EFFECTIVE PROJECT MANAGEMENT OFFICE PROCESSES AND
TECHNOLOGY TRANSFER: IMPLEMENTATION OF AN AVAYA VOICE OVER
INTERNET PROTOCOL TELEPHONY SYSTEM IN MEXICO.

BY

Submitted to the graduate degree program in Global and International Studies and to the
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ABSTRACT
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This project-thesis examines the technical requirements of a Voice over Internet Protocol (VoIP) solution and is it advantageous for a Multinational Corporation (MNC) to utilize the Project Management Office (PMO) processes as defined by the Project Management Institute, Inc. (PMI) to implement Information Technology (IT) projects and to transfer technology "know-how" knowledge to its subsidiary in Mexico. To answer this question, an assessment of Cisco and Avaya VoIP telephony systems was completed. The assessment revealed Avaya offered more enhanced features and applications. The Avaya Communications Manager (CM) 450 gateway IP telephony system was selected. PMO processes were utilized to implement the G450 in Nuevo Laredo, Mexico.

The project results revealed PMO processes were effective in successfully managing the implementation of the Avaya IP telephony system and for transferring technology "know-how" to the Mexico subsidiary. The Avaya G450 features and applications improved business efficiencies and reduced communications expenses.

DEDICATION

I would like to dedicate this work to my beloved Husband C. Armando Perez, Sr., my children, and to my parents who have all been so patient and understanding with me during my project thesis process. To Professor Hal Wert who has given me tremendous support, guidance and continuous encouragement. Thank you from the bottom of my heart!

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Chapter One: Introduction

Globalization has created expanding markets which is bringing countries closer together. With growing competition Multinational corporations (MNCs) have had to restructure from a traditional business strategy to an integrated Information Technology (IT) strategy. Information Technology, (IT) encompasses all forms of technology used to create, store, exchange, and utilize information in its various forms including (business data, voice conversations, still images, motion pictures, multimedia presentations).[1] It is important for an MNC, and subsidiaries to communicate effectively and exchange information about customers and business applications. More than ever a MNC needs to incorporate new strategies and technology to improve business efficiencies.

According to Ives and Jarvenpaa, (1991)

> The firm following a global strategy closely coordinates worldwide activities
>
> through central control from headquarters so as to capitalize on the economies
>
> associated with standardized product design, global scale-manufacturing, and
>
> centralized control of worldwide operations (p. 36).

Therefore, an MNC needs to carefully review business and IT objectives and adopt an integrated IT strategy that will help implement new innovations and Voice over Internet Protocol (VoIP) technology to stay ahead of the competition.

Voice over IP or IPT, also called Internet telephony is the technology that makes it possible to have a telephone conversation over the internet or a dedicated Internet Protocol (IP) network instead of dedicated voice transmission lines.[2]

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[1] Retrieved February 18, 2012 from http://www.entrepreneur.com/encylopedia/term/82268.html. Information Technology.
[2] Retrieved February 7, 2002 from http:// www.edinformatics.com/internet/voice_over_IP.html. "What is Voice over IP?—IP Telephony? n.p.,p.1

VoIP technology continues to be improved adding new features and applications. New protocols have been developed to better manage the quality of the voice transmission and enhanced features and applications. VoIP technology offers an MNC ways of reducing costs by converging voice and data networks, enhancing operations and is a good return on investment.

This IT VoIP telephony project was implemented by a U.S. MNC who offers services in managing freight forwarding, brokerage services, warehousing and distribution. It has a large global supply-chain in the United States, Asia, and Europe and in South America which is driving growth and innovation. The MNC's motivations for implementing the VoIP technology are: to comply with the existing integrated IT strategy to migrate from traditional Time-Division Multiplexing (TDM) digital services and standardized equipment and services using VoIP telephony technology throughout the corporation, to reduce costs and increase business efficiencies and to transfer "know-how" knowledge to its subsidiary.

Today, most of the phone systems throughout the MNC are legacy stand-alone TDM systems of various manufacturers and are no longer supported. Telecom vendors are developing and manufacturing systems to support IP technology and are no longer investing in traditional TDM systems. The MNC has used traditional analog and digital services for over twelve years and is interested in migrating to VoIP telephony. Keen (1997) contends that "…the telecommunications architecture is generally the strategic driver for evolving a truly international capability" (p.9).

Another motivation is the transfer of technology "know-how" knowledge to its subsidiary. Transferring information about the new VoIP telephony system is important for the MNC to be able to have local support that can administer the G450 system, voice mail and call center management system (CMS). The MNC provided basic training such as adding a new phone extension, a call pick up group, hunt groups, adding voice mail boxes, adding call center

skills groups and agents. Also, training was provided on how to create CMS reports for tracking inbound call traffic to determine staffing and call center agents performance. (See Appendix J, Appendix K, Appendix L).

Project Goals

This paper's main goal is to understand the technical requirements of a VoIP telephony solution and is it advantageous to utilize Project Management Office (PMO) processes to manage and implement a VoIP telephony system. Another focus of this project is whether technology "know-how" knowledge can be transferred successfully to its subsidiary in Mexico. The paper will review the project management planning, execution, monitoring and closing processes taken by the MNC on this IT VoIP telephony project. The paper will reveal that it is advantageous for the MNC to utilize project management processes to implement VoIP IT projects.

The argument of this thesis demonstrates an approach by a MNC to implement an Avaya G450 gateway VoIP telephony solution to become more competitive and to transfer advanced technology to its subsidiary. Another focus examines the PMO process groups utilized to better manage resources and project deliverables and implement the VoIP telephony system.

Project Background

The project began with an evaluation and analysis of two leading IP telephony vendors, Avaya and Cisco. A request for proposal for a VoIP telephony system was sent to both vendors. Interviews were conducted with business managers in upper management and with IT directors of various departments to review their operations and IT requirements. A vendor analysis matrix was then created to compare the hardware, software features and applications. Each vendor's attributes were assigned a weight value for scoring. After reviewing the scores for each vendor the decision was made by the IT Chief Information Officer (CIO) to move forward with the

Avaya VoIP solution for the MNC's IT strategy. The executive stakeholders approved the strategy developed by the IT department, the VoIP telephony project and budget (See Appendix A).

An Avaya Communications Manager 450 gateway Voice over Internet Protocol (VoIP) or more commonly referred to as the Avaya G450 was implemented in Nuevo Laredo, Mexico. There were five project objectives:

1) To utilize PMO processes to remotely manage, and track project task to implement the Avaya G450 VoIP telephony system. Put a project management team together to create a project management plan, to manage the project timeline, review milestones, review the list of deliverables and change control processes. To conduct a kick-off meeting, review the communications plan, project closure to review results, document best practices and lessons learned.

2) To integrate the Avaya G450 in Mexico with the G450 system in the MNC's Headquarters office in the United States and route calls between the locations when call volumes are heavy to share resources.

3) To test different call scenarios, monitor system performance and customer satisfaction and to confirm the Avaya G450 is configured correctly. The test call scenarios are:

   a. Internal calls from IP phone to IP phone. Internal calls are processed over the LAN. A Local Area Network is a network that links together computers and peripheral equipment within a limited area, such as a building or a group of buildings.[3]

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[3]Retrieved February 18, 2012 from http://www.dictionary.reference.com/local_area_network

b. Intercompany calls from IP phone in Headquarters office to IP phone in Mexico office over the wide area network (WAN) and then make calls out over the public station telephone network (PSTN). Set up the same call scenario from Mexico to the Headquarters.

c. Follow up with end-users to confirm they are satisfied with the G450 IP telephony system, the phone features, applications and quality of service.

4) To set up new features and applications for Mexico subsidiary office.

a. Set up Call Center Agents and Agent Skill groups. The call center agents' handle calls related to customer pick up requests, tracing shipments and accounts payable and receivables. The Avaya G450 and call center software features offer better management of inbound call routing, reports on agents' performance, call history to show the peak times and duration of calls and the ability to move agents from one group to another when call volumes are high. These call center features improve the ability to answer call quicker and efficiently improving customer service.

b. Set up Avaya IP softphone (road warrior and telecommuter). The IP softphone is a software feature that is installed on a personal computer and gives a user the ability to work away from the office when traveling or telecommuting and still have all the functionality as if they were in the office. This feature can also be used for the call center agent if they need to work from home in the event of bad weather or if they are working on a special project.

c. Set up Fax over IP. This feature offers the ability to transmit fax data over the network to reduce the cost of a dedicated land line. An adjunct IP to analog

device is required to connect the fax machine to analog or digital lines. The device converts the internet protocol transmission signal to traditional TDM signal to send the call over the Public Station Telephone Network (PSTN).

5) To transfer technology "know-how" knowledge about the Avaya G450 system's hardware, features and software applications in the form of training to the subsidiary. The following training was provided to employees in Mexico.

    a. Onsite system administration and equipment training was provided by local Avaya technicians.

    b. Remote training was provided by IT telecom system engineer in Headquarters over the phone and transmitting documentation via email.

The result is a suggestion on how a MNC can successfully implement an IT VoIP telephony system. This project was limited to one site and therefore the information does not represent all IT international implementations. It only offers a start to examining the issue of how MNCs can better manage the implementation of IT international projects with PMO processes and transfer technology "know-how" knowledge to its subsidiary.

This paper includes resources from various websites, journals, books, and resources within the MNC and included telecom vendors. The Avaya G450 VoIP telephony system was purchased and installed in Nuevo Laredo, Mexico.

Organization of Chapters

Chapter Two, is an overview of an MNC and its subsidiary in Mexico, an overview of VoIP technology, advantages and disadvantages of VoIP, an overview of the Avaya 450 gateway VoIP telephony system and equipment components, an overview of PMO processes, advantages and disadvantages of PMO processes and an overview of transferring technology "know how" knowledge.

Chapter Three provides information about the Methodology, Results and Limitations. The VoIP IT telephony configuration and location is discussed. Other information, data collection, and analysis, and limitations of the study are considered.

Chapter Four provides the conclusion and future project work. Also, included are recommendations and changes for MNCs who are interested in implementing a voice over internet protocol solution and using PMO processes.

