

Case Study In Operations Management

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ABSTRACT

This case study is conducted within the context of the Theory of Constraints. The field research reported in this document contains information specific to the telecommunications industry. An examination of the history, organization design, problems and solutions for one telecommunications company are undertaken from the perspective of academic work in the Theory of Constraints. The information included in this document was developed through interviews with four senior managers including the President, the Chief Technology Officer, a Vice President and a department manager. Their responses were the basis of identifying problems and undesirable effects. The undesirable effects were diagramed in six UDE clouds dealing with the following issues: 1- unclear vision from management to employees; 2- supplier; 3- market; 4- the price and regulation environment; 5- production; and 6- bureaucracy. These undesirable effects were logically examined until a single cloud depicting the core conflict was found. This core conflict is the company cannot simultaneously choose to make money over time through both conducting business as usual, and through means that are adapted to the environment and customer needs. Solutions tried to date by the company are explained. These solutions are reviewed from both an internal and external perspective. Alternative solutions are examined, as are obstacles to reaching the desired state. The case concludes with thoughts on the future desired state.

INTRODUCTION

Theory of Constraints, introduced by Eliyahu M. Goldratt, is a philosophy of management and a means of achieving improvement that focuses on finding and correcting the weakest link in a chain of events (Goldratt, 1992). Today, Theory of Constraints philosophy has been, and continues to be, utilized in many practical applications in production, project management, distribution, supplier relations and other areas. In order to review the underlying concepts within Theory of Constraints, this field research is conducted as a means of evaluating conditions in the current telecommunications environment. The application of these concepts should be of interest to the practitioner and academic alike as achieving improvement is a continuous area of management concern. The process of evaluation undertaken here can be similarly used in other situations and industries.

OVERVIEW OF THE TELECOMMUNICATIONS INDUSTRY AND ENVIRONMENT

The telecommunications industry is characterized as serving consumers and businesses by installing infrastructure, managing or providing business services, and providing services to consumers.

The telecommunication services industry includes firms that provide electronic communications using wire networks or fiber-optic lines. The U.S. wireline infrastructure consists of over 750,000 miles of aerial wire, 3.5 million miles of cable, and more than 4.5 million miles of optical fiber (Encyclopedia of American Industries, 2001). The services provided often utilize satellite and microwave systems as well. Long distance carriers typically pay a fee to have local carriers route long distance calls to their lines.

HISTORY

The Telecommunications Act of 1996 (Federal Communications Commission, 2003) maintained that the industry was largely divided into long distance carriers and local telephone companies. Local companies provide basic telephone services by bringing telephone access lines into homes, connecting new customers, and servicing local lines

and equipment. They also connect customers to long distance carriers, and sometimes handle intrastate toll calls: also considered long distance.

In 1982 (Federal Communications Commission, 2003), AT&T agreed to divest its operations. Among other results of industry deregulation, competitors were allowed to enter the long distance service industry. Federal and state regulators planned to slowly remove restrictions on AT&T as competitors became established. When AT&T was divided in 1984, its sales represented almost 90 percent of U.S. wireline long distance services sales. In 1995, its toll service revenues were more than 56 percent. By 1998, its share had decreased to approximately 43 percent.

Regulators began to loosen restrictions on AT&T and the Baby Bells in the late 1980s (Federal Communications Commission, 2003). In 1989, they removed profit caps on AT&T, and in 1991, they reduced pricing constraints. In 1995, the FCC ended its classification of AT&T as a "dominant carrier." The Baby Bells, though still hampered by state price and profit regulations, were enjoying greater flexibility and competing in some new markets in the mid-1990s.

The legislation to deregulate the industry was intended to promote competition across the industry, resulting in the development of new technology, the creation of new business and new jobs, and ultimately lower prices. Local telephone companies, long distance providers, wireless companies, and cable television operators would be free to offer any and all telecommunications services (Encyclopedia of American Industries, 2001).

During the 1990's and continuing through today, there were a large number of mergers, acquisitions, and joint ventures. Anticipating deregulation, many companies joined with companies in other segments of the industry (Federal Communications Commission, 2003). For example, AT&T acquired McCaw Cellular Communications, the largest cellular provider in the United States. Altogether, 746 combinations were announced in the industry between 1994 and 1996. Nearly 73 percent were mergers of service providers, i.e., wireline, wireless, and cable TV operators. The rest involved equipment and software providers. In 1998, mergers and acquisitions in the U.S. telecommunications industry were valued at \$234.8 billion; four times the figure for 1997. Industry analysts expected the trend toward consolidation to continue into the new century, including more international ventures which has been the case to date.

EXPECTATIONS

The telecommunications industry as a whole continued experiencing steady growth. Total local service revenues grew along with the long distance segment of the market showing an increase of over six percent in long distance minutes (Carden, 1999).

The growth in popularity of the Internet, as a business tool as well as a medium for non-business consumers, continues to significantly impact the strategy of industry players. Industry powers were acquiring wireless cable companies and other new companies developing Local Multipoint Distribution Systems (LMDS) and Multichannel Multipoint Distribution Systems (MMDS), both for their potential to provide a way to bypass the local telephone company and for their potential to provide the broadband delivery of data necessary for the Internet (Carden, 1999).

The buzzword throughout the telephony industry at the turn of the century was convergence. Through convergence, the new-generation telecommunications company may eventually offer local, paging, long-distance, cellular, and Internet phone services. For the consumer, these convergent technologies may one day mean one stop shopping and a single access number bill. Computer telephone integration was aided by enhanced voice recognition technology for use with messaging products and automatic call distribution (Carden, 1999).

Demand for remote connectivity is also enhanced by the Internet. Integration of wireless communications and Internet access is a priority among the major telecommunications and electronics firms. As business shifts increasingly to online networks, this market experienced considerable growth. Some analysts worried that the demand for perpetual connectivity, particularly in wireless technology, would outpace the ability of companies to meet

expectations. Every company in the industry recognized that wireless Internet access was the crucial component of convergence (Carden, 1999).

