

**OFFICE OF NEW YORK STATE  
ATTORNEY GENERAL  
ELIOT SPITZER**



**FROM WALL STREET  
TO  
WEB STREET:**

**A REPORT ON THE PROBLEMS AND  
PROMISE OF THE  
ONLINE BROKERAGE INDUSTRY**

**PREPARED BY:**

**INVESTOR PROTECTION  
AND SECURITIES BUREAU**

**INTERNET BUREAU**

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## I.

### EXECUTIVE SUMMARY

The complex world of trading securities in cyberspace is truly booming. Indeed, the growth rate of the online brokerage industry is astonishing even in the realm of e-commerce. During the first quarter of 1997, online trades comprised just over 7% of total trading volume. By the first quarter of 1999, this percentage had more than doubled. Online trading grew nearly 50% during that quarter alone, with one in six equity trades occurring online. Analysts project that one in every four trades will take place online by the end of 2000. As of January 1999, there were approximately seven million online brokerage accounts open. By July 1999, there were approximately ten million.

Online trading is revolutionizing the securities industry in several critical ways. The advent of the online brokerage industry is fundamentally changing the relationship between broker-dealers and their customers by allowing individuals to manage their own investments in a manner never before possible. Members of the public can now readily access a range of sophisticated research materials and financial data -- once available only to market analysts -- directly from the websites of most online trading firms. Equipped with this information, investors can, if they choose, make an independent evaluation of stock performance. Investors can also place their trades without the assistance of a registered securities representative by entering an order and transmitting it to an online firm for execution by traditional mechanisms.

The easy availability of these online services is also democratizing the securities industry. Per trade costs are dropping dramatically for individuals who use online brokers, both at firms that provide online services exclusively, and at those that provide a mix of traditional full-service trading and online options. As a result, those who might have found the charges of a full-service brokerage firm prohibitive can now be active participants in the securities trading arena.

This migration of trading services to cyberspace holds great potential for investors, as well as for the securities industry as a whole. Yet, the explosive growth of this industry also poses unique risks to the public, and presents tough challenges to regulators charged with ensuring the integrity of the trading environment.

These risks were acutely apparent during a rash of system slowdowns and outages experienced by numerous online brokerage services earlier this year. Within the first quarter of 1999, the New York Attorney General's Office received a dramatic surge in complaints from investors affected by these slowdowns and outages. Investors identified a range of problems, including an inability to access online trading services, delayed executions of trading orders, and inadequate dial-up customer service. These delays resulted in some investors paying tens of thousands of dollars more for stock than they expected to when they placed their trades online.

Pursuant to his authority under New York's securities and consumer protection statutes, Attorney General Eliot Spitzer initiated an inquiry of numerous firms in the online

brokerage industry. As part of this inquiry, the Attorney General's Office reviewed over 120,000 pages of documents provided by the firms, spoke with dozens of online brokerage firm representatives and experts regarding information systems and online trading practices, and visited firms at twelve sites located in five different states.

This Report sets forth the results of our extensive nine month inquiry into the practices of seven online brokerage firms and three industry participants. Online brokerage firms are identified in the Report in those circumstances where information was derived from publicly available sources, regardless of whether the firm was part of our inquiry. However, the Office has chosen not to identify firms -- which have had no opportunity to review this Report before its release -- when discussing potentially proprietary information gathered in the course of our confidential inquiry.

The Office identified several factors, each briefly summarized below, which contributed to the online brokerage performance problems and investor dissatisfaction. This Report sets forth these findings, makes recommendations to the industry and investors, and discusses investor education initiatives which the Attorney General and the Securities Industry Association have agreed to put in place. While the Office has not commenced any enforcement actions regarding these events, we will continue to monitor the performance of online brokerage firms.

## **A. Investor Expectations and Advertising**

The Attorney General's Office identified a significant gap between the expectations of online brokerage firm customers and the services that online brokerage firms provide. Complaints received by this Office indicate that many novice online investors expect unfettered, direct, and immediate market executions. Online brokers, for their part, can provide investors with only a faster mechanism for placing orders -- and, at that, a mechanism vulnerable to occasional failures and slowdowns.

This "expectation gap" is in part being fueled by the aggressive advertising campaigns being waged by online brokerage firms. Many of the advertisements for online brokers -- a common sight on billboards, on television, and in numerous publications -- convey a message of convenience, speed, easy wealth, and the risk of "being left behind" in the online era. These themes ignore several critical facts about online trading, which we discuss in the "Recommendations to Investors" section below.

A better understanding of these constraints, and the resulting periodic system slowdowns and outages, will allow investors to craft their investment strategies with a full understanding of the limitations of online trading. For their part, online brokerage firms should ensure that advertisements do not foster unrealistic expectations about the potential of online trading, and undertake the education initiatives detailed below.

The tremendous surge in advertising also raises another troubling concern: Can the firms adequately service new customers, especially if the increase in accounts exceeds

the firms' expectations? Online brokerage advertising budgets have ballooned over the past two years, which has generated a tremendous increase in total trading volume and the number of customer accounts. As the slowdowns and outages of this year indicate, however, many online brokerage firms were not prepared to handle this increased demand. While several firms responded to these difficulties by responsibly decreasing advertising activity, not all firms acted in this manner. In light of the extraordinary increases in advertising dollars budgeted for the coming year, online brokerage firms should consider whether the capacity of their trading systems will permit them to adequately handle the influx of new accounts that will likely result from this additional spending.

**B. Moving Online: Shortcomings in Online Brokerage Disclosures and Information Systems Performance**

As the slowdowns and outages of this year demonstrate, the migration of trading to an online environment has encountered several significant glitches. These system slowdowns and outages appear to be related to an unprecedented surge in demand. During the period when this Office's complaint volume spiked, total online trading volume was also skyrocketing -- a "blowout," as one analyst described it. The online brokerage industry had not anticipated investors' appetite for online trading of Internet "dot.com" stocks, and the accompanying increase in demand pushed many of the firms' information systems beyond capacity. Another complicating factor was the substantial volatility in certain sectors, particularly high-tech stocks. Prices for numerous stocks fluctuated wildly during this period, compounding the adverse consequences for investors of any delays in accessing an

online brokerage firm's website or in executing a trade. A final factor was the unprecedented rate at which individuals signed up for online services, including online brokerage accounts.

A central focus of our inquiry was determining why these failures occurred. It is extremely difficult to identify and assess what makes a particular firm's information systems inadequate. Each system is comprised of numerous complex components, any one of which can become a bottleneck that constrains the firm's overall ability to accommodate customer demand. The firm's operational capacity is therefore inevitably limited by its weakest link, even if virtually every other component operates at a low percentage of available capacity. Furthermore, the percentage of an information system's capacity utilized by customers generally varies throughout the day, reaching "high points" at market open and close. Thus, capacity that may be sufficient to accommodate trading volume during much of the day may not be adequate during these narrow windows of high demand.

Our review also identified potential deficiencies in each "tier," or major component, of online brokerage information systems, and revealed how those deficiencies contributed to the performance slowdowns and outages that occurred earlier this year. The problems we found included:

- Deficiencies in the "front end" of online brokerage information systems, which provides the web interface used by online brokerage customers. Front-end hardware was in some instances insufficient to handle high-volume traffic. Moreover, some firms used older software to handle their front-end tasks, which is not optimal for

high-volume web traffic and can slow system performance. Customer log-in posed particular problems for online brokerage firms. Log-in times were further delayed by capacity constraints on databases that are essential to the log-in process.

- Deficiencies in the “middleware” component of online brokerage information systems, which routes messages back and forth between the front and back ends of the system. Capacity constraints on the number of messages that could be routed, as well as software bugs, adversely affected customer response times.
- Deficiencies in the “back end” of online brokerage information systems, which controls order routing, the vetting of trade orders, and maintenance and updating of customer accounts. Of particular concern were deficiencies observed at service bureaus to which online and offline firms outsource back-end processes.
- Limitations in the back-up systems utilized by online brokerage firms, which could adversely affect their ability to function in the event of system failures.
- Inadequate access to customer service support, which is particularly critical when online systems are delayed or down.

The Office also identified a number of constraints on firm capacity, including

the following:

- A number of online brokerage firms rely upon mainframe computer systems originally designed for use by brokers employed by the firms themselves, and not intended for 24 hours-a-day, 7 days-a-week high-volume transactions that involve a direct interface with customers.
- The architecture of online brokerage information systems

may limit their “scalability,” or ability to grow as customer demand increases.

- Physical limitations, including adequate space, power, and cooling needs, may also constrain the ability of online brokerage firms to expand their information systems as needed.
- Online brokerage firms may find it difficult to hire and train highly-skilled technical staff, which is critical to the expansion of information systems capacity.

The delays experienced by online customers were caused not just by these technological deficiencies, but also by the actions taken by online brokerage firms -- without any notice to their customers -- in response to these problems. Some of the deficiencies discovered through our intensive nine month inquiry where disclosure to customers would have been appropriate include the following:

- Because of capacity bottlenecks which developed as the result of a heavy concentration of trading activity in a small number of securities, one firm “blocked” the placement of online orders for those securities, and instead required orders for those securities to be called in by phone, so as to slow the order flow.
- Due to heavy trading volumes, and a belief by one firm that some investors were inappropriately using order modifications and cancellations during market hours, that firm disabled the on-screen buttons, thereby preventing all online customers from canceling or modifying their orders.
- Many firms do not update certain customer account information to reflect the day’s transactions until after the market has closed. At those firms, the account buying power, portfolio value and other critical

information will be outdated, often reflecting the account information from the previous day's close. We discovered that due to the use of this outdated information, investors were able to make purchases which exceeded their margin buying power and/or other account limitations at the time that those purchases were made. We also found that investors were able to make securities purchases from self-directed IRA accounts which exceeded the value of those accounts, thereby obligating investors to make additional, and often unintended, IRA contributions.

- Although touch-tone trades offer investors an alternative method for submitting orders when a company's website is inaccessible, because some firms route touch-tone orders through the same system as online orders, an outage which prevents online orders from being executed may likewise prevent touch-tone orders from being executed.
- We discovered that during times of high trading volume, one firm would utilize system operators to reduce the number of "ports" available for the order entry process, thereby slowing the flow of orders by preventing some customers from completing the order entry process in a timely manner.

Because we believe that better disclosure is vital to ensuring that investors make informed decisions, the "Recommendations to the Industry" section below discusses disclosures that we believe firms should make to online investors.

### **C. Moving Forward: Improving Online Brokerage Risk Management**

We found that many of the specific technical deficiencies that led to slowdowns and outages earlier this year have, for the most part, been remedied. But our dialogue with the industry also revealed that the risk management procedures utilized by

online brokerage firms should be strengthened to avoid recurrence of similar problems in the future, especially as online trading volume continues to expand.

It is worth noting that the observed slowdowns and outages are symptomatic of failures that have been, and in all likelihood will continue to be, experienced generally by e-commerce firms, communication providers, and even the stock exchanges themselves. The susceptibility of “mission critical” information systems to temporary failure has elevated the industry’s awareness of the need to adopt risk assessment and mitigation strategies. This process is particularly important for online brokerage firms and other financial institutions, where customers demand extraordinarily high performance because delays may prevent them from taking advantage of market conditions -- or worse, expose them to market harm.

Our review also confirmed the need to improve online brokerage risk assessment and mitigation strategies. The inquiry revealed that mission critical failures generally occurred when online brokerage firms sought to develop and deploy new software applications and hardware upgrades, especially when the firms sought to introduce applications and upgrades amidst a highly pressured environment and without adequate technology development processes. Such a “cowboy mentality,” as one academic terms it, seems endemic to the e-commerce world, which frequently directs resources at quick fixes and lightening-fast deployment of new business applications. The focus on speed, however, tends to elevate concerns in the highly-regulated arena of securities trading. Inadequate quality assurance and risk assessment practices in these circumstances may lead to the

interruption of online transaction processes which, as we have seen, can have adverse economic consequences for both the online brokerage firm and its customers.

The occurrence of numerous mission critical failures, and the obvious need to minimize the future prospects of such failures, raise several questions that online brokerage firms should consider. Specifically:

- What are the “best practices” for maintaining a continuous (24 hours-a-day, 7 days-a-week) online transaction processing system, and for moving from an older information systems platform to a newer, more scalable and robust one?
- What are the “best practices” for identifying and mitigating risks when new mission critical software is continuously being introduced to an enterprise?
- When a new application is internally developed, what are the “best practices” for ensuring that the software will deliver requisite functionality, with appropriate quality assurance?
- What are the “best practices” for pre-testing system changes, whether internally developed or purchased from an outside vendor, to evaluate their prospective impact on overall system performance and stability?
- What should an online brokerage firm disclose about system problems it encounters, and at what point should such disclosure occur?
- What role should management and the Board of Directors play in this process?

#### **D. Recommendations To The Industry**

The Attorney General’s Office is making several recommendations that will

facilitate the responsible growth of online investing.

- Telling the truth about technology and services. At present, current and prospective online brokerage customers have only limited information about available technology and services. Assuring investors that a sound technological foundation supports online brokerage generally, and persuading them that this foundation can successfully accommodate future demand, will require additional disclosure about online brokerage information systems. The public should be able to understand and compare the service quality offered by various online brokerage firms. We believe this goal is best accomplished by mandating disclosure standards which allow for “apples-to-apples” comparisons of technology performance, customer services, and technology development processes, preferably through a combination of standardized self-reporting and independent third party reviews.
- The firms themselves should assess and improve their quality assurance processes. Online brokerage firms should consider using models widely recognized in the computer industry, such as CMM or ISO 9000, to fully assess their own software development processes.
- Online brokerage firms should improve the disclosure of certain events that may occur in the course of trading. Specifically, firms should disclose slowdowns or outages as they occur, in a prominent and easily-accessible location on the affected firm’s homepage. Firms also should notify customers of heightened margin requirements, limitations on customer account buying power, and order cancellation procedures. Furthermore, investors should be informed of market conditions, such as extreme volatility, which might affect customer trading practices. Finally, the industry should seek to dispel, not foster, certain investor

misconceptions. For instance, the industry should clearly inform customers that there is no direct access to stock markets; that mere submission of an order does not mean the order has been executed; that account updates are not instantaneous; and that market orders, as opposed to limit orders, may expose investors to significantly greater liability in fast moving markets.

- While government should avoid placing regulatory “handcuffs” on the online brokerage industry, several specific and narrowly-tailored changes should be considered by the SEC and self-regulatory bodies such as the NYSE and NASD. Specifically, these entities should consider adopting requirements regarding the documentation and retention of system outage information, system performance standards, and customer service data. Regulatory bodies might also consider whether it is appropriate to require an effective and accountable process for online brokerage capacity planning; to provide further guidance regarding disclosure of online brokerage information system capacity and reliability; and to mandate disclosure of online brokerage spending on information systems technology.

#### **E. Recommendations to Investors**

Although online investing is undeniably an excellent opportunity and tool, investors should note the following caveats before they trade:

- Clicking the mouse is easy, but making sound investment decisions is not. Nothing can substitute for good old fashioned research and education. Investments are not sound just because they are easy to make.
- “Making a trade” with a click of the mouse is not the same as executing the trade. The technology is not instantaneous -- it still requires navigation of several market layers and can encounter delays before the stock

is actually purchased or sold.

- Cheap, easy, and frequent trading does not equal successful trading. Trading over and over again may be a good strategy for some, but making long-term, sound investments is still the best course for most investors.
- Speed, access, and reliability of online services is dependent on system availability, and will inevitably be subject to occasional delays. The computer screen an investor sees still has complex functions behind it that may, at times, fail. The technology, while wonderful, is not infallible.
- Contrary to frequently encountered advertising rhetoric, online investors are not connected “directly to the markets.” Online trading simply gives the investor the opportunity to place the trade in the firm’s trading system, a function previously performed by a broker.
- Trading fees may be more complicated and expensive than they appear. Investors need to read the fine print to see the cost of the trades they anticipate making.

#### **F. Attorney General’s Plan of Action and Investor Education Initiatives**

Working with the Securities Industry Association (“SIA”) during the upcoming year, the Attorney General will pursue certain important industry and educational initiatives. In addition, the Attorney General intends to continue this inquiry in discrete areas, by collecting more information about investor attitudes and needs, as well as by proposing round table discussions on the e-commerce issues raised in this Report. The Attorney General’s initiatives include:

- The formation of an Online Brokers Committee. The

SIA, working with the Attorney General, will form a committee dedicated to the particular issues confronting online brokers. The committee will be comprised of senior legal counsel of the top online firms and will meet regularly to discuss these issues and foster improved investor education.

- In conjunction with the Attorney General's Office, the SIA will publish educational materials for national distribution to assist online investors.
- The SIA committee and the Attorney General's Office will create and fund full page advertisements to appear in major newspapers, both across the State of New York and the nation. The intended purpose of the advertisements will be to educate present and future online investors regarding the benefits and pitfalls of online trading.
- The Attorney General's Office and top online firms will post the SIA educational materials on their websites.

\* \* \*

While the Attorney General's Office believes that the online brokerage industry can yield tremendous benefits for all participants -- investors, the corporate community, and brokerage firms themselves -- we also are firmly convinced that the industry must be responsive to the legitimate concerns voiced by online brokerage customers. The online brokerage industry can achieve this goal by ensuring that online brokerage advertising does not mislead investors about the limits and mechanics of online trading; by engaging in proactive investor education about the risks and limitations of online trading; by continuing to remedy technological constraints on online brokerage information systems capacity; by

implementing responsible risk assessment practices; and by disclosing relevant information to the public about the strengths and weaknesses of firms' information systems. In turn, the Attorney General will continue to work with and monitor the industry in order to ensure that these goals are met and that investors and markets are adequately informed and protected.

## II.

### BACKGROUND

#### A. The Market Storm of 1999 -- the Outages and Customer Complaints of Online Trading

If the 4th quarter of 1998 was a record quarter for the online industry, then the 1st quarter of 1999 was quite simply a complete blowout. Surprising almost everyone in the industry (including most capacity planners at online trading firms), online trading volumes surged to an all-time record level of 499,476 trades/day. This represents an amazing 47% sequential growth rate, which comes on the heels of a record 34% sequential growth rate in [the fourth quarter of 1998] and is therefore the single highest sequential growth rate . . . ever recorded for the industry.<sup>1</sup>

While online trading levels skyrocketed during the first quarter of 1999, the general market volumes grew a mere four to five percent over the same period of time.<sup>2</sup> During the first quarter, one out of every six securities transactions occurred online.<sup>3</sup> This unprecedented growth in the online trading sector was complicated by volatile markets within the Internet sector, which created fast moving prices that fluctuated wildly. Especially prevalent from late 1998 to the spring of 1999, the combination of volatile markets and huge trading volumes created an unpredictable “Market Storm,” as the frenzied activity of this

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<sup>1</sup> “Online Trading Quarterly: 1st Quarter 1999,” Credit Suisse First Boston Report, June 1999.

<sup>2</sup> Id.

<sup>3</sup> Id.

period has been dubbed.

These factors certainly contributed to a rash of outages experienced by numerous online trading firms. In fact, most of the large online brokers had some sort of technological difficulties during the first few months of 1999. A few of the more prominent examples include:

- Discover Brokerage Direct's (now known as Morgan Stanley Dean Witter Online, but referred to herein as "Discover") voluntary disabling of its website numerous times during the week of January 11 through the 15, in order to "dig out from under the crush of orders";<sup>4</sup>
- TD Waterhouse Securities, Inc.'s ("Waterhouse") difficulties with its trading systems for two straight days on January 12 and 13, for a combined total of over one and a quarter hours of inaccessibility;<sup>5</sup>
- DLJdirect's service disruption for three hours and thirty minutes on February 1;<sup>6</sup>
- E\*Trade Securities, Inc.'s ("E\*Trade") three consecutive days of service disruptions of varying duration from 30 minutes to over two and a half hours from February 3 to February 5;<sup>7</sup>

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<sup>4</sup> Buckman, "As Web Traffic Jumps, Brokers Run Into Jam," Wall St. J., January 15, 1999, at C1.

<sup>5</sup> Olmstead, "Today's Wild Market Spawns More Grief For Online Brokers," The Street.com, January 13, 1999 <<http://www.thestreet.com/stocks/trading/642888.html>>

<sup>6</sup> Simon, "E-Broker Outages Are Difficult to Track," Wall St. J., November 15, 1999, at C1.

<sup>7</sup> Thurm, "For Frazzled Online Brokers, Technology Is the Problem," Wall St. J., March 4, 1999, at B6.

- Charles Schwab & Co., Inc.’s (“Schwab”) February 24 and March 1 outages of 90 minutes and 20 minutes, respectively;<sup>8</sup> and
- National Discount Brokers’ (“NDB”) service disruption for approximately four hours on April 21.<sup>9</sup>

Public announcements of system difficulties have now become common in the marketplace. While there are now approximately 150 online brokers, the media predictably focuses on reporting outages of the top 10 online brokers with the largest market share. While there have been significant improvements from the first quarter of 1999, reported outages for both the online and traditional firms are still frequent enough that just this month an analyst commented that “the reality is everybody’s site crashes about once a week.”<sup>10</sup> A few of the more recent outages include:

- An almost six hour outage suffered by Waterhouse on September 3, 1999;<sup>11</sup>
- Fidelity Investment’s two hour and 34 minute outage on September 10, 1999;<sup>12</sup>

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<sup>8</sup> Thurm, “For Frazzled Online Brokers, Technology Is the Problem,” Wall St. J., March 4, 1999, at B6.

<sup>9</sup> Simon, “E-Broker Outages Are Difficult to Track,” Wall St. J., November 15, 1999, at C1.

<sup>10</sup> McGeehan, “Merrill Lynch Has Trouble Processing Trading Orders,” N.Y. Times, November 10, 1999.

<sup>11</sup> Simon, “E-Broker Outages Are Difficult to Track,” Wall St. J., November 15, 1999, at C1.

<sup>12</sup> Simon, “E-Broker Outages Are Difficult to Track,” Wall St. J., November 15, 1999, at C1.

- An almost two and a half hour outage at Schwab on October 20, 1999, the same day Schwab began offering its customers the ability to engage in after-hours trading;<sup>13</sup>
- An outage at Merrill Lynch of approximately three hours on November 9, 1999, due to a problem with its mainframe computer.<sup>14</sup>

Indeed, there is no such thing as a glitch-free site,<sup>15</sup> and understandably online brokers will continue to suffer problems with their trading systems.

### **B. Attorney General's Receipt of Complaints**

Concurrent with the "Market Storm," there was a dramatic surge in complaints received by the Office of the Attorney General Eliot Spitzer from investors who were experiencing problems with their online brokerage services. At the same time the online trading industry itself was growing at an astonishing rate, investors were reporting serious difficulties with their online brokerage services that exposed the investors to real and potential financial harm. Investors identified a range of problems, including an inability to access online trading services; delayed executions of orders; failure to provide best execution of a trade; inadequate staffing and training of dial-up customer service; inaccurate entry of trade orders; and execution of orders beyond the account buying power. Regardless of the

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<sup>13</sup> "Online Broker Schwab's System Down Temporarily," Yahoo News, October 20, 1999, <[http://dailynews.yahoo.com/h/nm/19991020/ws/schwab\\_down\\_1.html](http://dailynews.yahoo.com/h/nm/19991020/ws/schwab_down_1.html)>

<sup>14</sup> Id.

<sup>15</sup> Simon, "E-Broker Outages Are Difficult to Track," Wall St. J., November 15, 1999.

level of investment experience and background of the complainants, or the characteristics of their trading orders, the kind of problems detailed in the complaints received by the Attorney General during this time appeared to be recurring in nature.

### **C. Online Survey of the Attorney General**

From early February to late May of 1999, the Attorney General made available on his website<sup>16</sup> an online survey that could be completed by investors who had engaged in online trading. The questions included in the survey were designed to assess an investor's investment experience, trading frequency, and any problems the investor might have experienced with an online trading firm. Overall, of the nearly 400 individuals who responded to the survey, over 75% reported problems with their current online brokerage service.<sup>17</sup> In addition, the overwhelming majority of problems reported by investors were "inability to access the broker's website," and "excessive delays in order processing and execution."

In order to paint a complete picture, respondents were asked a number of

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<sup>16</sup> The Attorney General's website can be located at "www.oag.state.ny.us."

<sup>17</sup> The survey asked, "Have you experienced problems with your current online brokerage service?" The survey respondent was then offered the option of clicking on one of three choices (Yes; No; Does Not Apply). The survey also asked, "Who is your online broker?" The survey respondent was then provided with a drop-down menu of 12 online brokerage firms which represented some of the largest online brokers in the industry at that time (Ameritrade; Citicorp; Datek Online Brokerage Services, Corp. ("Datek"); DLJdirect; E\*Trade; NDB; Schwab; Muriel Siebert & Co., Inc. ("Siebert"); Suretrade; Trading Direct; Web Street Securities; Waterhouse). In order to capture firms that were not named in the drop-down menu, an "other" category was also included.

questions designed to assess their trading experience. An analysis of this data indicates that neither prior investment experience, nor frequency of online trading appear to affect the likelihood of confronting difficulties during the trading process. In fact, nearly three-quarters (73%) of those individuals trading only one to five times per year reported problems with their online brokerage service and an almost identical proportion (72%) of those trading more than fifty times per year also reported problems. Additionally, the trading experience of those survey respondents that had experienced problems with their online brokerage firms was evenly divided across the board, with almost the same number of people having been engaged in online trading for less than 6 months, as those who had been engaged in online trading for over 2 years. Thus, although a self-selected group, nearly three-quarters of all survey participants reported experiencing problems regardless of the frequency or the length of time for which they used an online brokerage service.

The survey results seem to indicate that investor inexperience is not a major factor in causing inability to access a website and dissatisfaction with firms' order processing and execution speeds. While it is difficult to ascertain from the survey results whether these problems resulted from difficulties suffered by the online broker, the online investor, or some other entity such as the online investor's Internet Service Provider, the market makers to whom the online brokerage firms route their orders, or the exchanges themselves, the vast majority of online investors who chose to answer the survey apparently suffered some significant level of dissatisfaction with the online trading process during the

relevant time period.

#### **D. Power of the New York State Attorney General**

The Attorney General has broad responsibilities under state law for ensuring the integrity of securities trading. The Martin Act sets forth the statutory framework governing the offer and sale of securities in and from New York State, as well as the Attorney General's broad investigatory and prosecutorial powers.<sup>18</sup> Section 352 of the Martin Act authorizes the Attorney General to investigate any "fraudulent practice" in connection with "the issuance, exchange, purchase, sale, promotion, negotiation, advertisement, investment advice or distribution within or from [New York] state." The Act defines "fraudulent practices" in a sweeping manner,<sup>19</sup> and case law stresses the breadth of

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<sup>18</sup> See Gen. Bus. Law, Art. 23-A.

<sup>19</sup> As defined in the Act, "fraudulent practices" includes the use of "any device, scheme, or artifice to defraud or for obtaining money or property by means of any false pretense, representation, or promise"; the use of "any deception, misrepresentation, concealment, suppression, fraud, false pretense or false promise"; and engaging in "any practice or transaction or course of business relating to the purchase, exchange, investment advice, or sale of securities . . . which is fraudulent or in violation of law and which has operated or which would operate as a fraud upon the purchaser."

Section 352-c of the Act further prohibits "any fraud, deception, concealment, suppression, [or] false pretense"; "any promise or representation as to the future which is beyond reasonable expectation or unwarranted by existing circumstances"; and "any representation or statement which is false, where the person who made such representation or statement: (i) knew the truth; or (ii) with reasonable effort could have known the truth; or (iii) made no reasonable effort to ascertain the truth; or (iv) did not have knowledge concerning the representation or statement made; where engaged in to induce or promote the . . . exchange, sale, negotiation or purchase within or from this state of any securities or commodities."

the Attorney General's authority to protect the investing public.<sup>20</sup> Upon learning of a potential fraudulent practice, the Attorney General may commence an investigation, subpoena witnesses and examine them under oath, and file civil and criminal proceedings.<sup>21</sup>

Moreover, under the state consumer fraud statutes, the Attorney General has enforcement authority to enjoin "Deceptive Acts and Practices," and "False Advertising," directed at consumers. Gen. Bus. Law §§ 349, 350. These statutes are patterned upon the anti-fraud provision of the Federal Trade Commission Act, 15 U.S.C. § 45. Although the individual purchase or sale of securities has generally fallen outside the ambit of consumer protection statutes, recent case law affirms that New York's consumer protection statute applies "to virtually all economic activity." Karlin v. IVF America, Inc., 690 N.Y.S.2d 495 (1999).<sup>22</sup> The advertisements of online broker services are directed to the consumer public

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<sup>20</sup> See, e.g., People v. Federated Radio Corp., 244 N.Y. 33, 38-39 (1926) ("the words 'fraud' and 'fraudulent practices' should . . . be given a wide meaning so as to include all acts, although not originating in any actual evil design or contrivance to perpetrate fraud or injury upon others, which do by their tendency to deceive or mislead the purchasing public come within the purpose of the law"); People v. F.H. Smith, Co., 243 N.Y.S. 446 (1930) ("The [Martin Act] is remedial in nature, and was passed to protect the inexperienced, confiding and credulous investor, and . . . should, therefore, be liberally and sympathetically construed in order that its beneficial purpose may, so far as possible, be attained."); Gardner v. Lefkowitz, 97 Misc. 2d 806, 412 N.Y.S.2d 740 (S. Ct. Special Term NY Co., 1978) ("The Martin Act (New York State) and the Securities Acts of 1933 and 1934 (Federal) are virtually identical in their design and scope, and the purpose for which they were enacted. Both were intended to be used in the prevention of the various kinds of deceptive practices and fraudulent schemes which developed side by side with the growth of the securities industry.")

<sup>21</sup> Gen. Bus. Law §§ 352(1), (2), 352-c.

