

# Lucent SCN: Leveraging the Fully Integrated Supply Chain

by

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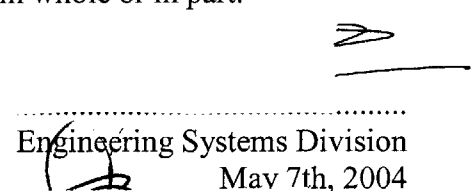
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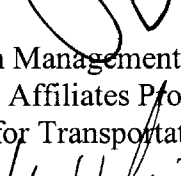
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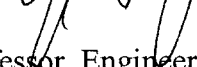
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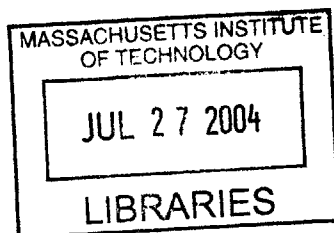
  
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## **Abstract**

Over the past three years, in response to dramatic changes in the telecommunications industry, Lucent Technologies has realigned its corporate strategy from being a provider of manufacturing excellence to one of supply chain excellence. Supported by this realignment, Lucent has recently returned to profitability after eleven consecutive losing quarters, and has posted dramatic improvements in financial, operational and customer satisfaction metrics. Lucent's new strategy is focused on leveraging its supply chain capabilities to create a new extended enterprise that is both customer and supplier intimate, and operates as a broad reaching cross-functional Supply Chain Networks (SCN) organization. Pivotal to the success of this realignment was extending the scope of Lucent's supply chain activities, both internally and externally to the company. Internally, Lucent integrated such non-traditional SCM activities as sales, product design, and margin management into its newly created SCN organization. Externally, by outsourcing virtually all of its manufacturing, and much of the associated supplier management, to Electronics Manufacturing Services (EMS) partners, Lucent became responsible for the orchestration of an extended multi-tier supply chain that integrated abilities and expertise of functional teams within Lucent and within its EMS partners, raw component suppliers and customers.

In this thesis, the Supply Chain Networks transformation at Lucent is examined in the broader context of the changes that took place in Lucent's: organizational model; leadership team; corporate culture; customer and supplier relationships; operations; and market space. The change that was effected in each of these areas is reviewed for its role in the success of Lucent's turnaround and, from the patterns that emerge, a basis for a new holistic framework for designing and leveraging an integrated supply chain is offered. This framework suggests that attaining competitive advantage from supply chain capabilities lies in a firm's ability to incorporate corporate culture, leadership style, organization structure and both inter and intra tier governance methods into its supply chain design in order to enable an integrated and extended organization where the channel expert can be identified and engaged in decision making in a natural, real-time and organic process.

## **Acknowledgements**

First and foremost, I'd like to thank my thesis advisor Jim Rice for his support and both academic and personal guidance throughout the evolution of this thesis and for inspiring my interest in organizational development and collaborative supply chain design.

I'd also like to extend my thanks, appreciation and admiration to the people of Lucent Technologies who effected the remarkable transformation described in the pages of this thesis. Specifically, I'd like to thank Joe Bellefeuille, Dan Fischer, Karen Griffin, Lisa Hock, Lynn Mercer, Steve Sherman, Mario Visco, and Jose Mejia who patiently answered my questions and provided support and encouragement.

It goes without saying that many of the ideas presented within this thesis are the assimilated product of the great minds that have inspired me and shared their experiences with me here at MIT. Specifically, I'd like to thank two of my professors, Jonathan Byrnes and John Sterman, for leading my thinking to a broader perspective and for showing me the interrelatedness of all things and the importance of focusing your efforts where they make the most difference.

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# Chapter 1. Introduction

## 1.1 Thesis Objective

The objective of this thesis is threefold: first, to examine the transformation of Lucent's supply chain strategy and structure as part of the creation and evolution of its Supply Chain Networks (SCN) organization; second, to identify key success factors in the execution of the SCN strategy that contributed to a dramatic improvement in Lucent's financial and operating metrics from 2001 to 2003; and third, to understand whether insight gained from the analysis of the interaction of these key success factors can be used to begin developing a new strategic framework for successfully designing and executing a fully integrated supply chain.

While the Lucent SCN story provides one example of a fully integrated supply chain, it is hoped that the combination of factors which made Lucent SCN successful will also be found present - with further research into the operations of other organizations - in other successfully executed integrated supply chain strategies. Finally, it is hoped that the findings of this work will lead to a new and expanded perspective that will assist supply chain managers in designing their own fully integrated supply chain for successful execution.

## 1.2 Motivation for Thesis

Lucent Technologies has over the past three years dramatically revised its supply chain strategy and structure. In January 2001, Lucent began redefining the boundaries and functions of its supply chain in the form of a newly created Supply Chain Networks (SCN) organization. Fundamental to the SCN philosophy was the extension of the boundaries of what constituted the supply chain beyond traditional functions such as purchasing, logistics and distribution, and into non-traditional areas of the business such as product design, sales and marketing, after-sales customer support and responsibility for product lifecycle margin management. Concurrent with the creation of its SCN organization, Lucent underwent a profound strategic and cultural shift, both in response to significant changes in the telecommunications industry in which Lucent operates, but also as a result of a clearly developed strategy centered on creating and leveraging a fully integrated supply chain to support a transition to virtual manufacturing<sup>1</sup>, while retaining best-in-class innovation and improved customer service capabilities. As a result of these actions Lucent has posted impressive improvements in net profitability and in many supply chain metrics used to monitor the health of its business.

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<sup>1</sup> Virtual manufacturing was the term used by Steve Sherman, vice president of SCN strategy to describe Lucent's "factory-less" manufacturing enterprise after implementing an outsourced strategy using electronics manufacturing services (EMS) partners; in effect making the EMS partners' facilities Lucent's "virtual manufacturing" operations.



There has of late been a movement in the trade press and in the literature to suggest that with the increasingly complex supply chain structures and relationships in which companies must operate, core capability in managing these complex supply networks represents a significant and largely untapped source of competitive advantage.<sup>2</sup> As the trend towards outsourcing of non-core corporate functions continues, with a subsequent increase in the interconnectivity, complexity and number of players involved in the supply chain, many companies have begun looking at the ability to manage these supply networks<sup>3</sup> as a strategic lever in its own right and not merely a back office support function<sup>4</sup>. Rice and Hoppe, for example, go on to suggest that defensible and sustainable competitive advantage can be obtained by “utilizing and integrating (not just adding) the capabilities of other members of the supply network, such as an upstream supplier or a downstream customer, to offer a unique and compelling solution”<sup>5</sup>. A unique and compelling solution will result in competitive superiority from “precise resource allocation that generates economies of scale, reduces duplication and redundant operations, and gains consumer loyalty through customized service.”<sup>6</sup> In other words, in theory, by integrating capabilities across the supply chain, partners can integrate their resources for a mutual gain.<sup>7</sup>

By any measurement, Lucent Technologies has effected a remarkable and fundamental change in the role it plays in its multi-tiered supply chain between component suppliers and electronics manufacturing services (EMS) partners on the upstream side, and a globally distributed customer base of telecommunications networking companies on the downstream side. By extending the supply chain’s involvement internally from purchasing to sales and from product design to customer delivery, and by moving from a vertically integrated to a virtually integrated<sup>8</sup> manufacturing model, Lucent has extended the boundaries of its supply chain, not just within its own organization, but also beyond the boundaries of to include customers and suppliers organizations - a process Jose Mejia, Lucent’s president of supply chain networks, describes as “connecting the dots”.<sup>9</sup> This process has been driven by activities on several fronts: changes to the organization structure, leadership style, mode and level of engagement with suppliers and customers and level of cross-functional communication and coordination within Lucent itself.

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<sup>2</sup> Rice and Hoppe, 2001

<sup>3</sup> The term supply chain, with its one-dimensional connotation has increasingly been replaced with “supply network” a term that Rice suggests more accurately describes the nature of supply relationships today (that is, nonlinear flows, network-like systems, and webs of suppliers and customers), Rice and Hoppe, 2001

<sup>4</sup> Rice and Hoppe, 2001

<sup>5</sup> Rice and Hoppe, 2001

<sup>6</sup> Bowersox et al, 2003

<sup>7</sup> Bowersox et al, 2003

<sup>8</sup> Steve Sherman used the phrase: “vertical to virtual integration” to describe the shift in Lucent’s strategy from manufacturing to coordinating a supply chain network system in an internal EMS whitepaper document prepared for Lucent’s board in 2002. Sherman, Lucent internal document, 2002

<sup>9</sup> Mejia has used the connecting the dot analogy in many press interviews to describe his approach to integrating flows of information and aligning processes as part of integrating Lucent’s supply chain organization. See for example, Roberts, 2002

Finally, it is important to recognize that during the entire process of Lucent's transformation out of a vertically integrated structure, many extreme and unprecedented transformations were taking place in Lucent's marketplace. The high-tech market boom of the late 1990's followed by the collapse beginning in mid-2000 saw the creation and subsequent destruction of vast amounts of wealth, both for individuals and for corporations. While, it is difficult to discern the impacts of the uncontrollable external market conditions from the impacts of the specific controllable actions Lucent has taken to alter its own environment, the role of the crisis is one that had a profound impact on the changes at Lucent and the analysis of the nature of this role presents an important background to analysis of Lucent's supply chain reorganization.

Taking these three themes together - the remarkable turnaround at Lucent Technologies from 2001 to 2003, led by an innovative supply chain organization integrating functions across traditional enterprise boundaries; the increasing complexity of supply chains and the predicted competitive opportunities for those players who are best able to coordinate the channel, and; the blurring of organizational boundaries as integrated systems and processes dependent on collaborative relationships drive non-zero-sum channel optimization – the question, and motivation, of this thesis, is to understand whether Lucent's success in building a fully integrated supply chain and in leveraging the resulting network capabilities represents a working example of a new paradigm in integrated supply chain design and execution.

### **1.3 Methodology**

This research for this thesis was carried out primarily as a case study of Lucent Technologies and the evolution of its Supply Chain Networks organization during the three year period from early 2001 through the end of 2003. Data was gathered from company internal documents and records, trade press articles, from seminars given by the senior leadership team of Supply Chain Networks during an MIT Affiliates day symposium in October 2003, and from interviews with seven senior managers, directors and executives at Lucent, each of whom variously architected, observed, influenced and participated in the evolution of the Supply Chain Networks organization.

## **Chapter 2. The Telecommunications Industry<sup>10</sup>**

### **2.1. A Brief History**

The telecommunications (telecom) industry, broadly categorized as consisting of those companies involved in designing, building, supplying or servicing infrastructure, hardware and software to support voice and data communication, can trace its roots back over 150 years. At its inception, with the formation of Western Union from a group of telegraph companies in 1856<sup>11</sup>, the industry consisted solely of telegraph equipment manufacturers. Over the past century and a half, the scope of the telecom industry has expanded far beyond the simple telegraph – beginning with the introduction of the telephone and associated cable and call routing equipment in the 1880’s and 1890’s; followed by radio broadcasting and microwave relay equipment in the first half of the twentieth century; and after the second World War, network and cable television, and long distance phone networks. In the late 1970s the telecom industry began experiencing rapidly accelerating growth, fueled by the emergence of the personal computer industry through the 1980’s, the rise of the internet and cellular phone technology in the 1990’s, and by huge strides in fiber optic and wireless technology that enabled quantum improvements in global voice and data connectivity in the 1990s. With the emergence of digital communications technologies, and the possibilities for rapid voice and data communication, the telecom industry experienced a tremendous growth, both in terms of scope and in rapidity of innovation. In 2003, in addition to the traditional telephone systems equipment, the \$1.3-trillion global telecom industry<sup>12</sup> included technologies and companies involved in developing fiber optic and wired networks, satellite and wireless technologies supporting a broad range of voice and data communication sectors.

### **2.2. Regulation in the Telecommunications Industry**

In the United States the telecom industry was regulated for most of its existence. After Alexander Graham Bell’s telephone patent expired in 1884, thousands of new telephone companies sprang up, many touting their own technologies and infrastructure. In response, in the 1900’s Theodore Vail, then President of AT&T lobbied the United States’ Congress for a “natural monopoly”, claiming that standardization and elimination of redundant infrastructure would benefit all. Vail proposed what became known as the Kingsbury Commitment, offering to allow competitors access to AT&T lines in exchange for protection from competition and regulated rates. This idea took hold and although the majority of long distance phone rates were regulated by 1925, the regulatory structure

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<sup>10</sup> Much of the information in this section was provided by Standard & Poor’s Industry Surveys – Communications Equipment, 1999 through 2004. See bibliography for complete listing of reports referenced.

<sup>11</sup> Lucent company history available at [www.lucent.com/corpinfo/history.html](http://www.lucent.com/corpinfo/history.html), accessed Feb 16, 2004

<sup>12</sup> Hahn, (Gartner Dataquest), January 16, 2004

was only finalized nine years later, when the United States government created the Federal Communications Commission (FCC) and passed the Communications Act of 1934.

The Communications Act of 1934 act was aimed at providing for the regulation of interstate and foreign communication by wire or radio for the purpose of regulating commerce in communication. The act was implemented to make available a “rapid, efficient, nationwide, and world-wide wire and radio communication service with adequate facilities at reasonable charges, for the purposes of national defense, and promoting safety of life and property through the use of wire and radio communication.”<sup>13</sup>

Deregulation of the US telecom industry began in 1982 when the AT&T monopoly was forced to split up after settlement of a lengthy US government anti-trust suit. With the split up of AT&T in 1984, the long distance service provider market was opened up to competition. Deregulation in the local telephone sector followed over a decade later with the passing of the Telecommunications Act of 1996. The act opened the door to increased competition between local telephone companies, long-distance carriers and cable television operators, as players in each of these segments were now allowed to enter each other’s markets. Consequently, competition and diversification led to aggressive spending on the latest communications equipment technology as these companies sought to gain a competitive edge through increased service offerings and reduced bandwidth costs. The availability of capital and the lure of high profit margins attracted thousands of new competitors into the telecom market space, with over three thousand new service providers entering the United States’ telecom market between 1996 and 1999<sup>14</sup>. Led by the United States, other countries began deregulating their telecommunications markets, with several European countries following suit in after the passage of the World Trade Organization’s 1997 telecom agreement.

### **2.3. From Boom to Bust:**

Following deregulation, a proliferation of new telecom carriers clamoring to buy equipment fueled a build out of network capacity; consequently, significant stockpiles of inventory were created as equipment providers sought to attract and retain customers with high product availability and low lead-times for the latest technology.

In the intensely competitive environment of 2000, the prevailing wisdom held that if a network service provider planned to stay in business, it needed to “spend heavily on capacity for data-driven communications”<sup>15</sup>. This heavy capital spending by North American telecommunications carriers culminated in a three-year binge from 1997

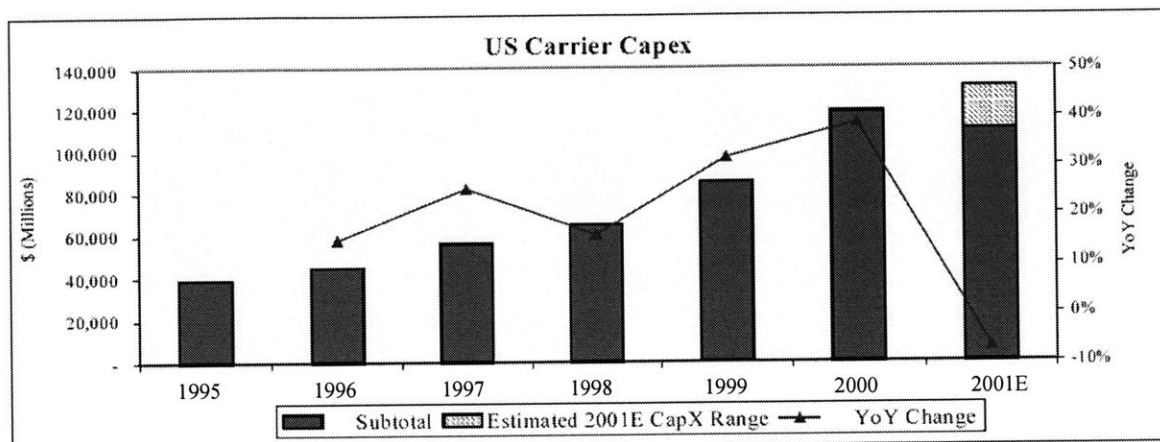
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<sup>13</sup> Selected wording taken from the Communications Act of 1934, available from the Federal Communications Commission. Full text is available at <http://www.fcc.gov/Reports/1934new.pdf>, accessed April 15, 2004

<sup>14</sup> Standard & Poor’s, December 23, 1999

<sup>15</sup> Standard & Poor’s, January 18, 2001

through 2000, where capital expenditure (CAPEX) increased from \$56-billion in 1997 to almost \$120-billion in 2000, representing 33 percent of total industry sales of more than \$350-billion<sup>16</sup> and a year-over-year growth rate of more than 30 percent for both 1999 and 2000. By contrast, retail sales during this same period had grown in the neighborhood of 10 percent year-over-year.