After the chapters are the Appendices and References.

Chapter Two: The MNC and Technology

Multinational Corporation

MNCs have been entering global markets to take advantage of expanding their market share and selling their products or services to new customers. There are 40,000 multinational corporations currently operating in the global economy, in addition to approximately 250,000 overseas affiliates running cross-continental businesses. In 1995, the top 200 multinational corporations had combined sales of $7.1 trillion, which is equivalent to 28.3 percent of the world's gross domestic product. [4] This statistic is impressive and will continue to increase as trade policies become less restrictive.

The Multinational Corporation (MNC), operates in more than one country at a time. Generally, the corporation has its headquarters in one country and operates wholly or partially owned subsidiary in other countries. Its subsidiaries report to the corporation's headquarters.[5] This particular MNC is located in the United States and the subsidiary is located in Nuevo Laredo, Mexico. The MNC does business in over 80 countries.

MNCs access international markets by establishing a joint-venture, or through a merger or an acquisition which allows them to enter into markets quicker. The MNC can take advantage of the joint-venture company's knowledge of the culture, economy, markets, customers' needs, and government regulations. The partner company provides the majority of the work force to handle the general office duties, the dock operations, and pickup and deliveries. The MNC hired and trained the management staff. Nuevo Laredo's management staff reported to the MNC's Dallas, TX business unit and complied with all the MNC's business strategies and policies. This MNC is big and has the capital to invest in international markets to take advantage of cheap

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[4] (2008)Retrieved from http://www.referenceforbusiness.com/management/Mar-No/Multinational-Corporations.html "What is a Multinational"
[5] (2012) Retrieved from http://www.britannica.com/EBchecked/topic/397067/multinational-corporation-MNC

labor, local market opportunities and transfer advanced technology intercompany to increase

their economy of scale and improve business efficiencies,.

Carlyle (1988) states,

> More recently, firms have begun to adopt globally integrative strategies in response to
>
> increasingly competitive global markets. Among these pressures are the searches for global
>
> economies of scale and scope, the development of global products, and the increasing requirement
>
> to satisfy the needs of worldwide customers. The consequent increased need for
>
> global coordination and control has placed greater demands on information and communications
>
> between headquarters and subsidiaries. (pp.54-57)

The need to share information across all business units within the MNCs motivated the IT

department to develop an IT strategy to deploy VoIP telephony technology. The technology

could utilize the existing private data network to provide faster methods of transporting

information such as real time customer information, and call processing between the U.S. and

Mexico.

The Mexico Subsidiary

The MNC's Mexico subsidiary is located in Nuevo Laredo, Mexico and is the main

border crossing office. Nuevo Laredo (along with Laredo, TX) is the most important trade

border crossing of Latin America (approximately 8500 trucks cross the border each day).[6]

The operation in Nuevo Laredo handles truck shipments from the U.S. to Mexico and

Mexico to the U.S. and Canada. The office is a hub to twelve satellite offices. The staff consists

of 40 office personnel and 25 call center agents. The staff is responsible for supporting

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[6] Retrieved February 24, 2012 from http://en.wikipedia.org/wiki/Nuevo_Laredo

customers in Mexico with shipments destined to the United States and Canada. In addition, the staff supports intercompany departments within the MNC with shipment and tracking information, customs duties documents and tax information, and account payment information. This information is normally sent via email and communicated by phone over traditional land lines.

Nuevo Laredo had an Avaya Definity G3 legacy TDM stand-alone system with call center features. The system's software could not support unified communications applications and the hardware could not be integrated with the MNC's headquarters phone system. Also, Avaya announced "end-of-life" product support on the hardware and software. They would no longer provide support or equipment and software maintenance coverage on the system.

The IT department determined the system needed to be replaced and decided to take advantage of deploying VoIP technology in Nuevo Laredo, Mexico. An Avaya G450 with S8300 enhanced local survivable processor was selected to be installed. The system would be integrated with the Avaya G450 in the headquarters to enable the transfer of calls between locations and to share call center staffing as needed.

The MNC in the United States and the Mexico subsidiary share a common border and their operations are closely tied to each other. There are bilateral agreements between Mexico and the United States to encourage MNCs to transfer advanced technologies. Cooperation on Telecommunications services continue to be the key to growth along the border.[7]

Avaya's business partner, CTE in Mexico was engaged; the equipment was purchased, the installation and programming and end-user training was contracted to them. The project took eight months from approval to implementation of the new VoIP telephony system and

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[7] Retrieved on August 28, 2007 from http://www.state.gov/r/pa/ei/bgn/35749.html Background Note: Mexico

completion of monitoring the system. The MNC in the United States was responsible for managing the implementation of the new Avaya G450.

Voice over Internet Protocol (VoIP) Technology Overview

Voice over Internet (VoIP) started in 1995 by people in Israel using computers to communicate. With later software and hardware developments by entrepreneurs and manufacturers more computer users had access to VoIP technology. A traditional call could now be processed over the internet. The voice quality was lower than a traditional call made on a normal phone. As a result of new improvements to the technology, businesses have adopted VoIP technology to transmit voice calls over their intranet networks.[8]

Once businesses started to learn more about VoIP technology and the benefits they started to migrate slowly away from the traditional TDM calls. Traditional calls are processed over TDM that utilize circuit switching. Circuit switching is communications via a single dedicated path between the sender and receiver.[9] Land lines are the infrastructure that supports voice analog calls which are owned by local exchange carriers (LECs) such as AT&T, Verizon and Sprint. Access fees are incurred by the MNC for the use of land lines which can be costly if the corporation has many lines. Land lines are reliable; however, only basic features are available. VoIP technology offers a MNC enhanced features and applications and is more economical.

VoIP technology converts an analog voice call to a digital signal and transmits it using packet switching over the Internet or over a private data network.

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[8] Retrieved February 27, 2012 from http://worldnet-long-distance.com/history-of-voip.
[9] Retrieved February 19, 2012 from http://www.dictionary.reference.com/browse/circuit+switching

Packet switch is a method of efficient data transmission whereby the initial message is broken into relatively small units that are routed independently and subsequently reassembled.[10] The packet contains a header and routing information. This packet information is compressed and sent over the data network to its destination where the destination switching equipment then receives the packet and decompresses the voice signal.

Protocols used with VoIP are Transmission Computer Protocol/Internet Protocol (TCP/IP) and H.323. TCP/IP was an earlier Internet communications protocol used and now most VoIP systems use H.323 or SIP packet protocol. The Avaya G450 supports both H.323 and SIP protocol for multimedia services such as voice, video and data conferencing and SIP trunking. [11] SIP, Session Initiation Protocol, is an emerging protocol for Voice over Internet Protocol (VoIP) which helps manage multimedia services.   SIP which is offered by most major LECs can reduce infrastructure expenses and offers a robust of telephony applications.

Multiplexing Protocol Label Switching (MPLS)

The MNC's existing Multiplexing Protocol Label Switching (MPLS) virtual data circuits in both the U.S. and in Nuevo Laredo will be provisioned to support VoIP. Multiprotocol Label Switching (MPLS) is a mechanism in high-performance telecommunications networks that directs data from one network node to the next based on short path labels rather than long network addresses, avoiding complex lookups in a routing table. The labels identify virtual links (paths) between distant nodes rather than endpoints. MPLS can encapsulate packets of various network protocols.[12] Also, the MNC's network engineers implemented two virtual local area networks (VLANs) to manage the voice and data traffic and assigned IP addresses to the voice

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[10] Retrieved February 19, 2012 from http//www.dictonary.reference.com/browse/packet+switching
[11] Retrieved August 10, 2010 from http://www.avaya.com/uk/resource/assets/factsheet/G450_Media_Gateway_LB3757%20new.pdf Product Brief: Avaya G450 Media Gateaway
[12]Retrieved February 18, 2012 from http://www.en.wikipedia.org/wiki/Multiprotocol_Label_Switching

and data hardware. The Network engineers are able to remotely access the data hardware to ensure the data is being processed through the network router gateways without problems between the two locations.

QoS (quality of service) refers to the mechanisms in the network software that make the actual determination of which packets have priority.[13] These policies are added to the data network to help manage the priority of voice and data traffic flow or bandwidth through the data network so that voice calls are processed without delays or noise. The transfer of voice over the data network allows calls to be handled much faster.

According to Edwards (2001),

> when compared with circuit-switched services (yet another name for legacy networks), IP networks can carry 5 to 10 times the number of voice calls over the same bandwidth. (pp. 96-97)

The advantages of VoIP technology are enhanced productivity and cost savings such as:

1) Using the existing data network to process voice calls can reduce infrastructure costs.

2) Calls can be processed over the WAN to reduce long distance costs.

3) Data is transmitted quicker to subsidiaries.

4) Better control and management of the data network.

5) VoIP technology offers new features and applications that can increase business productivity.

6) IP phones can be easily administered and moved to new locations without requiring a technician to physically cross-connect cabling to activate the phone.

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[13]Retrieved February 27, 2012 from http://www.encyclopedia2.thefreedictionary.com/QoS

7) Cabling to the desktop costs can be reduced. Only one cable is required to support a personal computer (PC) and an IP phone. In a traditional environment two cables are required, one for voice and the second for data.

8) Standardization across MNC makes it easy to adapt to corporation change in business operations.

The disadvantages of VoIP technology are:

1) The technology is not quite as reliable as traditional land service. It is dependent on electrical power and the data network to support the VoIP telephony. TDM land lines should be installed for back up to route calls out of the office.

2) QoS policies must be added to the data network to ensure call quality. Voice and data share the same data network and if QoS is not added then voice and data packets can compete for bandwidth. Voice packets can be dropped, disconnecting the caller and latency on transmitting the voice packets causing the voice call to sound broken and distorted. In traditional land lines only the voice call is transmitted.

3) E911 does not always route calls to the correct E911 emergency center or the wrong address can be displayed which causes an issue with emergency responders going to the wrong location. Again, a traditional land line is recommended to provide the correct E911 call information.

