

Engineering Management Field Project:
A Pragmatic Business Analysis Model for Telecom Operators

By

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Master of Science

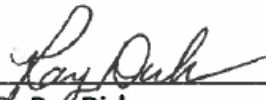
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To my family and friends, your love and support made this possible; thank you!

To all, as you read this report, remember the quote by Johann Wolfgang von Goethe: "knowing is not enough, we must apply!" This quote was the mantra throughout this research. My sincere hope is that this work can be knowledge worth applying in your organization; enjoy!

For questions or comments related to the material presented in this research, please email the author (Eric Kwete) at PBAM4TELECOM@gmail.com.

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Executive Summary

It was July 2008, in a conference room at the headquarters of CLEC Telecom that the idea for this research was conceived. I was meeting with my new boss, Sunil Bhojwani, to understand the team's *raison d'être* and determine my new role in meeting the team's objectives. Mr. Bhojwani was a visionary manager; he wanted to be able to manage his unit as though it was his own business, working to reduce cost and make the unit profitable. This would in turn guarantee that the unit's activities aligned with the overall corporate strategy to reduce cost. What was missing was a pragmatic framework; this is where the research comes in.

The idea to manage a business unit with full Profit/Loss responsibility down to the line manager's level is a straightforward strategy to conceive but not so much to execute. The lack of supportive documentation to assess the impact of the team's activities *vis-à-vis* the company's strategy presented a challenge. How are the team's core activities impacting the bottom line? Is the team's strategic plan justified? Or is the resulting savings a drop in a bucket? These concerns could not be accurately address using pure operational data; there was need for a better approach.

For example, reporting the number of T1s disconnected monthly would not be an accurate measure of savings because of T1 cost variability – A T1 can cost anywhere from USD 3.00 to USD 4,000.00 monthly. How can the impact of a T1 disconnect activity be appraised pragmatically?

The standard financial reports are too vague, as is the team's interpretation of them. What is needed is a new framework with better metrics. Metrics that could capture operational as well as financial information to better reflect the team's financial impact. There was need for a new way to view the business and that is the essence of this research project – to develop a Pragmatic Business Analysis Model (PBAM) for telecom operators.

This report is a blend of theoretical research and empirical learning that resulted from the implementation of PBAM at CLEC Telecom. The model is primarily geared towards line-level managers but the benefits can be realized throughout the vertical management chain.

The research spanned multiple semesters, starting in the fall of 2008 and concluding in the spring of 2010. Much of the study revolved around empirical learning through data collection, analysis, monthly reporting, and continuous improvement of the model. Focus was on the usefulness of the proposed metrics to assess the business impact of an operational unit.

The research project was a tremendous success. CLEC Telecom line managers use PBAM to manage their unit as though it was their own business. It has boosted confidence and determination in tactical project management of cost saving initiatives. Strategic planning can now be performed at a level where the execution of it is required! PBAM infused the organization with a sense of financial accountability and ownership down to the line manager and individual contributor levels.

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Chapter 1 – Introduction

This chapter provides an overview of the project, scope, and purpose. CLEC Telecom Pragmatic Business Analysis Model (PBAM) – bridging the gap between Finance and Operations – is a means to unleash the prowess of the line manager by unlocking their unit’s potential. This is achieved by introducing metrics that will capture financial as well as operational information for a complete business view.

Project Scope

This section articulates the scope of the project. A PBAM must provide:

1. A common language for strategic goal setting
2. A unique and unified view of the business
3. Flexible root cause analysis with aggregation or disaggregation abilities
4. Actionable Key Performance Indicators (KPIs)
5. Clear ownership and accountability for strategic intent and results

Problem Statement

Managers across the company face an incredible dilemma: how to manage a unit with full financial and operational accountability?

This fundamental dilemma brings about questions that managers can not readily address with factual correctness – the kind backed by data or statistics.

It is like playing NFL football without knowing if or when the teams scored, or let alone know when the competition ran havoc on the defense. It would be a terrible way to set strategic goals or compete if the end of the season was the only time teams glimpsed at their performance.

In the corporate world, this somber realization happens at the end of a quarter or the year. Even then, there is no efficient way to tie the company's performance to specific managerial units or tactical decisions. Therefore, root cause analysis for profitability becomes a daunting task; one that most business units shy away from.

At best, this situation enables reactive mode management instead of a more pro-active approach in which the line manager knows and is in charge of where the ship is sailing.

How does a line manager know if his/her unit is profitable? How can he/she help the company cut cost? How does he/she prioritize day to day activities based on profitability? Should he/she backfill a position? What about those yearly performance plans? And finally, does his/her unit add value to the bottom line?

Without access to financial data, especially a correlation of operational data with financial indicators, management tends to preach the same remedy for every problem: do what is best operationally and all will fall in place. Sort of like the man with the hammer syndrome who approaches every problem as a nail. This may be a successful approach operationally, but may not necessarily translate to profitability for the business.

Furthermore, without an understanding of how a unit impacts the bottom line, strategic planning becomes a paralytic exercise rather than a process to be synergized.

This research will attempt to bridge the gap between Finance and Operations, unveil a way to manage business units as potential profit or loss drivers, and explore the management philosophy that would best support it. The study will focus on the VoIP business of CLEC Telecom – a Competitive Local Exchange Carrier (CLEC) in the United States. The methodology can be applied to other business units.

Project Significance

The main goal of the CLEC Telecom PBAM is to develop a unified view of the VoIP business through the use of actionable Key Performance Indicators (KPIs). It will provide a paradigm shift in management by providing actionable metrics that will serve as the common language for strategic goal setting and performance assessment.

Ultimately, PBAM will restore a sense of accountability, responsibility and ingenuity for management – especially, the front line managers.

Primary focus will be given to rendering financial data, usually presented at the executive level, meaningful to lower management and employees; ultimately, empowering line managers to run their units as though it was their own business.

The PBAM platform will resemble a dashboard or scorecard with drilldown capabilities on KPIs pertinent to specific audiences across the organization. It will help mend disconnects that exist between high level financial reports (e.g. Operating Income Before Depreciation and Amortization (OIBDA)) with unit's operational output or quality initiatives.

Finally, the CLEC Telecom implementation of PBAM will improve the efficiency of capital management at CLEC Telecom.

Project Limitation

PBAM implementation at CLEC Telecom focuses on strategic execution linking operational activities with financial indicators. Compared to the balanced scorecard (which has four distinct perspectives), PBAM ties appropriately with the financial perspective. The metrics introduced within the PBAM framework can be leveraged to tie into the customer, process/internal, and learning/growth perspectives of the

Balanced Scorecard but that is beyond the scope of this research. For this research, focus is on the financial perspective.

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Chapter 2 – Literature Review

This section of the report explores notable work related to the implementation of PBAM. The material was used as theoretical background and/or reference for the research.

Industry

This section contains literature related to the telecom industry in general, understanding the market, and dynamics that shape it.

The Telecom Factbook, Second Edition by Joseph Pecar and David Garbin presents a well-written summary of the history of voice services in the United States. The authors dedicate a portion of the introduction to run through the major regulatory decisions that have shaped the telecom market in the United States. The brief history takes us from the days of monopoly with AT&T to the current marketplace that is open to competition. The authors provide insight into the events leading up to AT&T's agreement to restructure through the "*Modification of Final Judgment (MFJ)*", which was approved by U.S. District Court Judge Harold Greene in August 1983, and became effective January 1, 1984." (Pecar and Garbin 2000) Figure 2.1 provides a summary of the resulting map after the act of 1984; it depicts seven Regional Bell Operating Companies (RBOCs). RBOCs were further broken up into Bell operating companies for a collective total of 22. The authors also provide information into the types of exchange carriers. Figure 2.2 titled "classification of local exchange carriers" (Pecar and Garbin 2000) summarizes this discussion.

The telecommunication industry is now heavily regulated. It is regulated at two fronts: federal level through the Federal Communications Commission (FCC) and state level through the Public Utility Commission (PUC). Part of the regulation surrounds auditing tariffs to make sure the prices are justified. For in depth understanding on the history and current market state, please refer to the book.