Source: Bernstein, 2000

Figure 1: US Telecommunications Carrier Capital Expenditure 1995-2001

A segmented breakdown of the carrier CAPEX shows that new long distance backbone spending, making up 25 percent of the \$119 billion total US carrier CAPEX, grew at a staggering 920 percent from \$3.26 billion to \$29.5 billion between 1997 and 2000.<sup>17</sup>

The reasons for this binge were several: the internet bubble was in full swing, driving data network capacity demand; the global telecommunications markets were deregulating, driving voice network capacity demand and there was an unprecedented availability of low-cost capital, led in part by the booming American economy and inflated stock market valuations for high tech companies, many of which would never earn a profit or even generate sales. This euphoric, get-rich-quick mentality, famously described by Alan Greenspan, Chairman of the Federal Reserve, as “irrational exuberance”<sup>18</sup> drove stock valuations and the paper wealth of investors to all time highs, in turn allowing any would-be entrant to the booming telecom market to turn to private venture capital and public offerings in the stock market for easy funding. Furthermore, a much anticipated year 2000 (Y2K) software “bug”<sup>19</sup> had spurred demand for redundant backup systems and upgrades as a means to defend against potential system failures.

<sup>16</sup> Sanford C. Bernstein, December 19, 2000

<sup>17</sup> Sanford C. Bernstein, December 19, 2000

<sup>18</sup> Remark made by Chairman Alan Greenspan to describe the source of “unduly escalated asset values, which then become subject to unexpected and prolonged contractions” at the Annual Dinner and Francis Boyer Lecture of The American Enterprise Institute for Public Policy Research, Washington, D.C., December 5, 1996

<sup>19</sup> The Y2K bug was a popular name given to an expected widespread software glitch - the result of early computer programmers choosing a two-character year field in many applications. Many experts believed

Despite increasing misgivings about the sustainability of such high level growth and urgings of caution from some industry observers, many experts continued to believe that the communications equipment market would continue to expand rapidly, with predictions at that time calling for a 14 to 15 percent annual growth rate for the following few years.<sup>20</sup>

#### **2.4. 2000: The Bubble Begins to Burst**

As it turned out, the Y2K bug failed to materialize in any significant manner, and as the summer of 2000 approached, indications pointed more and more to an end to the untenable double-digit growth of the past few years, with retail spending slowing while CAPEX continued to rise.

Although CAPEX growth was increasingly outstripping retail sales growth, more troubling was the rising level of carrier industry debt, which topped 91 percent of sales at the end of September 2000.<sup>21</sup> As a result, the banking sector was increasingly scrutinizing its exposure to the telecom sector and with the result of a tightening of the capital market for carriers. In order to continue growing, equipment suppliers increasingly financed their customers in order to keep product moving out the door. For their part, equipment suppliers continued to invest heavily in new technologies in attempts to capture market share and stimulate sales growth from new technology offerings. For example, according to Standard & Poor's, as of the third quarter of fiscal year 2000, Lucent Technologies had extended \$1.5 billion in financing to its customers - more than double the \$700 million sum for the comparable year-earlier period. During this same period Lucent's competitor Nortel Networks had extended a similar \$1.4 billion in financing to its customers, a \$300 million increase year-over-year.<sup>22</sup> Equipment makers were even providing customer financing in some instances to fund purchases of competitors' products.

By early-2000, the cumulative effect of these trends – slowing retail sales growth, increasing vendor financing, and rapid innovation and competition driving a push-product-to-market mentality on the part of the equipment suppliers – was an increasingly untenable situation. As supplier capacity and material constraints led to component shortages; as a result buyers, afraid to be left without product, engaged in double-ordering and padding of forecasts throughout the multiple supply tiers of the industry, leading in turn to capacity allocation as suppliers prepared their manufacturing lines in response to grossly overstated forecasts. In response, toward the end of 1999, some

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that the calendar rolling over from 99 to 00 would be interpreted by software as meaning 1999 to 1900, with disastrous implications; for example, interest calculations. For more information see the National Year 2000 (Y2K) Clearinghouse at [www.y2k.gov](http://www.y2k.gov). This website is a combination of the President's Council on Year 2000 Conversion, the Chief Information Officer's Council Committee on Year 2000, and the U.S. Federal Gateway for Year 2000 Information Directories.

<sup>20</sup> Standard & Poor's, December 23, 1999

<sup>21</sup> Sanford C. Bernstein, December 2000

<sup>22</sup> Standard & Poor's, January 18, 2001

equipment suppliers began vertically integrating to reduce reliance on external sources; for example, Nortel announced in November 1999 that it would triple its own capacity for producing optical components.<sup>23</sup>

Taken together, these trends caused ordering and manufacturing to reach fever pitch. Rich McGinn, then CEO of Lucent likened the market situation at the end of 1999 to a “huge race” driven by an internet revolution that was “creating huge changes in e-business, business-to-business, as well as e-commerce” and a belief that “everything in the GNP that can be digitized will be digitized.”<sup>24</sup>

<b>GROWTH OF THE COMMUNICATIONS EQUIPMENT MARKET</b>	
<i>(Compound annual rate, 1996 to 2001)</i>	
	<b>GROWTH RATE (%)</b>
Wireless infrastructure	22
Wireless handsets	19
Data networking	25
Narrowband switching	5
Optical equipment	25
Access	15

Source: Lucent Technologies; some estimates by S&P.

**Table 1: Growth of the Communications Equipment Market 1996-2001**<sup>25</sup>

The telecom industry reached the zenith of its growth trajectory in mid 2000 as the forces that had fueled the industry for the past few years continued to drive expansion: Deregulation and a widespread availability of capital had fueled capital spending by new and existing service providers; the internet and cell phone proliferation were combining to create unprecedented demand for communications equipment and the build out of network capacity as expectations for exponential growth in required capacity to support new bandwidth-hungry applications continued.

As 2000 progressed, economic growth slowed, funding for carrier CAPEX dried up as installed and committed network capacity far exceeded current demand and investors became more wary of the bubble that was increasingly apparent. Standard & Poor’s gave the following retrospective analysis at the year 2000:

<sup>23</sup> Standard & Poor’s, December 23, 1999

<sup>24</sup> McGinn, 2000

<sup>25</sup> Standard & Poor’s, January 18, 2001

“With capital spending rates climbing well ahead of revenue growth, carriers began to curtail network deployment in the second half of 2000, as shareholders began to raise questions about their ability to recoup network investments.”<sup>26</sup>

As carrier orders were pushed out or cancelled and inventories began to accumulate, equipment makers began delaying new product launches in attempts to sell on-hand inventories. As the manufacturing lines sat idle, prices plummeted upwards of 40 percent on an annualized basis<sup>27</sup> as the costs of carrying growing inventories mounted and equipment makers attempted to continue to squeeze returns out of fixed assets in underutilized factories.

By the end of 2000, increasing economic uncertainty, missed revenue targets, mounting inventories and several notable earnings misses by heavyweights Nortel (3Q2000) and Lucent (January 2000) and a rapid succession of warnings by three of the top wireless handset makers<sup>28</sup> had led to disenchantment with the telecom sector’s near-term prospects. As a reflection, the S&P Communication Equipment stock price index was down 56 percent for the year 2000, a marked turnaround from its 129% increase in 1999.<sup>29</sup>

It became increasingly apparent that a new era in the Telecom industry was about to begin, with new challenges for those seeking to remain leaders.

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<sup>26</sup> Standard & Poor’s, January 18, 2001

<sup>27</sup> Lucent average estimate across product lines. According to Lucent, optical equipment prices fell 50 to 70 percent per year in 2001 and 2002. (Piconi, MIT Affiliates Day presentation, 2003)

<sup>28</sup> Nokia, Motorola, Telefonaktiebolaget LM Ericsson, accounted together for over 50% of WW sales in 2000. (Standard & Poor’s, January 18, 2001)

<sup>29</sup> Standard & Poor’s, January 18, 2001



## Chapter 3. Lucent Technologies<sup>30</sup>

While Lucent Technologies was officially created in 1996 when AT&T divested its systems and technology business in an initial public offering which raised over \$3-billion, the company's roots reach back over 150 years to the origins of the telecom industry itself. In 1856 Western Union was formed with the purchase of several telegraph makers. Western Union was joined with Gray & Barton, a Cleveland based electrical equipment maker in 1872 and the group was renamed Western Electric Manufacturing Company. Elisha Gray (of Gray & Barton) was the loser to Alexander Graham Bell in the race to patent the first telephone in 1876 and his company, American Bell, subsequently bought control of Western Electric in 1881, eventually converting it into American Bell's manufacturing division. In 1885 American Telephone and Telegraph (AT&T) was incorporated as a wholly owned subsidiary of American Bell, and was chartered to build and operate the original long distance telephone network. AT&T completed the first section of its coast-to-coast network from New York to Chicago in 1892. In 1899, American Bell changed its name to American Telephone and Telegraph (AT&T), a name that today remains closely tied to the telecom industry.

Bell Laboratories, formed in 1925 as AT&T and Western Electric's research and development unit, established AT&T as the industry leader in technology innovation; today Bell Labs is still synonymous with revolutionary technological advancement. Since its formation, breakthroughs such as the laser, transistor, fax machine and touch-tone telephone have all been attributed to the work done by the scientists at Bell Labs. In 1999, Bell Labs was being producing on average 3.5 patents every 24 hours<sup>31</sup> and at the end of 2003, having just received its 30,000<sup>th</sup> patent in the United States, was described by Lucent as "the innovation engine that powers Lucent Technologies".<sup>32</sup>

For much of its history, AT&T functioned as a legally sanctioned, regulated monopoly, protected initially by the Kingsbury Commitment, an agreement made with the US government in 1913 that saw AT&T divest its interest in the telegraph business and agree to allow telephone companies use of its network in return for exclusive long distance network provision rights. This protection more or less lasted until 1982, when as a result of a settlement in an eight-year long antitrust battle fought with the US government, AT&T agreed to sell its wholly owned Bell operating companies, responsible for exchange services and retained its long distance services, manufacturing, and research and development (Bell Labs) operations.

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<sup>30</sup> Unless otherwise referenced, facts and figures in this section were obtained from Lucent's corporate website [www.lucent.com/corpinfo/history.html](http://www.lucent.com/corpinfo/history.html), accessed Feb 16, 2004 and AT&T's corporate website [www.att.com/history/history1.html](http://www.att.com/history/history1.html), accessed April 15, 2004.

<sup>31</sup> Standard & Poor's, December 23, 1999

<sup>32</sup> Lucent Technologies Annual Report 2003

In 1995, in response to an “increasing lack of synergies between the communications and manufacturing divisions”<sup>33</sup>, AT&T decided to restructure, divesting the systems, equipment and Bell Labs operations as Lucent Technologies.

When launched in 1996, Lucent was involved a broad range of segments in the telecommunications industry: mobility, optical, data and voice networking technologies; web-based enterprise solutions that link public and private networks; communications software; professional network design and consulting services; and communications semiconductors and optoelectronics.<sup>34</sup> Between 1996 and the end of 2000 Lucent spent more than \$46-billion on a total of thirty-eight acquisitions (sixteen in 1999 alone) as the company continued to strengthen its position as a full spectrum provider in the communications industry. In the process, Lucent’s revenues grew from \$23-billion in the twelve months following its IPO in 1996<sup>35</sup> to a peak of \$38-billion in fiscal 1999<sup>36</sup>. Employee headcount also increased tremendously during this time, with then-CEO Rich McGinn proclaiming in November 1999 that “forty percent of people at Lucent today were not here at the time of the IPO four years ago, we’ve hired thirty-thousand people in the past year alone.”<sup>37</sup>

Lucent was well positioned in the newly deregulated market with significant size, a wealth of experience, and had the innovation engine of Bell Labs behind it. This position was however by no means secure; deregulation had exposed Lucent’s customers – primarily network carriers – to competition from cable television and new entrants in the local and long distance provider markets, making customers increasingly cost-sensitive, and demanding of fast product availability and the latest in technology that would give them an edge over their competition.

In response to the proliferation of new customers in its market, in the late 1990’s Lucent reorganized its three operating divisions into eleven largely independent businesses. With the accelerating growth of its company, both in revenue, customers and employees, Lucent’s senior management felt that a decentralized and autonomous decision making structure would enable more customer responsiveness and faster, better-focused innovation.<sup>38</sup>

The strategy was successful and at the end of 1999, Lucent held double-digit market share in the majority of its product categories (See Table 2 for a breakdown of revenue and market share in 1999) and was considered well positioned to take advantage of expected continuing strong industry growth in its major market segments, with industry pundits making projections at that time for compound growth rates through 2003 of 15 percent in telecommunications equipment, 30 percent in wireless infrastructure and

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<sup>33</sup> AT&T’s corporate website [www.att.com/history/history1.html](http://www.att.com/history/history1.html), accessed April 15, 2004.

<sup>34</sup> Lucent website <http://www.lucent.com/corpinfo/history.html>, accessed Feb 16, 2004

<sup>35</sup> Beginning September 30, 1996, Lucent changed its fiscal year-end from December 31 to September 30 and reported results for the nine-month transition period ended September 30, 1996 as US \$16.6-billion

<sup>36</sup> Lucent Technologies Annual Report 1999

<sup>37</sup> McGinn, 2000

<sup>38</sup> Christensen and Raynor, 2003

48 percent in optical networking equipment .<sup>39 40</sup> As the 20<sup>th</sup> century came to a close, Lucent's 110 million lines represented roughly 58 percent of the United States wireline local access installed base and 13 percent of the worldwide installation.<sup>41</sup>

	FY 1999 Revenue	1999 Mkt. Share	% of Corp. Revenue
<b>Product Categories*</b>			
Carrier	\$ 25,272	15%	66%
Switching and Access	\$ 7,063	19%	18%
Wireless Infrastructure	\$ 5,760	18%	15%
Optical Networking	\$ 3,989	16%	10%
Fiber/Cable/OSP	\$ 1,420	13%	4%
Transmission Systems	\$ 1,344	11%	3%
"Pure" Carrier Data	\$ 2,743	37%	7%
Carrier Messaging	\$ 579	18%	2%
Carrier Software	\$ 1,815	9%	5%
Services and Other	\$ 559	3%	1%
Enterprise	\$ 8,563	13%	22%
Switching & Key Systems	\$ 3,499	16%	9%
Voice Proc. Applications	\$ 2,608	28%	7%
Enterprise (Unadj.) Data	\$ 336	2%	1%
Services and Other	\$ 2,119	17%	6%
Microelectronics	\$ 3,862	-	10%
Other	\$ 711	-	2%
<b>Total Lucent:</b>	<b>\$ 38,408</b>	<b>-</b>	<b>100%</b>
* categories not mutually exclusive, category revenues do not sum to total revenue.			
Source: Bernstein (April 2000)			

**Table 2: Lucent FY 1999 Revenue and Market Share by Product Category<sup>42</sup>**

<sup>39</sup> Standard & Poor's, December 23, 1999

<sup>40</sup> Sanford C. Bernstein, April 07, 2000

<sup>41</sup> Morgan Stanley Dean Witter, December 28, 1999 (a)

<sup>42</sup> Sanford C. Bernstein, April 07, 2000

### 3.1. *Lucent in 2000*

Lucent's strategy in 2000 was geared toward increasing sales and broadening the scope of its technology offerings; the two keys, it felt, to success and longevity in the race to attract and retain customers. McGinn in November 1999 attributed much of the success Lucent had attained in its market to its strategy of growth:

"Becoming an industry leader, moving to the top of a list for any one of dozens of industry segments is the result of growth, not the cause of it... To a great extent, our growth is a function of strategy and execution. However, it is also the result of an unrelenting drive to be first to market, to address opportunities that emerge and to really drive ourselves and our teams to achieve."<sup>43</sup>

Lucent's customers were clamoring for the newest technology and often cost was not a decision factor; getting the newest product to market, and not losing a sale to a competitor due to unavailability of the latest product were the main forces driving Lucent during this time. New carriers (for example Qwest Communications International Inc, Level 3 Communications and Global Crossing Ltd)<sup>44</sup> had invested heavily in digital switches and broadband technology in an attempt to capture market share and established players were being forced to upgrade to keep pace. As a result little attention was paid to mounting inventories. One senior manager explained: "Service and availability were key back then; no one wanted to be responsible for product not being available when a customer wanted it and as a result, inventory levels were excessive. As long as the product kept flowing out the door, no one looked too closely at the growing pile of inventory."<sup>45</sup>

On the other hand, Lucent was also suddenly exposed to competition from technology-based competitors funded by tech-boom capital and looking to erode Lucent's position through development of specialized niche products.<sup>46</sup> Tellabs Inc. was one such competitor, developing technology that would enable voice, data, and video traffic to travel through the telephone network. Because of this niche competition, which had to be responded to from within the Lucent business unit whose market was being threatened, the product units were strongly focused on their own market segments and on making sure that they were not responsible for giving up any of Lucent's share. A director in Lucent's Optical Networking group recalled: "back then everything was driven by the heads of each product unit pushing to develop the next big thing ahead of competitors. They would do whatever it took to get out there first."<sup>47</sup>

The results of missteps in getting to market first could be devastating; a newer, faster product being introduced by a competitor could render warehouses full of finished goods and vast component stocks virtually obsolete overnight. For example, in January

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<sup>43</sup> McGinn, 2000

<sup>44</sup> Standard & Poor's, December 23, 1999

<sup>45</sup> \_\_\_\_\_ interview, \_\_\_\_\_ 2004

<sup>46</sup> Standard & Poor's, December 23, 1999

<sup>47</sup> \_\_\_\_\_ interview, \_\_\_\_\_ 2004

2000, Lucent lowered sales and earnings expectations for its December 1999 quarter (fiscal 1Q2000), citing problems with not foreseeing the shift to faster 10 Gigabit OC-192 optical systems.<sup>48</sup> As a result, Lucent was stuck selling lower-speed 2.5 Gigabit OC-48 systems<sup>49</sup> while chief Canadian rival Nortel Networks benefited as many of Lucent's customers clamored for the higher-speed systems.