The new generation telecommunications company expects to provide the entire menu of telephony services. Mergers and acquisitions allowed for the building of vertically and horizontally integrated parts to better meet the demand. The move toward convergence and the corresponding industry consolidation has resulted in cross-segment combinations. Cable-modem combinations resulted in matches such as TCI, Cox, and Comcast to bring combined communication services to consumers (Carden, 1999).

RESEARCH AND TECHNOLOGY

Telecommunication service industry investments have been targeted at several emerging technologies during the 1990s. The most important area of research and development is digital transmission. Long distance and local carriers are competing to develop and integrate new digital technology that will increase line capacity and speed, and allow the efficient transmission of data, voice, and video. These technologies, combined with advancing fiber-optic and ISDN efforts, have resulted in data transmission improvements (U. S. Department of Commerce, 1995).

In 1996, data traffic exceeded voice traffic on major communications networks. This reinforced the need for technological convergence in the industry. It is estimated that Internet users now number 300 million users. The early industry leaders were large corporations most able to invest capital in these types of cutting-edge systems (U. S. Department of Commerce, 1995).

REGULATION

Although the breakup of AT&T was the major event causing communications to innovate, convergence with the computer industry is currently driving industry strategy. The Telecommunications Reform Act of 1996 (Federal Communications Commission, 2003) removed barriers to competition throughout the industry and opened the way for the industry to seek cross-industry alliances with computing.

New entrants to the telecommunications market are perceived by existing telecommunications companies to have an unfair advantage. Internet service providers are the primary target of these accusations since they are unregulated and are not subject to the layers of local, state, and federal taxes with which telecommunications firms must deal. This is becoming a major political topic. With older technologies merging and newer ones emerging, analysts are advocating for the elimination of all regulatory oversight (Federal Communications Commission, 2003).

ORGANIZATIONAL ARRANGEMENTS

At the time of this field research, the specific telecommunications company reviewed had four major operating divisions controlling various aspects of the business including its network holdings and international concerns. Either through shared or duplicated arrangements among the operating divisions, there were some fourteen major departments reporting directly to the CEO. In some cases, regulatory requirements stated that operating divisions must have an arms-length relationship to other operating divisions requiring a separate, and fully duplicated, organization.

DESCRIPTION OF DEPARTMENTS – MEASUREMENTS, BEHAVIORS AND POLICIES

What follows provides both additional details on the purpose for selected departments within the study firm and some of the measures used to rate the effectiveness of the organization. Behaviors and policies, both written and unwritten, are also detailed when available. The information contained in these sections comes from personal interviews with executives and other public sources.

Process And Cost Review

Process and cost review, as a department, has existed for some time, and has oversight responsibilities. As the main charge and part of its long-standing work, the organization attempts to reduce operating expense by streamlining processes and reducing costs. Often, this organization is given the task of identifying how many employees could be removed from the payroll, in what time frame, and in which organizations. Establishing a separate organization for this type of operating expense reduction programs allows for some measure of objectivity in the recommendations offered to the CEO.

Physically, the employees in this department were housed in a single location away from the corporate offices. This separation communicates the conditions of anonymity to the remaining employee body. Success is measured through employee reductions and savings of expense dollars.

Auditing, Security And Corporate Compliance

The compliance organization is fairly diverse in purpose. Reporting within this structure are the chief corporate auditor, and security and business control vice presidents. Additionally, other groups, like event planning and corporate real estate management fall into this organization as well. Measures of performance evaluate success in different ways for this diverse organization. Meeting time commitments in a meticulous fashion is important for the auditing arm, and ensuring training on security issues for the employee body is important for another area. Measures related to cost savings are important to corporate real estate management, and event planning has strict budget and time considerations.

Human Resources

The human resources department has several measurable objectives that drive behavior. Examples of these objectives are the following: reducing the time to proficiency for external hires and employees changing jobs internally, reduce undesirable first year attrition, recruiting and retaining a workforce that reflects the diversity of the communities served, and developing of a labor model with the union that is focused on service, effectiveness, and meeting the competition head-on. In order to meet the objectives, the organization is divided into units that work specific concerns of compensation and benefits, labor relations, leadership development, and staffing and development.

Marketing

The marketing department deals with the domestic operations markets. To support their efforts, specific measures of success are defined. These imperatives include meeting a financial revenue target, financial targets for growth of long distance, retaining existing customer revenue, re-acquiring, or “winning-back” local service revenue from customers choosing local service alternatives, and new product sales, among others.

The marketing organization also has non-financial measures for success. There are service excellence measures and technology deployment strategies that target specific metro areas for sales. An example of a service excellence measure is the target of releasing bills by a specific workday with a certain degree of accuracy. Additionally, the marketing department specifies key behaviors for ensuring every management employee has a growth and development plan, and that the department actively supports a culture of community service by committing to sponsored community activities.

Infrastructure

The infrastructure organization engineers, builds and maintains the cable and wire of the traditional regulated telecommunications backbone. This organization recognizes that a battle is being waged with the competitors over customer satisfaction. The competition is differentiating their offering based on superior service, and the customer is increasingly savvy in demanding faster, more efficient service completed with courtesy and expertise.

The infrastructure department has written behaviors that are expected of these employees regarding call back times and help desk support. Comparative measures are used to evaluate the performance of various geographic areas. The areas are evaluated on a host of cost containment and performance measures. Examples of those measures are the following: safety as measured by motor vehicle and personal injury tallies, percent of customer satisfaction with the technician's work, percent of ineffective dispatches measuring how often an installer is sent to a location that is incorrect or otherwise does not lead to the completion of a customer order, and number of tasks per service technician per day. Many of the comparative measures are also published industry-wide and lead the financial markets to evaluate one company's performance against another. Another such comparative measure used by the financial markets is the number of employees per access line.