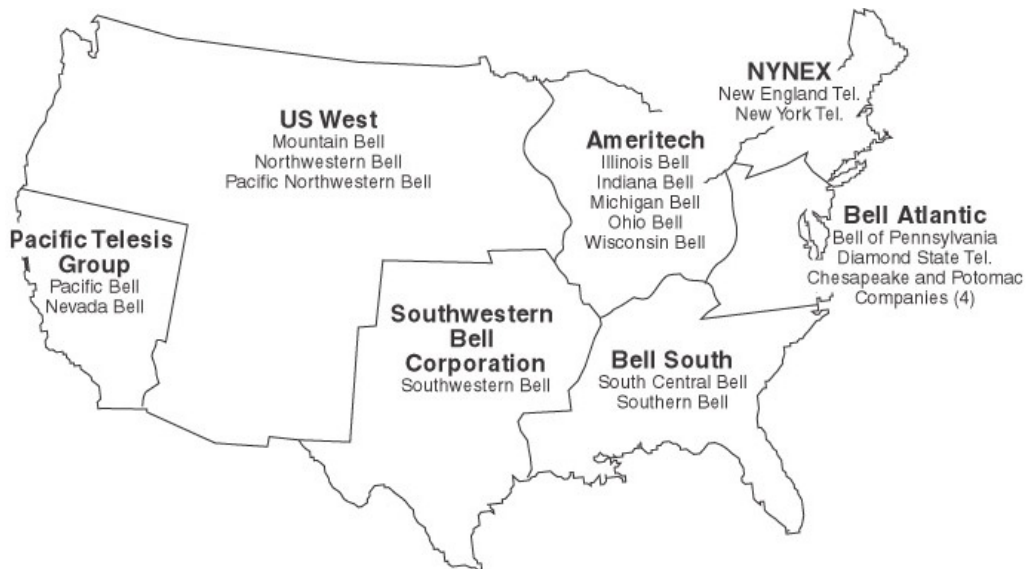


Figure 2.1 – The result of 1984 Act, Regional Bell Operating Companies

LECs – All Local Exchange Carriers	
ILECs – Incumbent local exchange carriers (providers of exchange service as of the date of enactment of the Telecom Act).	CLECs – Competitive local exchange carriers (companies which began providing alternative exchange service to an area in competition with an ILEC).
BOCs – Bell Operating Companies (22 specific telephone companies created from the divestiture by AT&T of the Bell System in 1984).	ITCs – Independent (non-Bell) telephone companies (some were incumbent LECs with their own franchised territory at the passage of the Act). Competitive LECs also fall into this category, but the term CLEC is most often used to describe the new companies.

Figure 2.2 – “Classification of Local Exchange Carriers” (Pecar and Garbin 2000)

The Telecom Management Crash Course book presents a business oriented view of the telecom industry. It was written by P.J. Lewis. The content is organized to be used as a crash course to understanding the forces that are driving the changes. Focusing on market dynamics, customer trends, and challenges faced by service providers. It presents a unique view from each of the players in the industry.

“The overall telecom marketplace can be classified as retail and wholesale. The retail business space includes companies that sell directly to the principal users of their equipment and services. The wholesale business space includes companies that sell equipment or services through at least one other party.” (Lewis, Telecom Management Crash Course 2002)

According to the author, the wholesale market can be divided further into vendors and carriers. Vendors provide equipment while carriers provide service. CLEC Telecom would be regarded as a wholesale carrier. The author also goes into the type of services that can be provided by the wholesale carrier and does a very good job in presenting the concept with supporting visual material for illustration. Overall, the Telecom Management Crash Course book provided a great deal of insight into the business aspect of telecommunications.

Cost Management

Telecommunications Cost Management by S.C. Strother provides literature regarding cost management for the telecommunications industry. It provides a comprehensive look at the type of cost associated with different telecom services and how a company can proceed with audit efforts aimed at reducing cost. Although it is geared towards retail telecom customers, it provides fundamentals that can be leveraged and applied at the wholesale level. The author presents “a simple step-by-step method for performing a complete audit of all your telecom services.” (Strother 2002) It is a guide to understanding telecom bills and developing strategies to reducing total telecom cost.

John Handley’s book Telebomb presents a great analysis of the cost structure of the telecommunications carrier’s networks. It gives a financial and investment view of the local and long haul network infrastructure needed to support capacity of user traffic. The book is centered on the events leading up to the telecommunication boom and bust giving a unified analysis (technical & financial) of the key forces. The research deals with cost management in the area of Access Planning which is directly

involved with traffic forecasting to provide insight into network infrastructure investment for capacity. As depicted in the book when there is disconnect between capacity demand and capacity investment, money is lost. In the book, the author presents the case of long-haul carriers (Level 3, Qwest, Frontier, GST Telecom, and Williams) rushing to build out more capacity for their Fiber Optic networks without a firm understanding of the available demand. According to the author: "The result of all the building and technology evolution was that, from a gross capacity estimate of 1.5 terabits per second (Tb/s) in 1994, the nation's long-haul networks grew to a capacity of 195 Tb/s by 1998. The capacity of AT&T's, WorldCom's, and Sprint's networks at the end of 1998 was 90 Tb/s. Estimated demand in 2001 was still less than 10 Tb/s." (Handley 2005)

The book, *Telebomb*, provides an insight into the challenges of matching demand with infrastructure investment (network capacity); a central issue to the network planner.

"Interconnection comes with a variety of controversies. None is more contentious than its price. The setting of interconnection charges can be used as a tool by regulators to finance unrelated policy goals, by incumbents to frustrate competition, and by entrants to gain a subsidy." (Noam 2001) In the book: *Interconnecting the Network of networks*, the author presents the issues related to regulation of interconnection agreements. Chapter 4 of the book deals with pricing of interconnection for access by competitive LECs (CLEC) by Incumbent LECs (ILEC). It is a particularly interesting dilemma as the CLEC basically buys capacity from the competitor – the ILEC. How do you know that the price set is fair? The book does a great job exploring the realm of interconnecting the Network of networks. This is the primary responsibility of CLEC Telecom to arrange agreements with incumbent LECs for access to their networks.

Frameworks

Balanced Scorecard

Translating strategy into action by Robert S. Kaplan and David P. Norton is an excellent resource into the use of the balanced scorecard to tie specific performance measures with the company's strategies. "The Balanced Scorecard translates an organization's mission and strategy into a comprehensive set of performance measures that provides the framework for a strategic measurement and management system." (Kaplan and Norton, *The balanced scorecard: Translating strategy into action* 1996) The book discusses the four elements or perspectives of the "balanced scorecard"; notably, the financial, customer, process/internal, and learning/growth perspectives.

According to the authors, the four perspectives should not be isolated or conflicting objectives. On the contrary they should all be linked with a clear cause and effect relationship. The ultimate goal is to produce financial results that will improve shareholder's value. To make this possible, each perspective (customer, learning, and process) should have measures that clearly link to the financial perspective.

The book's material is organized into two sections with one focusing on measuring business strategy, and the other on managing it. According to the authors, "the Balanced Scorecard (BSC) provides managers with the instrumentation they need to navigate to future competitive success." (Kaplan and Norton, *The balanced scorecard: Translating strategy into action* 1996)

Ron Person's book on the balanced scorecard provides a more pragmatic approach to strategy setting. The *Balanced Scorecards and Operational Dashboards with Microsoft Excel* presents literature that aligns perfectly with the requirements of the research that is to leverage existing systems (using Excel) and provide ways to view both operational dashboards along with strategic performance measures. "This book is a guide to how your organization can create a competitive advantage by successfully executing strategy and accelerating performance." (Person 2009)

Strategy and Operations

The Execution Premium: Linking Strategy to Operations for Competitive Advantage provides great insight into strategic planning and operational execution. It is written by Robert S. Kaplan and David P. Norton. References are drawn to available tools for doing strategic as well as operational analysis although the authors challenge companies to link strategy with operations. “Given the myriad strategy and operational management tools now available, we believe that companies can benefit from taking a systems approach to link strategy with operations.” (Kaplan and Norton, The Execution Premium: Linking Strategy to Operations for Competitive Advantage 2008)

In this research project, a modified version of figure 2.3 was used to define an approach to developing a Pragmatic Business Analysis Model for CLEC Telecom. The image is taken out of the book by Kaplan and Norton.