To accommodate the growth and customer demands, Lucent did a lot of buffering with finished goods inventories to reduce lead-times<sup>50</sup>; the disposition of this inventory was often through provision of financing to customers and offering end-of-quarter discounts to encourage buying. Customers came to realize that if they came asking near quarter-end, deals were often available. One SCN director, recollected:

“Everything back then was about revenue growth and just keeping the bubble growing - customers knew that and went shopping at the end of quarter for fire sale deals, put on by Lucent (and other Telecom makers) to make the numbers. Everything was building for a perfect storm in inventory”.<sup>51</sup>

After the troubles with aligning with customer demands on the move to 10 Gigabit optical systems, McGinn announced in April 2000 that Lucent would divest its enterprise networking business<sup>52</sup> and that it would change its global manufacturing strategy in order to sharpen its strategic focus and allow Lucent to “capitalize even more quickly on the fastest growth opportunities in communications networking”.<sup>53</sup> At the same time McGinn announced intentions to transition manufacturing to EMS partners in efforts to “respond more quickly to changes in customers' demands and allow it to focus its capital in other critical areas.”<sup>54</sup> The following quarter it was announced that Lucent's microelectronics division would also be divested, eventually becoming Agere Systems, and at the end of 2000, Lucent completed the sale of its power systems division to Tyco International Inc as it continued to refocus its market presence.

As the year progressed, Lucent's end markets continued to soften and losses and inventory mounted leading to the announcement in October 2000 – in conjunction with the September quarter results - that Lucent's board was replacing McGinn as CEO with Chairman and former CEO Henry Schacht. For the fourth quarter of 2000 (Lucent's first quarter of fiscal 2001), Lucent posted a loss of \$1.02 billion, compared with a profit of \$1.08 billion in the same year-earlier quarter and a balance sheet inventory position of \$6.4 billion on \$5.84 billion in sales<sup>55</sup>. Along with the announced earnings, Schacht

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<sup>48</sup> Lucent press release Jan 06, 2000: Lucent Technologies comments on expectations for first fiscal quarter 2000 earnings, available at [www.lucent.com/press/0100/000106.cob.html](http://www.lucent.com/press/0100/000106.cob.html)

<sup>49</sup> Standard & Poor's, January 18, 2001

<sup>50</sup> \_\_\_\_\_ interview, \_\_\_\_\_ 2004

<sup>51</sup> \_\_\_\_\_ interview, \_\_\_\_\_ 2004

<sup>52</sup> This divestiture was concluded when on October 2<sup>nd</sup>, 2000 when Avaya Inc was launched on the New York Stock Exchange.

<sup>53</sup> Rich McGinn: Lucent Press Release April 19, 2000. Available at [www.lucent.com/press/0100/000106.cob.html](http://www.lucent.com/press/0100/000106.cob.html)

<sup>54</sup> Lucent press release April 19, 2000, available at [www.lucent.com/press/0100/000106.cob.html](http://www.lucent.com/press/0100/000106.cob.html)

<sup>55</sup> Lucent press release January 24, 2001, inventory figure taken from 2Q2001 balance sheet.

announced a major restructuring program aimed rebuild the company for long-term, sustainable profitability. A key component of this program was to significantly expand previously announced plans to use contract manufacturers.

By the time the fiscal year closed on Sept. 30, 2001, Lucent had recorded \$11.42 billion of restructuring and one-time charges, including \$1.26 billion in inventory write downs, had reduced headcount by 29,000 to 77,000 (excluding the Agere spin-off)<sup>56</sup> and had begun widespread restructuring of its supply chain to support the demands of a new market reality.

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<sup>56</sup> Lucent Technologies Annual Report 2001

## Chapter 4. Supply Chain Management at Lucent

### 4.1. Supply Chain Management: Pre-2001

Supply chain management at Lucent had evolved as largely a local support function, managed by each of Lucent's eleven business unit in an autonomous and largely independent manner with each business unit owning its own factories, EMS relationships, supplier assessment plans and report cards. By decentralizing decision making and allowing each stand-alone, product-focused and customer-intimate business unit (BU) to autonomously make its own design, sourcing and sales decisions, and to design and manage its supply chain how it saw fit, Lucent was able to react quickly and responsively to the varied demands of its customers across its broad scope of businesses – from semiconductors to wireless networking to optical switching equipment. The manufacturing enterprise consisted of 29 factories in the United States and abroad, 16 repair centers, over 20 thousand employees and an annual operating budget of \$1.9-billion. On the outbound side, Lucent's distribution network comprised over 200 commercial warehouses and 1700 freight carriers to deliver product to customers.

#### **Purchasing and Supplier Management:**

There was a global purchasing office (GPO) whose staff did the buying for the business units and made attempts to aggregate demand and negotiate bulk pricing deals. These attempts were of limited effectiveness due to several consequences of the stand-alone operation of each business unit: a lack of integrated information technology systems, a lack of a centralized inventory system, competition between program teams for raw materials, and differing approved vendor lists (AVL's) between programs for similar components. Because such a high focus was placed on innovation and time to market, suggestions by the GPO to alter design activities through inclusion of new unproven vendors or alternate lower cost components were often ignored. A senior executive, involved in the GPO organization during the late 1990's, recalled: "we had set up the global purchasing office (GPO) but there was enough independence in the business units that they could run roughshod over us if they wanted to".<sup>57</sup>

In general, designers would have a clean sheet of paper to design-in components independent of factors such as corporate relationships, current buying power or excess inventory in-house. Consequently, supplier proliferation was rampant: By the end of 2000, Lucent had over 3000 suppliers - with the top 1000 suppliers accounting for 40 percent of the material spend - and was doing business with all of the more than 200 semiconductor manufacturers serving the market at that time.<sup>58</sup>

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<sup>57</sup> \_\_\_\_\_ interview, \_\_\_\_\_ 2004

<sup>58</sup> Mejia – MIT Affiliates Day presentation, 2003

## Product Design:

With design teams reporting into the business unit and operating independently to serve their respective customers, product was often customer specific and inventory procured to support such a product was not easily reallocated to other customers should demand not materialize as forecasted. In addition, as Lucent's customers were demanding product to be available on very short lead-times, building to forecasts based on product team estimates was commonplace. One SCN director explained how this worked in the optical networking group: "It was very much a push-system; inventory was generally customer-specific and built on spec without firm demand. We were dealing with the challenge of building products with wavelengths specific to a customer, not configurable afterwards for others"<sup>59</sup> In 1999, Lucent introduced over 120 new products and technologies<sup>60</sup>, each of which was designed and sourced for the most part independently.

Jose Mejia, president of supply chain networks, reflected: "We didn't have the concept of platforming, of utilizing engineering assets across different development teams. Each new product was its own startup, recreating everything down to sourcing its own enclosures."<sup>61</sup> Mejia described a meeting where his team gathered every one of Lucent's products together in a room to illustrate this lack of standardization: Lucent's platforms were using 47 different enclosure designs, each of which had its own tooling investments, sourcing process and design resources. According to Mejia, it "looked like they were made by different companies."<sup>62</sup>

Another result of the decentralized supply chain structure was that layers of costs were added through duplication of work, repeating learning curves, and maintaining separate databases of information. According to Christensen and Raynor<sup>63</sup>, this reorganization to a decentralized structure in the late 1990's "seemed to make Lucent slower and less flexible in responding to its customers' needs. Rather than saving costs it added a whole new layer of costs" Consequently, difficulties arose in tying these costs back at the product level to ensure that profitability was maintained and oftentimes there was little visibility into true costs and margins involved when making a sale to a customer.<sup>64</sup>

## Manufacturing Operations:

The supply chain teams were designed and geared to support manufacturing. As part of Lucent's strategy in the late 1990's of divisionalizing it's company to be closer to customers and more able to innovate and respond to competition, manufacturing facilities

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<sup>59</sup> \_\_\_\_\_ interview, \_\_\_\_\_ 2004

<sup>60</sup> McGinn, 2000

<sup>61</sup> Mejia, quoted in the MIT Affiliates Day report, October 23, 2003

<sup>62</sup> Cottrill, 2003

<sup>63</sup> Christensen and Raynor, 2003

<sup>64</sup> Lee Brown, Offer Development and Technical Sales VP, North America, Affiliates Day, Oct 28 2003



became increasingly focused on their own business unit's needs and, as the ability to get product to market first was a function of manufacturing's (and the supporting supply chain's) ability to deliver quickly, manufacturing controlled the supply chain to meet this speed-to-market focus. A director in the supply chain networks team recalled:

“(In the late 1990's), everything was driven by the head of each product unit pushing to develop the next big thing ahead of competitors. They would do whatever it took to get out there first”.<sup>65</sup>

He continued: “Back then the vice president of manufacturing was God”.<sup>66</sup>

While Lucent had began experimenting with the use of EMS partners in the late 1990's - originally to provide upside capacity to meet spikes in demand, and then later to support revenue growth without the capital investment required to build factories – the move to EMS was accelerated by the downturn of 2000 and 2001 when Lucent began focusing intensely on capital utilization and gross margins in the wake of increasing demand softening and pricing pressure. Lucent's culture was rooted in manufacturing excellence attained through automation, process control, and a strong heritage of quality and reliability. Steve Sherman, vice president SCN strategy, explained:

“These were large, proud facilities, rich in heritage, tradition, and a long history of being able to produce – building the essential backbone equipment that powered the communications of the U.S. and significant parts of the rest of the world.”<sup>67</sup>

In 1998, Lucent outsourced less than 1 percent of its manufacturing requirements to the EMS industry. By 1999, as a result of an internal initiative to improve cash flow and capital utilization at Lucent, this figure had increased to slightly less than 10 percent, but because each business unit managed its own EMS relationships independently, Lucent's outsourced requirements were distributed among 25 EMS partners.<sup>68</sup> As the level of outsourcing increased, a Chief Manufacturing Office was created to consolidate, track and manage the outsourcing arrangements for the manufacturing facilities.

During early 2000, as inventory levels continued to grow, Lucent's senior management began reviewing their manufacturing strategy in light of the increasing financial pressures and end-market challenges the company was beginning to face. Sherman explained: “we concluded we were doing too much manufacturing in-house, from a cash management perspective”. After examining a number of alternatives, the executive team chose to pursue a virtual manufacturing strategy, based on selling the majority of Lucent's 29 factories into the EMS industry - along with outsourcing agreements for manufacturing requirements - and retaining a small, globally diverse network of System Integration Centers (SIC's)<sup>69</sup> Sherman recalled the vision for the

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<sup>65</sup> \_\_\_\_\_ interview, \_\_\_\_\_ 2004

<sup>66</sup> \_\_\_\_\_ interview, \_\_\_\_\_ 2004

<sup>67</sup> Sherman, Lucent internal document, 2002

<sup>68</sup> Sherman, Lucent internal document, 2002

<sup>69</sup> Sherman, Lucent internal document, 2002

SIC's: "These centers would focus on only the most complex systems, and support both early new product introduction, and provide an integration service and operational competency to continue the strong heritage of servicing customer needs."<sup>70</sup>

McGinn announced the new outsourced manufacturing strategy in April 2000, citing the company's renewed focus on high value-added areas including R&D, systems integration, customer support, network design, consulting and installation and high-end process manufacturing.<sup>71</sup> As the year progressed, pricing pressure increased and demand plummeted, leading to increasing focus on cash flow, gross margin and capital utilization. In January 2001, in conjunction with the announcement of the company's first quarter 2001 results, Schacht declared an acceleration of the outsourcing strategy previously revealed by McGinn, as it became apparent that the evolutionary approach to outsourcing previously employed wasn't moving fast enough to drive down fixed costs.

## **4.2. Evolution of the Legacy Supply Chain**

Lucent's formation up until its divestiture from AT&T was a sedimentary process consisting of years of evolution of processes, systems, organizational structure and a culture focused on growth and deep seated pride in the innovations that had borne the Bell Labs insignia.

This cultural focus on innovation and growth in a regulated industry became a hindrance when the need to compete on speed-to-market and service became reality post-deregulation and during the dotcom boom. Lucent's response – to decentralize its manufacturing operations into independent business units was an appropriate and successful response, but not one was transferable to the market demands of innovation, service AND low cost which was the new reality, when the dotcom bust began. Having originally been protected from competition by US government regulations, AT&T was able to focus its managerial attention and resources on generating top-line growth and continuous innovation through Bell Labs. With deregulation came pricing pressure from increased competition but much of this remained obscured by the run-away demand for new products that the internet bubble precipitated. With the burst of the internet bubble and the evaporation of much of the demand for its products, Lucent (and many of its industry peers) found itself, with too much inventory and a cost structure grown opaque and bloated, unable to support prices low enough to entice struggling customers to buy.

AT&T's and subsequently Lucent's heritage was rooted in innovation and manufacturing; according to company records more than two dozen new ventures have come from Bell Labs since its inception, and its scientists have counted among themselves eleven Nobel Laureates, recipients of nine National Medals of Science, seven National Medals of Technology, one Draper Prize and even an Emmy Award.<sup>72</sup> The culture of AT&T was influenced heavily by the role it played in delivering the creativity,

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<sup>70</sup> Sherman, Lucent internal document, 2002

<sup>71</sup> Lucent press release: "Lucent announces change in global manufacturing strategy" April 19,2000

<sup>72</sup> Mejia – MIT Affiliates Day presentation, 2003

innovation and technological breakthroughs that secured the position of the United States as world leader in scientific advancement in the twentieth century. As a protected monopoly player in a regulated industry, AT&T developed a strong identity with its fundamental role and responsibility in creating the innovation, through Bell Labs, that connected people and businesses across the country and improved quality of life for its customers. Not taking this responsibility lightly, it is understandable that a strong pride in the achievements of Bell Labs led to the emergence of a culture rooted in quality and reliability. In the words of AT&T's corporate website describing the AT&T culture pre-1984 as one which "venerated service, technological excellence, reliability, and innovation within a non-competitive internally-driven framework of taking however much time and money it took to get things done right."<sup>73</sup>

The decentralization of Lucent's organization structure was rooted in an attempt to instill responsiveness and customer-intimacy in an organization grown slow and bureaucratic from decades of sedimentary growth in a protected market. By decentralizing, Lucent was able to compete effectively on availability of products, but at the price of holding a large inventory of components and finished goods, oftentimes customer and application specific. The combination of large inventories, a rapid development cycle and a sales model focused on making revenue numbers led to significant end-of-quarter discounting and increasingly risky financing arrangements with customers to stimulate demand. The highly cyclical demand spikes that resulted only served to amplify variability in the supply chain, both in purchasing and manufacturing, and with significant hidden cost. Sherman recalled: "The facilities were geared towards producing and delivering the end of period spikes that were so typical of Lucent's non-linear sales model."<sup>74</sup> Despite being geared to support and even encourage a highly cyclical model, delivery performance was still not meeting customer expectations or business objectives: In 2000, fewer than 80 percent of systems and 50 percent of components were delivered on time to Lucent's customers.<sup>75</sup>

In many ways, Lucent was providing what the market was demanding and its growth oriented and entrepreneurial business unit strategy was very successful during the late 1990's. The burgeoning inventories that accumulated during the late 1990's were the inevitable result of the supply chain structure in place during that period being tuned for innovation and speed-to-market with little focus on costs. Not only was the inventory build-up the result of an at-any-cost drive to market mentality, but also of the rapid evolution – and obsolescence - of the telecommunications equipment technology. The lack of visibility into customer demand or market shifts led to weak demand planning performance which in turn made it difficult for Lucent to adapt to large fluctuations in demand. Moreover, adaptation to large demand swings was further hampered by little standardization in product design, and virtually no communication or inventory sharing between product teams.

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<sup>73</sup> Lucent website: <http://www.att.com/history/history4.html>, accessed April 14, 2004

<sup>74</sup> Sherman, Lucent internal document, 2002

<sup>75</sup> Mejia – MIT Affiliates Day presentation, 2003

The consensus among Lucent executives polled for this research was that the dynamics of Lucent's market space in 2000 were such that innovation and product availability were the key success drivers. Anything and everything that could be done to ensure that the latest products were available to customers at the shortest possible lead time, was done - often to the detriment of cost-effectiveness, flexibility to changes and responsiveness to surprises. In short, Lucent was working to optimize many largely independent business units, but failed to realize at that time that, from a cost and responsiveness perspective, the sum of optimized business units did not equal the optimal of the whole company. As a result, costs generating activities in the supply chain were duplicated across different business units, supplier leverage was diluted with little concentration of buying power and information and material were not extensively shared between business units to minimize waste, errors and delays. Moreover, there was frequent customer dissatisfaction with service levels as on-time delivery and service to commitments were difficult to control and enforce with no full-stream advocacy of customer interests across the supply chain.<sup>76</sup>

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<sup>76</sup> Mejia – MIT Affiliates Day presentation, 2003

## Chapter 5. Jan 2001: The Telecom Collapse

### 5.1. A Sudden Change

By the time the year 2000 closed, it was apparent that there were major and rapid changes occurring in the telecommunications industry. Deregulation of telecom markets that had occurred in the United States in 1996 had triggered other countries to follow suit. While deregulation opened up foreign markets to Lucent, it also allowed foreign competitors into Lucent's US market. At the same time the world's major economies began slowing in 2000. Capital availability continued to shrink for carrier companies, as investors exited the sector in droves. As a result, several struggling carriers went bankrupt and Lucent, and other equipment makers, needed to be increasingly selective about which customers they chose to extend financing to. As of September 30, 2000, Lucent had made commitments or entered into agreements to extend credit to certain customers for an aggregate of approximately \$6.7 billion.<sup>77</sup>

#### **Cash is king and inventory falls out of favor:**

While financing of customers was done to drive sales growth, it was also done to ensure that customers whose inventories were sitting in Lucent's warehouses remained solvent and if not liable for those inventories, at least eventual consumers of them. Moreover, the increased uncertainty of their customer's health made it increasingly risky for equipment makers to carry large amounts of specialized inventory, either in the component or finished goods stage. Customer demand continued to soften and as a result many telecommunications equipment manufacturers and assemblers accumulated unprecedented levels of inventory. One notable example was EMS provider Solectron Corporation, which ended its March 2001 quarter with \$4.9 billion of inventory on hand, up 270 percent from \$1.8 billion during the same previous year period. By comparison, sales during this period increased only 85 percent.<sup>78</sup>

Another illustration of the mounting inventory buildup was Cisco Systems, Inc. In May 2001, Cisco announced a \$2.25 billion inventory write down, largely a result of obsolete inventory and severe price erosion in the wake of the telecom meltdown.<sup>79</sup> Severe pricing pressures, with prices dropping upwards of 30 percent<sup>80</sup> per year on some finished goods, led to strong pressures on margins. As an example, Lucent's gross

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<sup>77</sup> Lucent Technologies Annual Report 2003 and 2000 Consolidated Statement of Cash Flows.