The infrastructure department has often been referred to as "the factory". It suffers, rightly or wrongly, from the perception that the organization is bureaucratic, and has a reluctance to review processes in place. This organization has the largest number of employees in the company and has often been the target of downsizing efforts over the past decade. With declining demand and capacity reaching record levels in the traditional network infrastructure, employee satisfaction surveys show declining results. Various programs were implemented to improve employee understanding of underlying causes and with the expectation of improving interpersonal skills in the company.

Information Technology

The Information Technology (IT) department is generally responsible for maintaining the systems that produce measures and reports used by all other organizations. IT put in place a set of principles, guidelines, standards, procedures and processes for system application design and employee behavior. It defined the standard product and gives constraints to developers. It provides a common view of the company business, and further provides a centrally focused application of technology support and reliability expectations.

Financial performance measures around IT expense per average access line in service, IT expense per total revenues, and delivery of projects on time are important. Documented behavior measures are established to create an organization that people want to join.

THE SUPPLY CHAIN, PROBLEMS AND SOLUTIONS

One unusual aspect of the supply chain at the telecommunications company reviewed, and one thought to be prevalent at telecommunications companies, is that in the middle of the supply chain, the process is handed over to suppliers for a period of time and then returned to the company employees for completion of the customer request. For example, the planning phase is performed in-house, an order is placed on a supplier for infrastructure equipment, and then is returned in-house for installation.

The process of working the supply chain begins with planning and development of architecture and infrastructure decisions that are considered core competencies. The company is engaged to help with customer decisions of market need and deployment strategies. Various departments are called on for testing and evaluation in examining one supplier product versus another. Final decisions are based on capability, performance, and cost measures, and contracts for specific purchase levels are signed. Plans are made for the actual deployments and system access that will be needed by groups in later processes. Budget allocations are acquired and authorizations written for signature at management levels specified by rigid approval level criteria. This becomes the work order authorizing expenditures with the suppliers.

Suppliers are now involved in the supply chain. Many, or a single supplier, may provide required equipment used in the telephone network, or to conduct any other phase of the business. The suppliers have both supply chain management organizations that negotiate the product design and price points as well as detailed engineering departments that fit the equipment to the specific case. In order to maintain warranty on some telecommunications equipment, the supplier specifies that only they may build and install the equipment to order. In other cases, only the

installation portion may be contracted to selected authorized parties. Warranty on this equipment is considered a critical issue and preservation of those warranties is prized within the company.

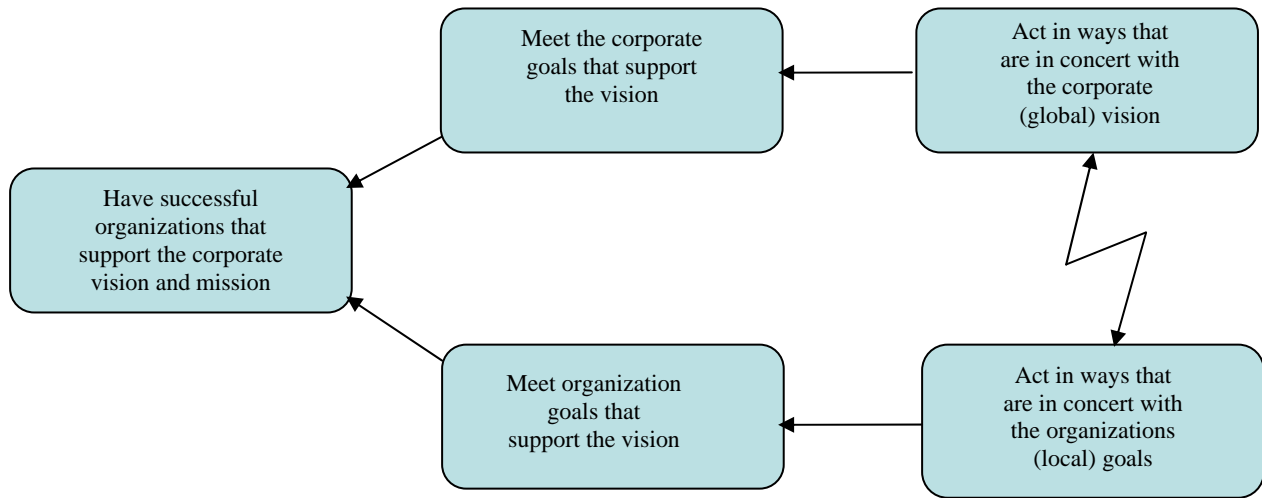
Finally, the customer facing departments within the company are notified of customer specific needs and timelines. These departments install the actual phone service at the customer premises, or otherwise complete database system work which automatically completes the connection. Other divisions ensure the maintenance of electronic equipment for accurate service on an ongoing daily basis. The customer receives service and pays the monthly bill to finalize the transaction.

UNDESIRABLE EFFECTS (UDE)

Several interviews were conducted to establish the nature of the problems encountered at the researched company. Those interviewed include a department manager, a department President reporting directly to the CEO, the chief officer over technology decisions, and a Vice President of infrastructure. Questions were posed which targeted the responses to one of several keys in identifying the weakest link in the supply chain process. The following bullet points capture those undesirable effects found from field research.