<sup>22</sup> While Gen. Bus. Law §§ 349, 350 and the Martin Act may premise an Attorney General action or inquiry, private class suits may no longer be viable against online brokers who are public companies. In Abada v. Charles Schwab & Co., Inc., 1999 WL 787448 (S.D. Cal. Sept. 7,

at-large. Such advertising of services goes beyond that of fact-specific one-on-one securities transactions, and promotes the sale of market and company research, margin loans, and other non-securities sales related products.<sup>23</sup>

### **E. Conduct of the Attorney General's Inquiry**

In response to the complaints received by this Office and general public concern about the firms' repeated outages, in February 1999 the Attorney General initiated an inquiry of seven firms that provide online brokerage services, as well as three other industry participants (cumulatively referred to as "firms"). These firms were selected because they possessed a meaningful market share in the online trading industry, and because the Attorney General's Office had received complaints about the particular retail firms. Together, the firms held more than three-quarters of the industry's market share.<sup>24</sup> The

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1999), removal of a state unfair trade practices class complaint of Schwab customers purportedly harmed during the November 13, 1988 IPO trading of "theglobe.com" was sustained by virtue of the preemption provisions contained in the Securities Litigation Uniform Standards Act of 1998. 15 U.S.C. § 78bb(f).

<sup>23</sup> The New York Court of Appeals case has held that the legislative purpose in enacting Gen. Bus. Law § 349 was to complement the definition applied by the Federal Trade Commission ("FTC") to its anti-fraud provision, 15 U.S.C. § 45. Oswego Laborers' Local 214 Pension Fund v. Marine Midland Bank, 85 N.Y.2d 20, 27, 623 N.Y.S.2d 529 (1995). The FTC in evaluating claims has scrutinized express claims, implied claims, and the sufficiency of fine print written disclosures. See Kraft, Inc., 114 F.T.C. 40, 120 (1991), aff'd 970 F.2d 311 (7th Cir. 1992), cert. denied, 113 S.Ct. 1254 (1993); Cliffdale Associates Inc., 103 F.T.C. 110, 180 (1984). Furthermore, the mere fact that words and sentences may be literally and technically true does not prevent their being framed so as to mislead or deceive. Koch v. FTC., 206 F.2d 311, 317 (1953) (citing Bockenstette 134 F.2d 369, 371 (1943)).

<sup>24</sup> Market share calculation as of the 4th quarter of 1998, based upon total average daily trades. "Online Trading Quarterly: Fourth Quarter 1998," Credit Suisse First Boston Report, p. 7.

Office's selection of certain firms and exclusion of others in no way implies any conclusions about the practices of other online trading firms.<sup>25</sup> Rather, the Office decided to confine its inquiry to firms that constituted a large percentage of market share and about which it had received a certain number of complaints.<sup>26</sup>

The Attorney General requested a range of materials from each of the subject firms, including information regarding advertising and other promotional activities; the terms and conditions of agreements between the firm and its customers, whether set forth in contract, disclosure forms, or on the firm's website; the firm's process for completing online securities transactions; projections of future account growth; customer service, including dial-up customer service; disclosures made to consumers by the firm regarding system delays or risks attendant to online trading; the reliability, availability, and responsiveness of the online services; and evaluations of mission critical computer systems.

The Attorney General's Office amassed and reviewed over 120,000 pages of documents provided by the firms, their customers and other sources; spoke at length with

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<sup>25</sup> In fact, it is worth noting that other firms with a substantial market share who were not subjects of the Attorney General's investigation also experienced outages over the past several months.

<sup>26</sup> The Attorney General's investigation did not address the unique regulatory and enforcement concerns posed by "day trading," which involves the speedy purchase and sale of a stock within a very short period of time (often minutes), in order to make a profit on small shifts in the stock's price. Although the trades of remote (as opposed to on-site) day traders certainly contribute to the demand for online trading services and the total volume of trades placed through an online brokerage firm, day trading presents unique risks which are not addressed in this report. The Office also elected not to address within this investigation specific types of securities frauds that often arise on the Internet (e.g., the offering of fraudulent stock or stock manipulation schemes).

representatives of various firms in the online brokerage industry regarding their information systems and online trading practices in nearly two dozen meetings; and made fourteen on-site visits to various firms in five different states. The Office also provided each firm with an opportunity to respond to our concerns about the adequacy of information systems capacity, disclosures to online investors, and planning for expanded investor demand.

#### **F. Actions by Other Regulatory Bodies**

Many agencies and legislators have begun to address emerging issues in the changing environment of online trading. The dialogue between regulators and the online brokerage industry should continue.

As the primary regulatory authority over the nation's securities markets, the Securities and Exchange Commission ("SEC") has been examining the impact of online trading on the securities industry. Although no prescriptive regulatory guidance has been provided to date on this subject, SEC Chairman Arthur Levitt warned online investors during the height of the Market Storm to exercise caution and to use limit orders during periods of market volatility.<sup>27</sup> Chairman Levitt has also directly addressed the issue of advertising by online brokerage firms. On May 4, 1999, he criticized the industry for exaggerating the advantages of online trading in advertising campaigns.<sup>28</sup> SEC Commissioner Laura Unger

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<sup>27</sup> Statement concerning Online Trading, Chariman Arthur Levitt, January 27, 1999 <<http://www.sec.gov/news/press/99-9.txt>>.

<sup>28</sup> Levitt, "Plain Talk about On-line Investing," Natl. Press Club, Wash., D.C., May 4, 1999 <<http://www.sec.gov/news/speeches/spch274.htm>>; SEC Press Release, May 4, 1999 <<http://www.sec.gov/news/press/99-43.txt>>.

also has held a series of discussions with representatives of the online brokerage industry over the past several months regarding online trading and is concurrently releasing a report regarding these round table discussions.<sup>29</sup>

Similarly, the National Association of Securities Dealers (“NASD”), a self-regulatory group that oversees its broker-dealer members of NASDAQ, is also examining the online trading industry. This year the NASD stressed the importance of educating investors about the limitations of online brokerage.<sup>30</sup> The NASD has also issued guidance to members on their responsibility to ensure adequate technological capacity to handle customer demand, particularly during periods of high market volatility.<sup>31</sup> For example, NASD members were advised in February 1999 that they “should consider disclosing that high volumes of trading at market opening or intra-day may cause delays in execution and executions at prices significantly away from the market price quoted or displayed at the time the order was entered.”

The North American Securities Administrators Association (“NASAA”), which includes representatives of state securities agencies across the country, is also examining a

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<sup>29</sup> Unger, “SEC Update: Closing the Millenium on an Uptick,” Security Traders Assn., March 24, 1999 <<http://www.sec.gov/news/speeches/spch262.htm>>.

<sup>30</sup> NASD, “Guidance to Investors Regarding Stock Volatility and On-line Trading,” January 26, 1999 <<http://www.nasdr.com/2545.htm>>; NASD Notice to Members 99-11, “Guidance Regarding Stock Volatility,” January 25, 1999 <<http://www.nasdr.com/pdf-text/9911htm.txt>>.

<sup>31</sup> NASD Notice to Members 99-12, “Guidance Concerning the Operation of Automated Order Execution Systems During Turbulent Market Conditions,” January 25, 1999 <<http://www.nasdr.com/pdf-text/9912htm.txt>>.

number of issues related to online trading. NASAA recently issued a report regarding day trading, and has recommended that the online brokerage community address several issues relating to online investing: (1) whether online brokerage firms have sufficient infrastructure to allow for continued growth; (2) whether the firms' aggressive advertisements regarding availability of online trading services are "creating false impressions," and whether the firms are "keeping faith with their customers by adding capacity in advance of increase demand"; (3) what obligations online brokerage firms have to customers in the event of an outage; (4) whether online brokerage firms have any suitability obligations to their customers, especially when the firm provides substantial customized research to the investor; (5) whether online brokerage firms adequately disclose to investors any limitations on the speed at which an online order can be executed; and (6) contingency plans regarding system outages and market events, including whether there are sufficient numbers of registered representatives available to take orders by phone.<sup>32</sup>

Finally, the United States Congress has begun to review the unique problems posed by online trading. For example, in March 1999, the Senate Permanent Subcommittee on Investigations held a hearing at which officials from the SEC and a representative from the Pennsylvania Securities Commission testified regarding securities fraud on the Internet. SEC Enforcement Director Richard Walker noted that "on-line brokerage does raise some new issues. . . . [I]ncreased trading activity heightens the importance of investor education

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<sup>32</sup> Testimony of NASAA, Sen. Perm. Subc. On Investig., 1999, at 12-13.

efforts . . . [regarding] the limitations -- not only the advantages -- of on-line trading. . . . In addition, as brokers and investors increase their reliance on technology, the reliability of these systems becomes critical.”<sup>33</sup> Legislation has also been proposed to improve disclosures to investors who use online brokerage firms. The Online Investor Protection Act of 1999 (S.1015) would require online brokerage firms to disclose on their website and to the SEC any delays in transactions due to service outages; any steps taken to address or prevent such outages or events; and any resulting investor losses.<sup>34</sup>

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<sup>33</sup> Testimony of Richard Walker, SEC Director of Division of Enforcement, Sen. Perm. Subc. On Investig., March 1999, at 27-28.

<sup>34</sup> S.1015 would require the following online trading disclosures: “(1) the date, time, and duration of any system outage or other event that prevented or materially delayed the execution of online securities transactions during the preceding quarter; (2) any steps taken to address or prevent such outages or events; and (3) information regarding limiting risk of loss to securities investors that is unique to online trading, as required by the Commission, by rule or order.” S. 1015, § 2(a). The proposed legislation also would require the SEC to study the quality of trade executions received through online trading services, including any effects on the promptness of execution and the resulting purchase or sale price obtained for the investor.

### **III.**

#### **PUBLIC PERCEPTIONS AND MISPERCEPTIONS ABOUT ONLINE BROKERAGE**

##### **A. Advertising and Investor Expectations**

Advertising activity in the online brokerage industry, especially since the fourth quarter of 1998, has been fast-paced, frenetic and fiercely competitive. At the same time, many trading systems have suffered significant technical glitches, downtime and outages. These factors in combination sparked an influx of investor complaints to the Attorney General's Office. The investors believed they had been misled and deceived by the advertised claims of the online brokers. Many investors complained that their trades were not completed or executed immediately as advertised, and that the service provided was not as promised.

This dissatisfaction seems to be fueled in part by the "expectation gap" between the online brokerage industry and its customers. The investor expectation of what online trading offers is different from the service that an online broker actually provides. Novice online investors may expect unfettered direct and immediate trade executions; online brokers expect to provide investors with a faster routing mechanism to the marketplace.

How can this gap be closed? The answer appears to lie with consumer education. As stated by Bill Burnham in his fourth quarter 1998 Online Brokerage report, money put towards improving an online broker's infrastructure "will be for naught if online trading companies don't do a better job of educating their customers and properly setting

their expectations . . . [u]ltimately, we believe that a lot of the ‘customer service’ problems that online trading firms have are rooted in the firms’ failure to properly educate their customers about how the market works as well as the limitations of online trading and their own systems.”<sup>35</sup> Many of the complaints received by the Attorney General’s Office echo this resentment.

For example, one inexperienced investor complained about his online broker’s “basic failure to have ever provided any real clue as to their margin requirements. I . . . realize that . . . [the company] has people signing up without any awareness of what may in fact be generally known in the ‘industry’ but couldn’t possibly be known by people like me.”<sup>36</sup> Similarly, another investor complained that by “promoting the ease and simplicity of services via the net, [the online broker] targets prey other than the usual market investor.”<sup>37</sup>

Another investor stated that his online broker’s “advertising touts that it has fast, reliable trading systems, [when the online broker] in fact suffers from serious reliability/access problems.”<sup>38</sup> “Consumers are investing over the Internet in record numbers and some companies . . . seem to operate under the policy of get as many as possible and don’t worry

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<sup>35</sup> Burnham and Earle, “Online Trading Quarterly: Fourth Quarter 1998,” Credit Suisse First Boston Corporation Report, March, 1999 at 18.

<sup>36</sup> Complaint to the Office of the New York State Attorney General, March, 1999.

<sup>37</sup> Complaint to the Office of the New York State Attorney General, January, 1999.

<sup>38</sup> Complaint to the Office of the New York State Attorney General, January, 1999.

about the logistics involved,” complained another investor.<sup>39</sup> Advertising boasting trades in “no time flat” should not take 20-25 minutes, complained another investor.<sup>40</sup> Similarly, a complainant felt wronged by another online broker’s “pitch of low cost and fast execution,” and concluded that the delays were “inexcusable.”<sup>41</sup>

While there have been an increasing number of investor education materials explaining the intricacies of online trading to novice investors,<sup>42</sup> aggressive advertising campaigns conveying messages of the “magic” of online trading barrage the marketplace and serve to bolster customer misperceptions about the realities of online trading. It is as if the industry seeks to give with one hand and take away with the other; while the industry does spend a significant amount of money on investor education, that same industry has bombarded television audiences with glib and unrealistic advertising about a very serious and regulated industry.

## **B. Misconceptions in Online Investing Advertisements**

“That’s my home. Looks more like an island. Technically, it’s a country,” runs a Discover Brokerage Direct television advertisement. “Online trading is like the Old West. The slow die first,” reads a full-page newspaper advertisement for Fidelity Investments.

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<sup>39</sup> Complaint to the Office of the New York State Attorney General, March, 1999.

<sup>40</sup> Complaint to the Office of the New York State Attorney General, February, 1999.

<sup>41</sup> Complaint to the Office of the New York State Attorney General, February, 1999.

<sup>42</sup> See e.g., “Fast Market Conditions - Understanding the Risks of Volatile Markets,” Charles Schwab & Co., Brochure, March 1999; “Tactics for Trading In A Volatile Market” Waterhouse Securities Inc., Brochure, March 1999.

“We’re now trusted with over 1,000,000 accounts. If you still think this is a fad, write us a letter on your typewriter,” teases an advertisement by E\*Trade.

Such aggressive advertising in this burgeoning online industry has fueled the message of convenience, speed, easy wealth, and the risk of “being left behind” in the new online era. Owning an island nation of your own, parking a helicopter in the front yard, and saving a small country from debt, all through the use of your online broker, may be hyperbolic -- but such advertising images can leave a residual impression of easy wealth when you trade online. As described by the SEC Chairman Arthur Levitt, “when firms, again and again, tell investors that on-line investing can make them rich, it creates unrealistic expectations. And when firms sow those grandiose and unrealistic expectations, they stand a good chance of reaping the adverse results when many of them go unmet.”<sup>43</sup> Recently, online brokers have toned down the tenor of their advertisements, but there is still a dichotomy between the lexicon of the online brokers, and the plain language perceptions of the online investor. There has been and still is a pervasive tone of glibness that accompanies many of these advertisements. A sense of humor and self-effacement is a good thing, but such characterization should be balanced with the sobering realization that we are talking about a regulated industry -- one that often deals with people’s life savings and retirement potential. What follows are a few examples of how some of the advertising practices and advertising content of online brokers may color the expectations of online investors.

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<sup>43</sup> Chairman Arthur Levitt, Speech at National Press Club, May 4, 1999.

**1. Clicking the mouse is easy, making sound investing decisions is not.**

While it may be quick, easy and simple to submit a trade, the process of making sound appropriate investment decisions has not gotten any quicker, easier or simpler. Selling securities is not like selling used books. Brokers have special duties to their customers. Financial decisions require a thoughtful assessment on the part of an individual investor in choosing the appropriate investing strategy. Yet there are advertisements that continue to blur this line of distinction. A recent mass-mailing by E\*Trade announced, "A cinch. A snap. A piece of cake. Believe it or not we're talking online investing."

**2. "Making a trade" is not executing a trade.**

Online broker advertisements may contain terms that are misleading to the novice online investor. For instance, in a recent Waterhouse television advertisement, famous former basketball coach Phil Jackson is asked, "You know anything about the trade?" He answers, "I'm going to make it right now." In another Waterhouse advertisement, film actress Geena Davis announces, "I must trade, now!" and clicks on the "submit" button.

"Making a trade" or "trading now" in the context of the aforementioned advertisements does not mean that a trade is executed simultaneously with the click of the button. A click of the mouse will send a request for a trade to the online broker who, after putting the trade through the proper vetting criteria, will, in turn, route the order to the marketplace (see further discussion in sections IV(A)(2) and IV(B)(1)). Once the trade request is sent to the marketplace, it is executed, and only then is a notice sent back to the

investor that the order was successfully executed. Additionally, the notice itself may be delayed by minutes or hours, especially during periods of high volume or volatile markets. These intricacies of the online trading process should be, but are not always, communicated clearly to investors. There are ads which continue to blur the ease of sending an order with the difficulties of understanding and participating in the financial markets. For instance, E\*Trade's recent mass mailing recruits new accounts by stating that making a trade is no more than a "click": "Just click on the Trading tab, enter your favorite stock symbol and the number of shares you want to buy or sell, click, and that's it."

Indeed, as discussed more fully in the next section, an online investor who "makes a trade" by placing a "limit order" should be prepared that the order may not be filled immediately, based upon the investor's requested price for a stock. Other orders, such as a "market order," may give the appearance of instant execution. However, although the process itself may take no more than a few seconds, it still must go through the same steps before it is executed. In other words, a click of the mouse represents a *request* for a trade, and should not be confused to mean an automatic and immediate execution. It is only more immediate than making a trade through a broker on the telephone in the sense that it cuts out the step of the broker placing the trade for the customer. Just like with a live broker, an investor may click on the mouse and then have to wait for an execution or be subject to delays, depending upon market conditions and the availability of trading systems.

### **3. Cheap, easy, peripatetic trading does not equal successful trading.**

“When customers trade online there’s an elasticity to demand that comes from both reductions in price and the ease of trading online -- people trade more when it’s easy and cheap,” as stated by David Pottruck.<sup>44</sup>

It is this “easy and cheap” dynamic that has encouraged a new online trading strategy that SEC Chairman Levitt has defined as “day-trading light.” This is a mixed strategy where investors use their online accounts both to invest for the longer term and to trade short term on momentum or small changes in the price of a stock.<sup>45</sup> This trading pattern is becoming more and more evident as online brokers recruit, and perhaps even create, “active” investors with a series of specialized trading and promotional incentives. As a means of drawing in new investors some online brokerage firms have been offering free “flier” miles and commission-free initial trades. Other firms offer incentives in price for active trading patterns.

For example, E\*Trade offers a service called "Power E\*Trade" to accommodate active online investing patterns. Under its commission structure, “Power E\*Trade” will pay the standard rate up to 30 trades (\$14.95 for market orders, \$19.95 for stop/limit orders and NASDAQ orders). For each trade over 30 and up to 74 trades in one quarter, “Power E\*Trade” customers will be charged five dollars less per trade, following rebate. Those customers who place 75 trades or more in one quarter qualify for “Platinum

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<sup>44</sup> Schwab Co-Chief Executive Officer, David Pottruck, Speech at IT Wallstreet ‘99, February 1999.

<sup>45</sup> SEC Chairman Arthur Levitt, Speech, May, 1999, supra.

Power E\*Trade” and will pay ten dollars less (following rebate) for that portion of their trades. While this arrangement may accommodate a knowledgeable active online clientele, it can also be a dangerous invitation for the less sophisticated, novice investor to engage in aggressive and frequent online trading activity. Moreover, while E\*Trade's "deep commitment to breaking down barriers and leveling the playing field"<sup>46</sup> includes extolling the rewards of joining a service geared for active traders, it does little to disclose the risks of “day-trading light” for novice investors who do not have the experience or training of financial professionals. These “extra-value” services do not necessarily encourage excessive trading, but they certainly reward such behavior, and do nothing to dispel the mistaken notion that more trading necessarily means more profits.

Indeed, one study suggests that an investor who trades more, does not profit more.<sup>47</sup> The research tracked the behavior and trading results of investors who switched from phone-based trading to online trading. The results show that the portfolio turnover rate rose to 96% a year from 74% and that investors also became twice as speculative in their trading. The theory behind these figures is that investors tend to attribute their success to their own abilities, even when such attribution is unwarranted. Thus after going online, most investors may have become overconfident, which led to a behavior of excessive trading. In

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<sup>46</sup> "E\*Trade Sets Industry Standard With Commissions As Low As \$4.95 for Active Investors," E\*Trade Company Release, August 18, 1999.

<sup>47</sup> Barber and Odean, “Online Investors: Do the Slow Die First?,” University of California at Davis, September 1999 Draft.

short, online investors traded more actively, more speculatively, and less profitably than before.

Thus, one of Ameritrade's recent advertisements uses an investor testimonial that states, "After trying several brokers, I finally found a stock market whiz. Me." The advertisement continues by saying, "You can pick stocks with the best of them. All you need is a computer and Ameritrade. We give you the same research tools that many professionals use. So it's easy to gain the knowledge you need to make the right picks."<sup>48</sup> While the democratization of investing is certainly a positive, online brokers' claims of "easy access to information" may give the investor the illusion that he or she has an "inside edge" to the markets which the investor does not have.

#### **4. Speed, access and reliability is dependent upon system availability.**

In the first quarter of 1999, bold advertising lines began to emerge in the online trading arena regarding speed, access and reliability. One example was, "If you're tired of online hype and want reliable service, consider Fidelity Brokerage."<sup>49</sup> This ad appears to reference the difficulties suffered by some online brokers due to the Market Storm and other technological causes. In March 1999, NASDR addressed some of these issues by announcing an advertising regulatory alert in which member firms must "balance discussion of speed, accessibility or reliability of electronic trading services with disclosures that market

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<sup>48</sup> Ameritrade advertisement, Barron's, October 4, 1999.

<sup>49</sup> Fidelity advertisement, Wall St. J., March 1, 1999.

volatility and volume may delay system access and trade execution . . . [and] must ensure that it is *communicated clearly and prominently*."<sup>50</sup>

Since these regulations, the tag lines that emphasize speed, access and reliability are still prevalent in the marketplace, but are now accompanied by small, fine print disclosures. For instance a full-page print advertisement by Fidelity reads, "online trading is like the Old West. The slow die first . . . Every second counts." This bold, large print statement about speed is "balanced" with a fine print disclosure that warns "system availability and response time may be subject to market conditions," located at the very foot of a full page advertisement.<sup>51</sup> Such disclosures do not appear to be "communicated clearly and prominently" to novice investors who are unfamiliar with the glitches, outages and delays that online brokers experience. One complaint received by the Attorney General stated the following: "If I had known that there was a good chance that I would not be able to reliably access my [online] account and that in effect I would be shut out of the market, then I might have gone long [sic] a stable blue chip stock. However, I absolutely never would have sold short 500 shares of a volatile, fast moving, Internet-related stock."<sup>52</sup> Moreover, as reported by the NASDR in September 1999, focus group participants who viewed television advertisements of online brokers "indicated they had a reasonable understanding of the risks

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<sup>50</sup> "Advertising Regulation: Electronic Trading Advertisements Raise Investor Protection Concerns," NASDR Regulation, March, 1999 (emphasis added).

<sup>51</sup> Fidelity advertisement, N.Y. Times, April 27, 1999.

<sup>52</sup> Complaint to the Office of the New York State Attorney General, January, 1999.

of online investing, with the exception of the risk of trading delays and system failure, in which case their understanding was more limited.”<sup>53</sup> Participants believed that firms “should enhance their disclosures of this risk.”<sup>54</sup> Thus, advertisements of online brokers should make certain that novice online investors are clearly notified that claims of speed, access and reliability are subject to availability of the online brokers trading system, the delays of the marketplace and other unforeseen circumstances.

### **5. All trades require a broker-dealer.**

Online brokers should not exaggerate customers' access to the markets by stating or implying that a customer can execute trades without reliance on a broker-dealer.<sup>55</sup> Claims, such as that of E\*Trade, that their technology “connects you directly to the markets so you bypass brokers and high commissions,” are misleading. All orders must first be submitted to a broker-dealer (which in this case is E\*Trade itself) before they go to the marketplace for possible execution. An online investor is never directly connected to the market. Indeed, aside from avoiding the step of engaging a live broker, using a computer to place a trade gives an investor no greater advantage over other investors.<sup>56</sup>

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<sup>53</sup> “Report of NASD Regulation, Public Policy Sessions Concerning the Advertisement of Online Brokerage,” NASD Regulation, September 21, 1999.

<sup>54</sup> “Report of NASD Regulation, Public Policy Sessions Concerning the Advertisement of Online Brokerage,” NASD Regulation, September 21, 1999.

<sup>55</sup> "Advertising Regulation: Electronic Trading Advertisements Raise Investor Protection Concerns," NASDR Regulation, March, 1999.

<sup>56</sup> See section IV(B)(1), infra.

## 6. The truth about commissions.

Many advertisements highlight their lowest commission fees without clear disclosure of what the fee constitutes. For instance, E\*Trade's recent advertisement states that it offers prices "that still start as low as \$4.95 with rebate."<sup>57</sup> Upon closer examination, the fine print at the bottom of the page explains that the "rebate applies to trades in excess of 75 per calendar quarter," which is for the "Platinum E\*Trade" account holders (although the Platinum service is never mentioned by name). Yet the advertisement itself appears to be for general recruiting of new E\*Trade accounts,<sup>58</sup> and not specifically for the active investor "Platinum E\*Trade" account. In addition, nowhere in the advertisement does it disclose the \$14.95/\$19.85 rate that a novice online investor, recruited by this advertisement, would be charged.

Another recent example is Fidelity's eight-page advertisement for their new "Powerstreet Online Trading Product."<sup>59</sup> The advertisement declares, "with Powerstreet, online trades start at just \$14.95." Again, it is only upon reading the fine print at the bottom of the full-page advertisement that the prospective investor learns that the \$14.95 commission

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<sup>57</sup> E\*Trade advertisement, Barron's, October 4, 1999.

<sup>58</sup> Id. The advertising text reads: "It's 4 am, and you're at the computer. What a coincidence, so are we. 24-hour customer service and we'll pick up the tab. Imagine someone always there; who cares; who can help. Sounds expensive, we know. At E\*Trade we've got a highly trained staff who's dedicated to help meet all your needs. And prices that still start as low as \$4.95 with rebate. Great service vs. great prices? We knew you'd have a hard time choosing so we gave you both. Also, get \$75 for signing up now . . . ."

<sup>59</sup> Fidelity advertisement, N.Y. Times, October 12, 1999.

is only applicable for "trades in the account of active traders." But it is confusing what level of trading activity is required for an "active trader." An "active trader" needs a "minimum 12 stock, bond, or options trades in the prior 12 months" or needs to "place at least 36 stock, bond or option trades per year"; it is unclear which is the proper definition. Regardless, an investor would have to be "active trader" to receive the \$14.95 commission rate, but nowhere does the advertisement disclose that the \$14.95 fee is limited to market orders or that placing limit orders and stop orders would be \$19.95.<sup>60</sup>

In addition, the fees for novice investors are not disclosed in the advertisement. Although the advertisement claims that "whether you're an active trader *or a beginner*, you can personalize Powerstreet to match your own individual needs and investing style," fees for a beginning online investor in a standard trading account are not indicated in the advertisement.<sup>61</sup> The fee for a standard market order is \$25 and \$30 for a limit or stop order.<sup>62</sup> Nowhere is that evident in the advertisement. Online brokers should be careful that investors opening an online account are informed of the applicable fees in a clear and concise manner.

### **C. The Nexus Between Advertising and Technology**

When acquiring new accounts, responsible online brokers should consider

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<sup>60</sup> Fidelity customer service representative, telephone call on October 14, 1999.

<sup>61</sup> Fidelity advertisement, N.Y. Times, October 12, 1999.

<sup>62</sup> Fidelity customer service representative, telephone call on October 14, 1999.

whether the capacity of their trading systems will permit them to appropriately handle the influx of new accounts. The failure to exercise such prudence can have serious consequences. In the last three months of 1996, America Online (“AOL”) launched an aggressive television advertising campaign built around a change in its pricing policy, yet AOL only added a modest number of modems to service these new online accounts. Within the first four weeks of the ad campaign, AOL added half a million new subscribers. As a result of this surge, an overwhelming number of customers were unable to access AOL. In short, AOL advertised a service they did not have the system capacity to provide.<sup>63</sup> By early 1997, AOL reached a settlement agreement with 36 state attorneys general, including this Office, which included provisions that advertising be ceased for a period of time and that any resumed advertising would have to disclose that users might encounter problems getting online.<sup>64</sup> Likewise, many online brokers, in light of the inability of their systems to properly handle the increased workload activity in their trading operations, responsibly recognized within this past year the need to scale back advertising activity in order to stem the tide of new accounts.

For instance, in the fall and winter of 1998, Ameritrade pulled back its advertising in an attempt to upgrade its systems before the onslaught of new accounts which the advertisements would generate. After gaining 54,000 new customer accounts and losing

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<sup>63</sup> Jackson, “AOL Buys Some Time,” *Time*, February 10, 1997, at 50.

<sup>64</sup> Sandberg, “AOL to Pay Refunds to Its Customers,” *Wall St. J.*, January 30, 1997, at A3.

6,000 from its expensive advertising campaign, Ameritrade Chairman and CEO J. Joe Ricketts acknowledged that Ameritrade is “struggling to get the infrastructure for the technology in place.”<sup>65</sup> Advertising spending for its quarter ending December 1998 was \$9.6 million, compared to the \$24.9 million in the same period in 1997.<sup>66</sup> Ameritrade had originally planned to spend \$100 million on advertising for their 1998 fiscal year, but instead spent approximately \$60 million because the company voluntarily scaled back to first update computer systems to handle the crush of new customers that the advertisements could generate.<sup>67</sup>

By February 1999, Peter Stern, Datek’s Co-founder and Chief Technology Officer, in response to slowed access to accounts during peak times, told online investors that “until [Datek] can get [their] systems to be so much faster than [the] customer load that speed isn’t even an issue,” marketing would be “ramped down.”<sup>68</sup> During this same time period, Schwab ran print advertisements that sought to warn investors about the issues associated with fast moving markets, and quoted sober words from SEC Chairman Levitt concerning the need for investor education.

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<sup>65</sup> Buckman, “Ameritrade Has \$13.7 Million Net On Sales Surge,” Wall St. J., January 21, 1999, at C22.

<sup>66</sup> Id.

<sup>67</sup> Hamilton, “Market Savvy; Savvy Confidential: A Briefing for Investors; Brokers Beef Up Their Ad Budgets,” L.A. Times, June 10, 1999, at C5; Schroeder, “Short Takes,” Web Finance, June 21, 1999, at 50.