<sup>78</sup> Solectron corporate website: [www.solectron.com](http://www.solectron.com): Press Releases: March 19, 2001 "Solectron Meets Second-Quarter Expectations, Revises Guidance for Fiscal Year", March 13, 2000: "Solectron Reports Record Sales and Presplit Diluted EPS US\$0.38 Before One-Time Charges for Second Quarter FY 2000"

<sup>79</sup> Cisco press release: May 8, 2001 "Cisco Systems Reports Third Quarter Earnings"

<sup>80</sup> Some technologies, such as optical equipment saw 50% plus annualized declines in prices during 2001 and 2002. (Picone – MIT Affiliates Day presentation, 2003)

margins - above 42 percent in each of fiscal 1998, 1999 and 2000 - declined to just 10 percent and 13 percent during fiscal 2001 and 2002 respectively.<sup>81</sup>

John Chambers, Cisco's chief executive officer, reflected on the new reality for the telecommunication industry in May 2001:

“What we have clearly seen over the last several years is the speed at which this new economy can move in both directions. Changes that used to take place over multiple quarters, or even over years, now take place within months. It is also now clear to us that the peaks in this new economy will be much higher and the valleys will be much lower, and the movement between these peaks and valleys will be much faster.”<sup>82</sup>

With cash management becoming more and more of a focus at the board level and in the investment community, in order to reduce inventory liability risk and increase capital utilization, equipment makers needed to find alternative cost-effective means to respond to unpredictable customer demand besides inventory. Additionally, maintaining gross margins in the face of severe pricing pressures put additional focus on driving inventory levels and costs down, while at the same time customers were demanding increased flexibility and responsiveness in the face of an increasingly uncertain market – these objectives: cost reduction and gross margin improvements, while increasing responsiveness and flexibility became the major survival goals of telecom equipment makers during 2001.

## **5.2. A New Reality for Lucent**

In response to the challenges of 2001, Lucent made a strategic realignment to focus on long term core customers and to largely exit manufacturing, choosing instead to move to a model combining EMS partners with five Lucent-owned system integration centers (SIC's). To reflect the new focus, Lucent revised its mission statement to reflect the new focus on serving strategic customers through an expanded value proposition based on speed, innovation, quality, and cost-effectiveness:

“The people of Lucent are committed to this mission: To be the partner of choice for the world's leading service providers by helping them create, build and maintain the most innovative, reliable and cost-effective communications networks and meet their customers' growing needs through the rapid deployment of new communication services.”<sup>83</sup>

Lucent announced to investors in December 2000 that it would drive out \$1-billion in costs and take other unspecified charges over the coming months in an effort to improve its cost structure and ability to bring product to market faster, and in a way that would allow Lucent to better adapt to this rapidly dynamic market reality. Schacht

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<sup>81</sup> Lucent Technologies Annual Report 2003 and 2000 Consolidated Statement of Income

<sup>82</sup> Cisco press release: May 8, 2001 “Cisco Systems Reports Third Quarter Earnings”

<sup>83</sup> Lucent corporate website [www.lucent.com](http://www.lucent.com)

announced as part of a seven step restructuring program, that Bob Holder, executive vice president, would be put in charge of “unifying all Lucent’s product units, manufacturing and supply chain, thereby accelerating product development and delivery.”<sup>84</sup>

In January 2001, Holder began executing his new mandate by combining manufacturing and supply chain organizations into a single group called the Supply Chain Operations group. The new organization was to be responsible for supply chain management, manufacturing, logistics and distribution. Named to lead the new group was Jose Mejia, then vice president and chief supply officer. Mejia explained his vision for his new role: “Integrating these functions into one highly focused unit is another step in streamlining our processes and systems to re-tool our business and increase operational efficiencies.”<sup>85</sup>

### **A new market reality:**

At the end of 2003 Mejia recalled the market situation his organization was facing in 2001: “The extreme decline in Communications capital spending accelerated (our) awareness that Lucent was facing a new competitive reality requiring us to step back and reexamine our structure and strategy.”<sup>86</sup> Mejia characterized the forces shaping Lucent’s market in early 2001 as follows:<sup>87</sup>

#### **Global competition:**

Regional dominance was no longer sustainable as countries continued to deregulate their telecommunications industries and as globally distributed customers and suppliers lent advantages to those companies able to leverage low cost sources, manufacturing locations and technology leadership to provide best-in-class service in all regions.

#### **Speed will determine success:**

The internet and other digital technology advances had accelerated the pace of business - from product innovation to the sales cycle, to delivery and installation lead-times. Mejia felt that speed in all dimensions would be fundamental to success going forward and that size and legacy could be a disadvantage - that most traditional organizations would be outmaneuvered by faster, more nimble competitors.

#### **Cost considerations are vitally important:**

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<sup>84</sup> Lucent press release: December 21, 2000

<sup>85</sup> Lucent press release Jan 15, 2001 “Lucent Technologies creates Supply Chain Operations Group”

<sup>86</sup> Mejia – MIT Affiliates Day presentation, 2003

<sup>87</sup> This list and comments are adapted from Mejia – MIT Affiliates Day presentation, 2003

Mejia believed that as costs came to dominate customer decisions, older, slower and more costly traditional companies wouldn't be able to compete.<sup>88</sup> The answer in his mind was to utilize horizontal and matrix organization structures and to leverage supply chain collaboration: "Companies that dominate in this new reality are those that operate with a flattened decision making structure and closely collaborate with successful external organizations instead of building and maintaining internal functions and capabilities."<sup>89</sup>

### **Unprecedented access to information presents an opportunity:**

According to Mejia, the most important hallmark of the new competitive reality was the unprecedented access to information. Mejia saw this as a tremendous opportunity for organizations that would be able to develop systems to collect and use the data now made available through internet connectivity and data warehousing advances.

In summary, Mejia saw the challenge as building a supply chain that would enable flexibility and adaptability in a dynamic market environment, and to do this at a lower cost and with less use of capital.

### **A new manufacturing reality:**

In parallel with the market challenges it was facing, Lucent had stepped up its plan of selling its factories and moving from a vertically integrated to a virtually integrated manufacturing enterprise (Figure 2). Besides the challenges and opportunities the market was presenting, switching Lucent's corporate mindset to support an outsourced model necessitated a reinvention of Lucent's approach to supply chain management. Sherman explained:

"This would dramatically shift the mindset of the operational leaders from internal manufacturing to a true supply chain orientation. And building a systems orientation (as opposed to 'building boxes') would also drive the overall supply chain network team as well. This meant creating a supply chain network vision, culture, and focus on system thinking - linking the supply chain's ability to bring together customer solutions, that matched our sales and marketing efforts to position Lucent as a systems and solution company."<sup>90</sup>

By the time fiscal 2001 drew to a close, the Lucent team had divested or closed over a dozen factories around the world, gaining, as Sherman explained, "significant experience and learnings along the way."<sup>91</sup>

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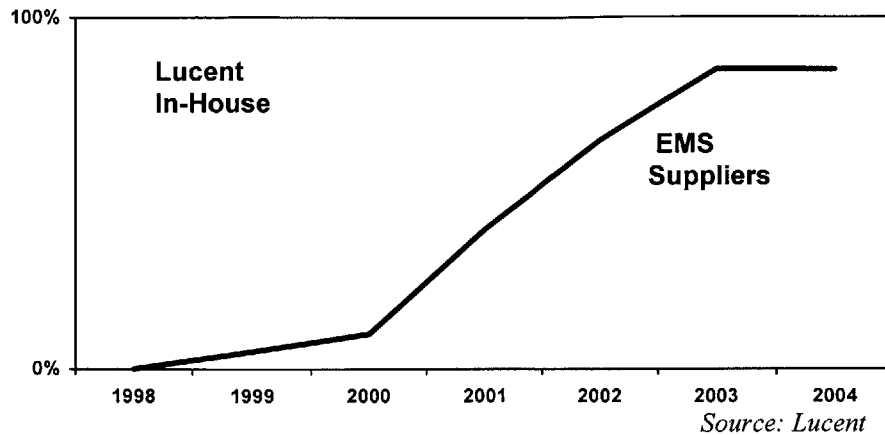
<sup>88</sup> Mejia – MIT Affiliates Day presentation, 2003

<sup>89</sup> Mejia – MIT Affiliates Day presentation, 2003

<sup>90</sup> Sherman, Lucent internal document, 2002

<sup>91</sup> Sherman, Lucent internal document, 2002





**Figure 2: Manufacturing Outsourcing Roadmap (2001)**

One of the lessons learned in selling the factories involved identification of further opportunities for streamlining the supply chain, as layers of processes and bureaucracy were stripped away with the integration of the EMS partners' operations. Problems previously concealed as fixed costs under the capital heavy, vertically integrated Lucent of old became painfully obvious as EMS partners took over the manufacturing sites and began charging on a variable basis for much of what used to be hidden costs in the old system. This process of variablizing costs through EMS outsourcing drew a lot of attention to previous inefficiencies within Lucent's supply chain, and helped drive a new mentality of cost-awareness within Lucent's design organization. Sherman reflected:

“One of the most frequent complaints from the development community after the transition to an EMS model was that prototypes that used to be ‘free’, (either built as part of manufacturing prove-ins, or early pre-production models that were put into inventory) now required hard purchase orders. Additional expenses have also come to light in other areas of engineering changes, expedited deliveries, and more. Of course these expenses were always there, just buried deep within our legacy systems.”<sup>92</sup>

It became clear that the transition to an outsourced model, combined with the continuing challenges of Lucent's end market necessitated a new and expanded role for Mejia's Supply Chain Operations group.

<sup>92</sup> Sherman, Lucent internal document, 2002

## Chapter 6. The Supply Chain Networks Organization

### 6.1. Supply Chain Networks – An Overview

Lucent's SCN organization represented an entirely new way of approaching supply chain management within the company. Whereas before, sales drove manufacturing which drove supply chain activities through a series of hand-offs of targets for execution, SCN comprised a new paradigm where supply chain capabilities drove manufacturing and sales. Supply chain activities and responsibilities were integrated across the Lucent enterprise and beyond - reaching upstream through collaborative partnerships with Lucent's EMS and second tier<sup>93</sup> suppliers and downstream to a customer-and-supply chain-intimate sales team - to drive customer responsiveness and commitments that were aligned with Lucent's capability to deliver. In the words of Mejia, Lucent wanted to evolve its "make and buy" supply chain into an organization tuned to "sense and respond".<sup>94</sup>

Motivated by the need to support a more global, more cost conscious, more information-driven and faster business model, the creation of SCN was philosophically centered on four themes:

**Customer intimacy:** Provide the customer with a single point of contact and ownership to manage all supply chain activities from bid through installation. Leverage supply chain expertise and knowledge of the customer's needs to drive new revenue opportunities and increased customer satisfaction.

**Zero-latency:** Eliminate delays and unnecessary steps from processes to provide speed in responding to the customer and simplicity in all activities of the business.

Zero-latency became a key value of Lucent's supply chain in driving customer-focused responsiveness. Similar to the concept of waste elimination as a tenet of lean manufacturing, zero-latency was about simplifying and eliminating redundant processes and activities in the supply chain that led to delays in responding to the customer. A director of supply chain business management explained this value: "There is now a golden thread linking everything we do to the customer and there's a mentality that if you're not working on something related to customer, maybe you shouldn't do it."<sup>95</sup>

**Margin management:** collaborate with customers, suppliers and internally to ensure that true costs are understood and margins are designed in during the entire business cycle from quote to cash.

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<sup>93</sup> Second tier here refers to those suppliers of Lucent which supply product to Lucent's EMS (first tier) suppliers.

<sup>94</sup> Mejia – MIT Affiliates Day presentation, 2003

<sup>95</sup> \_\_\_\_\_ interview, \_\_\_\_\_ 2004

Central to its strategy of margin management, Lucent began using what was termed “full-stream target costing” throughout the life-cycle of its products – from new product introduction through end-of-life. Rob Picone, vice president supply chain design and optimization, defined target costing as “a structured process for determining and realizing a full-stream cost at which a proposed product with specified functionality, performance, and quality must be produced in order to generate the desired profitability at the product’s anticipated selling price over a specified period of time in the future.”

**Cultural change management:** relentlessly seek out nonalignment with the strategy and address in an open communicative manner. Mejia called the process of sensing nonalignment “measuring the drift” and the process of putting everything on the table and discussing openly “killing the snakes”.<sup>96</sup>

## **6.2. Functional Area Descriptions<sup>97</sup>**

The Supply Chain Networks (SCN) organization was a cross-enterprise team arranged into four functional groupings:

- **Customer Facing**
- **Manufacturing Facing**
- **Product Facing**
- **Full-stream: Margin Modeling**

### **Customer Facing: The Customer Delivery Organization**

In order to better coordinate supply chain activities with customer needs and to ensure that sales personnel were able to make informed and achievable commitments, the Customer Delivery Organization (CDO) was created. The CDO became the owner of a customer relationship after contract signing and was aligned closely with customer sales and service teams while they were involved in selling and servicing solutions to ensure that customers received the optimal solution<sup>98</sup>; and with the Lucent World Services (LWS) installation team, to ensure that delivery commitments were kept and customers were satisfied and attended to at all stages of the contract engagement. In addition to supporting customer teams, the CDO supported and managed the process of logistics and installation of solutions - including integration of third parties (EMS partners, logistics providers) - as well as oversaw supply chain performance metrics.

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<sup>96</sup> Mejia uses many powerful visually compelling analogies as part of his leadership style. Snakes are issues that people in the organization are aware of but wouldn’t otherwise talk about, leading to internal subversion of an aligned and cohesive culture, unless addressed and resolved openly.

<sup>97</sup> This section adapted from MIT Affiliates day presentations and other Lucent provided documentation.

<sup>98</sup> Mejia – MIT Affiliates Day presentation, 2003

Overseeing the execution of each CDO team was a general manager (GM), responsible for providing end-to-end continuity of ownership and accountability and dedicated to a specific customer. Lynn Mercer, customer supply chain officer, explained "We now have small, dedicated teams that support particular customers by acting as their advocates both inside and outside of SCN. The GMs make it easier for the customer to do business with us, and easier for us to know what the customer wants and expects from Lucent"<sup>99</sup>

In addition to the coordination and installation activities provided by the CDO and the LWS teams respectively, there was the challenge of moving products from the assembly facility – either EMS factory or Lucent SIC – to the installation site. As part of the SCN organizational design, Lucent decided to outsource its logistics execution to Vastera, Inc., a Virginia based provider of global trade management solutions. With the installation of Vastera as its lead logistics provider (LLP), Lucent replaced its legacy network of over 200 warehouses and 1700 carriers with a single LLP. Lucent retained a core internal compliance team to manage the relationship with the LLP, whose responsibilities in turn were to:<sup>100</sup>

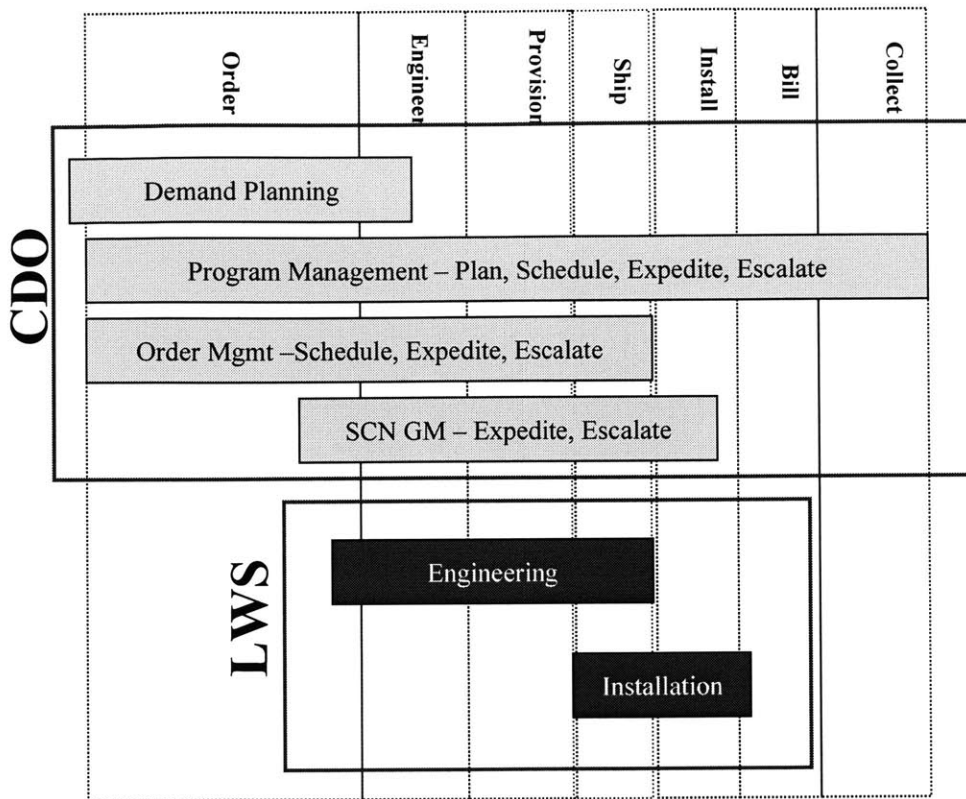
- Manage carrier base and transportation processes, including payment and contracting
- Optimize warehouse and distribution network
- Enable delivery information exchange between carriers, customers, suppliers and Lucent CDO to support event management and full chain visibility
- Manage warehousing activities and inventory
- Provide merge-in-transit programs
- Support customer managed inventory initiatives
- Track and manage logistics and deliver metrics to support customer service level agreements (cost, quality and time interval targets)

The CDO, led by Nick De Tura, vice president customer delivery organization, was arranged in a matrix structure, aligned both by customer and by functional activity (Figure 3). The CDO provided a single face to customers, with full-stream quote-to-cash accountability for supply chain activities. To further underscore its customer focus, the CDO's performance metrics and incentives were aligned with customer commitments and measurements, as well as with Lucent's business strategies and objectives.

