lower Costs**

Perhaps the easiest sell for VoIP systems remains their ability to save corporations money. Unlike many of VoIP's benefits, cost savings is quantitative in nature. There are several ways in which cost savings occurs. Most savings stems from the ability of offices geographically located in different states or countries to communicate with one another without incurring long-distance fees. As we discussed earlier, this benefit occurs because traditional circuit switches do not carry the electronic signal. Instead, the signal travels through a web based connection and is

reassembled at the termination point. Electronic signals travel over the web free of charge the same way e-mail is delivered. Since VoIP is classified as information or data service as opposed to communication service, no charge is incurred. (See the "regulation issues" section for additional discussion).

**Exhibit Five**
**Key Performance Indicators Applicable to VoIP**




Additional savings stems from the elimination of service lines as well as administrative repair and maintenance. Most businesses with 20 or more lines on a PBX network lease a T1 line for their voice network, as well as a separate T1 line for Internet access. VoIP eliminates the need for the second T1 line which can significantly reduce costs. [6] In addition, administrative expenses are cut allowing IT departments to focus time and money on other advancements. IT staff can manage a single network infrastructure from one data center as opposed to maintaining two or three different networks.[11] Since the connection is tied to the individual and not the circuit, companies no longer have to commit maintenance costs when a new employee is added or an existing one transfers offices. The end result is a virtual PBX system without local hardware investment or maintenance. [6]

**Convergence**

The future of IP networks lies in the convergence of a variety of applications. These include IP telephony, audio conferencing, videoconferencing, unified messaging, and presence technologies (i.e., "chat" capabilities). The basic idea behind convergence is the ability to consolidate several network platforms. Traditionally, companies were forced to pay for two different networks; one for voice capabilities and another for data systems (i.e. IBM is expected over the next five years to reduce voice/data communications by 25% due to the implementation of a global VoIP network). IBM's efficacy will stem from the reduction of the number of PBX switches from 900 currently in use to just two IP-based platforms. [11]

In the interim, many companies are enjoying a hybrid system which features both traditional PBX systems and VoIP capabilities. The advantage they sustain can be viewed through the slow reduction of costs associated from jumping to VoIP networks. In addition, many companies postpone VoIP implementation to salvage capital invested in traditional networks. Slow integration facilitates the technological benefits of VoIP while relying on the backup of PBX networks if a security scare enters the picture.[11]

**Innovative Tele-Working**

Employees today are less tied to their offices than their predecessors. The mere introduction of the cell phone has altered the way business is performed. The future will include even more change. IP networks enable employees to set up call lists including multiple phone numbers so calls to a VoIP number can automatically follow them to their desired location or office. [6] This feature also facilitates the use of call capabilities available on desk phones.[19]

The same control can be used to block or screen unwanted calls from specific numbers. Faxes can be converted into voicemail and vise versa. Mobile employees possessing internet access can turn their laptop into an office with the same advanced features. Since VoIP systems do not require a special phone, calls from a customer can be forwarded to an employee's cell phone without disclosing the number.[6]

**Multimedia Conferencing and High-Power Call Centers**

Cost saving is not the only benefit from IP networks. Increased productivity can improve a company's bottom line just as significantly as cost efficiencies. VoIP enables multiple users to communicate via voice and video.

Furthermore, they can still use data sources consisting of spreadsheets and financial statements. For instance, accountants separated by seas could visibly work together to solve tax problems. Board meetings could occur in real time without leaving the office. This feature not only allows a constant flow of data but also maximizes time efficiency.[9]

Call center operators are able to provide focused assistance to customers through improved time efficiencies. Operators can simultaneously access and distribute customer information (i.e. account history, credit information, inventory and shipping data) at the exact moment the call/inquiry is received into the network.[9]

**Unified Messaging**

Due to the nature of the electronic digitalization, all types of communications can be transformed into the desired output. Voicemail can be converted into text using voice recognition software the same way an e-mail can be converted into a voice message. As a result, users are able to organize and prioritize messages in a manner suiting their needs.

Furthermore, storage mechanisms are improved with the ability to convert voice to text and vise versa. Further advantages are viewed through the ability to consolidate all types of messages into one unified mailbox. This attribute reduces the limitation of only receiving e-mail through a computer, voicemail on the phone, and faxes through fax machines.[9]

**Simplified Relocation**

The process of relocating an employee within the firm is simplified with the use of VoIP technology. Mapping extensions, re-programming call-handling features, activating new phone sets and re-customizing employee configurations are eliminated with VoIP technology. All configuration data is tied to the employee rather than the office network or physical extension. As a result, all modifications can be made through the network. In addition, cost benefits exist due to the lack of IT support needed to perform modifications.[9]

According to Nemertes Research, an independent research firm which specializes on the impact of IT technology, companies on average can save over $100,000 in annual costs associated with employee relocation with IP telephony systems. The firm surveyed 100 companies with average IT budgets of $10,000,000. They found employees move an average of 0.87 times per year at an estimated $100 per move. Therefore, a company with 1,200 employees could expect to save $104,400 in annual costs.[15]

**Reliability**

Most individuals who utilize the internet have experienced failures while browsing the web. If web browsers can experience trouble, so can VoIP users. Failures are attributed to traffic surges to a particular IP address. Hence, the network is usually to blame.