<sup>68</sup> Message posted to non-Datek newsgroup by Peter Stern, Feb. 12, 1999, (<http://talk.techstocks.com/~wsapi/investor/reply-7801347>)

Similarly, Discover stopped advertising on cable television, substantially scaled back its presence on network television and stopped print advertising in May, June and part of July 1999 due to the overloads suffered in customer service.<sup>69</sup> As explained by Alan Reid, Senior Vice President and Director of Business Delivery, “[Discover] stopped and took our breath in May and June.”<sup>70</sup> Discover started rolling out its ads again in late July 1999.<sup>71</sup> The firm quadrupled its phone representatives to 230 and plans to triple that staff again to handle the expected increase in customer accounts because of their increased advertising activity.<sup>72</sup>

Likewise, Waterhouse, which suffered a series of critical outages in January 1999, pulled back their planned advertising activity until their systems recovered.<sup>73</sup> Waterhouse Chief Executive Frank J. Petrilli commented that “until these [trading] volumes blow off, we are doing nothing more than adding people and improving our systems every day.”<sup>74</sup> Moreover, as recently as August 1999, Waterhouse and Discover Brokerage Direct

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<sup>69</sup> Daly, “Waterhouse, Discover Scale Back Ads to System, Customer Service Overload,” Financial NetNews, August 2, 1999, at Vol. IV, No. 31, at 1, available in LEXIS, Market & Industry, RDS Business & Industry Database.

<sup>70</sup> Id.

<sup>71</sup> Id.

<sup>72</sup> Id.

<sup>73</sup> Buckman, “As Web Traffic Jump Brokers Run Into Jams,” Wall St. J., January 15, 1999, at C1; see also Oppel, “On-line Trading Woes Ruffles All Sides in Deals,” N.Y. Times, January 25, 1999, at C2.

<sup>74</sup> Buckman, “As Web Traffic Jump Brokers Run Into Jams,” Wall St. J., January 15, 1999, at C1.

were both reported as having “slashed their advertising and marketing because systems and customer service centers began to strain under the increase in customers. The brokerages wanted to stop attracting new customers through advertising and also wanted to siphon money from marketing budgets to pay for system improvements and staff additions to their call centers.”<sup>75</sup>

In sum, there are several online brokers which have taken responsibility by decreasing advertising activity to maintain the integrity of their trading systems. However, there are several factors now coming to the forefront which may skew the balance between account acquisition and the level of service provided. Presently, the number of online trading accounts continues to grow at an aggressive rate. As analyst Bill Burnham notes, this trend means that online brokerage firms can capture substantial market share: “[t]his is a gold rush [for brokers]. They are absolutely reluctant to take their foot off the gas pedal.”<sup>76</sup> A complainant had similar sentiments when speaking about his general dissatisfaction: “This was not just a simple software failure. This was shrewd, calculated illegal corporate greed. While [the online broker’s] computers and phone systems were failing they continued to market for new customers.”

As part of this battle, online brokers are competing to see who can build a “brand” the fastest. It is brand awareness that fuels the wars of name recognition and,

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<sup>75</sup> “Waterhouse, Discover Scale Back Ads Due to System, Customer Service Overload,” <<http://www.financialnetnews.com/fnn/index.html>>.

<sup>76</sup> Cohen, “E-Crash,” *Forbes*, June 14, 1999, at 312.

ultimately, creates dominance in the marketplace. Len Short, Executive Vice President of advertising and brand management for Schwab seeks for Schwab “to be the power brand for financial services . . . [w]e’ve had the credit card wars. The phone wars. The sneaker wars. In each case, a power brand has risen to the surface until it grows to represent the entire category.”<sup>77</sup> Short believes that Schwab is winning the “financial services war.”<sup>78</sup> He views Schwab as “currently in the battle” to build customer awareness and increased ad spending dramatically.”<sup>79</sup> Similarly, Tom Lewis, Ameritrade Co-Chief Executive says that “this market is just exploding and now is the time for us to gain market share.”<sup>80</sup> In addition, Stephen McDonald of Waterhouse’s parent group acknowledges that Waterhouse’s “biggest shortfall was brand recognition [and that the new \$100 million ad campaign] is a big brand launch.”<sup>81</sup> As recently as October 1999, this aggressive television advertising strategy was especially evident during the 1999 Major League Baseball Championships and World Series.

Advertising budgets over the past few years have ballooned at an alarming rate, rising to astronomical sums. In 1998, Ameritrade, Schwab, E\*Trade and Discover spent

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<sup>77</sup> “The Money War; Charles Schwab’s Online Services”, MC Technology Marketing Intelligence, July 1, 1999.

<sup>78</sup> Id.

<sup>79</sup> “ChatRoom: Len Short, Charles Schwab & Co., Executive V.P. of Advertising and Brand Management,” Financial NetNews, September 20, 1999, Vol. IV, No. 38, at 9.

<sup>80</sup> Schroeder, “Market Savvy; Savvy Confidential; A Briefing for Investors, Brokers Beef Up Their Ad Budgets,” L.A. Times, June 10, 1999, at 5.

<sup>81</sup> “TD Waterhouse Steps out with \$100 Million Ad Campaign,” www.cnet news.com, September 30, 1999.

about \$100 million combined on advertising, which is about a sixth of the entire budget for the entire U.S. securities brokerage business, according to a research firm.<sup>82</sup>

A recent Lehman Brothers report estimates that the eight largest online brokers will spend a combined amount of approximately \$1.2 billion combined on their advertising budgets in the fiscal year 2000.<sup>83</sup> The amount spent by these major online brokers, including E\*Trade, Schwab and Ameritrade, to attract new customers will be more than the combined spending of Burger King and McDonald's.<sup>84</sup> It will be more than the advertising budgets of Walt Disney and Coca-Cola, and is rivaled by last year's Ford Motor's advertising budget for sales of its cars and trucks.<sup>85</sup>

The advertising and marketing budgets of Ameritrade, E\*Trade and Waterhouse exemplify this explosive growth in advertisement spending. In approximately March of 1999, Ameritrade had planned to spend \$100 million on advertising for its next fiscal year (beginning October 1), but three months later (in June 1999), Ameritrade had increased that figure to an amount between \$150 to \$200 million.<sup>86</sup> Tom Lewis, Co-CEO,

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<sup>82</sup> Dugan, "Brokerage Ads Veer from Mainstream; Industry Touting Online Services," Wash. Post, April 23, 1999, at E1.

<sup>83</sup> "How About Some Talking Frogs?" SmartMoney.com, September 23, 1999.

<sup>84</sup> Ferrel, "Online Brokers Plan Ad Blitz Growth in Trades Slowing," USA Today, September 17, 1999, at 3B.

<sup>85</sup> Kahn, "The Media Business: Advertising; The On-line Brokerage Battle," N.Y. Times, October 4, 1999, at C1.

<sup>86</sup> Schroeder, "Short takes," Web Finance, June 21, 1999, at 50.

announced that Ameritrade increased its budget because the firm had such strong results from its previous advertisement spending and that the firm recognized “huge opportunities” out in the marketplace.<sup>87</sup> Ameritrade would start its advertisement campaign in summer of 1999, with advertising spending at its peak this fall, Lewis said.<sup>88</sup> This budgeted amount is well over half of what Ameritrade is expected to receive in revenue this year.<sup>89</sup>

Similarly, E\*Trade now spends about half its revenue on marketing.<sup>90</sup> In January of 1999 E\*Trade sponsored the 1999 Super Bowl in one of the largest marketing initiatives in the history of online financial services.<sup>91</sup> This advertising campaign came on the heels of the overwhelming customer response E\*Trade received from its successful sponsorship of the 1998 World Series.<sup>92</sup> By February of 1999 E\*Trade suffered a series of well-publicized outages. Yet in the first quarter of 1999 E\*Trade increased its already aggressive marketing campaign to a record \$60 million in marketing spending which drew in a deluge of over 233,000 new accounts and increased the total account base by 35%.<sup>93</sup>

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<sup>87</sup> Id.

<sup>88</sup> Id.

<sup>89</sup> “Online Brokers Risk Going an Ad Too Far,” The Natl. Post, October 5, 1999.

<sup>90</sup> Id.

<sup>91</sup> “E\*Trade Advances Marketing Campaign with Blitz of Super Bowl Ads,” E\*Trade Press Release, January 29, 1999.

<sup>92</sup> Id.

<sup>93</sup> Burnham and Earle, “Online Trading Quarterly: 1st Quarter 1999,” CreditSuisse First Boston Report, June, 1999.

E\*Trade has not disclosed the exact amount it plans to spend on advertising in 2000, but industry executives estimate it to be about \$300 million.<sup>94</sup> That would be more than Merrill Lynch, Paine Webber and Morgan Stanley Dean Witter combined, according to estimates of brokerage firm marketing budgets, as compiled by an investment bank.<sup>95</sup> E\*Trade has already seen an incredible growth in the number of acquired accounts in the past year. By April 1999, E\*Trade had surpassed one million accounts by more than doubling its online accounts in a mere seven month time span.<sup>96</sup> E\*Trade's rapid growth in account acquisition will most likely continue in the face of drastic increases in advertising and marketing.

Moreover, Waterhouse announced in September 1999 its plans to spend \$100 million in an aggressive brand launch featuring sports and entertainment celebrities.<sup>97</sup> By June 1999, Waterhouse had surpassed two million active customer accounts, which represented a 63% increase in active customer accounts from the previous 12 months.<sup>98</sup> Total

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<sup>94</sup> "TD Waterhouse Steps Out With \$100 Million Ad Campaign," [www.cnetnews.com](http://www.cnetnews.com), September 30, 1999.

<sup>95</sup> "Online Brokers Risk Going an Ad Too Far," *The Natl. Post*, October 5, 1999.

<sup>96</sup> "E\*Trade Records 1 Million Active Customer Accounts," E\*Trade Press Release, April 26, 1999.

<sup>97</sup> "TD Waterhouse Steps out with \$100 Million Ad Campaign," [www.cnetnews.com](http://www.cnetnews.com), September 30, 1999.

<sup>98</sup> "TD Waterhouse Tops 2 Million Active Accounts," TD Waterhouse Press Release, July 27, 1999, [www.waterhouse.com/about/press/releases/072799.html](http://www.waterhouse.com/about/press/releases/072799.html).

accounts reached approximately 2.8 million.<sup>99</sup> The sizable advertising campaign is a “departure for the once-quiet firm,”<sup>100</sup> and its efforts to build brand awareness through such an extensive advertising campaign could result in an even larger growth percentage of newly acquired online accounts in the coming year. With these huge dollar amounts being invested in advertising and marketing, online brokers should be careful to not get carried away by the rush to gain market share.

In the face of these extraordinary advertising and marketing budgets, online brokers should be prepared to address concerns that their technology may not be able to keep pace with the influx of new accounts. Many online brokerages continue to suffer major service outages, downtimes and glitches. Although there have been great technological strides in the past few years, and trading systems are improving at an accelerated rate, it is difficult to ascertain how individual online brokers will service their accounts in the wake of a market crash or correction, increased demands of 24-hour trading, or the decimalization conversion.

Moreover, online brokers should be alert to the possible risks of aggressively acquiring accounts while simultaneously preparing for the technology concerns of the year 2000 (“Y2K”). The quality assurance (“QA”) process for testing software and hardware for the production environment, in general, is a complicated one. As such, many online brokers

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<sup>99</sup> Id.

<sup>100</sup> “TD Waterhouse Steps out with \$100 Million Ad Campaign,” [www.cnetnews.com](http://www.cnetnews.com), September 30, 1999.

are freezing technological upgrades and installations for the last quarter of 1999, to help ease the possible transition strains of Y2K. Thus, the crush of new business may tax the capacity of trading systems that cannot accommodate major adjustments or upgrades due to these technological freezes.

Firms must be wary that the pressure to garner greater market share does not compromise the services they deliver. In other words, online brokers must ensure that their ubiquitous and aggressive advertising strategies do not have the effect of sacrificing reliability or capacity for the immediate satisfaction of obtaining a bigger slice of the marketplace. These companies should not advertise without regard to technological restraints on their capacity to take on new business.

Throughout this inquiry, the Attorney General received many complaints and comments from online investors who fell victim to the misperceptions about online trading. Many investors suffered financial losses without apparently being properly apprised of the risks that accompany investing in this new Internet environment. In fact, several online brokers, after being subject to regulatory scrutiny, have modified some of their advertisements, added voice-over or written disclosures, or pulled them from circulation. However, as this industry continues to grow, online brokers must continue to be vigilant in offering online trading services in a manner that is responsible, fair and balanced in its representations.



## **IV.**

### **INITIAL BUMPS IN THE ROAD: MOVING TRADING ONLINE**

#### **A. Overview of the Online Trading System**

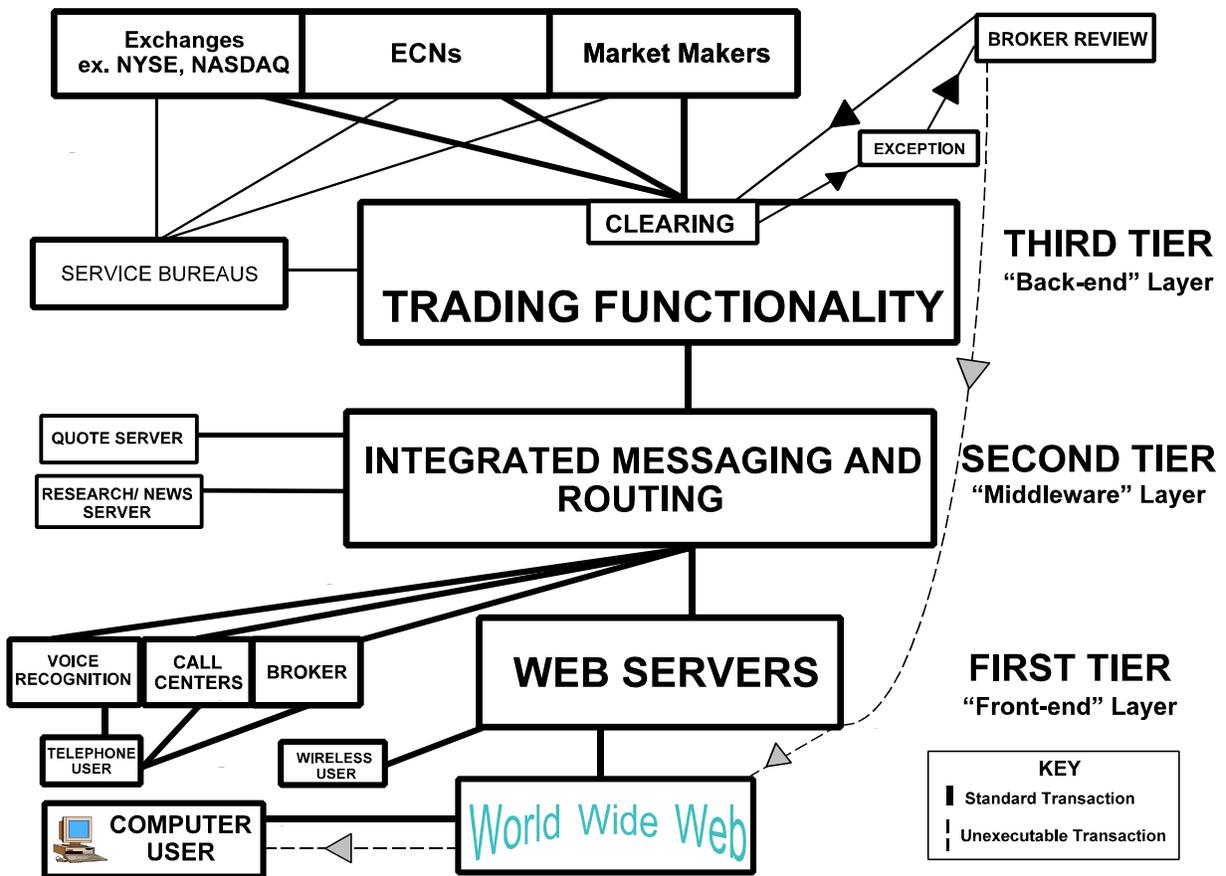
##### **1. The birth of the online brokerage industry.**

Many of the brokerage firms offering online trading services are not new to the securities industry. In fact, these same firms have been servicing the securities industry since well before the advent of online trading. For example, prior to servicing the online brokerage community, Schwab, Fidelity, and Waterhouse were leaders in the offering of traditional discount brokerage services. As a result, some of these older brokerage firms already had substantial technology in place for providing brokerage services before entering the online market. As discussed more fully below, these older trading systems are generally referred to as “legacy systems,” many of which were not originally designed to handle high transactional, 24 hours-a-day, 7 days-a-week customer access.

When servicing traditional brokerage clients, orders were manually entered into the system by a broker after the broker received instructions from the client. In contrast, online investors place orders directly into the brokerage firm’s trading system, via the Internet, and circumvent the need for order entry by a broker. The implementation of direct order placement by online investors has revolutionized the securities industry with the facilitation of online trading. Notwithstanding, many online brokerage systems have given rise to a number of highly publicized outages, slowdowns and associated problems.

## 2. How an online brokerage system operates.

Many of the online brokerage firms utilize a three tier architecture system consisting of the following: a front-end system, middleware and back-end system. Although discussed in greater detail in subsequent sections, the following diagram and overview of system operations is useful.



The first tier of architecture consists of the “front-end system.” (See above graph.) The front-end system enables online investors to place orders directly into the firm’s trading system. Generally, the front-end is comprised of computer servers or web servers, which are controlled by application software designed to manage individual client sessions.

After accessing the Internet through an Internet Service Provider, and typing in the online brokerage firm’s website address or Internet Protocol address, an online investor connects to the online brokerage firm’s system, through the firm’s web servers. For certain features, such as free research and delayed quotes, the online investor can obtain the information without logging into the firm’s secure investor account and trading areas, also known as “member areas.” When logging into member areas, the online investor is asked to provide his or her account name and password. Once this information is authenticated against the brokerage firm’s member database, the online investor is admitted into the member area and may begin requesting account information and placing trades.

The second tier of architecture, or “middleware,” provides messaging, routing, and access to the firm’s trading system. (See above graph.) The middleware determines the type of request that the user is placing, such as a request for research, quotes, or customer support, and routes that request to the appropriate part of the system for a response. For example, if the user requests a quote for a security, the middleware sends a message to the quote server in order to retrieve that quote. The quote server forwards the appropriate response through the front-end system, through the web servers and eventually back to the

user, via the Internet. Similarly, if the online investor places a trade, the middleware routes the transaction to the system's trading and account components in order to accomplish the task requested.

Trading functions occur within the third tier of architecture or "back-end system." (See above graph.) Generally, it is the back-end of the system where the firm maintains its customer trading information, on either database servers or a mainframe, and its "trading functionality," again on either servers, or a mainframe. Once a member enters an order, the front-end system will return a message to the member asking for confirmation of that order. At that time, the member is usually provided with a real-time quote for that security. From the time the order is confirmed and until the order is routed to the market for execution, the order passes through the front-end to the back-end of the system. It is at that time that the order undergoes a vetting procedure to check for restrictions on the member's account, to verify that the member has adequate capital, and to ascertain whether the member is authorized to trade on margin. Generally, the vetting procedure is performed by the firm's systems without human intervention according to pre-programmed instructions. While some firms perform these checking functions through their own systems, others contract with third party back-office providers which serve as the firm's clearing agent. One example of a prominent back-office provider is Automated Data Processing ("ADP").

Once an order passes through all of the firm's pre-programmed vetting criteria, the order is sent to the market for execution. If the order does not pass the pre-programmed

vetting procedures, the order will become what is called an “exception,” and will be manually reviewed by a broker at the brokerage firm. After being reviewed by a broker, and assuming that the reason for the exception has been adequately addressed, the broker will then submit the order for execution.

Whether the order is approved manually or electronically, ultimately the order is routed to the marketplace for execution. The order may be routed to various markets for execution depending, at least in part, upon which market makers the brokerage firm has established a relationship with, and on which exchange the security is listed. An order may be routed to an electronic marketplace, such as the NASDAQ, and traded by market makers, such as Knight/Trimark, or it may be routed directly to an exchange such as the New York Stock Exchange. Orders may also be routed to Electronic Communication Networks (ECNs) for execution, such as Island or Brut. As a general rule, the order is routed to various markets using pre-programmed logic.

Generally, brokerage firms receive payments from market makers when orders are routed to them for execution; this is known as “payment for order flow.” In contrast, brokerage firms do not receive payments for orders routed to ECNs. In fact, when using an ECN, the opposite occurs: brokerage firms are charged relatively small fees. Currently, individual users are not provided with the opportunity to choose where and how their orders are routed, but the issue is under consideration within the industry and may become a reality in the near future.

Once the order has been executed, the market maker, exchange or ECN forwards an execution report back to the online brokerage firm, through the firm's back office provider or clearing agent. The agent or provider then forwards the execution notification to the online brokerage firm's back-end system, which is used to update the user's account information and order status screens. At times of high market volume and/or volatility, these execution reports may be delayed due to capacity limitations and/or system bottlenecks. As a result, although an online investor's order may have already been executed, the online investor's account may not be updated to reflect the execution. Once the investor's account information is updated, however, the investor may log into member areas and review the status of his or her order. In some firms, the investor may also be able to check the new buying power of the account. As discussed later in this Report, however, some firms may not be able to update buying power until the next day. The brokerage firm's clearing agent also generates a paper confirmation, which is sent to the user through regular mail. The investor then has three days from the date of execution, known as the "settlement date," within which to fund the transaction.

## **B. Disclosures of the Risks and Limitations of Online Trading**

In section III, this Report reviewed consumer perceptions of online trading and how advertising affected those perceptions, or misperceptions. Regardless of the root of consumer expectations, there is clearly a need for a concerted effort to correct these erroneous expectations. The best method for accomplishing consumer, or in this case

investor, protection is to arm investors with the information needed to make logical and informed decisions. The advent of the Internet has created an unprecedented wealth of information and research on a wide range of topics. At the same time, however, there is a relative dearth of information about the operations and limitations of online trading firms. This section will discuss some of the issues that may affect the ability of online brokerage firms to provide the expedient and automatic execution of trades that the industry has historically promised, as well as ways that the firms can better serve their online investors. The goal is to provide investors with the relevant information necessary for making educated choices about choosing an online brokerage firm.

**1. Disclosures in advertisements, websites, and account application materials regarding risks and limitations of online trading.**

Despite having devoted a substantial amount of money to aggressive marketing campaigns, the information furnished to investors by the online brokerage industry does not always apprise those investors of all of the relevant risks and limitations of online trading.

**(a) There is no direct access to stock markets.**

As discussed previously, although online trading permits online investors to transmit orders without initiating direct voice contact with a broker, order handling and execution for online trading is not that dissimilar from traditional trading. The perception that online trading somehow links an individual directly to the market is incorrect. Although online trading permits an investor to send an order directly to the online brokerage firm over the Internet, alleviating the need to telephone a broker, the differences generally end there.

Regardless of whether the order is transmitted over the Internet, or called in to a broker, the order must still be reviewed by the brokerage firm, which includes but is not limited to checking the order against the customer's account records, verifying the account buying power, and examining any trading restrictions imposed on the customer's account. Additionally, as discussed infra, depending upon the trade placed and the system's pre-programmed logic, even orders entered online may eventually be reviewed by a broker, sometimes necessitating manual verification by a broker employed by the online brokerage firm.<sup>101</sup>

**(b) Submission of an order does not mean that it has been executed.**

The transmission of an order request over the Internet does not necessarily mean that the order will be executed immediately. In addition to delays that might occur during the order verification procedures, the order may also be delayed by slowdowns, outages and/or capacity bottlenecks on the systems of the online brokerage firms, or at the market makers or exchanges to whom the brokerage firms direct orders for execution. There may also be delays due to congestion on the lines that connect the brokerage firms, the clearing agents, back office providers and/or the markets. Online brokers do not "fill" or execute requested orders. Online brokers can only provide a service of routing orders to the marketplace.

**(c) Account updates and reports do not occur simultaneously**

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<sup>101</sup> See Section IV(B)(2), infra.

**with executions.**

Even after an order has been executed, online investors may experience delays in their receipt of reports confirming their order executions. Confirmation reports can be delayed for a number of reasons, including: (1) delays by the market makers and/or exchanges in reporting order executions to the online brokerage firms; (2) bottlenecks in the communication lines between the market makers/exchanges and the online brokerage firms; (3) system delays and capacity bottlenecks at the clearing firms utilized by the online brokerage firms; (4) delays in customer account updates due to an ongoing batch process being performed by the firm's systems; and (5) system delays and outages at the online brokerage firms themselves. Additionally, as discussed infra, in some cases online brokerage system delays may be caused by pre-programmed slowdowns designed to allow the system to degrade gracefully, by favoring order receipt by the firms over order reporting back to investors. Regardless of the underlying reasons for these reporting delays, however, online investors should not presume that the execution of an order has not taken place just because the execution has not yet been reported back to their account. Any attempts to shut down and reboot a computer to resend a previous trade request could result in an investor unintentionally submitting a second duplicate order and therefore incurring liability for multiple orders.

Online investors may also face difficulties in attempting to cancel an order. In light of the potential reporting delays discussed above, an order may in fact have been

executed despite the fact that the investor's account has not yet been updated to reflect that execution. In such an instance, it would be impossible to cancel the order since it would have already been executed. Moreover, having placed a cancellation order, an online investor should not proceed to place a second order until he or she has received confirmation that the first order has been canceled. Otherwise, the online investor may unintentionally purchase the same security twice. Many of the complaints received by this Office were of this type. In such an instance, absent extraordinary circumstances, the online investor may be responsible for both orders, thereby doubling his or her liability and exposure.

**(d) Limit orders compared to market orders.**

Since at least the beginning of 1999, the stock markets have witnessed unprecedented volatility, as extreme price differentials in a security on any given day, or within any given hour, are not unusual. As such, placing market orders for stocks could expose online investors to greater risk than they ever experienced in the past. In fact, even the real-time price quotes provided to an online investor at the time of order entry may not be accurate, because the price may have changed substantially in the small amount of time that it took for the price quote to be displayed. Additionally, the potential delays in execution discussed above further delay the transmission of the order to the market for execution. As such, there is a significant danger in placing market orders for stocks, since there is no way to know exactly when the order will be executed and at what price it will execute.<sup>102</sup> Thus,

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<sup>102</sup> For example, in November 1998, numerous investors placed market orders for an initial public offering, theglobe.com, which had priced at \$9. Despite its relatively low pricing,

the online investor who places the market order risks theoretically unlimited liability. In order to ensure that an online investor does not unwittingly receive an order execution at a price significantly different from the price initially quoted, online investors should use limit orders instead of market orders.

**(e) Messages acknowledging order entry.**

Based upon a review of the investor complaints filed with this Office, as well as the investor complaints which we secured from the online brokerage firms pursuant to our inquiry, there appears to be a great deal of confusion about the messages which investors receive during the order entry process.

For example, at the time that an investor first places an order with one of the brokerage firms we examined, the investor generally receives a message that the order is “processing.” Once the order has been vetted through the firm’s clearing agent, the investor’s order status is then updated to read “placed.” However, neither the terms “processing” or “placed” really provide the investor with adequate information to understand where the order is in the execution cycle. At the time that an investor receives the message “placed,” he or she is left wondering whether the “placed” message means that the order is merely deemed placed with the brokerage firm, subject to the firm’s order verification

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however, the stock opened at \$90, and soon climbed to \$97, eventually closing that day at \$63.50. Online investors who had placed market order for shares in theglobe.com soon found themselves liable for tens of thousands, if not hundreds of thousands of dollars more than they had intended. Some online investors attempted to cancel their market orders once they realized how fast the stock was climbing, but many found themselves unable to do so, in some cases due to system problems at the online brokerage firms.

procedures, or whether it means that the order was sent out for execution. In light of the numerous investor complaints received about the speed of executions, it would appear that many online investors expect their orders to be executed at the time that they receive a message in response to their entry of the order, or at the time that they click their mouse button. As discussed previously, this expectation is misplaced.

Even after investors have brought their confusion to the attention of these firms, the firms have not always been very accommodating. For example, a senior officer of one online brokerage firm stated that if an investor receives a tracking number at the time he or she submits an order, and then submits a duplicate order, the duplicate order is the investor's responsibility. However, if the investor does not receive a tracking number with the initial order, the order is not deemed to be the investor's responsibility, and the firm would reverse the duplicate trade. At no time, however, did the firm explain the significance of a tracking number, or why possessing such a number would create liability for the investor. Nor is it explained why an investor does not always receive a tracking number, or at what point during the order routing and execution process a tracking number is assigned to the investor. Moreover, since the assignment of a tracking number is apparently not done on a consistent basis, it would be difficult for an investor who did not receive a tracking number to ensure that the entry of multiple orders would not occur.

Traditionally, when trades could only be placed through a broker, there was never really a question about the information provided to investors at the time of order

placement. Generally, the broker would place the order while the investor was on the phone, or would call the investor back at the time the execution occurred and inform the investor of the price obtained. Similarly, the risk of double order entry was negligible. With the advent of the online trading paradigm, however, this has all changed.

There is no question that instantaneous access to account information is not currently a regulatory requirement. Based at least in part on online brokerage firm advertising, however, online investors have come to expect this. If online investors are unsure of the status of their orders, they may expose themselves to unnecessary risk by placing duplicative orders, or failing to take timely action to cover themselves during a market turn-around. Especially during times of high volume and volatility, when an online investor is knocked off the brokerage firm's website and unable to log back in, the investor may be left wondering whether the message he or she received meant that the order has actually been sent out for execution. This can, and does, result in double order entry by online investors.

As such, additional regulations regarding disclosures should be considered to protect investors. In the interim, firms should endeavor to improve their disclosures during the order entry process. It serves neither the firm's nor the investor's interest to have an expectation gap which could potentially result in investor dissatisfaction, and the filing of arbitration claims.

- (f) **Disclosure regarding known problems with a back-office provider.**

As discussed infra, a number of online brokerage firms utilize back-office providers to perform their order processing functions. Unfortunately, however, a number of those online brokerage firms have encountered system limitations and capacity bottlenecks with these outsourced firms over an extended period of time. Yet despite these known, and in some cases recurrent, problems with their back-office providers, none of the online brokerage firms ever provided disclosure to their investors.

