STRATEGIC ANALYSIS OF TECHNOLOGY INTEGRATION AT ALLSTREAM

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Bachelor of Technology, British Columbia Institute of Technology 2007

PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF BUSINESS ADMINISTRATION

In the Management of Technology Program
of the
Faculty
of
Business Administration

SIMON FRASER UNIVERSITY

Summer 2011

Approval

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Abstract

Innovation has been defined as the combination of invention and commercialization. Invention without commercialization is rarely, if ever, profitable. For the purposes of this paper the definition of innovation will be further expanded into the concept of technology integration. Successful technology integration not only includes new technology introduction, but also the operationalization of the new technology within each business unit of the enterprise.

This paper conducts an analysis of Allstream's internal organizational structure, and reviews a number of key processes and business support systems that are required for the integration of new technology into Allstream. Gaps and ambiguities are identified within the processes and business support systems used to integrate new technology into Allstream. Recommendations are presented to address these gaps and ambiguities, so that Allstream can create a strategic advantage through superior technology integration.

Keywords: Allstream; technology integration

Executive Summary

No overall governance exists in Allstream for new technology integration. New technologies are introduced into Allstream on an ongoing basis, but new technology introduction in and of itself does not ensure that the various operational teams can manage the new technology. Gaps in the current governance related to new technology integration exist in the following key areas: modelling of the equipment in the business support system databases, addressing inventory levels for all newly-introduced components, and critical sparing of each of the newly-introduced components.

Technologies at Allstream are introduced as individual platforms, as compared to technologies that make up a part of an overall service. Due to this focus, ambiguities exist as to how the technology will eventually be used to provide services to Allstream's end customers. Most new technologies that are introduced into Allstream are typically used in the middle of the network. Due to this fact, it is not possible to forecast the quantities of each individual component that will be installed in the network from a sales or marketing forecast. This lack of forecasting has led to low stocking levels of components for service delivery and low sparing of components for service and network assurance. These key gaps in the governance related to new technology integration have had a negative impact on: Service delivery cycle times, Service and Network Assurance cycle times, Revenue realization, and Customer Experience. This report outlines the current situation, impacts

on the business and recommendations for improvements in the new technology integration governance within Allstream.

An enhanced focus on business processes, which considers the new physical attributes of the new technologies, is now required. Allstream can no longer overlook the physical layer of the technologies introduced into Allstream's network. Allstream needs to move away from the traditional tactical approaches used individually within each separate organization, and adopt an overall strategic approach when integrating new technology into its business operations.

To create a strategic advantage through superior technology integration, Allstream needs to complete a number of key activities. A full orientation with existing staff on the various processes used in relationship to technology integration is required. This orientation will provide insight to all staff within Allstream as to who is accountable to carry out which specific activities; and, more importantly, it will clearly identify those activities where there is no team that is explicitly accountable for the activity. Technical project managers or technology integrators need to be used to project manage the various activities that are required to integrate new technologies into the various business processes, as it is out of the scope of the Technology Development technical specialists to project manage teams outside of Technology Development. Integration of the various business support systems that are impacted by technology integration is required as there is duplication and misalignment of information between the various business support systems. Only by taking a full strategic end-to-end view of new technology integration will Allstream be able to achieve a competitive advantage with its newly introduced technologies.

Dedication

I dedicate this to my family. To my wife Andrea, my children Kimberly and Erin, to my parents Dennis and Joan and my best friends Sean and Eleanor. I thank you for your patience and understanding to allow me the time to embark on this endeavour. Without your ongoing encouragement and support, none of this would have been possible.

Acknowledgements

I would like to extend my sincere thanks to all of the staff in MTS Allstream with whom I worked with and interviewed as part of this project. Specific thanks go to Scot Roberts and Stephen Grosz, who were my sponsors for this project, and Jason Levitt and Johanne Cleyn for their feedback throughout this project.

I would also like to extend my thanks to the faculty at the Beedie School of Business at the Segal Graduate School for their teachings throughout the MOT MBA program. In particular, I would like to thank professor Michael Parent for his insightful teachings and approach to understanding corporate governance and strategy, Dr. Andrew Gemino for his seemingly effortless approach to teaching, and Colleen Collins and her never-ending enthusiasm and encouragement.

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Glossary

Allstream	Is a Canadian competitive local exchange carrier with operations across the country. Allstream is a wholly owned division of the parent company MTS Allstream. Prior to being purchased by MTS in 2004, Allstream had operated in Canada under the previous name of AT&T Canada.
ATM	Asynchronous Transfer Mode. A switching technique for telecommunication networks. Data is encoded into small fixed-sized cells.
BSS	Business Support System – computer systems primarily used for the entry, processing, management and subsequent billing of a customer's service order.
CLEC	Competitive Local Exchange Carrier - is a competitive phone company that competes with the traditional incumbent phone company in a specific geographical area.
Auto-discovery	Auto-discovery is an IT system used within MTS Allstream to capture information from the intelligent equipment deployed in Allstream`s production network.
CPE	Customer Premise Equipment – Equipment physically installed within an end customer's office.
CRC	Centralized Repair Control
Critical Spare	A term used to describe any component of the MTS Allstream telecommunication network that is kept on hand, and used to replace a failed component in the production network.
EAN	Equipment Approval Notice
ERP	Enterprise Resource Planning - MTS Allstream uses the SAP ERP system.
ESMT	Equipment Support Management Tool. A database management tool that allows select Allstream staff to review and edit any contract information for Cisco routers deployed within the Allstream network. This tool provides the information required by Cisco to open a TAC case (trouble ticket) with Cisco.
eTOM	Enhanced Telecom Operations Map - a business model architecture that describes the full scope of business processes required by a service provider and defines key elements and how the business processes interact. The eTOM is now known as the

Business Process Framework within the TM Forum Frameworx architecture.

FOA	First Office Application – a term used to described when a specific technology is used in a specific geographical region or office for the first time.
Frameworx	Is a programme developed by the TM Forum that provides ways to help communication service providers to manage their business. Frameworx includes a set of principles and technical deliverables.
ILEC	Incumbent Local Exchange Carrier - typically an ILEC would be the monopoly phone company in a specific geographical area.
IW	Information Warehouse - a database system used by MTS Allstream to carry out data mining activities.
MMA	Material Master Authorization - a process to have items catalogued in the MTS Allstream SAP ERP.
MTS	Manitoba Telecom Service - the incumbent local exchange carrier (local telephone company) for the province of Manitoba. The MTS name is the customer-facing brand name used within Manitoba for all sales and customer operations within the province of Manitoba.
MTS Allstream	The parent corporation for the MTS and Allstream operating divisions.
NIMS	Network Inventory Management System - a database system used to inventory the telecommunications equipment deployed in the Allstream network.
On-Net	A term to describe a customer or a building as being on Allstream's network as there is an Allstream Point of Presence (POP) in the building.
OSI	Open Systems Interconnection - an industry standard model that allows communication systems to be broken down into smaller parts called layers.
OSS	Operational Support System – computer systems primarily used for the management of the services, network and physical elements that make up a telecommunication network.
POP	Point of Presence – a physical location within a building where Allstream has an established footprint of telecommunication equipment that can be used to provide services to multiple tenants within the building.
PTG	Provisioning and Troubleshooting Guideline

RTN	Responsibility Transfer Notice
TCD	Technology Change Document
Telcordia	Is a telecommunications research and development (R&D) company that has developed the Granite database system and provides consulting services related to the Granite database system. Formerly known as Bell Communications Research, Inc. or Bellcore,
TM Forum	Is an international non-profit industry association that focuses on improving business effectiveness for service providers and their suppliers in the information industry, the communications industry and the entertainment industry.

1: Introduction

This section summarizes the current situation at Allstream, provides background information on the Open System Interconnection (OSI) model, and discusses the scope of this project.

1.1 Current Situation

Allstream is a Canadian telecommunications services provider, or what would more commonly be known as a Competitive Local Exchange Carrier (CLEC). Telecommunications services have significantly changed over the last twenty years. The speeds and capabilities of today's new services are faster and significantly more complex than the legacy services offered in the past. Associated with the rollout new services has been a vast assortment of new underlying telecommunications equipment and technologies to enable these services within the Allstream network. These new underlying telecommunication platforms used to provide these new services have not been evolutionary, but rather revolutionary in their physical nature. Due to the novel and complex physical nature of these new technologies, challenges have been faced during technology integration activities within Allstream, as many of the staff within the operational side of the business did not have the absorptive capacity to fully comprehend the impact on their processes and procedures the introduction of the new technologies would have on them.

This lack of understanding of the impact the new technologies would have on the operational side of the business has resulted in a number of negative impacts on Allstream ability to generate revenue. The key challenges that have been faced are in the areas of revenue generation and customer experience. These challenges are discussed next.

Revenue Generation

Due to the ambiguities surrounding the new technologies, the overall time to deliver a service became much longer than what was typical for the delivery of a legacy service. As the duration of time lengthened from when a customer ordered a service to the time the service was delivered and subsequently billed, Allstream's ability to generate revenue decreased.

Customer Experience

Customer Experience was impacted in two main ways:

- Missed due dates: Allstream's ability to deliver a service on the due date that was originally provided to the customer was not consistently attained.
- Long service outages: Allstream's ability to restore a failed service that was provided on the new technologies was longer than what was typical for a legacy service.

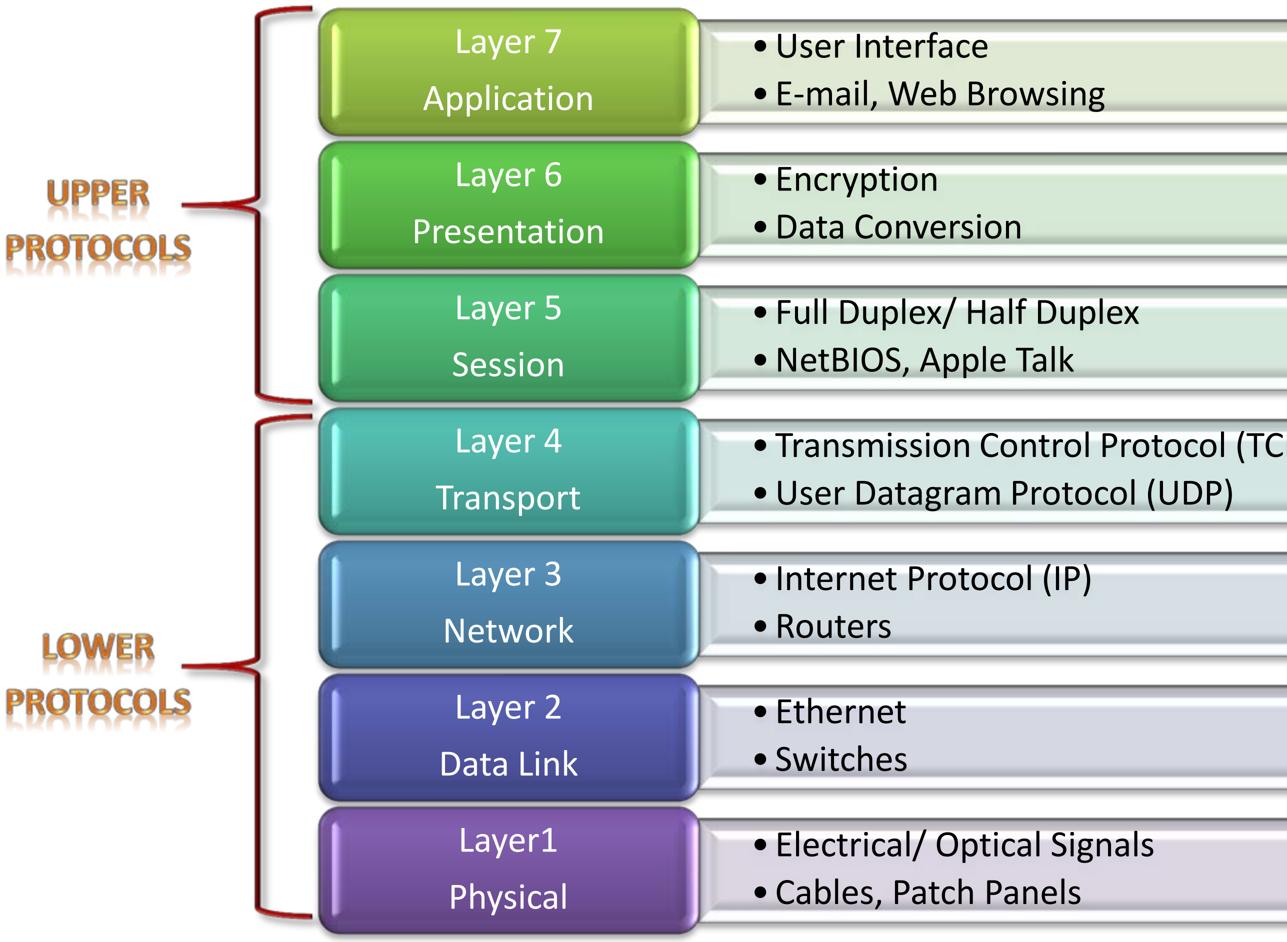
These Customer Experience issues related further eroded Allstream's ability to generate revenue, as customer's good will towards Allstream decreased. Due to this decrease in goodwill, it is hypothesized that a customer's willingness to pay for

Allstream's services has decreased and their likelihood of purchasing additional Allstream services or recommending Allstream to others has decreased as well. While there was a business requirement to make changes to the underlying technologies used within the Allstream network to provide next generation services to Allstream's customers, the methodologies and practices followed did not ensure smooth integration of the new technologies into the operational organizations within Allstream.

1.2 Background Information – The OSI Model

To allow for a better understanding of the revolutionary nature of the physical changes in the underlying platforms now in use within Allstream, it is necessary to introduce the Open System Interconnection (OSI) model (International Organization for Standards, 1993). This model is an industry standard that allows communication systems to be broken down into smaller parts called layers. The OSI model is composed of seven layers:

Figure 1 – OSI Model – Magnitude of Change for Each Layer
Source: International Organization for Standards, adapted from OSI Model



Changes in the technologies used within Allstream have typically happened within layers two through four: Data Link, Network and Transport. Layers 5 through to seven of the OSI model typically have no effect on telecommunication service providers as these layers fall within the control of the end customer. Where the current impact is now being felt within Allstream is at Layer 1 – the physical layer. For a significant period of time, the changes that have happened at the physical layer have been evolutionary at best. The legacy physical interfaces used to provide services to customers have been standardized and have not significantly changed over the past twenty or more years. Over the past number of years, Allstream's focus on process development and training (both technical training and process training), when new technologies have been introduced, have been on layers 2 to 4 of the OSI model, as there had been little to no changes in the layer 1 technologies. The new technologies that have been adopted over the past few years have physically changed the way in which services are now provided; however, the teams tasked with the process development and training did not foresee the impact these physical changes would have on Allstream's business processes.

