Key Points

- A disaster is the largest "R" in MTTR that you'll ever have to deal with. By developing and then testing your plans thoroughly, you can confidently reduce that recovery time and get your users back to work faster.
- Disaster recovery is incredibly complex and prone to failure. By paying attention to the details, you can increase the likelihood of a successful recovery.
- There is no recovery, nor enterprise, without people. If you treat your people well, they will treat you well in return.

CHAPTER 21

A Resilient Enterprise*

The harder I work, the luckier I get.
—George Allen

Unlike the other chapters in this book, this chapter is a snapshot of an ongoing story. By the time you read this chapter, it will not reflect the current state of affairs at the New York Board of Trade. The point of this story is to describe the efforts and accomplishments of a dedicated group of people faced with a set of horrific circumstances that they could not have imagined, not in its being up to the second. Even when the story is 50 years old, it will still be interesting and relevant to anyone who is attempting to design and implement a disaster recovery solution.

At 8:46 A.M. on Tuesday, September 11, 2001, an airplane struck 1 World Trade Center in Lower Manhattan. The New York Board of Trade, located at 4 World Trade Center, a nine-story building adjacent to Tower Two, ceased trading and evacuated their building. By eight o'clock that evening, despite the total destruction of that building and its computer systems, the New York Board of Trade was ready to resume trading.

* This chapter is reprinted, with some minor modifications, from *The Resilient Enterprise*, a book produced by VERITAS Software in the spring of 2002. It appears here with the permission of Richard Barker and Paul Massiglia of VERITAS Software, as well as many others who worked on the book, and with the gracious permission of Pat Gambaro and Steve Bass of the New York Board of Trade.

The story behind this recovery is a fascinating one that demonstrates the personal and corporate qualities that are required to be able to recover quickly from a disaster of previously unimaginable magnitude.

The New York Board of Trade

The New York Board of Trade (NYBOT) is a commodity trading exchange with a history of well over 100 years. They trade options and futures on coffee, cocoa, sugar, cotton, and orange juice, as well as several financial indices and currencies, including the New York Stock Exchange Composite Index, the Standard & Poor's Commodity Index, and the U.S. Dollar.

Unlike equity financial instruments, whose traders sit in front of computer screens and execute trades in a relatively calm and orderly manner, through electronic trading systems, NYBOT's trading environment is quite frenetic. Some call it organized chaos. They trade in trading pits or rings, in a style called *Open Outcry*. Buyers and sellers stand, literally facing each other, on three or four steps arranged in a ring, as shown in Figure 21.1, and buy and sell these commodities based on orders from their customers. For example, the farmers who grow cocoa sell cocoa futures, and companies such as Hershey and Nestlé buy them. Prices are set through a verbal bid and ask process, where a seller might offer some cocoa (called a "lot") at a particular price (called an "ask"; a buyer's offer price is called a "bid"). If several buyers are interested in that lot, they might bid the price higher in an attempt to buy it, until only one buyer is willing to pay the new bid price. If there are no buyers at a particular asking price, the price might fall in an attempt to generate some buy orders. When an order is executed, its price is entered into NYBOT's computer system, and the prices of the most recent transactions are publicized instantaneously within the pit, and to the outside world. This process sets market prices for these commodities on a worldwide basis.

The result is a trading environment that operates at a very high noise level. Since the key to getting the right price on an order is to be heard by the person with whom you wish to deal, it is usually necessary to yell louder than the next trader. There is also much jumping up and down, waving of hands and papers, and jockeying for position in an attempt to get attention.

There is never just one trading pit or ring actively trading a commodity at a time; pits work in pairs. There is a pit for futures on a commodity ("I want to buy a lot of cocoa that will be delivered in March..."), as well as options on those futures ("I will pay you now for the right to buy a lot of cocoa to be delivered next October at a price we agree on today..."). The two pits are physically adjacent and active simultaneously, which just adds to the noise level.

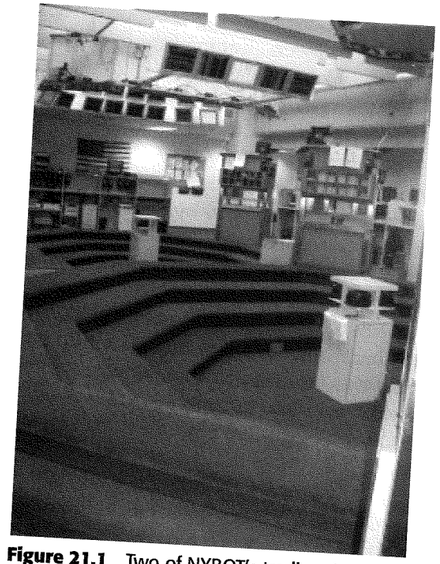

Figure 21.1 Two of NYBOT's trading rings.

Another important difference between trading pure financial instruments like equities and trading physical commodities like cocoa and sugar is that if someone purchases a lot of sugar and doesn't resell it to someone else before its expiration date, it will be physically delivered to him. Although some of the traders want and expect to take delivery of the commodities that they buy, there are also speculators who try to take advantage of inefficiencies in the market, and may buy a lot planning to sell it before its delivery date.

What's more, since NYBOT trades in physical commodities, they have additional responsibilities; they must grade and certify their products, and store them in certified warehouses. Plus, all information about these activities must be available to any of their members at any time.

There are roughly 1,000 members of NYBOT; members are the only people who can make trades. Roughly 600 traders trade at NYBOT on an average day. Altogether, there are about 1,500 people working at NYBOT, including members, support staff, and so on. NYBOT services a community of roughly 10,000 people, although the precise figure would be very difficult to discern. The community includes growers, millers, farmers, buyers, sellers, and so on; all the people who are directly and indirectly touched by NYBOT's activities.

NYBOT makes their money on commissions. They get a fee for every contract of every trade that is completed in their trading pits. Besides Hershey and

Nestlé, other NYBOT customers include the companies that produce Tropicana, Minute Maid, Maxwell House, Folgers, various clothing brands, as well as the growers and mills that produce the raw commodities that go into these products. NYBOT makes a significant amount of additional revenue by distributing their commodity pricing information to their customers and to ticker service bureaus.

When NYBOT was housed at 4 World Trade Center, they had 13 trading pits, which allowed them to trade multiple commodities at the same time. Trading in the agricultural commodities would last for anywhere from four to five hours a day, depending on the commodity. Trading in the financials lasted from 7 to 18 hours per day. Typical daily NYBOT trading volume across all commodities was about 72,000 lots. As with other exchanges, when the trading day is done, much work remains. This back office work is the process of settling trades, and making sure that what was bought matches what was sold, and generating all the associated paperwork and audit trails.

The First Time

Shortly after noon on Friday, February 26, 1993, a bomb went off in the basement parking garage beneath the World Trade Center complex. The exchanges that were then called the Coffee, Sugar, and Cocoa Exchange (CSCE) and the New York Cotton Exchange were located in 4 World Trade Center (4 WTC), a nine-story building on the southeast corner of the complex about 100 feet away from the South Tower (Tower #2). Staff at both exchanges felt an explosion, and their lights blinked. Soon, they learned that a bomb had gone off. The explosion caused their facility to lose power, heat, and data center cooling, and the building was evacuated.