- Employees identified problems with management skills as an undesirable effect. Unclear vision and direction are a result. This lack of clarity results in employees hearing an inconsistent message from upper management. As departments are reducing the number of employees, decisions about which organization coordinates activities, and the direction organizations should take, is not fully discussed.
- Long lead times for projects and projects-over-budget point to problems with the suppliers. An example of this in practice is that quantity discounts are negotiated based on volume commitments, but often this equipment cannot be leveraged for the future. Older technologies are purchased due to price reductions when technology advances are available.
- Difficulties in finding and keeping customers, i.e., market constraints, are seen as an issue. One undesirable effect is the over abundance of capacity for older technologies and lack of physical facilities to support newer technologies.
- Undesirable effects result from pricing strategies influenced by regulation which spurs competition on the basis of price. The Triennial Review Order, on the one hand, removes the ability to compete with pricing strategies, but on the other hand, the company's position is that services must be priced to maximize margins.
- Replenishment issues appear in the form of missed or partial services to customers while excess capacity exists on other services. An example of this undesirable effect in practice is that often databases for control and monitoring are not in place at the time new technology related services are established. This causes a need to change the scope for the now urgently needed system to one of minimized implementation that doesn't provide for maximum adaptability.
- The undesirable effects from excessive bureaucracy and lack of management skills delay processes. Like many large corporations, bureaucracy can become an issue in attempting to provide timely service to the customer. An example of this conflict is that in the rush to meet intervals meant that not all organizations published appropriate contact numbers.

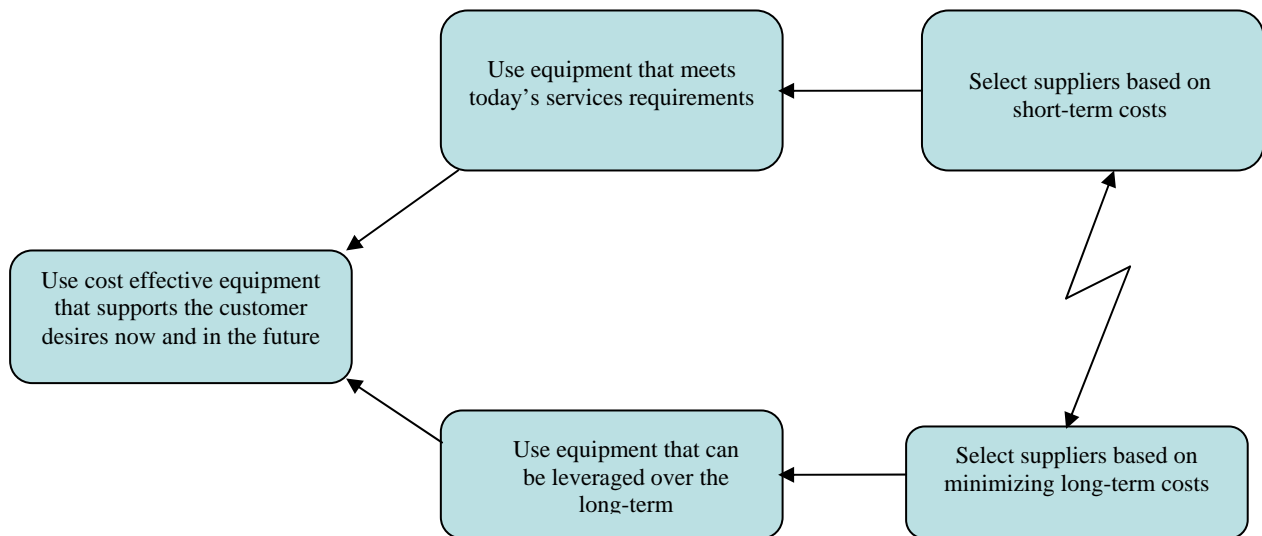
Figure 1
UDE Cloud Related To Unclear Vision From Management To Employees



Vision From Management

Clarity of communication is an issue for employees. The company’s internal review of employee satisfaction supports this statement. The internally conducted studies at the time of this review showed that employees were unclear about the company direction, and that any vision for the company was not well communicated. The impact of unclear vision results in organizations meeting the local optima.

Figure 2
UDE Cloud Of Supplier Issues



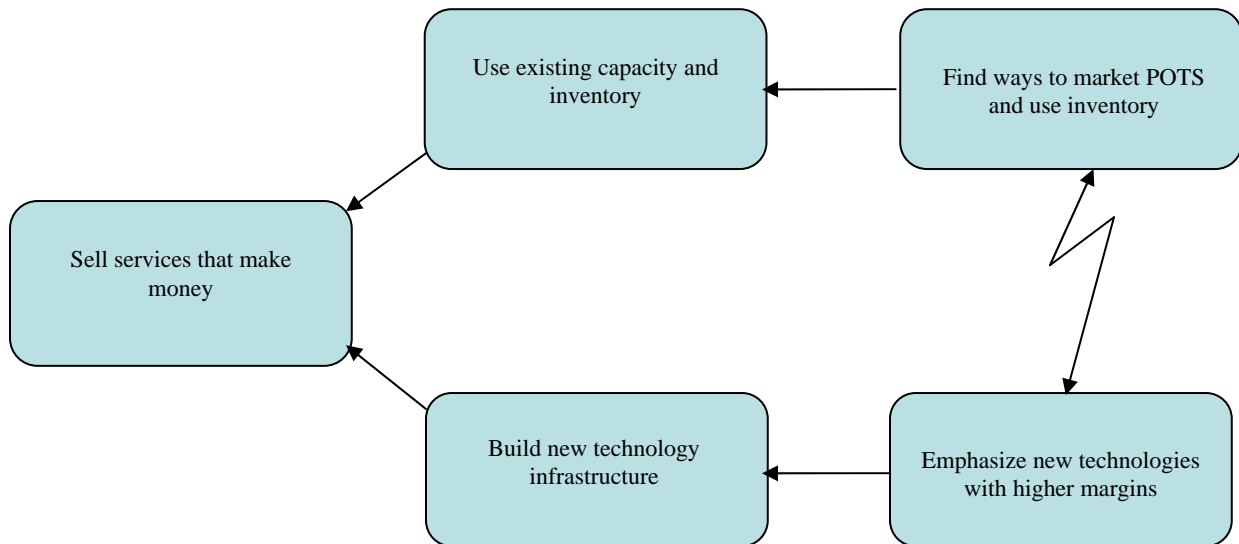
Suppliers

When considering problems with suppliers, the often asked questions in a manufacturing setting might concentrate on long supplier lead times, or quality issues. While the typical considerations for finding constraints in the supplier relations area were not supported at this company, one problem was identified in the supplier management arena. The viability of suppliers is an issue. Some consideration is given at selection as to whether or not suppliers will be in business in a year, and this weighs on the management decision for contract letting or purchase agreements. It is not offered as a major constraint in the system, but is simply one of those business considerations that must be made. This conflict is expressed as one between finding low cost suppliers and those that will be viable enough to grow to the future.