1.3 Scope of Analysis

The scope of this project is to provide a high level analysis of Allstream and the markets in which it competes. This is followed by an in depth view Allstream's corporate structure and business support systems and the challenges Allstream currently faces when new technology has to be integrated into the business operations. Following sections outline best practices discovered through a literature review and specific recommendations where changes can be made to improve Allstream's ability to integrate new technologies into its business operations.

2: Overview of MTS Allstream

MTS Allstream is a leading national communications provider in Canada and the market leader in Manitoba. The company is organized into two principle business segments: MTS, operating in Manitoba; and Allstream, operating nationally. MTS leads every telecommunications market segment in Manitoba, delivering a full suite of wireless, broadband (high-speed Internet and digital television), converged Internet protocol (IP), unified communications, security, home alarm monitoring, local access, as well as long distance and legacy data services. This complete range of products is unmatched by any other provider in the province. MTS serves both residential and business customers in Manitoba.

Allstream is a leading competitor in the national business and wholesale markets; offering small, medium and large businesses and government organizations a portfolio of telecommunications solutions tailored to meet their needs. Allstream's main products are IP-based communications, unified communications, voice and data connectivity, and security services. Allstream operates an extensive national broadband fibre optic network that spans almost 30,000 kilometres, and provides international connections through strategic alliances and interconnection agreements with other international service providers.

MTS Allstream was created in 2004 when then Manitoba Telephone Services purchased Allstream. Allstream's history goes back to the mid 1800's starting with Montreal & Toronto Magnetic Telegraph Company (M&TMT). In 1980, Canadian

National Telegraphs (which bought M&TMT in 1881) and Canadian Pacific Telegraph merged to become CNCP Telecommunications. In 1990, CNCP changed its name to Unitel Communications and in 1992 became one of the first competitive long distance telephone service providers in Canada. After AT&T Corporation in the USA purchased 20% of Unitel in 1993, Unitel changed its name to AT&T Canada Long Distance Services in 1996. In 1999, AT&T Canada Long Distance Services, MetroNet, Netcom Canada & ACC TelEnterprises merged to become AT&T Canada. In 2002, AT&T Canada ended its co-branding agreement with AT&T Corporation and, in 2003, was renamed as Allstream.

Within MTS Allstream, common core parts of the business have been merged (Network & Information Services, Finance, Legal, Corporate Communication & Human resources); however, the customer facing operational parts of the business operate as two separate divisions:

- MTS – for customers within the province of Manitoba, and
- Allstream – for customers outside of the province of Manitoba.

Each of these two divisions has their own president that report to the CEO of MTS Allstream. Each president has his own sales, marketing and customer facing operations organizations as the businesses in each of the two geographic areas are significantly different. The MTS division within Manitoba operates as an Incumbent Local Exchange Carrier (ILEC); whereas, the Allstream division outside of Manitoba operates as a Competitive Local Exchange Carrier (CLEC). For the purposes of this analysis, only the Allstream division, in conjunction with organizations in the Network & Information Services and Finance departments, is considered.

2.1 Allstream Product Strategy

The Allstream division has made significant changes in its product portfolio of telecommunication services over the past ten years. The margins Allstream was able to earn from its legacy services, such as local voice, long distance voice, Frame Relay and Asynchronous Transfer Mode (ATM), had been significantly eroded as these products had become commodities within the market place. To become profitable again, Allstream had to create a new portfolio of telecommunication services that would generate better returns. The new products within this new portfolio are:

- Wavelength - also known as Wavelength Domain Multiplexing (WDM)
- Switched Ethernet (SwE)
- Business IP (BIP) - also known as Multi Label Protocol Switching (MPLS)

These products, along with Internet services, make up the IP Converged (IPC) product portfolio within Allstream.

2.2 IPC Product Analysis

Coupled with the introduction of the new IPC portfolio of products, further initiatives have been launched to improve Allstream's profitability by reducing the overall provisioning cycle time for the delivery of the services when the customer is physically located within a building that Allstream has a Point of Presence (POP). When a customer is located in a building with a POP, the customer is referred to as being on Allstream's network or as an On-Net customer. By reviewing and realigning the specific tasks that make up the overall provisioning process for the Allstream IPC product portfolio of services, the expectation is that, by delivering the service more quickly to the customer, the customer can be billed sooner and revenue can be realized sooner. A polar analysis of Allstream's operational processes for the delivery of IPC products shows a significant gap in the speed of delivery and the reliable delivery of IPC services as compared to the desired state. Figure 2 provides the definitions for the polar analysis.

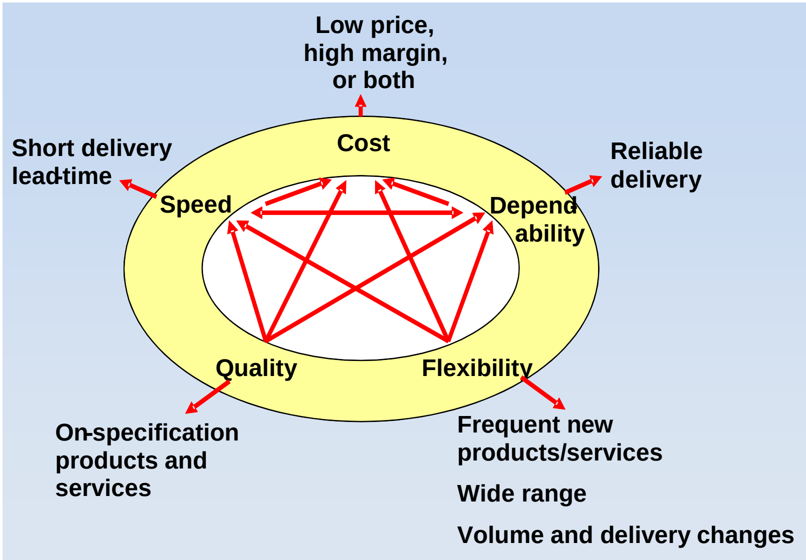


Figure 2 – Polar Analysis Definitions
Source: Slack, N. et al, with framework adapted from Operations Management 6th edition
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Figure 3 overlays the Allstream's current polar diagram with the desired polar diagram for the delivery of IPC services. As can be observed from contrasting the "current" and "desired" lines in figure 3, the existing margins and service quality for IPC services are adequate and do not need to be adjusted. However, the speed with which On-Net IPC service can be delivered and the resulting reliable delivery of On-Net IPC services are both areas that are in need of improvement.

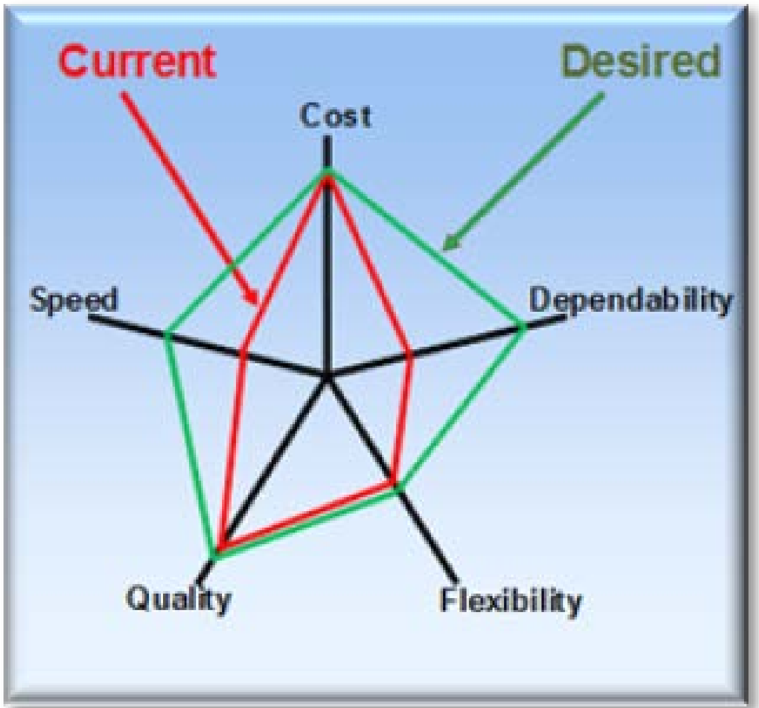

Figure 3 – Polar Analysis Allstream IPC Services
Source: Slack, N. et al, with framework adapted from Operations Management 6th edition

2.3 Competitive Environment

Allstream competes in the data communications services market both within Canada and globally. Within Canada, the data communications market has been estimated at $3.353 billion in 2009 (Sone, 2010). While there has been an overall decline in the market size in 2009 as compared to 2008, it is forecasted that, as the global economy recovers from the recession experienced in the 2008/ 2009 period, the Canadian market for data communication services will being to grow. The current estimated Compounded Annual Growth Rate (CAGR) of the Canadian data communications market has been estimated at 1.8% over the 2009 to 2012 period (Sone, 2010). Chart 1 outlines the estimated value of the Canadian data communication market.

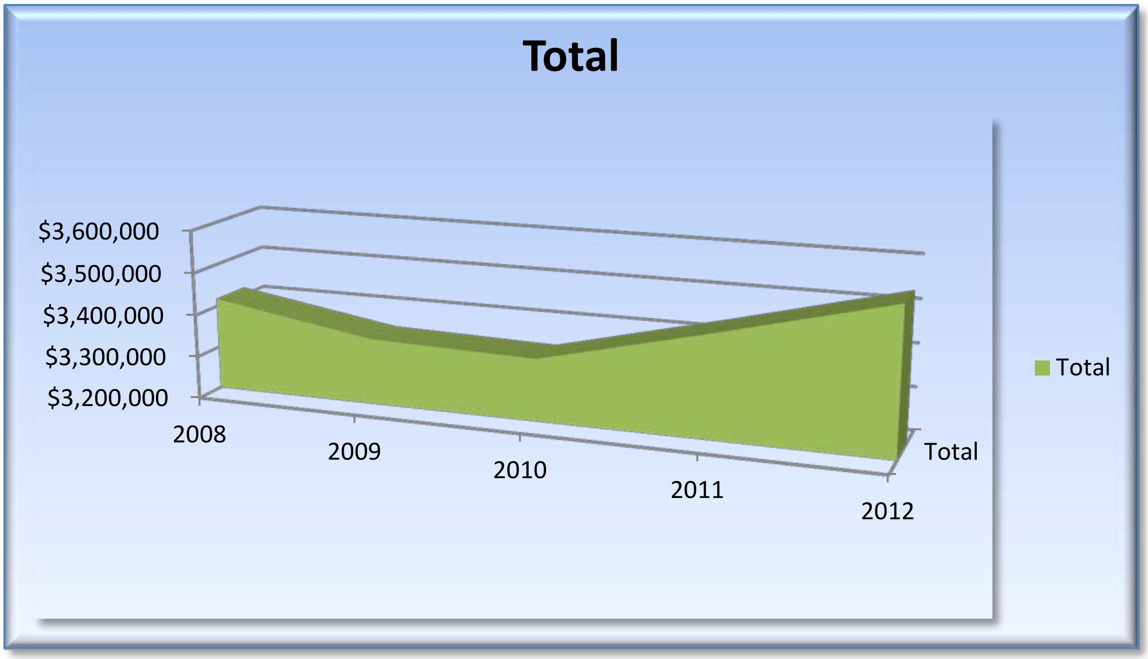

Chart 1 – Canadian Data Communications Market Value 2009 ~ 2012 est.
Source: NBI/Michael Sone Associates Inc., Canadian Data Communications Services Market Report 2010 Edition

The makeup of the services within the Canadian data communications services market has been continually evolving over the past number of years. The total percentage of the market contribution from legacy data services has been in a continual decline for a number of years; whereas, market contribution from newer advanced services (services within Allstream IPC product portfolio) has been growing. Chart 2 outlines the changes in market contribution between legacy services and advanced services.

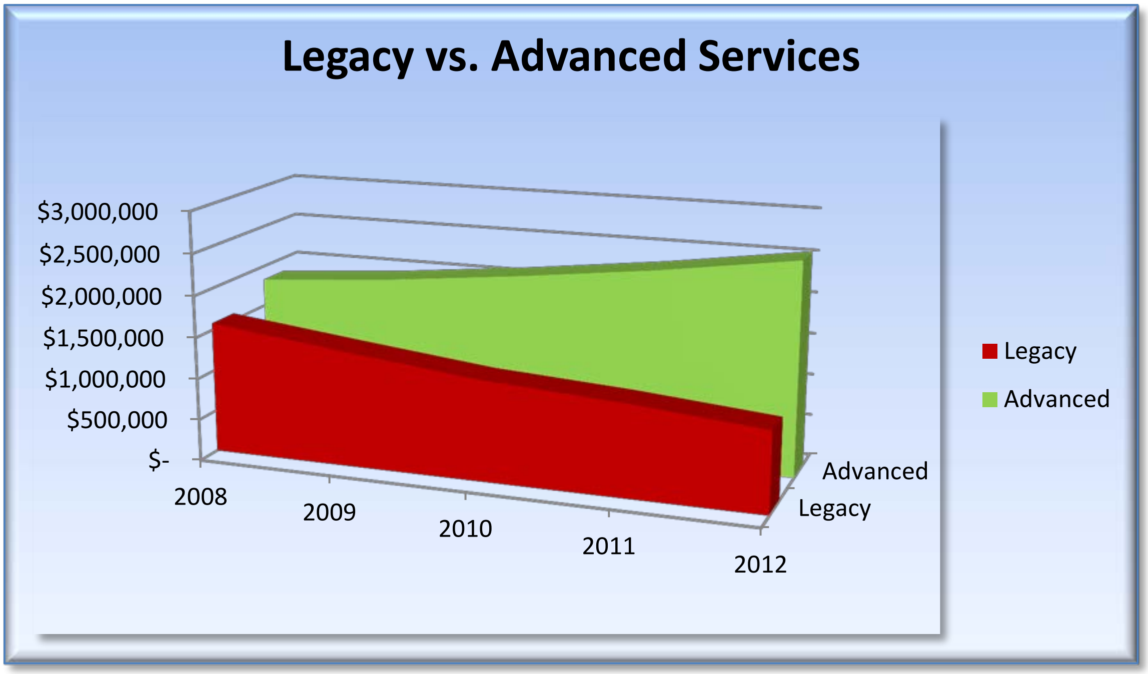

Chart 2 – Legacy versus Advanced Services Value Trends 2009 ~ 2012 est. Source: NBI/Michael Sone Associates Inc., Canadian Data Communications Services Market Report 2010 Edition

MTS Allstream's major competitors in the Canadian data communications market are Bell Canada and Telus. MTS Allstream currently holds 9.4% of the market whereas Bell Canada & its Bell West subsidiary hold 44% and Telus and its Telus East subsidiary hold 19.8% (Sone, 2010). It should be noted, even though the overall market shrunk 2.1% from 2008 to 2010, MTS Allstream was able to grow its market share from 9.1% to 9.3% during this period. Charts 3, 4 and 5 outline the percentage market share held by each of the competitors from 2008 to 2010.