CSCE maintained a disaster recovery plan in 1993, which consisted of a migration to a cold backup site at Sungard Recovery Services in Philadelphia. The Cotton Exchange outsourced their computer management. CSCE's plan called for their system administrators to travel to Philadelphia, install an operating system on these cold systems, and install their applications and data. The recovery process was expected to take between 24 and 48 hours to complete.

Almost immediately upon the evacuation of 4 WTC, several system administrators headed down to the Philadelphia cold site carrying backup tapes.

The hole in their recovery plan was that there was no backup site from which to trade. Thus, even if they could get their computer systems back online, without access to their building, it would take at least 30 to 60 days before they could acquire a new site and install everything that would be required to allow them to resume trading.

On Sunday morning, February 28, New York City said that it could be a week or two until the exchanges could get back into the building. Later that day, the situation changed, and limited power (but no heat or air-conditioning) was restored to the WTC complex. This allowed the exchanges to reenter their building, where they could prepare for a limited trading day on Monday. Meanwhile, CSCE's system administrators who had gone to Philadelphia had reconstructed February 26's trading day and closed out processing so that their computer systems were now ready for the next day's trading. In 1993, all transactions were paper-based, and so it was relatively easy for the back office people to resubmit the transactions manually.

On Monday, March 1, trading resumed, but in a limited manner for just two hours a day. All back office computer functions were performed at the alternate site in Philadelphia, because while basic electric power had been restored, the air-conditioning systems remained off line. The computer systems could operate, but since they could not be cooled they would overheat if allowed to run for too long.

The exchanges continued to trade in this fashion for about two weeks, until the city was able to construct a temporary five-story structure adjacent to the World Trade Center complex to provide air-conditioning and heat to the entire WTC complex. At that point, the system administrators who had gone to Philadelphia were recalled, and CSCE computer operations were restored to 4 WTC.

One of the most remarkable and noteworthy things about this event was how the other exchanges in New York (the New York Stock Exchange and the American Stock Exchange) all pulled together and offered CSCE temporary equipment to help see them through their difficulties.

No Way for a Major Exchange to Operate

When all the dust had settled, Pat Gambaro, who was the Senior Vice President of Trading Floor Operations and Systems at the time, realized that this was no way for a major exchange to operate. CSCE needed a solid plan in the event that another disaster forced a relocation; they could not live with 48-hour delays in migrating their computer services. Besides, when working with cold site providers like Sungard, there is no guarantee that an incoming customer will actually get the equipment he needs; equipment is doled out on a first come, first served basis.

In advance of this disaster, there was not nearly enough time spent planning, and as a result, far too much time was spent scrambling after it had hit. So, Pat proposed to CSCE's Board of Managers that he develop a thorough disaster recovery plan that included a dedicated, hot recovery site for their computer systems, rather than a cold site, and, if possible, space for trading if the primary trading floor was rendered unusable. A hot computer site meant that all computer data created at the main site would be replicated to the hot site almost immediately after it reached the disks at the local site; this would

allow them to recover from a disaster much more quickly than if they had to restore everything from tape. The Board encouraged Pat to look into acquiring such a site. Even as he looked for a site, he was developing cost estimates.

The costs associated with creating a second trading floor were more than the Board was willing to absorb, and so that part of the proposal was set aside, so Pat revised his proposal to include only a hot site for recovering their computer systems. The Board was reluctant to spend that money, too, but they agreed to a compromise. Pat would bring in an outside consultant to review his proposal and see if it made good business sense.

In the end, the consultant agreed with Pat, but felt that his recommendations did not go far enough. The most important fact that the consultant identified was that when that the CSCE was unable to trade, it cost them $350,000 per day, and it cost their business partners $3,500,000 per day. When they heard those cost numbers, the Board quickly decided that a hot site for their computers made a lot of sense. Soon, work began to identify an appropriate location for such a site.

CSCE began working with Chubb Recovery Services (later acquired by Comdisco, which was acquired in 2001 by Sungard Recovery Services), who, after an extensive search, found them a site in Brooklyn. However, before CSCE was ready to act, Chubb offered an alternate location in a building they had just acquired in Long Island City, Queens. This new site was on a separate power and phone grid from the World Trade Center, and had plenty of telephone service and redundant power. Furthermore, there was adjacent vacant space that could potentially be converted to a backup trading floor.

Chubb and CSCE worked out a deal that would allow CSCE to be the first tenants in the new building with a low rent. Although the Board had decided not to proceed with the alternate trading space, Chubb was very interested in helping CSCE build one. While they had built computer recovery sites before, Chubb had never built an open outcry trading environment; they felt that this could help them move into new business areas.

When the cost estimate came back at about $1.2 million, the Board had to say no. When Chubb offered to split the cost 50/50, the Board was still unwilling. However, when Chubb offered to pick up $1 million, leaving only $200,000 in costs to CSCE, the Board agreed, and work began.

Annual rent for the hot computer site would be about $50,000. When the Board learned that the rent for the whole site, including the trading floor would cost $200,000 a year, they initially did not want to spend the money. Pat kept working to change their minds until they finally agreed in early 1995. Each year at budget time, Pat had to go through the same efforts to justify this expense.

The Queens trading space was completed in 1995 with just two trading rings. In the event CSCE needed this trading floor, the plan called for the

commodities to share the floor and trade in limited sessions of roughly 2 hours apiece, just as they did after the 1993 terrorist bombing.

But, before they could actually build this new hot site, they needed to end their contract with Sungard for the cold site in Philadelphia. In return for getting out of the contract prematurely, CSCE contracted with Sungard for the development and ongoing maintenance of a Business Continuity Plan (BCP) document. The BCP, roughly the thickness of a medium-sized city's phone book, described the recovery of every process and activity, manual or automated, in every department within CSCE after a disaster. There was also an individual concise document for each department. An incident management team was put together to oversee the plans. The BCP also included specific instructions for each employee as to where they should go after the disaster occurred. Sungard was also responsible for maintaining the document through personnel and procedural changes. The plan also included specific plans for information technology, a quarterly testing schedule, and just about everything else that a good disaster recovery plan should include.

Steve Bass, then the VP of Information Technologies, developed a scheme that allowed CSCE to place hardware at the Queens site at no cost. Although physical space there was still at a premium, another cost that the Board watched very closely was the cost of computer hardware. When NYBOT upgraded their system hardware at 4 WTC, the old plan was to retire the old hardware, and either donate it or recycle it. The new scheme called for them to take the old hardware, move it to Queens, and use it there for recovery purposes. Once a system was retired a second time, then it would then be donated or disposed of. This plan pleased the Board, as it allowed them to get their recovery site without having to purchase all new hardware.

In 1998, CSCE merged with the New York Cotton Exchange ("Cotton") to create the NYBOT. One of the biggest challenges that faced the merging organizations was how to reconcile the fact that CSCE had always managed their computer technology in-house, while Cotton had always outsourced it. Steve prepared a lengthy paper justifying CSCE's position that their computers should be managed in-house for the merged entity, NYBOT.

After a long series of debates, Steve and Pat prevailed, and systems administration was brought in-house. By doing so, they were able to be more nimble with their technological responses and development, allowing them to remain ahead of the technology curve in the years to come.