Distribution And Replenishment.

In considering constraints that exist in the market, distribution management of capacity, and replenishment of used capacity, it is to be expected that there is excess capacity in some products and under utilization of existing capacity on other products. This is an issue to some degree at the company under field research. The older technologies, referred to as POTS service for Plain-Old-Telephone-Service, are under utilized. With the loss of telephone access lines for substitution to newer technologies or products, such as wireless and digital, the excess capacity is growing in older service type equipment. Those services that are on the leading edge of newest technology deployments are in short supply and result in periods of high demand on delivering the newest services.

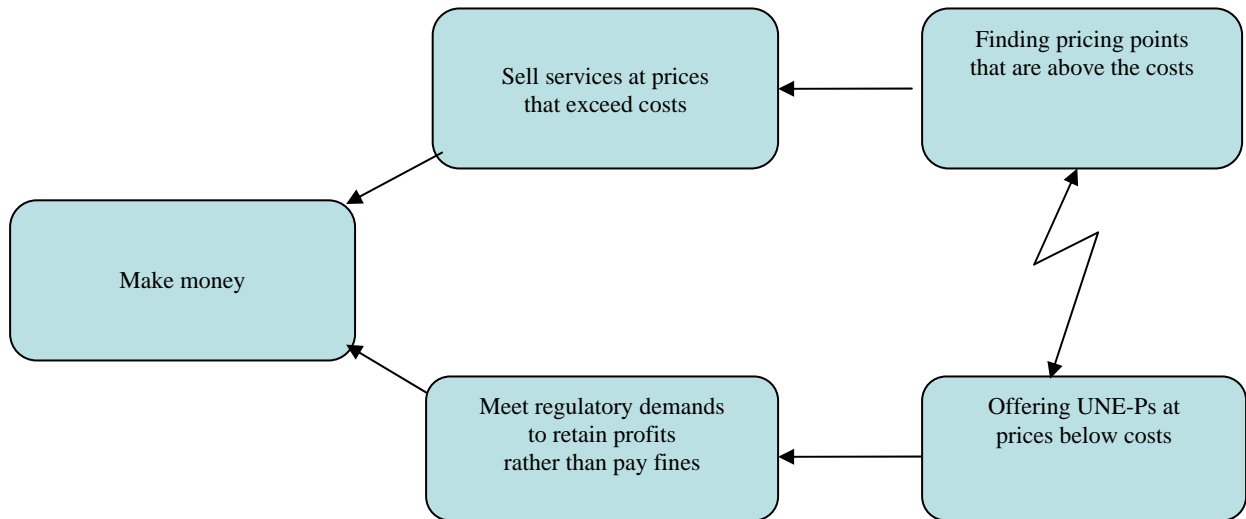
Figure 3
UDE Cloud Of Distribution And Replenishment Issues



Market

There is some indication that the constraint may be in the market, but pressure on price, and not enough business, normally associated with a constraint in the market, is driven by regulation and the economy. Regulation has set price points below acceptable margins according to the company. The company is forced to sell services to its competitors who then resell to the company's former customers at those federally determined prices for some unbundled network elements. This increases the level of competition which was previously relatively unchallenged.

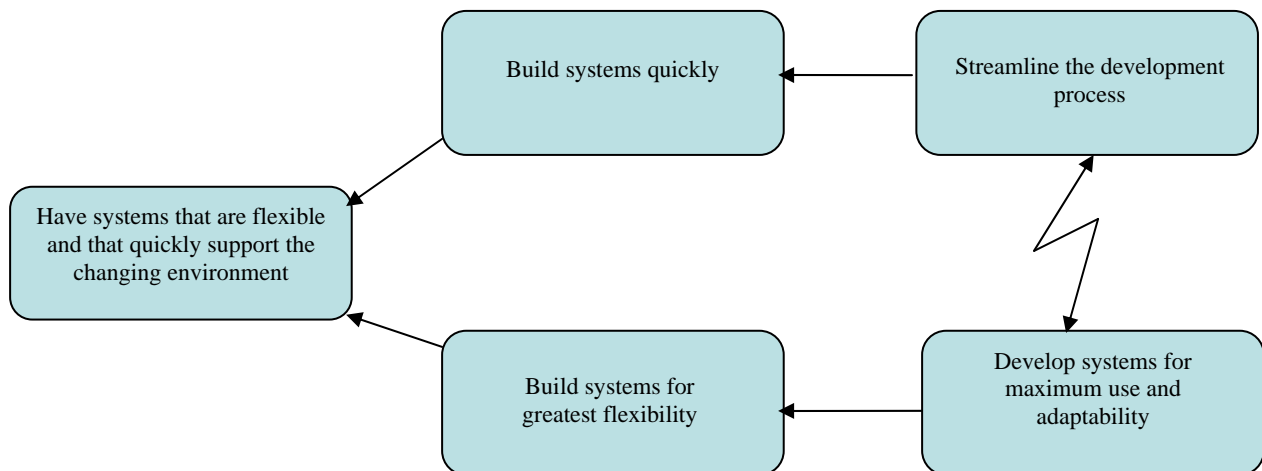
Figure 4
UDE Cloud Of Market, Price And Regulation Issues



Production

Long production lead-times associated with systems work is another undesirable effect. In particular, the systems support work that is of concern happens near the end of the supply chain. Problems in this area of operations are primarily ones of speed and capacity. Often the customer’s willingness to wait on service is exceeded by the company. A significant amount of money has been invested in updating systems to speed delivery and to automate those functions that have traditionally been handled manually. The layoffs and early retirement offers that have been part of the culture for several years happen quickly even before automation is completed.