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<sup>99</sup> Mercer quoted in "SCN Earns Medal of Professional Excellence for Bold New Vision of Supply Chain", Purchasing Magazine, 2002

<sup>100</sup> De Tura – MIT Affiliates Day presentation, 2003



(source: Lucent)

Figure 3: Customer Delivery Organization responsibilities

## Manufacturing Facing: Supply Chain Operations

With the move to an outsourced model using the EMS industry, manufacturing in Lucent's SCN organization consisted of coordinating activities between its five systems integration centers (SIC's) channel partners and the CDO. Supply chain operations were responsible for overseeing and the management of all assets and inventory, supply chain execution and evaluation. Direct operations consisted of five SIC's - Lucent managed integration facilities located globally to provide flexibility in how to best serve customers. The SIC's had responsibility for:

- Final assembly of complex products and systems test including software download and system configuration.
- Integration, configuration and test, including integration of sub-assemblies, products and original equipment manufacturer (OEM) equipment.
- Supplier-facing logistics and order fulfillment
- Coordination of shipments from multiple supply nodes for synchronized delivery of system.
- New product introduction

- Managing direct fulfillment of customer orders by EMS partners as part of Lucent's virtual manufacturing organization (VMO).<sup>101</sup>

Mike Jones, vice president of supply chain operations, described his team's responsibilities as "systems integration and supply node management"<sup>102</sup> to reflect his organization's role as coordinator of supply and manufacturing activities - ensuring that EMS partners, second tier suppliers and customer installation sites were connected with the appropriate network of supply nodes to provide optimal support.

## **Product Facing: Product Planning, Engineering & Supplier Management**

Product planning, engineering and supplier management worked together to manage supplier and component selection, qualification and to communicate and collaborate on product development and design with the supplier base. These teams interfaced with the product units who were responsible for designing and developing products that addressed the needs of the marketplace. Key to the successful collaboration between SCN team with the design team was the realigning of compensation so that the product design teams were now measured on product margin, and on the delivery schedule not just the cost.

Supplier management in SCN was handled by the supplier management group, a team led by Joe Carson, vice president supplier management. The supplier management group was responsible for developing sourcing strategies in conjunction with the design teams, managing the supplier base, and making outsourcing decisions for business processes and indirect spend.

Sourcing strategies were prepared by supplier managers in collaboration with the product and design teams with the goal of aggregating spend with as few suppliers as possible and on developing partnerships with suppliers who brought a high level of technological expertise and collaboration into Lucent. Strategies were reviewed annually to ensure that new technology advancements were being fully utilized and to allow continual refreshing of the portfolio as the supplier and technology landscape changed. Supplier sourcing decisions were influenced by both the success of the business relationship – managed and evaluated through the supplier relationship program (SRP) – and by performance in supplier partnership workshops – collaborative forums for early involvement in product design where the supplier is expected to contribute ideas for generating cost savings (Figure 4)

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<sup>101</sup> "Virtual manufacturing organization" was the phrase used by Mike Jones, vice president of supply chain operations, to describe Lucent's outsourced manufacturing enterprise where increasingly, the EMS partner will deliver finished products directly to Lucent's customer's installation site. A model described by Jones as a "highly leveraged operational model.", Jones – MIT Affiliates Day presentation, 2003

<sup>102</sup> Jones – MIT Affiliates Day presentation, 2003

The supplier relationship program was a program designed to ensure a globally consistent approach to supplier management where Lucent would work with its chosen strategic suppliers to form a common vision of success and establish mutual business goals jointly defined and unique to the relationship. The key features of the program were<sup>103</sup>:

- Joint assessment of opportunities
- Performance measurement, going beyond price
- Creation of a new forum for idea generation
- A metrics driven process to eliminate marginal suppliers
- Sharing of risks and rewards
- Rewarding of cross-company teams for achievements
- Benchmarking of cost performance with target cost model

Carson explained: “The supplier relationship program is the supplier management group’s tactical vehicle for creating and improving supplier relationships that promote Lucent’s supply chain strategy and goals. In addition to goal-setting and measurement, the SRP provides a process for building extraordinary relationships with suppliers, in order to achieve results otherwise not possible.”<sup>104</sup>

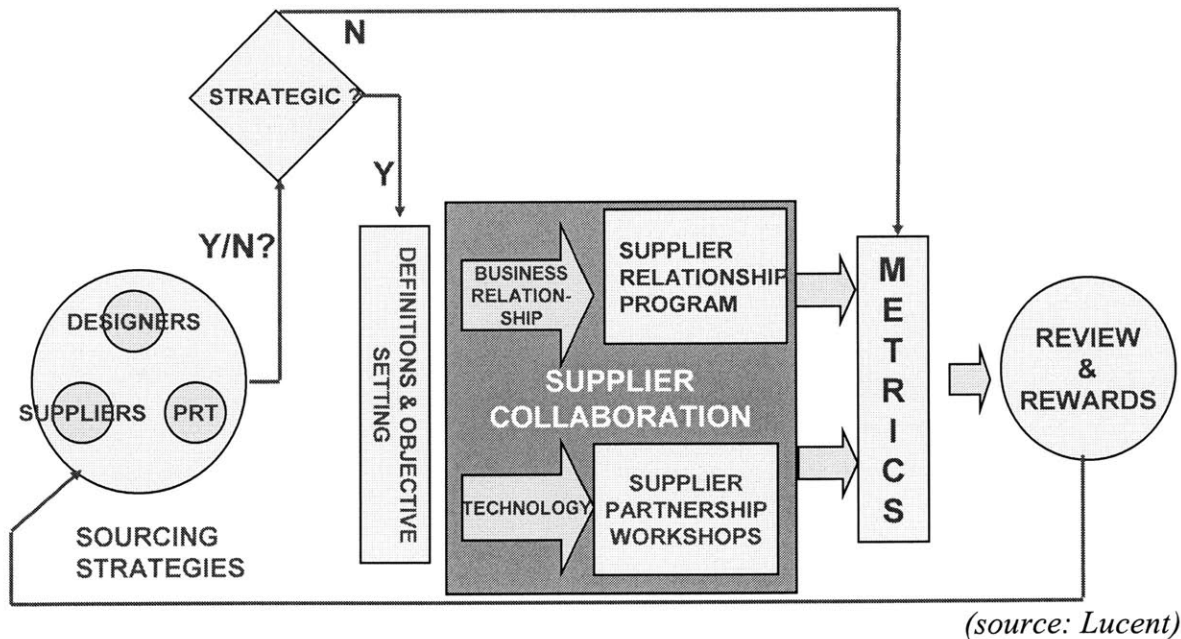


Figure 4: SCN Supplier Management Model

<sup>103</sup> Adapted from Carson – MIT Affiliates Day presentation, 2003

<sup>104</sup> Carson – MIT Affiliates Day presentation, 2003

## Full-Stream: Margin Modeling and Target Costing

Margin modeling using full-stream target costing was an integral cross-enterprise feature of SCN, designed to leverage the new capabilities of the extended and integrated SCN organization to design in profitability to every product and customer contract. Margin modeling comprised establishing margin upfront using a top-down cost model, where price would be established first, target margin removed and the resulting cost becoming the target for the supply chain – design to supplier to manufacturing . Rob Picone, vice president supply chain design and optimization, defined the vision for margin modeling:

“Based on an understanding of all the key drivers of Lucent margin performance (sales mix, pricing, and cost), deliver and implement an enterprise-wide margin improvement plan for each of the quarters in a fiscal year.”<sup>105</sup>

Picone defined the features and results of the margin modeling program:<sup>106</sup>

### Features:

- Clear accountabilities for margin across functions
- Actual results tracking and comparisons with the plan
- Clear reporting of major fall-downs in achieving the stated plan
- Rapid reassessment of plan priorities in response to changing business realities.

### Results:

- Dramatic acceleration of margin improvement results across the quarters.
- Greater predictability of margin results.
- Improved visibility to risks, obstacles, and fall-downs in the attainment of margin results.
- Longer-term process improvements to assure a sustained high level of performance.

In summary, SCN was a cross-enterprise, and cross-company coordinating network working to connected product design, sales, manufacturing and fulfillment. Mejia explained: “We created SCN to create a virtual fulfillment network that could assist and leverage the research power of Bell Labs and speed solutions to market.”<sup>107</sup> Steve Sherman added: All the magic is at the edge, with the suppliers, with the customers with the designers, with the manufacturing – SCN is the network behind the scenes that makes the connections work.”<sup>108</sup>

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<sup>105</sup> Picone – MIT Affiliates Day presentation, 2003

<sup>106</sup> Adapted from Picone – MIT Affiliates Day presentation, 2003

<sup>107</sup> Mejia – MIT Affiliates Day presentation, 2003

<sup>108</sup> Sherman interview, February 2004



### **6.3. The Evolution of SCN**

#### **A virtual manufacturing enterprise is born:**

The seeds of the SCN organization were planted in the late 1990's as Lucent began exploring the use of the EMS industry to support the company's rapid growth and subsequent increase in manufacturing capacity requirements, without the requisite capital investment in new factories and equipment. While the EMS industry, formerly known as the Contract Electronics Manufacturing (CEM) industry, could trace its roots back to the early 1960's, its use by Lucent was largely confined to periods of seasonal demand spikes and for commoditized, mature processes. Steve Sherman explained: "Electro-mechanical assemblies, cable harness assemblies, and molding operations had all gone through life cycles of becoming mature, and alternative supply was available from outside suppliers with low enough costs to justify the outsourcing."<sup>109</sup> Printed circuit board assembly, on the other hand, had traditionally been done in-house. However, with the emergence of surface mount technology (SMT)<sup>110</sup>, which required significant capital investments in equipment in order to be cost-effective, the EMS industry began to gain a new attractiveness. The general trend to outsourcing and rapid growth in the high technology industry fueled a rapid expansion of the EMS industry - both in scale and in breadth of capabilities - beginning in the late 1990's; as a result, Lucent began looking more closely at using the expanded value proposition - technological, service offering and global presence - that this industry now offered, to support its own growth.

The EMS industry emerged in the late 1990's as a capable and reliable provider of manufacturing services across an expanding range of value-adding activities - beyond commodity assembly and tactical procurement, as were historically offered, to a more comprehensive service offering including strategic sourcing and procurement services, supplier management, logistics and order fulfillment services and increasingly, design for manufacturing, reengineering for low cost and access to low cost labor markets in Asia. The EMS industry reached a collective size where it was able to develop significant buying power through aggregation of volumes across many OEM customers and attain significant material savings on many commodity electronics components. Moreover, as Lucent's customers became increasingly global and increasingly price sensitive, the expanded global footprint of the top-tier EMS firms in low-cost labor regions and in proximity to Lucent's growing global customer base made an increasingly compelling case for the EMS industry as an alternative to in-house manufacturing.

When the decision to move toward an outsourced virtual manufacturing enterprise was taken by Lucent, the senior management team realized that such a broad reaching

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<sup>109</sup> Sherman, Lucent internal document, 2002

<sup>110</sup> Surface mount technology is a highly automated means of mounting electronic components on the circuit board without the use of wires, with soldering done through use of a specialized reflow oven. Pin-through-hole (PTH) was the previous technology process used in circuit board assembly, where component placement was largely done by hand, with soldering done using a wave-soldering tank - basically a standing wave of molten solder through which the underside of the circuit board is passed, coating the terminals.

realignment of the company's focus would require a new organization to support it. Sherman recalled:

“The decision was made that a transformation of this magnitude could only be implemented with a more focused organization, an organization that could efficiently balance the need for central direction, strategy, and vision, while staying local and flexible. This would enable not only the manufacturing transformation, but provide a solid platform for a number of other significant supply chain initiatives being considered.”<sup>111</sup>

The organization Sherman referred to, the chief manufacturing office, was formed in early 2000 and was later combined with the global purchasing office to become the supply chain operations group in January 2001.

### **Capacitor allocation leads to centralized supply planning:**

Precipitated by widespread tantalum capacitor shortages and allocation of supply that faced the industry in the second half of 2000, Jose Mejia, at that time head of the global purchasing office, created a “global control tower” organization to measure, consolidate and manage demand planning across Lucent's facilities world-wide.<sup>112</sup> Under allocation, manufacturers of tantalum capacitors prioritized customers and allocated supply and capacity accordingly. In order to manage limited supply, customers were required to provide manufacturers with firm demand requirements far in advance (as many as 26 weeks)<sup>113</sup>. As the allocation situation had caught many manufactures by surprise, it became increasingly important to be able to measure company exposure to potential shortages in any number of otherwise inconspicuous components. One senior SCN executive explained: “We put together the first structure for the supply network – called the Global Control Tower - to put uniformity in demand planning and measurements.”<sup>114</sup>

### **The Supply Chain Operations group is formed:**

With the creation of the Supply Chain Operations group combining Lucent's manufacturing and supply chain organizations in January 2001, Supply Chain Networks got its start. Mejia, now in charge of the combined organization, was tasked with creating a cohesive and integrated supply chain out of previously independent purchasing, planning, and manufacturing teams. This was a logical fit, as part of managing the outsourcing process was to collect demand planning information across the business units so that outsourcing decisions could be orchestrated and prioritized depending on value and volume expectations. Moreover, it was necessary that contracts

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<sup>111</sup> Sherman, Lucent internal document, 2002

<sup>112</sup> Tantalum capacitors were used heavily in cellular telephone handsets and a significant increase in handset sales in 2000 led to shortages and output allocation of these components as supply fell far short of demand.

<sup>113</sup> See for example EE Times, Feb 06, 2001 “Tantalum capacitor suppliers still wary about ability to meet demand”, available at <http://www.eetimes.com/story/OEG20010206S0080>

<sup>114</sup> \_\_\_\_\_ interview, \_\_\_\_\_ 2004

with EMS providers most accurately reflected expectations of business levels. By bringing these functions together, supply chain management was brought back into the focus of the Lucent executive team; Sherman elaborated: “As manufacturing got outsourced, supply chain management lost focus: “If you don’t do manufacturing, there is a tendency to marginalize supply chain activities”.<sup>115</sup>

### **Thee Bull’s Eye Chart: Supply Chain in the spotlight:**

In January 2001, as part of planning Lucent’s restructuring program, Mejia, now head of the Supply Chain Operations group, attended a weekly planning meeting with Schacht and the rest of executive team to identify the ten most critical issues facing the company. To track progress, each of the ten issues identified was labeled on a bull’s-eye chart, and an executive owner was assigned; leaving the meeting, Mejia’s name was next to seven of the ten issues. From seeing the extent to which Lucent’s turnaround relied on the activities of Mejia’s team for success, Schacht elevated the supply chain operations group to division status and appointed Mejia president. Mejia renamed his new division Supply Chain Networks to more accurately capture his vision for the organization: Mejia recalled:

“Lucent people were network people, so I had to speak to them in network language. If I talked supply chain, they would think manufacturing and procurement. I had to get them to see what I was thinking about.”<sup>116</sup>

What Mejia was thinking about was a supply chain that could adapt and respond to changing market conditions and, at the same time, provide real time visibility into the health of the company, a role Mejia likens to the vital signs of the human body: “Just as a doctor monitors these vital functions to gauge the health of the human body, the supply chain organization should monitor the health of the company.”<sup>117</sup>

Mejia turned to his new organization and began examining the vital signs of the now combined supply chain operations. One of the first things he did was to measure and benchmark key performance metrics against industry peers, to establish a starting point. A senior manager in SCN described the results of these initial comparisons:

“It took six months to extract and aggregate data and find a common denominator. The news was pretty bleak – median days of supply were seventy-five, we had over one hundred. On inventory turns, the median was twenty, best in class was fifty, and we were at one-and-change; now we’re at over seven. Our cash-to-cash cycle was at 200 days whereas the best-in-class were sixty to ninety days and the median was around 100 days. We established the line of demarcation. The net message was that we were spending more than our competitors on our supply chain.”<sup>118</sup>

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<sup>115</sup> Sherman interview, February 2004

<sup>116</sup> Mejia, quoted in Meyer and Meyer, MIT, 2003

<sup>117</sup> Roberts, 2002

<sup>118</sup> \_\_\_\_\_ interview, \_\_\_\_\_ 2004

The message was clear, Mejia determined that a huge change was needed and it was needed fast. In Mejia's words:

"We had to change our manufacturing organization, and we had to change it in weeks and months, not years."<sup>119</sup>

With a clear understanding of where the problems lay, Mejia summarized the structural challenges Lucent's supply chain was facing in early 2001:<sup>120</sup>

- **Vertical organizational structure with a silo mentality:** Communication was limited to and objectives were optimized within a narrow perspective, often to the detriment of the broader company goals.
- **Legacy infrastructure not sufficiently flexible or cost effective:** Outdated equipment and processes were unable to adapt to or support the new reality Lucent was facing.
- **Supply chain product development and costs could be better leveraged across platforms, suppliers, sourcing:** Redundant activities and a lack of standardization was hindering realization of scale economies and purchasing power.
- **Supply chain IT systems needed to be more integrated and efficient:** Fragmented databases and systems were not able to manage a bigger picture view of the company and facilitate the new fast, connected, and data-enabled organization Mejia envisioned.
- **Opportunity to improve visibility and understanding of margin and profitability contribution across the enterprise:** True costs of products and sources of those costs were not well understood and presented a significant opportunity to eliminate waste and drive sales.
- **Customer and supply chain connection not optimally established:** The supply chain was operating largely in isolation from the customer and was not plugged into the needs of the customer.