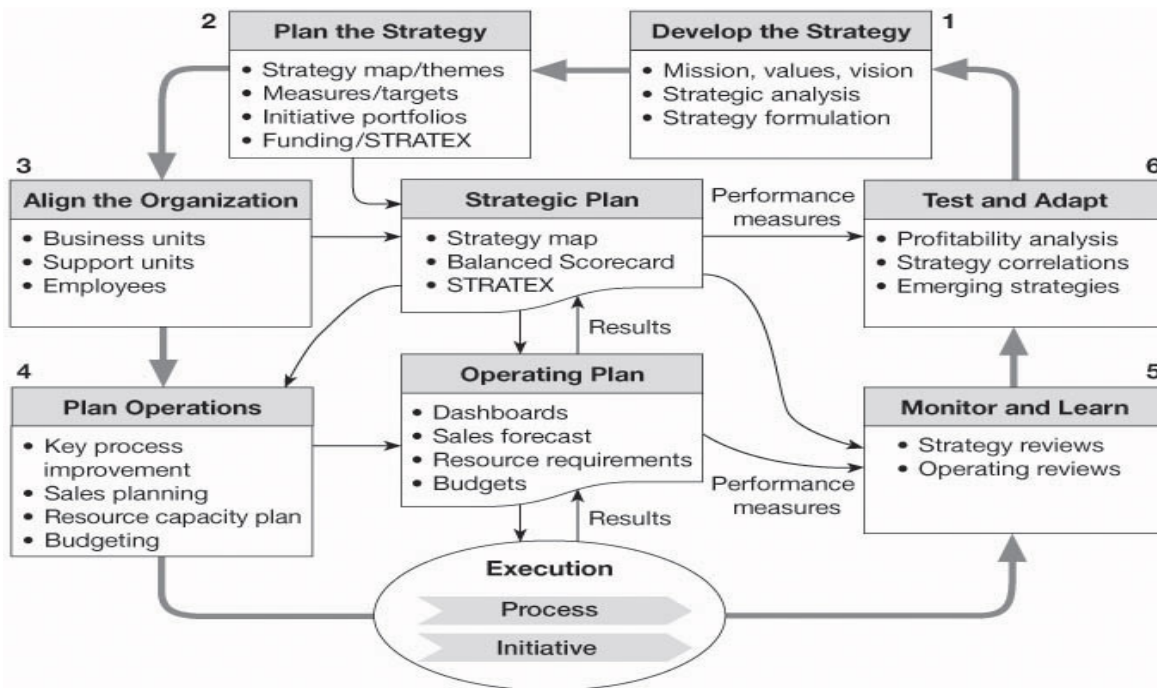


Figure 2.3 – “The Management System – Linking strategy to operations” (Kaplan and Norton, The Execution Premium: Linking Strategy to Operations for Competitive Advantage 2008)

Activity Based Management

“[Activity Based Management] gives you the ability to attach costs to your business process.” (Trotta 2003) The book: Translating Strategy into Shareholder Value provides a way to associate strategy and finance through the Step-Wise Approach to Value (SWAV). SWAV is a framework that allows for the evaluation of different strategic alternatives through the application of different filters. Of interest to us is the application of the operational filter. The discussion on value creation and drivers that can provide shareholder’s return in profit margin and efficient utilization of assets were of particular interest to the research. The author also discusses Activity Based Costing (ABC), a process in which managers can use to improve financial performance for their business unit. ●

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Chapter 3 – Research Procedure

This section provides the steps taken to complete the research.

The following steps were followed to complete the research:

1. Develop Problem Statement

Define the current business unit conditions with specific interest in the articulation of the problem. This is the situation that would be resolved once PBAM is implemented for the business unit. Initial discussion with stakeholders and development of research project objectives were outcome of this step.

2. Understand the Business

In this stage of the process, research revolves around understanding what the business unit does. The five questions listed below are used to focus on the elements that add value to the whole organization.

1. What is the unit's primary function and customer commitment?
2. How is the customer commitment met?
3. Who is responsible to meet these commitments?
4. Who are the stakeholders and what are their expectations?
5. What constitutes success for the unit's operation and CLEC Telecom?

3. Define and Evaluate Data Streams

In this step, collect the data currently available to describe the business unit's performance. Focus is put on how the available data stream can be used to produce KPIs that will meet the PBAM KPI standards. Evaluation of different data streams provides

4. Design and Implement PBAM Dashboard

This stage implements the information obtained from Steps 1 through 3 into a working system.

Creation of all systems, processes, and business rules required to support PBAM are put in place. Interaction with the end user is crucial to ensure information adheres to the PBAM requirements.

5. Document and Report

This step involved the collection of monthly performance data out of the PBAM Dashboard for analysis by the end user (line managers). Documentation related to PBAM functionality, report frequency, and purpose was produced during this step.

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Chapter 4 – Results

This chapter presents the research's results. It is the outcome of the application of the methodology presented in chapter 3 – Research Procedure.

The first step in developing a model to set, track, and measure strategic impact on the network infrastructure business unit is to obtain a clear understanding of what the unit's business entails. What role does the business unit play?

First, develop a motto for the company's existence; one sentence that summarizes the reason for its existence along with a description of the activities that sustain it from the unit's point of view. The core of CLEC Telecom's business is to provision quality wholesale Voice over Internet Protocol (VoIP) service for VoIP wholesale customers on time.

Understanding the Business

The following questions serve as a guide to understand in more detail a unit's core business responsibilities vis-à-vis the company's motto ("to provide quality wholesale VoIP service for wholesale customers on time"):

1. What is the unit's primary function and customer commitment?
2. How is the customer commitment met?
3. Who is responsible to meet these commitments?
4. Who are the stakeholders and what are their expectations?
5. What constitutes success for the unit's operation and CLEC Telecom?

At CLEC Telecom, the overall commitment is to provide quality wholesale Voice over Internet Protocol service to the customer – in most cases, a VoIP Wholesale consumer company – on time. In this role, operating as a competitive local exchange carrier (CLEC), CLEC Telecom is the middle-man between the wholesale VoIP consumer Company and the rest of the communications world (Local Exchange Carriers, Long Distance carriers, etc). Every VoIP customer company's network must be fully connected with the outside world; more on this later.

As a wholesale service provider, CLEC Telecom turns up rate centers that are served by VoIP service resellers, referred here-on as the wholesale customer. A rate center is a geographical area associated with one or more NPA-NXX codes. An NPA-NXX code refers to the first six digits of a phone number in North America as derived from the North American Number Plan (NANP). Therefore, a rate center could be thought of as a block of telephone numbers that can be serviced in a particular area.

Furthermore, the map of the United States is divided into geographical regions called Local Access and Transport Areas (LATAs) in which telecom companies operate; this is used for regulatory and administrative purposes. Therefore, a rate center is a subset of a LATA. One LATA is associated with many rate centers. In terms of service provisioning, a LATA is essentially a collection of multiple blocks of phone numbers (rate centers).

In this research, focus is on the business unit within CLEC Telecom providing the interconnection solution to allow for a seamless interface between the wholesale customer and the rest of the telecom world; all the other carriers. Focus is given to the Infrastructure group responsible for planning and testing network infrastructure supporting these interconnections. Going forward, this group will be referred as CLEC Telecom-Planning.

The local telephone company is referred to as a Local Exchange Carrier (LEC) in regulatory terms. At the LATA level, CLEC Telecom as a provider of wholesale VoIP service must interconnect with LECs in the

local jurisdiction to turn up (i.e. fully connect) a rate center. For this to be accomplished, CLEC Telecom-Planning is responsible for determining how these connections must be set-up. The critical question that is addressed is that of capacity; this is where financial strategy intersects operational tactics.

To put it plainly, CLEC Telecom -Planning is responsible for the daily planning and maintenance of interconnections between various networks. Primarily, it is responsible for managing, implementing, and negotiating work level agreements with internal as well as external stakeholders at two levels: 1-Operational and 2-Financial. Traditionally, the financial impact of the planning function has not received as much focus as the operational side. As a result, efficiencies to be gained by this study are very attractive to CLEC Telecom as a cost saving initiative.