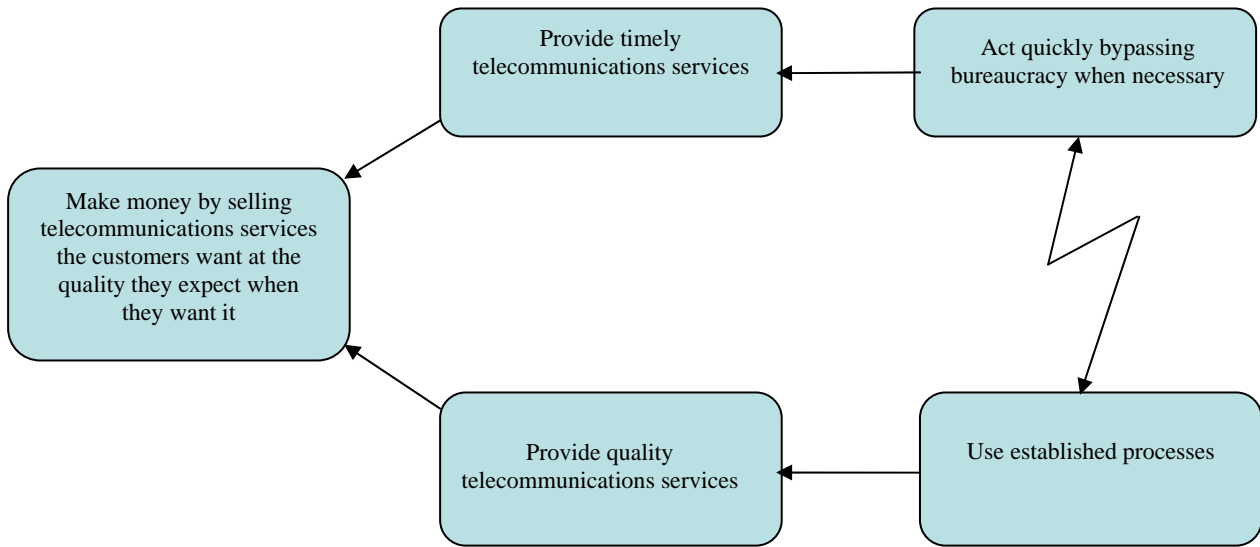
Figure 5
UDE Cloud For Production



Bureaucracy

Another undesirable effect is the interplay between bureaucratic management versus the need for speedy action conflicts. The local optima of using standard procedures that follow standard metrics for installation and software connection are often in conflict with the push to provide bundled services to customers in a speedy manner.

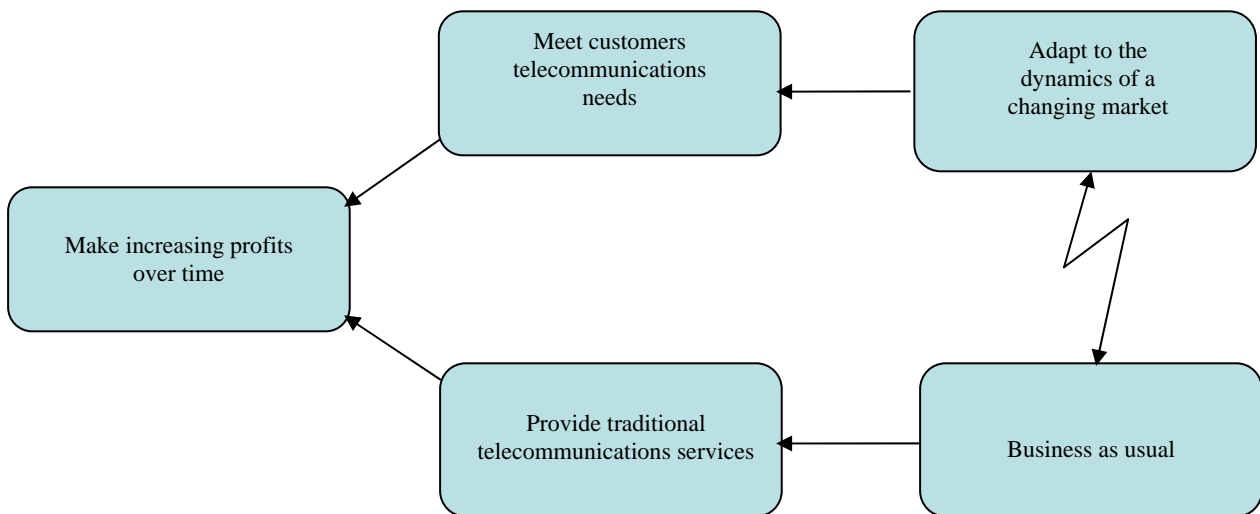
Figure 6
UDE Cloud For Bureaucracy



Aggregate UDE Cloud

After logically evaluating the concerns of the several UDE clouds presented to this point, the core conflict can be qualified as one which pits the desire to adapt to the dynamics of a changing telecommunications market against the local optimum of providing service as if business is proceeding as usual.

Figure 7
Core Conflict



SOLUTIONS TRIED TO DATE

Several solutions have been attempted by the company to date. Controls and measures have been put in place on inventory production of POTS services. Specific levels of utilization must be met before capacity relief can be added for some services. IT programs have spent significant amounts in updating systems and replacing manual work with automation in an attempt to add speed and reliability to the production system. Training programs have been initiated for all management employees to create an employee body more willing to move beyond the status quo.

For regulatory issues, the company is finding support in approaching the governmental agencies. Court cases are watched and appealed when the result is not as desired.