Network Architecture Design

The MNC's data network and telecommunications system engineers collaborated on the network architect design to support VoIP technology. Based on the MNC's business requirements for this project a multi-site design was deployed. The data network engineers reviewed the existing data equipment configuration to ensure the routers and gateways could

handle VoIP telephony and reviewed the MPLS data circuits to ensure they could handle the

bandwidth for converged voice and data traffic. The headquarters Avaya G450 VoIP system

would act as the main processor for controlling calls and the existing MPLS virtual data network

would be used to route calls over the WAN to the remote subsidiary in Mexico. The sites are

both configured with a few traditional land lines to process calls locally through the Public

Switched Telephone Network (PSTN).

Calls processed between the sites are transmitted over the WAN and by-pass the local

exchange carrier so long distance charges are eliminated. This reduced long distance and

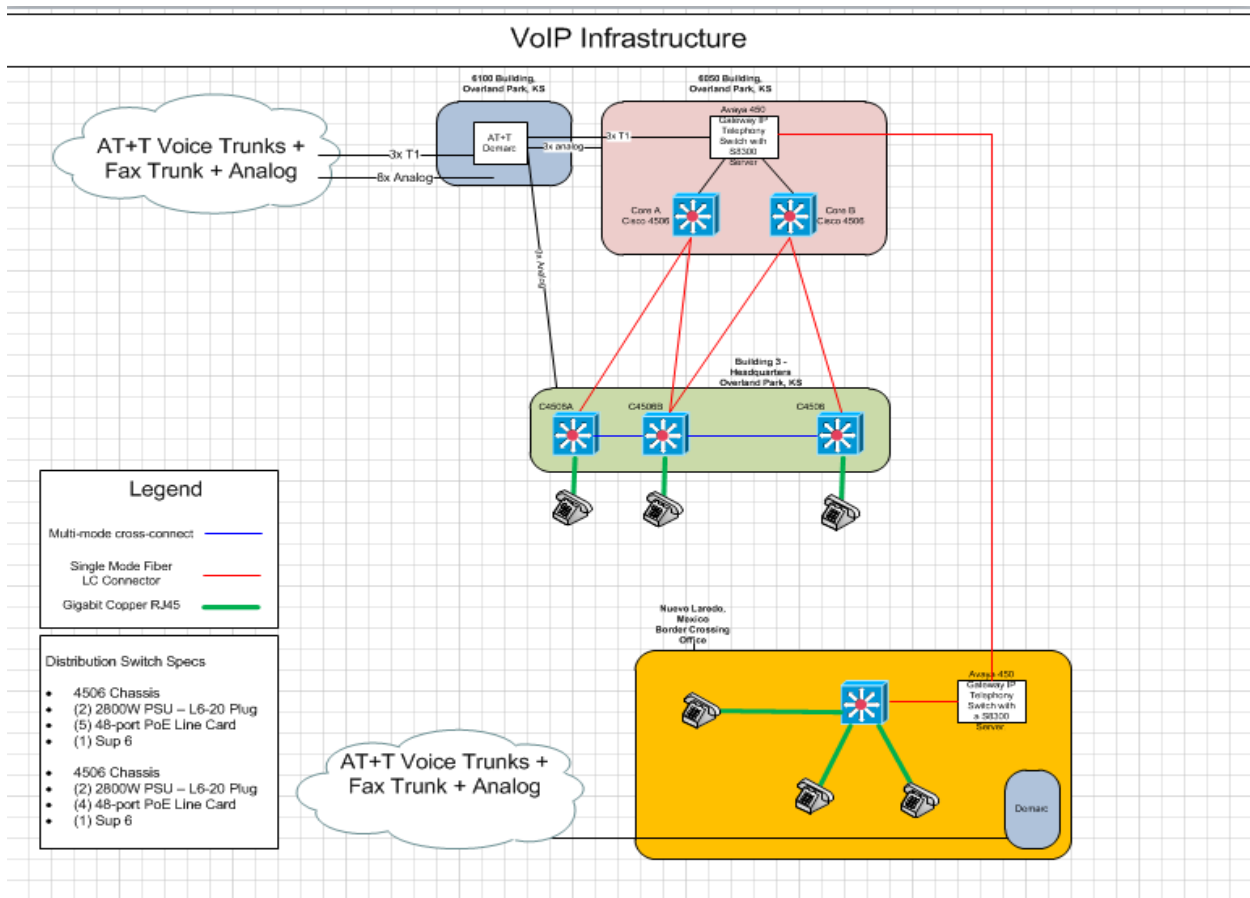international communications expenses for the MNC and its subsidiary.

Figure 1. Network Architecture Design

Project Management Office (PMO) Processes

Project Management Office (PMO) is important to the MNC's strategy for implementing international Information Technology (IT) projects and standardizing project processes. Project integration management describes the processes and activities that integrate the various elements within project management Process Groups.[14] The project scope of work, time and costs of a project is referred to as the "triple constraint". All three areas are closely monitored by the project manager. If one slips it could impact the other two areas jeopardizing the project target date. All three areas need to be balanced to ensure success of a project. Project management brings a team of corporate players together to better manage resources, vendors, project tasks and monitoring to help keep costs aligned with the budget. Also, transferring technology "know-how" between locations is more effective when you have a project management team with technology expertise that can share information.

According to Project Management Institute (PMI), over 72 percent of companies, which implemented PMOs, have achieved higher performance levels against those companies which did not implement PMO structures.[15]

A PMO can reduce project costs, but a MNC should focus on creating project standards that will deliver the IT projects efficiently and effectively. "More recently, project performance has been described subjectively by measuring client satisfaction (Baker et al 1988)". An MNC needs to ask employees in their subsidiary questions about the project that will help measure efficiency of the project deliverables. In this case, How is the new G450 VoIP system operating?

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[14] "A Guide to the Project Management Body of Management" Third Edition (PMBOK Guide) 2004, PM Institution, Inc., Four Cannavo Boulevard and Newton Square, PA 19073-3299 U.S.A., p9
[15] Retrieved February 27, 2012 from http://www.mymanagementguide.com/project-management-office-definition-p.2)

Are employees satisfied with the new IP phone functionality? Are the new applications and features making the business more effective? Also, the experience the managers and employees in Nuevo Laredo had dealing with the project team and the technicians throughout the project is another way to measure success of the project.

Implementation of the Avaya G450 using PMO process Groups

For the implementation of the Avaya G450 VoIP telephony system a project management team was put together that consisted of members from departments across IT and the MNC based on their technical expertise and experience implementing voice and data equipment and services.

The project team was responsible for the planning and implementation of the Avaya G450 VoIP telephony system and for transferring technology "know-how" knowledge in the form of training to the employees in the subsidiary.

This was a fast path project requiring less than 500 hours to complete. Since there was a major concern the legacy Avaya Definity system in Nuevo Laredo, Mexico would fail and impact business operations, the executive stakeholders expedited the approval for the purchase and implementation of the new VoIP telephony system.

There are five PMO process groups and processes from each one were used for this project. However, the Initiation group which includes the Charter document which authorizes the project was not necessary due to the urgency of the business need to replace the legacy phone system. The new Avaya G450 was purchased from CTE, who is an Avaya partner in Mexico. A scope of work was created to provide a high-level list of project deliverables, risks and schedule for the executives. The project management team was responsible for adhering to four process groups for implementing the Avaya G450 in Nuevo Laredo and integrating the system with the headquarters. They are as follow:

1) The Planning Process Group. (See Appendix B). The PMO and team met with Stakeholders to review project objectives and scope of work and to determine what action to take to complete the scope of work. The team gathered information about the Nuevo Laredo phone, voice mail and Call Center Management (CMS) systems

and business operations to determine the configuration of the system and features and applications that would be required. The voice TDM services and data network were evaluated to determine if changes to existing configurations had to be made to support the new VoIP telephony system. Milestones, a Statement of Work which provides a detail of the scope of work and a Work Breakdown Structure which is a hierarchical structure of all the project tasks that need to be executed for the project were created to provide project scope to stakeholders and the project team. This information was then put into a project management plan where the team could review and better manage the deliverables to meet the deadlines for each task. (See Appendix D and Appendix E). There are other processes within the Planning Group that are important to Project planning. They are:

a. Communications planning. These processes are within the project management plan and determine the type of information that is required to be communicated to stakeholders and project team members across IT departments. The project manager conducted a weekly conference call with the project team in the U.S. and a few managers and IT employees in Mexico to review the progress on project deliverables and issues. The Change control process is important and all project team members were informed of the process and were given a list of the directors in the IT department that had authorization to approve changes. Communications was conducted via email, telephone calls and vendor visits. A weekly project status report was typed and sent via email to stakeholders, project team members and to the subsidiary managers. The project manager was responsible for updating the work breakdown structure and adjusting the time schedule and budget. Overall,

communications increased and information was shared between the U.S. project team and the employees in Mexico (See Appendix G).

2) Execution Process Group (See Appendix C). These processes are used to complete the project tasks that are defined in the project management plan and to manage resources. The project team executed the following project tasks.

    a. Coordinate technicians to prepare the IT room in Nuevo Laredo for installation of the new Avaya G450, voice mail and CMS equipment, E1 voice circuit and the installation of new infrastructure cabling thorough the facility to support the IP system.

    b. Coordinate with CTE the delivery and installation of the equipment and configuration of the systems. Schedule and provide technicians with information for administering the trunk groups for the new E1 voice circuit, the route patterns, phone extensions and voice mail boxes, IP regions for calling over the wide area network Mexico to the United States. Conduct testing to ensure the G450 was able to route calls out over the correct trunk groups and calls could be made from IP to IP phone, IP phone in U.S. to IP phone in Mexico over the wide area network and then Mexico IP outbound local and long distance. Oversee technicians monitored the circuits and all telephony equipment to ensure system functioned properly. The data network engineers configured the data circuit with QoS to ensure voice and data traffic could be transmitted without contingency problems.

    c. Quality Performance processes. These processes related to the level of customer satisfaction the employees in Mexico experienced with the Avaya hardware, features and applications functionality and Avaya maintenance

coverage and support. Prior to the start of the project a list of phone, voice mail and call center requirements were gathered. Once the Avaya G450 was implemented and was fully operational, the project manager set up a conference call with the manager and a few employees in Nuevo Laredo to follow up to see how the new VoIP telephony system was functioning. Were calls routing to the right departments and call center groups? Are the new IP phones easy to operate? Are they able to call to the U.S. via the WAN and is the call quality satisfactory? The response from the people in Nuevo Laredo was positive. They were very satisfied with the new system and the enhanced features and applications.