In fact, according to Jed Stafford, president of INET Pricing, the T1 lines used for PBX systems are identical to those used for Internet access. Both have a failure rate of less than 0.01%. However, this fact does not defer worries associated with high traffic volumes.[6]

**Viruses**

VoIP traffic faces a greater security threat due to several factors. First, the signaling information which establishes the IP call and the voice digitalization run on the same network. This function differs from PSTN technology where the signal information is carried on a network physically separate from voice signals. Secondly, an IP phone can become an access point to a network, unlike legacy systems. This characteristic enables hackers to capitalize on security breaches and subject the network to viruses, denial-of-service, fraud, eavesdropping and potential impersonation.[20] However, according to Phil Edholm, CTO and VP of network architecture at Nortel, virus exposure depends on the type of device the phones use to operate. IP phones range from simple interfaces and minimal displays through HTML/XML capabilities, to PDA's and PCs.[21]

IP phones should not individually require anti-virus protection as long as they are not able to download files from the Internet. The future of IP phones stems from Session Initiation Protocol (SIP) and Extensible Markup Language (XML), which prohibits phones from downloading files directly off the Internet. Instead, SIP applications come from vendors with IP-PBX systems or from an operating system such as Microsoft. According to Edholm, "a quality implementation of an IP phone would assure any XML data could not execute and run in the device or impact the protected structure (i.e. applications software, OS, data, parameters, etc.)." Still, when IP telephony networks connect to PDA's and cell phones the potential for viruses increases (i.e. people can download ring tones and game applications to phones and PDA's). It only takes one injection of a virus into the system to spread throughout a network. As a result, any device with additional connections other than to a central server such as a corporate network must be protected with anti-virus technology.[21]

**Technology Obsolescence**

Although not currently outdated, VoIP applications appear to have a relatively short shelf life. It took approximately five years for initial applications to become dated. However, demand has increased drastically along with the number of companies competing for market share. As a result, the more technology improves the shorter the shelf life.

Paul Saffo, at Silicon Valley's Institute for the Future, believes the entire notion of a phone call will cease in ten years. His beliefs are based on a new concept of IP ports. One day you may be able to simply click on an icon and talk. No direct signal would be started and stopped. As a result, the direct line would always remain open.[22]

The concept of obsolescence is not new to the digital age. Almost daily companies mass produce better technology and improve on past capabilities. One thing is certain, companies can expect current VoIP applications to change must faster than the amount of time it took traditional networks to update to VoIP. Companies must be aware of potential costs associated with these changes and be prepared to incur them once they have switched away from traditional networks.

## SUMMARY PER REVIEW OF IMPLEMENTATION DECISION CRITERIA

Based on the assumptions viewed in the above problem, a company with similar circumstances may or may not keep their traditional PBX network. Despite a higher net present value, the VoIP technology is still open to significant change (i.e. shorter useful life) which leads to a higher effective annual cost.

Furthermore, additional depreciation can be utilized with the traditional PBX network which reduces taxable income and increases cash flow. For this reason, it remains logical to rationalize why many companies have not immediately jumped into VoIP technology. This said, many companies weigh the non-quantitative benefits and decide through a BSC model to implement the technology. The objective of the problem was to subject the reader to the gray areas of capital expenditures and illustrate both quantitative and non-quantitative measuring methodologies.

## LITIGATION/LEGISLATION ISSUES

During the planning process of this paper, the fate of VoIP technology was undetermined. Many businesses and consumers wondered whether or not the government and/or states would implicate taxes on IP telephony due to its resemblance of communication services as opposed to data services. However, a November 2004 decision by the FCC to enable VoIP services to grow free of "patchwork" from regulations and taxes facilitated further growth of the technology. The FCC ruled 5-0 that calls made over the Internet were regulated by the FCC, and therefore cannot be regulated by states.[23] Interest in the topic has risen as the number of users continues to soar.

By October 2004, 22% of Americans or 63 million people had broadband connections that facilitate VoIP services.[6] Under the current law, VoIP is classified as "information service" and is exempt from rules governing the telecommunications industry. This definition was the result of the 1996 Telecommunications Act. As a result, the service is not taxed like traditional telephone services.[9] The FCC's decision occurred due to Minnesota phone regulators attempts to impose regulations on Vonage Holdings Corporation of New Jersey. They wanted Vonage to register its rates, provide 911 services and meet other requirements.