One reason for the debate on outsourcing was that it would be necessary to upgrade and enhance the BCP. All of the processes and procedures that the inclusion of the Cotton Exchange added had to be added to the BCP. However, as they were before the merger, computer management costs continued to be a major concern. Since the three-year agreement that was signed in 1995 with Sungard was expiring, the BCP upgrade was accomplished with Steve's in-house staff, and only minor help from Sungard.

Since information technology costs were still a concern, when Steve and Pat approached the Board to ask for additional funding to expand the Queens site to accommodate the new commodities and personnel acquired in the merger, they were unable to get the money. This meant that the recovery site did not grow to support the additional capacity that was necessary to keep all of NYBOT's products running after a disaster.

The last major shortcoming in the plan was in the recoverability of their back office applications. They knew that they could switch over all of their trading operations to the Queens site in about 15 minutes. However, without the ability to recover back office operations, they could not close their trading day, or perform other important, but less critical functions. Because of the ongoing budget tightness, Steve and Pat had to develop a low-cost or cost-free scheme to back up these functions.

One of the compromises that they made at the recovery site to save money was that there would be limited space for NYBOT's staff to work. The plan was that some of them would report to work at the recovery site, while others would work from home. The administrators were given suitable access from home (paid for in full by NYBOT), and would be expected to report there in the event of a disaster. This would be inconvenient, but since the system administrative staff's presence was not considered critical to the business, this made sense. The Long Island City facility held limited space for offices, trading pits, facilities, and all of the other things that NYBOT would need to operate long-term.

There was another implicit assumption being made throughout NYBOT's disaster plans, which was most evident in this lack of space for system administrators. Long Island City was seen as a temporary home. The plan did not consider the possibility that the entire World Trade Center building might be lost. They figured that if there were a fire or other calamity, they might be out of their WTC building for a week or two, or a month at most. They did not consider the possibility that the World Trade Center could be totally lost. Needless to say, this assumption would not prove to be a valid one.

Y2K Preparation

NYBOT saw Y2K coming before it became a public issue. The system administration staff began to prepare for Y2K as far back as 1997, and they had all of their internal applications totally compliant before 1999 began. In 1999, when their regulatory agency, the Commodities Futures Trading Commission (CFTC), sent all the forms and paperwork to NYBOT for Y2K certification, Pat told them that they were already done. It took a while to convince them, but once the CFTC believed that NYBOT was truly prepared, they asked for and received permission to use NYBOT as an example for their regulated organizations, to show them what to do, and how to do it.

Just because NYBOT was ready, that didn't mean that all of their partners were. So, there was still plenty of work to do to make sure that systems were compatible, and there were still many tests, milestones, and deadlines to meet, but NYBOT was way ahead of the curve. Pat and Steve describe most of this effort as busy work for the staff, since they were so well prepared.

Pat and Steve had nothing but good things to say about their staff. The systems management organization grew from 6 people in 1994 to over 60 at the end of 2001. They have kept very current on technology, and so have been able to implement new technology that has made their trading environment increasingly competitive. Besides Y2K preparation and Disaster Recovery, they were also early adopters of client-server technology, and are now (early 2002) implementing hand-held wireless devices to get customer information and orders closer to the traders in the pits. They raved about how well their staff has performed over the years in trying circumstances, and without the amounts of funding that they really wanted, and how despite that, the staff has allowed NYBOT to remain on the cutting edge of technology, and far ahead of competitive exchanges.

One of the biggest internal problems with which Pat and Steve had to contend was the unwillingness of their customers, the traders, and other NYBOT members to come visit the Queens site so that they could see where their money was going, and what the recovery facilities looked like. They were unable to persuade traders to come in and do a weekend day of mock trading, nor to close down WTC for a day and do a disaster drill. Nobody would seriously consider it. They even went so far as to charter buses and cater a lunch for the traders. Logistical problems messed that day up, and so even that endeavor failed.

The system administrative staff had spent many days in Queens, testing every aspect of the facility that they could. They had done mock trading, even in volume, and they knew that every system at the recovery site worked as advertised. Testing was done every quarter. But since the traders and users were unwilling to visit, there would still be logistical complications if they ever needed the site. Complete testing was just not possible without a greater degree of cooperation.

Since Pat and Steve could not get the traders' cooperation in solving the potential logistical problems, they needed the next best thing. In 1999, as part of Y2K preparation, they developed a comprehensive "Member Disaster Recovery Packet." The packet, which was given to every member, user, and trader, contained directions to Long Island City, operations information, and a plan for allocating scarce trading floor space and telephones, and other scarce resources.

The packet included key radio stations, web sites (the disaster recovery plan was on the staff intra-web site, and would failover to the Queens site transparently if necessary), home phone numbers, addresses, local restaurant and

hotel information, street and subway maps, vendor contact information, driving instructions, contact information for pretty much everybody at NYBOT, and all sorts of other relevant information. The BCP was the official source of information about which system administrators were expected to report to Queens and which ones would be required to go home. It also included trader booth assignments at the Queens site, along with booth phone numbers. It even included a wallet-sized card that members could carry at all times with the most important information on it. Since the information was made available on paper and electronically via NYBOT's web site, there was no excuse for anyone to be without it.

Two of the most important issues introduced in the Y2K BCP were the concepts of shared space and staggered trading schedules. The Queens site had just 2 trading pits, rather than the 13 at 4 WTC. In order to continue trading under these cramped and limited conditions, they needed to develop a plan to share the trading floor by staggering trading schedules. Instead of trading simultaneously for four or five hours a day, as each commodity did at 4 WTC, at the recovery site they would be forced to limit their trading to just 90 minutes a day. All around the trading pits are trading booths: small cubicle-like spaces with telephones, where orders are sent to the brokers and all the paperwork associated with the trading is done. At 4 WTC, there were 600 booths. In Queens, there were just 100. This meant that users who were accustomed to having four or five booths might be relegated to just one or two. And instead of having access to the booths all day, traders would only have them for a 90-minute interval each day. After one broker's time expired, another broker would take over the booth and its phones.

Of course, just because all this was written into the plan doesn't mean that anyone had ever tried it.

In the end, though, after all of this preparation, and as it did for so many other organizations, January 1, 2000, came and went without incident for NYBOT.

Once they got through Y2K, a new push began. The system administrators worked to change the corporate culture to get all users to put all of their files and other data online and on the servers whose data regularly got replicated to the recovery site. If they failed to do so, individual user data would be lost in a disaster.

In early 2001, the information technology group began to push their testing efforts harder than ever before. Everyone who could work from home was able to work from home, and this capability was regularly tested, and all expenses to do so were picked up by NYBOT. The goal was to make sure that even if a user had no work space in Long Island City, he would still be able to get his job done, albeit remotely. Quarterly testing remained the target, and everybody whom they supported seemed much more willing to take part in testing than they ever had before.

Every system at 4 WTC had a backup system operational in Queens, and they all worked. When problems occurred at 4 WTC, and processing switched over to Queens, users could not tell; the switchover was totally transparent to NYBOT's users. Testing for the second quarter was done on July 12, and the third quarter's round of tests was scheduled for September 18. It never occurred.

NYBOT was about as well prepared for a disaster as they could be. Sadly, one occurred anyway.

