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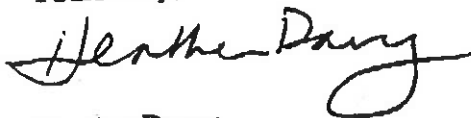
December 16, 1998

P.D. Villarreal
G.E.
3135 Eastern Turnpike, W3E
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Dear P.D. Villarreal,

On behalf of Professor Applegate, I am enclosing the latest copy of the TPN Register case.

Yours truly,



Heather Darcy
Enclosures

*gd, Hans + Scott -
See attached Harvard
case study in TPN.
TPD*



Harvard Business School

TPN Register: The Trading Process Network

Consumers want convenience and businesses want to expand markets, lower costs, and pump up customer service. [We] project that Internet business trade will mushroom to \$327 billion by 2002, while on-line retail sales will hit \$17 billion by 2001...Corporations will prefer buying to building. By 2000, even our early adopter interview group plan to buy instead of to hand-build [iCommerce] software. And, as iCommerce moves beyond these early adopters, a combination of better products, time-to-market urgency, and thin technical skills will ensure that mainstream firms embrace packaged commerce software.

Forrester Research Report, May 1998.¹

As he placed the final touches on the report he would give to the board the next day, Orville Bailey, president of TPN Register, could not help but think back over the success that the company had achieved and the challenges that it had faced during their first year in operation. (Visit the company's web page—www.tpnregister.com—for company background and to review recent press releases and news stories.) Since its founding in March 1997 through a merger between General Electric (GE) and Thomas Publishing, TPN Register was one of a new breed of companies that were hoping to become the future leaders in providing solutions and services for firms wishing to do business on the internet. Bailey explained:

TPN Register combines GE Information Services's supply chain management technology and services [called the Trading Process Network or TPN] with the supplier products and services of Thomas Publishing's Thomas Register business unit.² Through the combined efforts of these two industrial age powerhouses, this new information age company and its partners offer a full range of electronic commerce products and services, including Internet-based supply chain management solutions, business process consulting, and back-end system integration. The marketplace is in its infancy and is growing exponentially. The competition is fierce.

¹ S. Dolberg, et al., "Sizing Commerce Software," *Forrester Research Reports*, Volume 1 (1), May 1998.

² When the joint venture was announced in February 1997, Thomas Register's industrial catalogs were used by over 90% of the *Fortune* 500. Thomas Register's on-line and paper-based catalogs provided up-to-date information on over 55,000 products and services from over 155,000 industrial suppliers.

Professor Lynda M. Applegate prepared this case as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

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Electronic Commerce and the Internet

Like many new IT ventures in the late 1990s, TPN Register was founded to exploit new business opportunities on the Internet. While many believed that the Internet had burst on the scene in the mid-1990s, technology insiders knew that its core technology was well-established, having been conceived and developed over 30 years ago.³ Until recently, however, its use was restricted to government, research and educational purposes. While the ban on commercial use of the Internet was lifted in 1993, it was the commercialization of the World Wide Web (WWW) and user-friendly browsers in 1993 and 1994 that fueled the rapid penetration of the Internet into homes and businesses worldwide. In 1994, three million people, most of them in the United States, used the Internet. By 1997, 40 million people around the world were connected,⁴ by early 1998, the number of people using the Internet had soared to 100 million.⁵ One expert predicted that one billion people would be connected to the Internet by 2005.⁶ (See Exhibit 1.) By July 1997, approximately 1.7 million Internet business sites had been registered, up from approximately 600,000 one year ago (see Exhibit 2).⁷

This expansion of use coincided with dramatic increases in computer, software, services and communications investments that were, in turn, making the vision of Internet-based electronic commerce a reality. While businesses began using the Internet for commercial transactions with customers, suppliers and business partners in early 1995, it was not until 1997 that Internet-based electronic commerce really began to catch on. Consider this:⁸

- In 1996, Amazon.com, the largest Internet bookstore, recorded sales of less than \$16 million. In 1997, revenues had increased to \$148 million.
- Auto-by-Tel, a Web-based automotive marketplace, processed a total of 345,000 purchase requests for autos through its Web site in 1996, generating \$1.8 billion in auto sales. As of the end of November 1997, the Web site was generating \$500 million a month in auto sales (\$6 billion annualized) and was processing over 100,000 purchase requests each month.
- Cisco Systems closed 1996 having booked just over \$100 million in sales on the Internet. By the end of 1997, its Internet sales were running at a \$3.2 billion annual rate.
- In January 1997, Dell Computers was selling less than \$1 million of computers per day on the Internet. The company reported reaching daily sales of \$6 million several times during the December 1997 holiday period.
- In 1997, Egghead Software announced that it would close all of its retail outlets and begin selling all of its software from its Internet web site.