3) Monitor and Control Process Group. These processes monitor the project execution and the project tasks to identify potential risks that might impact the project and alter the project delivery date.

    a. The risks identified on this VoIP project were the potential delay with vendors' delivering and installing the Avaya G450 equipment, the new T1 voice circuit, and possible equipment and service failures. Another risk was the English and Spanish language barrier. Would the MNC project team be able to effectively communicate with the subsidiary's employees and Avaya technicians in Mexico?

    b. Integrated Change control processes where used to manage the need to communicate an issue to the stakeholders and get approval to implement another solution to help keep the project on schedule. A weekly meeting was conducted to review risk, and changes to the project management plan.

4) Closing Project Process Group. These processes are used to follow up on all the project activities and to deliver the final product or service to the customer. In this case, the MNC project team met one final time to review all the tasks on the work breakdown plan and confirmed all tasks were completed, all equipment and services were installed and functioning properly and the employees in Mexico were satisfied with the new Avaya G450 VoIP system. CTE sent an acceptance letter to the MNC to fill out and confirm all equipment and service deliverables were completed. In addition, documentation was created to list the new equipment inventory and new maintenance contract information and shared with the telecom group. Finance removed old equipment off the depreciation book. Lessons learned and best practices were documented for future projects. Once the project team agreed all process were completed the project was closed.

The Advantages of PMO process groups are:

1) The process groups can help an MNC create structure in groups to be able to work together and share information across departments and identify project deliverables, and risks upfront to complete project on-time, and on budget.

2) Improvement in communications and the transfer of "know-how" knowledge between the MNC and its subsidiary.

3) Resources and deliverables can be better managed and monitored.

The Disadvantages of PMO process groups are:

1) Stakeholders do not all buy-in and support the project.

2) Business culture is different in Mexico and project management processes are not fully understood or followed.

3) Limited technical expertise in the Nuevo Laredo office and the risk of the trained employee moving on to a new job. Additional training is required and the acquiring of a high level of technology expertise will be slow.

Overview of Avaya G450 gateway VoIP telephony system

The Avaya Communications Manager G450 gateway works with the Avaya IP telephony software. The Avaya G450 VoIP telephony system can support from 250 to 1000 end users and can be easily expanded for growth.

The G450 supports different endpoints such as Avaya IP and digital telephones, analog fax, telephones and modems. A S8300 server can be installed in the G450 to provide enhanced local site survivability (ESP) for providing back up for call processing and provide full feature functionality.

The Avaya 450 gateway offers features and applications such as Internet Protocol (IP) Telephony and Unified communications. The G450 translates voice and signaling data between VoIP and the system used by the telephone and trunks.

The G450 provides VoIP services over the local area network (LAN) and wide area network (WAN). All transmission is bi-directional and utilizes voice codex G.711, G726A or G.729 standards for bandwidth requirements for sending a call over the network.[16]

Unified Communications

Avaya supports Unified Communications messaging which provides the ability to integrate communication services on different platforms such as voice calls, emails and faxes and manage them on one platform. The MNC selected a few applications to implement on this project. First, The Avaya G450 and voice mail systems can integrate with a Microsoft Outlook email exchange server so that voice mail messages can be moved into the user's email box. The user could listen to the message over the phone or with audio software on a PC can listen to the

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[16]Retrieved February 8, 2012 from http://www.avaya.com/uk/resource/assets/factsheet/G450 _Media_Gateway_LB3757%20new.pdf

message through the PC's speakers and the message could be forwarded to another email user or saved to a hard drive.[17]

Second, Avaya IP phone software was installed on a personal computer and via the internet connects back to the AvayaG450. This provides the ability to work off-site and still be connected to the Main Avaya G450 and have all the features and functionality of the system. Also, when traveling using this feature helps reduce long distance and international costs. The IP phone connects back to the Avaya G450 and calls can be made and sent out over the local TDM lines, saving in long distance costs.

Third, the Customer Contact and Call Center software was added to the Avaya G450. This enabled the MNC to set up a call center in Nuevo Laredo to better manage inbound calls and resources. The call center features provide the ability to set up agents in groups and set up specific call criteria for handling and delivering calls. For example, an inbound call could be first directed to an announcement which would give the caller different department options to choose from and depending up the selection the call would be sent along a call path to a group of agents who can assist them or to another announcement that gives them the option to leave a voice mail message. The system tracks call history and reports can be generated to show peak call time, provide agent call performance to improve call handling and to better manage staffing. Also, with integrating both Avaya systems in the U.S. and Mexico call center resources could be shared if needed.

Fourth, Video Telephony and conferencing is supported on the Avaya G450. These features provide the ability to process real time video and conferencing and sharing documents between the two locations over the private data network. These applications were beyond the

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[17]Retrieved February 8, 2012 from www.avaya.com/Avaya_Overview_for_the_Avaya_450_Media_Gateway-03-602058

scope of this project. There are business requirements that can benefit from these features such as using video and conferencing features to reduce travel expenses and also to transmit pictures of damaged freight to the headquarters claims department for quicker processing. The MNC will review these applications later in 2012.

IP Telephony Hardware and Voice Configuration

Avaya G450 with S8300 server built into unit. (See Figure 2: Avaya G450 Note: The S8300 server is installed in the first slot). The other slots are for media modules that support analog, digital and T1 voice circuits and manage the conversion of TDM voice signals to IP packet switching.   The paging port is built into the unit. The Avaya G450 modular unit is rack mountable.

Figure 2 Avaya G450

Source: http://Avaya.com/G450   Product Brief: Avaya G450 Media Gateway (Retrieved 8-10-2010)

IP Phones

The 9608 IP model is a desk style phone, 8-line buttons, 4 softkeys (hold, transfer, conference and forwarding), speakerphone and a monochrome display. The phone has a second Ethernet connection for headsets or a personal computer. Software supports H.323 and SIP protocol. Supports standard codex: G.711, and G.729.[18]

The 9621G IP model is a desk style phone with color display, 4 touch screen line buttons, (hold, transfer, conference and forwarding) and speakerphone. The phone has a second Ethernet connection for headsets or a personal computer. Software supports H.323 and SIP protocol. Supports standard codex: G.711, and G.729.[19]

Traditional Time Division Multiplexing (TDM) Services and Multi-Protocol Label Switching Circuits

The existing traditional TDM analog lines, digital T1/E1 circuits and services were retained in conjunction with the MPLS circuits for processing calls over the PSTN and private data network.

Avaya G450 VoIP System Configuration

1) Trunk Groups. The Headquarters is configured with two trunk groups, one trunk group consists of two T1 circuits for processing local calls and the second trunk group consists of two T1 circuits for processing long distance and toll free calls. The Mexico subsidiary is configured with two groups, one trunk group consists of four local POTS lines for Local call processing and fail-over and the second trunk group consists of one E1 circuit for long distance and toll free call processing.

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[18]Retrieved February 18, 2012 from
http://www.avaya.com/usa/resource/assets/factsheet/Avaya%209608%20IP%20Deskphone%20-
%20Fact%20Sheet%20UC4559.pdf
[19]Retrieved February 18, 2012 from http://www.smartcom.pt/docs/avaya_9621G_ip_deskphone_description.pdf

2) Route Patterns. Route patterns are parameters programmed in the Avaya 450 gateway to manage outbound calling. Four route patterns were set up in both sites Avaya 450 gateway VoIP systems. The first is for routing local calls, the second one for routing long distance calls, the third for international calls and the fourth for routing calls over the WAN between the U.S. and Mexico. A wide area network is a communications network that uses such devices as telephone lines, satellite dishes, or radio waves to span a larger geographic area than can be covered by a LAN[20] (See Appendix I).

3) IP regions. Regions are set up to identify IP phones in the U.S. MNC and in Nuevo Laredo to manage call routing between the locations.

Remote Site Survivability

The G450 gateway can be configured to support remote site survivability in the event the system loses power, the private data network or internet link goes down. Depending upon how the G450 is configured it can support a local survivability processor (LSP) with standard features or add a S8300 server to support the enhanced survivability processor (ESP). This provides all available features. The S8300 takes control and processes calls without interruption to the user. Once power is restored then the G450 system regains control.[21]

In survivable mode local plain old telephone lines (POTS) can be utilized to process calls until the MPLS data network is restored. This fail over option provides business continuity.

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[20] Wide Area Network Retrieved February 18, 2012 from http://dictionary.reference.com/wide_area_network
[21]Retrieved August 10, 2010 from
http://www.avaya.com/uk/resource/assets/factsheet/G45_Media_Gateway_LB3757%20new.pdf Product Brief: Avaya G450 Media Gateway

Transfer of Technology "Know-how" knowledge

"In the last few decades foreign countries have created less restriction on trade and regulations to encourage technology transfers" (Ramanathan, p.1).   Mexico's policies on technology transfer in the past have been restricted and patents on U.S. technology were not protected by the government. MNCs have limited the transfer of technology to certain markets to avoid the risks of infringement of their patents and of losing business. With growing global markets more countries are developing policies for open trade across international borders. Mexico realizes acquiring advanced technology and "know-how" knowledge is important to increase their economic growth. Mexico is making efforts to create less restrictive trade and technology transfer policies. Implementing the Avaya VoIP telephony system and using a vendor in Mexico is one way to transfer advanced technology across international borders to its subsidiaries. The definition of transfer technology "know-how" is best described as,

> Transfer encompasses diffusion of technologies and technology cooperation across and within countries. It covers technology transfer processes between developed countries, developing countries, and countries with economies in transition. It comprises the process of learning to understand, utilize and replicate the technology, including the capacity to choose and adapt to local conditions and integrate it with indigenous technologies.[22]

Technology "know-how" in the form of training was provided on the Avaya G450 VoIP telephony system's hardware, software features and applications. The MNC's IT and Project management team members provided the employees in Mexico with the Avaya product

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[22]Retrieved February 18, 2012 from http://www.thegef.org/gef/Technology_Transfer Technology Transfer for Climate Change.

information and transfer technical information to help build the skills necessary to adequately

administer the system and support the equipment. Technology transfer "know-how" knowledge

flows from the MNC's project team members who transfer their technical expertise to teach the

IT employees in Nuevo Laredo Mexico new telecom skills.