For example, we learned that bottlenecks at one firm's back-office provider occasionally caused order processing delays. Due to these delays, the brokerage firm was at times forced to disable a feature that allowed for automatic submission of rudimentary customer orders to the market place for execution. Disabling the function required a manual release of each order to the back-office provider, thereby slowing down the order routing process. Despite the firm's recurrent practice of disabling this function due to backlogs at its back-office provider -- an action which was intended to slow the order flow -- the firm never disclosed this to investors.

Similarly, the back-office provider of one firm encountered difficulties in adding new incoming orders to a stored file of all open orders in heavily traded securities (also known as the "open order file"). As such, it became difficult for this firm to process new orders in these heavily traded securities, causing the firm to engage in "blocking" of these securities (see discussion, infra). Despite this known problem, the brokerage firm never disclosed this to investors. This failure to disclose is all the more troubling in light of

the fact that the problem existed for approximately the first half of 1999. In fact, the back-office provider had even alerted the brokerage firm to this potential problem in the 4th quarter of 1998.

## **2. Order processing delays and intentional slowing of order flow.**

Despite the highly advanced technology employed by the online brokerage firms, there are still numerous instances of human intervention in the process. As discussed previously, before an order is routed to the market for execution, the order is automatically reviewed against an online investor's account balance, buying power and trading restrictions. If during this review process a problem is found concerning the order, often referred to as an exception, the order will be routed to a broker for a manual compliance review. Likewise, if a problem occurs after an order has been routed to a market maker for execution, the order might be returned to the brokerage firm for manual review, a procedure known as a "kickback." Investors are generally not informed of these exceptions to the normal automated processing of their orders. Moreover, since the investor who placed this order is generally not informed that the order has been kicked-back or flagged for manual review, the investor is left with the impression that the online brokerage firm somehow sat on the order and failed to execute it in a timely manner.

Some firms also took steps to intentionally slow the flow of orders. One example of a firm's intentional slowing of order processing was its transition to manual order entry, referred to previously as "blocking," which involved a procedure implemented by that

firm because of the problems that its back-office provider experienced in writing orders to the firm's open order file. This procedure prevented online investors from entering orders for certain securities, and instead required them to telephone the orders in to the firm. This in turn slowed the flow of orders for these securities, permitting the back-office provider's system the time it needed to write these orders into open order file. But the firm never disclosed this intentional shunting of orders for select securities to a manual telephone system. Investors, therefore, were likely under the mistaken impression that they were unable to place orders due to a problem they were experiencing with the website or their own personal computer.

Another example of an online brokerage firm's manual intervention would be a firm which on a number of occasions earlier this year intentionally reduced the number of individuals who were able to transmit orders at any given time as a means of preventing the system from over-running capacity. Additionally, due to that firm's system design, bottlenecks in the system were designed to occur, if at all, in the reporting of executions. As such, during times of high volatility online investors encountered difficulties in entering orders and the firm experienced delays in reporting trades. Yet despite these known limitations of the firm's system, both of which were meant to reduce stress on the system by slowing order entry and order reporting, the firm never disclosed these limitations to online investors.

### **3. Disclosure of outages and slowdowns as they occur.**

Despite some of the well publicized outages that the major online brokerage firms have suffered this year, overall there is still a lack of adequate disclosure as to each and every outage suffered by a firm.<sup>103</sup> For example, while we were visiting the technology center of one of the largest online brokerage firms, that firm suffered an outage which lasted for approximately 45 minutes. During that time other Attorney General personnel attempted to log in to the firm's website in order to ascertain whether or not the outage was disclosed on the website. After searching through a number of the firm's web pages, we were unable to find any mention of the trading outage. Upon raising this concern with the firm, we were informed that the outages would not have been posted on its home page. However, should an online investor have wished to place a trade, the investor would allegedly have been informed that trading functionality was inoperative at the time the investor attempted to log in to his or her account to place an order. During subsequent outages at other firms we found similar failures to disclose in a prominent location such as the firm's home page.

As a general rule, all firms should be required to post a notice of an outage on their home pages during the time that the outage is in effect. This would ensure that online investors learn of the outages in a timely manner, before spending a significant amount of time on the site, only to find out that trading is not working, or that the trading section of the website is not even accessible. Akin to automated teller machines that prominently display

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<sup>103</sup> Simon, "E-Broker Outages Are Difficult to Track," Wall St. J., November 15, 1999, at C1.

all warning messages on the main screen as to which functions cannot be performed at that time, all online brokerage firms should be required to prominently disclose ongoing outages on their home pages. Hand-in-hand with disclosures of system outages, online brokerage firms should also be required to provide disclosure when they encounter system bottlenecks which impact their ability to process orders, route them for execution and/or report the executions back to the customers. This holds especially true if these delays are known to the firm due to slowdowns, system design limitations or other chronic system problems.

#### **4. Disclosure of outdated account information.**

Many of the online brokerage firms necessarily run substantial batch programs in order to update their customer accounts to reflect the most recent transactions from any given day. With the possible exception of one firm, which claims to utilize proprietary software to provide intra-day account updates (including account buying power), generally all of the firms which rely on nightly batch processing presently lack the ability to provide real time updates of account buying power, available margin, and positions. Because batch processing generally does not occur until the evening, after the market has closed, the intra-day information in an online investor's accounts is often based upon the previous day's close. Moreover, at times when the batch processing runs over a firm's batch window, the online investor's account balances could even be outdated by as much as two days. Since this delay in updates is a known limitation, brokerage firms should be required to provide better disclosure to online investors of these limitations. Additionally, online investors should also

be informed that they may be unable to access their account information at certain times, because the account functionality is disabled while the batch process updates the account information. For example, at the same time that a firm advertises instant access to account information 24 hours-a-day, the firm should also consider alerting customers to the fact that some of this information will reflect the previous day's information.

**5. Insufficient disclosures regarding functionality.**

**(a) Disabling of the cancel/modify order feature.**

Due to unusually heavy trading activity, and because one firm believed that some investors were using order modifications and cancellations to change their original orders, and accepting those changes only if they were profitable for investors, at least one firm disabled these features. Beginning in late December 1998 that firm asked its market maker to refuse to accept cancellations or modifications of market orders from its online investors during market hours, unless the firm actually contacted the market maker to approve of the cancellation or modification. Yet, despite the fact that these features had been disabled for all of the firm's online investors, the options were never removed from the firm's order entry screen, and the firm apparently never disclosed this limitation to its investors who surely could have mistakenly relied on their having submitted a modification or cancellation without knowing that the functionality had been deactivated.

**(b) Exceeding the buying power of the account.**

As discussed in a previous subsection, due to the use of batch processing as a

means of updating customer account information, certain customer account information, including buying power and margin obligations, may be based upon the previous day's close. As a result of a firm's inability to update account buying power and margin obligations, intra-day, we found that many firms permitted online investors to place orders for securities which exceeded the actual buying power of the account at the time the orders were placed. Additionally, we also found that online investors were able to place order for securities which permitted them to exceed any limitations placed on an account, including pre-set margin spending limits. While a traditional broker might verify that an order would not exceed certain pre-set margin limits before sending it for execution, the fact that a number of the systems rely upon account information from the previous day's close permits order executions to take place which might not otherwise be permitted.

This problem is best illustrated by the highly publicized theglobe.com initial public offering discussed previously, wherein individuals who traded using cash only, non-marginable accounts, such as IRAs, found themselves purchasing theglobe.com stock at prices up to ten times higher than they had expected, and in some cases, much higher than the value of their accounts. This, in turn, created unexpected investor indebtedness of up to hundreds of thousand of dollars.

This problem is all the more troubling when one observes the impact that this could have on self-directed IRAs. Yearly contributions to IRAs are generally restricted to certain pre-specified limits, pursuant to a comprehensive federal regulatory scheme. Yet,

since an online brokerage firm utilizes account information which could potentially be outdated by a day or more, customers can, and indeed have, purchased stock which far exceeded the buying power of the account. In such an instance, the online investors has three days to forward the additional balance owed to the firm's clearing entity. Since there do not appear to be any special screening tools utilized to prevent individuals from making purchases which exceed the buying power of their IRA accounts, these individuals could potentially make purchases which exceed their IRA holdings, thereafter being required to forward additional monies to cover these purchases. As a result, online investors could be required to make IRA contributions which they never intended to make, which are not tax deductible, and which they may not be able to withdraw for many years without penalty.

**(c) Trading by touch tone phone not available during system down times.**

Many online brokerage firms offer investors the choice of trading using a touch tone phone as an alternative means of trading stocks when the firm's online systems are not operating. Although touch-tone trading will allow investors to input trades over the phone when the firm's Internet based trading functionality is inoperable, the mere input of an order via telephone does not necessarily mean that the order will be executed at that time. Depending on the architecture of the online brokerage firm's system, and the system of its clearing agent, touch-tone trades and Internet trades may both be routed through the same system for execution. Thus, an outage which prevents Internet orders from being executed would likewise prevent touch-tone orders from being executed, and this limitation on touch

tone trading should be disclosed to investors.

**(d) Disclaimers by firms.**

An online investor is required to complete and sign an account application to open an account with an online brokerage firm. As part of this application process, the investor is also asked to sign a customer agreement, within which the brokerage firms generally disclaim responsibility for a laundry list of system problems, including their own hardware and software problems, which may affect the processing or execution of a online investor's order. In light of the fact that the online brokerage firm is generally in the best position to assess its systems, it is questionable whether these disclaimers are appropriate. This is especially true in light of the inadequate disclosures discussed previously, including inadequate disclosures of capacity bottlenecks and system outages. Ironically, pursuant to some of these disclaimers, firms could potentially be held harmless for acts which they intentionally implemented in order to slow down order processing.

**C. Identified Deficiencies in Online Information Systems' Capacity and Reliability**

As the online brokerage industry has captured mainstream investors, terms once understood by only the most technologically sophisticated people have now become part of the modern every-day lexicon. For example, where once only system administrators

worried about “CPU capacity” (central processing unit capacity), “servers,” and databases, many financial news outlets now regularly report on brokerage system availability and diagnose service disruptions.

In order to gain a better understanding of how to assess an online brokerage firm’s technological capacity, our office visited each of the firms involved in our inquiry, toured their technology centers, and spoke with their Chief Information Officers (“CIOs”), and/or Chief Technology Officers (“CTOs”), as well as many of their support technology staff. Indeed, we were onsite at one firm when it experienced a significant outage.

We came away from these visits and our other research with several insights. First, we learned that a number of online brokerage firms were unable to meet the demands on their systems at various points during the Market Storm when online trading hit unexpectedly high volumes. During these periods, a number of firms witnessed peak capacity utilization rates much higher than planned, resulting in many cases in performance degradation and outages.

Second, in examining why these performance degradations and outages occurred, we learned that assessing the adequacy of a firm’s information systems capacity is a difficult task. Systems themselves vary considerably. There is no single number or metric which can accurately identify a firm’s capacity and its concomitant ability to meet user demand.

Third, we identified a number of technological constraints affecting online

brokerage information systems: including the use of hardware systems beyond initial design specifications; architectural scalability limitations, and operation of hardware in excess of 100% CPU utilization. We also identified a number of physical capacity constraints, including inadequate electrical power and cooling facilities.

Fourth, we identified vulnerabilities in each “tier” of online brokerage information systems, all of which contributed to the repeated performance degradations and outages that occurred earlier this year. Specifically, we identified web server capacity constraints on the front-end which sometimes prevented users from logging in, we identified messaging problems in the middleware which were causing processing queues, and we identified capacity bottlenecks and database constraints on the back-end, which impacted the firm’s trading capabilities.

Finally, in human terms we concluded that customer service accessibility -- a critical means of getting help when systems suffer delays or go down -- was in some instances wholly inadequate. Numerous customers experienced lengthy delays in answering their calls, and a substantial percentage of customers simply abandoned their calls.

### **1. Technological and physical capacity constraints.**

One of the most striking conclusions we reached in our extensive inquiry into the technological capacity of online brokers was the difficulty of assessing the adequacy of information systems capacity. A key reason for the complexity in making such assessments is that each firm’s system is composed of numerous components, any one or combination of

which can become a bottleneck, in turn constraining a firm's overall ability to meet user demand. For example, if virtually every component of a firm's system operates at a low percentage of its available capacity, the system's overall operational capacity will be limited by the component with the lowest capacity threshold. In essence, in measuring a firm's capacity, the focus should not be on the overall system, but rather on the weakest link in that system. As David Pottruck of Schwab observed, "[a]s more people log on to our site, new bottlenecks develop, new critical points of failure emerge, complexity goes up, finding a problem and solving it becomes more difficult."<sup>104</sup>

Furthermore, the percentage of capacity utilized at a given firm varies wildly throughout the trading day, spiking dramatically before and during market open and again before the market close. Thus, the capacity sufficient to accommodate trading volume may not be adequate during these narrow time frames of high utilization while on average the demand on a system for the entire day will appear satisfactory. Indeed, many firms have revamped their capacity planning in response to this dynamic, switching from a capacity planning model based upon a factor of average daily demand, to a factor based upon average daily peak demand. Similarly, capacity can also be stressed during times of high volatility, as well as when there is a large concentration of trading activity in a small group of securities. These latter two factors were most prevalent in January, April, and May of 1999, when many firms were hit with unprecedented trading volumes.

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<sup>104</sup> David Pottruck, Speech at IT Wallstreet, February 1999.

**(a) Mainframe legacy limitations.**

While the architecture of every online brokerage system is unique, the hardware used to house an online brokerage firm's back-end trading system is generally composed of either a mainframe system, or a bank of computer servers. The mainframe systems used by some online brokerage firms, or their service bureaus, appear to have strained to accommodate the extremely high demands of the online trading environment. Mainframe systems have operated at brokerage firms for decades and were originally accessed only by brokers. These systems were never designed to run on a 24-hours-a-day, 7-days-a-week basis.<sup>105</sup> Instead, they were originally designed for back-office functions, not for high-volume, online transactions that involve a direct interface with consumers.

With the advent of online brokerage services, however, firms and customers wanted the ability to engage in online trading. Firms adapted their systems to allow customer access, typically through the addition of a "front-end" and a middleware system. As a general matter, any system component, either hardware or software, may be referred to as a "legacy" component until IS managers identify a plan to replace, adapt or upgrade the component with more robust technology. Many of these legacy systems have been replaced or substantially modified to offer online brokerage services. Where a legacy system remains

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<sup>105</sup> "This problem with e-commerce, in a lot of cases, is that you are putting a 24-by-7 Web front end on a [legacy] transaction system that has to undergo regular planned outages. God never meant those two systems to work together." Max Watson Chairman & CEO of BMC Software, NASDAQ AMEX, p. 43, June 1999. This is not to suggest that mainframe systems are unsuitable or inferior to other systems. They also present certain advantages along with their distinct operating procedures.

in place but exercises a constraining limitation on the ability of the system to adequately meet increasing user demand, a “scalability” issue is said to exist.

First, many mainframe systems utilize some type of legacy programming. As some firms phase out these legacy systems, primarily through software and hardware upgrades, others still find them reliable for their needs.

For example, at the time we visited one firm, the firm was in the middle of transitioning away from its legacy trade routing system, which suffered from numerous outages as a result of its use in the online transactional environment. Recognizing the problems associated with this legacy system, in early 1999 the firm began the process of migrating to a new order routing and management system, which was designed specifically for the online trading environment.

Additionally, legacy systems were designed to handle no more than a few thousand trades per day, and were not built for the large concurrent processing which is required in the online trading environment. Moreover, tinkering with these systems can worsen the problem, as it becomes continuously more cumbersome and trouble-shooting becomes increasingly difficult. Further, as new changes are made to the existing code, the code becomes overly complex and non-uniform. However, online brokerage firms are, as a general matter, in the process of migrating to new systems, designed specifically for the online trading environment, which should ease these problems.

Second, mainframe computers cannot service customers 24-hours-a-day, 7-

days-a-week because, by their very nature, these systems require planned downtimes and outages. Every mainframe must be taken down at least some time during a given day in order to update the mainframe's database to reflect the day's transactions, as well as to print reports and perform numerous system housekeeping functions.

Third, mainframe computers are limited in terms of their messaging and processing capacity. In order to route information to and from the mainframe, a system must employ some type of messaging software. To facilitate the routing of messages, the mainframe must dedicate a certain block of virtual memory space to these functions; this reserved block of memory is generally known as a "partition." As discussed in section IV(C)(3), the pre-set partition space allocated in these mainframes for messaging was sometimes overrun by trading volume and customer activity. Firms needed to overcome these messaging limitations through the simple expedient of additional partitions to handle the increased messaging traffic.

Fourth, firms experienced overall limitations in their mainframe capacity, beginning in the fourth quarter of 1998. For example, one firm, during periods of high trading volumes, witnessed over 100% CPU utilization nearly every day during the quarter. This, in turn, limited both the online and batch performance. As trading volumes continued to soar, the firm's IS managers relieved the situation by adding another mainframe. By splitting the load across multiple mainframes, the CPU drain on any one mainframe was alleviated.

Although the firm is now able to utilize many mainframes to perform the work that was initially being performed by just one, the main database driver still resides on only the original mainframe. This constitutes a single point of potential failure. Additionally, since all database changes need to be routed through each of the mainframes in order to be written to the primary database, this routing places additional and unnecessary workload burdens on each of the mainframes. The problem is expected to be alleviated at some point in the near future when this firm switches to a newer database, which will allow each mainframe to run in parallel.

Another potential advance on the horizon for this firm involves what is referred to as “multi-plexing technology,” which will permit this firm to distribute the transaction load between multiple technology facilities simultaneously, whereas currently almost the entirety of the firm’s load is run out of a single facility.

**(b) Hardware scalability and architectural limitations.**

As we have noted, the “scalability,” or ability to expand an information system, may be limited by hardware, software or the architecture of the firm’s system. To some extent, physical plant limitations can be overcome through on-site expansions, or as is common with many of the online brokerage firms, expansion into additional, off-site facilities, which are “load-balanced”-- or split between the facilities -- using sophisticated

hardware and software. Scalability limitations which result from a system's architectural design, on the other hand, are much more difficult to address. Such constraints must be overcome through the redesign of a portion of the system's architecture. For example, a database storing information necessary to authenticate the identity of a customer, or vet trades, might require redesign where it cannot easily be expanded to accommodate increases in the total number of customer accounts.

Moreover, when scalability limitations manifest themselves in a system already under stress, the efforts to modify a system may fail due to unforeseen circumstances or inadequate evaluation and pre-testing of the system change.

Thus, we observed a case where, due to its original architectural design, the firm's critical trading functions were being run off a single server. This configuration eventually reached a CPU scalability limit. As such, the firm could no longer add more CPU capacity and undertook a number of alternative measures to alleviate the work-load on this critical component. This was accomplished primarily by off-loading some functions to other components of the firm's back-office system. With the installation of the software upgrade, however, some of the off-loaded work shifted back onto the critical component, which proved too much for it to handle. The shift in workload caused this critical component's CPU utilization to jump to full capacity on a number of days. The cascading effect of the software installation on the firm's trading system manifested itself through CPU saturation, thereby leading to multiple outages.

In order to avoid a recurrence of these problems, the firm began to configure

a second critical component identical to the first, effectively doubling its capacity to handle the trading functionally. Despite the addition of this second critical component, however, this firm still worries that the single location of the firm's primary trading system and database still represent potential scalability and reliability limitations.

**(c) Capacity planning and management.**

As detailed elsewhere in this report, a number of online brokerage firms have engaged in aggressive advertising campaigns in order to garner a piece of the burgeoning online investment market. This advertising, combined with a public mania for Internet stocks, gave rise to growth in customer accounts and total trading volumes that surpassed the expectations of the online brokerage firms. This tremendous expansion strained the technical capacity of online brokerage firm firms -- sometimes to the breaking point -- manifesting itself in the numerous outages, slow-downs, and degradations in system response times witnessed over the past year. Then, in facing the need for firms to increase capacity under Market Storm conditions, two further difficulties resulted.

First, a number of firms implemented hardware and software upgrades "on-the-fly," often making these changes without performing a thorough analysis or without examining the impacts of these changes on other parts of the system through rigorous quality assurance ("QA") testing.<sup>106</sup>

Second, some firms found it difficult to add components quickly enough to

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<sup>106</sup> See discussion at section V(B)(3), *infra*.

keep up with increasing demand. For example, as one firm provided capacity relief during the fourth quarter of 1998, the increased capacity was immediately absorbed by “latent” customer demand. In another case, previously planned hardware upgrades were postponed in order to concentrate energies on handling existing demand.

**(d) Physical plant and power capacity limitations.**

In addition to technological constraints on an online brokerage firm’s ability to expand its capacity, there are also physical limitations which can affect scalability. Because online trading takes place over the Internet, in the cyber-world, people tend to discount the significance of real-world considerations. However, all of an online trading firm’s servers, mainframes, routers, and storage devices still need to be housed in a physical plant. Additionally, these systems require a tremendous amount of power and an efficient cooling system. Any attempt to increase capacity through the addition of hardware will therefore always be affected by the physical constraints of the online brokerage firm. We have found that physical plants have become major scalability constraints, particularly in light of the unexpected surge in demand experienced by firms. As firms add more customers and more hardware, they ultimately confront the physical limits for maintaining and operating this equipment within the physical confines of the technology center. In a related case, we found that a site could accommodate more hardware but the electric transmission capacity was at its limit. To bring in additional power would have required shutting the technology center down for a period that exceeded the demands of the business. Hence,

electric power had become a scalability issue which was overcome by opening an additional technology center in another location. This had the additional benefit of diversifying computing, thereby avoiding potential for a single point of failure.

**(e) Difficulties in hiring and training skilled technology staff.**

Another real-world capacity constraint encountered by some of the online brokerage firms, as well as by traditional brokerage firms,<sup>107</sup> has been the ability to attract, hire, and train highly-skilled employees needed to operate and monitor trading systems. While these resource needs are somewhat offset by the allure of working for a highly visible Internet business with a booming stock price, the combination of high growth, many concurrent projects, and competing employment opportunities has made it difficult to obtain all the highly skilled technology staff that are needed.

For example, in a review of one firm's technology operations, a consulting firm noted that resources were stretched across all personnel teams and that there were inadequate resources to support the test and production areas at the firm. Management and the Board of Directors, having identified the "critical skill shortages," brought in specifically qualified personnel and greatly augmented the IS staff.

**2. Front-end web interface.**

Regardless of whether an online brokerage firm utilizes a server system or a mainframe for handling its back-office trading operations, virtually every firm utilizes some

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<sup>107</sup> See Richtel, "Need for Computer Experts is Making Recruiters Frantic," N.Y. Times, p. A1, November 18, 1999.

type of server-based architecture to handle the front-end interface with customers. These servers are more generally referred to as “web servers.”

Many online brokerage customers have experienced problems with their online brokerage firm’s front-end systems. These have included slow customer response time, the inability to log on to a website, and being involuntarily logged off the website. As detailed below, these difficulties apparently resulted from a range of capacity-related problems with the firms’ front-end systems.

**(a) Front-end software and hardware problems.**

In addition to the web servers used to host an online brokerage firm’s customer sessions, the front-end part of a firm’s information systems generally consists of a complicated and delicately balanced array of hardware and software arranged to meet the informational and transactional needs of the firm’s customers. For example, a front-end configuration might initially involve multiple Internet points of connection, traffic directors and security checkpoints which protect the system from non-customers. In back of these firewalls may be a router, which sends the incoming web traffic to one of a number of web servers, based upon availability. The web servers will in turn connect to the firm’s middleware, which handles message routing, including customer inquiries, and can access all of the relevant systems such as quote servers and the firm’s back-end systems.

The exact configuration of a firm’s front-end architecture can significantly affect a firm’s ability to balance web server capacity and customer access requirements.

Even established online brokerage firms must continually re-examine and redeploy their front-end architecture to gain better efficiencies and prevent potential front-end bottlenecks. These efforts, however, have not always been fully successful in alleviating all potential bottlenecks, especially if an individual component is not performing as expected.

In addition to the front-end hardware, the software utilized to run the web servers can also have a significant impact upon the system's ability to service customers. Generally, the purpose of this software is to act as a bridge, or interface, accepting incoming customer web traffic and then transferring that traffic to the system's middleware depending on the nature of the customer's requests. The actual software utilized to operate the web server varies by firm, but Netscape is a common supplier. While many firms are currently using or migrating to updated-web interface software, not all firms have transitioned from older versions.

**(b) Log-in problems related to web-server capacity.**

During the Market Storm, the front-end system of one firm was running close to capacity nearly every single day. We infer, from the data that we reviewed, that many people experienced delays when logging onto this firm's web site. Despite the firm's capacity relief efforts, including the accelerated completion of an additional planned technology facility, the firm continued to experience service challenges with web interface during the second quarter of 1999. Specifically, product performance issues with the firm's web server layer compromised the firm's forecast of concurrent online user capacity per

channel. Even though the firm quickly took steps to reconfigure and redeploy the relevant system architecture, the changes only improved, but did not wholly rectify, the web server performance situation.

In addition, at one firm that we visited, a relatively old and resource consuming web-interface software reduced the firm's web server performance and speed. This firm concluded that the use of this software created additional work for the web servers because it needed to be loaded for each transaction, thereby slowing system performance and requiring additional web servers. Similarly, older software may stymie a firm's ability to handle high volume web traffic.

**(c) Customer authentication.**

Generally, any member of the public may log-in to a brokerage firm's website to obtain limited research materials, delayed quotes, and financial news. In order to enter the firm's back-end system where a customer can place trades or check account information, however, the individual must log-in utilizing an account number and password. This number and password are verified by the system before allowing access to these sensitive customer-only areas. This process is generally referred to as "customer authentication."

In some instances, customers have been able to log-in to a brokerage firm's website, but not able to log-in to the customer-only areas of the site. This was especially true earlier this year, when customers were unable to access account information or place trades, due to delays in customer authentication. As a general rule, these delays in customer

authentication appeared to stem from capacity bottlenecks in the brokerage firms' front-end systems.

For example, one firm suffered capacity bottlenecks on the server database on which it housed its customer authentication information, which in turn delayed the speed of customer authentication. In addition to storing customer authentication information, this server database was also used by various trading applications and was used to generate reports. At the time that the server database was first placed into service, transactional volume was relatively low, and as such, authentication requests were capable of being handled in a reasonable amount of time, in addition to the other functions for which the server database was accessed.

Over time, however, the database's ability to service all customer log-in requests degraded, due to the fact that these authentication requests were competing with other demands placed on the database. Eventually, the demands placed on the database exceeded its ability to provide authentication information in an acceptable time period. This is caused delays in the customer log in process. In fact, if the system was too slow in completing the authentication process, customers may have been timed-out of the system before they could even finish logging in. These problems were especially prevalent during the beginning of 1999. The problem was solved by stream-lining the software code, adding additional database servers and isolating customer authentication information in a separate database.

Another firm also encountered authentication problems due to the architecture of its system. Despite the fact that the firm could perform customer authentication through either its servers or a mainframe, all log-in authentication requests were directed to the mainframe, regardless of how much work-load the mainframe was handling. As such, during periods of high volume, planned mainframe downtime, or when the mainframe batch process ran over its expected time window, customers attempting to log-in to the system would likely have encountered problems due to the delays in the authentication process. This problem was subsequently resolved by shifting to a system which switches log-in authentication requests to the database if the mainframe is busy or unavailable.

**(d) Log-in delays due to database capacity constraints.**

In some instances, successful log-in may require access to a particular database. Any capacity constraints on such a critical database will necessarily affect log-in times, and potentially prevent completion of the log-in procedure. For example, one firm experienced problems due to the capacity constraints on a critical database that generated what is known as “alert” messages.<sup>108</sup> The alert functionality is key to the log-in process, because the firm’s system was designed to check for alerts during the log-in process, pulling up any alerts that

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<sup>108</sup> There are three ways that an alert can be generated for a customer account: (1) the firm might place an alert on the account in order to apprise the customer of a relevant account issue; (2) the customer might ask the system to alert him or her if a stock price reaches a pre-specified amount; or (3) the customer might choose to have the system alert him or her if there is any news on any pre-selected companies being followed. If an alert is placed on a customer’s account for any of these 3 reasons, the customer’s account is deemed at that time to be an account with alert functionality.

might be active and presenting them to the customer for review. Conversely, if the system was unable to complete the process of retrieving these alerts, the customer would be unable to complete the log-in process. That is precisely what happened at this firm in early 1999, when the firm experienced volume exceeding the capacity of its systems. During this time period, the firm utilized only a single database server for alerts. Due to the surge in demand, the system could not keep up with all of the requests upon the single database server, and was therefore unable to complete all of the necessary retrievals of alerts for the customers attempting to log-in simultaneously. Since the customer log-in procedure could not be completed until these alerts were retrieved, numerous customers faced log-in difficulties. To rectify this problem, the firm eventually added additional database servers.

**(e) Slow response time due to a proliferation of website applications.**

Another problem that appeared to adversely affect the performance of online brokerage firms' front-end systems was the increasing array of options and services offered by the online brokerage firms. The breadth of these offerings has obvious advantages for customers. The benefits of access to enhanced research materials and other services, however, must be balanced against the added strain that these applications place on front-end systems. As the number and scope of website offerings and services have proliferated, some

firms have experienced performance degradation in their front-end systems, which has been noticeable by visitors to the firms' websites.

**(f) Time outs.**

Numerous investors have experienced difficulty in maintaining an online connection with online brokerage firms' websites. This problem appears related to the use of what is known as "time-out parameters" by the firms. These parameters work as follows. If a customer request to the system should take longer than expected, the system is designed to time that user out after a pre-set period of time. Such "time outs" are conceived to conserve system resources for persons who are actively attempting to use the system, as opposed to maintaining an open channel. The time-outs, however, became a problem when the response time from a firm's system degraded due to any of the problems discussed above. During these busy periods, customer requests may take a prolonged time to process, which resulted in customers being involuntarily timed out of the system.