³ See L.M. Applegate, "Paving the Information Superhighway: Introduction to the Internet," *Building Information Age Businesses*, Boston: Harvard Business School Publishing, 1998.

⁴ Mary Meeker, and Sharon Pearson, *Morgan Stanley U.S. Investment Research: Internet Retail*, Morgan Stanley, May 28, 1997.

⁵ U.S. Department of Commerce, *The Emerging Digital Economy*, April 15, 1998, National Technical Information Service (www.ntis.gov/yellowbk/1nty800.htm), order #PB98-137029.

⁶ Nicholas Negroponte, "The Third Shall Be First: The Net Leverages Latecomers in the Developing World." *Wired*, January 1998.

⁷ www.netso.com (March 21, 1998).

⁸ U.S. Department of Commerce, op. cit.

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While the above are primarily examples of consumer electronic commerce, business-to-business Internet commerce was also on the rise (see Exhibit 3). In 1998, businesses that used the Internet to buy, sell, distribute and maintain products and services had begun to realize significant cost savings and increased sales opportunities. And, these benefits increased as the network of businesses conducting electronic commerce grew.

Supply chain management initiatives were an early focus of attention for Internet-based electronic commerce. (See Appendix A for background on supply chain management.) Much of this interest was driven by the fact that purchased goods and services accounted for between 50 and 80% of a company's total costs (see Exhibit 4).⁹ Furthermore, a recent McKinsey study indicated that, after pricing, improvements in supplier management were the most powerful tool that a manager could use to increase shareholder returns (see Exhibit 5).¹⁰ An example of an industry that sought these benefits was the automotive industry.

In January 1994, Chrysler, Ford, GM, Johnson Controls and 12 of their suppliers began working together to improve the flow of physical goods and information within their supply channels.¹¹ At the project's outset, it took four to six weeks for information to flow through the channel. Along the way, the information was distorted and truncated. The resulting late, inaccurate and untrusted information cost millions of dollars in the form of "just-in-case" inventories, premium freight, and other inefficiencies. By redesigning processes and electronically connecting the participating companies, cycle time decreased to less than two weeks. On-time shipments improved 6 percent, and error rates were reduced by 72%. Labor costs were reduced by eight hours per week per customer. It has been predicted that the ability to use the Internet to connect all worldwide manufacturers and suppliers could save the industry nearly \$1.1 billion annually—a cost savings of \$71 or more per car—and decrease information lead-time to just one day.

In 1998, the automotive industry was investing in just such a venture, building the Automotive Network Exchange (ANX)—a secure Internet-based industry network, to link manufacturers and suppliers worldwide. Scheduled to be fully implemented by the year 2000, the network would electronically route product shipment schedules, computer-aided-designs, purchase orders, payments and a wide range of other business information.

The results achieved by the auto industry were being replicated in many other industries. Because of its low cost and ease of use, the Internet was expected to accelerate the pace at which businesses communicated with each other electronically and the benefits they could realize. And, because supply chain management represented a huge area of leverage across many industries, Internet-based supply chain management was expected to be a significant market opportunity well into the 21st century (see Exhibit 6). In fact, Internet-based corporate purchasing was estimated to be a \$1.9 billion market in 1997, that was expected to grow to \$32.4 billion by 2000.¹²

Not surprisingly, a number of supply chain management software and solutions firms had entered the market during the late 1980s and 1990s, intent on establishing a lead in this emerging market. Given the relative immaturity of the Internet as a secure environment for electronic commerce, the market was dominated by established players offering packaged solutions based on traditional client-server technologies (see Exhibit 7). Of these established players, Manugistics and i2 were the market leaders in procurement packaged solutions, and Siebel Systems, Scopus

⁹ Chapman et al., "Purchasing: No Time for Lone Rangers," *McKinsey Quarterly*, 1997.