The common thread through Mejia's list of challenges is that they all involved integrating areas of the business that previously had been fragmented and disjointed: reporting structures, systems, processes, lines of sight to profitability and margin and tying front end sales activities to back end supply chain operations. Clearly, coordination was to play an important role in the evolution and success of SCN.

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<sup>119</sup> Mejia, quoted in Meyer and Meyer, 2003

<sup>120</sup> Jose Mejia – MIT Affiliates Day presentation, 2003

## **6.4. The Role of Coordination: Engaging the Expert**

Fundamental to creating the flexible, responsive and dynamic supply chain that Meija and his leadership team envisioned, was the need to share information and coordinate activities such that cost generating activities were carried out in the most efficient and cost-effective area of the business stream.<sup>121</sup> Beyond the cost benefit, the creation of an adaptive and responsive yet capital-light supply chain necessitated a structure where decisions could be made quickly and correctly, eliminating delays and costly mistakes. Oftentimes this meant that decisions needed to be made by that member of the channel with the most information and expertise pertinent to the decision at hand – to ensure speed - and with visibility and understanding of the full chain impact of that decision - to ensure correctness.

For example, in the case of selecting a component to use in a new design, the ideal “network expert” would be a hypothetical channel member with: technical understanding of the specifications and parameters required for the application; component cost and availability visibility; full knowledge of inventory on hand; awareness of strategic relationships and other financial implications of doing business with a particular supplier (i.e. payment terms, electronic order processing capabilities, capacity flexibility, etc.). With such a diverse range of functional-area specific knowledge required, finding the network expert amounted to facilitating the flow of information and the organic formation of virtual, cross-functional teams, coming together to make an informed set of decisions particular to a given challenge and then disbanding. A natural and efficient means of forming and disbanding these collaborative teams could be envisioned as a migrating locus of expertise that could move around the supply network, pulling in and engaging expertise and capabilities from across the enterprise and channel partners. The first step – finding the expert – amounted to institutionalized processes and integrated systems that enabled communication and information flow throughout the network, the second – engaging the expert – amounted to sharing of risk and rewards and aligning incentives to deliver an aligned response.

Building the SCN integrated supply network to allow this freely migrating locus of expertise and efficiency involved coordination of activities along three separate fronts within Lucent’s business stream:

- Supplier facing
- Customer facing
- Internal, cross-functional coordination

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<sup>121</sup> This concept, of multi-tier supply chain coordination leading to a natural migration of costs and activities to the most cost-effective and efficient location in the chain, builds on ideas put forth by Rice and Hoppe, 2001. See bibliography for a complete listing of references on supply chain coordination.

## Supplier Coordination:

Supplier coordination in the SCN organization was instituted and accelerated through two initiatives beginning in 2001: the transition to a virtual manufacturing enterprise and the move to reduce inventory levels and increase component reuse by standardizing product platforms across Lucent, concurrently rationalizing part numbers and suppliers.

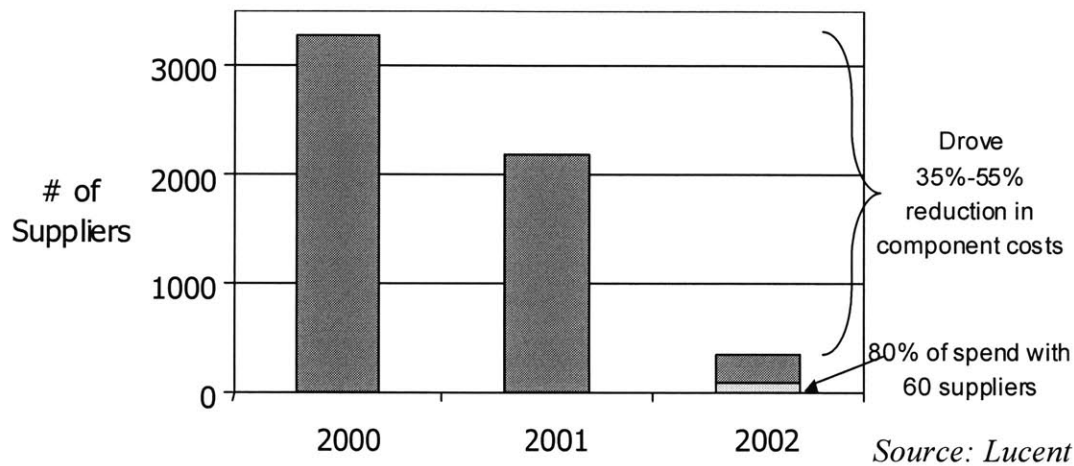
As Lucent moved out of manufacturing, it no longer made economic sense to maintain the same degree of management of component suppliers – after all, part of the EMS value proposition was consolidation of purchasing activities for many OEM customers into a single set of management resources. At the same time, it remained necessary to ensure that component suppliers had full visibility into Lucent’s demand and that Lucent continued to align with key component suppliers on technology roadmaps and development activities. With the increased reliance on EMS providers, and the accompanying requirement for information sharing and coordination to manage operations at a distance, a new level of integration and coordination was required to manage the more complex multi-tier relationship dictated by the outsourced model. Moreover, as Lucent’s outsourcing transition continued, EMS partners began increasingly developing capabilities and expertise in design for manufacturing, supplier management and EDI<sup>122</sup> purchasing systems, which Lucent was able to leverage through increased sharing of information. Lucent and its EMS partners collaborated on supplier management to allow whichever party had the better relationship, contractual terms, and purchasing power to own the relationship. Furthermore, EMS partners were increasingly involved in providing input to the Lucent design team on their strategic suppliers with whom the lowest cost, highest flexibility solution could be delivered.

The second initiative which drove supplier coordination was the push to increase standardization and platforming in Lucent’s product lines. The rationalization push was largely intended to facilitate inventory reuse and pooling of demand uncertainty among several platforms in order to mitigate inventory risk. Prior to SCN, Lucent’s widely distributed spend among its supply base encouraged a sourcing strategy of playing suppliers against each other and awarding business to the lowest bidder. Supplier relationships for the majority of commodity classes were transactional in nature for the following two reasons: (1) transactional relationships have the lowest separation cost if business is to be moved to a new source and; (2) maintaining collaborative relationships – including attending review meetings, integrating systems and negotiating various contracts - with a large supplier base was cost-prohibitive. Furthermore under the pre-SCN model, more suppliers were preferable because it provided a measure of flexibility, though unreliable for all but the most commoditized technologies, if the sourced supplier were to fail to deliver on time or meet cost reduction targets.

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<sup>122</sup> EDI (electronic data interchange) is a means for companies to exchange paperless transactions including purchase orders, demand forecasts and invoices and consequently dramatically reduce transaction costs of order placement and processing, as well as improve forecast visibility through automated regular transmissions.

With the creation of the centralized SCN organization and the new levels of cross-enterprise aggregation of demand and development activities, Lucent was able to make much more credible cases for collaboration with its suppliers and was able to provide strategic suppliers with sufficient intelligence into its requirements to make them effective contributors on design and cost reduction initiatives. Through the creation of the Supplier Relationship Program (SRP) within SCN, which was responsible for building long term collaborative relationships with Lucent’s strategic suppliers, Lucent was able to tap into the expertise of its component suppliers to mutually arrive at solutions that met Lucent’s needs for flexibility, cost-effectiveness and technological leadership.



**Figure 5: Lucent Supplier Rationalization 2000-2002**

A similar rationalization and collaborative engagement of expertise occurred with Lucent’s EMS partners, with EMS spend going from over 25 EMS providers in 1999 to 4 at the end of 2003.<sup>123</sup> Sherman described Lucent’s strategy for its EMS partners as now having a “focus more on optimizing relationships and supply chains than on significant consolidation and churn of portfolio”<sup>124</sup>. The opportunity for value creation now lay in getting more than cost reductions out of the partners Lucent had selected: developing relationships with existing suppliers and ensuring that the current portfolio of suppliers was able to continue learning about Lucent’s business, participate in full chain-optimization, and contribute to Lucent’s goals of:<sup>125</sup>

- remaining vigilant about focus on cost
- simplifying the entire supply chain
- building additional flexibility into the supply chain

<sup>123</sup> Sherman, Lucent internal document, 2002

<sup>124</sup> Sherman – MIT Affiliates Day presentation, 2003

<sup>125</sup> Sherman – MIT Affiliates Day presentation, 2003

Sherman projected at the end of 2003 that Lucent's EMS partners' roles in supplier management, product design, and supply chain re-engineering will continue to grow, as the focus on collaboration upstream in the supply chain begins driving partner engagement from Lucent's bottom line to top line.<sup>126</sup>

## **Customer Collaboration: The Customer Delivery Organization**

Lucent's reduced customer base - the result of a refocusing of its strategic focus on the largest global service providers around the world - meant that a whole new level of customer intimacy and attention was required to retain customers in a deregulated market filled with competitors increasingly able to compete on cost and technology. As Lucent moved to differentiate itself away from the increasingly commoditized equipment market, it chose to focus on becoming a service-based organization and a whole new level of coordination and collaboration with its customers became required.

The Customer Delivery Organization (CDO) was the instrument in the SCN organization which tied the rest of the extended supply chain to the customer. With joint ownership of accounts by sales and supply chain, and a single interface between the customer and various functional areas of the organization, customer requirements and customer wishes were transmitted throughout the organization to those best able to service them.

## **Internal Collaboration: Supply Chain Networks**

Internally, perhaps the most significant change in the Lucent corporate structure as a result of the SCN implementation was the alignment of previously disjointed and oftentimes antagonistic functional components of the supply chain into a cohesive and coordinated organization. In many ways, SCN was simply about removing delays, lost visibility and redundant cost structures in the old siloed organization and aligning metrics and incentives with the twin objectives of delighting the customer and improving profitability. SCN built this internal collaboration through an iterative process of restructuring reporting lines – for example, moving manufacturing and purchasing into the same Supply Chain Operations group in January 2001 and building support through demonstrated and measured results. At the end of 2003, with component engineering, test engineering, corporate quality, purchasing, manufacturing, logistics, margin planning, distribution and warehousing all reporting into the same SCN organization and marching to the same set of orders, SCN enabled Lucent to operate corporate-wide as an aligned and congruent entity focused on the customer and the top and bottom lines.

### **A challenge to build connections:**

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<sup>126</sup> Sherman – MIT Affiliates Day presentation, 2003



Building the coordination into the supply chain structure that would address the challenges Meija identified at the beginning of 2001 presented a number of significant challenges in itself, involving difficulties with the end market, struggling customers facing problems of their own, and effecting the largest cultural transformation the company had every undergone. Sherman summed it up: “Major changes in a supply chain don’t just happen or evolve. They take committed leadership, planning, execution, and simply a lot of hard work.”<sup>127</sup>

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<sup>127</sup> Sherman, Lucent internal document, 2002

## Chapter 7. Challenges and Profound Change

Effecting change and creating the new supply chain involved surmounting challenges on three major fronts: market realities, customer realities and internal mentalities.<sup>128</sup>

### 7.1. External Challenges: Customer and Market

From 2001, when SCN was formed, until the end of 2003, the contraction in the telecom market continued (Table 3), leading to a process of change and adaptation at Lucent that Pat Russo, who replaced Schacht as chief executive in January 2002, likened to “flying a plane through a storm while changing engines”.<sup>129</sup> During this three year period, Lucent saw its revenue slide from \$21.3-billion to \$12.3-billion to \$8.4-billion year-over-year. The protracted telecom slump was concurrent with a prolonged slowdown in major global economies that delayed capital investment and the filling up of installed network capacity. As a result, many of the changes that occurred in 2001 and to which many players in the industry reacted to initially as a short term challenge became clearly the new reality for the foreseeable future. In the words of Matthew J. Flanigan, president of the Telecommunications Industry Association: “(In November 2003) the telecom industry remains in an unstable condition. It has not fully rebounded from the 600,000 manufacturing jobs lost, \$1-trillion in corporate debt and dramatic capital expenditure cuts that have occurred over the past three years.”<sup>130</sup>

Worldwide Telecommunications Market Revenue by Sector, 1999-2003 (Millions of U.S. Dollars)					
	1999	2000	2001	2002	2003
Enterprise Systems and Applications	54,205	63,347	47,584	44,763	46,277
Growth %:		17%	-25%	-6%	3%
Infrastructure	180,820	217,074	166,267	128,422	122,825
Growth %:		20%	-23%	-23%	-4%
Mobile	338,036	427,861	462,264	494,731	549,489
Growth %:		27%	8%	7%	11%
Services	804,502	892,142	591,164	607,351	615,775
Growth %:		11%	-34%	3%	1%
Total Telecommunications Equipment	311,302	381,030	311,430	267,831	266,362
Growth %:		22%	-18%	-14%	-1%
Total Telecommunications Services	804,502	892,142	906,084	967,342	1,031,139
Growth %:		11%	2%	7%	7%
<b>Total Telecommunications Market</b>	<b>1,115,804</b>	<b>1,273,172</b>	<b>1,217,515</b>	<b>1,235,173</b>	<b>1,297,501</b>
<b>Growth %:</b>		<b>14%</b>	<b>-4%</b>	<b>1%</b>	<b>5%</b>

Source: Gartner Dataquest (January 2002), (January 2004)

**Table 3: Growth of the Telecommunications Market 1999-2003<sup>131</sup>**

<sup>128</sup> Mejia paraphrased in Meyer and Meyer, MIT, 2003

<sup>129</sup> Romero, Feb 3, 2003

<sup>130</sup> Cottrill, November 10, 2003

<sup>131</sup> Adapted from Hahn, (Gartner Dataquest) January 2, 2002 and January 16, 2004

Remaining competitive and growing in this new market reality required many of the same changes to the operations of Lucent as were needed simply to survive in 2001. Mejia saw adapting to the market as the primary long-term challenge and that aligning the organization internally and building a new level of speed, responsiveness and flexibility to the customer as being fundamental to responding to the broader challenges of the market. Mejia explained:

“There are always other challenges such as implementing the organization’s vision, getting the right talent, and ensuring that we’re working on the right problems, but the biggest challenge is really adjusting to the marketplace”<sup>132</sup>

Mejia recognized that the pace of change in Lucent’s marketplace was ever-increasing and it was becoming ever more difficult to predict what customers would require in the future. In addition, there was little SCN could do to influence or control the market conditions or the realities Lucent’s customers were facing. To that end, the perfect supply chain solution was one that provided as much flexibility and adaptability as possible so as to ensure that whatever the market or customers dictated, Lucent would be able to respond quickly and effectively. Mejia saw this as an opportunity - that if Lucent could build a better extended supply network than its competitors, then it would have a defensible and sustainable competitive advantage – and that a more adaptable and responsive supply chain would be something customers would be willing to pay for as flexibility and responsiveness joined low-cost as primary decision criteria for awarding contracts. Mejia explained:

“Supply Chain Management expertise driving the lowest cost, highest quality and fastest time-to-market has become just as critical to the customer as product technology and services differentiation”.<sup>133</sup>

Mejia also saw this as an opportunity to redefine the role of the supply chain in the organization and to demonstrate the potential contribution that the supply chain organization can provide. “The market has supplied one hell of an opportunity for supply chain professionals”<sup>134</sup> Mejia explained, continuing: “I believe that our profession needs to take advantage of the marketplace the way it is today realizing that we are a very essential part of business success.”<sup>135</sup>

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<sup>132</sup> Roberts, 2002

<sup>133</sup> Mejia – MIT Affiliates Day presentation, 2003

<sup>134</sup> Electronic Buyer’s News, December 16, 2002

<sup>135</sup> Roberts, 2002

## 7.2. **Internal Challenges: Changing the Culture of Lucent**

Implementing Mejia's vision for a sensing and responding SCN organization represented a fundamental change in the mentality of Lucent's employees. Mejia's approach to managing this change comprised several key elements:<sup>136</sup>

- Create a "burning platform"<sup>137</sup>
- SCN Senior Leadership buy-in for the need for culture change
- Decide what is consensus and what is a MUST decision. Decide, act quickly on non-alignment
- Vision of a positive possibility
- Dissatisfaction with the current situation
- First steps in building the organizational foundation
- Clear understanding of the vision

In more general terms these can be grouped into four categories:

- **Communicate** a clear vision
- **Align** the organization behind a common objective
- **Empower** people to take action
- **Inspire** people to take action now - create a sense of importance and urgency

### **Communicate a clear vision:**

From the inception of SCN, Mejia engaged his organization and showed people that their input was valued, expected and important to the success of the organization. A new level of openness was encouraged and supported through new multi-level communication between the senior leadership team and the rest of the organization. A telling illustration of this new openness is given by a story related by several of Mejia's staff: Shortly after being put in charge of the SCN organization, Mejia called his team into a staff meeting whereby he produced a large flip-chart and several markers; he then invited anyone to come up while he stepped out of the room and write down any issues they saw with him personally, or with the changes he was making – he stressed that nothing was to be considered "off the table". When he returned, he worked through every one of the issues and addressed them. "It was refreshing, and it was shocking – people were used to being given orders to execute, not to being engaged on that level" recalled one senior manager. Later, monthly "water cooler chats" - anonymous conference calls with the executives, where anyone can table issues they feel are relevant – were added to encourage active participation by employees in creating an engaged and more effective organization. Another tool used to foster this sense of openness was a

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<sup>136</sup> Mejia – MIT Affiliates Day presentation, 2003

<sup>137</sup> Burning Platform, a vivid metaphor for creating a sense of urgent need for action, is a reference to a crisis on a burning oil platform at sea where there are very limited choices available if corrective actions fail. In the case of Lucent, the burning platform was the financial challenges the company was facing.

regular survey to everyone in the SCN, asking questions such as “do you feel your work impacts the organization?”, or “what can we do differently?”<sup>138</sup> One SCN director summarized:

“Today there is a lot more engagement – for example there are now quarterly web-casts with the executive team that employees can participate in. There is much more of a collaborative environment and there is communication like I’ve never seen it before.”<sup>139</sup>

She continued: “We now have a five-to-eight year plan and everyone understands the vision, and how it is linked to their own goals and objectives”.