For example, at one firm we reviewed, the firm's customer application timers were apparently set to operate with a 2 minute window. This meant that if a user request to the system was not executed within 2 minutes, the user would be timed-out of the system without the request being filled. This was apparently related to a problem with the way the firm stored its customer information. Specifically, whenever there is insufficient contiguous space on a disk to store a complete file, the file is broken into multiple pieces, known as file fragmentation. When a disk becomes significantly fragmented, the system is placed under

additional stress and there are delays in reading and writing data. In this case file fragmentation appears to have become excessively large over time, resulting in the input/output performance of the firm's systems being degraded, which in turn may have caused customer requests to the system to be frequently timed out without their requests being filled.

**(g) Session management.**

“Session management,” or the manner in which a system manages and routes an individual customer session, may also affect a customer's ability to promptly log-in to an online brokerage firm's website. For example, a customer might be identified during a particular session by their Internet protocol (“IP”) address. Assuming that every customer was logging-in from a unique IP address, this method of tracking the session would be feasible. Unfortunately, however, some individuals access the Internet through what is known as a “proxy server”. A proxy server generally masks all of the internal IP addresses that lie behind it, and presents only a single IP address to the outside (the proxy server's IP address). Regardless of how many customers log in from behind the proxy server, that proxy server will only provide a single IP address to the outside world. This presented front-end problems for at least one firm reviewed by the Office.

Specifically, once a customer's session was established with the system, the customer log-in information, including the customer's IP address and port information, was recorded in a database which was then used to identify the user for the length of the customer

session. Because the firm used IP addresses to track customer sessions, proxy servers, which presented only a single IP address no matter how many individuals logged in from behind the server, made it impossible for that firm's systems to track customers logging in through proxy servers. If more than one individual tried to log in to that brokerage firm's website from behind the same proxy server, the IP address provided to the firm for purposes of tracking these customer sessions would be identical for all customers, which might prevent all but one customer from successfully accessing the system and conducting a session.

### **3. Middleware.**

An online brokerage firm's "middleware" is responsible for providing the integrated messaging between the front and back-ends of the brokerage firm's three tier system. Generally, this routing of messages is handled by software. In essence, the middleware can be thought of as a critical facilitator, through which all information must pass. Just as many firms' front and back-end systems have suffered from capacity-related problems, so has the middleware which connects the two.

For example, earlier this year, one firm experienced problems when the virtual memory allocated to handle messaging, known as a "partition," was exceeded. When the mainframe was first placed into service, it was configured with a single "partition" to handle the routing and processing of transactions between the front and back-ends of the system. In the context of the middleware, a "transaction" does not merely refer to a trade, but rather refers to a unit of work, such as an order, a request for a quote or a customer account inquiry.

Because the partition could only handle a limited number of transactions per second, it was unable to timely process the influx of transactions that accompanied the upsurge in trading volume during January 1999. As such, transactions began queuing up once they surpassed the pre-set limits of that single partition. The firm was able to redress this issue by allocating additional partitions for handling messaging.

In addition to such a capacity-related problem, a firm's middleware can also be adversely affected by software problems. For example, in another instance investors suffered delays due to problems the firm experienced with the messaging software connecting its back-end system and its web trading servers. Customers experienced slow response times in web trading, an inability to access certain account and transaction information, and other system availability impacts over the period of almost a week. The firm's problems with its messaging software recurred a month later with similar effects. This well illustrates that the complexity of these systems can make it difficult to discover, when an anomaly is first observed, what is causing the system's unsatisfactory performance.

#### **4. Back-end systems.**

A brokerage firm's back-end is probably the most critical part of its system. It is the back-end where the trading and order routing logic resides, where the vetting of trades occurs, and where customer security accounts are maintained and updated. The back-end of the system also appears particularly vulnerable to capacity-related problems, since many back-end trading systems were never designed to handle high volume/transactional

direct interface with customers. These deficiencies, and the ensuing difficulties experienced by customers, are discussed in greater detail below. They include the following:

- A major component of most firms' back-end system is a mainframe computer, or a bank of servers, which handles the firm's order vetting and routing functions. Weakness in these components interfered with the processing of orders, and occasionally led to outages. Specifically, during times of high volatility, many of the firms were operating their primary trading system CPU at or above capacity limitations.
- Other firms out source their order routing and clearing functions to an entity generally referred to as a "back-office provider." The back-office provider will generally reconcile investor accounts and provide other support for customer trading activities. In some instances, capacity limitations on the back-office provider systems, as well as bottlenecks in lines between the online brokerage firms and these providers, appeared to adversely affect timely processing and execution of trade orders.
- Regardless of whether a firm handles its back-end tasks internally or by out-sourcing, any back-end system is still reliant on the customer database to maintain customer and transaction information. This database is usually housed on either a mainframe or a set of database servers, or in some firms on both. Heavy demands on these databases appeared to be a frequent source of bottlenecks and often affected order routing and the reporting back of filled orders.
- Many firms also did not satisfy investor expectations when it came to reporting trades back to their customers in a timely manner. It seemed likely that investor expectations of expedient trade reporting were fueled, in large part, by the marketing campaigns of the online brokerage firms themselves.

**(a) Overview of back-end capacity constraints.**

The back-end systems of numerous online brokerage firms encountered problems earlier this year as a result of capacity constraints. In some instances, the lack of adequate capacity to meet customer demand was severe. For example, one firm charted excess trade demand to exceed its trade capacity by approximately one-third earlier this year. Online trading demand at this firm also exceeded the capacity on one component of its back-end system during this same period, at one point by as much as 50%, raising questions about the system's ability to adequately support the number of customers using the system. In fact, in a review by an outside technology consulting firm, this component was identified as a major capacity bottleneck, not able to support the number of users of the system. In describing its modifications of this back-office system, the consulting firm described the situation as a patchwork and observed that such modifications may improve appearances and surface functionality, but do not solve the underlying problem.

While the capacity constraints at some firms caused slowdowns and outages, at least one firm we examined chose to avoid outages by intervening through a managed service degradation under load. The firm's system was designed to perform a complex balancing of the ports allocated for various processes, including order entry. As stress increased on one part of the system, due to an increase in the processes handled by that part of the system, operators could relieve the stress by decreasing the number of ports dedicated to that process.

Thus, if the queue of orders began to grow, thereby placing stress on the trading system, the firm could offset this load by shutting down some of the ports dedicated to the order entry process. For example, if the firm hypothetically allocated 20 ports to order entry processes, and it needed to reduce the flow of orders, an operator could reduce the number of order entry ports to 15. By reducing the number of order entry ports, fewer customers would be able to complete the order entry process, thus decreasing the queue of orders, and thus the stress on the system. Due to the decrease in ports, however, the customer order processes would take longer to complete, in some cases causing orders to time-out before completion.

According to this firm, the need to degrade system availability through the reconfiguration of available ports was especially crucial in the first quarter and into the second quarter of 1999. Through these manual interventions, which at times prevented some customers from placing orders, this firm claims to have been able to keep its order processing systems from exceeding its capacity ceiling.

**(b) Capacity problems as a result of system limitations in reading and writing data.**

Probably one of the most significant factors which may limit the capacity of an online brokerage firm's back-end system is its ability to read and write data. While memory upgrades, as well as hardware and software upgrades, are important for purposes of accelerating processing speed and efficiency, the back-end system is always reliant on its ability to read and write data to and from the location where it is stored. Frequently, much

of this data resides in one or more databases, hosted on one or more database servers. In other circumstances, the data might be written to a solid state disk array or cached in memory. Regardless of where this data is stored, the speed with which a system can access it for purposes of reading and writing has presented various capacity bottlenecks, and in some cases, constrained scalability.

For example, one firm utilized a database process which made it difficult to handle requests of customers who had more than one account with the firm. Customers of this firm may also have experienced difficulty with its order processing capability due to database problems. Pursuant to the system's original design, more than one process within the trading system was capable of attempting to access the same data at the same time, which would result in what is known as a "lock contention." This could have resulted in making parts of the database unavailable to customers at times. Although this firm is currently in the planning stages to migrate to a more scalable database, migration is not expected to be completed until at least the beginning of 2000 due to a Y2K freeze on all hardware changes.

Another firm experienced problems with its database when the number of transactions per day significantly exceeded the maximum number of transactions that the database server was designed to handle. It is important to bear in mind that "transactions" refers to both executed trades, as well as orders which may not necessarily execute at the time that they are inputted, such as limit orders. Surpassing the estimated limitations on the server database caused capacity bottlenecks and degraded the response times. This bottleneck was

eventually alleviated by a reconfiguration of the databases and the addition of more powerful hardware.

A particularly dramatic example of a capacity bottleneck caused by a limit in the ability to read and write data, pertains to the storage of all pending open orders in what is known as an “open order file.” Generally, the open order file is broken down by security, with each security being allocated a certain amount of file space for purposes of storing the open orders for that security. These file space allocations were generally based upon certain historical norms, including market volatility, and volume concentration in a given security.

Although a number of firms apparently use this open order file, we found one firm specifically where this open order file became a serious problem. This problem arose primarily due to a new paradigm in overall market trading: shifting from what had historically been heavy trading in a wide variety of securities, to a heavy concentration of trading in a relatively small number of securities. Due to this heavy concentration in a small number of securities, the firm’s back-office provider began to run into severe capacity bottlenecks as the amount of storage space devoted to each of these heavily traded securities hit its pre-set ceilings. As such, an extensive amount of input/output activity was required as the system continually tried to allocate additional storage space for heavily traded securities. The lack of storage space, coupled with the excessive input/output activity which it spurred, created a capacity bottleneck which in turn strained the back-office provider’s order processing capability and threatened the brokerage firm’s ability to accept orders in those

securities from its clients. This led to a number of outages by the firm, most prominently in the first third of 1999. Yet, this problem was by no means unexpected. Document review demonstrated that based upon traffic studies and an analysis of the firm's growth curve, the firm had been warned of these potential problems and the resultant outages as far back as October 1998.

As a long term solution, the brokerage firm undertook a project to move the open order file to internal memory, which would result in improved speed and reliability. In the short term, however, the brokerage firm was forced to take more immediate and drastic actions to avoid bottlenecks and outages due to the open-order file problem. As such, the firm implemented a policy termed "blocking." The blocking of certain securities meant that on-line investors' orders for those blocked securities would be rejected by the firm's website, and customers would receive notification to call the firm's branch office and place the order manually over the phone. The branch office would call the orders into the back-office provider for distribution to the execution points. Essentially, blocking was meant to purposefully slow the order flow and alleviate the bottleneck associated with orders coming in simultaneously.

It is interesting to note that other entities, including the NYSE, were also affected by this new volume concentration paradigm. For example, on April 20, 1999, the volume in AOL (32.6 million shares for the day on the NYSE and 23 million shares at regional exchanges and third market firms) caused queues of "cancel or replace" order

messages to build which could not be cleared until after the market closed.

**(c) Delays in reporting executions to investors.**

One of the more common complaints raised by consumers pertained to delays in the updating of their accounts to reflect that a security transaction had been executed. For example, although a trade may occur at 9:31 A.M., the customer's account status indicating that trade might not be updated until 11:00 A.M., or even later. Numerous investors claimed that due to rapid market movements, by the time they received notice of the execution, the price might have moved dramatically in one direction or the other. This is all the more likely when an investor is trading the highly volatile "dot.com" stocks, where large differentials in a day, or even an hour, are not unheard of. Yet, if the investor does not know the order has been executed, and that he or she now owns the stock, the investor cannot take steps to sell the position if it were to fall. Because of the substantial number of complaints we received about delays in the reporting of executions, we endeavored to ascertain the reason for these reporting delays.

One cause of these delays might be system or hardware failures by the market makers or exchanges to whom these orders are routed. Delays might also occur as a result of the deficiencies in the lines connecting the market makers and exchanges to the brokerage firms and/or their back-office providers. These lines must carry a range of information back and forth, including trade orders and reports of fills of executed traders back to the online brokerage firm. Since the lines can conduct only a finite amount of information at any given

time, as order volume increases, the information that must flow over those lines at any given time increases. Thus, sharing the same line, incoming order flow will often take priority over the flow of outgoing execution reports. This can result in a delay of reporting timely executions to investors when a particular line is overburdened with incoming order.

Interestingly, although at least one of the market makers we spoke with did have additional line throughput which was at times underutilized and which would have permitted the reporting of trades in a more expeditious manner, these lines were not used because of pre-set limitations imposed upon the market makers by some online brokerage firms and/or their back-office providers. Some of those rules include: (1) reports of any partial fills must be transmitted back over a special line which is dedicated to partial reports, even if other non-partial lines are available, and are less congested; (2) reports of fills must be sent back through the same line that the order was transmitted to the market maker, despite the availability of other, less congested lines which would permit quicker reporting.

These restrictions appear to play a part in delaying the speed with which execution reports can be transmitted to a brokerage firm, and in turn used to update a customer's account. In order to overcome these rules, at least one market maker had to write a proprietary program to trick the routing firm's system into believing the report was being sent back down the same line that it was transmitted, even though it was not.

Another factor affecting the speed with which orders are reported to investors is the actual speed which brokerage firms and service bureaus can transmit information back

and forth to each other. For example, while the bandwidth of the lines which connect one service bureau to a market maker can carry data at speeds up to 56,000 bits per second, the service bureau itself can generally only transmit the information over those lines at 4800 bits per second, or less than 10% of the total capacity of those lines. Yet another constraining factor on the reporting back of trades is that some online brokerage firms and service bureaus still utilize lines that run on antiquated communication protocols.

Reporting delays might arise at the online brokerage firms due to system slowdowns and outages. Interestingly, one firm actually designed its system so that, before it needed to engage in any intervention to offset stress, the system would first attempt to permit its queue of customer execution reports to build. In essence, reporting filled trades back to customers was given a lower priority than order entry, and thus the system was designed so that if delays were to occur, they would occur at the reporting stage. As a result, that firm's customers incurred delays in the receipt of execution reports at various times. Although trading volumes have generally decreased over the third quarter of this year, the firm recently confirmed that its execution reporting system remains a system limitation.

**(d) In-house vs. out-sourced solutions.**

As noted previously, some online brokerage firms out-source back-end tasks to a "back-office provider." Delays in the back-end processing of customer trade orders may be due, in part, to problems experienced by these back-office providers. In several instances, trading functionality has been unavailable (i.e., customers have been unable to enter trade

orders) due to insufficient systems capacity in the lines connecting the online brokerage firm with its external back-office provider, or on the part of a back-office provider itself. Similarly, at least one firm voluntarily disabled its web-based order entry when its service bureau experienced an outage or delays due to a capacity bottleneck since the firm knew that its back-office provider would be unable to process any orders received by the firm.

## **5. Back up systems.**

As one would expect from any company with a business reliant primarily on computer hardware and software, online brokerage firms utilize a number of methods to prevent a cessation of operations when a problem occurs with an individual system component, or multiple components. For example, in order to prevent a complete loss of data should the data in a database become corrupted, or should a database server fail to function, a number of online brokerage firms maintain a string of database servers, running one primary database, with at least one secondary back-up database. Other firms maintain two or more copies of the database, one for purposes of reading and writing transactions, and the other for purposes of log-in, authentication and account information queries. Another option utilized by some firms is to operate more than one database, each residing in a different physical location, and each maintaining virtually the same information as the other through the use of data replication.

While maintaining separate back-up redundancies of data is essential to the uninterrupted operation of an online brokerage firm, maintaining a separate back-up facility

is no longer as necessary as it may have been a decade ago. Thanks in part to routers, load balancers and other sophisticated technological achievements, most online brokerage firms no longer have a single point of failure, such that failure of one system would disable the entire business. The best practice of the firms we examined was operating their day-to-day functions out of more than one facility, as a means of spreading load across multiple facilities and thus attempting to avoid over-loading any one facility. While one facility is not operated as a back-up for another facility, with both facilities theoretically splitting the day to day transaction load, the operation of multiple facilities eliminates the need for a separate back-up facility.

While most brokerage firms and market makers operate multiple facilities, at least one major market maker, and one back-office provider use only a single facility. While these entities may have built multiple redundancies into their systems at that single location, they are still subject to an unexpected cessation of business should something happen at that single facility, for example, flooding, a loss of power, or fire. Additionally, while a number of the online brokerage firms operate their entire business through load-balancing across more than one location, at least one major brokerage firm still operates its business primarily out of a single technology center. This firm by necessity, maintains a back-up facility to which it has transitioned during system outages, although it is moving towards balancing its workload across multiple facilities.

Because this firm has only a single primary facility, any time that the firm

experiences an outage, the firm must make a decision as to whether to transition to this back-up system. Any number of considerations may factor into this decision, including the cause of the outage, if known, how long the problem will take to fix, and the time of the day. Additionally, the fact that this transition is not currently seamless, meaning that investors do not have access to all of the features that they have when the primary system is operating, also figures into the decision of whether or not to switch to the back-up facility. In the future the firm anticipates that a seamless switch-over will be possible.

Interestingly, just as many firms' primary systems suffered from capacity related problems earlier this year, likewise this back-up system also encountered capacity related issues during its implementation. For example, in an analysis of an outage this spring, this firm's IS staff sourced the performance of the back-up system as partially attributable to inadequate capacity to support the firm's transaction load.

## **6. Customer support services.**

Our review of the customer service records of a number of online brokerage firms confirmed that customers were unable to reach customer service support at these firms earlier this year. This was especially true during times of high volume and volatility. Additionally, although this problem was most apparent in January 1999, when many of the online brokerage firms attempted to catch up with the customer demand that they created, in part by their marketing campaigns, these problems were by no means limited to that time period.

The extent of deficiencies in customer support services is apparent from a review of the average time in which firms answered a customer call (“average response time”), and the rate at which customers simply abandoned unanswered calls. For example:

- An analysis of key telephone statistics conducted by one firm it was revealed that the total calls answered within 60 and 120 seconds had dropped from almost 100% for both, to one-quarter and one-third respectively, in late January 1999. Additionally, average response time climbed to around 10 minutes in late January 1999, peaking at about 13 minutes in the first half of February. Although response times subsequently improved, they again rose to 9 minutes in early May of 1999.
- At the same firm, the number of abandoned calls also increased. Almost half of all customer calls were abandoned during the period from mid-January to mid-February. Even more striking, on one day in the Spring of 1999, the number of total calls abandoned exceeded the number of calls answered by almost one-third.
- At another firm, response times were particularly slow in January 1999. On one day, the longest wait time was over a quarter of an hour, and almost one-fourth of all calls were abandoned. The following week, the longest wait time grew to almost three quarters of an hour, with the call abandonment rate on that day approaching 20%. Similar customer service deficits were noted throughout the first third of 1999.
- E-mail response time also encountered increased backlog. At one firm, the average E-mail response time in hours grew from a low of 14 hours at the end of December 1998, to a high of 90 hours at the beginning of January 1999. In fact, at one point E-mails had exponentially increased at this firm so quickly that despite utilizing overtime customer service personnel to reduce the backlog, there were still thousands in queue awaiting a response.

It should come as no surprise to investors that firms with multiple access channels (of large phone centers and branch offices) generally did a better job responding to customers when systems were out or delayed. It is also worth noting that customer service problems experienced by at least one firm were related to obtaining approval from the NASD to hire additional registered securities representatives. NASD Regulation frequently places caps upon a broker-dealer's employment of registered agents through its member review process. Since all agents must be supervised, NASD Regulation seeks to prevent hiring from spurting ahead of sufficient management resources. In this case either the application was submitted too late or its approval was delayed. That firm did curtail advertising during the Market Storm, but it did not eliminate all marketing.

**D. Market Makers: Trade Execution Solutions for Online Investors -- Knight Securities, L.P.**

**1. Complaints relating to poor executions.**

A recurrent theme of the investor complaints reviewed by our office relate to delayed or questioned trade executions, particularly during the period from late October 1998 through February 1999. Knight Securities was the leading provider of automated trade executions ("auto-ex") for online brokers, and the curtailment of auto-ex services by Knight was a likely source of many of these complaints. Accordingly, our inquiry evaluated Knight's performance, as well as other market makers. For illustrative purposes, the following sections address the performance of Knight during the 1998-99 Market Storm and the issues

that arise for online investors involving market makers.

The tremendous stress placed upon NASDAQ market making firms in the Market Storm are best illustrated by the volatility witnessed in Internet stocks:

- On November 30, 1998, Onsale (ONSL) traded from 108 to 50 in 25 minutes.
- On November 13, 1998, the shares of theglobe.com (TGLO) commenced trading after an IPO at \$9 per share, traded as high as \$97, closed at \$63.50.
- Also in mid-November, Avtel Communications (NASDAQ symbol "AVCO") went from \$11 to \$31 in the last 30 minutes of trading as a result of a mention on CNBC. At this trading peak AVCO had a market capitalization of \$3 billion; today it is in violation of a loan covenant that it maintain a minimum net worth of \$2 million.
- On January 14, 1999, CMGI opened at \$146, traded down to \$88 and back up to \$130 in 15 minutes.

Volatility of this magnitude can be simply lethal for novice investors -- and is even hazardous for market makers. These and similar events prompted SEC Chairman Arthur Levitt and the NASD Regulation in late January 1999 to call upon investors to employ limit orders, as opposed to market orders, in order to gain price protection against such volatile trading conditions.<sup>109</sup> Online firms acted quickly to disseminate this information via their websites, monthly statement stuffers and advertisements.

We have sought to weigh the performance of Knight Securities under these

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<sup>109</sup> Statement concerning On-Line Trading, January 27, 1999, [www.sec.gov/news/press/99-9.txt](http://www.sec.gov/news/press/99-9.txt).

circumstances and conclude that the NASDAQ market place must facilitate, as Knight itself has urged, better tools by which market makers may effect executions against other market makers so that auto-ex providers will have an enhanced ability to offer uninterrupted liquidity to investors.

## **2. Who is Knight Securities?**

Knight Securities is a wholly owned subsidiary of Knight/Trimark Group, Inc. a public company since July 1998. While Knight Securities concentrates upon NASDAQ market making from its Jersey City headquarters, sister corporation Trimark Securities provides off-exchange executions for NYSE listed securities.

The origin of Knight/Trimark Group began in 1995. Until just prior to its initial public offering, the business was 60% owned by a consortium of 27 broker-dealers and their affiliates with management owning the remaining 40%.<sup>110</sup> After the 30% of Knight now owned by executive officers and directors, online broker-dealers remain the largest shareholders in Knight.<sup>111</sup> Waterhouse owns 8.53%, Ameritrade 7.13% and E\*Trade and Discover collectively about 5%.<sup>112</sup> Waterhouse, Ameritrade and E\*Trade each contributed

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<sup>110</sup> Knight/Trimark Group, Inc., Prospectus, July 8, 1998.

<sup>111</sup> Knight/Trimark Group, Inc., Proxy Statement, April 16, 1999.

<sup>112</sup> These percentages have been declining and appear likely to continue to decline as TDWaterhouse and E\*Trade are reportedly prepared to sell additional shares. Gabele, "Knight/Trimark Finds Out Who Its Real Friends Are," TheStreet.com, November 11, 1999, [www.thestreet.com/comment/gabele/817480.htm](http://www.thestreet.com/comment/gabele/817480.htm).

about 12% of Knight's order flow in the quarter ending June 30, 1999, totaling 36.5%.<sup>113</sup> The total payments-for-order-flow earned by Waterhouse and Ameritrade from Knight in the June 30 quarter was \$12.4 million.

Knight employs sophisticated trading systems and proprietary methods to offer "best execution" services to broker-dealers and institutional customers emphasizing automated execution. The firm also utilizes proprietary risk management systems which provide Knight with real-time, online risk management and inventory control. Knight is also beginning to deploy innovative Internet based tools that permit customer broker-dealers to access information, such as pending order status, within Knight's system.<sup>114</sup>

Knight makes markets in more than 7,000 NASDAQ and OTC Bulletin Board stocks.<sup>115</sup> Through its Trimark subsidiary, it also makes off-exchange markets in all NYSE and AMEX-listed equity securities. As of June 1999, Knight held the largest market share, at 17.5%, of total OTC dealer trading volume.<sup>116</sup> In the course of accomplishing its market making business, Knight may either carry inventory (be long) or borrow shares (be short). As of June 30, 1999 Knight held \$200 million in long positions and \$220 million in short positions.<sup>117</sup>

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<sup>113</sup> Knight/Trimark Group, Inc., SEC Form 10Q, August 11, 1999.

<sup>114</sup> Knight/Trimark Group, Inc., Press Release, April 8, 1999.

<sup>115</sup> Id.

<sup>116</sup> Form 10Q, August 11, 1999.

<sup>117</sup> Id.

### **3. Making payments for order flow.**

As a market maker in NASDAQ securities, Knight engages in the widespread industry practice of “payments for order-flow.” Under this practice, broker-dealers who originate market orders receive rebates of typically between 1¢ and 2¢ per share for orders directed by them to selected market makers for execution. This payment is not reflected in the trade confirmation seen by the investor but is paid by the dealer executing the trade from its market making profits. The customer agreements of the online brokers examined typically disclosed the firm’s practice of accepting such payments. Further, the fact that the broker may receive other remuneration in connection with the order is typically a disclosure on the back of the trade confirmation documents issued to an investor.<sup>118</sup> The absence of payment for order flow revenue from investor limit orders has typically resulted in online firms charging a higher price for limit orders as compared to market orders.<sup>119</sup> Recently, one online firm has advertised its refusal to accept payment for order flow.<sup>120</sup>

Broker-dealers that do not make markets in individual securities, including online firms, direct order flow to firms such as Knight and Mayer & Schweitzer to achieve fast and advantageous executions for their customers. Market conduct rules obligate these originating firms to closely monitor the performance of firms providing such execution

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<sup>118</sup> This disclosure derives from SEC Rule 10b-10, 17 C.F.R. §240.10b-10(a)(7)(iv).

<sup>119</sup> By way of example E\*Trade typically charges \$14.95 for a market order and \$19.95 for a limit order. Ameritrade and other firms also employ a \$5 differential.

<sup>120</sup> Barron’s, September 13, 1999, p. 25 (full page advertisement by onlinetrading.com).

services for consistency with applicable market rules and practices. Periodic reports are compiled and furnished to the firms that sell their customer order flow which analyze the market maker's execution services and the frequency of achieving price improvement for customer's orders. However, this information does not reach customers or the public.<sup>121</sup>

Payments for order flow represent the second highest expense item of Knight's business, at 24% of net trading revenues in the three months ending September 30, 1999. A closer look at Knight's most recent 10Q reveals, however, that, as a percentage of net trading revenue, payments for order flow have declined 21.6% in the first nine months of this year. For the first nine months of this year, such payments constituted 18.85% of net trading revenues compared to 24% for the same period in 1998. This change potentially reflects heightened investor understanding of the risks of market orders and greater use of limit orders which are not eligible for order flow payments.

Payments for order flow have been surrounded in controversy since well before online brokerage firms arrived.<sup>122</sup> Critics have assailed them as outright bribery and a breach of the broker's agency obligations to the customer. At a minimum, a broker's opportunity to sell customer order flow presents a potential conflict with customers receiving "best

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<sup>121</sup> A leading commentator has called for a "standard, industrywide scorecard that focuses on broker performance . . . balanc[ing] the complexity of order-routing with the clarity investors need." McNamee, "It's Time To Shine a Light on Brokers," *Business Week*, November 22, 1999, p. 183.

<sup>122</sup> Coffee, "Brokers and Bribery," *N.Y.L.J.*, September 27, 1990, p. 5; Note, "The Perils of Payment For Order Flow," 107 *Harv. L. Rev.* 1675 (1994).

executions” since market makers paying for order flow may be less vigilant in obtaining price improvement for customers where it might reduce their own profits. The SEC has not elected to bar the practice and the New York Court of Appeals has determined that application of our common law agency disclosure duties was impliedly preempted by the conflict that would arise with the “policy-based delicate balance Congress directed the SEC to achieve.”<sup>123</sup>

Amid signs that the payment for order flow practice is now gaining a foothold in the options market,<sup>124</sup> the SEC is again sounding alarms that the practice is not clear to investors and harmfully conflicts with the broker’s “best execution” duty.<sup>125</sup> A further assault on the practice may develop when equity pricing converts to decimals on June 30, 2000. The anticipated squeeze on market makers’ quote spreads is expected to reduce, if not eliminate this practice. In fact, long-term revenue estimates of analysts for online brokers omit order

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<sup>123</sup> Guice v. Charles Schwab & Co., Inc., 89 N.Y. 49, 651 N.Y.S.2d 352 (1996). But see, Norris, “Market Place/The SEC drops a plan to force brokers to disclose a practice,” March 13, 1995.

<sup>124</sup> Sears, “Payment for Order Flow, Common Practice in Stock Trading, Emerges in Options Market,” Wall Street Journal, p. C24, November 5, 1999.

<sup>125</sup> Arthur Levitt (Chairman), “Best Execution: Promise of Integrity, Guardian of Competition,” Remarks to the Securities Industry Assn., Boca Raton, FL, November 4, 1999, (“Some firms appear to be allowing payments for order flow or other inducements to affect which markets they send their orders to - at the expense of quality executions.”), [www.sec.gov/news/speeches/spch\\_315.html](http://www.sec.gov/news/speeches/spch_315.html).

flow payments.<sup>126</sup>

Investors should inform themselves about the payment for order plan practices of their brokers. “With today’s low commissions, investors need to start focusing on other transaction costs,” says John Markese, president of the American Association of Individual Investors.<sup>127</sup> In placing orders, they should weigh the impact of the practice in light of their price and time objectives. In selecting their brokers, they should determine what percentage of its customers get price improvement, the average savings and the time it takes to obtain these savings.<sup>128</sup>

#### **4. Automated executions.**

The average online investor clicking the order entry box on their computer probably believes that their electronic buy/sell request for a particular security is directly connected to another party who has an inventory of the stock or seeks to buy the stock. This may occur if different customer limit orders are matched. In fact, such is the model upon which electronic communication networks (ECNs) such as Instinet, Island, REDIBook and Archipelago operate. Nonetheless, NASDAQ itself is not a marketplace of firm orders but a collection of market making dealers quoting bids/asks and profiting from the spread

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<sup>126</sup> Humer, “For Online Brokers, the End of the Order-Flow Gravy Train,” TheStreet.com, November 19, 1999, [news.yahoo.com/street/99/11/19/broker\\_991119.html](http://news.yahoo.com/street/99/11/19/broker_991119.html).