It remains an obvious position that Internet be categorized as an interstate service. Unlike many services it is not bound by logistical distances. As a result, the FCC acts as the pre-eminent regulator. According to FCC Chairman Michael Powell, "the genius of the Internet is that it knows no boundaries. In cyberspace, distance is dead."[23]

Critics of the decision focus on the lack of state revenue generated from traditional PBX systems as companies and individuals switch to VoIP. Two major consumer groups believe the FCC failed to address enhanced 911 and universal service issues with their recent decision. They point out VoIP's failure to produce a 911 equivalent compared to traditional phone networks. In addition, they exclaim universal service, which acts as a subsidy from revenues generated on traditional long-distance phone service, will not be able to cover charges to remote areas that otherwise cannot receive service.[23]

## CURRENT APPLICATIONS OF VOIP TECHNOLOGY

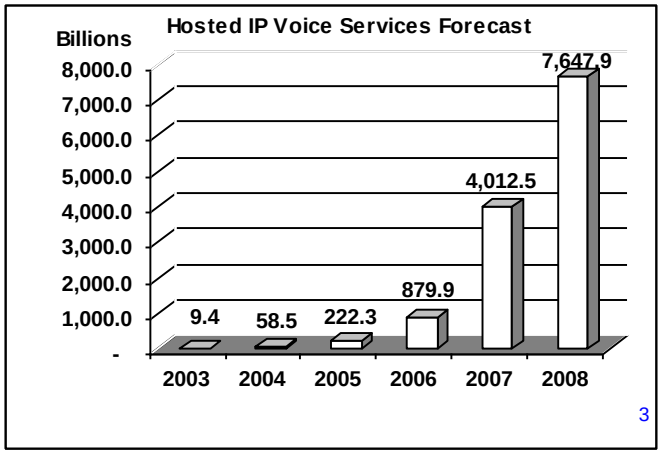
The market appears to be dictating demand for VoIP technology. Economists can approximate when and how much; however, the determining factor for capital implementation occurs when businesses start purchasing. The evolution for corporate VoIP technology occurs in three stages. First, the company must enable the underlying data network to ensure voice security and QoS. Second, it must plan for the equipment necessary to facilitate a VoIP network. Lastly, it must begin the adaptation toward new software applications used in IP telephony.

According to a cooperative survey between AT&T and Economist Intelligence Unit, the majority of 254 senior executives from worldwide corporations predict the eventual implementation of VoIP into their business strategy. Forty-three percent of respondents acknowledged they were using or testing VoIP technology in 2006. Another 18% believed they would implement the networks long-term. This evidence provides validity to research from Gartner Dataquest, which predicts retail voice revenue from PSTN will slowly decline through 2008, while

VoIP revenues will ascend by 38.6% over the same period. The question is no longer if, but when VoIP will become the new standard for voice technology according to Cathy Martine, AT&T's senior vice president of Internet telephony.[24]

The following chart displays the actual and estimated IP voice service revenues forecasted through 2008.

**Exhibit Six**
**Actual and Estimated IP Voice Service Revenues Forecasted through 2008**




Further verification stems from the high number of corporations currently implementing the technology. Recently, Cisco Systems sold over 200,000 IP phone installations in a 90-day period to Boeing and Ford Motor Co. Boeing's installation will involve 150,000 IP phones scheduled over the next five to seven years. The implementation will replace approximately 125 circuit-based telephone switches.[25] Ford's implementation will affect over 50,000 users in 110 Ford facilities over the next three years.[3]

Other projects during this decade include Bank of America, which first began their VoIP installation in 2002. Upon completion of their project (which is over a multi-year period), they will have purchased 180,000 IP phones involving installations in 5,800 locations across the United States.[26] Not-for-profit agencies are also jumping on the cost savings bandwagon. The Minnesota Department of Labor and Industry first purchased 300 IP telephones from Cisco in 2000 for $435,000, which eventually reduced their monthly phone bill by more than $10,000 per month.[26]

## CONCLUSION

Like many improved efficiencies in the business environment, VoIP technology can be measured both quantitatively and non-quantitatively. The best way to measure the quantitative function of cost efficiencies remains through activity-based costing (ABC). However, non-quantitative attributes are harder to measure than quantitative. As a result, they tend to provide confusing conclusions.

Improvements not significantly increasing companies bottom-line are viewed as a poor investment decision when in fact they may improve efficiency. Such capital expenditures are best measured with a scorecard approach which reflects "cause and effect" relationships.

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