The newer services, which are driving growth, require new systems that are reliable and fast. These services are pushed into unregulated arms of the business to aid in speed of delivery methods and desirable pricing conditions. The newer systems use combinations of various state of the art business practices including Activity Based Management, Just-In-Time, Business Process Reengineering, Benchmarking, and Material Resource Planning techniques to accomplish their goals.

Theory of Constraints research is understood by some management personnel and consideration is given to the principles of increasing throughput, using inventory and reducing operating expense. A critical examination of solutions tried, as well as those offered by the authors, is covered in research contained in later sections of this document.

SOLUTIONS TRIED

Throughout the preceding sections examples of the solutions tried were mentioned. This section provides additional structure and explanation of those efforts. The solutions tried are examined in light of the undesirable effects presented, but no evidence exists that the solutions were attempted as part of a process directly related to Theory of Constraints thinking.

Internal Business Processes

Solutions tried can be viewed from the impact to internal business processes or those with a more external, or market impact. This section addresses the internal solutions tried as they relate to the undesirable effects mentioned earlier.

Successful Organizations In Support of the Mission

One previously discussed UDE considered the inconsistent messages that employees report from upper management. The company implemented a program to introduce the employees to concepts that affect the telecommunications industry and how those, in turn, affect their specific company. Every session of the program was moderated by a management person at vice presidential level or higher. Concepts discussed include: an overview of the customer base and each segment's contribution to the bottom-line historically and today; high level presentation of the competitors, competitor/suppliers, and the perspective that these companies are taking in the market; and a review of the history of regulation, recent rulings and planned company actions. The characteristics of the environment with all the current uncertainty are openly discussed. Frank discussion of markets, opportunities and evaporating telecommunications companies and jobs is managed within the format of the program.

Cost Effective Equipment Use

The impact of trying to resolve a conflict in purchasing equipment to receive quantity discounts versus purchasing equipment that can be leveraged for the future is reflected in several historical and current programs. First, one program attempted to remove and reuse older technology equipment to avoid purchasing new vintages of an aged technology. The program met with limited success. Occasionally, the internal accounting procedures for removing and

reusing the equipment at the new site showed a more costly transaction than a new equipment purchase. Removal and reuse remains an option to defer expenditures, but it is used with caution to avoid the pitfalls discussed.

Another example of attempts to purchase new technology in quantities has had some measure of success, especially in the software purchase and associated hardware needs arena. Software for telecommunications equipment, much like software for personal computers, requires upgrading to keep current with needs and fashion. At one time, software upgrades and the hardware required to allow for that software enhancement were purchased by site on individual orders. This eventually evolved to a process of buying software for the telecommunications equipment on a regional basis as a means of attempting to reduce costs. One problem was that not every site needed the upgrade at the same time because the customers in some locations were in a more mature portion of the service life cycle than others. These large deals resulted in cash out-flow for software at sites that might not need that software for some into the future. At this time, the process has ripened to one of taking the best of both the site specific solution and the buyout solution. Today, software and the requisite hardware needs are evaluated on a time interval. This allows better evaluation of which areas need the upgrades first and for what reasons. Once the locations in the near-term are found that have a market need, then the software and its hardware are negotiated for a limited buyout.

Measures throughout the organization are used to compare the relative cost effective use of equipment by one area versus another. These measures are often viewed in ranking groups in terms of first place to last place and are presented as such.

Databases

Full database implementations are not in place, in many instances, at the inception of new technology deployments. This signals the potential for customer outages and service related problems since equipment cannot be monitored or maintained. Many programs have been attempted to fix these issues. Before a service can be offered as part of the business, it must pass various check points and meet minimum standards. This means that the service must be engineered, and each feature translated into appropriate software code such that it ensures appropriate interworking with equipment, including billing and maintenance systems.

The infrastructure organization has attempted various programs to speed the delivery of databases including: the capturing of data measurements from equipment to determine when equipment reaches the limits of performance capabilities; the use of contracted firms to handle the overflow of work opportunities; the demand that suppliers comply with some minimum set of requirements; and others. Still, the delivery of timely databases remains a problem.

External Business Processes

Solutions with a more external, or market impact are evaluated.

Regulation And Pricing

Pricing strategies, of course, attempt to maximize margins, but on occasion, regulation caps the margin to be charged. The newest attempts to move to a market based competitive environment involve approaching state regulators for relief in areas the company can show that fair competition is progressing while maintaining regulated status for the most vulnerable markets.

Another solution tried in the regulation arena is to partner with other telecommunications companies interested in the same, or similar, outcomes to help with the approach to the legislative and regulatory bodies. Political action committees attempt to convey the message of the company to those voting on the decisions that impact the business.

Finding And Keeping Customers

Several attempts have been made to find new uses for the products and services. The company has met with significant success in many areas in this regard. The wholesale market for telecommunications services is one relatively new area. Recently with the move to telecommunication land-line substitutes, such as satellite and mobile communications, an over abundance of older technology telecommunications equipment and services are available. Customers have disconnected second and third lines to substitute with newer technologies. Initiatives under the auspices of the marketing organizations were undertaken to push for new applications of existing services. Few of these initiatives met with success.

Another concern regarding the impact of substitution to products other than land-line based solutions is the fact that suppliers, who were once a research and development machine for new land-line solutions, are changing their emphasis to catch the newest markets in the more virtual communications technologies. In the past, these suppliers were counted on to find the newest and most innovative ways to market the older equipment. That is no longer the case.

One previously tried program attempted to give away a telephone line for every line of another targeted type that a customer purchased. This solution did not work. The problem in this case was that even free lines aren't free when they are taxed and include the regulated additional charges.

Solution Offered

Posing a solution to a problem that the authors have researched for considerably less time than the very capable management at the reviewed company is presumptuous. Therefore, this portion of the research will focus on the solution process itself and, where applicable, possible solutions yet to be tried.