<sup>127</sup> Arthur Levitt, “Best Execution: Promise of Integrity, Guardian of Competition,” Remarks to the Securities Industry Assn., Boca Raton, FL, November 4, 1999.

<sup>128</sup> See McNamee, *supra*.

between the bid and ask. A quote is not the equivalent of an order. An order is firm. How firm is a quote if the market maker delays responding to another dealer's attempt to trade at the quote?<sup>129</sup> How much size is in the quote? If the quote size is only for 200 shares, how liquid is the market? How long will it take for my order to be filled?

NASDAQ requires that dealers fill orders at the price and at the size represented in their quotes "at the time of receipt of any such offer."<sup>130</sup> However, this has never been construed by the NASD to mean instantaneous, yet that is frequently the expectation of public customers. After its quote is hit, the market maker has an additional 10 seconds to change the quote's price and size during which period it is not required to honor its quote. The minimum size for a quote on NASDAQ National Market ("NNM") securities varies, depending on volume, between 1000, 500 or 200 shares.<sup>131</sup> In addition, NASDAQ operates the Small Order Execution System (SOES) which does operate as an automatic execution system for small orders from the public.<sup>132</sup>

In sum, the image and the legal reality of NASDAQ are quite distinct. The basis for the investor's perception of NASDAQ lies in the fact that market makers, such as Knight, go beyond NASDAQ's minimum practices and guarantee to automatically execute

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<sup>129</sup> This slippery practice by market makers is called "backing away" and it imperils firms that seek to offer auto-ex.

<sup>130</sup> NASD Rule ¶ 4613(b), known as the "firm quote" rule.

<sup>131</sup> NASD Rule ¶ 4613(a)(2).

<sup>132</sup> NASD Rule ¶¶ 4700-4770, SOES rules.

transactions at NASDAQ's national best bid/best offer (the NBBO) substantially beyond NASDAQ's minimum practices and in amounts well in excess of NASDAQ legal requirements.

But Knight is not a charity. It is a NASDAQ market maker like all the rest. It has no better position than any other market maker in getting executions against other dealers. During periods of abnormal volatility and volume in a particular stock or group of stocks, Knight reserves the right to suspend its auto-ex guarantee. If the flow of customer orders to Knight exceeds the parameters it has set for auto-ex in an individual security, its traders decide order-by-order whether, to trade or pass the order along.<sup>133</sup> Knight's calculation is ultimately dependent upon whether, if it adds to a long or short position by filling the order, it will be able to reverse that position by executing trades for itself against other NASDAQ market makers. Hence, the size of market makers' quotes is the barometer of NASDAQ's liquidity. The volatility of stock prices cited above illustrate what happens when NASDAQ's market makers see risk, step on the brakes (widen their spreads and reduce the size of their quotes), liquidity disappears and prices consequently gyrate.

Under these circumstances, market makers, such as Knight, that provide auto-ex can be expected to and do in fact curtail or suspend auto-ex. As a result all orders reaching these market makers queue up and take longer to manually execute. Separate, but

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<sup>133</sup> While Knight is the house, the compensation of its traders is dependent upon their profitability in operating Knight's system. Typically, groups of these traders, led by a senior trader, handle groups of 25 to 50 securities.

related, delays may occur at the broker-dealers, online or offline, that originate customer orders. These delays may arise in the event of equipment failure or insufficient bandwidth to accommodate transmitting all of the information that must be dispatched to Knight or other market makers. The correspondent's bandwidth constraint may exist at an overall ceiling level, a destination level (the size of the pipe to Knight or other market makers) or an individual security level.

During the past year's Market Storm, Knight constantly recalibrated the auto-ex parameters that it offered for securities. Changes in auto-ex parameters or suspension of auto-ex after a pre-set threshold is hit are electronically disseminated by Knight to its customer broker-dealers before the market opening and as they occur. Knight does not publicly post this information on its website and brokers who receive this data have varying practices as to what they disclose to individual investors.

The prevailing practice appears to be a pop-up notice to the investor advising that a group of securities is trading in a "fast market." Since the events of January this year, online brokers have made informational efforts to educate investors of the meaning, resultant risks and behavioral adjustments arising from such conditions. Of course, there may be a general notice if such condition is endemic to the entire NASDAQ market place as has occurred this year on a number of occasions. The following is representative of the message that Ameritrade displayed during the Market Storm relating to Internet stocks:

Due to the extreme volatility in certain Internet related securities, the quotes carried by market data services may

not be reflective of the actual price at which trades are occurring. In addition, most NASDAQ market makers have turned off "Auto-Execution" facilities for many of these stocks. Manual execution procedures can take much longer to complete and partial executions at various prices on market orders often occur during these types of markets. Thank you.

At the time of our July 16, 1999 on-site visit at Knight's facility, the predominant auto-ex circuit breaker on intra-day execution was a trade that created a long or short position ("inventory") aggregating thousands of shares above the minimum NASDAQ NNM quote sizes. For volatile issues, such as Internet stocks, the threshold was 60% lower, but still well above the NASDAQ quote sizes. If the trade flagged by the circuit breaker results in shares only marginally above the pre-set inventory benchmark, the Knight trader will frequently click and accept the orders. The purpose of the software is to allow Knight to tap the brakes on how much stock it will either be long or short after the trade. Knight's options, of course, always include curtailing or suspending auto-ex down to NASDAQ's minimum requirements. However, the growth in Knight's business demonstrates that it is loathe to cede its position as the premier auto-ex destination and has garnered business on that basis.

For the day previous to our visit, only 31 stocks of the 4600 stocks where Knight offers an auto-ex guarantee saw trades that exceeded Knight's circuit breakers. Half of these stocks saw only five or fewer trades exceed the threshold. In contrast, 73.5% of trades exceeding the threshold were in just two securities that went public on July 15th. Both

of these were Internet related issues.<sup>134</sup> Finally, 18% of the circuit breaker trades occurred in big name NASDAQ stocks such as Amazon, Microsoft, Network Plus, Glenayre Technologies, Cisco and Viasoft.

Apart from intra-day operating parameters, Knight extends specially tailored execution services for NASDAQ's high-volume morning opening of trading. In June of this year, Knight announced a mid-point pricing plan that accommodates orders aggregating to 250,000 shares in 4800 NASDAQ issues.<sup>135</sup> Knight guarantees that orders up to the ceiling will be executed at the mid-point of the first unlocked, uncrossed NBBO regardless of market imbalances. Knight maintains that mid-point pricing results in price improvement for all pre-opening market and marketable limit orders.

Knight is currently conducting an advertisement campaign that proclaims, "Who's the force behind the online trading revolution? We're Knight, the world's leading market maker . . . ."<sup>136</sup> Certainly, it is true that today's market volume and speed of executions is inconceivable without auto-ex facilities by market makers at thresholds substantially greater than NASDAQ's firm quote rule.

It is our conclusion that the only way for the NASDAQ market to progress and

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<sup>134</sup> Efficient Networks, Inc., a supplier of high-speed digital subscriber lines, accounted for 65% of the parameter breaking trades. National Information Consortium, Inc. (EGOV), a builder of Internet portals to access information from and transact business with governments, was the other IPO.

<sup>135</sup> Knight/Trimark Group, Inc. Press Release, June 1, 1999.

<sup>136</sup> Barron's, September 6, 1999 (full page ad).

dispense with the auto-ex curtailments witnessed during the Market Storm, not to mention preparedness for the storms of activity that may lie ahead, is for NASDAQ itself to create a tool that will permit market makers to auto-ex each other at size levels much above the current firm quote rule. Only when immediate access exists for auto-ex providers to other sources of liquidity, can we expect to stem NASDAQ execution delays.

## **5. Capacity and reliability.**

The centrality of Knight in the online trading revolution raises significant questions.

- Is Knight a potential single point of failure that would impact the entire market if it experienced either a hiccup or a more serious event?
- How reliable are the systems that Knight has constructed?
- How much capacity does Knight have and how much capacity will it need for the market to weather the next Market Storm?

In the following sections we present the information gathered on these topics during our inquiry. We do not suggest that we can answer these questions. We did find thoughtful, competent managers that are seeking to insure satisfactory answers in an environment where there are only general directives from either NASD or the SEC.<sup>137</sup>

### **(a) Single point of failure.**

At its present Jersey City facility Knight has built in redundant systems, including emergency power generation, to insulate itself and investors from a system outage.

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<sup>137</sup> See discussion infra, at Section V. B(5)(b)(ii).

However, the firm lacks a “hot” back-up data center and is in the process of establishing such a facility.<sup>138</sup> Such a facility would substantially diminish Knight’s exposure to a business interruption due to fire, weather, environmental or other emergency. Knight’s Trimark affiliate, located in New York, is now available as a back-up site.

No online brokers are solely reliant upon Knight as they maintain relationships with other firms, together with the communications infrastructure to reach these alternate execution points.

**(b) System reliability.**

Knight’s uptime availability for the eighteen months covered by our inquiry was 99.95%. This performance was superior to that of any of the online brokerage firms that we examined. A single 45-minute-outage was experienced by Knight on November 30, 1998 -- a Market Storm day when Ameritrade also experienced an outage.<sup>139</sup>

On November 30th, the Monday, following the Friday (November 27th) after Thanksgiving that also witnessed unprecedented volatility in Internet stocks, Knight saw order imbalances on the morning of the 30th and suspended auto-ex for 60 stocks before the opening. Knight’s systems were overwhelmed as it explained in a subsequent letter to its customers:

The additional processing required to handle

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<sup>138</sup> Knight Prospectus, dated February 1, 1999, p. 44.

<sup>139</sup> On two other occasions in 1999 Knight advised its customers to route orders away for periods of 15 minutes as a precaution but did not experience a system outage.

approximately 40,000 orders manually significantly impacted our trading system. This deluge of order flow also strained every part of our end-to-end service from our help desk response time to our P&S department reconciliation process. As a result, we have taken action to change our auto-ex procedures and to reconfigure our system to handle the type of trading situations encountered on November 30th.<sup>140</sup>

As indicated in the letter, Knight, as a consequence, made adjustments to its systems and improved its notification procedures to its broker customers.

**(c) System capacity.**

Knight/Trimark recorded a 600,000 trade day on November 7, 1999, representing cumulative share volume of 328 million shares of OTC and listed securities.<sup>141</sup>

Knight claims that its installed technology provides capacity of 1.2 million trades per day. This data indicates excess capacity of 50% over a peak day, but it does not capture the relationship that the day's order flow at 9:31 AM, one of the busiest times of the day, bears to total transaction capacity at that time.

It is impossible for a regulator to say that Knight's excess capacity is sufficient -- dependent as such a prognostication would be upon both general market activity and Knight's share (recently increasing) of overall activity. As we set forth below in our recommendations, periodic public visibility of all firm's performance metrics and capacity planning will serve to ensure that firms such as Knight continue to manage responsibly the

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<sup>140</sup> Knight, Sample Letter to Customers, December 18, 1998.

<sup>141</sup> Knight, Press Release, November 18, 1999.

growth of the electronic marketplace.

## V.

### **MOVING FORWARD: IMPROVING ONLINE BROKERAGE SYSTEMS' RISK MANAGEMENT PROCEDURES**

#### **A. Points of Reference: E-Commerce Failures**

The persistent system outages experienced by the online brokers are not unique to them. Rather, they are symptomatic of failures that are experienced and will continue to be experienced, by all e-commerce firms, technology-dependent firms, communication providers and, even, by the exchanges themselves.

##### **1. MCI WorldCom and AT&T.**

From August 5 through August 15, 1999, MCI WorldCom, the number two U.S. long-distance carrier, experienced the most persistent and disruptive communications failure witnessed to date. The failure occurred in its frame-relay network which transmits data between computers at very high speeds<sup>142</sup> and resulted in the Chicago Board of Trade ("CBOT") shutting down its electronic trading system for more than 60% of its usual operating hours during August 5th to 13th.<sup>143</sup> Additionally, ATM networks experienced periods of unavailability because these machines depend upon frame relay networks to

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<sup>142</sup> Harris, "MCI WorldCom Shuts Network Over Weekend," Wall St. J., August 16, 1999 at p. B2; Edwards, "MCI Problem Cripples ATMs, Data," AP Wire, August 10, 1999, 4:48 p.m. ET.

<sup>143</sup> Id. One post-mortem faulted CBOT for failing to have a back-up service in the event of a long outage. Gillmor, "The MCI Lesson: Did you Back Up Your Net Today?," Computer World, August 23, 1999, [www.computerworld.com/home/print.nsf/all/980823BC52](http://www.computerworld.com/home/print.nsf/all/980823BC52).

determine customer balances.<sup>144</sup> Internet service providers (“ISPs”) were also affected.<sup>145</sup> An estimated 15% of the frame relay network failed, impacting 30% of the network’s customers.<sup>146</sup>

The most important lesson from this outage is that “it won’t be the last such outage,” as observed by telecom consultant Jeffrey Kagan. Despite doing “everything they could,” MCI was unable to avoid this, stated Kagan.<sup>147</sup>

Indeed, MCI WorldCom’s failures parallel system outages experienced by AT&T’s frame relay network in April 1998.<sup>148</sup> Both outages occurred while the firms upgraded their systems.<sup>149</sup> MCI WorldCom resolved the outage problem only by removing a new version of Lucent software from the network.<sup>150</sup>

AT&T also suffered network capacity problems with customer demand for its WorldNet, unlimited access Internet service, earlier this year and again in November.<sup>151</sup>

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<sup>144</sup> Edwards, “MCI Glitch Disables ATM,” AP Wire, August 11, 1999, 12:07 a.m. ET.

<sup>145</sup> Reuters Wire, “MCI WorldCom Data Network Still Seeing Problems,” August 11, 1999, 12:45 a.m. ET.

<sup>146</sup> AP, “MCI WorldCom Service Restored, But Many Users Still Angry,” [www.mercurycenter.com/news/breaking/merc/docs/054026.htm](http://www.mercurycenter.com/news/breaking/merc/docs/054026.htm).

<sup>147</sup> Id.

<sup>148</sup> “MCI WorldCom Shuts Network Over Weekend,” supra.

<sup>149</sup> Id.

<sup>150</sup> Id.

<sup>151</sup> Blumenstein, “AT&T Scrambles to Meet Demand For Its WorldNet,” Wall St. J., p. C11, March 11, 1999; Bloomberg, “AT&T Says Some WorldNet Users Couldn’t Gain Access,”

After introducing the unlimited service in December 1988, demand began to outstrip capacity in 60 of 500 service areas with the problems manifesting in “high-peak periods.”<sup>152</sup> The situation echoed the difficulties America Online faced in 1997 when it extended monthly unlimited usage.<sup>153</sup>

## 2. eBay.

The most significant web failure experienced by any e-commerce site so far occurred at the online auction house eBay over June 10-11, 1999 when the site closed for 22 hours.<sup>154</sup> Prior to June 10, 1999, eBay experienced other significant failures and has since suffered additional outages which together totaled more than 70 hours of outages in the first seven months of the year.<sup>155</sup> During the two day June crisis, eBay’s stock crashed \$47 to \$135, wiping out \$5.7 billion of market capitalization, and dipped below \$80 in early August before rising again the \$130 range.<sup>156</sup> Experts assessing the cause of the disaster cite eBay’s

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November 10, 1999, aol://4344:30.BLOOMBRG.5288278.602602747.

<sup>152</sup> Id.

<sup>153</sup> Id.

<sup>154</sup> Janah, “Seller, Investor Defections Plague eBay’s Comeback,” June 14, 1999, [www.mercurycenter.com/svtech/news/indepth/docs/ebay061599.htm](http://www.mercurycenter.com/svtech/news/indepth/docs/ebay061599.htm).

<sup>155</sup> Wilson, “eBay Retrenches -- Devastating Outage Exposes Lack of Redundancy, Need for Simplicity,” *Internet Week*, June 21, 1999; Thurn, “Latest Web Glitch Session Has Analysts Jittery About Sitting on the Stock of eBay,” *Wall St. J.*, August 9, 1999, at p. B6.

<sup>156</sup> Dalton, “Coping With An E-Business Emergency,” and “Auction Site’s Bid For High Availability,” *Information Week*, September 6, 1999, [www.informationweek.com/751/crisis.htm](http://www.informationweek.com/751/crisis.htm).

failure to build a redundant, scalable web architecture.<sup>157</sup> Moreover, eBay's outage was prolonged due to the fact that its database files became corrupted, requiring the files to be rebuilt before the system could be brought back online.<sup>158</sup>

The outages at eBay echo the strain that outsized demand has placed on online brokerage firms. As one consultant noted, "A lot of these sites just can't keep up with their growth. They don't have enough skills to keep the site running all the time."<sup>159</sup> (And the extent and complexity of these problems prevents easy solutions.) Thus, eBay outages knocked its site out four times in five days this November.<sup>160</sup> The latest was attributed by eBay to a nearly ten-fold increase on a server for graphic images.

### **3. NYSE and NASDAQ.**

The major exchanges themselves have not emerged unscathed from the recent trading spurts. Despite the centrality of adequate systems capacity for the markets themselves, they too have suffered failures of systems. Notable recent events include the following:

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<sup>157</sup> Id.

<sup>158</sup> "eBay Retrenches," supra; Lyons, "E-blame," Forbes, July 26, 1999, at p. 238.

<sup>159</sup> "eBay Retrenches," supra.

<sup>160</sup> Wolverton, "Fourth eBay Setback in Five Days," yahoo.cret.com/news/0-1007-200-1430233.html.

Date	Exchange	Description
October 26, 1998 1:16 to 2:15 p.m. ET	NYSE	Failure of a switch, that was on the verge of being replaced, preventing queuing orders from reaching electronic order display books of approximately 25% of NYSE stocks. <sup>161</sup>
March 6, 1999 9:41 a.m. to shortly after 11:00 a.m. ET.	NASDAQ-SOES (Small Order Execution System) & SelectNet	Equipment failure. <sup>162</sup>
April 1-13, 1999	NASDAQ SelectNet	Higher volume of SelectNet orders (a 25% increase over 1998) had a capacity impact on systems, leading to slowed trading in the first half hour of trading as systems labored to clear orders that accumulated overnight. <sup>163</sup>
April 20, 1999	NYSE	Volume in AOL (32.6 million shares for the day on NYSE and 23 million shares at regional exchanges and third-market firms) caused queues of “cancel or replace” messages to build which could not be cleared until after the market closed. <sup>164</sup>

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<sup>161</sup> Ip, “Systems Glitch Halt’s Trading on Big Board,” Wall St. J., October 27, 1998, at p. C1; Feder, “Switch Failure Halt’s Trading on NYSE,” N.Y. Times, October 27, 1998 at p. C10.

<sup>162</sup> Dow Jones, “Computer Problems Disrupt the NASDAQ,” N.Y. Times, March 6, 1999 at p. C3.

<sup>163</sup> Ewing, “Volume and Volatility Rise Up to Slow Down an Important NASDAQ Communication System,” Wall St. J., April 14, 1999, at p.C7. See also, Lillington, “New Technology Underpins NASDAQ Ambitions for Exponential Growth,” Irish Times, December 4, 1998, at p. 60 (quoting NASDAQ’s chief technology officer, John Hickey, “the system turns at 90% of capacity before the opening peak subsides.”)

<sup>164</sup> “Big Board System Slowed AOL Investors Monday,” Wall St. J., April 21, 1999 at p. C15.

Date	Exchange	Description
October 6, 1999	NASDAQ SelectNet	Triggered by a software change made overnight to allow the market to extend hours for its trade-reporting and quotation systems, SelectNet ran slowly for hours and the Instinet, Island and Brut ECNs were removed from NASDAQ's quote display. These ECNs have recently accounted for almost 30% of NASDAQ volume. <sup>165</sup>
November 16, 1999	NASDAQ SelectNet & SOES	A mid-day software upgrade that was attempted during a record 1.46 billion share trading day blacked out SelectNet and SOES from 3:40 EST to 3:57 EST. NASDAQ has claimed that it has adequate capacity for a four billion shares trade day. <sup>166</sup>

A fair assessment of this record indicates that any system operating at over 90% of capacity is simply inviting a system failure with the next spurt in trading. Moreover, the AOL incident at the NYSE illustrates that the growth in trading volume is not symmetrical across all issues. Certain issues will at times experience extraordinary volume and exceed the systems resources allocated to them.

Despite the centrality of NASDAQ and NYSE systems to the health of our

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<sup>165</sup> Ewing, "NASDAQ Glitch Causes Quotes to Disappear," Wall St. J., October 7, 1999 at p. C1; Task, "SelectNet Slowdown Affects Investors Big and Small," TheStreet.com, November 9, 1999, [www.thestreet.com/pf/comment/taskmaster/816170.html](http://www.thestreet.com/pf/comment/taskmaster/816170.html). (Knight/Trimark Group's CEO, Kenneth Pasternak, observed that SelectNet has been "totally dysfunctional" around the opening and the closing of trading "for a couple of weeks.")

<sup>166</sup> Ewing, "Problem at NASDAQ Disrupts Trading as Volume Swells," Wall St. J., November 17, 1999, at p. C16 ("NASDAQ officials have conceded that there are regular problems despite efforts to fix SelectNet with network, switching and software upgrades.")

markets, no SEC rules prescribe how much transaction capacity an exchange must maintain but the SEC does obtain information from and review it with the exchanges (see section V(B)(5)(b)(iii), infra.). Moreover, the exchanges have made minimal data about system capacity available to the marketplace.

#### **4. Failures of business information systems.**

In an effort to understand the technology issues faced by online brokers, the Attorney General's Office examined the growing frequency of mission critical failures at firms that installed major new information systems.

- SAP AG, a dominant worldwide supplier of Enterprise-Resource Planning ("ERP") systems, is currently defending itself against customer disputes over snarled installations at Hershey Foods Corp., Whirlpool Corp., and FoxMeyer Corp.<sup>167</sup> Also this year, two other firms, Allied Waste Industries, Inc. and Waste Management, Inc. pulled the plug on a total of \$175 million of ERP development costs for SAP projects.<sup>168</sup> FoxMeyer, once a \$5 billion wholesale drug distributor, filed for bankruptcy in 1996 after an Andersen Consulting concluded that the SAP installation crippled the firm's distribution.<sup>169</sup>
- W.L. Gore & Associates (Gore-Tex) recently brought

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<sup>167</sup> Boudette, "Europe's SAP Scrambles to Stem Big Glitches," Wall Street Journal, November 4, 1999, at p. A25. Hershey's \$110 million distribution system has already cost the company \$150 million in lost sales.

<sup>168</sup> Branch, "Hershey, Citing Technology Trouble, Says it Will Miss Earnings Estimates," Wall St. J., September 14, 1999 at p. B12.

<sup>169</sup> Montoya, "FoxMeyer Files Suit against SAP Software Company," AP Wire, August 27, 1998; Diederich, "Bankrupt Firm Blames SAP for Failure," ComputerWorld, August 28, 1999, [www.computerworld.com/home/news.nsf/all/9808285\\_sap](http://www.computerworld.com/home/news.nsf/all/9808285_sap); Caldwell, "Andersen [Consulting] Sued over 'Flawed' SAP R/3 Job," InformationWeek, July 3, 1998, [www.techweb.com/wire/story/TWB19980703S0002](http://www.techweb.com/wire/story/TWB19980703S0002).

suit against software vendor People Soft Inc. and its project manager Deloitte & Touche LLP when its human resources package failed and put Donald Duck on the payroll. Fictional employees from the test phase could not be removed from the system.<sup>170</sup>

- Oxford Health Plans, Inc., a leading New York health care provider, lost \$4 billion in market value as its stock crashed in 1997 after admitting that its self-developed software snarled collections from members and payments to providers causing it to lose hundreds of millions of dollars.

Author James Champy observed that these fiascos have given new meaning to the term, “killer application.”<sup>171</sup> Today, “[c]all centers, reservation systems, on-line order systems are all a couple of electron impulses away from disaster.”<sup>172</sup> While the blame is frequently placed on faceless technology, it is increasingly recognized that systems failures often arise from management failures at either the host firm or its development partners.

Both the growth of e-commerce and the attention paid to firms that experience mission critical failures has elevated the industry’s awareness of the need to adopt risk assessment and mitigation strategies. “E-commerce will be the next area for risk management,” says Lynn Edelson, head of PriceWaterhouse Coopers’ operational and systems risk-management practice. “Organizations are starting to understand that e-

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<sup>170</sup> MacDonald, “Maker of Gore-Tex Sues People Soft and Deloitte” Wall Street Journal, November 2, 1999, at p. B14.

<sup>171</sup> Champy, “Killer Technologies,” Forbes, September 8, 1998; Michael Hammer and James Champy, Reengineering the Corporation, 1993 at p. 180.

<sup>172</sup> Id.

commerce is not only a financial proposition, but an enterprise-wide system that needs sophisticated assessment to identify which risks can be controlled and which can't."<sup>173</sup> In the following sections we identify business processes that foster quality software and reduce risks for technology dependent firms.

## **5. External risks to system availability.**

Beyond the manifest need to maintain reliable systems with adequate capacity, lie the imponderable events that may knock an e-commerce, or indeed any business, out of business for some period of time. These events range from power outages, cable cuts, and acts of terrorism such as the February 26, 1993 truck bomb that damaged the World Trade Center.

The starting point for any contingency planning is a backup or redundant system, which optimally includes duplicate copies of critical business data at an alternative operation site. Several recent events illustrate how some firms have failed and others succeeded in building robust systems:

- While reeling under the weight of losing its frame relay communication network, the CBOT, one of the world's busiest futures exchanges, was forced to close at 1 p.m. CDT on August 12, 1999 due to a downtown Chicago power outage. The adjacent Chicago Board Options Exchange and the Chicago Stock Exchange both

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<sup>173</sup> Jaleshgari, "Project Mars Minimize Risks, "Information Week," October 4, 1999, [www.informationweek.com/755/risks.htm](http://www.informationweek.com/755/risks.htm).

remained open.<sup>174</sup>

- An April 13, 1999 an accidental cable cut in Tyson's Corner, VA partially knocked out service for several major ISPs. However, those with redundant networks were able to stay online.<sup>175</sup>
- A power outage in downtown San Francisco on December 8, 1998 knocked out power, telephones and computer functions at two Schwab buildings. Schwab did not lose any production system affecting clients and customer calls were routed to two other unaffected facilities.<sup>176</sup>

## 6. The candor issue.

Unreliable system performance of net-centric businesses has been a major issue with the public in 1999. Because such failures are so transparent -- although not their nature or resolution -- a Schwab executive observed: "It's within 10 minutes of an outage that we start getting calls from the press and our customers."<sup>177</sup> Yet no firm wants the black eye that will result from identification in the media as having a service reliability issue.

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<sup>174</sup> "Big Power Outage In Chicago Wrecks Havoc On Trading," Wall St. J., August 13, 1999, at C15.

<sup>175</sup> Jander & Greenfield, "Major Outage Hits Internet Hub," InformationWeek Online, April 15, 1999, [www.informationweek.com/story/twb19990415S0002](http://www.informationweek.com/story/twb19990415S0002).

<sup>176</sup> "I Left My Power Out in San Francisco," InformationWeek Online, December 8, 1998, [www.informationweek.com/story/twb19981208S0008](http://www.informationweek.com/story/twb19981208S0008).

<sup>177</sup> Sliwa, "Net Reliability Hinges on Web Site Architecture," Computer World, August 30, 1999.

When Schwab experienced a 90-minute outage on February 24th, its press office counted 300 news broadcasts that reported the event.<sup>178</sup> This scrutiny tempts many web sites to dissemble when the media calls about a service issue. MCI WorldCom took this approach during its August outages, embittering its customers.<sup>179</sup> Similarly, when Amazon.com experienced a 36-minute outage in July its spokesperson declared that it was company policy not to disclose specifics about such incidents.<sup>180</sup> Further, when Intuit's online tax preparation service was shuttered for 12 hours on the eve of April 15th, Intuit denied any traffic problems, only "routine maintenance."<sup>181</sup> This approach only serves to invite skepticism and investor distrust. A better and ultimately more profitable policy would be directed towards candor.

## **7. The search for a capacity metric.**

Interviews with IT professionals at the examined online firms produced a variety of responses on the issue of information technology, including ways to ensure that information system capacity is adequate to accommodate investor demand. The most robust measure on metric was to ensure that peak demand never consumed more than one-third of

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<sup>178</sup> Id.

<sup>179</sup> AP, "MCI WorldCom Service Restored, But Many Users Still Angry," [www.mercurycenter.com/news/breaking/merc/docs/054026.htm](http://www.mercurycenter.com/news/breaking/merc/docs/054026.htm), ("MCI...received more criticism for keeping customers in the dark and downplaying the seriousness of the situation than the outage itself.").

<sup>180</sup> Ohlson, "Amazon.com Site Down Briefly," ComputerWorld Online News, July 15, 1999, [www.computerworld.com/home/news.nsf/all/9907154amdown](http://www.computerworld.com/home/news.nsf/all/9907154amdown).

<sup>181</sup> Diederich, "Online Tax Site Suffers Outage," ComputerWorld Online News, April 14, 1999, [www.computerworld.com/home/news.npf/all/9904143taxes](http://www.computerworld.com/home/news.npf/all/9904143taxes).

the system's available transaction in processing capacity.<sup>182</sup> Professing this goal, however, does not ensure a successful realization of the goal. In section V(B)(5)(b) we examine the legal framework for maintaining adequate online broker operational capacity.

**B. Risk Management Practices for "Mission Critical" Information Systems**

**1. Technology management challenges for online brokers.**

As the securities markets change rapidly -- with ECNs, extended hours, and decimalization as pressing examples -- all securities firms must continuously adapt and upgrade their systems. This process necessitates a seamless, continuous roll-out of improved technology and service extensions. The Internet both accelerates and increases the volume of such changes, since the medium empowers users to access a repository of information, services and application tools which is steadily rising.

To deliver improved services one firm implemented nearly 18,000 software changes in 1998 -- and 8,300 just through the first five months of this year. Some of these changes were executed flawlessly. Some were not, as online investors have directly experienced this year. Indeed, we found that the firm's most disruptive outages occurred on the heels of systems changes.