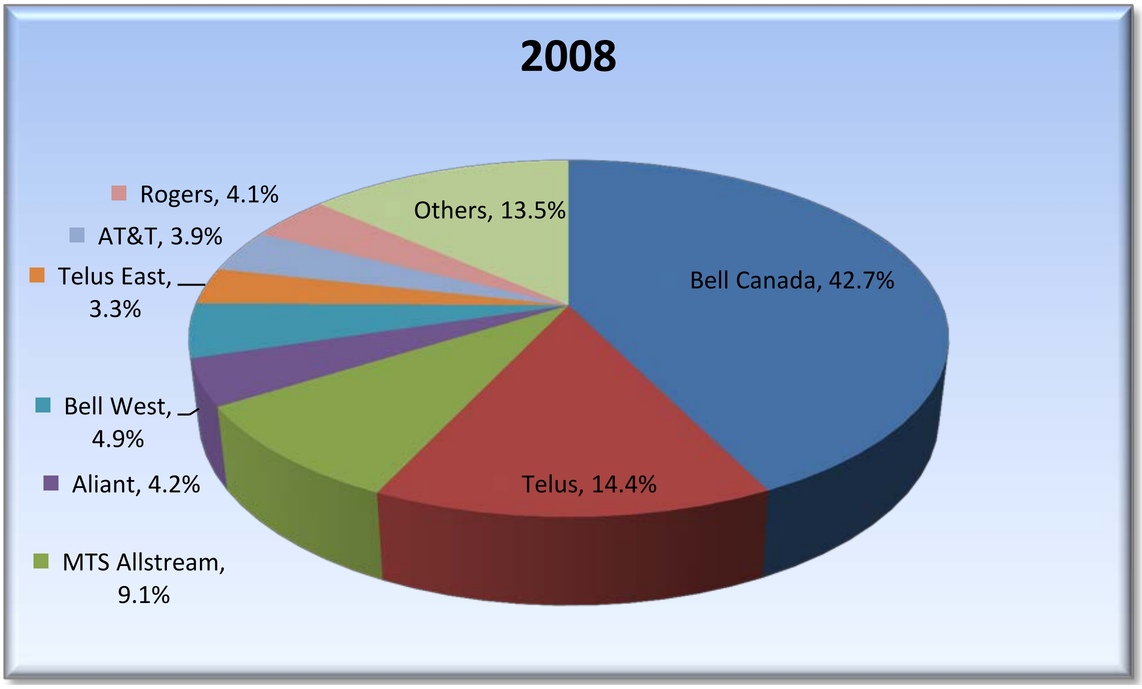

Chart 3 – Canadian Data Communications Market Share 2008
Source: NBI/Michael Sone Associates Inc., Canadian Data Communications Services Market Report 2009 Edition

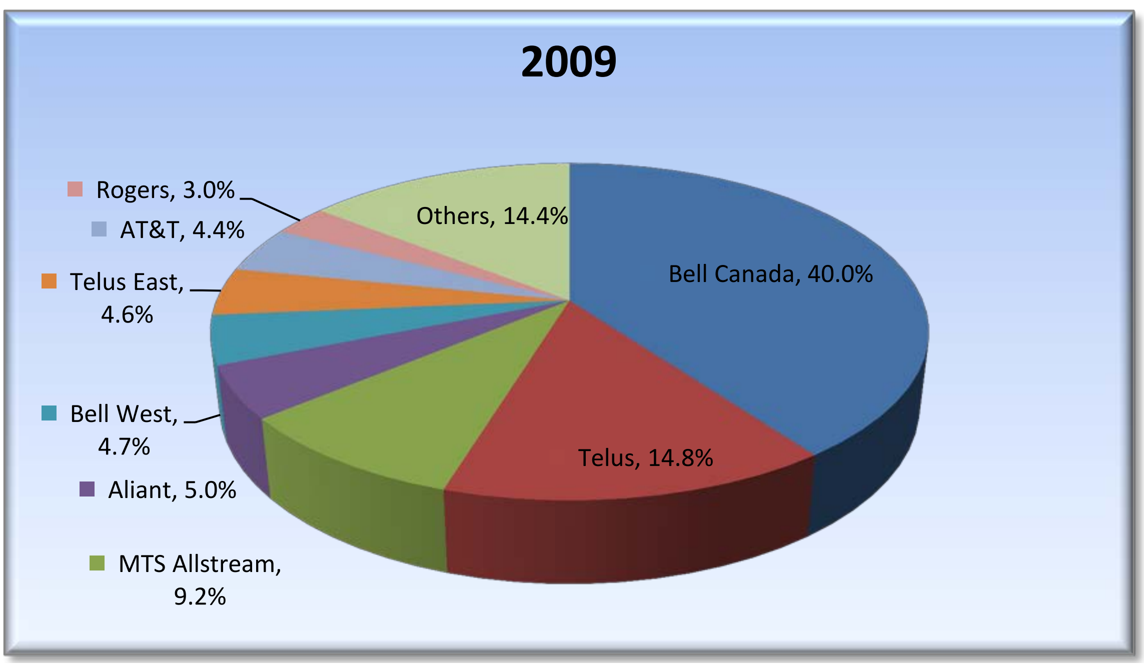

Chart 4 – Canadian Data Communications Market Share 2009
Source: NBI/Michael Sone Associates Inc., Canadian Data Communications Services Market Report 2010 Edition

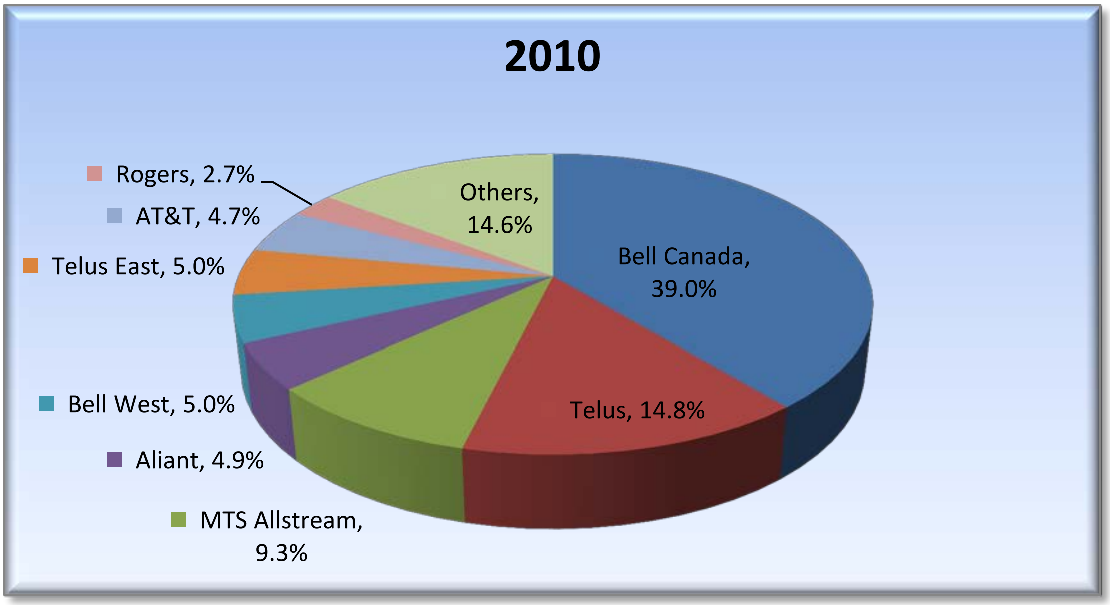

Chart 5 – Canadian Data Communications Market Share 2010 – estimate (Sone, 2010)
Source: NBI/Michael Sone Associates Inc., Canadian Data Communications Services Market Report 2010 Edition

When compared to Bell Canada and Telus, Allstream's greatest strength is its relatively small size. Allstream's smaller size allows it to respond more quickly to changes in the market than can Bell Canada or Telus. What continues to be Allstream's greatest weakness is its lack of brand awareness in the market, especially in western Canada. Recent surveys have shown that brand awareness among some of Allstream's largest customers is poor (Badgley, 2010). Opportunities for Allstream will be in the area of its IPC portfolio of products and expanding its physical network so as to reduce reliance on others telecommunication service providers (specifically Bell Canada & Telus) to provide the "last mile" local access to Allstream's end customers. The ongoing threat that Allstream must face is the "deep pockets" of both Bell Canada and Telus. Both Bell Canada and Telus have demonstrated that they will provide services at a loss for large- enterprise customers if there is believed to be a strategic advantage to win that customer's business.

3: Company Structure

The following sections outline the various organizations within each business unit and the information systems that are impacted with the introduction of new technology at Allstream. Figure 4 provides an organizational chart of the business units and their functional groups that are involved in new technology integration within Allstream.

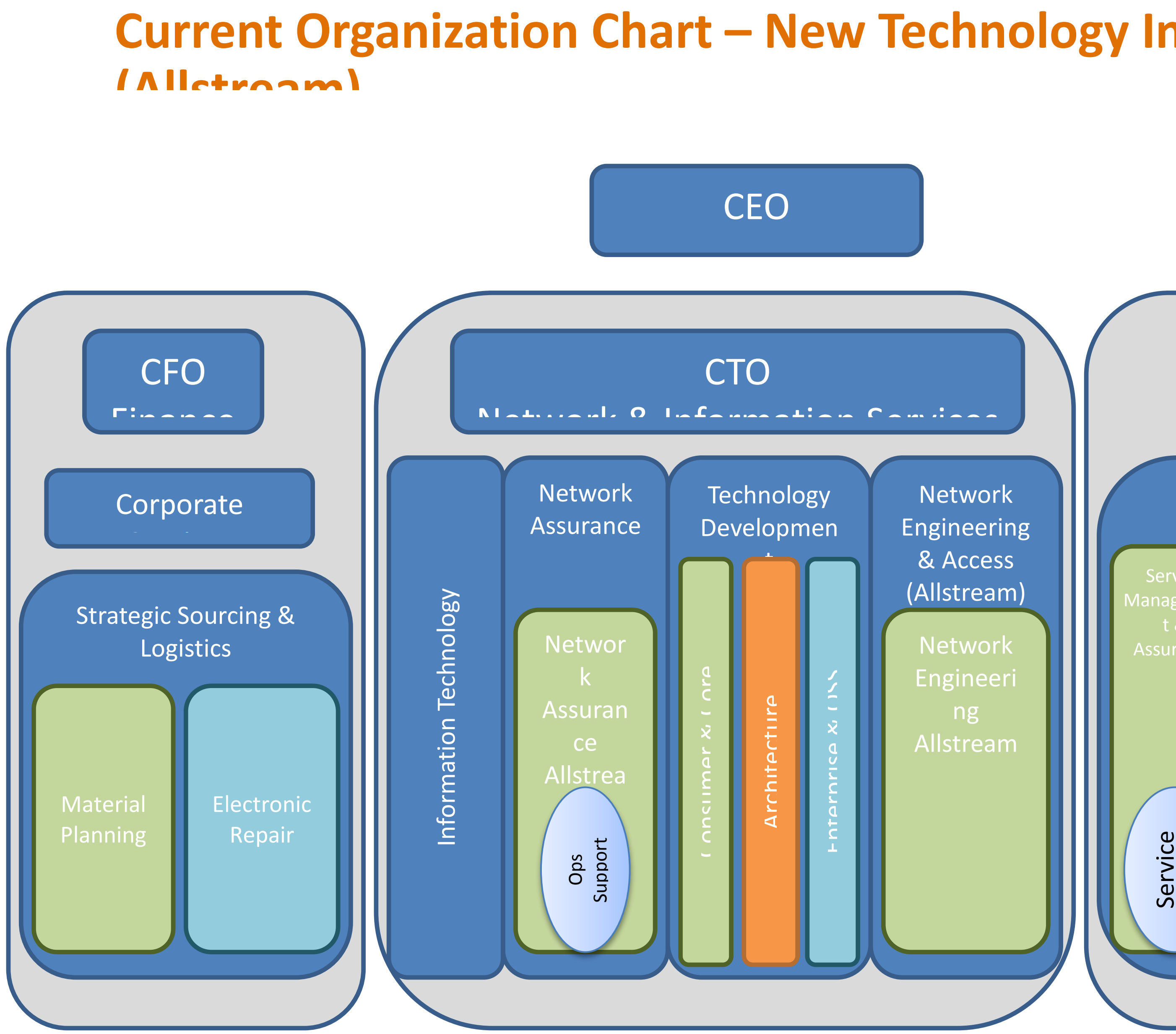

Figure 4 – MTS Allstream Condensed Organizational Chart- Current
Source: created by author

3.1 Network and Information Services

Within the Network and Information Services organization fall the Technology Development, Network Engineering, Information Technology and Network Assurance organizations of MTS Allstream. Each of these four business units report up to the Chief Technology Officer (CTO), who, in turn, reports to the CEO of MTS Allstream.

3.1.1 Technology Development

Technology Development (TD) is accountable for providing network architecture and technology for the MTS Allstream network in support of current and future network and market requirements. TD is responsible for New Technology Introduction (NTI), the process where new components, devices, and technologies are reviewed, selected, and introduced into the MTS Allstream networks, and for the development of the MTS Allstream Plan of Record and related strategies. The TD organisation covers the technology areas of Allstream Collaboration Suite, Consumer Technology Solutions, Core transport and IP services, Enterprise Technology Solutions, OSSs, and Voice and Contact Centre Solutions.

As part of the NTI process, the TD team has solicited participation from various other teams within MTS Allstream to be engaged with the various NTI projects. Representatives from parallel TD teams, Network Assurance, Service Management, Field Operations, Network Engineering and others are routinely invited to participate in the NTI process. Included within the scope of the NTI process, TD issues the following documentation to be used by other teams to integrate the new technology into the operational business:

- All approved parts in the Equipment Approval Notice (EAN),

- Within the EAN, there is a high-level recommendation for critical sparing of equipment. Within Allstream these components are referred to as critical spares,
- A high level description of the new technology and its various configurations and applications in the Technology Change Document (TCD),
- A high level process description of how to commission the equipment and provision services on the equipment in the Provisioning and Troubleshooting Guideline (PTG).