September 11, 2001

As the first plane struck the World Trade Center complex on September 11, Pat was stuck in routine morning traffic, waiting to drive into the Holland Tunnel from New Jersey. He heard a news bulletin of a still-unidentified explosion at the World Trade Center. Immediately, he picked up his cell phone and called his office. He spoke with Walter Hines, NYBOT's CFO, who had felt the explosion shake their building violently, but he didn't yet know what it was. The Executive Floor Committee (the members who help coordinate daily floor operations) had calmly decided that it would be wise to evacuate the building. The phone call ended calmly, with a simple "talk to you later."

Since it was early in the day, there weren't too many people at work at NYBOT yet. There were about 200 to 250 people there altogether, 100 active cocoa traders (cocoa trading had begun at 8:00 A.M.), 50 financial traders, and 25 to 50 support staffers. There were also a handful of coffee traders who had arrived, as coffee trading was scheduled to begin at 9:15.

Next, Pat's wife, Adele, called him, and said that a plane had crashed into Tower 1. Like most people, Adele and Pat assumed that it was just an accident. She saw the pictures on TV, including the fireball and the big hole, and she was very concerned, but no more than that. Before they got off the phone, she saw the second plane hit. That changed everything. Pat was still half a block from the Holland Tunnel toll plaza, and he was stopped right there. Port Authority Police immediately closed the tunnel, and turned everyone around. Having no place else to go, Pat returned home, arriving there just after Tower 1 collapsed, at around 10:30.

Steve was at Penn Station in midtown Manhattan having just arrived on a commuter train from his home in Pennsylvania. He was unable to get any kind of information. The police closed Penn Station, and said that there was some sort of police action in progress at WTC, but nothing else. His first clue that there was something serious going on was when the police appeared and forced all the taxi cabs out from their taxi stand underneath the station.

The 250 or so NYBOT evacuees reached the street very quickly, as most of them were on the eighth floor of 4 WTC. Most of them got downstairs in time

to see the second plane hit Tower 2. When they saw that, many of them panicked and ran south and east, which would take them away from the complex, but not toward any particular river crossing or landmark. They just wanted to get away from the scene as quickly as possible. At least one of the evacuees is a long-distance runner, and without really thinking about it, he ran five or six miles uptown away from the scene before he stopped to think about what he was doing or where he was.

Forty-five minutes later, when Tower 2 collapsed (the second building attacked was the first building to collapse), it fell onto the adjacent building number four, and in addition to the horrific loss of life that it caused, it totally destroyed the entire $25 million dollar NYBOT operation in that building, including almost $3 million in computer and networking hardware and infrastructure.

Pat was uniquely qualified to be the nerve center of the whole recovery operation. His house became a communication center and clearinghouse for the welfare of employees, utilizing all four phone lines running into his home. Cell phones were basically useless due to a combination of system overload and loss of access points. Many of NYBOT's personnel had Nextel cell phones/walkie-talkies, the walkie-talkie portion of which continued to function, but otherwise communications were very limited.

When Steve and Pat first spoke, they decided to declare an official NYBOT disaster with Comdisco, and that was the message sent around to all employees via phone, Nextel, and whatever other communications method could be found. The disaster declaration meant that the recovery effort in Long Island City would commence immediately.

Even though Pat was stuck in New Jersey, Steve was not. He began to make his way to Long Island City. There were no cabs, no buses, no subways, no cars, no nothing. So he started walking the roughly 3 ½ miles from Penn Station to the Long Island City site. Steve arrived at 12:30 P.M., and was the first NYBOT person to arrive there. Others began filtering in over the next four to six hours, most of whom had walked the nearly seven miles from the World Trade Center, after several detours. A couple of information technology executives were stuck in California at a conference. (They flew home once the restrictions on air travel were lifted.)

Steve spent his time on the phone, mostly, coordinating efforts with his users, system administrators, members, vendors, suppliers, and so on. Plus, his staff was calling him to make sure that recovery efforts were on track. Steve and Pat spoke several times throughout the day.

Because of the published and well-publicized plan, Steve's IT staff knew what to do. Some were supposed to go home and work from there. Those who were able to get there did so. Others reported to Long Island City, as they were supposed to.

Largely because the BCP included everyone's phone number, by midnight on the 11th, everybody at NYBOT had been accounted for. Three exchange members had been killed, all of whom were elsewhere in the World Trade Center complex that morning, including one who was at a meeting at the Windows on the World Restaurant. In addition, Pat's cousin, with whom Pat was very close, and who worked for Cantor Fitzgerald, was killed in the attacks.

Although this discussion is concentrated on the computer impact of the disaster, it is very important to point out that there was a significant emotional and psychological impact on the NYBOT members and employees. As a result, NYBOT arranged to have therapists and medical personnel on-site in Queens for two weeks after the 11th to help their members and staffers cope with the previously unimaginable levels of stress that the attack created.

As the system administrators arrived in Queens, they began bringing the recovery computers online. Once the systems were up, there was some important work that needed to be done: cocoa and some of the currencies had begun trading that morning. Before anything else could take place on the systems, the trading days for those commodities had to be closed. This was completed by 7:00 P.M.

And just a few minutes after 8:00 P.M. on September 11, NYBOT had completed their disaster recovery process. Their systems were ready to begin trading again.

Getting Back to Work

Even as the systems came back online, Pat remained at home on the phone, speaking with Steve, the NYBOT Board, regulatory agencies, users, traders, members, and employees. He received calls from other exchanges, including The New York Mercantile Exchange (NYMEX), The New York Stock Exchange (NYSE), The Chicago Mercantile Exchange, and The Securities Industry Automation Corporation (SIAC), offering anything that they had to help the NYBOT recover. Pat said that it was very gratifying to see the level of camaraderie and cooperation that these events brought out in everybody. However, it would have been very difficult for NYBOT to take advantage of the offers of computer hardware, as there are no standards between the different exchanges. NYBOT's primary hardware platform is Tandem. The NYSE's, for example, is not, and so it would have been very difficult, if not impossible, to get NYBOT's applications in a usable state on NYSE's platforms in any reasonable time period.

But getting started at Long Island City was not easy, as many of the organizations with which NYBOT communicates were also taken out by the attack. As a result, although everything was working as designed in Long Island City, they had networks that were no longer of any value because they were running to

demolished or empty buildings (like the World Financial Center, located across the street from the site of the World Trade Center). They had never established network links between LI City and these partner organizations' recovery sites.

On the night of September 11, Pat and Steve got off the phone at 1:30 in the morning. Steve slept in a chair in the Long Island City facility.

The next morning, Pat made it to the DR site, having managed to drive to Queens from New Jersey. That task became much more complicated in the following days, as local authorities imposed restrictions on automobile access into Lower Manhattan and closed many river crossings in the New York area. When he arrived, he confirmed that everything had gone according to the plan, the systems were ready to go, and trading could begin.

When members and traders began contacting Pat and Steve later in the day on Wednesday the 12th, they wanted to know when they might be able to begin trading again. They assumed it would be Friday or Monday before they'd be ready, but, no, trading could resume immediately, at least from a computer perspective. In the end, though, that became a moot point, as all trading on all New York-area exchanges was suspended until Monday, September 17.

Before traders even arrived, there was an operational problem to contend with. Even though the staggered trading schedule (90 minutes for each commodity) was going to be in effect, there was no place to gather the group of traders who were waiting to take the trading floor. They needed the ability to gather and prepare themselves without impeding the active trading that was already in progress, as well as a way to more easily move the active traders out of the trading area when their time expired. The answer: more space. In a great stroke of luck, the only other tenants in the Long Island City building had moved out months before, so there was a tremendous amount of available space in the building. NYBOT quickly made a bid and acquired the space.