As observed during the Attorney General's inquiry, such mission critical

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<sup>182</sup> While we did not uncover an e-commerce formulation establishing a capacity metric, we found evidence that the best industry practice is to run at no more than 30 to 35 percent of capacity. Blackford, "Building Better E-Commerce," Computer Shopper, August 1, 1999, quoting a representative of web purveyor Onsale.

failures largely occurred as online brokers sought to internally develop and deploy a number of critical software applications and hardware upgrades. Frequently, these upgrades were made pursuant to management's recognition that system failures were associated with outdated or obsolete architecture. For example, Schwab's October 20-22, 1999 outages occurred as it began to offer online investors extended hours trading.

Although the online brokers examined were large firms with significant market share, the inquiry uncovered significant evidence of immature, underdeveloped software and technology deployment and risk management practices. The quality levels of smaller, underdeveloped online brokerage firms which have swelled the marketplace are even more suspect. There are now reportedly 150 online brokers. Our findings, however, should not be construed to suggest that online brokers are less vigilant and effective than IS managers in other businesses. As the literature that we survey below illustrates, technology development processes generally fail as often as they succeed.

The following is a distillation of some of the comments and recommendations made by the online brokerage firms themselves in self-assessing their technology development processes. The list highlights the scope of the issues and problems that at times present themselves in this fast moving and highly competitive industry.

- There is a tension between the tactical fire-fighting mode, which is the result of enormous management pressure to do things quickly, versus long-term strategic planning for IT.

- Staff is often reluctant to confront senior management with realistic delivery dates, and the result can be that dates are set months in advance without the benefit of adequate planning.
- Technology life-cycle processes needs to be formalized. Systems are sometimes patched together and used beyond their realistic life spans.
- Project dependencies and related impacts upon other systems are often unknown.
- Development approach needs formalization.
- Build requirements are underestimated. There is a need for a formal build environment.
- Procedures for project change requests and issues tracking/status are inadequate.
- Source code control is very primitive at times.
- There is only limited integration testing. Often it is not well-coordinated. There is a need for end-to-end total test environment replicating the operation environment to determine performance characteristics before changes are deployed.
- No information systems audits have been performed covering organization, systems and processes.
- There is insufficient attention to addressing operational deficiencies.

This state of affairs has been summarized as the e-commerce “cowboy mentality” by Howard Rubin, chairman of the computer sciences department at Hunter

College in New York City.<sup>183</sup> The explosion of the Internet and electronic commerce has fostered a management climate where available resources are concentrated on quick fixes, and rapid deployment of new business solutions, not upon enhanced project management techniques.<sup>184</sup>

Both the recent occurrence of and prospect of future mission-critical system failures raise numerous questions that online brokers and a broad range of technology-dependent companies must consider:

- What are the best practices for maintaining a continuous online transaction processing system?
- What are the best practices for managing the migration from a legacy information system environment to a more robust information system platform?
- Where new mission-critical software is continuously introduced to an enterprise, what are the best practices for identifying and mitigating risks?
- Where a new application is internally developed, what are the best practices for the creation of software that delivers required functionality with appropriate quality assurance?
- What are the best practices for pre-testing system changes, whether internally developed or purchased, to evaluate the prospective impact upon the overall system's performance and stability.

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<sup>183</sup> Asbrand, "IT Metrics for Success," InformationWeek, August 17, 1998, [www.InformationWeek.com/696/96iumtr.htm](http://www.InformationWeek.com/696/96iumtr.htm).

<sup>184</sup> Id.

- What role should management and the company’s board of directors fulfill under these circumstances?

The touchstone for these questions is that a failure to observe generally recognized standards applicable to any given area of endeavor is evidence from which one can infer that a non-compliant firm has failed to exercise reasonable prudence.<sup>185</sup> If management knows that important aspects of its operations are not compliant with industry-wide “best practices,” and that material adverse consequences will follow for its customers from a quality, capacity, or reliability failure in such a business process, the failure to have disclosed this non-compliance may constitute securities fraud upon the firm’s own shareholders.<sup>186</sup> Moreover, these facts may also support both consumer fraud actions on the America Online model, and securities fraud actions under the “shingle theory.”<sup>187</sup>

While awareness of a material gap between a company’s practices and “best practices” may initially seem to be a significant proof hurdle, the pervasiveness of total

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<sup>185</sup> Second Restatement of Torts, §§ 295A (Custom), 299 (Want of Competence) & 299A (Undertaking in Performance or Trade).

<sup>186</sup> Ernst & Ernst v. Hochfelder, 425 U.S. 185 (1976); Rolf v. Blyth, Eastman Dillon & Co., 570 F.2d 38, 47 (2nd Cir. 1978); In re Time Warner, Inc. Sec. Litig., 9 F.3d 59, 269 (2nd Cir. 1993), cert. denied, 114 S. Ct. 1397 (1994). Further, neither New York State nor the SEC need to prove intentional fraud in civil enforcement actions. People v. Federated Radio Corp., 244 N.Y. 33, 38-39 (1926).

<sup>187</sup> Under the “shingle theory” brokers are deemed to make certain implied representations when they “hang out their shingle” to do business. The shingle theory has been part of the fabric of securities law for six decades. Grandon v. Merrill Lynch & Co., 147 F.3d 184, 189-90, 192-193 (2d Cir. 1998); SEC v. First Jersey Secs., Inc., 101 F.3d 1450, 1469 (2d Cir. 1996), cert. denied, 118 S.Ct. 57 (1997); Charles Hughes & Co. v. SEC, 139 F.2d 434, 437-38 (2d Cir. 1943). In the online context, brokers proclaiming their web smarts must have technology to back up the boast.

quality management (“TQM”) and continuous process improvement disciplines virtually ensures that every enterprise has staff that is aware of the relevant best practices and how their enterprise compares.<sup>188</sup> Further, our experience has shown that consultants retained by firms confronting IS challenges frequently invoke applicable “best practice” yardsticks in critiquing the circumstances that they find.

The lesson of “best practices” is that the output of a firm’s software developers, system architects and hardware managers must be measured by the same standards applicable to IBM, Microsoft or an avionics program -- standards must be universal. If this is an unflattering comparison, then the decision to deploy the internally developed application or install an incompatible purchased system, will constitute recklessness. Although no overarching institutional paradigm has yet been framed for e-commerce or technology-dependent firms, formulations of “best practices” exist for both quality management practices and for software development processes. These management disciplines are examined for their relevance to online brokers and technology-dependent firms generally in Section VI(C) below.

## **2. Recognizing “mission critical” systems.**

The management information systems (“MIS”) professionals who are accountable for the firm’s entire information system have christened as “mission critical” systems those which the enterprise requires to be at the highest level of availability and

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<sup>188</sup> See James Cortado, Best Practices in Information Technology (1998).

responsiveness to system users. The term is widely employed in MIS literature<sup>189</sup> and is beginning to be examined by the courts.<sup>190</sup> The SEC's Report to the Congress regarding its own Y2K readiness identified and assessed 53 "mission critical" systems at the SEC.<sup>191</sup> In this report, the SEC, with the evident aid of its Office of Information Technology, crafts a useful definition of "mission critical" systems as those "systems that, if they are inoperable for any length of time or generate erroneous data, would cause great disruption to the organization."<sup>192</sup> More recently, the SEC has framed rules addressing, "year 2000 operations capability requirements" for broker-dealers which treats virtually all of an online broker's transaction processes as "mission critical" systems:

The term mission critical system means any system that is necessary, depending on the nature of your business, to ensure prompt and accurate processing of securities transactions, including order entry, execution, comparison, allocation, clearance and settlement of securities transactions, the maintenance of customer accounts, and the delivery of funds and securities.<sup>193</sup>

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<sup>189</sup> See Y. Lirov, Mission Critical Systems Management (1997).

<sup>190</sup> U.S. v. Computer Associates Intl., 1996 W.L. 351151 (D.D.C.) (finding Computer Associates to be engaged in "mission critical" mainframe computer installations, maintenance and support; National Treasury Employees Union v. Lyng, 706 F.Supp. 934, 939 (D.D.C. 1988) (drug testing of "mission critical" employees); Swann v. Walters, 620 F.Supp. 744, 745 (D.D.C. 1984) (employment).

<sup>191</sup> [www.sec.gov/news/studies/yr2000.htm](http://www.sec.gov/news/studies/yr2000.htm), p.4. June 1997.

<sup>192</sup> Id. at p. 8.

<sup>193</sup> Final Rule: Year 2000 Operational Capability Requirements for Registered Broker-Dealers and Transfer Agents, Rel. No. 34-41661 (July 28, 1999); 17 C.F.R. § 240.15b7-3T(g)(1) and § 240.17Ad.21T(h)(1); [www.sec.gov/rules/final/34.4166/.htm](http://www.sec.gov/rules/final/34.4166/.htm).

Processes that are “mission critical” for the online broker are equally critical for the public customers who have accepted the advertised premise that online personal trading is the key to realizing timely, low-cost access to investment (or speculative) opportunities. Once the customers have arrived, any interruption in the availability of online transaction processes will have material economic consequence for both the online firm and the customer. Indeed, the mission critical outages during this year’s Market Storm triggered the customer complaints leading to the Attorney General’s inquiry.

### **3. Quality assurance practices for mission critical systems.**

No one who has confronted an unresponsive screen as they tried to enter an order will fail to appreciate that software development projects are high-risk endeavors when any glitch compromises reliable customer service. Only the recent SEC efforts to focus on disclosure of Year 2000 remediation costs have begun to direct any attention at all upon the generally abysmal disclosure practices of companies engaged in these high-risk technology development endeavors.

Yet, awareness of these risks did not spring into existence in 1998 with millennial fever. By 1996, the Software Engineering Institute at Carnegie Mellon University (“SEI”)<sup>194</sup> published the following data: that one-third of all large-scale software

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<sup>194</sup> SEI is a federally funded research and development center sponsored by the U.S. Department of Defense through the Office of the Under Secretary of Defense for Acquisition and Technology. The SEI contract was competitively awarded to Carnegie Mellon University in December 1984. It is staffed by technical and administrative professionals from government, industry, and academia. See, [www.sei.cmu.edu/topics/about/about.html](http://www.sei.cmu.edu/topics/about/about.html).

development projects had been canceled; that the average project is delivered 50% beyond its scheduled completion date; that 75% of all fielded software applications are a disappointment because the systems do not function as expected.<sup>195</sup> A similar study in 1996 found that 42% of all information technology projects were abandoned before completion.<sup>196</sup> Even completed projects fail to meet chief executives' expectations 50% of the time according to a survey by Computer Sciences Corporation.<sup>197</sup>

The high incidence of failure, as suggested in the software engineering literature and revealed in our inquiry of online brokers, lies in management practices that are themselves under-developed in relation to the tasks at hand. Many software development projects are conceived after a critical system upgrade already constrains a system's functioning or in response to an application that a competitor has already introduced. The projects themselves may suffer from a lack of appreciation of their scope and they may be compromised further by being rushed to completion, sometimes by developers whose skills are not well-matched to the task.<sup>198</sup> Quality assurance, code documentation and installation risk assessments are compressed and compromised. When successful it is more often due to

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<sup>195</sup> Jerome Gabig, "Buying the Secret Codes: Software Development Contracting Is Risky Business," *Legal Times*, June 17, 1996 (reviewing SEI's findings).

<sup>196</sup> Bernard Wysocki, "Pulling the Plug: Some Firms, Let Down by Computers, Opt to 'De-Engineer'," *Wall St. J.*, April 30, 1998, at p. A1; Standish Group, "Unfinished Voyages," (research paper 1996), [www.standishgroup.com/voyages.html](http://www.standishgroup.com/voyages.html).

<sup>197</sup> Id.

<sup>198</sup> Jim Hughes, "Learning to Avoid Project Failures," *ComputerWorld Canada*, July 2, 1999.

heroic individual efforts than any disciplined development process. More than two-thirds of the IS shops surveyed by the SEI were not using basic project-management tools and techniques.<sup>199</sup>

The leading benchmarks for assessing the quality of software development processes are the Capability Maturity Models (“CMM”) of the Software Engineering Institute (“SEI”)<sup>200</sup> and the ISO 9000 series of five standards promulgated by the Geneva-based International Organization for Standardization (“ISO”) in 1987 and revised in 1994.<sup>201</sup> “The two are driven by similar issues and are intuitively correlated, but they differ in their underlying philosophies.”<sup>202</sup> The ISO provisions which are pertinent to software development identify the minimal requirements for a quality system, whereas CMM’s emphasis is upon continuous process improvement.<sup>203</sup> Both quality assurance models afford a basis for internal and third party audit assessments of the extent to which a firm meets the ISO or CMM criteria. This process is called conformity assessment and is conducted by persons who are themselves certified to conduct the assessments.

The past decade has witnessed a sea change in management’s engagement with

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<sup>199</sup> Gill, “Project Management Gets Little Attention,” InformationWeek, January 25, 1999, [www.informationweek.com/718/18iubn3.htm](http://www.informationweek.com/718/18iubn3.htm).

<sup>200</sup> [www.sei.cmu.edu/](http://www.sei.cmu.edu/).

<sup>201</sup> [www.iso.ch/9000e/htm](http://www.iso.ch/9000e/htm)

<sup>202</sup> Paulk, “How ISO 9001 Compares with CMM,” IEEE Software, January, 1995 at p. 74.

<sup>203</sup> Id.

quality standards for business processes. Whereas in 1992 a survey of mid-size U.S. firms found that 48% had not heard of ISO 9000, a similar survey four years later by Grant Thornton found that 52% of all mid-size manufacturers intended to be ISO 9000 certified by the end of 1998.<sup>204</sup> These results have been corroborated by data showing that the total of ISO 9000 registered sites (certification is location specific) has grown from a mere handful at the beginning of the decade to over 200,000 worldwide.<sup>205</sup> The rapid acceptance of ISO 9000 illustrates both appreciation of the influence of the standards and the impetus of competitive pressure that the absence of certification may be exercising upon firms with products in international commerce.

**(a) ISO 9000.**

The ISO 9000 series of standards have garnered widespread acceptance by corporations that are building quality management and quality assurance systems.<sup>206</sup> The central ISO 9000 standard is an international blueprint for a generic core quality system that can be applied to a broad range of industry and economic sectors. It specifies elements that firms should implement when adopting a quality system appropriate to their business. The

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<sup>204</sup> Simmons & White, “The Relationship Between ISO 9000 and Business Performance: Does Registration Really Matter?,” *Journal of Managerial Issues*, Fall 1999; “International Standards Take Root with Manufactures that Export,” *Wall St. J.*, November 14, 1996 at p. A1.

<sup>205</sup> Id.

<sup>206</sup> [www.asq.org/standcert/iso.html](http://www.asq.org/standcert/iso.html), p.3.; Elmuti, “World-class Standards for Global Competitiveness: An Overview of ISO 9000,” *Industrial Management*, September 19, 1996; Hormozi, “Understanding and Implementing ISO 9000: A Manager’s Guide,” *SAM Advanced Management Journal*, September 22, 1995.

ISO 9000 Standard outlines 20 aspects of a model for quality assurance in design, production, installation and servicing.

The American Society for Quality Assurance reports that European and foreign customers increasingly expect U.S. companies to have their quality systems registered to ISO standards, particularly in high tech areas where product reliability is crucial.<sup>207</sup> For example, servers for e-commerce sites are frequently required to be ISO 9000 certified. We are thus at the point where the lack of ISO 9000 certification may arguably itself be a material competitive limitation, particularly where competitors possess such certification, that public companies must disclose.<sup>208</sup>

In 1987, the ISO published ISO 9001, Quality Systems - Model for quality assurance in design/development, production, installation, and servicing. ISO 9001 is the most comprehensive model in the ISO 9000 series of standards. It describes a minimum set of activities found in companies and organizations that consistently produce products that satisfy customer requirements. The policies, procedures, standards, records, and associated business activities are the quality system. While ISO 9001 is still written to describe any company providing any product or service, it tends to employ manufacturing terminology, which must be interpreted for non-manufacturing environments, including service and software providers. To ensure a uniform interpretation of ISO 9001 for software engineering

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<sup>207</sup> American National Standards Institute, Committee on Quality Assurance, “FAQs About the ISO 9000 Series, [www.asq.org/stancert/iso.html](http://www.asq.org/stancert/iso.html), p.3.

<sup>208</sup> See discussion, of SEC Regulation S-K, Item 101, at Section V(B)(a)(ii).

organizations, ISO published guidelines for use as ISO 9000-3, “Guidelines for the Application of ISO 9001 to the development, supply and maintenance of software.”<sup>209</sup>

To date, no reported decisions have invoked the ISO 9000 standards or the SEI’s Capability Maturity Model in a software dispute. On the eve of the Year 2000 and the dawn of millennium bug litigation this appears certain to change dramatically, as courts have already been entertaining proof of ISO standards in other contexts.<sup>210</sup>

**(b) Capability maturity model (CMM).**

The origins of SEI’s CMM approach lies in the Department of Defense’s efforts to insure timely, high-quality results from military software development projects which, with their civilian contractors, were equally experiencing high failure rates -- the avionics system for the B-1 bomber being a notable case. The SEI mission is to provide leadership in advancing the state of the practice of software engineering to improve the quality of systems that depend on software. The SEI accomplishes this mission by promoting the evolution of software engineering from an ad hoc, labor-intensive activity to a discipline that is well managed and supported by technology.<sup>211</sup>

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<sup>209</sup> See Paulk, IEEE Software, at p.76, *supra*; O’Connor, “Quality Management Systems,” Waterford Institute of Technology, Lecture Notes, Nov. 5, 1998, <http://emhain.wit.ie/~doconnor/lectures/se3/qms/tsld0001.htm>.

<sup>210</sup> Novo Nordisk A/S v. Becton Dickinson & Co., 1998 WL 119691 (SDNY 1998) (compatibility of needles with ISO standards); Praff Am. Sales Corp. v. U.S. 17 CIT 550, 544, 1993 WL 209619 (1993) (ISO nomenclature for sewing machines recognized).

<sup>211</sup> SEI at [www.sei.cmu.edu/topics/about/about.html](http://www.sei.cmu.edu/topics/about/about.html).

The CMM is regarded as having two principal advantages over ISO 9001. First, it was designed specifically for software engineering processes. Further, its five maturity levels support continuous process quality improvement management practices by offering a pathway for effective, reliable and consistent development processes. The five software CMM levels are as follows:

**Level One: Initial** Software process is ad hoc, even occasionally chaotic. Few processes are defined, and success depends on individual effort and programmer heroics.

**Level Two: Repeatable** Basic project-management processes are established to track cost, schedule, and functionality. The necessary process discipline is in place to repeat earlier successes on projects with similar applications.

**Level Three: Defined** The software process for both management and engineering activities is documented, standardized, and integrated into a standard software process for the organization. All projects use an approved, tailored version of the organization's standard software process for developing and maintaining software.

**Level Four: Managed** Detailed measures of the software process and product quality are collected,

enabling both the software process and products to be quantitatively understood and controlled.

**Level Five: Optimizing** Continuous process improvement is enabled by quantitative feedback from the process and from piloting innovative ideas and technologies.<sup>212</sup>

SEI has also elaborated CMM for related processes, including software acquisition, systems engineering, integrated product development, systems integration and software workforce management.<sup>213</sup> In fact, one of the firms we examined had identified that “critical skill shortages” in MIS was a continuing issue as of May 1999.

Our investigation found that a growing number of prominent financial services organizations that, like online brokers, have scores of mission critical systems have embraced the CMM methodology. These include J.P. Morgan, Fleet Financial Group, Citicorp and EDS.<sup>214</sup> A Gartner Group study has found that Level 2 or 3 firms enjoyed a 30% productivity

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<sup>212</sup> SEI website, [www.sei.cmu.edu/activities/cmm/cmm.sum.html](http://www.sei.cmu.edu/activities/cmm/cmm.sum.html).

<sup>213</sup> SEI website, [www.sei.cmu.edu/cmm/cmms/cmms.html](http://www.sei.cmu.edu/cmm/cmms/cmms.html).

<sup>214</sup> A compiled list of firms receiving CMM certification (levels 2 through 5) appears at the SEI’s web site, [www.sei.edu/sema/pub\\_ml.html](http://www.sei.edu/sema/pub_ml.html). See also, Orenstein, “Fleet Embraces IT Process Improvement,” *ComputerWorld*, June 7, 1999, [www.computerworld.com/home/print.nsf/all/990607AC76](http://www.computerworld.com/home/print.nsf/all/990607AC76); Shachtman, “Measure Success,” *InformationWeek*, October 26, 1998, [www.informationweek.com/706/06iumea.htm](http://www.informationweek.com/706/06iumea.htm); Asbrand, “IT Metrics for Success,” *InformationWeek*, August 17, 1998, [www.informationweek.com/696/96iumtr.htm](http://www.informationweek.com/696/96iumtr.htm); Anthes, “Capable and Mature,” *ComputerWorld*, p. 76, December 15, 1997, Citibank and J.P. Morgan.

advantages over most firms which are at Level 1.<sup>215</sup>

The highest concentration of firms that have achieved high CMM certification are based in India. Their CMM benchmarked high quality status has helped them garner software outsourcing contracts, complete assignments on a timely basis and increase shareholder value. One such firm's shares rose 8% when it announced that it had been assigned SEI's highest level of CMM-5.<sup>216</sup> Likewise, a competing Indian firm boasted when it joined the select international group of just 30 companies which have achieved CMM-4, saying that it would boost future awards of offshore development assignments.<sup>217</sup>

CMM has also gathered some critics along the way. Some assert that, "CMM actually gets in the way of rapid development. The principle of creating repeatable development processes is a good one, but the extensive software testing required by CMM would actually prevent us from getting new releases into the market before our competitors."<sup>218</sup> In sum, the CMM approach is perceived as inconsistent with the iterative style of development characteristic of companies operating on Internet time. In fairness to CMM, this appears to be a rationalization for "good enough" software quality that reasons

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<sup>215</sup> Orenstein, ComputerWorld, supra.

<sup>216</sup> "City Diary: Software Stocks Zoom Ahead of Q2 Results," The Economic Times of India, September 21, 1999, WL 23699271.

<sup>217</sup> Menon, "Mastek Aims to Achieve CMM Level 5 by 2000," Financial Express (Bombay), September 23, 1999 (1999 WL 21407854).

<sup>218</sup> Seof, "A Question of Quality," "InformationWeek" February 22, 1999, [www.informationweek.com](http://www.informationweek.com), (quoting, Robert Bickel, SVP of Bluestone Software Inc.).

that speedy deployment offsets living with some inevitable software bugs.

These contrasting views are worthy of a full debate and this report makes several recommendations for fostering such a debate. Initially, we offer several critiques of the “good enough” software school of thinking.

- Customers of financial institutions have zero tolerance for any type of computer glitch that causes them to miss an opportunity or experience a financial loss.
- Many customers already feel burned by the “good enough” approach to e-commerce systems development and would likely choose a more costly but more dependable product or provider.
- The tolerance for some glitches when a sub-par project is installed may in fact be revealed to have been a “bet-the-company” decision as the FoxMeyer and Oxford Health cases, discussed above, illustrate.

#### **4. Current quality assurance practices at online brokerage firms.**

##### **(a) Management Information Systems development processes.**

None of the online firms that we examined have ISO 9000 or CMM certification. Some of the technology officers we spoke with during the Office’s inquiry stated that they envisioned ultimately seeking CMM Level 3 certification. They recognized that embracing CMM’s methodology would help their organizations become world-class. This is not to suggest that these or other firms have not adopted, or are at least seeking to establish, procedures that resemble the best practices of mature organizations -- though it is presumed that the industry is not functioning at Levels 3, 4 or 5 of the CMM.

Most of the firms examined maintain quality assurance groups to assess

proposed software additions. These changes are also reviewed by senior operating officers prior to implementation. The object of these reviews is:

- to ensure the change is appropriate;
- to identify any potential adverse impacts on the systems or any of their components;
- to assess the adequacy of the back-out plan in the event of any abnormality; and
- to determine the optimal time for inserting the change.

The inquiry uncovered evidence at one firm of a formalized change review process culminating, after circulation of the relevant materials, in weekly meetings to review prospective changes. In this process the proponent or sponsor of the development project acts as presenter and advocate. The change review board members ask questions and discuss the issues raised. In firms with less formalized processes these issues may be discussed in either periodic or spontaneous meetings of officers either in person or by conference calls, sometimes daily or more frequently when systems were being stressed.

**(b) Mission critical failures and information system monitoring.**

Early in the course of our inquiry, the Office asked all firms to promptly report to us any material mission critical failures.<sup>219</sup> Because the request was prior to the SEC rulemaking which defined “mission critical” events, the Office developed with the online

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<sup>219</sup> We permitted the firms to exclude events that either were of merely transitory duration or did not substantially affect its customers, e.g., an event disrupting traffic over a small ISP. See discussion at Section V(B)(2), supra.

brokers a common understanding of what matters would be reported to us.

From these communications with the online brokerage firms, the Office discovered that they were only then in the process of moving from ad hoc analysis and reporting of mission critical outages to more formalized procedures. Not surprisingly, the inquiry showed that at times of major outages that were the subject of significant press inquiries, managers of online firms went to great lengths to construct and to disseminate minimizing explanations.

To varying degrees, the Office found that boards of directors and appropriate executives obtained information regarding IS developments. The best practice identified in this regard was the preparation of quarterly reports that assessed the performance of IS units, including evaluating capacity data, customer service metrics and outages that may have occurred. Such reports also typically discussed future system changes. However, this level of management discipline is more typical of large, publicly-traded online brokers than smaller or non-public firms. Illustrative of this, one firm stated that a committee of its outside directors has been charged by the full board to conduct a schedule of quarterly topic-centered oversight meetings. Two of these topics are technology issues and legal/compliance issues.<sup>220</sup>

**(c) Third party reviews of online brokers' systems.**

Nearly all of the firms examined had made some use of outside resources in

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<sup>220</sup> See In re Caremark Int'l Inc. Derivative Litig., 698 A.2d 959, 1996 WL 549894 (Del. Ch. 1996) (informing this practice).

relation to their IS units. The predominant model was the use of vendor resources and consultants with specialized skills. Less frequently, the firms engaged independent third parties to review and assess aspects of their IS environments. Similarly, firms that have outsourced significant elements of their online transaction process to a service bureau did not obtain independent assessments of the capacity and reliability of the mission critical processes that they had turned over to these partnering firms. While these relationships do involve hour-by-hour monitoring of the service bureau, the absence of more formalized processes are significant since the contractors are neither licensed nor supervised by the SEC or any SEC-registered self-regulatory organization such as the NASD or NYSE. The following sections assess options for the outside review of online brokers' information systems.

**(i) Vendors and consultants.**

Undoubtedly IBM, Sun Microsystems, Cisco, Oracle, EMC, and Compaq, to name the most obvious, are technology firms of the first order. Their products are supported by cadres of technologists who help the e-commerce firms optimize the performance of these products and trouble shoot amidst the mayhem of a system failure. Much as expected, the Office has observed numerous instances of vendor activity including: (i) preparation of reports by reputable vendors assisting online brokerage firms in developmental processes; (ii) analysis of legacy systems; and (iii) a Schwab-IBM partnership to extend the operational

envelope for mainframes.<sup>221</sup>

Yet at root these are consulting arrangements overlaid upon a sales relationship of products delivered, either hardware or software, or expected to be ordered in the future. These are parties dealing at arm's length, presumably -- as not principal and agent, which would entail disclosure obligations on the part of a retained expert to the hiring principal. Moreover, both the product advocacy inherent in vendor representatives and their product-focused fund of knowledge renders them a leaky bulwark for e-commerce managers requiring a fully candid assessment of a firm's technology issues.

Similar circumstances limit the utility of outside consultants. Consultants have a natural incentive to increase the scope of projects and to identify new issues warranting their services. This observation was made to us by firms in the course of our inquiry. It is logically linked to the SEC's concerns that the independence of public accountants is diminished by the multiplication of consulting engagements that they obtain from audit clients.<sup>222</sup> Moreover, to the extent that most persons tend to develop specialized skills focused upon specific vendor hardware or software, they also are compromised by an

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<sup>221</sup> Schwab Press Release, "Charles Schwab, IBM to Deploy Next Generation of Support Technology for Online Trading," June 16, 1999, 11:00 a.m. EDT; Reuters, "Focus-IBM, Schwab to Add Online Trading Safeguards," June 16, 1999, 7:08 p.m. EDT; CNET, "IBM Mainframes to Take On Schwab Traffic," June 16, 1999, 12:20 p.m. PDT.

<sup>222</sup> Arthur Levitt (Chairman), Remarks to the Panel on Audit Effectiveness of the Public Oversight Board, Public Oversight Hearings, New York, N.Y., October 7, 1999, [www.sec.gov/news/speeches/spch301.htm](http://www.sec.gov/news/speeches/spch301.htm); Norman Johnson (Commissioner), Speech, "The Year of the Accountant," to the Utah State Bar, St. George, UT, March 6, 1999, [www.sec.gov/news/speeches/spch264.htm](http://www.sec.gov/news/speeches/spch264.htm).

approach that seeks solutions from within their existing product specific fund of knowledge.

Furthermore, the selection process for vendors, consultants and outsourcing partners itself involves significant risk. As the litigation arising from failed application development projects attests, see Section V(A)(4), every vendor, consultant and outsourcing partner must have the demonstrated ability to deliver quality software solutions on time. The best practice is to choose only outsourcing partners certified to be in compliance with ISO 9001 or Level 3 of the CMM.<sup>223</sup>

**(ii) Independent third party reviews.**

The complexity of information systems and the potential adverse consequences to a company from failure of any mission critical system, or the emergence of a millennium bug, suggests that third party audit/review is the most appropriate practice. Accounting firms already are obliged to examine a company's internal controls before formulating audit plans. Public companies, particularly those experiencing rapid growth, acquisitions or the implementation of new hardware or software, will be well advised to conduct periodic information systems audits both to satisfy their duty to monitor, to assure themselves that their securities disclosures are fully compliant, and most importantly, to ensure highly reliable service to their customers.