As part of the NTI process, it is left up to other teams that are part of the NTI process to resolve the items listed below without any specific guidance from TD as the TD team excludes within the scope of their work any recommendations for the following:

- How the new equipment will be modelled or defined in the Allstream Network Information Management System (NIMS) database. The NIMS database is the engineering database of record for all equipment deployed in the Allstream network,
- How any services to be provisioned on the new equipment will be defined within the NIMS database,
- What the preferred or standard configuration of the equipment should be within the Allstream network,
- A thorough breakdown of the vendor's product equipment codes/ part numbers for each component and an Allstream inventory catalogue

number for each component in Allstream's Enterprise Resource Planning (ERP) database, and

- Detailed work instructions within the Provisioning and Troubleshooting Guideline (PTG) documentation outlining which team would carry out which specific task when commissioning or configuring the new technology or a service on the new technology.

In early 2011, TD started developing an updated Responsibility Transfer Notice (RTN) document that would be used when a newly introduced technology was to be used for a First Office Application (FOA). The RTN document was created to help address and identify issues that had been encountered in the past when a new technology was introduced.

It should be noted that new product introduction (NPI) (new services) is not within the scope of this paper. However, it has been observed that the NPI process tends to be much more of a collaborative effort with other parts of the Allstream organization. The TD Enterprise Services Development team has routinely engaged the support organizations within Customer Operations to ensure that any new product that is introduced integrates into the existing Customer Operations business processes.

3.1.2 Network Engineering

Network Engineering is accountable for the design and implementation of the network in a quality and cost effective manner to meet customer and network growth requirements and evolution plans. Network Engineering is also accountable to ensure physical network element information is accurately reflected in relevant corporate databases.

The Allstream Network Engineering group has five separate teams. They are the Western Region engineering team; Central Region engineering team; Eastern Region engineering team; Network Engineering Control Centre (NECC) and the Power and Structures engineering team. The three regional engineering teams carry out similar activities of network engineering the telecommunication network in their responsible geographical areas. As it related to new technology integration, the NECC provides an administration function to carry out the Material Master Authorization (MMA) process. The Power and Structures engineering team is accountable for the selection, standards and engineering of the DC power plants and backup generators used within the Allstream network. It should be noted that this team carries out the new technology introduction activities for the DC power plants and generators used within Allstream network but this team does not follow or adhere to Allstream NTI process nor does this team have any dotted line accountability to the TD department.

One of the key accountabilities for Network Engineering is the purchase of the initial set of critical spare equipment when that specific equipment is used for the first time in a specific geographical region. The network engineering team uses the Central Repair Center (CRC) database to determine if any critical spare equipment has been purchased for the area when additional equipment is to be installed into the network. It should be noted that once the Network Engineering team purchases the initial set of critical spare equipment for an area, Network Engineering does not purchase any more critical spare equipment to ensure that the ratio of critical spare equipment to what has been deployed into the production network is maintained as outlined in the TD EAN document.

3.1.3 Network Assurance

Network Assurance (NA) is accountable for the overall management, performance, and reliability of the MTS Allstream networks. Teams exist within Allstream's NA organization that focus on the following:

- Transportation and Infrastructure
- Voice and Traffic Management
- Data and IP
- NOC Operations
- Operations Support

The NA team uses the NIMS database during triage activities when a network failure occurs. The information in NIMS provides the NA team with the information regarding the physical components installed in the network in the event a component has failed. Once NA has determined what the failed component is, they will use the CRC database to find a critical spare component. Once a critical spare has been located, NA will dispatch a Field Operations technician to pick up the critical spare component and then travel to the site to replace the failed component.

3.2 Strategic Sourcing and Logistics

Within Strategic Sourcing and Logistics (SSL) fall the Material Purchasing and the Electronic Repair organizations within MTS Allstream. The Strategic Sourcing and

Logistics business unit reports up through the Finance organization to the Chief Financial Officer (CFO) who in turn reports to the CEO of MTS Allstream. Strategic Sourcing and Logistics supports the company's objective of reducing costs and achieving maximum value in the acquisition of goods and services through four main functions: Sourcing, Logistics, Business Process Outsourcing, and Support Services.

3.2.1 Materials and Purchasing

The Materials and Purchasing team monitors the consumption of the items that have been catalogued in the SAP ERP system. The material planners within Materials and Purchasing team set the inventory levels (reorder point & lot size) and determine, based on usage and recommendations from other parts of the overall organization, whether an item should be stocked in the warehouse or ordered directly from the supplier. In April 2011, an ad-hoc team was put together with representation from Materials Purchasing, Field Operations, Shared Services and Service Delivery to review inventory levels of components stored in the Toronto corporate warehouse that are used for the day to day delivery of services to Allstream's customers. Primed by the manager of Materials & Purchasing, this ad-hoc team meets on a monthly basis to review the inventory levels of items that have run out of stock which have resulted in the service delivery due date for a customer order being missed.

3.2.2 Electronic Repair

The Electronic Repair team maintains the CRC database, processes all of the repairs and returns that come back from the field and works with MTS Allstream`s vendors to have failed equipment repaired. The CRC team does not set stocking levels nor recommend where spares are to be kept as they have no visibility to the NIMS database or what equipment is deployed in the production network. The Electronic Repair team relies on input from other organizations within MTS Allstream to establish stocking levels of critical spares and the location where critical spares are to be kept in the various critical spare depots across the country.

3.3 Customer Operations

Customer Operations organization within Allstream is accountable for the design, delivery, invoicing, and support of the services provided to Allstream's customers. The following teams within Customer Operations organization are impacted by new technology integration: Service Management and Assurance, Service Delivery, Field Operations, and Shared Services

There are two distinct classifications of technicians within Customer Operations:

Field Technicians

A field technician physically installs and maintains Allstream's telecommunication network. These technicians physically work in Allstream's central offices, customer locations and carry out activities on Allstream's outside plant infrastructure (inside manholes, up telephone poles, mountainside microwave repeater sites, etc...). The technicians in Field Operations are primarily field technicians.

Remote Technician

A remote technician works in an office type environments and remotely logs into Allstream's telecommunication network from their office. Remote technicians do not travel to any Allstream network or customer sites. The technicians in Service Management and Assurance and Service Delivery are all remote technicians.

3.3.1 Service Management and Assurance

3.3.1.1 Service Management

The Service Management organization is accountable for service quality and performance through the timely and complete resolution of chronic and systemic problems, pro-active supplier management, and quality assurance of customer provisioning and maintenance of existing and new products, services and technologies. The Service Management organization provides technical support for the Service Activation and Assurance organization by taking away and looking into chronic issues that inhibit the smooth day-to-day operations within the Service Activation and Assurance organization.

Within the Service Management organization, a Quality Management team has been created. The Quality Management team has been tasked with leading and managing service database quality assurance activities through establishing standards, processes & templates; assessing the conformance/impact of existing/new components against these standards and overseeing reconciliation activities. One of the committees that is headed up by the Quality Management team is the NIMS Advocacy Forum.

The NIMS Advocacy Forum was created in late 2010 as an outcome of a consultation project where Telcordia was engaged to work with Allstream to address issues that had been encountered related to the quality of the data stored within the NIMS database. In March of 2011, the consultation phase with Telcordia came to a close. Telcordia provided a report to Allstream outlining a number of areas that could be improved related to: what information should be captured in the NIMS database, and how that information should be represented.

The NIMS Advocacy Forum is made up of members from Network Assurance, Technology Development, Network Engineering, Service Design, Field Operations as well as others from the Service Management and Assurance organization. It should be noted that attendance to the weekly meetings by the various teams that make up the NIMS Advocacy Forum has been quite good, with the exception of TD. Of the eight meetings held from 24 Mar 2011 until 12 May 2011, there was no representation from the TD Architecture team and representation from the TD OSS team was only provided on one meeting on 31 March 2011.

3.3.1.2 Service Activation and Assurance

The Service Activation and Assurance organization is accountable for the initial activation of a service for a customer as well as the ongoing maintenance and trouble-shooting and repair of the service. These two activities are carried out by the Customer Test and Activation (CTAC) team and the Service Assurance (SA) team. The members of these two teams have very similar skill sets however the CTAC team focuses on the activation of a customer’s service; whereas, the SA team focuses on the maintenance and restoral of a customer’s service.

3.3.2 Service Delivery

The Service Delivery team is accountable for the order entry, order management, logical design/ initial configuration and invoicing of a customer's service within Allstream's network. The Service Delivery team uses the NIMS database to inventory and track each customer service that is implemented within the Allstream network.

3.3.3 Field Operations

Field Operations is accountable for the timely, cost effective field installation and maintenance of all central office and customer premise facilities within the Allstream geographical territory. Field Operations includes a Control Desk (dispatch organization) that schedules field technicians for customer circuit installations, removals and maintenance activities. Separate from the Service Management organization, Field Operations has an internal support team that provides day to day technical and process support for the Allstream Field Operations organization. This support team is separate from the Service Management organization as the Field Operations support team has to focus on the physical challenges faced by the technicians that work in the field as compared to those remote technicians that work within the rest of the Customer Operations. In 2011, the Field Operations Support team brought additional staff members on board to try to capacity manage the critical spare components kept on hand and tracked in the CRC database.

3.3.4 Shared Services

Shared Services is accountable for taking a leading roll in providing shared services to operational stakeholders within Customer Operations to enable strategic program planning and delivery, process optimization, change management and workforce management. Staff within the Share Services team are primarily business and process analysts. These staff members create and optimize the various business processes used within the Customer Operations organization; however, these staff tend to be non-technical and are not familiar with the physical telecommunications technologies used to deliver the services offered by Allstream. The Shared Services team is not currently engaged with the New Technology Introduction process but it is engaged in the New Product Introduction process.

3.4 Business Support Systems

The following sections outline the information systems that are impacted by new technology integration. It should be noted that there are no linkages between these various database systems. Figure 5 provides a graphical representation of how the various business units and their functional departments interact with the impacted information systems.

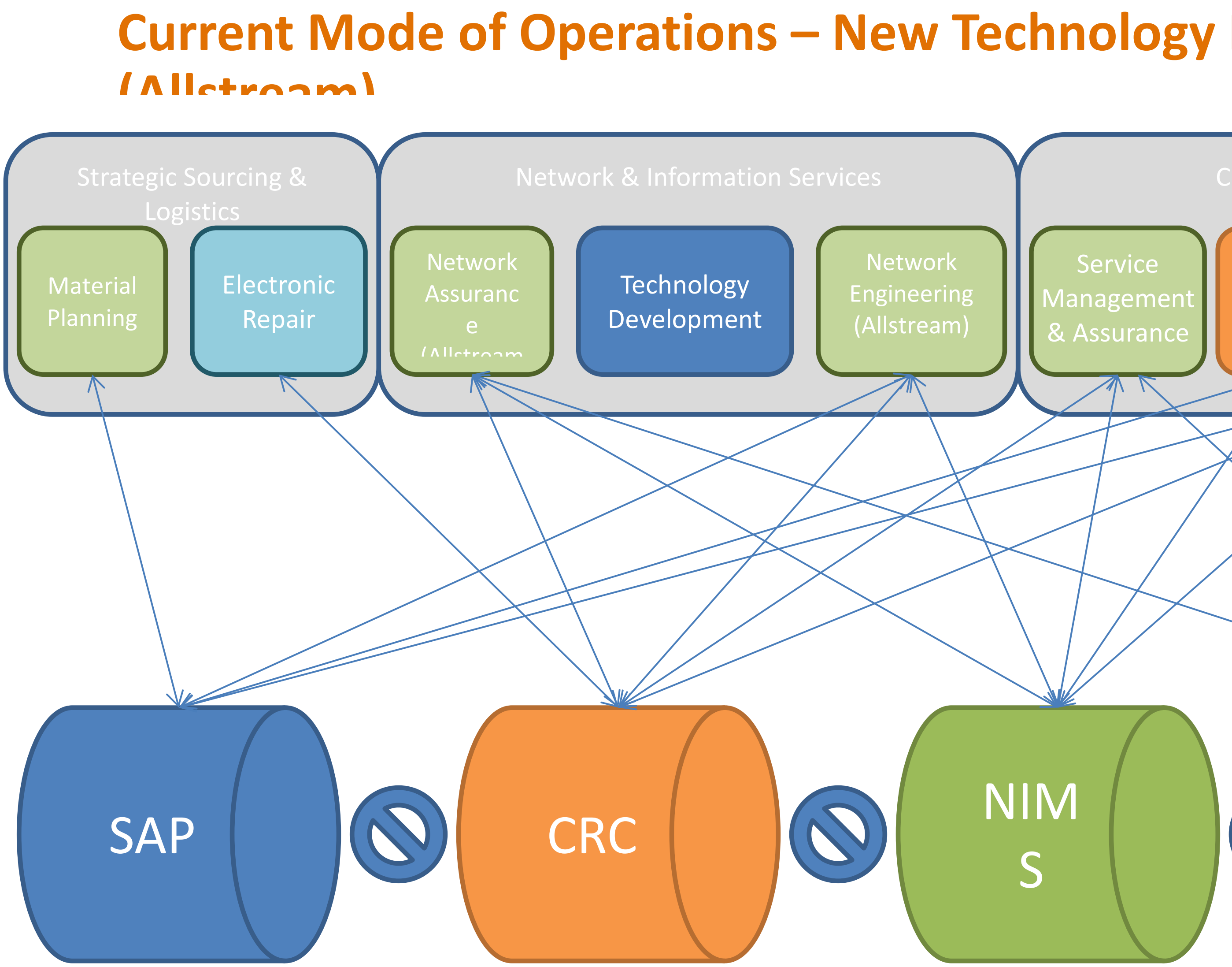

Figure 5 – Current Mode of Operations with Systems
Source: created by author

3.4.1 Network Inventory Management System (NIMS)

Allstream uses the Telcordia® Granite Inventory database to track the equipment and facilities that make up the Allstream network. Within Allstream, the application is referred to as the Network Inventory Management System or NIMS database. This database system is used to record all of the services that are installed for Allstream customers across the Allstream's physical telecommunication network. The NIMS database is a significantly important database as it is used by the various functional teams that install and support the services provided to Allstream customers.

After new equipment is introduced by the TD organization through the NTI process, it is up to network engineering to create the templates and model the new equipment in the NIMS database. The activity of modelling the equipment not only encompasses the physical attributes (the physical size) of the equipment but also modelling the physical ports and logical channels of the equipment in the database. It is the modelling of the physical ports and logical channels that is of primary concern to the Customer Operations organization.

3.4.2 Enterprise Resource Planning System (SAP)

Allstream uses the SAP ERP software to manage the inventory of parts and equipment that are used within the Allstream network. As part of the process to have items set up in the SAP ERP database, the SSL team has created a Material master Authorization (MMA) process. The MMA process requires the person that is requesting that an item be catalogued in the SAP ERP to fill in the MMA form. The MMA form has a number of mandatory fields that need to be completed so that the inventory management of the item can be carried out by the SSL team.