There are two forms of technology transfer. According to Robock

> The technology can be transferred in a pure informational form, which has been
>
> called disembodied technology transfer. Or, the technology can be *embodied* in
>
> the form of technology through a product, machine, process, or person and then
>
> transferred. The advantage of an *embodied* form of transfer is that the person,
>
> machine, software, etc., "packages" the know-how in a way that makes the
>
> technology able to be implemented (p.34).

This project focused on the embodied, product technology "know-how" knowledge. The

people on the project team had the knowledge and skills needed to implement the VoIP

telephony system. The MNC transferred technology "know-how" about the Avaya G450

telephony system features and applications and hardware. According to Flamm (1986)

> the multinational firm, through its international operations, is a key agent in the
>
> process by which technology is transferred and diffused into new markets (p.198)

In addition, the MNC reduced their costs associated with transferring technology "know-

how" via intercompany since both operations are governed under the same integrated IT strategy.

Transferred technology improves the effectiveness of the MNC, customer service and increases

employee productivity.

Figure 3 shows the cycle for knowledge/technology transfer. On the left side the research

is conducted on the product and through communications and processes the knowledge/

technology is transferred to the other business unit. In regards to this project the Avaya VoIP

telephony product knowledge originates from the Transferor, MNC's IT project experts to the

Transferee, the IT employees in Nuevo Laredo, Mexico through constant communications.
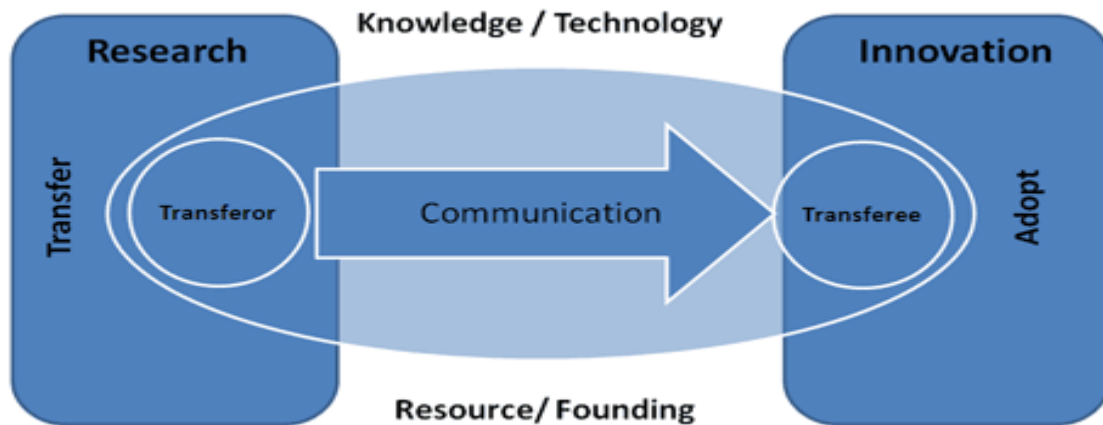
Figure 3. Knowledge/Technology Transfer.
 Source: http://www.qiaolab.com/qiao-lab-incubator/knowledge-a-technology-transfer. 1-28-12

Technology transfer is difficult to measure. Normally, the way to review measurements is by

how the technology is being used by the employees and if it improves business efficiencies.

"The greatest transfer will occur through people when the greatest skill level is achieved for

example through training or transfer of experts" (Grosse 1996).

Telephony training was incorporated within the Project management processes.

Chapter Three: Methodology and Results

Purpose

The project-thesis main goal was to understand the technical requirements for a VoIP

solution and to utilize PMO processes to implement the new system and to transfer technology

"know-how" knowledge to its subsidiary in Mexico. Three questions were examined for this

project. 1) What is VoIP technology and how can this technology be used to improve a MNC's

business operations, reduce infrastructure costs and provide a competitive edge? 2) How

effective are PMO processes for implementing IT telephony projects in Mexico? 3) How does

the MNC transfer technology "know-how" knowledge about the Avaya VoIP telephony system

to its subsidiary in Mexico?

Methodology

Two methods were used for this project thesis, 1) PMO processes were used to manage

the implementation of the IT VoIP telephony phone system and transfer technology "know-how"

knowledge to subsidiary in Mexico. 2) An Avaya Communications Manager with G450 gateway

was implemented in Mexico. Testing of the hardware, software and of voice calls were made to

measure voice quality and to ensure calls made were routing over the network to their

destination. The assessment determined the network was configured to support quality of service

on calls on the network and to the public network. In addition, post interviews with managers

and employees in Nuevo Laredo were conducted to evaluate the success of implementing the

new Avaya G450, the skill level achieved administering the Avaya G450 and to evaluate the

business benefits from the Avaya G450.

The Avaya VoIP system was selected by the MNC after thorough analysis of Cisco and

Avaya hardware, features and software applications. The Avaya VoIP solution provided a more

reliable hardware platform and software with a rich variety of telephony features. Avaya has a

long history in the telecom industry and is a leader with more experience supporting Voice over IP systems especially with Call center operations.

Nuevo Laredo was selected for this project because the equipment needed to be replaced and the MNC's business and IT strategy was to deploy VoIP technology to all business units. It was an opportunity to install the Avaya G450 and connect to the office to the Headquarters office in the United States to improve business efficiencies.

Location

Mexico Subsidiary: Nuevo Laredo, Mexico (Border crossing office)

Staff size: 40 General office and 25 Call Center agents

Data Collected

Data was gathered from vendors and put into a matrix with weight scores to compare hardware, features and applications to determine which vendor would provide the best VoIP solution for the MNC. Information gathered about technology requirements for business and IT operations from interviews of business managers and IT directors from across departments was included in making the final decision on the choice of vendor. Constant monitoring of the project tasks, timeline and resources were conducted throughout the project. In addition, Avaya reports were pulled to show the G450 and CMS performance.

Results

The results determined that using PMO processes is important to effectively implement an IT VoIP project. IT projects can be reviewed by stakeholders to determine if they align with integrated IT strategies. Communications is improved when everyone has a buy in on the scope of work and deliverables. Resources can be better managed and can be scheduled according to their expertise to help complete project task quicker and more efficiently. The employees in Mexico were satisfied with the Avaya G450 gateway, voice mail and call center applications.

Productivity and customer service was improved with Avaya G450 software enhanced features and applications. Employees were able to take advantage of features such as EC500 that would allow them to telecommute or travel and still receive their calls as if they were in the office. With remote call center agent software an agent was able to login from home and take calls. Also, international communications costs were reduced by routing calls over the Wide Area Network to the U.S. MNC.

The transferring of "know-how" knowledge about the Avaya IP telephony system to its subsidiary in Mexico was included in the Project plan and allowed for better management. On-site Avaya training and remote hardware and software administration were used to transfer technology "know-how". The Avaya 450 gateway provided new features and applications which improved the subsidiary's productivity. Customer service was improved with the new call center contact features and the ability to better management inbound calls by quickly routing calls to the appropriate call center agent groups.

Standardizing on the equipment platform provides consistent functionality and efficient support and reduces IT voice and data costs across the corporation. Locations can share phone and call center systems which can reduce costs and increase productivity. The convergence of voice and data technology and the ability for an MNC to transfer technology "know-how" to its international subsidiaries will help make it more competitive.

Limitations

The sample size was small. Only one Avaya G450 gateway VoIP telephony system was implemented by the U.S. MNC and in one international subsidiary. At the time of this project there was limited corporate funding and was approved based upon the Avaya end-of-life coverage on the legacy phone system. Also, it was difficult to measure technology transfer.

This one implementation of the Avaya G450 cannot be fully representative of all international IT VoIP telephony projects. More research needs to be done about the transfer of technology "know-how" knowledge with an MNC.

Chapter Four: Conclusion and Future Recommendations

Conclusion

While MNCs use different approaches for implementing IT projects and transferring technology "know-how" to subsidiaries, the MNC successfully implemented the Avaya G450 in Nuevo Laredo with the use of PMO processes. The PMO processes provided structure and enabled the project manager to engage stakeholders at the beginning of the project to more clearly define and communicate the project scope, goals and objectives. Better planning was achieved by using a hierarchy approach to manage project tasks. IT resources were better managed across the organization as well as improved phone training within the execution phase. The project manager was able to monitor the training task, assign the right IT experts to transfer the "know-how" and schedule training when needed. As a result, project costs, project tasks and deliverables were delivered quicker and more efficiently. The Communications management plan resulted in improved communications throughout the project and proved to be critical to the success of the project.

The project results revealed by utilizing PMO processes a MNC can reduce potential uncertainties and reduce delays that could jeopardize meeting the project target date. The project was completed on schedule, within budget and delivered the expected business results. "The capability of transferring best practices within the firm is linked to competitive advantage" (Sulanksi 1996). The MNC documented best practices to be referenced by the project management team for future VoIP telephony implementations. New policies were established that put into place the use of PMO processes for the organization in order to implement IT projects more effectively, and be able to complete multiple projects concurrently.

Overall, MNCs who adopt an IT VoIP strategy to standardize and centralize equipment and utilize PMO processes can successfully implement IT projects and reduced infrastructure costs and improve business efficiencies. The Avaya G450 hardware and software provides a VoIP platform with robust features and application to give a MNC a competitive edge in Mexico.

Future Recommendations

In the future, MNCs need to develop an integrated IT strategy to become more competitive in the global markets. With the importance of real-time information and data sharing across the organization an MNC will need to conduct an assessment of their existing voice and data networks and create a plan for migrating to VoIP technology.