¹⁰ Ibid

¹¹ This example was drawn from the U.S. Department of Commerce report, "The Emerging Digital Economy," April 15, 1998.

¹² Forrester Research Report, "Fourth Channel Purchasing," September 1997.

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Technologies, and Vantive were market leaders on the sales side.¹³ Linking the buy-side and sell-side were firms that offered internal Enterprise Resource Planning (ERP) packaged solutions (e.g., Oracle, SAP, PeopleSoft, Baan and J.D. Edwards). In 1998, these established software firms were working to develop the interfaces that would allow their products to run on the Internet, and, assisted by systems integration services firms (e.g., Anderson Consulting, Deloitte and Touche, Ernst and Young), they were also extending their products and forming partnerships with other players up and down the channel to enable implementation of the integrated supply chain management solutions demanded by customers.

But, as established software firms worked to integrate their product offerings and to ready them for Internet-based electronic commerce, Internet entrepreneurs were rushing to establish a strong foothold in the market (see Exhibit 8). Some offered packaged solutions (e.g., BroadVision, Pandescic, Ariba), others offered services—often within a specific industry or industry segment (e.g., WW Grainger for industrial supplies, MicroAge for enterprise computing).¹⁴ Still others offered a combination of packaged solutions and services (e.g., TPN Register, IBM Commerce Point) designed to integrate both the “buy” and “sell” chains. Finally, others offered general purpose Internet-based electronic commerce engines (e.g., Netscape, Microsoft, Lotus/IBM, Open Market).

Evolution of TPN Register

TPN Register's early roots could be traced to internal process redesign efforts at General Electric (GE). In 1994, General Electric (GE) purchased approximately \$25 billion in supplies, components and services, which represented nearly half of their yearly costs. (See www.ge.com for GE background.) Recognizing that revamping their procurement processes presented an opportunity for significant cost and productivity savings, in late 1994, the company began a series of corporate initiatives to transform the way they sourced products from suppliers, buyers and vendors. By early 1996, the company's redesigned sourcing processes were transferred from corporate headquarters, where experimentation and development had taken place, to GE's information services business unit GEIS. GEIS named the Internet-based supply chain management service the Trading Process Network (TPN). Initially launched for use by GE businesses, TPN was launched as a commercial product in late 1996. In March 1997, GEIS partnered with Thomas Publishing to create a new company, TPN Register, that would develop and sell a full range of Internet-based supply chain management systems and services to support business-to-business electronic commerce.¹⁵ (See www.thomaspublishing.com for background on Thomas Publishing's Thomas Register subsidiary.) The partnership between Thomas Publishing and GE enabled TPN Register to unite the “buy side” focus of GE's TPN with the “sell side” focus of Thomas Publishing's Thomas Register thus creating the opportunity to provide integrated supply chain management solutions and services.

The TPN initiative evolved in three stages discussed below:

- Developing the Business Concept (1994-1995)
- Launching TPN as a Service Offered through GE Information Services (1996) and
- Launching TPN as an Independent Business (1997 to present).

¹³ In May 1998, Stibel Systems completed its merger with Scopus.
¹⁴ For more information on WW Grainger, visit their web site at www.grainger.com. See MicroAge, Inc.: *Orchestrating the Information Technology Value Chain*, HBS No. 398-068.
¹⁵ See L. M. Applegate, “Electronic Commerce: Looking Back as We Look Ahead,” HBS Publishing No. 398-707 for an overview of the evolution of electronic commerce and the implications for doing business on the Internet. A glossary of terms is also provided.

Phase I: Developing the Business Concept (1994-1995)

GE began exploring the potential of the Internet as a platform for electronic commerce in 1994. At that time the Internet and World Wide Web were in their infancy. Despite the fact that the technology could be used for little more than publishing and e-mail, managers at GE could already see its promise as both an open platform for global communications and as a powerful tool to manage and communicate information in its many forms (e.g. data, text, audio, video, pictures, and graphics). Mark Mastriani, who at that time was Manager of Technology for GE and a key champion of the company's early Internet efforts, said,

We knew that GE could exploit the Internet's features to achieve our vision of becoming number one or number two in all of our businesses and a truly global company. But, we also knew that it would be several years before the Internet lived up to its potential, and there was also a chance that the technology would never catch on. Rather than wait, we decided to get started while carefully managing the risk.