3.4.3 Central Repair Control Database (CRC)

The Central Repair Control (CRC) database is an in-house developed application within MTS. The use of the CRC database was rolled out to the Allstream division in 2006. This CRC database is an inventory system that tracks the physical location of critical spare equipment throughout all of the MTS & Allstream operational areas. All critical spare equipment and equipment repairs are tracked within the CRC database.

3.4.4 Equipment Support Management Tool (ESMT)

The ESMT is used to track the maintenance contracts that are applied to each Cisco router that is deployed within MTS Allstream. The MTS Allstream Network Assurance organization has accountability to manage and pay Cisco a support fee for each router that is actively deployed within the MTS Allstream network. As part of the provisioning process for a customer installation, the Field Operations router staging team adds the serial number of the new Customer Premise Equipment (CPE) router to be installed at the customers place of business into the ESMT database. When a CPE router is removed from the network the router information is removed from the ESMT database and the payment for support is cancelled.

It should be noted that the ESMT is not supported by the Allstream IT organization but is a `skunk-works` application that was developed and maintained within the Service Activation and Assurance organization. The individual who created the ESMT database has recently resigned from Allstream (July 2011) and is passing over the accountabilities to updated and maintain the ESMT to another person in the Service Assurance organization.

3.5 Accountabilities for New Technology Integration

Table 1 on the following page provides a summary of the accountabilities of each of the teams involved with new technology introduction. This table outlines what each team currently does when new technologies are introduced into Allstream operational processes. However, what is not addressed with all of these accountabilities is how new technologies are to be integrated into the operational business. As an example, TD is accountable for providing new technologies and Network Engineering, through the NECC, carries out the administrative function to carry out the MMA process. Within the current organization, as shown in figure 4, no one is accountable to provide a forecast for the future consumption of the newly introduced equipment. Without the forecast information, the material planners have no information to determine how much stock of any particular item need to be brought into inventory. Additionally, as shown in figure 5, there are no direct correlations between the business support systems that are impacted by the introduction of new technologies. As these systems are not linked, there is no way to use data from one system (i.e. NIMS) to forecast future inventory requirements in the other systems (i.e. SAP and CRC).

Organizations			Accountabilities
Network and Information Services			
	Technology Development		accountable for providing network architecture and technology for the MTS Allstream network in support of current and future network and market requirements.
	Network Engineering		accountable for the design and implementation of the network in a quality and cost effective manner to meet customer and network growth requirements and evolution plans.
	Network Assurance		accountable for the overall management, performance, and reliability of the MTS Allstream networks
Strategic Sourcing & Logistics			
	Materials and Purchasing		accountable for the company's objective of reducing costs and achieving maximum value in the acquisition of goods that are inventoried in the warehouse
	Electronic Repair		accountable for maintaining the CRC database and processing all of the repairs and returned that come back from the production network
Customer Operations			
	Service Management and Assurance		
		Service Management	accountable for Service Quality and Performance through the timely and complete resolution of chronic and systemic problems, pro-active supplier management, and quality assurance of customer provisioning and maintenance of existing and new products, services and technologies
		Service Activation and Assurance	accountable for the initial activation of a service for a customer as well as the ongoing maintenance and trouble-shooting and repair of the service
	Service Delivery		accountable for the order entry, order management , logical design/ initial configuration and invoicing of a customer's service within Allstream's network
	Field Operations		accountable for the timely, cost effective field installation and maintenance of all central office and customer premise facilities within the Allstream geographical territory
	Shared Services		accountable to take a leading roll in providing shared services to operational stakeholders within Customer Operations to enable strategic program planning and delivery, process optimization, change management and workforce management

Table 1 – Summary of Allstream Structure and Accountabilities
Source: created by author

4: Impacts & Shortcomings

This chapter discusses the impacts on Allstream business processes due to the shortcomings that currently exist with how Allstream carries out new technology integration into its business processes. Each of the main sections below in this chapter identify key shortcomings and discuss how these shortcomings impact downstream business processes. While it may seem reasonable on the surface to assign the shortcomings listed below to specific teams within the organization, it is instead suggested that these shortcomings exist due to the lack of understanding of the deliverables, accountabilities and process gaps that exist between the various teams within the overall organization. Only by initially identifying the various shortcomings and through future discussions can these shortcomings be assigned to specific teams or groups of teams for resolution.

4.1 New Technology Introduction

The Technology Development team tends to work in isolation from the other parts of the Allstream organization when carrying out their activities. The current NTI process that was introduced in January 2007 has had a positive impact on overall technology integration within Allstream as the operational teams outside of TD now have prior knowledge of the new technology that is being introduced. Unlike other organizations within the Allstream division or Network and Information Services, the TD team has no support organization to facilitate new technology integration with the other operational organizations. When TD has been asked to provide further clarification on the information and documentation provided on how a new technology is to be integrated into the operational organization, the TD team has stated the following:

- TD does not train process to other parts of the organization
- TD does not know the processes used within other parts of the organization
- TD is not required to know the processes used within other parts of the organization to introduce new technology.

Further to TD's lack of understanding of the processes used within the operational organizations of Allstream, TD does not provide any guidelines as to how equipment should be integrated or modelled in the following business support systems: NIMS, SAP, CRC or the ESMT. Currently staff within the TD organization have no access to these systems. Any time one of the technical specialists in TD needs to get information from one of these systems, they call others from the operational organizations to get the required information.

This lack of engagement with the rest of the MTS Allstream organization has resulted in the information being provided by the TD organization not meeting the needs of the operational side of the business. The information being provided by TD, while technically correct, does not take into account the needs of those teams that must use the information. Listed below are some keys gaps that have been identified:

4.1.1 Equipment Compatibility/ Interoperability

The vendors of the telecommunication equipment used within the Allstream network, routinely issue newer/ updated versions of the same equipment. The TD organization will update the TCD and EAN documents but do not include a compatibility/ interoperability chart to identify which components between the generations are interoperable. As an example, table **2** lists the four different generations of the Nortel OME6500 platform (a Nortel OME6500 is a piece of telecommunication equipment commonly used throughout the MTS Allstream network). This table was put together after reviewing each subsequent EAN document plus the vendor's manuals. As can be seen in table 2, most components are not interoperable across the various generations of the OME6500 platform. This has caused great confusion when it comes to the maintenance and repair of the equipment as it is unknown within Network Assurance or Field Operations as to what critical spare component will work.

Unit Description	Nortel Pec Code	NTK503AB (BB)	NTK503CA (MSPP)	NTK503CDE5 (40G w/ electrical)	NTK503ADE5 (40G w/o electrical)
40 Amp Power Card	NTK505CE	X	X	Not Supported	Not Supported
40 Amp Power Card	NTK505CEE5	Not Supported	Not Supported	X	X
40 Amp Power Card	NTK505DEE5	Not Supported	Not Supported	X	X
60 Amp Power Card	NTK505CAE5	Not Supported	Not Supported	X	X
Top Venting Cooling Unit	NTK507AB	X	Not Supported	Not Supported	Not Supported
Front Venting Cooling Unit	NTK507BB	X	Not Supported	Not Supported	Not Supported
Rear Venting Cooling Unit	NTK507CB	X	Not Supported	Not Supported	Not Supported
Top Cooling Fan Unit	NTK507KB	X	Not Supported	Not Supported	Not Supported
Front Cooling Fan Unit	NTK507LB	X	Not Supported	Not Supported	Not Supported
Rear Cooling Fan Unit	NTK507MB	X	Not Supported	Not Supported	Not Supported
Front Venting Cooling Kit	NTK507BA	Not Supported	X	Not Supported	Not Supported
Rear Cooling Fan Module	NTK507MA	Not Supported	X	Not Supported	Not Supported
High Flow Front Venting Cooling Unit	NTK507BCE5	Unknown TCD not issued	Unknown TCD not issued	Not Applicable	Not Applicable
High Flow Rear Venting Cooling Unit	NTK507CCE5	Unknown TCD not issued	Unknown TCD not issued	Not Applicable	Not Applicable
High Flow (HF) Front Venting Cooling Module	NTK507LDE5	Not Supported	Not Supported	X	X
High Flow (HF) Rear Venting Cooling Module	NTK507MDE5	Not Supported	Not Supported	X	X
Access Panel	NTK505MA	X	X	Not Supported	Not Supported
Access Panel	NTK505MAE5	Not Supported	Not Supported	X	X
Air Filter	NTK509EA	X	X	Not Supported	Not Supported
Air Filter	NTK509ED	Not Supported	Not Supported	X	X

Table 2 – OME6500 Component Compatibility
Source: created by author

4.1.2 Stocking/ Inventorying of New Equipment

The SSL organization requires that a Material Master Authorization (MMA) form be submitted for each new component introduced into the Allstream network. While the NECC team provides the administration service to carry out the MMA process when new technology is introduced, the information provided in the TD EAN document does not meet the needs of the NECC team (Guthrie, 2011). This lack of understanding has led to instances where specific equipment required to activate a service for a customer have not been stocked or there is inadequate stock in the Allstream warehouse. When items have inadequate stocking in the warehouse, it is only discovered a few days before the due date that the service is to be delivered to the customer that there is a lack of inventory of equipment in the warehouse. Due to this lack of inventory in the warehouse, customer order due dates are missed, reducing Allstream ability to generate revenue as the billing for the service is delayed until some point in time in the future after the required parts become available.

Process	GAPS	Impacted System	Impacted Organizations	Customer Impacts
New Technology Introduction	Compatibility/ Interoperability between generations of equipment is unknown	NIMS	Network Assurance & Field Operations	Long service outages
	Stocking/ Inventorying of new equipment	SAP	Network Engineering, Service Delivery & Field Operations	Delayed service installations

Table 3 – New Technology Introduction Gaps and Impacts
Source: created by author

4.2 Network Engineering Standards

Though invited to participate by TD, the Network Engineering team does not consistently provide a representative to attend the various NTI calls (Cleyn, 2011).

Typically, the network engineering team does not get involved with NTI projects until the FOA. Due to the inconsistent early participation in the NTI process, Network Engineering tends does not to provide any feedback to the TD team when new technology is introduced to ensure the needs of network engineering are met. This inconsistent participation has resulted in staff within the Network Engineering team having various questions during a FOA when a new technology is to be designed and installed into the production network. As the staff in Network Engineering are seeking answers to their questions, the release of their designs are delayed. These delays result in the overall cycle time for service installation for Allstream customers being lengthened. As the cycle times for service installations lengthen, Allstream's ability to generate revenue and the overall customer experience are negatively impacted.

Prior to the creation of the NIMS Advocacy Forum, Network Engineering had not spoken with the other users of NIMS as to what information would be of value to be included in the templates for newly introduced technologies. Requests from other organizations to have additional information added into the various NIMS templates for new equipment have typically been rejected by network engineering. The network engineering organization saw no additional value to network engineering having this information in NIMS. The replies to such request typically came back stating to have the additional information added into the NIMS template would be too much work for network engineering. One of the critical omissions from the NIMS database equipment templates and models has been information about the common components of the equipment. Examples of common equipment are: power supplies, input/ output modules, fan modules, maintenance interface cards as well as other non traffic or service carrying components. The exclusion of common components from the NIMS database has created further complications when a failure of a common component in the production network occurs. This complication manifests itself in two key ways as outlined below.

4.2.1 Inventorying of Common Components

When a common component fails (i.e. a power supply) the Network Assurance team is accountable to determine the exact replacement component. As the component has failed, there is no way to remotely communicate/ interrogate the failed component to get the specific part/ model number. When this occurs, the Network Assurance team can only guess as to what the specific replacement component will need to be. Field Operations, when contacted by Network Assurance, will have no prior knowledge to what the exact model/ part number of the failed component is. Due to the lack of information in the NIMS database, the overall cycle time of the restoral process is lengthened as the only way to determine the exact part number of the failed component is for a Field Operations staff member to first travel to the location of the failure. As an example listed in table 2, twelve different fan modules/ cooling units (i.e. NTK507xxxx) for the OME6500 platform have been approved for use by TD in the various EAN documents. As the specific model number of the fan modules/ cooling units are not tracked in the NIMS database, it is impossible to know which one is required to facilitate a repair. Due to this ambiguity of not knowing which component to take, the time spent to complete the repair activity by the Network Assurance and Field Operations staff is increased which reduces their overall productivity.

4.2.2 Capacity Management of Critical Spares

As the common components are not tracked in the NIMS database, it is impossible to capacity manage (ensure enough spare parts are on hand) the critical spares of the common components as there is no record of what has been deployed into the production network. Further to the capacity management of critical spare common components, as mentioned in section 3.1.2, the Network Engineering team does not purchase additional critical spare components after the initial critical spares have been purchased as part of the FOA deployment of a particular technology in a specific geographical region. As more and more components are deployed into the production network, the sparing ratio that was recommended in the TD EAN document is not maintained. This results in insufficient critical spare equipment being kept on hand to address failures of components in the network.

Recently, additional staff members have been brought into the Field Operations organization to try to address the issue of the capacity management of critical spares by appointing a manager and assigning clerks to carry out routine critical spare inventory counts. While management has acknowledged the need to address this issue, the allocation of additional staff does not address the fundamental issue that not all of the various components within the production network are inventoried in the NIMS database. Without a complete listing of the components in the production network, it will be impossible to ensure the required critical spare components are kept on hand and readily available in the event a failed component needs to be replaced.

Process	GAPS	Impacted System	Impacted Organizations	Customer Impacts
Engineering Standards	Inventorying of common components	NIMS	Network Assurance & Field Operations	Long service outages
	Capacity management of critical spares	CRC	Network Assurance, Service Assurance & Field Operations	Long service outages

Table 4 – Engineering Standards Gaps and Impacts
Source: created by author

4.3 Isolated Process Optimization

Processes optimization has generally been carried out within the confines of each team without a clear understanding of the impacts of these optimization initiatives on other teams within the organization. What may initially seem to be quite logical to do within one team has lead to unforeseen consequences within other teams. Listed below is one specific examples.

4.3.1 Reduced IPC Cycle Times

As outlined within section 2.2, an initiative was implemented to reduce the provisioning cycle times of Allstream IPC services. The following two process maps outline the 'before' and 'after' states of the task realignment.