Once the space was acquired, Comdisco (the owners of the building) set to work preparing it to NYBOT's specifications, and in just a couple of days the space was ready to be used as setup space for incoming traders. (Comdisco assures us that under normal circumstances, this build-out would have taken a couple of weeks, if not longer.) Comdisco had obtained and set up tables, chairs, phones, and workspaces. This first upgrade greatly reduced tension throughout the organization, as it allowed members a space to work that was not on the trading floor, or in the way of active traders.

Since trading was not scheduled to resume until Monday, few members had any plans to visit the Queens site before then. However, Pat, Steve, and the Board realized that Monday morning would be total chaos, what with most of the 1,000 members arriving at once, all looking for their familiar booths, trading pits, phones, and other facilities. Many of them would not be familiar with the staggered schedule and would expect to trade all day as normal. As this would not be conducive to trading, it was decided to announce a mock trading day on Saturday, September 15.

On Saturday morning, everyone was asked to come in and acquaint themselves with the plans and policies that had been set up for Monday, and to do so on the staggered schedule. In reality, there were no plans to mock-trade anything. The point of the exercise was to bring everyone in to reduce Monday's chaos. (After all, since the system administrators had done a great deal of test trading, they already knew that they could trade successfully in Queens.) Saturday also gave NYBOT a chance to reissue badges and other paperwork that had been lost on the 11th.

What they learned was that, despite its availability, many members had neither seen nor read the disaster recovery packet. Others complained that while they had two or three (or six) booths at WTC, they were being limited to just one at the recovery site. Nevertheless, the overwhelming reaction from the members was a combination of pleasant surprise, amazement, and genuine relief. They were amazed to see that what they had been paying for all those years was real, and they were relieved because it would likely save their jobs. Suddenly, all of the funds that Pat and Steve had been fighting for all those years over objections from many quarters turned out to be money well spent.

The Saturday session revealed one very serious problem: The main telephone switch in the Queens building did not work. This meant that on Monday there would be no telephones in any of the booths for any of the traders. Pat contacted Mayor Giuliani's office on Saturday to get Verizon (their local telephone company) to come in and repair the failed switch. The Mayor's Office was exceptionally cooperative, and, in fact, had identified them as one of their three top priorities (along with the NY Stock Exchange and the NY Mercantile Exchange). Just in case Verizon could not get the switch working, later on Saturday Steve and Pat went out and bought 250 cell phones (cost for phones and service: $70,000) as a backup in case the new switch didn't work out. But, on Sunday afternoon, Verizon was able to get the switch working, and each booth had its two working phones. Even so, when members arrived Monday, cell phones were handed out on a limited basis, and they were used as extra lines for booths that needed more than two lines. The phone switch, however, held up just fine.

Trading began on time at 7:30 A.M. on Monday, the 17th, with cocoa, as per the staggered schedule. Normally, cocoa is a lightly traded commodity, and the pit at 4 WTC where cocoa was traded had room for about 60 traders. On this day, though, over 150 traders were crammed into a much too small space. Witnesses said that it reminded them of a Tokyo subway at rush hour. In the end, though, the abbreviated trading session went without any major hitches; the traders handled any disputes themselves, and trading itself was successful and completed on time. By the end of the day, NYBOT had traded 140,000 lots

of all commodities, which was almost double the volume of a normal day. The additional volume was attributed to pent-up demand, and the volatility to market uncertainty.

In addition to the overcrowded trading conditions, NYBOT was also the center of a great deal of press attention, so on top of all the traders, there were a slew of newspaper and television reporters, along with representatives from the Mayor's Office.

NYBOT accomplished all of this trading activity amidst another serious problem. It became apparent early in the day on the 17th that two wired phones per booth would be completely inadequate, especially with the compressed trading day. To be successful, each booth needed at least six phone lines. The only way to achieve this increased capacity would be to bring in a new and larger phone switch. So late in the day on the 17th, the Mayor's Office was once again contacted, this time to request a new 1,200-line telephone switch, with the highest possible priority. With air travel and crossings in and out of New York severely restricted at this time, getting a switch delivered to Queens was no easy task.

Nevertheless, the Mayor's Office was able to cut through immense amounts of red tape, and on Wednesday, a U.S. Army helicopter flew to Long Island City with a 1,200-port telephone switch (a piece of equipment roughly the size of a standard computer rack). Four days later, in time for the Monday, September 24 trading day, every booth had four new phone lines running to its four new telephones, giving each booth a total of six lines and six phones. NYBOT estimates that under normal circumstances, it would have taken 30 to 60 days just to obtain the phone switch, and longer to get it installed and all the lines run and phones installed.

Chaotic Trading Environment

So, while trading went on successfully at this early stage of recovery, and as indicated in Figure 21.2, the quarters were kind of cramped. Making things more complicated, though, was that trading was very rushed. When NYBOT traded at the World Trade Center, each commodity traded for four to five hours per day. At the recovery site, trading was limited to just 90 minutes, with a 30-minute changeover period in between commodities. During this 30-minute period, the traders had to complete their trading and wrap up their trading days (a very complex manual process), the system administrators had to change all the display screens to reflect the correct data for the next commodity to be traded, and all the traders had to physically leave the floor with enough time for the next set of traders to come in and take their places.

Adding to the chaos was the telephone and booth sharing. An example of the small booths NYBOT used in Long Island City is shown in Figure 21.3.

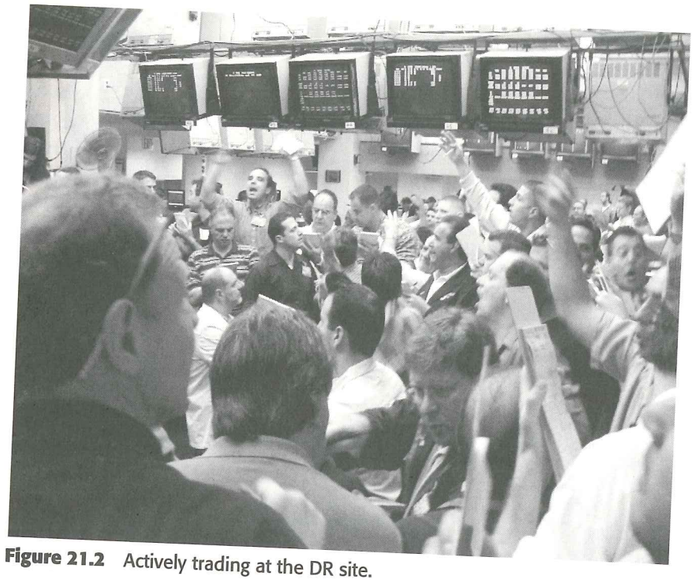

Figure 21.2 Actively trading at the DR site.

During the course of the trading day, several sets of traders would occupy each booth. The telephones and telephone numbers in each booth were assigned to the booth, not to the traders; they were shared among all the occupants of a particular booth. A call to one of the six phones in row one, booth one at 9:00 A.M. might reach a cocoa trader; the same phone at 11:00 A.M. might reach a coffee trader. At 2:00 P.M., a sugar trader may answer.