Going forward, operational excellence and financial responsibility is the strategic order for CLEC Telecom. From an operational view, interconnections must meet specific traffic capacity requirements for maintaining Grade of Service (GoS). From a financial standpoint, interconnections must be “lean” to offer cost savings or avoidance. The challenge is that literal GoS improvement calls for investment in infrastructure – the addition of capacity, while literal cost savings or avoidance calls for downsizing/rightsizing existing infrastructure – reduction in capacity. What is the correct balance? Furthermore, the term “lean” in defining financial targets for the network must be quantified to be as clear as its operational complement in order to maintain a particular level of GoS.

Since network capacity is the common denominator between operational excellence and financial responsibility, it is the primary focus for the research. Network capacity is used as the springboard to implement KPIs that would allow for a balanced view of the business. It is the foundation for the research and the basis for the metrics developed to understand how day to day activities for CLEC Telecom-Planning impact the bottom line.

Network Capacity

For CLEC Telecom-Planning, the smallest unit of infrastructure used to deal with network capacity is a Digital Signal level 1 line (DS-1); it is the smallest unit of channel that can be billed (facility charge). A DS-1 or T-1 is a serial line that transmits data at a rate of 1.544 Megabits per second (Mbps). Each DS-1 contains twenty-four (24) Digital Signal level 0 (DS-0) channels. A DS-0 is a 64Kbps channel; it is the smallest physical unit that can carry a voice call.

Note that a Digital Signal Level 3 (DS-3) is a bundle of DS-1 circuits; it is made out of twenty eight (28) DS-1 channels. CLEC Telecom-Planning is not responsible for planning and capacity management at the DS-3 level. Hence, DS-3 cost analysis is not in scope for this research. Figure 3.1 depicts the relationship between DS3, DS1, and DS0 from a capacity stand point.

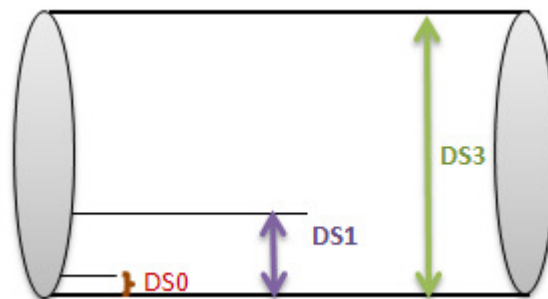


Figure 3.1 – Capacity view of DS-1, DS-3, DS-0 (not drawn to scale)

Service Make-up

Define the final product/service in an operational sense, the final deliverable for which the customer is doing business with the company. For CLEC Telecom, the final product is “dial-tone,” in an operational sense, it is VoIP traffic. For the sake of business simplicity, categorize traffic so that it has just enough operational meaning without losing its financial appeal. This is a very important concept. For this research, a number of data sources were evaluated before deciding to use billing records as the primary

source for Utilization Cost. The smallest unit of utilization is a Minute Of Use (MOU) and it can be assessed a fee (billed) more than once. To illustrate, take for example a VoIP user, Sally Sunflower, making a call to her boyfriend John Cool who is with a different carrier, DestTel. Refer to Figure 3.2 for the pictorial view of this scenario. For the call to complete it must traverse CLEC Telecom’s network, go across the interconnection with an intermediary telephone company – IntTel before the call is terminated at DestTel. IntTel is responsible for the hand over to the Destination Telephone Company – DestTel who will complete the call to John Cool. From a billing stand point, CLEC Telecom will be billed as follows: IntTel will assess transit fees on the same MOU that DestTel will charge CLEC Telecom a terminating fee. As a result, analyzing operational reports depicting strict operational Call Detail Records (CDRs) will not offer accurate costing information. Utilization cost does not have a linear relationship with MOU volume.

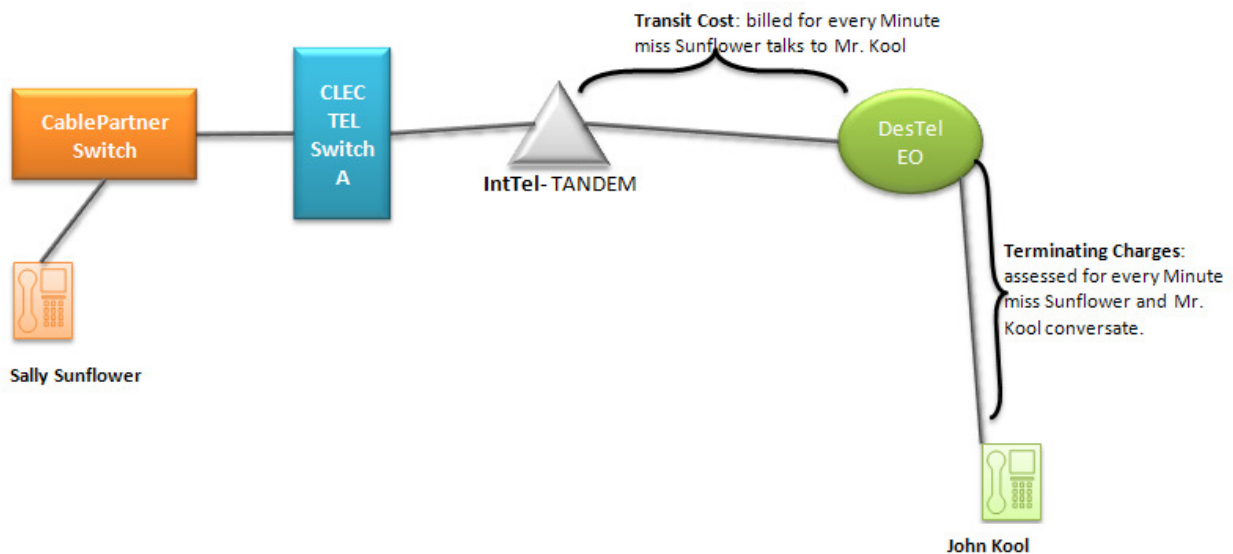


Figure 3.2 – Illustration of how one (1) Minute of Use (MOU) can be billed multiple times

Telecommunication is no different than any other industry vis-à-vis general product procurement. In order to have a finished product, steps must be taken to ensure quality and availability of the infrastructure to support the product. At CLEC Telecom, in order to provide quality voice service

infrastructure capacity must be in place to support potential traffic. Working to ensure capacity on network infrastructure introduces facility cost. Maintenance of these facilities is the responsibility of the CLEC Telecom-planning team.

It is time to analyze how CLEC Telecom-Planning impacts the Operational expense for the wholesale VoIP “dial-tone” service. Insight into the importance of billing structure in driving categorization of utilization cost for optimum operational meaning is paramount before turning focus to the revenue aspect of the business.

Network Anatomy

Understanding the anatomy of a telecom operator’s network and how it integrates with the geography of the area it is serving is paramount in understanding the business. This section (Network Anatomy) provides a “system-view” of the network from an operational perspective, identifying key components used by operation to manage the network. For example, in order to register how a call should be billed, the system should have a way to determine if the destination party resides in an area that is considered local to the originating party. In this case, the system uses the LATA identifier to complete this task.

Relationship View

Using an object-oriented approach, define the attributes of each component that is part of the business focusing on the relationship that exists between them. The outcome will provide a hierarchy of related elements that becomes the basis for the aggregation/disaggregation capabilities for PBAM; it will provide the “drill-down” functionality. Figure 3.3 and 3.4 depict a high-level hierarchical view of network assets (infrastructure) and the service area (geographical area).