My recommendations for the MNC who is interested in implementing IT VoIP projects effectively are:

1) Create policies to require the use of PMO processes and provide training for multiple resources.

2) Review best practices from this project and adjust the work breakdown structure for new projects as needed.

3) Implement more Avaya G450 VoIP systems and implement one application or feature at a time. This will allow for proper testing, monitoring and ensure the user is properly trained and is comfortable using the application or feature.

Furthermore, it is important for the MNC to keep abreast of new equipment and software upgrade releases to be able to take advantages of new features and to ensure the system continues to function properly.

This MNC will continue to take a look at other offices within the United States and its foreign subsidiaries where the Avaya VoIP telephony system can be implemented to improve

business efficiencies. Currently, two offices, one in California and one in Mexico City are going

through the initiation process and tentatively scheduled for fourth quarter of 2012.

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APPENDICES

APPENDIX A – VENDOR MATRIX

Vendor Analysis – Avaya and Cisco
(Note: Vendor Total scores are not provided, however, Avaya scored higher than Cisco.)

Critical Weight: Importance of Vendor Capability to MNC
1: Not important
2: Somewhat important
3: Important
4: Very important
5: Extremely important

E: refers to whether the critical weight is essential
D: refers to whether the critical weight is desired.

**Vendor's Score: Rating of the vendor's capability**
0: Non-existent
1:Unacceptable
2: Poor
3: Average
4: Average
5: Excellent

Vendor Criteria	Critical Weight (1-5)	Essential or Desired	Justification of Scoring
1. Experience			
Vendor demonstrates experience with clients similar to the size and scope required by MNC.		E	Overall a good experience with Avaya.
Depth of solutions (from design to implementation to post-implementation support) meets MNC's needs.		E	Avaya has a good partnership with local Avaya dealer and in Mexico.
Vendor will provide solutions to MNC seamlessly on a global scale if needed.		E	Avaya has the ability to delivery equipment and services globally.
Subtotal for Experiences	0		
2. References			
The Vendor has provided good client references of Internet protocol telephony (IPT) solutions agreements of similar scope and complexity.		D	Yes, Avaya and partners have delivered numerous large scale deployments similar in size and scope.
Vendor's development (technical/process) capability been evaluated by your technical staff or a third party for flexibility, speed and value.		E	Avaya and Local Avaya dealer have done a good job of this.
Vendor proves its track record in keeping schedule and budget commitments		D	Yes, when dealing with Avaya.
Vendor has a good history of long term relationships with clients.		E	Avaya has a 15 to 20 years relationship with MNC.
Subtotal for References	0		
3. Financial Viability			
Vendor's financial structure and resources are compatible with requirements with its potential relationship.		E	Financial strength well below that of other industry leaders.
Vendor reinvests in its business to promote innovation processes and new technologies.		D	Invest in Research and development .
Subtotal for Financial Viability	0		

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# APPENDIX A - Vendor Evaluation Matrix

c. Features		
Current telephony features and functionality are found in IP telephony solution offering	D	Yes, given the current Avaya install at MNC
Availability of call center/ACD functionality	D	Yes, supports all necessary ACD functionality
IP (soft) phone capabilities for laptop/desktop	D	Yes, through IP Softphone product htt://www.avaya.com/gcm/master/usa/en-us/products/offers/ip_softphone.htm
Availability and support of advanced routing features	D	Yes, supports all necessary routing features
Global dial plans supported	D	Yes
Subtotal for Features	**0**	
d. Architecture		
Redundancy design: complete, complex	D	Local redundant Sxxxx server provides faster failover per BCF testing.
Transparent switchover to a redundant system	D	(greater than 5 minutes) and complex. Every call is dropped. Adm sessions are dropped, application and system links are dropped etc. htt://www.avaya.com/gcm/master-us/en-
Database synchronization process for redundant systems	D	Dependent on processor platform
Mean time between failures (MTBF); call processing server	D	Dependent on processor platform
Disaster recovery methodology; complete service restoration	D	(greater than 5 minutes) and complex. Every call is dropped. Adm sessions are dropped, application and system links are dropped etc. htt://www.avaya.com/gcm/master-us/en-
Remote sites supported by a centralized solution	D	Good, but will require large number of interfaces to accommodate central solution (many Clan cards etc.) also remote site LSP requires manual intervention after central site service restoration.
Subtotal for Architecture	**0**	

APPENDIX B - PROJECT PLANNING FLOW CHART
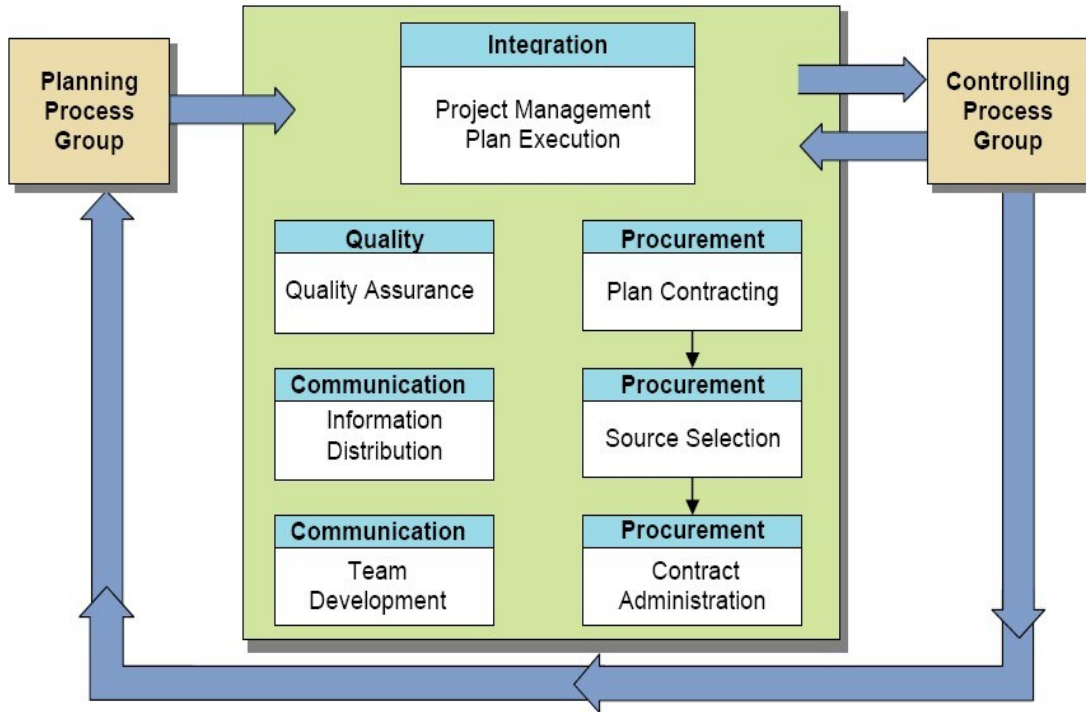
Source: http://en.wikipedia.org/wiki/project_management_office

APPENDIX C - PROJECT EXECUTION FLOW CHART
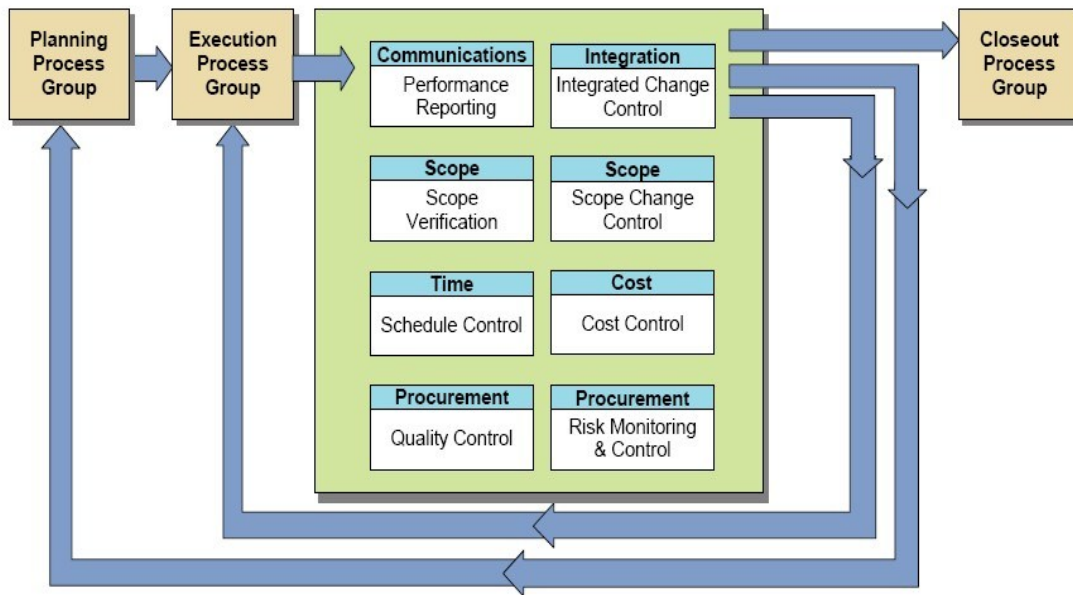
Source: http://en.wikipedia.org/wiki/project_management_office

APPENDIX D – STATEMENT OF WORK

IT STATEMENT OF WORK

IMPLEMENT AVAYA G450 Voice over Internet Protocol (VoIP) telephony
system in Nuevo Laredo, Mexico - IT Construction Phase
May, 2007

1   DOCUMENT OVERVIEW

This IT Statement of Work (SOW) provides formal written agreement between the MNC and <sponsoring
organization> This document drives toward a common understanding of Project: (1) Scope, (2), Budget, (3)
and Schedule.

2   SCOPE

In Scope

MNC will deliver the following key business capabilities as defined in the (Name of Project], [Analysis –
Requirements Definition document (ARD)].