After some time passed, and everybody got accustomed to the new arrangements, things got a little more efficient, and so the changeover time was reduced from 30 minutes down to 20, adding 10 minutes to the trading day for each commodity. Without the full cooperation of the brokers and the entire NYBOT staff, this switchover would simply not work. Pat reports that the brokers have shown remarkable levels of cooperation.

Before September 11, sugar traders traded an average of about 30,000 lots in a four-and-a-half-hour trading day. Since September 11, average trading volume has risen somewhat, but all the trades were being completed in just 90 minutes. That means that the rate of lots traded roughly tripled, from about 6,600 per hour to more than 20,000 per hour. What's more, since NYBOT trades manually rather than electronically, there is a tremendous amount of post-trading day activity that must be done to close the day. Because of the compressed schedule, all of that work must be done in less than the half-hour (now 20 minutes) that the traders have to clear the floor.

Figure 21.3 A shared trader's booth at the DR site.

NYBOT has been able to add an additional 100 phones to the trading reconciliation area, as well as provide additional trading input terminals. Both of these improvements have resulted in increased efficiency in trade reconciliation, and a little less work that needs to be done on the trading floor.

Another unforeseen complication was with the financial instruments traders (U.S. dollar, and foreign currencies) who also traded at 4 WTC. The disaster recovery plan for them was to fly to Dublin, Ireland, where they would resume their trading activity on NYBOT's Dublin trading floor. Their exchanges quickly learned that flying anybody anywhere in the days after September 11 was going to be difficult, so the decision was made to find some space for them within the Queens facility. Adding to the complexity, because the financial traders work with exchanges at other facilities, they do not get to set the hours in which they trade. In order for them to trade, they must do so at all hours that trading is done. This means that they cannot share the facilities at NYBOT with other commodities; instead, they must have their own area in which to trade. They don't need trading pits, but they do need full-time phones and booths to trade from, reducing the pool of booths available to be shared among the commodities traders.

Improvements to the DR Site

By rearranging seating and other facilities, NYBOT was able to add a pair of smaller trading rings for orange juice and cocoa, the two commodities with the fewest traders and lowest average volume. By clearing those traders away from the main rings, they have been able to extend trading on the other commodities. By early February 2002, 12,000 square feet of trading space was available, more than double the space they had on September 17. They added two more rings by mid-February 2002, allowing even more trading for longer periods each day.

Additional facilities are being added to Long Island City beyond trading space. Upstairs, away from the trading area, a small lounge and lunchroom are being put in, as well as a coatroom to get coats off the trading floor. The additional space will also include conference rooms, offices and cubicles for staffers, and additional trading preparation space, including more telephones and data entry space for traders. This additional space will further reduce the amount of work that must be done on the trading floor at the end of each commodity's session.

AUTHOR'S NOTE

The last 8 months have been an extremely busy and productive period for our friends at the New York Board of Trade. Although they remain in their DR site in Long Island City, New York, they have made arrangements, and construction is expected to begin very soon on their new primary site in Manhattan. While planning has been going on for the move, they have continued to upgrade the Long Island City site, making it more productive for the different groups of traders, and more comfortable for the long term.

NYBOT is taking a very bad situation and making the best of it. They are taking particular advantage of new technologies, and their new trading floor will have some of the most modern information sharing technologies on any trading floor of its kind.

In early 2002, the trader transition area was relocated from the first floor to the second floor, and a whole new trading floor was built out in its place. Normally, the building of a new trading floor can be expected to take 6 months or more, but they were able to accelerate the process, and completed the floor in just 2 months.

* * * * *

In its new location, the transition area spread out to cover a lot more space, and included many of the amenities that the traders had done without since the relocation. The additional space gave the traders and support staff telephones, PCs, and space and equipment where they could enter their trades, as well as a lounge, a coat room, a vending machine area, offices for the executives, and space for other critical functions like compliance and trade clearing.

The addition of the new trading rings brought the total number of rings to eight. These new rings made trading much easier and more comfortable and meant that commodities could trade more hours a day than at any time since 9/11. For example, cocoa trades for nearly four hours a day, or only 1 hour less than at the WTC.

Eight rings, of course, is not 13, and so the commodities were not all able to trade in the hours of the day that they would like. The cotton and orange juice traders would prefer to trade with morning hours, but are unable to, due to the lack of trading space. Doubling up on trading space with other commodities is still a procedural requirement.

New Data Center

While the construction of the new trading rings was going on, Steve got approval from the Board to open a new backup data center in Lower Manhattan.

Steve's biggest concern since NYBOT had moved to Long Island City was that the building created a single point of failure for the entire operation. He saw that it would likely take a year or more before a new trading site could be operational, so he campaigned for a secondary separate site for a data center. This new site would give NYBOT a couple of substantial benefits. It would allow them to get the data center away from the trading floor, thus eliminating Long Island City as a single point of failure, and it would give Steve a place to house his IT staff.

With the Board's approval, Steve signed a lease for the new data center space in February. At WTC, the data center was over 6,000 square feet. Because of the remarkable reduction in the physical size of their servers, Steve was able to lease just 2,000 square feet of space, and that included offices that were not included in the 6,000 square feet they had before. What's more, the lease for the new data center was much less costly than any real estate they had leased in the last several years.

Once the lease was signed, the build-out began. Staffers, many of whom had been working from home most of the time since September, began to move in during early April. The data center was completed at the end of June. Almost immediately, the Lower Manhattan site became the DR site for Long Island City's data center. Two weeks after its completion, NYBOT ran their first DR tests. The tests were successful, and at this writing, they have been replicating

data from Long Island City to the new site without incident for over two months.

Everyone felt a lot more comfortable once the Lower Manhattan data center came online and Long Island City was no longer a single point of failure. The Manhattan data center also ensured that they can relocate the development staff from Queens, removing a lot of the people from that site, freeing up space and other resources. Not only didn't they have a backup site before Manhattan came online, but they were using their production systems for development, a state of affairs that had made Steve very uncomfortable.

The New Trading Facility

Within days of the migration to Queens, Pat and his staff began the search for a new trading facility. They looked at nearly 20 different sites over a period of several months before they found the right one. They settled on the New York Mercantile Exchange building at 1 North End, overlooking the Hudson River. 1 North End is an ironic choice because of its location, just a block and a half west of the World Trade Center site.

The prospect of returning to the same neighborhood has made some of their members and employees uncomfortable, but from a business perspective, 1 North End is the right choice for NYBOT. Since they are relocating back into their original neighborhood, now called The Liberty District, they are entitled to federal money to rebuild their facilities. NYBOT received a piece of the $20 billion that Congress allocated to rebuild Lower Manhattan. They also received direct, personal appeals to return to the neighborhood from New York City's Mayor Michael Bloomberg and New York State's Governor George Pataki, as well as from some of the economic agencies who are chartered with rebuilding Lower Manhattan in the wake of the attacks.

Before The New York Mercantile Exchange ("The Merc") built and moved into its building at 1 North End, the New York Cotton Exchange and the Coffee, Sugar and Cocoa Exchange (before they merged into NYBOT) had been in discussions with them and their other sister exchange, The New York Commodities Exchange (Comex), to build a shared building. When negotiations went too slowly, the Merc went ahead and built their own building for themselves and the Comex, whom they had acquired.