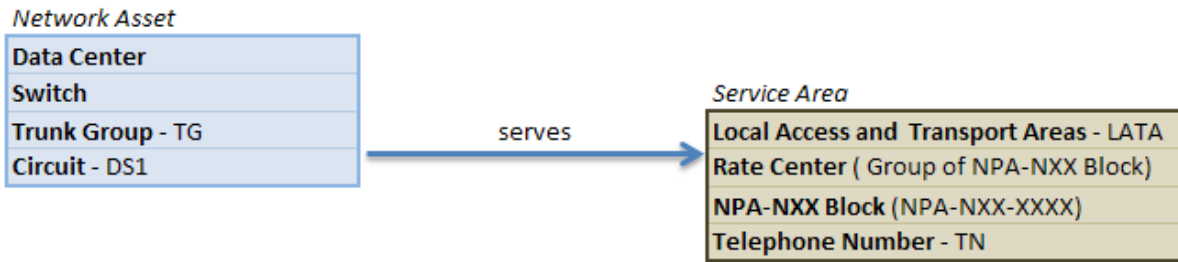


Figure 3.3 – A Network asset serves or supports a service area

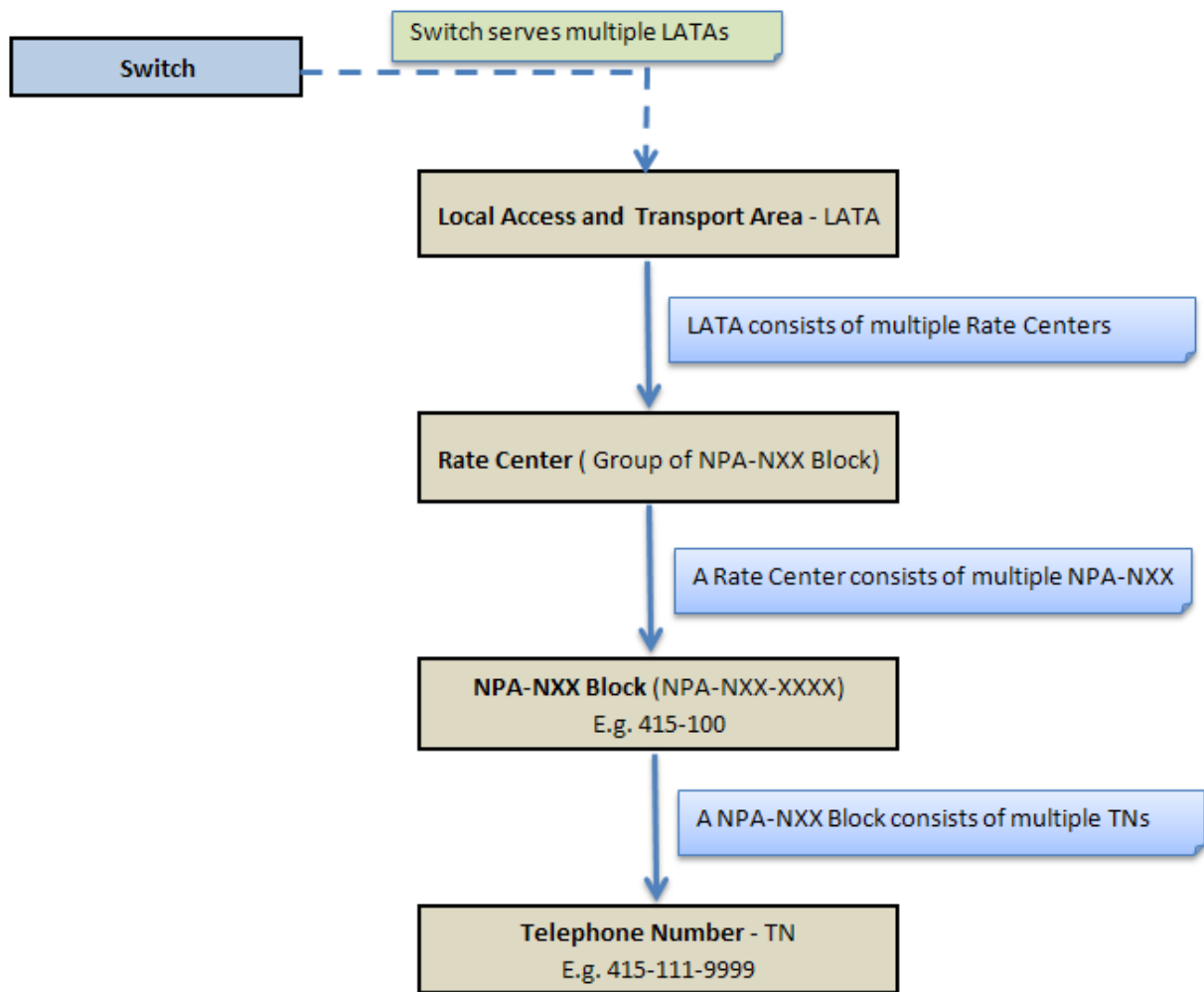


Figure 3.4 – Relationship between network assets and service area

Revenue Analysis

How does CLEC Telecom make money? Specifically, how does CLEC Telecom-Planning fit in that equation? Revenue analysis addresses these questions. Revenue is not as clear-cut as cost, not every unit is directly revenue generating. Therefore, in-depth analysis of the final product is essential. Ask the following questions to help:

1. How does the customer pay for the service?
2. What is the main driver for revenue?
3. What data is readily available documenting revenue?

For CLEC Telecom, the immediate customer for Wholesale VoIP service is another VoIP provider. CLEC Telecom has many VoIP providers as customers. Each VoIP provider is different but they all do share one important element – they have a VoIP service subscriber base. Therefore, the smallest unit driver of revenue is a VoIP service subscriber. Put a different way, without subscribers there is no revenue. This is an important realization because it sets the stage for associating revenue with CLEC Telecom-Planning functions. CLEC Telecom-Planning works mainly in providing capacity for VoIP providers' subscribers that in turn generate revenue for CLEC Telecom. With that said revenue analysis for this research focused on analyzing subscriber base. Theoretically the number of potential customers that can reside in a rate center is known. Most importantly, operational data documenting subscriber count by rate center is readily available for a more practical view. The next step is to correlate this data with existing reports documenting revenue. In this case, the Operating Income Before Depreciation and Amortization (OIBDA) was used to perform the correlation.

With Expense and Revenue clearly defined for CLEC Telecom-Planning, the stage is set to introduce KPIs that will allow front line managers and individual contributors to view their unit as a full profit or loss

driver. A KPI with underlying expense and revenue consideration brings financial accountability, ownership, and responsibility to the operational decisions that will make the final-product more profitable; empowering the unit to make sound business decisions that affect the bottom line without sacrificing operational standards therefore safeguarding product quality.

Cost Analysis

Define at a high level cost that the unit can impact or control; focus on the top items. Top items must be sensitive to corrective measures the team can undertake. They should offer considerable improvement to the company's bottom line, therefore worth the cost to track and develop strategies to improve them. For CLEC Telecom-Planning the three top cost items are:

1. Labor Cost
2. Facility Cost - Physical Circuit Cost
3. Utilization Cost – based on MOU

Please note that the ultimate focus of this research is to develop ways to reduce Operational Expenditure (OpEx). The impact of OpEx savings strategies could well benefit Capital Expenditure (CapEx) forecasts. For example, choosing to disconnect underutilized T1 circuits could save ports on a switch hence providing savings on future CapEx. However this is not explored in this research.

Billing Structure

It is important to understand the billing structure for the infrastructure that will support the implementation of the network's services. For CLEC Telecom, infrastructure is billed at the physical and the logical (usage) levels using set tariffs and fees. All interconnections with other telephone carriers – be it, local or long distance – are governed by Inter-Connection Agreements (ICA). Interconnection Agreements are legal documents binding carriers to terms regarding the network connections they

share to allow for a seamless exchange of traffic. ICAs are documents that provide billing guidelines and are often used during billing disputes, planning to evaluate alternative routes, or during initial service setup. There is a separate group within CLEC Telecom responsible for the negotiation and implementation of ICAs. For the sake of this research, the assumption is that such documents already exist.

Billing Arrangements

1. **Bill and Keep:** with bill and keep, the two parties assume that the amount of traffic exchanged between their customers is close enough that the difference is insignificant. As a result, they agree to settle by not sending each other bills, basically trading traffic for traffic – no money is exchanged. This is essentially billing the other party without ever sending the bill out (zeroing the account by choosing to keep the bill).
2. **Bill:** request for monetary compensation for utilization or facility cost. This arrangement requires the billing party to send a bill. There are no requirements on format or strict rules on timeline. It varies per telephone carrier. There is no standardization on bill content or bill format. In fact, some telephone carriers send their bills using printed media while others use the electronic conduit. The lack of consistency in bills presents a major challenge in the consolidation and analysis of operating cost (See the section on challenges).