This new spirit of communication as a means to facilitate change was not limited to within Lucent’s own organization. When faced with the painful decision to lay off staff as part of the sale of factories to EMS partners, Lucent managed the process in a sensitive manner and involved union representatives from the start, allowing a potentially lengthy and contentious transition to be completed in as quickly and sensitive a manner as possible.

Sherman elaborated: “From the very beginning, Lucent’s approach was to engage the unions by keeping them fully informed of its strategy, sharing an unprecedented amount of data with them and their financial advisors and eliciting their concerns and suggestions.”<sup>140</sup>

## **Align the organization behind a common objective**

Getting the SCN team tuned to execute the vision involved creating the right supply chain structure and processes, but it also required changing the incentives, objectives, and reporting structure of the organization to facilitate an organic sharing of knowledge and learnings, but also to ensure that employees were measured and focused on activities that added speed, improved margin and delivered customer satisfaction. Mejia termed this concept “zero-latency” and its relentless pursuit by all SCN employees was one of two main touchstones of the new SCN organization culture.

### **Redesigning the organization:**

Part of reducing latency in SCN was a general flattening of the organization and the introduction of a matrix structure – aligning staff by functional activity and also across functions with a customer or product team. Sherman described the new organizational structure:

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<sup>138</sup> Hock interview, April 2004

<sup>139</sup> \_\_\_\_\_ interview, \_\_\_\_\_ 2004

<sup>140</sup> Sherman, Lucent internal document, 2002

“SCN’s organizational model and thrust has been a matrix one, where functional organizations work closely aligned to Lucent’s customers, products/services, and infrastructure. This brings together the best and the brightest in a given area to serve and connect the entire Lucent business to a One Lucent supply chain vision.”<sup>141</sup>

He continued: “This effort has seen significant payoffs in terms of the sophistication and experience of the SCN global team as it relates to optimum performance.”<sup>142</sup>

### **Removing Non-alignment:**

The other touchstone of the new SCN organization culture was a concept introduced by Mejia known as “killing the snakes”. Mejia felt that allowing issues to remain hidden - “in the grass”, so to speak - would lead to breakdowns in communication and an overall reduction in the executional effectiveness of the networked organization. Part of Mejia’s change management strategy was to constantly search for any hidden issues that would detract from the team’s focus – when issues were detected or identified, they were discussed in an open and engaging manner where they could be addressed and resolved. “You have to get the snakes on the table and deal with them”, Mejia explained.<sup>143</sup>

Mejia also described the process of sensing nonalignment by talking to people at different levels of the organization and in different roles in order to “monitor the drift”. Drift is the term Mejia used to describe ethereal undercurrents of culture and attitudes in the organization. According to one of his staff, Mejia liked to ask people on his team the question: “What makes leaders fail?” He would then pause for effect before delivering the answer: “Because they’re no longer connected to the organization, they’re no longer monitoring the drift.” He would then explain: “We all have blind spots and we need to have people around us who will help us stay connected.”<sup>144</sup>

### **Empower people to take action**

Empowering people to take action was one of the major changes in Lucent’s culture in which Pat Russo, who took over as CEO from Schacht in January 2002, was instrumental. A SCN director described Russo’s style in this respect, “Pat brings a whole new appreciation of people, something that I hadn’t seen before at that level”, consequently Russo was willing to give Mejia the support he needed to build the SCN organization and effect the changes he envisioned. Russo had briefly left Lucent, where she was head of the carrier equipment division, to take the role of chief operating officer at Kodak, before being brought back in to lead Lucent’s turnaround. A senior member of the SCN team recalled: “When Pat came back in 2002, the numbers were improving, the

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<sup>141</sup> Sherman, Lucent internal document, 2002

<sup>142</sup> Sherman, Lucent internal document, 2002

<sup>143</sup> Mejia quoted in Meyer and Meyer, MIT, 2003

<sup>144</sup> \_\_\_\_\_ interview, \_\_\_\_\_ 2004

SCN organization was starting to take place and she was impressed at what had happened.”<sup>145</sup>

The culture of empowering people to take action, strongly imbedded in the SCN leadership model, was embodied in the following two values:

**A focus on continuous learning and risk taking:**

Recognizing that the old way of doing things wasn't going to work necessitated the fostering of a new mentality that was open to risk taking and the openness to exploring new ideas that learning entails. Part of this change was accomplished by putting people in new roles, where they could bring fresh perspectives to driving change rather than defending past approaches. One senior manager explained: “(Mejia) staffed his organization with people who weren't constrained by the ‘this is the way we've always done it’ attitude. He's built an organization that's predicated by learning and change.”<sup>146</sup> Selecting a senior leadership team that shared this view and was supporting and open was the first step; Sherman reflected: “Change of this scale is not easy, and not without mistakes, yet a fundamental organizational culture that could adapt and learn each step of the way was fundamental to success.”<sup>147</sup>

Lisa Hock, strategy operations program manager, explained that the focus is now more on improvement and understanding the broader company benefits of one's activities rather than meeting myopic functional objectives: “you don't fail if you set a goal of ten inventory turns and you get eight. The old mentality was more focused on making the numbers and less on taking empowered risks.”<sup>148</sup> This big picture mentality, again, was a change in leadership style introduced by Russo and Mejia; a director in SCN elaborated: “The use of metrics is now a lot more holistic – for example, we have a target on inventory, but Pat (Russo) understands how the metrics interact and if we need to give a little on one to get a bigger benefit somewhere else she's okay with people taking those decisions.” She continued: “It is a much more empowering, much safer and collaborative environment. People are empowered and enabled to make their own decisions.”<sup>149</sup>

**Building leadership at every level:**

Another value within SCN that was instilled to empower employees was the development of leadership skills at all levels. Rather than contain leadership decisions and activities to the upper echelons of the management hierarchy, as had been historically done, SCN imbued the organization with a leadership development focus throughout the ranks.

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<sup>145</sup> \_\_\_\_\_ interview, \_\_\_\_\_ 2004

<sup>146</sup> \_\_\_\_\_ interview, \_\_\_\_\_ 2004

<sup>147</sup> Sherman, Lucent internal document, 2002

<sup>148</sup> Hock interview, April 2004

<sup>149</sup> \_\_\_\_\_ interview, \_\_\_\_\_ 2004

As an example, Mejia created the Leadership Development Program (LDP), a program designed to provide high potential employees - through a two-year rotation across various functional areas - with a broad exposure to and deep understanding of Lucent's business. The LDP program recruited graduate students from top universities around the world and provided a level of leadership development not seen before, including regular direct time with Mejia. A SCN director provided an illustration, recalling an event where Mejia was speaking to the LDP team: "Look around this room, not everyone here will remain at Lucent but these are the people you will be networking with in the future, so get to know them and build that connection."<sup>150</sup> Mejia also arranged to have the CEO of Kellogg's come in to talk to the LDP team to provide yet another perspective on leadership.

Another illustration of the focus on leadership development within the organization was the presenting of an annual SCN Leadership Award, also known as "the Charlie award" - in honor of a former mentor and inspiring leader of a young Mejia - to one or two employee-nominated managers within SCN who "lead you do things you never thought you could." According to a member of his staff, Mejia liked to tell people in his organization "don't forget you are all Charlies".<sup>151</sup> The final decision between the nominees was made through vote by the senior leadership team, with the one or two award presentations made in front of the whole SCN community including a web-cast to off-site employees.

### **Inspire people to take action now:**

Getting people to take action involved creating a new sense of urgency in everything they did. Under the regulated monopoly environment, speed and cost were secondary to innovation and quality. Under the new reality, innovation, and quality continued to be crucial, but speed, flexibility and cost were decisive. One senior SCN executive recalled: "According to the old Western-Electric and AT&T mindset, we were the best-of-the-best; people would say 'these are the processes, don't mess!' This mentality was founded in the luxury of not worrying about money, cost, or competition. In the old reality, people were allowed to be slow and there was a certain arrogance that came from being in a monopoly situation."

### **A crisis accelerates change:**

Changing this mentality involved creating a sense of crisis in the business. In many ways this crisis was real; the reality of Lucent's marketplace was such that rapid change was critical for survival, but also an opportunity for improvement. Accelerating the transition to a virtual manufacturing enterprise was one such opportunity, as Sherman explained:

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<sup>150</sup> \_\_\_\_\_ interview, \_\_\_\_\_ 2004

<sup>151</sup> \_\_\_\_\_ interview, \_\_\_\_\_ 2004



“Every business crisis requires someone, or some team to move first, and the transition of the manufacturing model created a huge organizational ripple across Lucent. Now, changes in other Lucent areas never before considered enter the realm of possibility given the dramatic overhaul of the manufacturing enterprise.”<sup>152</sup>

Mejia described creating focus on moving forward with change and letting go of the old way of doing things as “burning the ships”. Sherman elaborated: “Similar to world explorers 500 years ago, it was often necessary to ‘burn the ships’, so that the broad Lucent team would focus their energies and talents forward, and not wish for the days of old.”<sup>153</sup>

In SCN, a sense of urgency, of a crisis to impart speed in actions was fundamental to Mejia’s model for driving successful change; one of Mejia’s staff explained: “with Jose, showing ‘years’ on the X-axis is a no-no”. Mejia reflected on the role of crisis in effecting change:

“Companies need to be paranoid; businesses need to be thinking about what is going wrong even while they are slapping backs after a great quarter. There’s nothing like a crisis to keep an organization rooted in reality and oriented toward change” he explained, continuing: “Companies that want to achieve a transformation like Lucent should have a crisis, if they don’t, then create one.”<sup>154</sup>

### **7.3. SCN: Results Delivered**

Although, during the SCN transformation market pressures continued to weigh on Lucent’s sales, with revenues declining year-over-year by 31 percent, 42 percent and 26 percent during fiscal 2003, 2002 and 2001 respectively, gross margins in 2003 were up over 230 percent from the year before, increasing to 31 percent, from 13 percent in 2002 and 10 percent in 2001.<sup>155</sup> In fiscal 4Q2003, gross margins topped 43 percent, up from a low of minus 15 percent in the same quarter the year before.

In its 2003 annual report, Lucent cited “lower inventory-related charges and continued focus on cost reductions”<sup>156</sup> as the primary reasons for the dramatic improvement in gross margin in fiscal 2003. Of great significance, both financially and motivationally, these cost reductions allowed Lucent to finish the fourth quarter of its fiscal 2003 with a profit, following eleven consecutive quarters of losses. Behind these cost reductions were dramatic reductions in operating costs and key margin management activities that enabled a focus on profitability at the product and project level. Many of the key operating supply chain metrics that were used to measure the health of the business showed dramatic improvement during the SCN transformation:

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<sup>152</sup> Sherman, Lucent internal document, 2002

<sup>153</sup> Sherman, Lucent internal document, 2002

<sup>154</sup> Cottrill, November 10, 2003

<sup>155</sup> Lucent Technologies Annual Report, 2003

<sup>156</sup> Lucent Technologies Annual Report, 2003

**Operational Metrics:**

Between 2001 and 2003, Lucent went from twenty-nine factories comprising over ten-million square feet to five system integration centers (SIC's) comprising less than one million square feet. In the process, the annual manufacturing budget was reduced from over \$1.9-billion to less than \$300-million. Supporting the manufacturing operations, Lucent went from sixteen repair centers to four, and from over 500 managed warehouses, to a single lead logistics provider operating a network of approximately 50 distribution facilities. Inventory across the supply chain was reduced from over \$8-billion in early 2001 to \$630-million by September 2003; inventory turns, a measure of the speed at which inventory moves through the company, increased from 1.3 to 7.4 during the same period.

In addition to a reduction in manufacturing overhead, through outsourcing of activities to its EMS partners, Lucent was able to transition management of over 80 percent of its component part numbers and 70 percent of its direct spend to the EMS industry, retaining control and focus on the remaining strategic or highly custom components.

Supplier rationalization has been another major result of the connections SCN has facilitated between product design and procurement. Standardization of designs and sharing of information have resulted in a supply base landscape that went from the pre-SCN state where over 3000 suppliers were specified - the top 1000 of those only representing 40 percent of the material spend - to the end of 2003 where 80 percent of the spend was placed with Lucent's top 60 suppliers.

**Customer Satisfaction:**

One of the key objectives of SCN was to drive down operating costs, while increasing customer satisfaction and executional excellence. At the inception of SCN, on-time delivery of complete systems was around 80 percent, for material delivery this number fell to 50 percent. At the end of 2003 these numbers had improved to 96 percent and 87 percent respectively. Reflecting the improvement in delivery performance, Lucent's customer loyalty index, as measured by a third-party survey, increased from 6.78 to 7.38 from the beginning of 2002 to the fourth quarter of 2003, finishing the year at the highest level the index had been at in over five years.

	Early SCN: 2001	Sept 2002	September 2003
Inventory	\$8 Billion (1.3 turns)	\$1.4 Billion (5.6 turns)	\$632M (7.4 turns) Q4 2003
Gross Margin	12.2% Q1 2002	-14.8%	42.6% Q4 2003
Factories	29 Factories (+10M Sq Ft)	5 Systems Integration Centers (<1M Sq Ft)	5 Systems Integration Centers (<1M Sq Ft)
Manufacturing Budget	\$1.9B	\$ 435M	< \$300M
Circuit Pack Manufacture	90% in High Cost Regions	70% in Low Cost regions	85% in Low Cost Regions
Lucent Repair Centers	16	4	4
Managed Warehouses	500+	101	0 (50+ Logistics Providers)
Supply Base	40% spend with 1000+ suppliers (3000+ suppliers total)	80% spend with 60 key suppliers	80% spend with 60 key suppliers
Delivery Systems Orders	80% in 2001	94%	96% Q4 2003
Delivery Material Only Items	50% in 2001	85%	87% Q4 2003
Customer Loyalty Index	6.78 Q1 2002	6.92	7.38 Q4 2003 (Best in Class 7.43)

(source: Lucent)

Table 4: Summary of SCN Results: Progress against Key Performance Indicators

### From reducing costs to building competitive advantage:

Today, Lucent's supply chain is not just a tool to enable efficient execution once business has been secured, it is helping to drive sales as a result of the new levels of service and responsiveness that are now possible: Lee Brown, vice president of offer development and technical sales, cited as an example of this, Lucent's recent installation of the largest CDMA (code division multiple access) network project ever in India, a project that relied on leveraging supply chain capabilities to commit to very aggressive prices and timelines at the bid stage. Brown explained: "The new processes and flexibility of Lucent's redesigned supply chain let it tap a network of local partners in India to help complete this massive project on time and on budget."<sup>157</sup> Steve Sherman added: "there was a real danger of losing CDMA to GSM<sup>158</sup> in India and SCN came together for delivery and margin. We did a lot of complex integration and orchestration and it worked. I look at this as a true success story for SCN"<sup>159</sup>. Others in the SCN organization agreed that Lucent wouldn't have been able to make the commitments needed to win this contract without being armed with the information and ability to execute that the SCN organization provided.

When asked about the changing role of SCN to drive sales and win customers, rather than simply to reduce costs, Mejia responded, explaining that redefining the supply

<sup>157</sup> Lee Brown quoted in Meyer and Meyer, MIT, 2003

<sup>158</sup> GSM (Global System for Mobile Communication) is a competing wireless networking standard to CDMA, the prevalent technology in the US.