In mid-2003, NYBOT moved into the seventh floor of 1 North End, a floor that had been roughly half vacant for several years, sharing the floor with the Comex. As part of the move, the trading floor was completely renovated. Comex moved to the formerly empty portion, and NYBOT took over Comex's vacated area. This design is the result of months of designs and redesigns, and nearly 40 sets of plans. The plan was in many ways like a jigsaw puzzle; space had to be found for Comex's 8 trading rings, plus the 13 that NYBOT would

have. Since the floor has only one proper entrance, there needed to be sufficient space so that the various groups of traders could move to and from their trading rings without getting in each other's way.

The trading floor is a triple height space, with a 30-foot ceiling. It extends up through the 8th and 9th floors, but it does not use up all of those floors. Remaining space on those floors will be used by both exchanges for office space, trade clearing, and other administrative functions. Additional space on 7 was allocated for cafeterias and other trader amenities. In addition to the trading floor space on the 7th floor, NYBOT will have space for trading support staff on the 8th floor and executive offices on the 13th floor.

In the end, NYBOT will have just over 13,000 square feet of trading floor space at 1 North End, and the Comex will have slightly less. The 13,000 square feet is approximately the same amount of trading space that they had at the World Trade Center.

Before they completed the move to 1 North End, NYBOT operated without a disaster recovery site for their main trading floor. The data center functions in Long Island City will continue to be replicated to Lower Manhattan until the move to 1 North End, at which time the direction of replication will be reversed.

Future Disaster Recovery Plans

The first step in NYBOT's future DR plans was taken very quickly: They have separated their data center from the building in which the trading floor is located. The attacks simultaneously cost them both their trading floor and their data center. By putting the two in separate buildings, NYBOT hopes that a single event can no longer disable both functions.

The current plan is for NYBOT to hold on to the Long Island City site for the time being, and perhaps permanently, depending on how their other plans go. But they have other options.

One DR option is to merge their DR plan with the Merc's. The Merc has their DR building on Long Island,[1] and NYBOT could take some space and move their DR environment there.

Another idea is to speak with other exchanges in other parts of the United States, and discuss the possibility of trading DR space with them. In this model, NYBOT might wind up with a DR trading floor in Chicago, while a Chicago exchange uses some of NYBOT's space in either Long Island City or 1 North End. Steve acknowledges that traveling to Chicago could be very difficult in some circumstances, so a remote DR site would serve as an additional DR site rather than the primary one.

At this writing, these decisions have not yet been made.

[1] Long Island City is not located on Long Island, but rather is part of Queens, one of the five boroughs of New York City. Long Island is located several miles east of Queens.

The Technology

Perhaps the most exciting thing about the move for Pat and Steve was that since they got to redesign the trading space from scratch, they got to investigate and implement new technologies to accelerate and enhance the trading process.

The Outcry for Open Outcry

One technological option that was quickly dismissed was eliminating the Open Outcry method of trading and replacing it with a more modern and technological, but less personal, electronic trading system. NYBOT remains committed to the Open Outcry method of trading, as it best supports their customer base and their agricultural products.

The primary advantage that Open Outcry offers NYBOT and their customers is price discovery. In an electronic trading environment, traders simply match anonymous deals within the system; the highest bid price is matched to the lowest sell price, and so on. On an equities trading floor a specialist will trade a particular stock, say, General Motors (GM). On NYBOT's floor, there may be 30 traders, each having his own customer base and all of whom may want to buy and sell the same future or option.

Open Outcry traders generally know more about their customers, and so are able make trades while keeping their long- and short-term needs and/or strategies in mind. Since electronic trading is anonymous, it is impossible to acquire this knowledge. In an electronic system, it is possible for a trader to withhold information when it is to his advantage. In Open Outcry, that is not possible, since the work is concentrated in the hands of fewer people. An Open Outcry trader is kept continuously up-to-date on the activities of the market in which he trades and the activities of his fellow traders. He uses this knowledge to advise his clients in an ongoing manner. Therefore, in an Open Outcry environment, there is no need for specialized researchers, as there is in electronic trading. Research opinions come directly from the traders on the floor.

Another factor driving electronic trading on equities exchanges is the demand for 24 × 7 trading. Pat says that he sees no such demand for his commodities, so there is no need to start moving in that direction. At this time, the daily three or four hours of trading in each commodity is plenty for their markets' participants.

Pat's beliefs were demonstrated very strongly in the days that followed September 11, 2001, as trading on worldwide commodities markets was greatly reduced during the four days that NYBOT was forced to suspend trading. It turned out that the other markets were waiting for NYBOT to come back online and resume their price discovering.

Despite the obvious advantages of Open Outcry in a small commodities marketplace, it is a very expensive way of doing business. Open Outcry requires more equipment and more real estate than electronic trading. But Pat firmly believes that Open Outcry is the way to trade for their customers and their commodities. One of their competitive exchanges did do away with Open Outcry and went electronic; Pat says that that exchange has not gained any volume, and may have lost some volume to the NYBOT.

Modernizing the Open Outcry Process

Just because NYBOT has decided to stay with older methodology for their trading environment does not mean that they have decided to force their traders to use primitive tools to get their jobs done. On the contrary, since the decision has been made to stick with Open Outcry, Steve and Pat have been able to update their traders' tools, permitting them to exchange information and trade faster and more efficiently than ever before.

Above the new trading rings at 1 North End, the walls are lined with brand-new lightweight flat screen monitors. These modern 8-pound monitors replaced the ancient and very heavy monitors that lined NYBOT's older rings. Each trading pit is surrounded by roughly 80 flat-screen displays, mounted on a series of custom-designed lightweight trusses.

Figure 21.4 The new and improved trading booth.

The photograph in Figure 21.3 shows the rather bare-bones trading booths at Long Island City, where the work of research and customer contact took place. Information was shared on large message boards and monitors spread along the walls throughout the trading area. Traders and brokers were forced to scan a 70-foot-wide area to find all of the available information.

Figure 21.4 shows a prototype of the trader's booth that NYBOT installed for their traders at 1 North End. The goal is for each trader in his booth to be totally self-sufficient, with his own telephones and computer screens for internal and external connectivity along with a printer and fax machine. Traders can enter their trades in the booth instead of traveling to a common trade-entry facility. To reduce the number of crossing cables, each booth's phones are wireless. Each booth has its own lightweight overhead flat-screen monitors with displays that are totally customizable on a booth-by-booth basis. By putting monitors in each booth, Steve believes there is less eyestrain for traders, and the data that is displayed will be more useful to each trader. Pat says that they will be able to deliver more information to each trader for less money with localized displays than they can with large centralized displays.

The new site at 1 North End also has an entirely new electronic system for entering trades, a new order management system, and improved connectivity to their back office functions. Information is provided to the traders that they never had access to before, including market analysis and recommendations, news, weather, information from the other financial markets, and worldwide market conditions specific to their commodities. Traders get real-time audit trails, online risk management, and faster delivery of information. The result has been a significant cost savings, since fewer people have to handle paper in the back office, allowing the exchange to handle more volume (quicker trade closure yields more trades), which translates to additional income for NYBOT and its membership.

In addition to the upgraded displays and information sharing, NYBOT has put another significant improvement to the trading process in place. They have implemented new communication technologies, putting wireless, touch-screen PDA-like devices in the traders' hands that enable traders to receive orders automatically, without the use of a telephone, and in return, submit execution data. Orders are seen and their information is sent to the order flow provider almost immediately. Order receipt and execution turnaround completes much more quickly with these new electronic tools, which also allow NYBOT to send trading information directly to the back office for final dispensation.