Data Source Evaluation

This section discusses the data source evaluation process. Focus is on the various sources, formats, and general availability for the data. It is important to go beyond evaluating the source, diving into the content and evaluating what it means to the flexibility, accuracy, and availability of PBAM. Data Source Evaluation is an important process because accurate data is the core of a successful implementation of PBAM.

Billing Data

The verification group within CLEC Telecom is in charge of collecting, storing, and verifying all bills received from other carriers including the LECs. Billing information is received in a myriad of formats; some use paper media, others come in electronically. For the bills that are received using paper print, CLEC Telecom works with a partner to upload them into an electronic format. Not all paper bills are converted into an electronic format. The process is not perfect and prone to errors that reduce the fidelity of the stored billing data. For the research, 80% of all bills were collected and assessed monthly. This was enough information to support sound decision making.

Lack of consistency in billing cycles between carriers presented a challenge. Business rules had to be established to draw “cut-off” dates for integration of raw data into PBAM. It was agreed to incorporate data into PBAM at a month delay. For example, January data will be incorporated in late February.

There was also variation in the presentation of the bill content. Different carriers presented the same billing content differently. This limited the ability to standardize all billing records across all carriers. For example, how do you narrow down how much CLEC Telecom spent on Mileage charges (a subset of facility charges assessed on a circuit)?

Reports

It is important to leverage existing reports to speed the implementation of PBAM. Please note that leveraging existing reports comes with a cost. Any assumptions made for a report cascades through and can have adverse effect on the accuracy of the PBAM implementation. It is important to do a light cost/benefit analysis before certifying a report as input-ready for PBAM.

The following reports were leveraged during the research project:

1. Subscriber summary report:

This report provides subscriber count information bi-weekly at the rate center level. This information was then aggregated by switch and region using the relationship between network assets and service area.

2. Labor cost report with business unit break down:

This report provides information about labor cost monthly. For the sake of privacy, management opted not to drill down on labor due to the sensitivity of the information.

3. Custom reports:

Implement custom queries or reports in a temporary database to provide insight into the business; this is important to leverage all related available data with PBAM.

The next section discusses Data Reconciliation.

Data Reconciliation

Variance in data from various sources and databases within the company provides a tremendous challenge. Data reconciliation involves collecting data from multiple sources to determine how close they relate. If the values show considerable discrepancy, assumptions must be made to improve data integrity and consistency. For example, Operation's record of total cost for T1 circuits in concept should match the cost being booked by Finance. Unfortunately this is not usually the case. The two departments may use different databases as the source for their raw data and this presents a risk for ambiguous data. The purpose of data reconciliation is to minimize the risk for error due to ambiguous data.

Challenges

This section discusses the main challenges that are inherent with the implementation of a PBAM of this scale.

System

System issues impacted the availability and accuracy of raw data. Different organizations or groups maintain different databases to store the same information. There is a lack of fidelity in some of the reports due to differences in how the data was being queried or assumptions made by the developers at the time. Regardless, it is important to check systems and understand the source of their queries. For example at CLEC telecom, provisioning systems did not contain all the information needed to accurately reflect the state of the network because of limited system access.

To resolve system challenges, decide to use the system that Finance uses to book cost and produce financial statements. When in doubt, request to obtain raw data from Finance to guarantee being on the same page with the organization that is responsible to maintain the overall company's financial information.

Communication

Inter-organization

Inter-organization communication deals with interfacing with external organization such as Finance and Access Verification. The challenge here was with respect to translating observed KPI trends to a format that other organizations could understand.

A solution to this problem is to enlist executive support to standardize the use of PBAM across the company especially organizational touch points with stake in the execution of a shared strategy such as reduction in cost.

Intra-organization

Intra-organization communication deals with how PBAM reports are disseminated within the business unit. Initially, PBAM reports were shared via meetings. Meetings had their benefits in reaching the masses but felt short at improving employee PBAM frequency of use. The goal for intra-organization communication is to encourage every employee to actively use PBAM to monitor progress or set tactical objectives to achieve the business unit's strategic goals.

The biggest challenge with intra-organization communication was motivating planners to use the PBAM dashboard. Meetings and revision sessions highlighted the trend at a high level but PBAM's extensive features must be explored individually. Management must be the champion for PBAM. They should be its cheerleaders by encouraging their teams to use it. It does not benefit the business unit if a few employees use PBAM; the biggest gain is achieved when the majority uses it. Strategy is everyone's business.

Cost Analysis – Labor

For Labor cost analysis, an existing financial report was leveraged to provide monthly labor cost broken out by director, and eventually manager groups for the purpose of this research. This information was used to calculate the appropriate KPI in PBAM.

Cost Analysis – CapEx

For the research project, little or no attention was given to capital expenditure (CapEx). The understanding is that existing company processes (for example: project evaluation procedures, or network equipment forecasting) cover this area extensively. The research focused on implementation of PBAM vis-à-vis lowering OpEx cost strategies.

Cost Analysis – OpEx

This section provides the result of the Operational Expense (OpEx) analysis for CLEC Telecom. Figure 4.1 presents a logical diagram of the interconnection between a VoIP Partner (CP – CLEC Telecom’s VoIP wholesale customer), CLEC Telecom’s next generation voice network switch, and the LEC’s switch. Emphasis is made on each interconnection segment identifying who is primarily responsible for the cost (OpEx).

Please note that the Monthly Recurring Charge (MRC) for facility cost is billed at the circuit level while Minutes of Use (MOU) is billed at the Trunk Group level. For CLEC Telecom’s top OpEx items, this is categorized as Special Access Cost (SPAC) and Switched Access Cost (SWAC). SPAC uses the MRC format, while SWAC uses the variable MOU format. From a cost management perspective, overall trunk group (TG) MRC cost follows a “stair-case” trend while its associated MOU cost does not. MOU Cost is variable and unpredictable. Figure 4.2 depicts the MOU vs. MRC trends given change in capacity demands for a particular trunk group (operational need).