<sup>159</sup> Sherman interview, February 2004

chain to create a core competitive advantage was the vision from the beginning to create a supply chain organization that would compete based on its ability to adapt quicker and respond sooner and with lowest cost, not just to ensure survival but indeed to succeed and thrive in any market conditions:

“Everything we’ve done was not done for today. We didn’t go through all this incredible change because of what we want to deliver today. It’s about creating the speed, the decision-making, the resilience, the leverage of assets that we need for the future. If things change, we’re flexible. What we’re creating is not a structure as much as people who are flexible. They believe in Darwin, who said it’s not the species that are more intelligent that win, it’s not the fastest that win, it’s those that continuously adapt to their surroundings.”<sup>160</sup>

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<sup>160</sup> Electronic Buyer’s News, December 16, 2002

**LUCENT TECHNOLOGIES INC. AND SUBSIDIARIES**  
**CONSOLIDATED STATEMENTS OF OPERATIONS**  
(in millions, except per share amounts)

	Years ended September 30,		
	2003	2002	2001
Revenues:			
Products	\$ 6,666	\$ 9,594	\$ 17,095
Services	1,804	2,727	4,199
Total revenues	<u>8,470</u>	<u>12,321</u>	<u>21,294</u>
Costs:			
Products	4,360	8,416	15,592
Services	1,458	2,353	3,644
Total costs	<u>5,818</u>	<u>10,769</u>	<u>19,236</u>
Gross margin	2,652	1,552	2,058
Operating expenses:			
Selling, general and administrative	1,509	3,969	7,410
Research and development	1,488	2,310	3,520
Goodwill impairment	35	826	3,849
Business restructuring charges (reversals) and asset impairments, net	(158)	1,426	6,308
Total operating expenses	<u>2,874</u>	<u>8,531</u>	<u>21,087</u>
Operating loss	(222)	(6,979)	(19,029)
Other income (expense), net	(428)	292	(357)
Interest expense	353	382	518
Loss from continuing operations before income taxes	(1,003)	(7,069)	(19,904)
Provision (benefit) for income taxes	(233)	4,757	(5,734)
Loss from continuing operations	(770)	(11,826)	(14,170)
Income (loss) from discontinued operations, net	-	73	(3,172)
Loss before extraordinary item and cumulative effect of accounting changes	(770)	(11,753)	(17,342)
Extraordinary gain, net	-	-	1,182
Cumulative effect of accounting changes, net	-	-	(38)
Net loss	(770)	(11,753)	(16,198)
Conversion and redemption costs – 8% redeemable convertible preferred stock	(287)	(29)	-
Preferred stock dividends and accretion	(103)	(167)	(28)
Net loss applicable to common shareowners	<u>\$ (1,160)</u>	<u>\$ (11,949)</u>	<u>\$ (16,226)</u>
Loss per common share — basic and diluted			
Loss from continuing operations	\$ (0.29)	\$ (3.51)	\$ (4.18)
Net loss applicable to common shareowners	\$ (0.29)	\$ (3.49)	\$ (4.77)
Weighted average number of common shares			
Outstanding — basic and diluted	3,950	3,427	3,401

**Figure 6: Lucent Technologies' Consolidated Statements of Operations 2001 - 2003**

## Chapter 8. General Discussion and Observations

Having reviewed the history and evolution of Lucent's Supply Chain Networks organization, the question remains: What was the magic formula that Lucent used to effect such a dramatic realignment and successful execution of its strategy? It would seem that the essence of the answer was captured by Jose Mejia, when he referred to his vision of the supply chain undergoing an evolution from making and buying to sensing and responding. In the new reality of the telecom industry, sensing what was going on was half the battle - having an organization that was able to respond to whatever changes sensors were finding was the other. Generalizing the success factors of Lucent from the preceding analysis of SCN, at least three supply chain design factors and two overarching themes are suggested, that these factors can be grouped into:

### Three supply chain design factors:

- **Assemble an aligned leadership team**
- **Build a sensing organization to support an iterative evolutionary vision**
- **Find, engage and leverage the expert**

Indications are that the success of SCN largely came down to three supply chain design factors: (1) A carefully selected leadership team aligned behind a clear vision; (2) The creation of a supporting "sensing" organizational structure that exposed real-time where the most big-picture leverage could be gained - whether in the capabilities of design, with the customer, supplier, or manufacturing - and thereby allowed the evolution and real-time modification of the leadership vision; (3) A responding culture rooted in openness, communication and self-awareness that, from understanding where the leverage was to be had, enabled "the expert of the moment" to be found and engaged within the network - either within the functional areas of the Lucent organization, or with an EMS partner, supplier or lead logistics provider. By building an extended network of capabilities, and an open, communicative and collaborative culture, Lucent was able to create an organization where the locus of expertise was able to follow the path of greatest efficiency - that is, activities could migrate to their center of competency. Thus, when a customer had the best information on a change in forecast or installation schedule, or when an EMS provider had a higher degree of purchasing power with a particular supplier, or a supplier had ideas for a better approach to solving a technical design challenge, the "expert of the moment" was able to be engaged naturally, immediately and effectively.

The telecommunications industry's boom of the mid-to-late 1990's and subsequent bust of 2001 to 2003, provided a unique stressor to companies in this industry. Lucent was in many ways subjected to a "step function" change in the inputs provided to its business - pricing pressure, customer challenges, competitive landscape - and to the outputs that were demanded for survival - among these: maintaining margin, improving capital utilization, flexibility and responsiveness. The survival reaction of Lucent to this step input was a rewiring of the "black box" that was Lucent to take the

new inputs and generate the required outputs before it ran out of money or customers or both. More importantly, the rewiring was done such that the inputs and outputs were directly connected with an organic and integrated supply chain that ensured that in the future, self-monitoring and self-repairing would be possible through the creation of, in the words of one SCN senior manager, “an organization predicated on change”.

**Two overarching themes:**

- **Manage the cultural transformation**
- **Always strive for simplicity and clarity (a crisis always helps!)**

Overlaying the three overarching success factors identified above, there are two recurring themes pervasively present in the Lucent SCN story: (1) Managing change: Building an organization predicated on change and adaptation meant dealing with human emotions and inertia, and constantly addressing hidden fears through open communication and empowerment – “killing the snakes”, as Mejia termed this. (2) Striving for simplicity and clarity: Mejia’s concept of zero-latency was tied to elimination of delays and unnecessary activities that obscure the line of sight to the goal – customer intimacy and understanding that can be used to drive sales and maximize margin. Much of what Lucent did in creating the SCN organization involved removing obstacles within its organization that previously prevented decision makers from seeing things clearly. By simplifying processes and eliminating bureaucracy and convoluted communication hierarchies, the decision path was made clearer.

Steve Sherman identified the institutionalization of simplicity as being the next step in the evolution of SCN; now that a successful organization had been built, taking the organization to the next level would require further simplification of SCN’s processes, organization and activities to allow the locus of expertise to migrate through the network even faster and more naturally, with less latency and less distortion – in other words to allow SCN to sense more accurately, and to respond faster, more efficiently and more effectively. One of the benefits of the crisis into which Lucent was thrust with the collapse of the telecom market was that the crisis forced simplicity and clarity into its response – without time for getting bogged down in the “nice-to have’s” and all the reasons why a new approach might not work, the sense of urgency of the crisis lent a basic decisiveness to Lucent’s culture that prevailed at the end of 2003: in the words of one SCN director, this polarization of decision criteria resulted in a “golden thread” running through the organization and connecting every activity to the customer and to Lucent’s top and bottom lines.

## **Chapter 9. Considerations for Future Work**

While the Lucent SCN story certainly provided a valuable opportunity to examine a single case of a fully integrated supply chain strategy, additional research is required to validate the success factors that emerged in the SCN transformation to determine whether these could provide similar impact in other industry and market environments – specifically, the relative importance of factors such as the role of a crisis and that of charismatic leadership have not been fully explored. Furthermore, with indications pointing at the time of writing to a recovery in the telecommunications equipment industry, it will be of value to continue to monitor the success of the SCN strategy as the telecommunications market continues to evolve in order to evaluate the adaptability of the model to a longer term dynamic set of market demands. Finally, this case presents several new supply chain design aspects worth additional study to assess their utility in broader contexts.



## References

### **Lucent Internal Documents:**

Sherman, S., "Lucent's Manufacturing Transformation...An Update on Our Journey...", Lucent Technologies, 2002

### **Lucent and MIT Affiliates Day 2003 Documents:**

*Presentation slides from MIT Affiliates Day, October 28-30, 2003:*

Ayers, D., vice president, SCN - Product Design Chain Solutions, "MIT Affiliates Day: Evolving the Supply Chain Organization of the Future"

Carson, J., vice president, SCN - supplier management group, "MIT Affiliates Meeting"

De Tura, N., vice president, SCN - customer delivery organization, "The SCN-Customer Delivery Organization"

Foliano, M., vice president, SCN - global logistics and delivery operations, "Lucent Technologies - Competitive Advantage through Global Logistics"

Jones, M., vice president, SCN - supply chain operations, "MIT Affiliates Day: Supply Node Management"

Mejia, J., president, SCN, "MIT Affiliates Day: Evolving the Supply Chain Organization of the Future"

Picone, R., vice president, supply chain design and optimization, "'Fanatical Financial Focus' - Customer-Driven Supply Chains that Maximize Profitability"

Sherman, S. vice president, SCN strategy, "MIT Affiliates Day: Evolving the Supply Chain Organization of the Future"

*Presentation summary and Thematic summary of MIT Affiliates Day conference, October 28-30, 2003:*

Meyer A., Meyer, D., "MIT Affiliates Day at Lucent Technologies: Evolving the Supply Chain Organization of the Future", MIT Center for Transportation and Logistics, November 12, 2003

## **Lucent Interviewees:**

Bellefeuille, J., Supply Chain Program Manager, Westford MA, January 21, 2004

Fischer, D., Director SCN, Westford MA, January 21, 2004

Griffin, K., Director of Supply Chain Business Management, Telephone, April 6, 2004

Hock, L., Strategy Operations Program Manager, Telephone, April 6, 2004

Mercer, L., Supply Chain Officer, Whippany NJ, February 2, 2004

Sherman, S., Vice President SCN Strategy, Whippany NJ, February 2, 2004

Visco, M., Senior Manager SCN, Whippany NJ, February 2, 2004

## **The Telecommunications Industry and Lucent Technologies:**

Gartner Research Note, "Predictions for Telecom Product Management in 2004", Note Number: SPA-21-7270, December 12, 2003

Hahn, W. L., "Global Telecommunications Market Take, 4Q01 (Executive Summary)", Gartner Dataquest, January 2, 2002

Hahn, W. L., "Global Telecommunications Market Take, 4Q03 (Executive Summary)", Gartner Dataquest, January 16, 2004

Hoover's Company Profiles, "Lucent Technologies", December 7, 2003

Lehman Brothers, Equity Research, "Lucent Technologies", February 11, 2004

Lucent Technologies, Annual Report, 1997, online version, <http://www.lucent.com>

Lucent Technologies, Annual Report, 1998, online version, <http://www.lucent.com>

Lucent Technologies, Annual Report, 1999, online version, <http://www.lucent.com>

Lucent Technologies, Annual Report, 2000, online version, <http://www.lucent.com>

Lucent Technologies, Annual Report, 2001, online version, <http://www.lucent.com>

Lucent Technologies, Annual Report, 2002, online version, <http://www.lucent.com>

Lucent Technologies, Annual Report, 2003, online version, <http://www.lucent.com>

Morgan Stanley Dean Witter, "C3Q99 TEQ — Telecom Equipment Quarterly", December 28, 1999

Morgan Stanley Dean Witter, U.S. Investment Research, "Technology: Telecom Equipment (Wireless/Wireline)", December 28, 1999

Morgan Stanley Dean Witter, U.S. Investment Research, "Technology: Telecom Equipment – Wireline", December 28, 1999

Sanford C. Bernstein & Co., Inc., Bernstein Research Call, "Networking and Telecommunications Equipment", December 19, 2000

Sanford C. Bernstein & Co., Inc., Bernstein Research, Weekly Notes, "Technology Sector Strategy: Is This Cyclical Deceleration Different From The Past?", December 22, 2000

Sanford C. Bernstein & Co., Inc., "Telecom Services: Wireless Infrastructure Update Part 2", April 7, 2000

Standard & Poor's, Industry Surveys, "Communications Equipment", VOLUME 167, NO. 51, SECTION 1, December 23, 1999

Standard & Poor's, Industry Surveys, "Communications Equipment", VOLUME 169, NO. 3, SECTION 2, January 18, 2001

Standard & Poor's, Industry Surveys, "Communications Equipment", VOLUME 170, NO. 5, SECTION 2, January 31, 2002

Standard & Poor's, Industry Surveys, "Communications Equipment," VOLUME 172, NO. 5, SECTION 1, January 29, 2004

Standard & Poor's, Industry Surveys, "Computers: Networking", VOLUME 167, NO. 34, SECTION 2, August 26, 1999

Standard & Poor's, Industry Surveys, "Computers: Networking", VOLUME 169, NO. 11, SECTION 1, September 14, 2000

Standard & Poor's, Industry Surveys, "Computers: Networking", VOLUME 171, NO. 38, SECTION 2, September 18, 2003

### **Leadership at Lucent Technologies:**

Christensen, C., Raynor, M., "Why Hard-Nosed Executives Should Care About Management Theory", Harvard Business Review, September 2003

- Cottrill, K., "Out of a 'Black Hole'; Lucent's Supply-Chain Networks team helped charter the way back to profitability by connecting the dots", Traffic World, November 10, 2003
- CNBC News Transcripts: Market Week with Maria Bartiromo, "Lucent CEO Patricia Russo on the telecom industry in general and the future of Lucent", 7:00 pm ET, May 6, 2002
- Electronic Buyer's News, "Lucent's Supply Chain Unit Takes the Driver's Seat", Volume 1343, December 16, 2002
- McGinn, R., "Executive Forum: The Race to Build Next-Generation Networks", California Management Review, Vol, 42, No. 2, Winter 2000
- Moules, J., "Making tough calls at Lucent: Interview Patricia Russo", Financial Times (London, England), July 17, 2003
- PR Newswire, "National Hispanic Organization names Lucent Technologies' Jose Mejia Engineer of the Year", PR Newswire Association, Inc., September 10, 2003
- Roberts, J.S., "One on one: Jose Mejia", Journal of Supply Chain Management, Spring 2002; 38,2
- Romero, S., "Lucent Chief Plans a Path Back to Black", The New York Times, Feb 3, 2003 Late Edition
- Trebilcock, B., "The real-time supply chain", Modern Materials Handling, September 1, 2003

### **Leadership and Organizational Change:**

- Aguirre, P., Macdonald, G., "Developing and Sustaining Leadership in High Technology Markets", Adventis, Flashpoint 2003
- Barbuto, Jr., J.E., Fritz, S.M., "A Field Examination of Two Measures of Work Motivation as Predictors of Leaders' Influence Tactics", The Journal of Social Psychology, 2002, 142(5), 601-616
- Carroll, J.S., Hatekenaka, S., "Driving Organizational Change in the Midst of Crisis", MIT Sloan Management Review, Spring 2001
- Lin, Z., Carley, K. M., "Organizational Design and Adaptation in Response to Crises: Theory and Practice", Academy of Management Proceedings 2001, OMT: B1

- Lubatkin, M., Chung, K., “Leadership Origin and Organizational Performance in Prosperous and Decline Firms”, University of Connecticut, Wichita State University, undated
- Pillai, R., Meindl, J.R., “Context and Charisma: A ‘Meso’ Level Examination of the Relationship of Organic Structure, Collectivism, and Crisis to Charismatic Leadership”, *Journal of Management*, 1998, Vol. 24, No. 5, 643-671
- Roux-Dufort, C., Vidaillet, B., “The Difficulties of Improvising in a Crisis Situation” *International Studies of Management & Organization*, vol. 33, no. 1, Spring 2003, 86-115
- Schaefer, S. “Influence Costs, Structural Inertia and Organizational Change”, *Journal of Economics and Management Strategy*, Volume 7, Number 2, Summer 1998, 237-263
- Smits, S., Ezzat Ally, N., “Thinking the Unthinkable” – Leadership’s Role in Creating Behavioral Readiness for Crisis Management”, *CR* Vol. 13, No. 1, 2003
- Wargin, J., Dobiay, D., “E-business and change – Managing the change in the digital economy”, *Journal of Change Management*; Aug 2001; 2,1; 72-82

### **Supply Chain Coordination:**

- Bowersox, D. J., Closs, D. J., Stank, T. P., “How to Master Cross-Enterprise Collaboration”, *Supply Chain Management Review*, July 1, 2003
- Hickey, K., “Getting in Tune: Standards Organizations see wider embrace of supply-chain standards and greater collaboration”, *Traffic World*, July 21, 2003
- Hoppe, R. M., “Outlining a Future of Supply Chain Management – Coordinated Supply Networks”, *Master of Science Thesis, MIT*, June 2001
- Rice, J. B., Jr. and Hoppe, R. M., “Network Master & Three Dimensions of Supply Network Coordination: An Introductory Essay (Working Paper)”, September 3, 2002
- Rice, J. B., Jr. and Hoppe, R. M., “Supply Chain vs. Supply Chain: the Hype & the Reality”, *Supply Chain Management Review*, September/October 2001
- Thomas, K., “FT Understanding – Understanding Supply Chain Execution”, *Financial Times (London, England)*, November 26, 2003