The company has evolved to one having many competitors. Most of these competitors came into existence to take advantage of new technology or to meet emerging customer demands. During this evolution, the company has competed alternatively on the basis of quality, service, or price depending on the competitor strengths and weaknesses. Conversely, some of its competitors developed strategies to simultaneously compete on quality, service, price, and customization. Competitors initially relied on the them for access to the communication infrastructure of wire and optic-cable, avoiding the high cost normally associated with entering a capital-intensive industry. Subsequently the new entrants quickly took advantage of newer technology such wireless and the Internet which had relatively low entry costs.

The company was further burdened by its regulated role as an agent for the government in collecting fees and taxes. The regulated role, while initially a benefit, became a problem as the customers perceived the confusing fees as a negative. The company was also obligated to sell access to the communications infrastructure to its competitors based on regulated formulas rather than real value.

From a Theory of Constraints perspective (Goldratt, 1992), the process for solving a problem is as follows:

- Identify the constraint.
- Exploit the constraint.
- Subordinate everything else to the constraint.
- Elevate the constraint.
- Do not let inertia set in (return to step one).

The company is losing some of its traditional customers to new competitors and it is competing with more nimble competitors for the customers seeking new technology solutions. It is tempting to identify the market as the constraint. Communication as a product is becoming more important but the customer's expectations are changing dramatically. The market has evolved from a single-line voice telephone to a communicate anywhere by voice, data,

and video market. The company views this market as a package of communications products while the customer views it as an integrated product.

It is possible that the company's inability to compete profitably in this environment is due to the management of its supply chain. As identified in the research, the supply chain is complex. Of the six problems identified as unintended consequences, all can be identified as supply chain management problems.

The following are the problems that were identified as undesirable affects in the research. They included:

- Unclear vision and direction.
- Long lead times & projects over budget.
- Finding and keeping customers.
- Competing on the basis of price.
- Lack of adequate support for new technology.
- Slow moving bureaucracy.

According to Cox, Blackstone, and Schleier (2003), the ultimate measure of a supply chain is delivering service to the customer on the customer's terms at a profit. They define supply chain management (Cox, Blackstone & Schleier, 2003, p 1107) as the "design, planning, controlling, and measuring of the ability of the people, departments, functions, and organization in the supply chain to respond to the needs of the consumer with respect to having the right good or service, at the right price, in the right quantity, at the right place, and at the right time."

Integration of all components of the supply chain is the critical difference in today's environment. While most of their problems seem to center on supply chain management, it is also a potential strength. Few other companies in the telecommunications industry have the experience and resources to manage the complex set of suppliers, technologies, products, and services. Proper integration of the supply chain has the potential to set this company apart competitively. The failure to find and keep customers is a direct result of the supply chain's failure to meet the customer's expectations. The supply chain has shifted its focus to reducing costs, resulting in not meeting customer and shareholder expectations.

Likewise, long lead times and failure to meet project financial goals, lack of adequate support for new technology, and a slow moving bureaucracy are also indications of a supply chain management problem. The components of the chain are viewed as separate and distinct activities each attempting to optimize individual (local) performance without adequate consideration for the affect on the organization's (global) performance.

Employee comments related to the unintended consequences implicate management of the supply chain as follows:

- Unclear vision and direction resulted in cost cutting
- Long lead times & projects over budget were driven by quantity discounts from suppliers
- Finding and keeping customers is seen as a way to sell excess capacity of old technology
- Competing on the basis of price indicated a lowered expectation of simply becoming the low cost provider
- Lack of adequate support for new technology resulted in service quality problems
- Slow moving bureaucracy caused poor communications which resulted in employee morale problems and customer dissatisfaction

Focusing on supply chain management will not be an overnight solution but it will address most, if not all, of the unintended consequences identified in the research. If nothing else, it will cause the organization to address customer satisfaction as the only path to financial success. The most important consideration may be that supply chain management may be a strength in that it is positioned to be the only organization in its market capable of successfully managing a complex supply chain. This would give the company a distinct competitive advantage that is not easily duplicated.

Obstacles To Achieving The Solution Offered

“Much of the current turmoil in the high-tech sector can be directly related to the loss of supply chain control” (Enslow, 2001). To recapture, the offered solution is attention to supply chain management. From Cox, Blackstone and Schleier (2003, p. 1107) this means “design, planning, controlling, and measuring of the ability of the people, departments, functions, and organization in the supply chain to respond to the needs of the consumer with respect to having the right good or service, at the right price, in the right quantity, at the right place, and at the right time.”

This leads to the first obstacle: understanding the supply chain and what management of the supply chain means. One view of the supply chain function is that it is to “squeeze suppliers and distributors to reduce logistics costs (Cox, Blackstone & Schleier, 2003, p. 1065). The more complete view of the effort is found in Cox, Blackstone and Schleier (2003, p. 1066):

We believe that effective supply chain management starts with a complete reexamination of the logistics strategy, policies, procedures and measures. In many cases completely new logistics strategy, policies, procedures, and measures must be designed and implemented to support each organization’s efforts in the supply chain to achieve the chain’s goal.

From these comments, other obstacles may be projected. First, a complete reexamination is costly in terms of human and capital resources. The time and cost issues must be considered, and means of overcoming the objections must be identified. Secondly, links often act independently of the other links, and therefore are not a supply chain by these definitions at all. A new emphasis on acting as a chain is critical to success. Additionally, uncertainty shrouds the communications to the lower levels of the employee body. Support from the highest levels of management is needed to counter this obstacle. Still, current performance measures are part of the comfortable status quo for many managers, but the measures only serve to optimize the individual links and not the supply chain. The obstacles may be summed up in behavioral terms: resistance to change.

CONCLUSIONS

This field research was conducted within the context of the Theory of Constraints. The application of these concepts should be of interest to the practitioner and academic alike as achieving improvement is a continuous area of management concern. While there may be limitations with this type of field evaluation concerning applicability to other situations, the general principles employed are thought to be of use to the practitioner community. Therefore, the field review undertaken herein has provided a guide for future evaluations of existing practices in other industries.

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