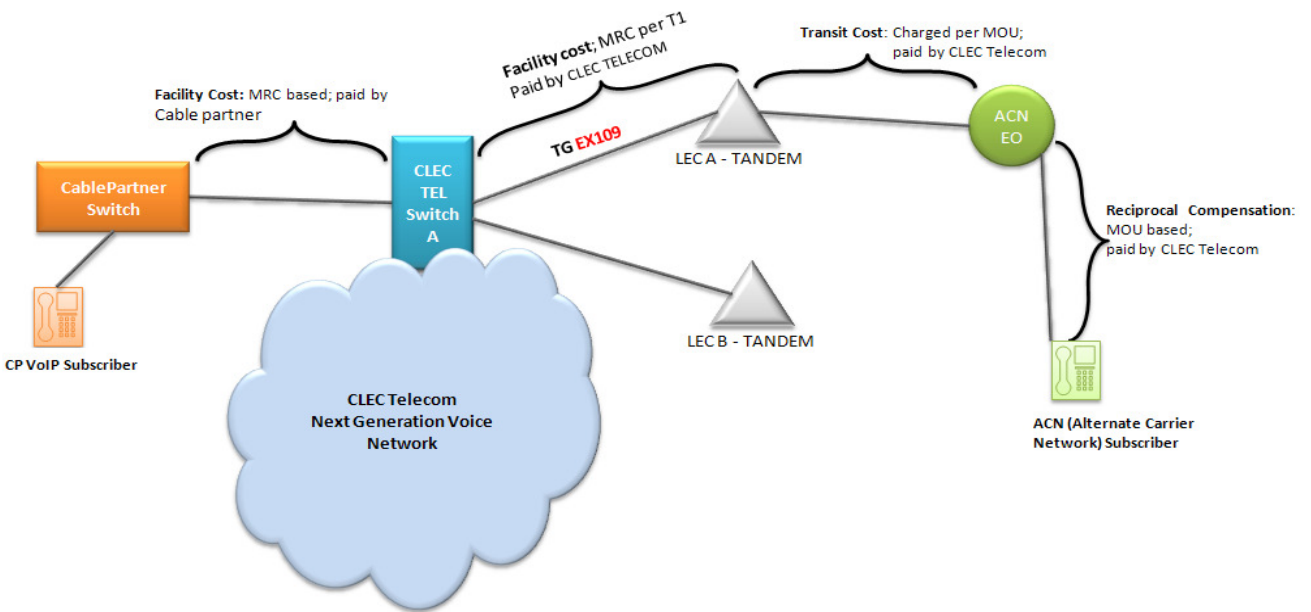


Figure 4.1 – Logical view of the interconnection between CP, CLEC Tel, and LEC A

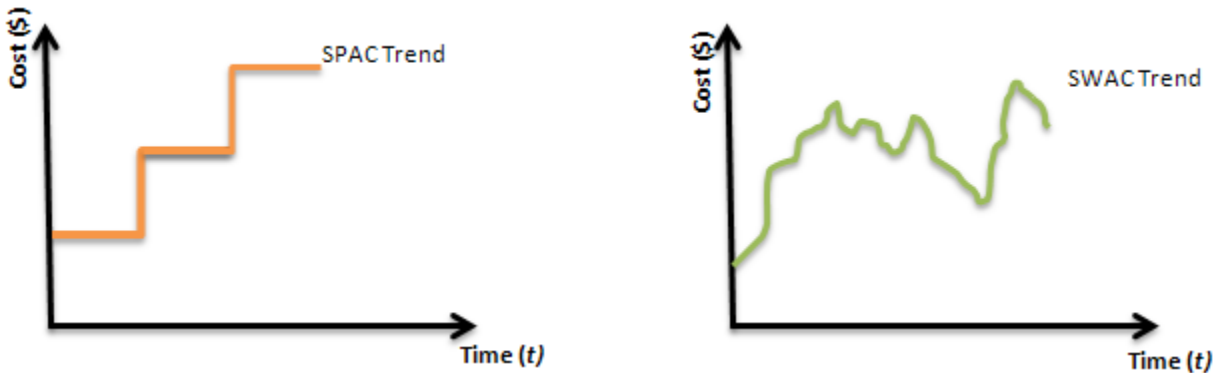


Figure 4.2 – Example of SPAC vs. SWAC cost trends over time for the same Trunk Group

Key Performance Indicators

This section presents information related to the Key Performance Indicators (KPIs) implemented for PBAM.

Expense to Revenue Ratio

The ratio of Expense to revenue, E/R , gives the manager an idea of how much a particular cost (expense) constitutes every unit of revenue. To put it plainly, it gives the cost of making a dollar. For example, using the total cost of doing business as the expense variable E , in the E/R equation, the result is the total cost of producing a dollar of revenue. In the same light, using portion of the total cost of doing business for example Special Access Cost (SPAC) for T1s circuits for E in the E/R equation, the result is the Special Access Cost (SPAC) of making a dollar of revenue. With the aggregation/disaggregation relationships identified between the network assets (Switch, Trunk group, circuits) and Service Areas (LATA, Rate Center, NPA-NXX Block, Telephone Number), E/R analysis can be performed up and down the aggregation map without any problem. The challenge is to associate the correct Revenue numbers with the correct Expense under analysis. For example, to determine the revenue generated by a particular subscriber base in a given LATA, start off with the total Revenue (as reported by Finance) then work backwards to determine the Revenue attributed to the LATA. The total subscriber base is known

therefore the revenue generated by a LATA *N* is just the fraction of the subscriber base for LATA *N* over the total subscriber base. Figure 4.3 shows an illustration of an E/R analysis; this view can be made at the Region, Switch, LATA, Rate Center or Trunk Group level. The numbers in the figure are for illustration purposes only. Per the figure, it can be understood that 54% of every dollar (i.e. 54 cents) is taken in as profit, while 46% (i.e. 46 cents) of every dollar constitutes expense. Of the 46% of Expense, 12% is booked against Labor cost, 8% against facility cost related to the T1 monthly recurring charges (MRC), and 16% goes against the utilization charges incurred for the total traffic volume. E/R analysis was done for the cost items that CLEC-Planning is able to directly control. A category for all other cost was defined to capture anything that CLEC-Planning had no direct control over. This was captured under the *E/R_Misc* metric. As a result, CLEC-Planning can be accountable for the overall strategy of reducing cost of doing business.

Since E/R analysis takes into consideration revenue, reducing cost was not just a matter of disconnecting infrastructure or making sure cost of total circuits went down month over month. It constitutes a combined view of the business. The E/R metric captures a justified trend (increase or decrease) in cost of doing business. For example, building infrastructure to support a new rate center would result in a cost increase; E/R would capture the justified trend. Granted there is a lag between the initial infrastructure turn up and revenue generation as a result of supporting more subscribers, it serves as an indicator to management that the spike in cost is justified. In due time the E/R metric should level off as new subscribers are provisioned.

E/R is a unique metric to communicate strategic intent. The cost management strategy for CLEC Telecom was transformed into an actionable statement rather than the vague “reduce cost by X amount.” With E/R, management is able to give a directive to maintain the E/R metric flat or trend it down. Anything else is an indication of a deviation from the strategic intent of reducing cost.

Incorporating the E/R metric made PBAM a practical tool for strategic goal setting at CLEC Telecom.

Figure 4.4 illustrates how the implementation of E/R analysis compared against the requirements of PBAM presented in Chapter 1.

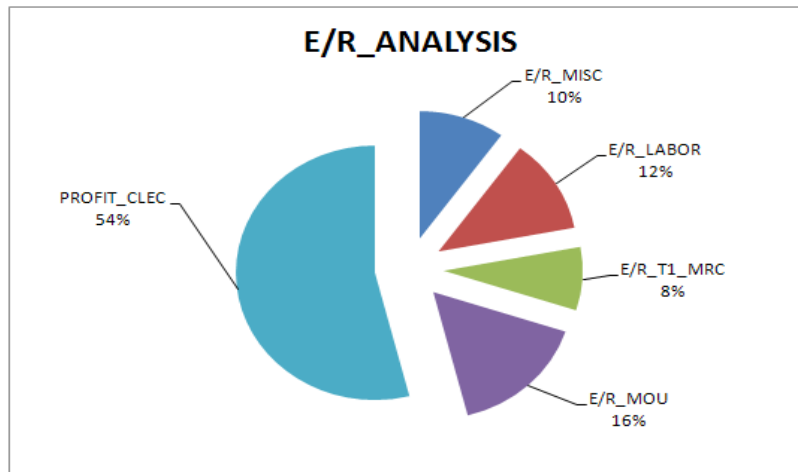


Figure 4.3 – E/R Pie Chart, split of a \$1 of VoIP Revenue

- Using E/R provides a common language for strategic goal setting
 - E.g. every one at CLEC Telecom can relate to stabilizing or reducing E/R
- Using E/R presents a unique and unified view of the business
 - E.g. Cost management is no longer viewed without regard to revenue generation.
- Provides a Flexible root cause analysis with aggregation or disaggregation abilities
 - E.g. E/R can be done at the Region, Switch, LATA, and even Trunk Group level
- E/R is an actionable Key Performance Indicator (KPI)
 - E.g. Switch owners for example would be able to take action if trend of E/R is not meeting expectations, in fact they can drill down further to identify which service area or network asset (Trunk Group) needs attention.
- Clear ownership and accountability for strategic intent and results
 - E.g. With E/R, we are able to tactically approach each service area with a focussed strategy.

Figure 4.4 – How does E/R analysis fare up against Project Objectives?

E/R Analysis provides a drill down functionality inherent from the way it is calculated. Drill-downs can be performed using the metric's formula, redefining E and R at the appropriate levels. In addition drill-down on the denominator or numerator can be performed to further understand the reason behind a particular trend. Figure 4.5 shows how PBAM implements E/R to fit seamlessly into the organization pyramid. The cost information is available at every aggregation level and so is the subscriber count (hence, Revenue). For example, it is possible to find out the Special Access Cost at the circuit level (which is the lowest level), the trunk group level, switch level, and finally the region level.