- Implement Avaya G450 Voice over internet (VoIP) telephony system.
- Implement Call Management Software, (CMS) for Call Center features and applications.
- Implement Voice Over Internet Protocol (VoIP) technology between Nuevo Laredo, Mexico and the
  MNCs Headquarters in the U.S.A.
- Install a Uninterrupted Power Supply, (UPS) for Avaya G450 telephony system.
- Provide maintenance coverage on PBX, voice mail and CMS hardware and software.
- Install a new E1 digital voice circuit.

Out of Scope

MNC will not deliver the following capabilities.

- No unified communications video or conferencing applications will be implemented at this time.

3   BACKGROUND

[Indicate details regarding this projects relationship to any existing programs.) This project does not tie to any
other IT VoIP implementation project. This project is isolated and came up unexpectly due to Avaya in Mexico
announcing end-of-life support on the Avaya Definity hardware and software. No maintenance coverage will
be available for this system.

Nuevo Laredo, Mexico office is our main U.S.A. and Mexico border crossing office. This terminal is a Hub to
twelve satellite offices. There are 40 office personnel and 25 call center agents. Currently, there is an Avaya
Definity PBX phone system with voice mail and Call Center Management, (CMS) system for generating reports
for the call center. Avaya announced they will no longer be providing funds toward research on this product
and will no longer offer maintenance on the hardware or software.

The PBX phone, voice mail and CMS system will need to be replaced and a new Avaya G450 Voice over
Internet Protocol (VoIP) telephony system with voice mail and CMS will need to be installed. The new
platform will follow the MNCs IT VoIP telephony strategy. To help reduce communications costs Voice over
internet protocol will be implemented between Nuevo Laredo, Mexico and the MNCs Headquarters office in the
U.S.A.

This construction project is planned and budgeted base on the information gathered from the Analysis project as
summarized below. NOTE: This project was not planned. Based on the necessity to implement a newer Avaya

Page 2

APPENDIX D – STATEMENT OF WORK

PBX platform to continue hardware and software maintenance coverage so as to NOT interrupt the business operations the cost justification was expedited for approval by the executives.

Analysis Project Results

Analysis Project Name	**NLX VoIP PBX Implementation**
Project Sponsor	David Calderon
ITPM	Mary Perez
IT Manager	Bill Urquhart
LOE Date	6/7/07
Analysis Start Date	6/8/07
Total IT Analysis Spend	$40,000.00 (U.S.A. dollar currency)
Document Repository	

4   APPROACH

This project will be executed according to the <u>IDLC Customer Software Development Path</u> framework, which includes the following key phases: Please refer to the IDLC documentation to review deliverables, approvers, acceptance criteria, etc.

- Detail Design
- Development and Testing
- System Integration Testing
- User Acceptance Testing (UAT)

The following roles apply to this construction project. Associated responsibilities are outlined in the IDLC documentation.

Project Sponsor: David Calderon, District Manager	Enterprise PM:
IT Manager: Bill Urquhart, Voice Services	IT PM: Mary Perez,
	Sr. Communications Analyst
IT Account Manager:	Business Lead: Fortino Landeros
	Manager, Finance-Mexico

Page 3

APPENDIX D – STATEMENT OF WORK

5 COST AND SCHEDULE
- Based on a +-30% margin of error, this construction project is estimated to cost a total of $42,000.00 and take a total of 400 hours.
- Based on the current Release Management calendar, this project is a candidate for the June, 2007. Release if approved and prioritized to start by June 4, 2007.

	Design	Develop & Test	User Acceptance Test	Implement	Warranty	Total
IT Hours	20	48		332		400
Non System Plan Labor Hrs						
System Plan Labor Hrs						
System Plan Labor Cost						
Equipment Cost						
Hardware and Software Cost						$40,000.00
Travel Cost						
Total Cost						
Total Target Capital Cost						$40,000.00
Total Target Expense Cost						$40,000.00

6 RISKS
A risk assessment has been conducted on this construction project focusing on impacts to Schedule, Budget and Quality as noted in the categories below. The table below defines the top three risks that have a high likelihood and impact on the project.

Risk Information	Description	Contingency Plan
Risk #1 Category Score 7	Existing PBX phone system hardware failure.	Delay in acquiring parts from Avaya for Repair. Need to make Business aware of extended phone outage.
Risk #2 Category Score 4	Delay in acquiring new Avaya G450 PBX phone system.	Keep in contact with Avaya Partner and Keep Business updated on order status.
Risk #3 Category	Avaya Partner technician will not have the technical expertise to install and program the PBX, voice mail and CMS systems.	Work with Avaya Partner Service Manager and identify technician who will be working on the project implementation. Set up a conference call to discuss the installation and programming procedures. Obtain all contact telephone numbers for technician and for Service department for after hours assistance.

Page 3

APPENDIX D – STATEMENT OF WORK
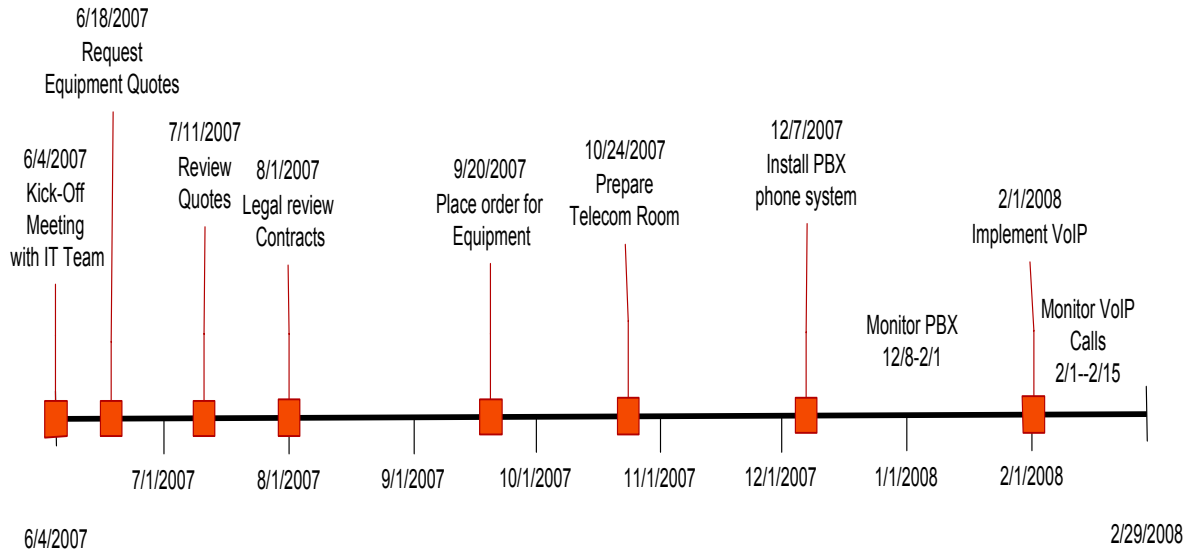
7   APPROVALS

Role	Name/Title	Signature	Date
IT Account Manager	Kevin Carracher, Director Network Services		
Project Sponsor	David Calderon, District Manager, Mexico		

APPENDIX E – WORK BREAKDOWN STRUCTURE

Task #	Phase	Task Name	YT GROUP	Resource	Start Date	Target Date
1	Planning	**Obtain blueprints/floorplans.**	Voice Services/IT Specialist	Mary Perez/Karla Garcia	6/4/07	2/29/08
9	Planning	**Review equipment room layout:** power outlets (UPS/housekeeping), DMARC (voice/data), Wiring field (voice/data/station), (router, Visual Network CSU/DSU, Adtran, ethernet switch, TR hub).	Voice Services/Network Engineering/IT Specialist	Mary Perez/Craig Bohon/Karla Garcia	6/4/07	2/29/08
10	Planning	**Determine Telecommunication Hardware requirements** (Include Paging, bogen music-on-hold player and tape, billbox phone and UPS for phone system.) and who will install equipment.	Voice Services/IT Specialist	Mary Perez/Karla Garcia	6/4/07	2/29/08
13	Planning	**Determine Telecommunication Service requirements**	Voice Services	Mary Perez	6/4/07	2/29/08
15	Planning	**Contact Telecom vendors for quote on Avaya S8400 with VoIP.**	Voice Services	Mary Perez	6/4/07	2/29/08
21	Planning	**Have Legal and Contracts review vendor contracts.**	Voice Services and Legal	Mary Perez/David Cooper/Ericka Molina	6/4/07	2/29/08
23	Planning	**Create Approval for Expenditure (AFE) for PBX purchase.**	(Mexico)	Fortino Landeros	6/4/07	2/29/08
26	Planning	**Infrastructure Wiring for Voice and Data**	Voice Services	Mary Perez	6/4/07	2/29/08
28	Planning	**Determine Data Network requirements**	Network Engineering	Mary Perez/Craig Bohon	6/4/07	2/29/08
		Order/Schedule Phase				
33	Order	**Award bid to Avaya and Order S8400 PBX phone system with VoIP.**	Voice Services	Mary Perez	6/4/07	2/29/08
		Equipment Configuration Phase				
		Installation & Programming Phase				
		Test and Monitoring Phase				
		Hardware Removal Phase				
		Clean-up Phase				
		Project Closure Phase				
60	Close-out	Close out Change Management		Mary Perez	6/4/07	2/29/08
61	Close-out	Release all Resources.		Mary Perez	6/4/07	2/29/08
62	Close-out	Final Status Report to Stakeholders.		Mary Perez	6/4/07	2/29/08
63	Close-out	Process invoices for payment.		Mary Perez	6/4/07	2/29/08
64	Close-out	Send an email to Finance to remove the old PBX equipment from the Depreciation book.	Voice Services	Mary Perez	6/4/07	2/29/08
65	Close-out	Share Lessons Learned with IT Team.		Mary Perez	6/4/07	2/29/08
66	Close-out	Update all documentation and the Telecom database.	Voice Services	Mary Perez	6/4/07	2/29/08