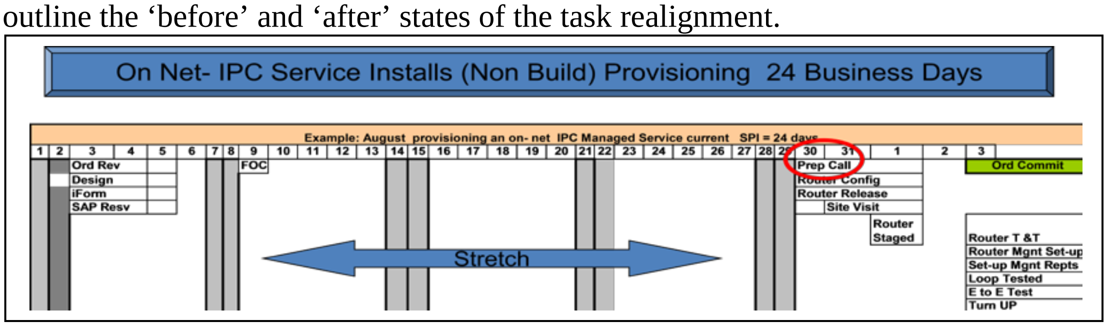

Figure 6 – Allstream IPC Service Install Process – Previous
Source: Lewis, K. Allstream Shared Services

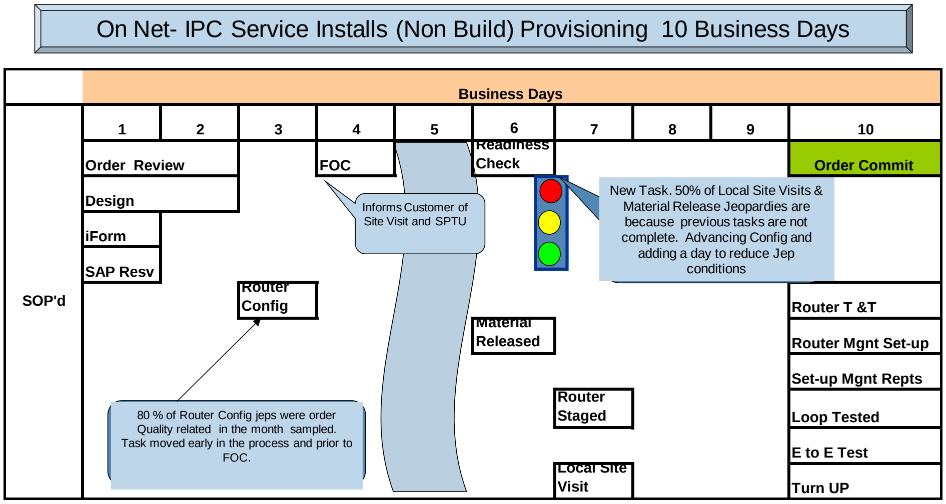

Figure 7 – Allstream IPC Service Install Process – Current
Source: Lewis, K. Allstream Shared Services

While this initiative was based upon sound business principles, this initiative did not address the ambiguities related to the underlying technologies used to deliver the IPC services. Since the changes to the provisioning process were made in Q4 2010, one of the more frequent issues has been IPC services being delivered late due to a lack of specific equipment in the Allstream warehouse. As the physical components used to deliver Allstream's portfolio of IPC services is different than the components required for legacy products, the shortening of the provisioning cycle time did not take into account the required stocking levels of the specific components in the warehouse or the vendor's delivery intervals when orders were placed for the specific components. Due to the low stocking levels of the required components and the relatively long delivery intervals of these components from the vendors, the due dates for the delivery of services could not be met consistently.

4.4 Business Support Systems

One of the key findings during the research for this paper was the realization that there are no linkages between the various database systems used to support the day-to-day activities of Allstream's business. Without any linkages between SAP, NIMS, CRC or the ESMT databases there is no ability to carry out any data-mining or queries on the data in these systems. Further is was discovered that the ESMT, while used extensively by Service Assurance, Network Assurance and Field Operations, has no formal support within the Allstream IT department. The ESMT is a "skunkworks" application created by the Service Assurance organization out of need. Figure 5 in section 3.4 provides an outline of these database systems and the teams that use them. The following sections outline the challenges to these information systems as they relate to new technology integration.

4.4.1 Network Inventory Management System (NIMS)

Even though the NIMS database is the engineering database of record for the Allstream network, not all components of the network have been recorded in NIMS. To date, the largest gap in the NIMS database data is information related to the common/ non service providing components (i.e. power supplies, fan modules, input/ output modules, etc...). As not all components are tracked in the NIMS database, the NIMS database cannot be used as a tool to capacity manage the number of critical spare components that need to be kept on hand.

4.4.2 Enterprise Resource Planning System (SAP)

No one within the Allstream division has been formally trained on the MMA process (Pankratz, 2011). One of the key areas of ambiguity with the MMA process is the requirement for the individuals that are filling in the form to provide "a monthly forecast for a 12-month period" for those items that are to be stocked in the warehouse (Klysh, 2011). With many of the new equipment types and technologies being introduced, there is no direct correlation between the equipment and a particular service. The new equipment could be used when activating one of many different services. As there is typically no way of directly correlating the monthly consumption of a newly introduced piece of equipment or technology with a specific service, there has been a hesitation to submit the MMA form to have new components stocked in the warehouse as there are no documented practices in places to assist in creating a consumption forecast for the newly introduced components.

4.4.3 Central Repair Control Database (CRC)

The CRC database has no linkages to either the SAP database or the NIMS database. This has resulted in two specific areas of concern: 1) A lack of critical spares; and 2) Inconsistencies in the description of the equipment. As there is no direct linkage between the CRC and NIMS databases, there is no functionality in place to ensure that additional critical spare equipment is purchased and provided as additional equipment is deployed into the production network. This lack of linkage/ process has resulted in instances where insufficient critical spare equipment was available to facilitate a service/ network restoral due to an equipment failure in the production network.

The information entered into the CRC database is entered into a number of free form fields. The staff within the CRC department enter the information provided to them by a technician in the field who fills in a blank form. As the technicians who are submitting the filled in forms to the CRC staff have no rigid guidelines as to what specific information should be used for the description of the equipment, errors are made when the forms are filled in. This incorrect information is then entered into the CRC database. The typical errors encountered are: "Incorrect manufacturer" (i.e. Cisco vs. Alcatel); and "Incorrect manufacturer part numbers." These errors result in longer restoral times as the correct critical spare component cannot be found or a mislabelled spares is selected but is found to be incompatible for the repair activity once the component has been brought to the site.

4.4.4 Equipment Support Management Tool (ESMT)

The ESMT database was originally created out of a need by Service Assurance to be able to ensure that MTS Allstream has a support contract in place with Cisco for each Cisco router that was deployed in the Allstream production network. Even though it has been proved to be beneficial, the ESMT duplicates data that is kept in other databases and the ESMT database structure is inflexible. To add vendors other than Cisco to the ESMT database, a significant amount of work effort is required to carry out the coding. Lastly, as the ESMT database is not supported by the MTS Allstream IT department, any requests to have further development of the ESMT is fully dependent upon the availability of the one individual who wrote the application (Maissan, 2011).

4.4.5 Results

The net impact of the missing linkages between these database systems has been that the required equipment for an installation activity or a repair activity was not readily available. This lack of equipment availability has resulted in the delay of service activation and service repairs for Allstream's customers. These delays negatively impact Allstream's ability to generate revenue as the billing for new services is deferred and potential rebates may have to be paid out to customers when services are not restored within the contracted service level objectives. The following table outlines the impacts to the various teams due to the lack of integration of these business support systems.

	SAP	NIMS	CRC	ESMT	Impacts
Material Planning		Does not access	Does not access	Does not access	- Unable to derive accurate inventry forecasts resulting in , customer order due dates being missed due to a lack of inventory in the warehouse
Electronic Repair	Does not access	Does not access	✓	Does not access	- Unable to capacity manage critical spares as there is no relationship between NIMS and the CRC database, resulting in extended service outages due to a lack of critical spare components being kept on hand - Unable to determine the support contract on a router sent to the CRC team for repair - Duplicate
Network Assurance	Does not access	✓	✓	✓	- Unable to capacity manage critical spares as there is no relationship between NIMS and the CRC database - Unable to determine if a component is available in the warehouse that could be used to effect a repair - Difficulties in determining if a compatable spare is available as there is no relationship between SAP, NIMS and the CRC databse - Duplicate/ misaligned information in NIMS and the ESMT database, resulting in confusion when determining Cisco support contract information
Technology Development	Does not access	Does not access	Does not access	Does not access	- Unable to derive any information from the various Business Support Systems as staff in TD have no access
Network Engineering	✓	✓	✓	Does not access	- Unable to capacity manage critical spares as there is no relationship between NIMS and the CRC database, resulting in extended service outages due to a lack of critical spare components being kept on hand - Difficulties in determining if a compatable spare is available as there is no relationship between SAP, NIMS and the CRC databse - Some network routers added into the network by Network Engineering may not have a support contract in place as Network Engineering has no access to the ESMT
Service Delivery	✓	✓	✓	Does not access	- Due to inaccurate inventory forecasting, customer order due dates are missed due to a lack of inventory in the warehouse - Duplicate/ misaligned information in NIMS and the ESMT database - Some customer routers added into the network by Service Delivery may not have a support contract in place as Service Delivery has no access to the ESMT
Service Management & Assurance	✓	✓	✓	✓	- Unable to capacity manage critical spares as there is no relationship between NIMS and the CRC database, resulting in extended service outages due to a lack of critical spare components being kept on hand - Duplicate/ misaligned information in NIMS and the ESMT database, resulting in confusion when determining Cisco support contract information
Field Operations	✓	✓	✓	✓	- Unable to capacity manage critical spares as there is no relationship between NIMS and the CRC database, resulting in extended service outages due to a lack of critical spare components being kept on hand - Difficulties in determining if a compatable spare is available as there is no relationship between SAP, NIMS and the CRC databse - Duplicate/ misaligned information in NIMS and the ESMT database, resulting in confusion when determining Cisco support contract information - Duplicate/ misaligned information between SAP and the CRC database, resulting in confusion when looking for critical spare components

Table 5 – Impacts on the Business Due to Misalignment of Business Support Systems
Source: created by author

5: Literature Review

The following section outlines some general best practices that can be followed when new technologies are introduced into any business. This is followed by some specific best practices that are directly applicable to the telecommunications industry.

5.1 Best Practices

Various articles, journals and books were reviewed in relations to the topic of new technology integration. Most of the resources reviewed focused on two main areas: the introduction of new services and the process to implement these services, and the development of manufactured products and how to transition a new manufactured product from the research and development (R&D) team into manufacturing and production. No specific articles were found relating specifically to the integration of new technology into the day-to-day business operations of a communications service provider. Though the material from the literature review primarily focused on the manufacturing industry, the literature generally suggested the following themes to facilitate successful technology integration:

- Introduce a R&D Quality Program to facilitate the following:
  - Reduce defects with current R&D practices
  - Reduce R&D cycle times
  - Improve the quality of the R&D output (Endres,1997)

- Create an understanding of the interdependence of R&D with other functions within the organization (Endres,1997)
- Realize the role that the customer should play in the design and development process (Endres,1997)
- Carry out multiple trials of a new process and explicitly document all differences between each trial run and address the differences before moving the new process into the production environment. This practice will ensure a smooth technology transfer from R&D to the production team (Iansiti, 1998)

Matheson & Matheson (1998) in their book, “The Smart Organization – Creating Value through Strategic R&D” created a “blueprint for doing the right R&D”. This blueprint contained 45 best practices for research and design that were identified in their study. While not all of the participants in the study used all 45 best practices, companies that were deemed to be successful with their R&D efforts followed a significant number of these practices. Chart 6 graphically portrays these 45 best practices.

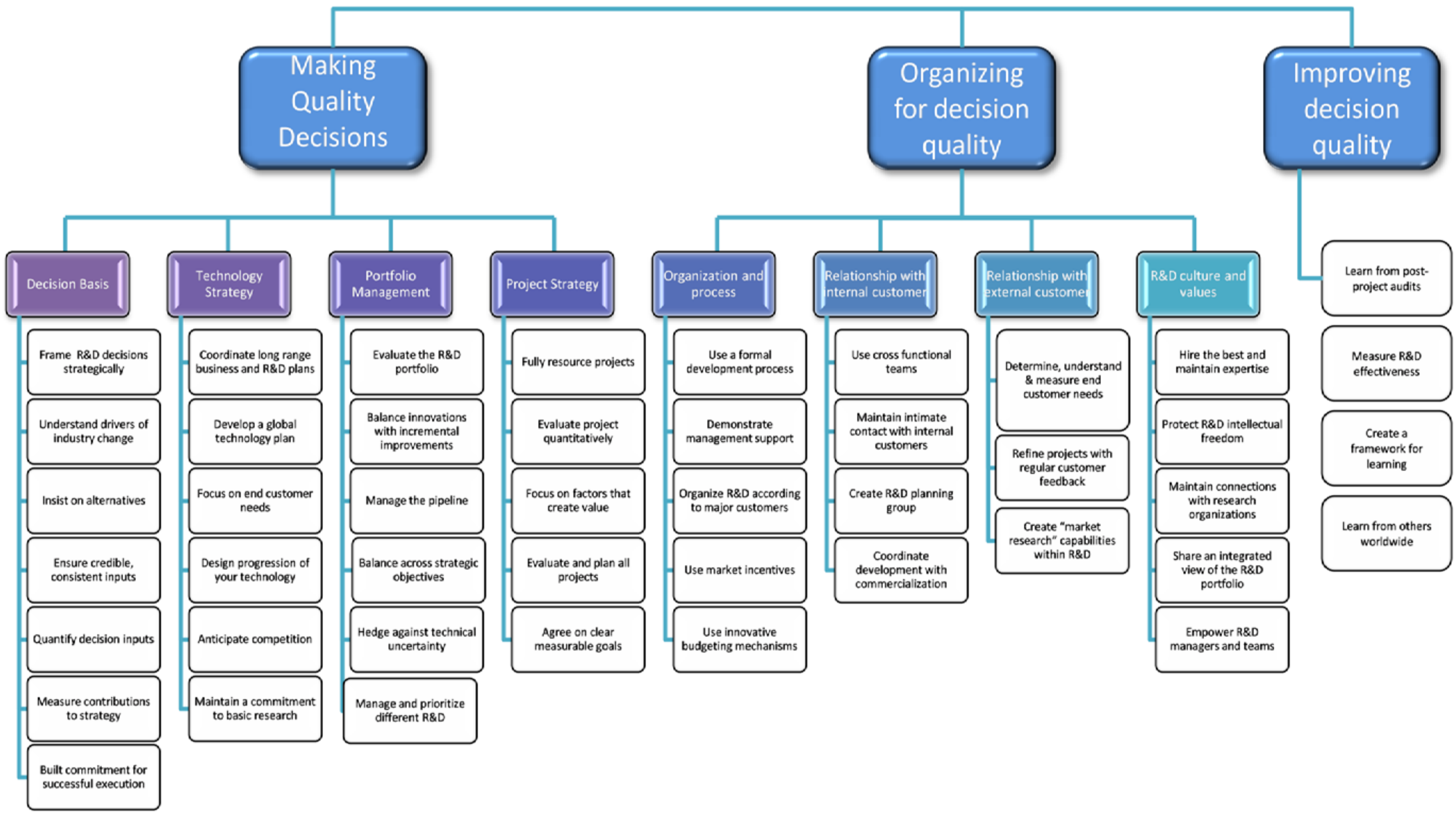

Chart 6 – R&D 45 Best Practices

Source: Matheson & Matheson, The Smart Organization – Creating Value through Strategic R&D

Though the literature review did not discover articles specifically related to a communication service provider, one specific online resource was reviewed that did. This resource was the TeleManagement (TM) Forum.