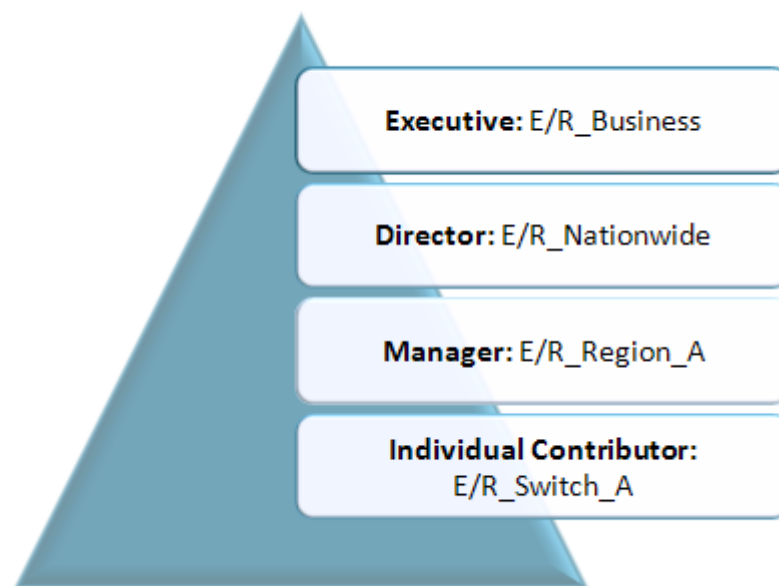


Figure 4.5 – How to implement E/R to fit into the organization pyramid

E/R Calculation

The first step is to collect the data. Once the data is collected, expense as well as revenue should be represented per subscriber. This step basically translates data into the common denominator for the business unit. For CLEC Telecom, all cost is incurred to support the provisioning of dial-tone for a single subscriber at the lowest level. Once the cost per subscriber and revenue generated per subscriber is

calculated, using simple arithmetic E/R can be generated. Excel Templates were created for this purpose.

E/R Implementation Challenges

1. Time consuming Analysis – E/R analysis takes time to develop hence it is recommended it is done on-demand. Monthly E/R calculations can be automated but true analysis requires focused observations of trends, digging further to obtain clarity.
2. Steep Learning Curve – there is a learning curve associated with the understanding of the use of E/R analysis. The challenge is to convince the employee base to use E/R analysis on an ongoing basis and not just for reporting purposes. The implementation of PBAM coined CLEC Telecom P&L Dashboard, is a collection of information with analysis that can be used as a great root-cause analysis for cost management.

Subscriber Trend Analysis

The Subscriber Trend Analysis is a matrix that shows the CLEC Telecom’s service area broken out by Rate Center, LATA, switch, or region (depending on the aggregation level) to show the trend Month over Month (MoM) in the subscriber base. This KPI ties directly with the revenue piece for CLEC Telecom. The higher the subscriber base the higher the revenue. The lower the subscriber base the lower the revenue. The matrix or map is color coded to be either Green or Red. Green status depicts a positive trend, addition to the subscriber base. On the other end of the spectrum, red status depicts a negative trend, a loss of subscribers. Figure 4.1 shows a view of the subscriber trend analysis map; the data used is only for illustration purposes.

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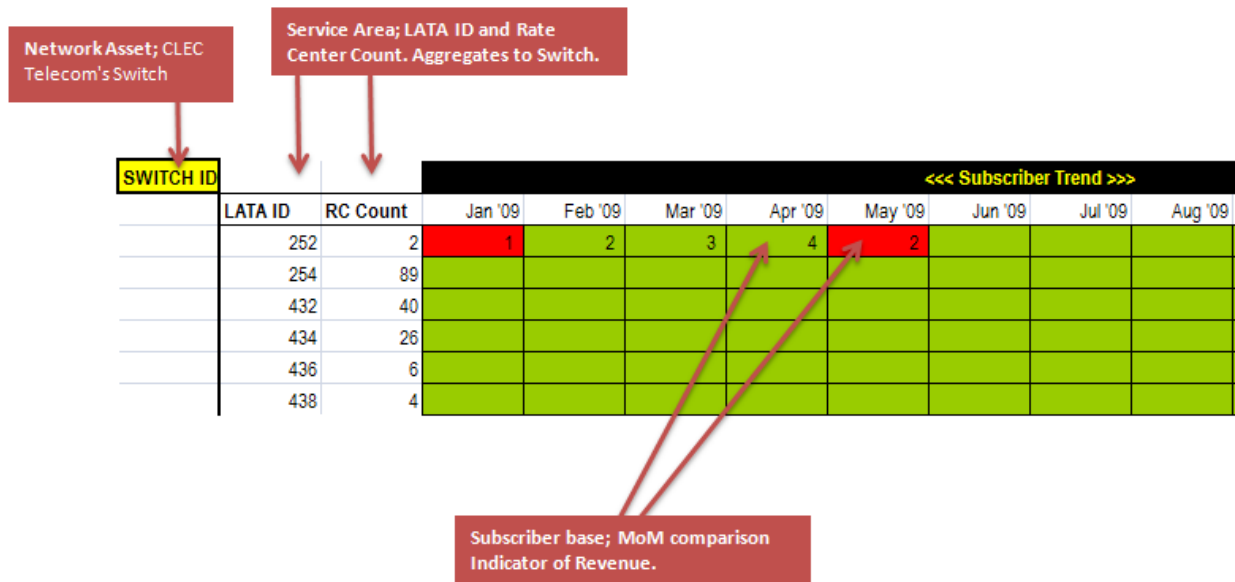


Illustration 4.1 – Sample view of the Subscriber Trend Indicator Map

Cost Trend Analysis

Using the aggregation and disaggregation feature generated by the E/R Analysis, it is also possible to do a pure cost analysis. Every Trunk Group or switch can be compared using the cost per subscriber metric to identify which areas are more efficient. This can provide insight on how to approach strategies as far as reducing cost of doing business.

This concludes the discussion on KPIs.

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Conclusion

In conclusion, strategy is everyone's business. There is plenty of literature covering the subject but until the wheels are set in motion within the context of a specific organization, that knowledge is not helpful. There is need to put the information in the context of each and every business unit that adds value to the organization. PBAM provides a vehicle for which strategy can be implemented with the involvement of each member of the team.

There are challenges involved in implementing PBAM to fit specific business units specifically related to communication and system as discussed in the report. All the same, the value of the end product well justifies the implementation cost. Focus on the data and less on the systems that will present or analyze the data. Leverage current information systems rather than looking to implement new ones. In fact, at CLEC Telecom, aside from building databases to house the data, existing IT systems were leveraged. Development costs were kept low as practical low cost solutions using Excel and Access were of ultimate preference.

The most important lesson learned from the implementation of PBAM at CLEC Telecom is that executive support is important. Use a top down approach in championing the use of PBAM but use a bottom up approach to implement it. A house is built brick by brick with a foundation from the ground up, so is PBAM. Remember: strategy is everyone's business!

The next chapter presents suggestions for additional work.●

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Chapter 5 – Suggestions for Additional Work

This chapter presents ideas that can leverage the project described in this report. It also highlights areas that can be explored in order to improve efficiency of cost management strategies at CLEC Telecom.

1. System Integration of the E/R analysis into appropriate data warehouses so that the model can be used to perform a what-if analysis. This will help the planner assess in real-time the impact of a decision to install new infrastructure to support a rate center build, migration, or augment. It could also be used to size up the effect of a potential disconnect effort.
2. Statistical approach to decision making especially in the area of traffic management. Develop a correlation between E/R analysis and pure traffic reporting. This will allow a planner to be able to look at the E/R metric for their particular Trunk Group along with its current utilization. Therefore, decision about capacity can be clearly linked to the cost of supporting that capacity. With this new view, planners can approach an operational situation with the background of assessing the financial result of a simple decision to increase network capacity for maintaining Grade of Service (GoS).
3. Further research is required in the area of categorizing bill elements in general grouping that can be used to report E/R. In depth analysis of the Miscellaneous cost drivers and how they can be measured, and reported for the sake of Expense to Revenue analysis.
4. Develop a way to standardize billing so that each itemized charge is represented the same across LECs. This would improve strategic goal setting. It would also improve efficiencies in billing, access verification, and accounting.
5. Implement additional metrics for PBAM that directly align with the other three perspectives of the balanced scorecard (i.e. customer, process/internal, and learning/growth perspectives). The research reported in this document focused on the financial perspective with the introduction of E/R analysis.●

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