APPENDIX F – PROJECT TIMELINE

PROJECT TIMELINE

6/18/2007
Request
Equipment Quotes

6/4/2007
Kick-Off
Meeting
with IT Team

7/11/2007
Review
Quotes

8/1/2007
Legal review
Contracts

9/20/2007
Place order for
Equipment

10/24/2007
Prepare
Telecom Room

12/7/2007
Install PBX
phone system

2/1/2008
Implement VoIP

Monitor PBX
12/8-2/1

Monitor VoIP
Calls
2/1--2/15

7/1/2007   8/1/2007   9/1/2007   10/1/2007   11/1/2007   12/1/2007   1/1/2008   2/1/2008

6/4/2007

2/29/2008

APPENDIX G – COMMUNICATIONS

Mexico Subsidiary

MNC
In U.S.A.

| David Calderon
District Manager of
Mexico Operations |

| Kevin Carracher
Director, Network
Services |

| Stan Cross
Manager, Nuevo
Laredo Operations |

| Bill Urquhart
Manager,
Telecommunications |

| Fortino Landeros
Mexico Operations |

| Mary Perez
Project Manager |

| Karla Garcia
IT Specialist in
Nuevo Laredo |

APPENDIX H – RESOURCES AND RESPONSIBILITIES

Project Management Position	Name	Typical Responsibility	Skill Requirements
Sponsor	David Calderon	Collaborates with Project Manager to determine technical and manpower requirements, schedules, and budgets. Measuring and analyzing project performance regarding technical progress, schedules, and budgets.	Planning, Coordinating, Analyzing, Understanding the organization
Task Manager	Mary Perez	Same as above, but stronger role in establishing and maintaining project requirements. Conducting trade-offs	Technical expertise, Assessing trade-offs, Managing task implementations, Leading task specialists.
Project Manager	Mary Perez	Same as above, but stronger role in project planning and controlling. Coordinating and negotiating requirements between sponsor and performing organizations. Prepare Request for Bid. Establish project organization and staffing. Overall leadership toward implementing project plan.	Overall program leadership, Team building, Resolving conflict, Managing multidisciplinary tasks, Planning and allocating resources, Interfacing with customers/sponsors
Team members	Karla Garcia	Implement tasks associate with implementing the new Avaya S8400 and VoIP.	Voice and Data communications knowledge and ability to work with vendors.
	Fortino Landeros	Review costs and budget purchase for 2007. Review the Avaya contract.	Finance and contracts background.
	Erika Molina	Review the Mexican Avaya contract to terms are compliant with YRCW's Master Contract.	Legal background.
	David Cooper	Review the Mexican Avaya contract to terms are compliant with YRCW's Master Contract in U.S.A.	Legal background.
	Roy Schleiden	Review Avaya contracts.	Corporate Contracts background.
	Craig Bohon	Set up new IP addresses for PBX and set up VoIP administration on the data network.	Data Engineering background.
Executive Program Manager	Rich Hardt, VP IT Infrastructure	Title reserved for very large programs relative to host organization. Responsibilities same as above. Focus is on directing overall program toward desired business results.	Business leadership, Managing overall program businesses, Building program organization, ensure the IT technology is compliant with corporate roadmap strategy.

APPENDIX I – AVAYA ROUTE PATTERN

APPENDIX J – CALL MANAGEMENT REPORTS

Agent Group Summary Daily

Agent Group Summary Daily - TLB

Report Edit Format Tools Options Help

Date: **5/23/2012**
Agent Group: **TLB**

Agent Name	ACD Calls	Avg ACD Time	Avg ACW Time	% Agent Occupancy w/ ACW	% Agent Occupancy w/o ACW	Extn In Calls	Avg Extn In Time	Extn Out Calls	Avg Extn Out Time	ACD Time	ACW Time	Agent Ring Time	Other Time	AUX Time	Avail Time	Staffed Time
Totals	**86**	**1:23**	**:00**	**36**	**4**	**215**	**1:54**	**488**	**1:33**	**1:58:59**	**21:48:09**	**:15:01**	**1:24:29**	**37:37:50**	**42:17:06**	********
George, Tammy	6	3:02	:00	79	7	13	2:48	29	1:17	:18:10	3:34:27	:00:33	:01:14	3:00:07	1:03:13	7:57:44
Johnson, Shelley	0			0	0	0		12	1:38	:00:00	:00:00	:00:14	:00:35	:19:49	2:10:10	2:30:48
Justice, Jack	10	:46	:00	3	3	16	1:40	11	1:12	:07:36	:00:00	:02:06	:05:37	8:47:33	4:50:38	********
Meoli, Nick	8	1:00	:00	54	4	29	1:44	119	1:21	:08:00	2:21:45	:00:49	:16:11	3:05:40	1:54:39	7:47:04
Metscher, John	12	:59	:00	26	4	29	1:04	29	1:15	:11:49	1:32:18	:02:41	:07:20	2:06:52	4:56:34	8:57:34
Neaveill, Jeff	0			100	0	10	2:16	24	2:59	:00:00	2:42:01	:00:00	:00:00	4:09:50	:00:00	6:51:51
Patterson, Jill	1	1:01	:00	1	1	7	1:25	40	1:29	:01:01	:00:00	:00:31	:02:54	4:22:47	2:56:44	7:23:57
Sackman, Douglas	0			92	0	7	1:03	16	1:12	:00:00	8:16:55	:00:04	:02:06	:01:32	:39:47	9:00:24
Arnett, Daniel	13	1:26	:00	16	11	16	2:29	64	2:02	:18:42	:19:07	:02:12	:13:51	3:00:13	4:29:34	8:23:39
Smith, Janis	1	:36	:00	0	0	5	1:17	28	2:11	:00:36	:00:00	:00:08	:04:13	3:21:32	5:30:37	8:57:06
Sonner, Bryan	7	1:24	:00	32	4	7	3:40	30	1:54	:09:46	1:52:29	:00:50	:04:16	1:05:55	4:36:30	7:49:46
Wilcox, Amy	15	1:01	:00	19	8	32	2:19	37	:51	:15:14	:38:41	:02:31	:11:38	1:55:23	4:31:30	7:34:57
Deiter, Timothy	13	2:10	:00	19	11	44	1:50	49	1:15	:28:05	:30:26	:02:22	:14:34	2:20:37	4:37:10	8:13:14

ACD1

APPENDIX K – CALL MANAGEMENT REPORTS

System Daily – MIQ TLB Provider 92

System Daily - MIQ TLB Provider 92

Report Edit Format Tools Options Help

Date: **5/23/2012**

Split/Skill	Avg Speed Ans	Avg Aban Time	ACD Calls	Avg ACD Time	Avg ACW Time	Aban Calls	Max Delay	Flow In	Flow Out	Extn Out Calls	Avg Extn Out Time	% ACD Time	% Ans Calls
Totals	**:09**	**:23**	**53**	**1:18**	**:00**	**3**	**:53**	**2**	**3**	**283**	**1:21**	**5.88**	**89.83**
MIQ TLB Provider 92	:09	:23	53	1:18	:00	3	:53	2	3	283	1:21	5.88	89.83

ACD1

APPENDIX L – CALL MANAGEMENT REPORTS

Agent Split/Skill

Agent Split/Skill Daily - Sonner, Bryan

Report Edit Format Tools Options Help

Agent: **Sonner, Bryan**

Date	Split/Skill	ACD Calls	ACD Time	ACW Time	Extn In Calls	Extn In Time	Extn Out Calls	Extn Out Time	Assists	Held Calls	Hold Time	Trans Out
Totals		**35**	**:51:12**	**4:53:05**	**25**	**1:50:48**	**216**	**6:50:10**	**0**	**45**	**:58:03**	**0**
5/14/2012	MIQ TLB 181	6	:14:39	:49:36	8	:40:50	39	1:32:34	0	11	:21:59	0
5/14/2012	MIQ TLB Ass	0	:00:00	:00:00	0	:00:00	0	:00:00	0	0	:00:00	0
5/14/2012	MIQ TLB88	1	:00:28	:00:00	0	:00:00	0	:00:00	0	0	:00:00	0
5/14/2012	MIQ TLB Pro	3	:01:35	:00:00	0	:00:00	3	:00:18	0	3	:00:26	0
5/15/2012	MIQ TLB 181	2	:05:39	1:15:25	5	:12:12	47	2:06:22	0	6	:15:58	0
5/15/2012	MIQ TLB Ass	0	:00:00	:00:00	0	:00:00	0	:00:00	0	0	:00:00	0
5/15/2012	MIQ TLB88	0	:00:00	:00:00	0	:00:00	0	:00:00	0	0	:00:00	0
5/15/2012	MIQ TLB Pro	2	:01:52	:00:00	0	:00:00	0	:00:00	0	0	:00:00	0
5/16/2012	MIQ TLB 181	3	:04:32	:33:40	5	:33:06	38	:44:58	0	5	:02:30	0
5/16/2012	MIQ TLB Ass	0	:00:00	:00:00	0	:00:00	0	:00:00	0	0	:00:00	0
5/16/2012	MIQ TLB88	0	:00:00	:00:00	0	:00:00	0	:00:00	0	0	:00:00	0
5/16/2012	MIQ TLB Pro	1	:01:42	:00:00	0	:00:00	2	:00:29	0	1	:00:37	0
5/17/2012	MIQ TLB 181	7	:10:12	:39:45	2	:08:55	19	:26:10	0	5	:01:37	0
5/17/2012	MIQ TLB Ass	0	:00:00	:00:00	0	:00:00	0	:00:00	0	0	:00:00	0
5/17/2012	MIQ TLB88	0	:00:00	:00:00	0	:00:00	0	:00:00	0	0	:00:00	0
5/17/2012	MIQ TLB Pro	2	:03:47	:00:00	0	:00:00	4	:02:30	0	2	:02:43	0
5/18/2012	MIQ TLB 181	6	:05:24	1:34:39	5	:15:45	62	1:55:36	0	10	:11:00	0
5/18/2012	MIQ TLB Ass	0	:00:00	:00:00	0	:00:00	0	:00:00	0	0	:00:00	0
5/18/2012	MIQ TLB88	0	:00:00	:00:00	0	:00:00	0	:00:00	0	0	:00:00	0
5/18/2012	MIQ TLB Pro	2	:01:22	:00:00	0	:00:00	2	:01:13	0	2	:01:13	0

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ACD1