5.2 TM Forum

The TM Forum is an industry association of service providers, network operators, software suppliers, equipment suppliers and network integrators (TM Forum, 2011). Over its 21-year history, the TM Forum has grown to over 775 member companies from 195 countries. The TM Forum actively works with its members to create and disseminate best practices and standards to enable the TM Forum members to succeed in their industries and markets.

The TM Forum originally released its Telecom Operations Map (TOM) in 1998. The TOM was a model that described the full scope of business processes required by a service provider and defined key elements and how those processes were to interact. Since that time, the TM Forum has built upon its original work to further develop the TOM into the Enhanced TOM (eTOM). The TM Forum eTOM has been adopted by the International Telecommunication Union as an industry standard. Further to the eTOM, the TM Forum has created a comprehensive integrated business architecture called "Frameworx". Frameworx was created through collaboration efforts with its members. Frameworx provides a set of common business operations standards for service providers. These business operations standards have been adopted by 90% of the world's largest service providers (TM Forum, 2011). Through the adoption of common standards, companies can leverage the common standards and practices developed within the Frameworx architecture to reduce overall service delivery cycle times and increase profitability. Within the Frameworx architecture, eTOM was renamed the Business Process Framework. Joining the Business Process Framework are the Information Framework and Application Framework. Figures 8, 9, 10 and 11 provide functional diagrams of the Frameworx architecture and each individual framework within.

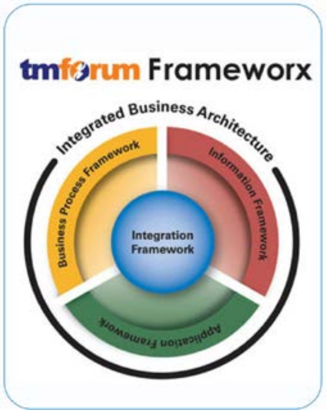

Figure 8 – TM Forum Frameworx Functional Diagram
Source: TM Forum

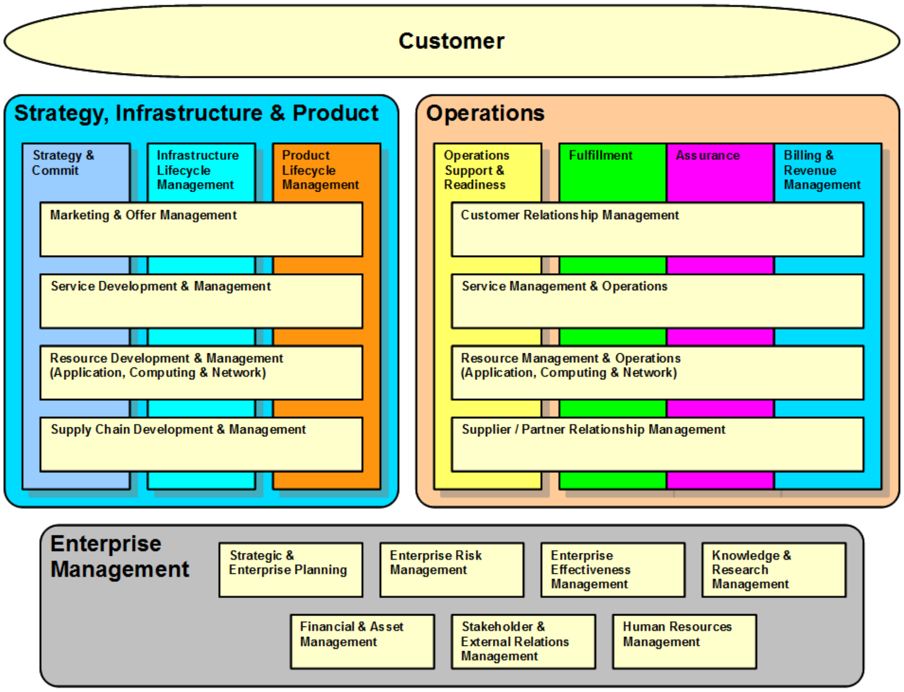

Figure 9 – TM Forum Business Process Framework
Source: TM Forum

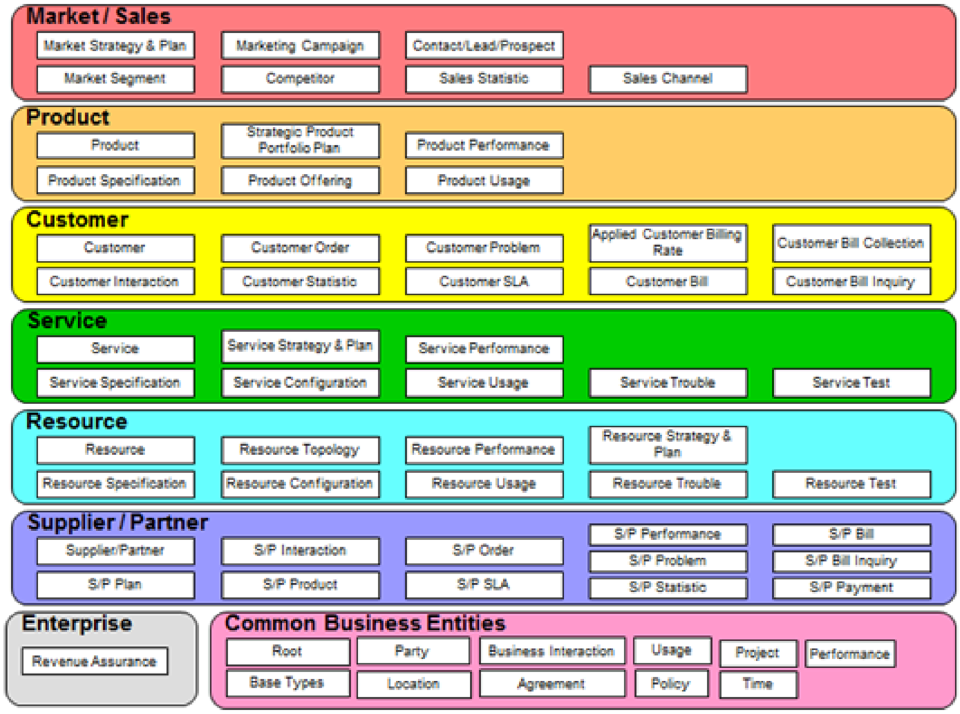

Figure 10 – TM Forum Information Framework
Source: TM Forum

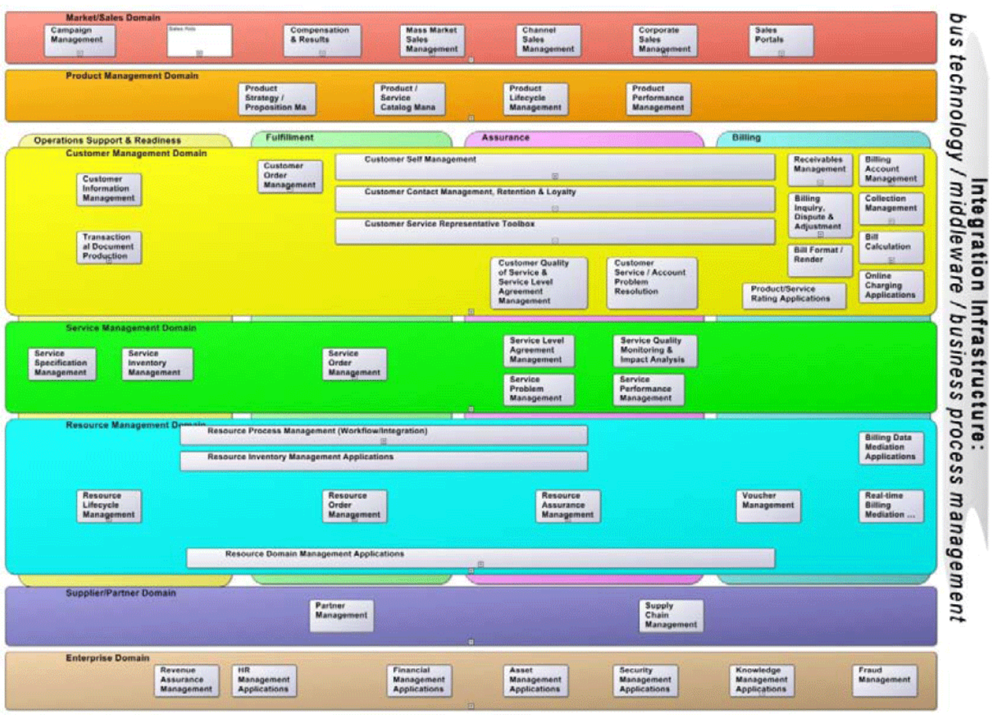

Figure 11 – TM Forum Application Framework
Source: TM Forum

MTS Allstream became a member of the TM Forum in 2007. Based upon interviews with various individuals within MTS Allstream, the use of the TM Forum best practices within Allstream has to date been limited to members within the IT organization (Edkins & Hass, 2011) and one member within the TD Architecture team. As part of Allstream's Renaissance project (back office modernization project), the new business support systems (BSS) and operating support systems (OSS) currently under development within the IT organization have been developed in accordance to the TM Forum Information Framework (Hass, 2011). By adopting industry standard BSS and OSS systems which are compliant with the TM Forum best practices, Allstream should be able to roll out new products and services faster than if it continued to enhance it legacy systems that were not compliant with the TM Forum standards.

6: Recommendations

This chapter discusses a number of specific recommendations to address the current impacts on Allstream business processes due to the shortcomings that currently exist with how Allstream carries out new technology integration into its business processes. Each of the main sections below in this chapter address the shortcomings identified in section four. The recommendation that follow are cross functional in nature, no one team would be accountable to implement the recommendations. To successfully implement these recommendations, a dedicated project manager will be required to ensure the changes are fully implemented and adhered to.

6.1 Orientation of Business Processes

As shown in figures 4 and 5, there are numerous unique departments and teams involved with the overall process of integrating new technology into Allstream's business operations and processes. Through the interviews and discussions carried out during the research for this paper, it has become abundantly clear that each team engaged within the NTI process has a varying understanding of the requirements, accountabilities and limitations of the other teams involved when new technology is to be integrated into the workflow processes of the various operational teams. Due to the lack of understanding of the required inputs and specific outputs of all involved within the integration process, significant ambiguities exist.

To reduce the existing ambiguities and to align the outputs of one internal organization to the inputs of the next, a full orientation is required for all teams within the new technology integration process. This internal orientation would facilitate communication between each of the teams to foster a shared understanding of what each team is accountable to carry out and deliver as part of the new technology integration process. It is further recommended that as Allstream further develops its business processes so that the processes follow the TM Forum standards. By following these industry standards, it is suggested that Allstream will be able to achieve the following:

- Understand customers through a common customer management information model
- Innovate and reduce time-to-market with streamlined end-to-end service management
- Reduce operating costs by enabling highly efficient, automated, industry standard operations
- Reduce integration costs and risk through standardized interfaces and a common information model
- Reduce transformation risk by delivering a proven blueprint for our business
- Gain independence and confidence in our procurement choices through conformance certification and procurement guides
- Gain clarity by providing a common, industry-standard language
- Build essential partnerships quickly and easily through common process and information understanding and terminology

(TM Forum, 2011)

6.2 Technology Integrators

The technical specialists and the NTI program managers within the TD organization are not accountable for project managing the deliverables of the other teams when new technology is to be integrated into the Allstream business processes. The technical specialists are extremely knowledgeable and have a significant depth of understanding of the technologies they introduce. However, these staff members do not have, nor are they required to have, the project management skills to facilitate the integration of new technologies into other parts of the Allstream organization. The TD NTI program manager is accountable for tracking various TD projects. A review of the active projects on the TD program lists shows there are just under 500 active projects underway. Due to the vast volume of TD projects, the TD program manager does not have the capability to ensure that technology integration activities within all parts of the Allstream organization are carried out.

To facilitate technology integration, a new type of technical project manager is required: a Technology Integrator. This person will not only have project management skills and an in depth understanding of Allstream`s business processes but also a solid technical understanding of the technology being integrated into the business. The Technology Integrator will carry out the various project management activities to ensure that the deliverables of all of the teams involved in the technology integration process complete their deliverables. Figure 12 outlines how each of the team involved with new technology introduction would interact with the Technology Integrators.