In 1994, one of GE's key corporate-wide strategic initiatives was to streamline processes to improve productivity and better serve customers and business partners. "As we thought about how to start learning more about the Internet," Mastriani remarked, "we decided to tie into important business initiatives that were already in process. One of those initiatives involved the redesign of the sourcing process. In 1994, GE purchased \$25 billion worth of components, products and services per year. We knew that our current way of doing business could be inefficient for GE and its sourcing partners. As we looked at processes to target for improvement, 'High Leverage—High Leakage' ones, such as sourcing, rose to the top of our priority list."¹⁶

The sourcing initiative involved the centralization of sourcing information and the processes through which GE dealt with external suppliers, contractors and vendors. Several core technologies were required at the start: a global supplier database, a global contact database, a transaction database that monitored exchange of information between GE and its suppliers, and a set of business systems that embodied the practices, principles and guidelines for corporate-wide sourcing. Initially, GE focused their redesign efforts on two aspects of the procurement process. First, by centralizing procurement activities and developing new contracting systems, the company changed its contracting process to take advantage of volume discounts and licensing agreements across GE businesses. Second, GE centralized and then redesigned the process through which its suppliers bid on GE requests for proposal (RFPs). The new RFP process utilized an auction model to streamline the process of procuring industrial components; initially, components in the \$1,000 to \$20,000 range were chosen to pilot test the system. RFPs were published on-line and GE suppliers were given a specific time frame within which they could bid for the contract. All suppliers were able to see competing bids and could lower their bid as often as they wanted until the close of the auction period.¹⁷

The auctions resulted in dramatic reductions in the cost of components. But, it was soon learned that there were some unintended consequences. Bailey, a leader in the development of TPN from its inception, explained:

The on-line auctions that we ran in late 1994 and early 1995 resulted in significant—20% to 25%—reductions in the bid price for industrial components. By mid-1995, the business units were standing in line to use the service. But we soon

¹⁶ By "High Leverage/High Leakage" GE managers referred to core operating processes that were central to GE business operations, yet were currently highly inefficient and ineffective. Thus, redesign efforts were expected to bring significant cost, quality and cycle time benefits, and enhance the competitive position of GE businesses.

¹⁷ A more in-depth examination of on-line auctioning can be found in *Internet Auctions*, (HBS No. N9-399-020) by Chad Raube, MBA 1998.

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learned that, over time, market feedback available during the on-line auctions signaled suppliers on the supply and demand for different components. As a result, the auctions were only useful for true commodity components. Additionally, the auctions were one-time events that needed to be managed in real time. As such, they could be very resource intensive. Because we had not yet built the systems needed to integrate the auction with our order fulfillment and sourcing processes, overall process inefficiencies remained, and, at times, the auctions increased sourcing costs elsewhere in the process. In addition, the auction could cause relationship problems with valued GE suppliers. For example, the transition from one supplier to another could negatively influence sourcing activities and relationships elsewhere in the company. After a few month trial, we came to realize that we needed to view the auctions within a much broader redesign of our end-to-end order fulfillment and sourcing processes. So, we stepped back from the pure auction format and asked for volunteers from the GE business units to prototype a more comprehensive process redesign. In this way, we hoped to capture both short term and long term benefits.

GE Lighting, (a pioneer in the use of EDI among GE business units), GE Aircraft Engines (a business unit that was actively working with government and defense industry partners in the development and deployment of computer-aided logistics systems through the CALS initiative), GE Medical Systems (a leader in the use of IT within GE businesses) and GE Capital volunteered to participate in the project.¹⁸ The four prototypes delivered tangible business benefits to the business unit sponsors (see Table A) and enabled further refinement of the organizational and information technology infrastructure required to transform sourcing within GE.