Even though NYBOT has made it clear that they plan to retain Open Outcry as their trading vehicle, all of this new technology must still be sold to their traders. Concerns such as lost jobs or lost business still linger in their minds. However, where possible, NYBOT will deploy new technology strategies on a nonmandatory basis to improve its Open Outcry platform.

The Effects on the People

The time since the recovery has been a very interesting one for Pat and Steve on many levels. As a direct result of their efforts, they have been rewarded by NYBOT, with Pat having been made Senior Executive Vice President of NYBOT, and later named Interim Chief Operating Officer of the entire organization. Steve was made NYBOT's Chief Information Officer.

Even before things settled down at NYBOT, Pat and Steve started to become major industry celebrities. In the month of September 2001 alone, just the first three weeks after the terrorist attacks, NYBOT was written up over 230 times in publications and on newswires around the world, ranging from the *Wall Street Journal* and *Fortune Magazine* to *The People's Daily* in China, the *Times* of London, the *National Post* in Canada, and even *Progressive Farmer* magazine. In the months that followed, NYBOT's recovery was written up in thousands of periodicals, and was shown on television programs all around the world.

Then the conference invitations started to come in. Pat and Steve have spoken at conferences put on by The Federal Reserve Bank, The Futures Industry Association (four times), The Commodities Futures Trading Commission (three times), The Vanguard Technology Transfer Institute, and at two different VERITAS Software conferences.

In their year-end awards for 2001, *Information Week* magazine named Steve one of their co-CIOs of the Year, citing all the work that he and Pat put into their business recovery plans. They also made a point of contrasting the frantic pace of work at NYBOT with Steve's easygoing manner.

In the months that followed, requests for interviews and appearances have continued. During the week of September 11, 2002, Pat appeared on CNNfn, CNBC, the BBC, and New York City's NY1 cable news channel, and NYBOT was written up once again in dozens of newspapers and periodicals around the world.

NYBOT, led by Pat, has begun to lobby the CFTC to get all exchanges and member organizations up to certain levels of disaster preparedness. They believe that these organizations have an obligation to their customers and to the general public (who are, after all, the ultimate consumers of these commodities) to ensure that they survive disasters. Pat has taken slight advantage of some of his speaking engagements and has publicly lobbied to make these changes. Though the CFTC did not take maximum advantage of the attention that they and their efforts received during Y2K preparation to promote disaster preparedness, the CFTC has used Pat well at CFTC-sponsored forums to promote disaster preparedness, and it is hoped they will be able to get appropriate regulations in place sooner rather than later.

Shortly after the recovery was in full swing and it was clear that NYBOT would, in fact, survive, Pat Gambaro received what he believes to be the nicest compliment of all, one that put all of their efforts into perspective. "Don't just think about how your efforts managed to keep the exchange trading," Pat was told, "think, instead, of all the people who still have jobs because there is a market to sell their commodities. Think of the growers, the buyers, the millers, the clerks, the customers, and everyone else who gets their income directly or indirectly through the efforts of NYBOT. Your work ensured that all of those people continue to have a steady income, and are able to continue to feed their families."

But the loss of NYBOT would have had an even larger impact. Consumers of chocolate, coffee, cotton, orange juice, and the other commodities that NYBOT trades would all be impacted as well, either through a shortage of these commodities, or through higher prices, since the loss of NYBOT would lead to at least temporary market inefficiencies.

Despite all of the attention and accolades that they have received, Pat and Steve are remarkably humble about their accomplishments. They say that they were just doing their job. The people whose livelihoods Pat and Steve saved through their most remarkable efforts would probably have a bit more to say on the subject.

NYBOT derived another, perhaps less obvious benefit from their efforts. As they put together their plan, they were forced to take an extremely close look at how their business operates. They had to examine processes and procedures and interactions that most organizations never take the time to see. As a result, they were able to better refine existing procedures, and make their overall business more efficient.

The most important lesson that Pat and Steve learned from their endeavors is to never lose sight of their goals, and always strive to reach them. If they had given up in their attempts to build and maintain a disaster recovery site every time the Board turned down their requests for funds, NYBOT would most likely not have survived the World Trade Center attack. Pat endured a great deal of ridicule and verbal abuse in his stubborn efforts to maintain a recovery site, but he was not deterred. In the end, and without exaggeration, his and Steve's efforts allowed NYBOT to remain in business after a calamity that destroyed many less well-prepared organizations.

Summary

By just about every measure, the disaster recovery efforts at NYBOT were a smashing success. There were some problems, of course, particularly with the telephones (both the failed switch, and the undercapacity of the lines in each booth), and the lack of space around the trading floor for staging. Nobody had expected the total loss of the WTC site (like so many others, their plans assumed a temporary loss of access), and so NYBOT's disaster recovery plans did not take that into account.

Probably the most remarkable thing about NYBOT's story is simply that it is so remarkable. Not to take anything away from the job that Pat and Steve did, which was stupendous, but they got all of these accolades and attention for essentially doing their jobs. They worked very hard, and fought against the odds, and were the recipients of a healthy dose of luck, but in the end, they were simply totally successful at their jobs. As a result of their efforts, NYBOT recovered from the biggest man-made disaster that had ever struck the United States quickly, and pretty much according to plan.

If all enterprises gave disaster recovery an appropriate level of attention, instead of making it the first place from which to cut spending when budgets tighten, and if the people responsible for disaster recovery were as diligent and stubborn as Pat and Steve, these accomplishments would simply not be remarkable. They would be the norm. After all, Pat and Steve are not superhuman, and there is no reason that anybody who reads this chapter could not do exactly what Pat and Steve did.

In telling the NYBOT story, we could have spent pages discussing their networking infrastructure, hardware, and storage platforms. We chose not to. We also chose not to describe the precise method through which they got their data from The World Trade Center to Long Island City. Instead of concentrating on technology, we wanted to emphasize the preparation, the thought, the care, the attention to details, the arguments, and all of the hard work that went into NYBOT's effort.

How many enterprises could not only survive the total destruction of their headquarters and data center, but be back online in less than 12 hours, with their business and customers essentially intact? Could yours?

CHAPTER

22

A Brief Look Ahead

All probabilities are 50%; either a thing will happen, or it won't.
—Colvard's Premise

Computers in the future may weigh no more than 1.5 tons.
***—Popular Mechanics* magazine, 1949**

The future becomes completely clear just after it arrives.
—Evan Marcus

What sort of self-styled industry pundits would we be if we didn't take a look at the future? In this chapter, and in no particular order, we take a quick look at a number of technology trends that we think are going to be important, or at least interesting and relevant, to the field of high availability over the next few years.

Please note that all predictions are based entirely on the information that was available to us when the book went to press. When you are zipping around in your flying car several years from now, and you read this book and see how ridiculous these predictions look in retrospect, please be kind.

iSCSI

Internet SCSI, or iSCSI, is a network-based protocol for sending SCSI commands and data over TCP/IP networks. Traditional SCSI, as we discussed back in Chapter 7, "Highly Available Data Management," is limited to very short distances, but through the use of iSCSI, the same functionality can be