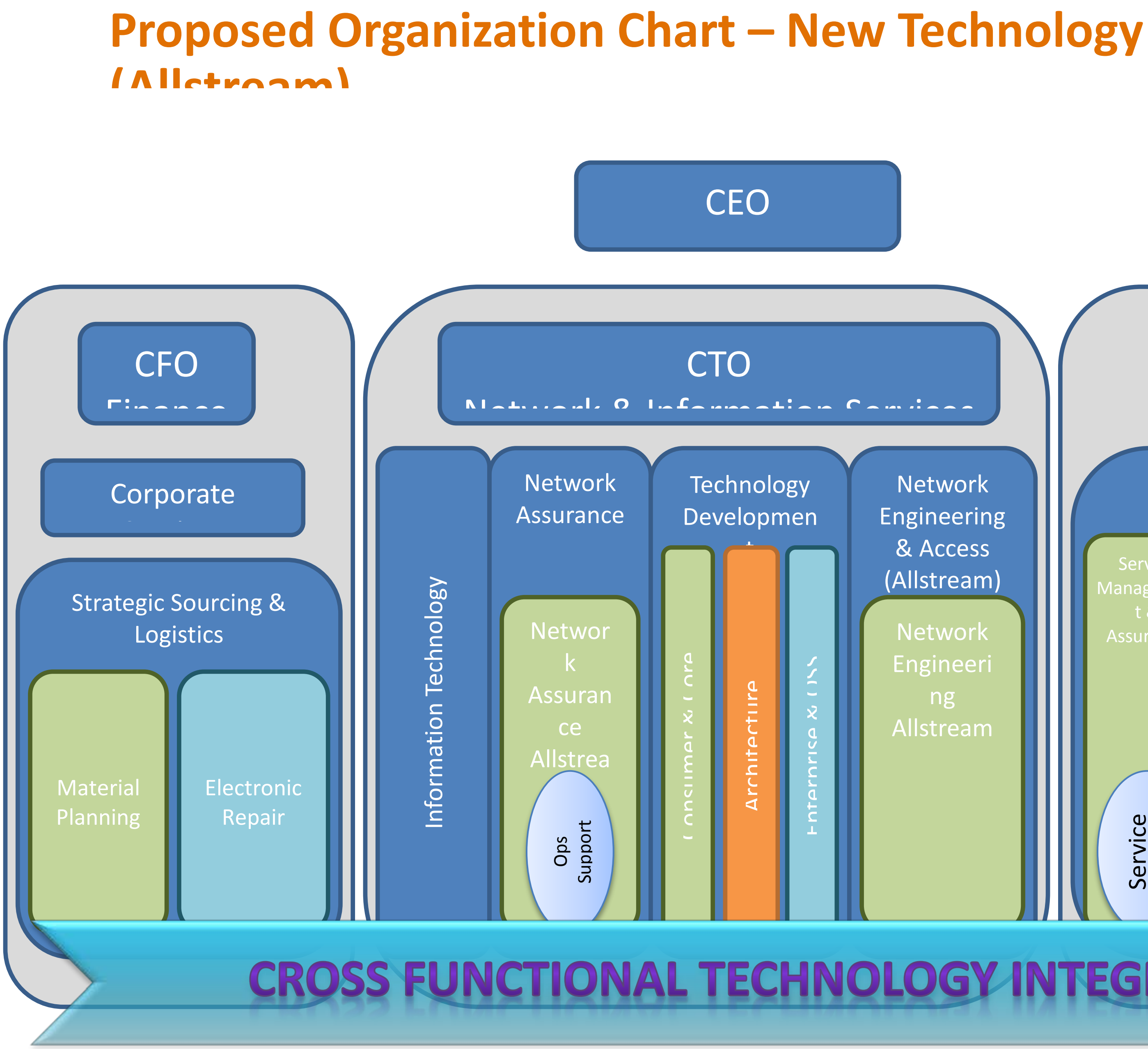

Figure 12 – MTS Allstream Condensed Organizational Chart- Proposed
Source: created by author

6.3 Business Support System Integration

As outlined in section 3.4, there are no linkages between the various business support systems used to support Allstream operational business. In the case of the ESMT database, there is no official support of this application within the IT organization. The lack of integration and linkages between these system results in both non-aligned and duplicated information within these database systems. Figure 13 graphically represents the following recommendations to address these issues.

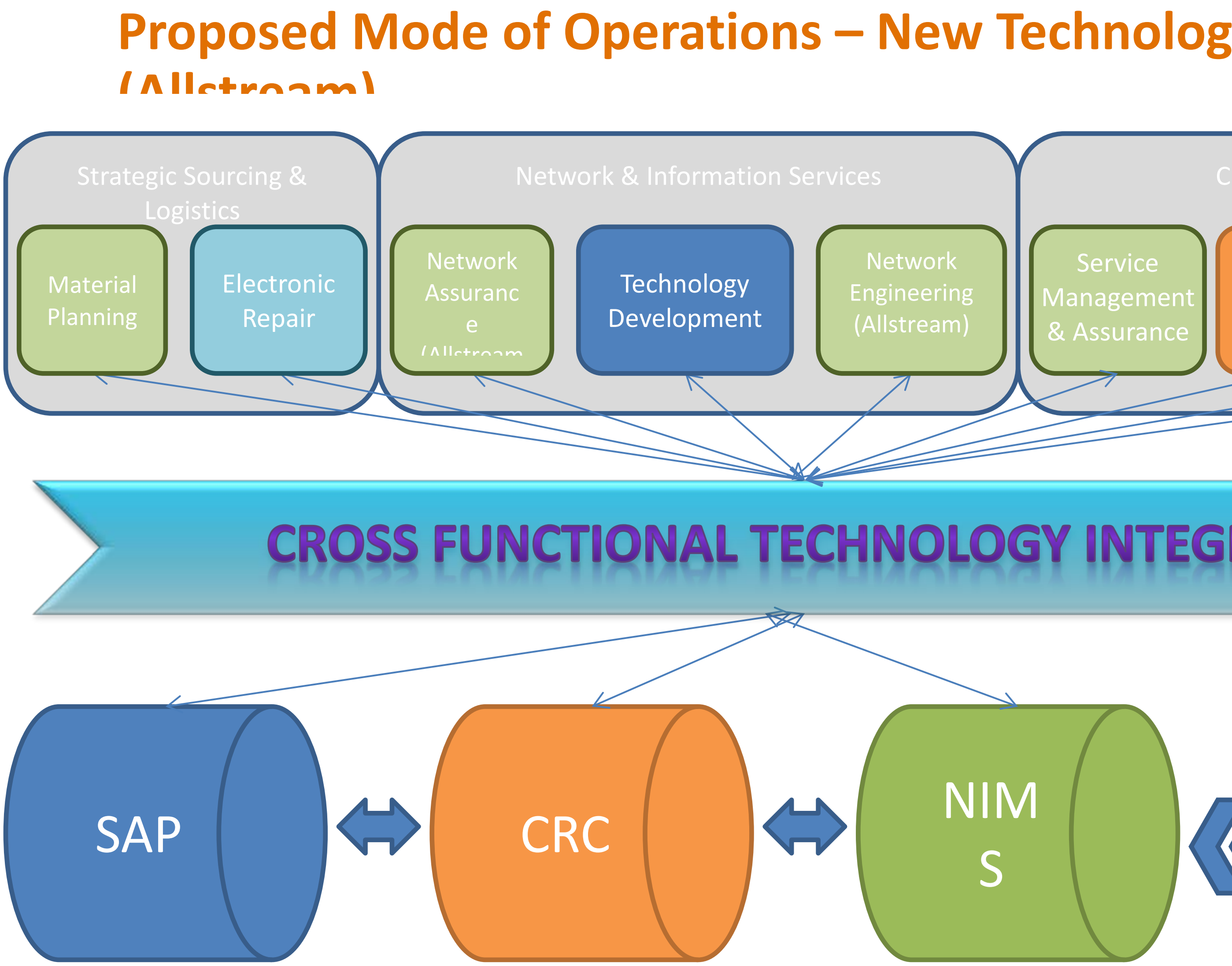

Figure 13 – Proposed Mode of Operations with Systems
Source: created by author

6.3.1 Network Inventory Management System (NIMS)

Agreements must be reached with the network engineering team to ensure that the equipment that is deployed into the production network is fully modelled in the NIMS database. Discussions at the NIMS Advocacy Forum have revealed that the auto-discovery tool, which currently exists within MTS Allstream, can be used to poll the deployed equipment in the network and subsequently populate the NIMS database (Chmiel, 2011). With the use of the auto-discovery tool, the argument that has been traditionally put forward by Network Engineering that it would be too much work to have all components listed in the NIMS database no longer holds up. All that is required of network engineering is to create the template in the NIMS database for the equipment so the auto-discovery tool can accurately capture all of the information and populate this information into the appropriate fields in the NIMS database. Once the initial equipment templates are created, the auto-discovery tool will populate the information into the NIMS database after the equipment has been physically installed, commissioned and is accessible via the required OSS.

6.3.2 Enterprise Resource Planning System (SAP)

All staff members within Allstream that are accountable for introducing new equipment and submitting the MMA forms need to receive formal training on the MMA process. Additionally as outlined in section 3.2.1, an ad-hoc group was formed in April 2011 to attempt to improve the forecasting of required future inventory levels. While this team has been able to identify specific items where stocking levels were significantly too low, the process is very manual and reactive at best.

It is recommended that in depth statistical analysis be carried out on Allstream`s historical sales booking data and the SAP consumption values of specific components. The analysis would try to determine if there is a positive correlation between Allstream`s sales booking data from one period and the SAP consumption data thirty to forty-five days later. It is hypothesized that a positive correlation could be identified between the data sets. This correlation could then be applied to future sales booking data to help forecast equipment consumption in the future when the services are being installed.

6.3.3 Central Repair Control Database (CRC)

Two relationships need to be created: 1) CRC database and NIMS; and, 2) CRC database and SAP. First, the relationship between the CRC database and the NIMS database would facilitate an accurate estimate of the critical spare equipment to be kept on hand to support the production network. This relationship should be set up to be near real time so that as new equipment is added into the NIMS database, an automated script can be run to determine if adequate critical sparing is in place before additional equipment is installed into the production network. In the event that a piece of equipment is added into NIMS and the required critical spare is not available, the automated script would alert the assigned team to procure an additional critical spare to support the new equipment that is to be deployed. One additional benefit of creating a relationship between the CRC database and the NIMS database is when an old technology or platform is retired from the production network it would be relatively easy to identify all of the critical spare components listed in the CRC database and have them pulled and sent to asset disposal as the components would no longer be required.

Second, to address the inaccuracies of the equipment descriptions in the CRC database, a relationship between the CRC database and SAP is required. This relationship should be keyed or indexed upon the equipment vendor`s part number in both databases. With the vendor's part number used as the relational tie between the two databases, other information such as the item description and vendor information can then be pulled from the SAP database to accurately reflect the equipment in the CRC database.

6.3.4 Equipment Support Management Tool (ESMT)

The functionality of the ESMT database should be integrated into the NIMS database. In additional to the duplicate data exists between these two systems today, the ESMT database is not supported by IT. Initial discovery discussions have been held with the IT team that supports the NIMS database, and it is believed that the ESMT functionality could be incorporated into the NIMS database (Chmiel, 2011). With the ESMT functionality built into the NIMS database, business processes could be simplified as the routers would only have to be defined in one database instead of two.

6.4 Responsibilities

The initial responsibility to implement the recommendations provided above will lie with the upper management team within Customer Operations, Network and Information Services and Strategic Sourcing and Logistics. These recommendations require a top down approach. Without buy-in from the upper management team these recommendations cannot be implemented as the lower management levels in these organizations do not have the authority to carry out such changes. Once the buy in from the upper management level has been achieved, it is recommended that a business analyst and project manager from the Customer Operations Shared Services organization be tasked with creating a high level cost estimate to implement the recommended changes.

Only once the high-level costs to implement the changes have been estimated can the recommendations be taken to the VP's within the various organizations to get approval to allocate the funding to implement the changes. Without the buy-in from the upper management and required funding to implement the changes, the recommended changes cannot be carried out. Within Allstream, the change management teams need to charge their time to a funded project to carry out the change management activities. Past experience has shown that, while a recommended change may be considered the right thing to do, without the required funding to implement the change, trying to get a change implemented on good will alone has rarely been successful.

6.5 Measures of Success

One of the measures that can be implemented would be to baseline the number of IPC product portfolio service orders tasks that cannot be completed, or are jeopardized, prior to implementing any recommendations. Once the baselines have been established, monitoring and reporting can be put in place to view the impact of the recommendations by the number of tasks that are jeopardized after each recommendation has been implemented. A jeopardy occurs when a specific task cannot be completed by the assigned staff member. Allstream has an existing automated process in place where tasks that cannot be completed can be "jeopardized" and a reason code can be provided as to why the task could not be completed.

In the summer of 2010, an analysis was done to baseline and compare the number of jeopardised tasks related to WDM orders versus orders for legacy private line services. This analysis is shown in table 6.

	Legacy Orders:	WDM Orders:
Sample Period:	April to June 2010	June 2009 to June 2010
# of Orders:	9223	280
# of tasks:	56088	7757
Average # of tasks per order:	6.08 tasks	27.7 tasks
Standard Deviation tasks per order:	6.9	24.05
Max # tasks per order:	76	148
Min # of tasks per order:	1	1
% of tasks with no jeps	**87.14%**	**52.55%**

Table 6 – Jeopardy Analysis
Source: created by author

While the sample size for legacy private line orders is significantly larger than that of the WDM orders, the WDM sample size was adequate for this comparison. The analysis shows that just over 87% of the tasks related to legacy private line orders were completed successfully (13% of the tasks were “jeopardized”); whereas, only just over 52% of tasks related to WDM orders were completed successfully (48% of the tasks were “jeopardized”). It should be noted that these are relative measures and should not be taken as absolute values. Once the recommendations are put in place, these relative measures between the number of tasks that are completed with no jeopardies can be used to measure the success of the process improvements.

During the discovery discussions for this paper, it was discovered that there is no automated way to capture variances only jeopardies. A variance occurs when a specific task is completed but work is done outside of the process to complete the task. As there is no way to automate the tracking of variances, it is difficult to track true success as there is no way to baseline the number of variances that occur today. All staff members within Allstream pride themselves with doing the right thing to get the job done, but when they complete a task that has a variance, the variance goes unreported.

Under a previous Allstream process improvement initiative entitled Cornerstone, a manual variance tracking procedure was put in place; however, due to the cumbersome manual process required to track variances, the use of the manual reporting tool was not consistently used by the staff. As the Cornerstone project wrapped up, variance reporting all but stopped. Only by putting in place an automated variance reporting mechanism similar to what is currently in place for jeopardies, can true measures of success be created for further analysis.

7: Conclusion

Allstream has demonstrated that it can bring innovative new services to the Canadian data communication market. This is apparent as Allstream has been able to grow its market share over the past three years in spite of the market turndown of the latter half of 2008 through to 2009. As noted in Allstream's current product strategy, advanced services based upon new novel technologies are what will continue to drive Allstream's market share. Coupled with these new technologies are efforts to significantly reduce the cycle time for the delivery of these advanced new services. However, due to the ambiguities surrounding the physical aspects of the new technologies, staff members within Allstream's operational teams have not been able to achieve success in the dependability and speed of delivery of these advanced services. While significant work is being done by the various teams within Allstream to operationalize these new technologies into the business, gaps exist in accountabilities between these teams to facilitate smooth technology integration into the existing business processes.

An enhanced focus on business processes that takes into account the new physical attributes of the new technologies is now required. No longer can the physical layer of the technologies introduced into Allstream's network be overlooked. Allstream needs to move away from the traditional tactical approaches used individually within each separate organization and adopt an overall strategic approach when integrating new technology into its business operations.

To create a strategic advantage through superior technology integration, Allstream needs to complete a number of key activities. A full orientation with existing staff on the various process used in relationship to technology integration is required. This orientation will provide insight to all staff within Allstream as to who is accountable to carry out which specific activities; and, more importantly, it will clearly identify those activities where there is no team that is explicitly accountable for the activity. Technical project managers or technology integrators need to be used to project manage the various activities that are required to integrate new technologies into the various business processes, as it is out of the scope of the Technology Development technical specialists to project manage teams outside of Technology Development. Integration of the various business support systems that are impacted by technology integration is required, as there is duplication and misalignment of information between the various business support systems. Only by taking a full strategic end-to-end view of new technology integration will Allstream be able to achieve a competitive advantage with its newly introduced technologies.

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