Through 1995, the sourcing initiative was managed and funded at GE corporate headquarters; the solution became known as the Trading Process Network (TPN). Gary Reiner, who in 1995 was vice president of corporate development, served as the executive sponsor. Reiner had been recruited to GE in 1991 from his position as a partner at Boston Consulting Group, and reported directly to Jack Welch, chairman and CEO. He was responsible for identifying and developing promising business initiatives within GE business units. By late 1995, Reiner believed that TPN had demonstrated that it could provide significant benefit for GE and that it was time to move it from corporate headquarters into a GE business unit, where it could be managed as a self-sustaining entity.

¹⁸ GE Capital, a business unit that had grown quickly through acquisition, chose to participate in the sourcing project to support efforts to streamline, integrate and centralize disparate sourcing and fulfillment systems.

Table A Summary of Phase 1 Activities and Benefits

Key Activities	Sample Benefits
<p><u>Organization:</u> Managed and funded in corporate headquarters</p> <p><u>Activities:</u></p> <ul style="list-style-type: none"> • Developed key component of the organizational and technical infrastructure (e.g., global supplier management systems, supplier and contract databases) • Created systems to enable on-line publishing of RFPs and on-line bidding. • Redesigned procurement and order fulfillment processes; pilot-tested in GE Lighting, Aircraft Engines, Medical, and Capital 	<p><u>Auction Prototype</u></p> <p>Savings: 20-25% reduction in the cost of sourced components</p> <p><u>GE Lighting Prototype</u></p> <p>Speed: 7-14 days to 1 day</p> <p>Savings: 100% savings on printing and mail costs; 50% headcount reduction; 20% reduction in the price of sourced components</p> <p><u>GE Medical Prototype</u></p> <p>Speed: 20 days to 5 days</p> <p>Savings: 100% savings on printing and mail costs; 11% reduction in the price of sourced components</p>

Phase 2: Launching TPN as a Service Offered through GE Information Services (1996)

* In early 1996, sponsorship and management of TPN was transferred from GE's corporate headquarters to GE Information Services (GEIS) and the TPN service was launched for use by GE suppliers. At approximately the same time, Reiner was named to a new position within GE as senior vice president and chief information officer. The press release announcing Reiner's appointment stated, "Reiner will use information technology to provide competitive advantages and growth opportunities for all of GE's businesses. GE Information Services (GEIS), the company's fast growing information business, will also report to Reiner."

In the press release Jack Welch, GE's CEO, stated, "This new position recognizes the importance that information technology will play in GE's future. It is the key to improving all our business processes from the customer to the supplier. Gary's years leading our efforts to share best practices within the company give him a great background for this assignment. His knowledge of our company-wide initiatives from quality to cycle time reduction to customer productivity make him ideally suited."

During 1996, under Bailey's guidance, TPN was expanded to include IT systems and organizational processes to support order fulfillment and on-going supply chain management. In addition, the service, which had initially been implemented on GE's internal proprietary networks, was launched on the World Wide Web. Gary Hare, TPN vice president of product development and commercial operations and an original member of the TPN project team, explained:

Most of our activities in early 1996 were directed toward refining the systems we had developed through our prototype activities to create an integrated package that could be deployed throughout GE and with a wide range of GE suppliers. By

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June 1996, we had launched TPN as an Internet-based service commercially available through GEIS.

Throughout 1996, the benefits that GE and its suppliers achieved through the use of TPN continued to grow.

Table B Summary of Phase 2 Activities and Benefits

Key Activities	Sample Benefits
<p>Organization</p> <p>Transferred to GEIS and funded through GE Business Units</p> <p>Activities:</p> <ul style="list-style-type: none"> • Refined systems and processes developed during the pilots and launched TPN throughout GE. • Commercialized TPN products, solutions and services. • Validated commercial viability of the TPN business concept. 	<p>GE Benefits</p> <p>Volume: \$1 billion in contracted transactions managed through TPN</p> <p>Speed: 50-80% cycle time reductions</p> <p>Savings: 10-20% savings in procurement and order-fulfillment costs</p> <p>Sample Supplier Benefits</p> <p>Speed: 55% cycle time reduction</p> <p>Savings: 54% reduction in cost of Request for Quote (RFQ) process</p> <p>Quality: 100% data accuracy</p>

Phase 3: Launching TPN as an Independent Business (1997 to present)

By 1997, a decision was made to launch TPN as an independent business. (Visit the company's web page—www.tpnregister.com—to examine TPN Register's current strategy, products and services.) Bailey explained:

Our experience with using TPN as a platform for doing business with GE suppliers helped us understand its potential value as a product and service that we could sell to other companies. So, as we rolled out use of TPN by GE business units in early 1996, we also began to package TPN's various modules into a set of commercial products that we could sell to other companies. The first set of products and services provided support for identifying suppliers, posting Requests for Proposals (RFPs), negotiating agreements and developing contracts. We then developed a set of systems that would take information from the contracting process and allow it to be entered into a company's existing order fulfillment systems and databases. The above systems were primarily targeted toward sourcing activities within production and manufacturing organizations. A final set of products and services were designed to support order fulfillment and sourcing activities related to general and administrative (G&A), capital equipment, and maintenance and repair.

Initially, it was thought that TPN would be offered to outside customers exclusively through GEIS. However, a desire to move quickly to capture share and establish a defensible position on the Internet caused GEIS to search for a partner to bring TPN to market. "As we struggled to create commercially viable products," Bailey explained, "it became evident that we could use the help of a partner. Inside GE, many of our businesses had contracted with Thomas Register to provide on-line catalog services, and we knew that 93% of *Fortune* 500 companies also used them. We approached

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Thomas Publishing, parent of Thomas Register, to explore potential relationships and, in February 1997, GE and Thomas Publishing decided to join forces in a 50/50 joint venture to form TPN Register—a limited liability corporation with the mission of developing products, services and solutions for conducting electronic commerce on the Internet. Thomas Register brought its database of over 155,000 industrial suppliers, 55,000 products and services, and 3,100 supplier catalogs to the relationship.” By June 1998, TPN Register procurement solutions were being implemented at 14 companies, 3 of which were implementing full enterprise rollouts. Once fully-implemented, these three companies would trade in excess of \$1.5 billion per year. (In 1996-1997, GE businesses traded in excess of \$1 billion using the TPN service.)

Table C Summary of Phase 3 Activities and Benefits

Key Activities	Sample Benefits
<p><u>Organization</u></p> <p>TPN Register, a limited liability corporation, launched through 50/50 joint venture between GEIS and Thomas Publishing</p> <p><u>Activities:</u></p> <ul style="list-style-type: none"> • Expanded TPN products and services. • Launched entrepreneurial firm to exploit Internet-based business-to-business electronic commerce opportunities. 	<p><u>TPN Register Benefits (June 1998)</u></p> <p># of Customers: 14</p> <p>Customer retention: 100%</p> <p>Customer Savings: up to 20% of procurement cost</p> <p>Revenues: N/A</p> <p>Profits: N/A</p> <p>Market Share: N/A</p>

By the time TPN Register was launched as a business, the initiative had evolved over a five year period that involved iterative periods of experimentation and organizational learning. At each step along the way, the company developed a deeper understanding of the new business model and the organizational and technical infrastructure required to create business value. While many business process reengineering projects flounder for lack of support, the TPN project had been championed at the highest levels at corporate headquarters and within all of GE’s business units. In addition, there was steady stream of tangible business benefits delivered during each phase of the initiative. These benefits, which were widely communicated, formed the basis for continued support and funding. Bailey explained:

As we look back on the evolution of TPN, we see that the major benefit of the early wins that we experienced with our first auctions was that we raised awareness of the potential of Internet-based electronic commerce and created excitement and support within GE at multiple levels. Because sourcing was a highly leveraged activity that cut across all business units, we were able to engage senior management across the company. This was a stark contrast to the support that we often received for other corporate IT projects. At the middle level, we engaged key business unit managers early so they were well informed and felt a sense of ownership. Finally, we were able to engage Gary Reiner as project sponsor. In his role as head of corporate business development, Reiner was responsible for identifying high potential projects and providing the required executive oversight and initial sponsorship needed to fully test the concepts. By the time that we launched TPN as a separate company in 1997, there was strong support at all levels of GE.

The same held true for the support and resources provided by Thomas Publishing to their ConnectsUS initiative. Anna Mickiewicz, President of TPN Register from its launch in March 1997 to May 1998, explained.