In our inquiry we found a limited attachment by online brokers to the principle of independent third party reviews. The most frequent use of such reviewers was in the case

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<sup>223</sup> Binstock, "Outside Development Partners," Information Week, October 18, 1999, [www.informationweek.com/757/outside.htm](http://www.informationweek.com/757/outside.htm).

of evaluations of their web security. Such security features lend themselves to objective testing, and the certification results have market power. E\*Trade, for example, publicizes the fact that it has earned the WebTrust seal of approval.<sup>224</sup> Finally, the Office found one instance where an online brokerage firm, having developed an alternative system architecture (to replace a legacy architecture), retained a major accounting firm to do an independent, pre-deployment review of the architecture to assess its scalability and feasibility. No firms examined made routine use of periodic, third-party reviews of their IS shops.

Our judgment that the customer, shareholder and public interest is best served by annual IS reviews by independent reviewers is no reflection on the men and women today engaged at online brokers in making the electronic marketplace a reality. We are also mindful of the potential anomaly this raises by putting one part of the securities industry under a burden that no other shoulders. But our recommendation is informed by the special circumstances inherent in IS departments:

- Technology expertise usually lies beyond the skills possessed by executives and directors. Hence, they are less equipped to obtain the relevant facts and make appropriate decisions.
- Incumbent managers have a vested interest in not saying that a project has failed or that a process must be re-engineered.
- The cost of the outside reviews appears dwarfed by the stakes

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<sup>224</sup> See Primoff, The CPA Journal, “Electronic Commerce and WebTrust(SM),” p. 14, Nov. 1998 (“These are also exciting opportunities for CPAs in public practice to become key players in the e-commerce infrastructure, by providing the new AICPA WebTrust (SM) assurance service . . .”).

for customers and investors.

**(iii) Internal auditors and quality assurance staff.**

While some might suggest that a firm's internal auditors may capably exercise independent judgment about the performance of IS units, that view is mistaken. It is wholly unrealistic to expect that the staff of internal audit departments, which have salary structures markedly below the ranges necessary to attract and retain software engineers, to possess the expertise, stature and judgment to probe activities that may involve millions of dollars of hardware or software development costs. Similarly, there is scarcely any suggestion that such staff possess the training to assess the quality of development efforts or conduct technology risk assessments. The prevailing model is to lodge quality assurance within the IS department but with a reporting line independent of those who supervise development projects.

An activity more suited to internal auditors and still valuable to online brokerage firms and their stockholders is to gather accurate data about the total costs of IS units including both day-to-day systems operations, often referred to as the "production" environment, and development projects.

In searching for common metrics for comparisons of online brokerage firms we sought to evaluate whether the public could obtain, at least for the brokers that are publicly owned, total IS cost data and compare it to either the firm's transaction volume or assets under management. To the Office's surprise we found this impossible. While the

firms may internally develop this data<sup>225</sup> it cannot, as a rule, be found in their periodic filings on forms 10-Q and 10-K. While a few disclosed technology development expenses -- generally a fraction of marketing expenses -- most firms did not segregate these costs from other broader categories. Similarly, the leading industry research reports published quarterly by Credit Suisse First Boston and Piper Jaffray omit any analysis of IS costs.<sup>226</sup>

If online brokerage firms were to break out total IS costs as a material expense for their e-commerce offerings, the public would be able to determine which firms were making the greatest investment in robust systems and introducing additional investor web features. A cynic might observe that the total costs would also be high for a firm that was engaged in a massive catch-up exercise. True, but analysis of the data over a series of quarters would reveal a worthwhile insight into management's philosophy about investing in technology.

**(iv) Independent reviews of information technology.**

In conducting our inquiry we also evaluated the sources of information available to investors to evaluate prospectively the establishment of an account with an online broker. We sought to assess whether existing information in the marketplace obviated the development of the online brokerage report cards envisioned by this report. While we

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<sup>225</sup> Schwab is reported to be spending 15 to 17% of its revenues this year on computer systems. Reuters, "Focus-IBM, Schwab to Add Online Trading Safeguards," June 16, 1999, at 7:08 p.m. EDT).

<sup>226</sup> However, the analysts have followed the online brokers' rising customer acquisition costs obtained from marketing expenditures and reports of new account growth.

found that there are lots of articles and rankings of online brokerage firms, they do not contain useful, specific information about either the reliability of the online broker's technology or a common metric for comparisons. Most of the information is simply subjective rankings of firms based on such factors as the extensiveness of the services offered, the costs and the ease of use.

The rankings scene itself is mostly a muddle with most firms able to claim that someone ranked them #1 (in some category), leading several firms to batter each other with advertisements contending they were really the #1. Even the late entrant to this market, Merrill Lynch, has now run an advertisement, reminiscent of the old Avis ads, that it is #2.

The quandary for the investor is best illustrated by E\*Trade, which in a September 15, 1999 press release trumpeted that it was ranked number one by Gomez Advisors for the second consecutive quarter and for the fourth time in five quarters.<sup>227</sup> In contrast, Smart Money in its June 1999 rankings placed E\*Trade 17th of 21 firms, ranking it worst for customer responsiveness and second worst for web reliability.<sup>228</sup> The Smart Money article also opened with an account of one extremely disappointed E\*Trade customer whose accounts purportedly had been "riddled" with "goof-ups" and endured "mind-numbing waits on the telephone."<sup>229</sup> In addition to under-weighting service quality and reliability,

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<sup>227</sup> [www.gomez.com/scorecards/index.cfm?topcat\\_id=3](http://www.gomez.com/scorecards/index.cfm?topcat_id=3).

<sup>228</sup> Packel, "The Best and Worst Discount and Online Brokers," [www.smartmoney.com/si/brokers/discount](http://www.smartmoney.com/si/brokers/discount), May 18, 1999.

<sup>229</sup> Id.

Gomez omits any evaluation of the quality of customers' trade executions.<sup>230</sup>

**5. Legal framework for identifying and disclosing failure risks of “mission critical” systems.**

To this point we have established that technology development and deployment efforts involve high risks both in firms generally and in the leading online brokers that we have studied. These risks are material because they constantly pose a failure risk to mission critical systems. There are several existing and developing legal and regulatory frameworks for requiring marketplace disclosures of the risk of financial loss occasioned by system failures, and at least six distinct groups that will derive substantial benefit from an enhanced disclosure regime.

- **Online investors** will gain the advantage of informed decisions in selecting brokers.
- **Managers** of the firms that develop performance metrics and risk data will be empowered to manage their business more effectively.
- **Investors** will be empowered to direct capital toward those that are managing operational risks well, while withdrawing capital from those firms that are uninformed and ill-prepared to manage operational risks.
- **Regulators** will be empowered by the data to concentrate attention upon the highest risk firms.
- **Competing firms'** managers will benefit from bench marking their own performance against data from similar businesses.

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<sup>230</sup> See discussion of execution data at Section V(D)(3).

- **Society** as a whole will gain from reduced regulatory costs and the higher efficiency of a marketplace affording better informed decision making.

The legal and regulatory rubrics that we examine below for their ability to secure appropriate market place disclosures are: (i) rules aimed directly at eliciting data about e-commerce operations and management practices; (ii) an investor-centered disclosure regime; and (iii) corporate governance approaches. While the first of these is the most logically compelling for obtaining these disclosures, we begin with the second since the predominant business model is that of public investor ownership, both for online brokers and e-commerce firms generally (which raise public capital to grow), resulting in publicly owned firms already bearing disclosure obligations. Prospective customers of online brokerage firms, we submit, are entitled to the same disclosures that prospective investors in their securities are entitled to receive since both face the risk of financial loss from any system failure.

**(a) Disclosure obligations for information systems uncertainties.**

**(i) Representative online broker investor disclosure practice.**

The ranks of publicly owned online brokerage firms increased this year with the IPOs of Waterhouse and DLJdirect, Inc. The Waterhouse offering alone raised \$1 billion. By completing the public offering registration process, these firms provided a litmus test of current SEC disclosure requirements for IS uncertainties.

The first transaction to actually clear the SEC was the DLJdirect offering,

which raised \$320 million from the public on May 25, 1999. The most prominent risk factor in the prospectus was the potential impact of “Systems Limitations and Failures.”<sup>231</sup> The risk presented by DLJdirect’s system was discussed from three perspectives. First, the outcomes that proceed from failing systems were stated:

- unanticipated disruptions in services;
- slower response time;
- decreased customer service and customer satisfaction;
- delays in the introduction of new products and services, which could result in financial losses;
- litigation or other customer claims; and
- regulatory sanctions.

Second, the prospectus stated that risk was inherent in the continuous expansion of self-developed systems in a growth environment:

DLJdirect uses internally developed systems to operate its business, including transaction processing systems, which can accommodate increased capacity. However, if DLJdirect’s customer base increases substantially, DLJdirect will need to expand significantly and upgrade its technology, transaction processing systems and network infrastructure. DLJdirect does not know whether it will be able to project accurately the rate or timing or cost of any increases, or expand and upgrade its systems and infrastructure to accommodate any increases in a timely manner.

The prospectus then went on to describe the risk of successfully providing

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<sup>231</sup> DLJdirect Prospectus, dated May 18, 1999, at 12.

“efficient and uninterrupted” system operation to its customers. This was then brought home by setting out the firm’s three most significant systems failures. The lead problem described in the prospectus was acknowledged to have been capacity-related outages in April 1998:

On April 21, 1998, a high volume of customer activity overloaded DLJdirect’s computer. As a result, customers logging into their accounts between 9:30 a.m. and 10:00 a.m. were unable to access the system or experienced significant lag times in doing so. This increased the number of customers who tried to place orders by telephone, causing such customers to experience significant wait times or failures to connect. The problem was resolved by 10:30 a.m. The problem occurred again but to a lesser extent on April 22, 23, and 27, 1998. Additional computer resources have been applied to solve the capacity problem.

We find these disclosures to be direct and informative. The disclosure of a firm’s most significant outages has important benefits. The investor/customer gains an appreciation of the complexity of the technology, examples of the points of possible failure and insight into how to transact in light of this risk. Yet at present no online brokerage firm provides this level of transparency to its customers. In fact, the only way for prospective customers to obtain this information is to scan the message boards about the firm and to search for news stories.

Subsequently on June 23, 1999, Waterhouse completed its IPO. The Waterhouse prospectus illustrates the ad hoc vagaries of SEC review. Although Waterhouse was presumably aware that the SEC made DLJdirect disclose its three most significant system outages, the Waterhouse prospectus cleared SEC review without drawing a similar

disclosure comment from the SEC. Disclosure, without specific examples, was made of Waterhouse's risk of transaction delays, system failures and capacity constraints:

We depend heavily on the capacity and reliability of the electronic systems supporting this type of trading. Heavy use of our systems during peak trading times or at times of unusual market volatility could cause our **systems to operate slowly or even to fail** for periods of time. Recently, we have experienced periods of extremely high trading volume and substantial volatility in the securities markets. On several occasions during these periods, the volume and volatility of trading activity **caused individual system components or processes to fail**, resulting in the temporary unavailability of our web site for electronic trading. On some other occasions, high trading volume has caused **significant delays** in executing trading orders, resulting in some customers' orders being executed at prices they did not anticipate. We cannot assure you that these events will not occur again in the future.<sup>232</sup>

The Waterhouse prospectus also discusses further operational risks arising from its reliance upon outside vendors for critical business processes. Waterhouse is especially reliant for back-office services. The investor risk factor on this subject follows:

**The Loss of Our Third Party Suppliers of Key Services Would Adversely Affect Our Business**

We rely on a number of third parties to process transactions. These include service bureaus for our customer account record keeping and data processing services and market makers and stock exchanges to execute customer orders. In the U.S., we depend on Automatic Data Processing . . . for back-office services,

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<sup>232</sup> Waterhouse Prospectus, "Risk Factors," p. 7, June 23, 1999 (emphasis added).

including broker terminal services and order entry systems, and other information necessary to run our business, including transaction summaries, data feeds compliance and risk management, execution reports, and trade confirmations. . . . We cannot assure you that any of these providers will be able to continue to provide these services in an efficient, cost-effective manner or that they will be able to adequately expand their services to meet our needs. An interruption in or the cessation of service by any third-party service provider as a result of systems failures or capacity constraints or for any other reason, and our inability to make alternative arrangements in a timely manner, if at all, would have a material adverse effect on our business, financial condition and operating results.<sup>233</sup>

Almost all online brokerage firms have similar external dependencies. All online brokers must extend to online customers information about such risk factors and the outages or delays arising from these relationships.

**(ii) Applicable SEC disclosure guides.**

The SEC, in a Staff Legal Bulletin on Y2K (“SLB-Y2K”), set out three bases requiring disclosure of “anticipated costs, problems and uncertainties associated with Year 2000 consequences.”<sup>234</sup> This analysis is fully applicable to known uncertainties that brokers

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<sup>233</sup> Id., at p. 12.

<sup>234</sup> Staff Legal Bulletin No. 5 (CF/IM), 1/12/1999 (rev’d); [www.sec.gov/rules/other/slbcf5.htm](http://www.sec.gov/rules/other/slbcf5.htm). The SEC home page for Y2K is [www.sec.gov/news/home\\_2000.htm](http://www.sec.gov/news/home_2000.htm). SLB-Y2K was reaffirmed by SEC Interpretation, “Disclosure of Year 2000 Issues and Consequences by Public Companies, Investment Advisers, Investment Companies, and Municipal Issues,” Release Nos. 33-7558, 34-40277, IA-1738, IC-23366, July 29, 1998, [www.sec.gov/rules/concept/33-7558.htm](http://www.sec.gov/rules/concept/33-7558.htm) (“Investors deserve no less . . . . [than] management’s assessment of their company’s year 2000 problems.”).

and all e-commerce firms have with their mission critical IS systems. First, SEC anti-fraud rules and Securities Acts §17(a)(2)<sup>235</sup> and Exchange Act §10(b) require the disclosure of any additional material information necessary to make the required disclosures not misleading. The SEC maintains that this requirement applies to both statements and omissions in SEC filings and outside of SEC filings.<sup>236</sup>

More explicitly, Regulation S-K's Item 303 requires that a company's Management Discussion & Analysis ("MD&A") disclose "known trends or uncertainties . . . that the registrant reasonably expects will have a material favorable or unfavorable impact on net sales or revenues or income from continuing operations."<sup>237</sup> Of course, it is likely true that no management "reasonably expects" its mission critical systems to fail. More likely is the case that management knows that an event will occur, e.g., the year 2000 or an IS conversion or upgrade, but is uncertain whether the inevitable "glitches" will rise to the level of a material effect. In this crucial instance the SEC directs management to "evaluate objectively the consequences" and make disclosure unless it determines that no material effect is "reasonably likely to occur."<sup>238</sup>

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<sup>235</sup> The language of section 17(a) parallels the Attorney General's authority under the 1921 Martin Act, Gen. Bus. Law § 352. New York's courts have indicated their intention to construe these statutes in parallel fashion. People v. Landes, 84 N.Y.2d 655 (1994).

<sup>236</sup> Securities Act Rule 408; Exchange Act Rules 10b-5, 12b-20 and 14a-9.

<sup>237</sup> 17 C.F.R. §229.303(a)(3)(ii).

<sup>238</sup> Management's Discussion and Analysis of Financial Condition and Results of Operation, SEC Release Nos. 33-6835, 34-26831, and Financial Reporting Rel. No. 36, 54 FR 2247, 1989 WL 258977, May 18, 1989; 7 CCH Fed. Sec. L. Rptr., Codification of Financial Reporting

Apart from SEC or Attorney General enforcement proceedings, several courts have concluded that no private right of action exists for an alleged failure to comply with MD&A 303's requirements.<sup>239</sup> Nevertheless, where management has "'hard' information about a 'known trend or uncertainty' that would have a material impact," private securities litigants have persuaded courts that companies are obliged to disclose the information pursuant to the requirements of general anti-fraud rules such as section 10(b).<sup>240</sup>

A final disclosure obligation arises from MD&A Item 101, "Description of Business."<sup>241</sup> The SEC states that, if "Year 2000 issues materially affect a company's products, services, or competitive conditions," disclosure under Item 101 may be necessary.<sup>242</sup> Thus, as noted above, absence of ISO 9000 or CMM certification for a software vendor needs to be evaluated for inclusion in the disclosures about the registrant's competitive position.

In summary, the SEC has a well-articulated combination of anti-fraud authority and prescriptive disclosure utterances that should prompt online brokers and e-commerce firms to disclose and "evaluate objectively" the known risks and consequences of the failure

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Releases, § 501.02, ¶ 73,193 at p. 62,843.

<sup>239</sup> In Re Verifone Sec. Litig., 784 F.Supp. 1471 (N.D. Cal. 1992), aff'd, 11 F.3d 865 (9th Cir. 1993); Alfus v. Pyramid Technology Corp., 764 F.Supp. 598 (N.D. Cal. 1991).

<sup>240</sup> Simon v. American Power Conversion Corp. 945 F.Supp. 416, 432 (D.R.I. 1996).

<sup>241</sup> 17 C.F.R. § 229.101.

<sup>242</sup> See SLB-Y2K, [www.sec.gov/rules/other/slbcf5.htm](http://www.sec.gov/rules/other/slbcf5.htm).

of their mission critical systems. A possible model for these disclosures is the DLJdirect prospectus from May 1999 that supplied detailed information, including the most significant outages suffered by the firm.

**(b) Regulatory paradigms for online brokerage operational capacity.**

**(i) SEC Y2K rulemaking.**

In 1998 the SEC took a small step in the direction of independent IS reviews. The SEC embraced the logic of third party review in the rulemaking process on the topic of the preparedness of broker-dealers (“BDs”) to meet the potential software and systems issues of entering the year 2000 (“Y2K”). The SEC debated and determined in 1998 to require the filing with the SEC by BDs of reports prepared by independent public accountants addressing the BD’s preparedness. Logically, the SEC should require the continued preparation and publication, via SEC filing, of such reports for all BDs and public issuers of securities that face material business risks from the failure of mission critical systems.

The SEC’s Form BD-Y2K requirement developed from a SEC proposal under section 17(a) (books and records) of The Exchange Act that a CPA attest that a “reasonable basis” exists for seven assertions that the BD must make in its second Y2K report to the SEC.<sup>243</sup> On July 2, 1998, the SEC reopened comment on the CPA attestation requirement due to AICPA criticism that the proposed assertions were “not appropriate for accountant

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<sup>243</sup> Reports To Be Made by Certain Brokers and Dealers, Rel. No. 34-39724, File No. 5-7-98, March 5, 1998, [www.sec.gov/rules/proposed/34-39724.txt](http://www.sec.gov/rules/proposed/34-39724.txt).

certification” and due to the absence of “established criteria related to Year 2000 remediation efforts.”<sup>244</sup> The SEC then replaced the attestation approach with a report meeting the reduced standard of an “agreed upon procedures” engagement as delineated by the Auditing Standards Board’s Statement of Position 98-8.<sup>245</sup>

**(ii) Emergence of Exchange Act rulemaking for broker-dealers.**

On March 5, 1999 the SEC proposed new rules addressing broker “operational capacity” pursuant to § 15(b)(7) of the Exchange Act.<sup>246</sup> The enabling statute for this action, Section 15(b)(7), was added to federal law in 1975<sup>247</sup> and states, in pertinent part, that no registered dealer shall transact business “unless such broker or dealer meets such standards of operational capability . . . as the Commission finds necessary or appropriate in the public interest or for the protection of investors.” The SEC also maintained that rulemaking on operational capacity arises from its general authority over BD business practices.<sup>248</sup> In laying out the case for rulemaking the SEC noted the increasing reliance of BDs upon computer

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<sup>244</sup> Reports To Be Made by Certain Brokers and Dealers (Further Proposal), Rel. No. 34-40164, File No. S7-7-98, July 2, 1998, [www.sec.gov/rules/proposed/34-40164.htm](http://www.sec.gov/rules/proposed/34-40164.htm).

<sup>245</sup> Reports To Be Made By Certain Brokers and Dealers (Final Rule), Rel No. 34-40608, File No. S7-7-98, October 28, 1998, [www.sec.gov/rules/find/34-40608.htm](http://www.sec.gov/rules/find/34-40608.htm)

<sup>246</sup> Operational Capability Requirements of Registered Broker Dealers and Year 2000 Compliance (“Operational Capability Rulemaking”), SEC Release 34-41142, File No. S7-8-99, March 5, 1999, [www.sec.gov/rules/proposed/34-41142.txt](http://www.sec.gov/rules/proposed/34-41142.txt).

<sup>247</sup> Pub. L. No. 94-29, 89 Stat. 97.

<sup>248</sup> Exchange Act § 15(c)(3), 15 U.S.C. 78o(c)(3).

systems to perform their functions. The SEC observed that the “absence of the ability to properly handle customer transactions” could result in a violation of anti-fraud provisions.

As a remedy, the SEC rule proposal barred a BD from placing trades for customers unless it possesses sufficient “operational capability” in order to conduct a securities business. The rule neither defined this term nor the threshold at which a system would be deemed deficient. It did attempt to address the materiality issue in the proposing release:

Because the rule is aimed at overall **capacity and mission critical systems** that effect processing of customer securities transactions, isolated systems problems unrelated to a broker-dealer’s core business would not violate the rule. For example, there can be occasional delays or outages in electronic systems due to high demand or software glitches. However, if delays or system outages occur **consistently due to insufficient systems capacity** that result in customer orders not receiving timely **executions** or customers not receiving timely **confirmations**, then a broker-dealer would be in **violation** of the proposed rule and would need to take appropriate actions before it could resume its normal operations (emphasis added).

The proposal was criticized by the industry for its vagueness, its inability to distinguish the chronic from the occasional problem and its failure to show the inadequacy of existing NYSE and NASD operational capacity rules.<sup>249</sup> The industry urged that the proposal be given further consideration in consultation with them. The SEC agreed, and

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<sup>249</sup> Securities Industry Association, Comment Letter, April 12, 1999, [www.sec.gov/rules/proposed/S7899spencer1.txt](http://www.sec.gov/rules/proposed/S7899spencer1.txt).

decoupled the proposal when it promulgated the Y2K rules that were part of the original release.<sup>250</sup> However, SEC Commissioner Laura Unger has publicly stated the SEC's intention to resume work on operational capacity rules.<sup>251</sup>

The operational capability proposal appears to be an outgrowth of SEC concerns initially expressed in a staff position paper<sup>252</sup> which was spurred by the chaotic trading on October 27-28, 1997.<sup>253</sup> Customers of online brokerage firms complained about delays and inability to access their accounts. The SEC found that, apart from the slowness of the Internet on October 28th, some online brokerage firms had web server capacity problems. Similarly, the electronic marketplace faltered as websites exhibited poor load-balancing, delays occurred with third party vendors (the contract back office firms), volume overwhelmed inadequate telecom bandwidth and poor integration of back-end systems, along with capacity problems with order routing systems, slowed order executions.

The customer delays and root system inadequacies that we have detailed in this

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<sup>250</sup> Year 2000 Operational Capability Requirements for Registered Broker-Dealers and Transfer Agents (Final Rule), Rel. No. 34-41661, July 28, 1999, [www.sec.gov/rules.final/34-41661.htm](http://www.sec.gov/rules.final/34-41661.htm).

<sup>251</sup> Laura Unger, "Remarks at the National Regulatory Services Fall 1999 Compliance Conference," Santa Fe, NM, Sept. 14, 1999, [www.sec.gov/news/speeches/spch296.htm](http://www.sec.gov/news/speeches/spch296.htm) ("Although we temporarily suspended our efforts to pass these rules, it is likely that we will return to them in the near future.").

<sup>252</sup> Staff Legal Bulletin No. 8 (Market Regulation), September 8, 1998, [www.sec.gov/rules/other/slbmr8.htm](http://www.sec.gov/rules/other/slbmr8.htm).

<sup>253</sup> On October 27, 1997 two circuit breaker halts occurred as the Dow Jones Industrial Average ("DJIA") lost 554 points (7.2%) to close at 7161. The next day, on then-record volume of a billion shares on both the NYSE and NASDAQ, the DJIA rose 337 points (4.7%).

report echo those reported by the SEC in September 1998 regarding the October 1997 episode of market volatility. These events inform our recommendation for independent third party reviews of the capacity and reliability of brokers' information systems and public report cards of the salient information.

**(iii) SEC's automation review policies.**

The SEC first warned broker dealers to have appropriate personnel and facilities to promptly execute and complete customer transactions during the back office crisis of the 1960s, when the NYSE curtailed its hours in order to reduce the strain from the paper intensive clearance process during a trading boom.<sup>254</sup> The issue resurfaced in the aftermath of the 1987 market break when operational difficulties were experienced by NYSE and NASDAQ automated systems and calls to BDs went unanswered.

The SEC responded by issuing two policy statements setting forth its automation review policies for exchanges and NASDAQ (ARP I and II).<sup>255</sup> In ARP II the SEC noted that its recommended approach vis-a-vis the exchanges "merit[ed] consideration by broker-dealers, service bureaus, vendors and clearing agencies, as well." Again in the proposing release for its suspended operational capability rule, the SEC stated that ARP I and II should be used by BDs as "guidelines."<sup>256</sup>

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<sup>254</sup> Exchange Act Rel. No. 8363, July 29, 1968, 33 FR 11150, August 7, 1968.

<sup>255</sup> Securities Exchange Act Release No. 27445, November 16, 1989, 54 FR 48703 ("ARP I"); Exchange Act Release No. 29185, May 9, 1991, 56 FR 22489 ("ARP II").

<sup>256</sup> Operational Capability Rulemaking, at n. 54, supra.

Indeed, ARP I and II are directly on point for online brokerage systems stressed by customer demand, as the SEC in these releases directed the exchanges to “establish comprehensive planning and assessment programs to test system capacity and vulnerability.” The SEC itself has asked the online brokerage firms to follow the ARP process as guidelines for their own practices.<sup>257</sup> Most importantly, the SEC initially told the markets, and now has suggested to brokers, that they “obtain an annual independent assessment of whether affected systems can perform adequately in light of estimated capacity levels and possible threats to the systems.”<sup>258</sup> In ARP II the SEC also called for a dialogue on “additional standards regarding audits of Computer systems.”<sup>259</sup>

These measures from ARP II are appropriate in the online brokerage context and are consistent with the prescriptive recommendations that we make in this report:

- [P]eriodic, comprehensive and **independent reviews** of . . . automated systems should provide a reasonable and cost-effective level of assurance to the Commission and investors alike that . . . automated systems are being adequately developed and managed with respect to capacity, security, development and contingency planning concerns.
- [T]he independent reviewer should undertake to perform a **risk analysis** of the covered systems. . . . Factors to be considered in performing the risk analysis are magnitude of exposure, age, risk of failure, degree of recent modifications, complexity of application, criticality of application, and sufficiency of general

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<sup>257</sup> Staff Legal Bulletin No. 8, supra.

<sup>258</sup> ARP II, supra.

<sup>259</sup> Id.

and compensating controls.

- [T]he Commission believes that it would be useful . . . to inform the Commission staff of significant systems changes. One approach would be through a two-tiered reporting process. The two tiers consist of: (1) an **annual planning and status report**; and (2) a **systems change notification** with respect to significant systems changes.
- [T]he Commission requests . . . **real-time notification of significant system outages**.

Investors are increasingly reliant upon the capacity and reliability of electronic brokerage; thus the SEC, or the SROs acting under the SEC’s supervision, should move beyond guidelines and require practices that will assure customers of online brokers’ operational capabilities.

(c) **Directors’ liability for failure to monitor.**

Chancellor Allen in Caremark has succinctly observed that a “board’s supervisory and monitoring role under § 141 of the Delaware General Corporation Law” requires “relevant and timely information [as] an essential predicate.”<sup>260</sup> Hence, directors are obliged “to assure that a corporate information and reporting system, which the board concludes is adequate, exists, and that failure to do so under some circumstances may . . . render a director liable. . . .”<sup>261</sup>

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<sup>260</sup> In re Caremark Int’l Inc. Deriv Litig., 698 A.2d 959, 1996 WL 549894, p. 7 (Del. Ch. 1996).

<sup>261</sup> Id. at 8 (emphasis added).

In Caremark the Court approved the settlement of a derivative lawsuit that ensued from the payment of \$250 million of civil and criminal fines and restitution for violations of laws applicable to health care providers. Nonetheless, the Court characterized the failure to monitor claim as “extremely weak” and suggested in dicta that “only a sustained or systematic failure of the board to exercise oversight -- such as an utter failure to attempt to assure a reasonable information and reporting system exists -- will establish the lack of good faith that is a necessary condition to liability.”<sup>262</sup>

The complexity of information systems and the potential adverse consequences to a company from failure of any mission critical system, or the emergence of a millennium bug, suggests that third party audit/review is the most appropriate practice. Accounting firms already are obliged to examine a company’s internal controls before formulating audit plans. Public companies, particularly those experiencing rapid growth, acquisitions or the implementation of new hardware or software, will be well advised to conduct periodic IS audits both to satisfy their duty to monitor and to assure themselves that their securities disclosures are fully compliant.

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<sup>262</sup> Id., at 9.

## VI.

### RECOMMENDATIONS

Information technology is radically transforming our securities market and the brokerage industry. As Merrill Lynch prepares to field its online trading service, distinctions between “full service,” “discount” and “online” firms have become blurred.<sup>263</sup> Brokers are now largely defined by their mission critical system. The quality of that technology is a direct reflection of the quality of service an online broker provides to its investors.

Electronic markets, enabled by new technologies, are sweeping away past practices, ushering in extended trading hours, and moving all brokers and investors to Internet speed. Decimalization conversion of equity pricing in the coming year will create an almost exponential increase in quote traffic, further challenging systems.<sup>264</sup> All of these currents, combined with the growth of online investors, will tax the capacity of online broker systems. The additional blossoming of ECN connectivity, wireless remote trading and new venues for electronic trading of options, fixed income products and private placements all

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<sup>263</sup> David Pottruck, CEO of Charles Schwab made this same point in an address to the Securities Industry Association, “Wall Street’s Wake-Up Call: Serving Empowered Investors,” Boca Raton, FL, November 5, 1999 (“[T]hese categories don’t exist anymore. Competition has wiped them out.”)

<sup>264</sup> The U.S. securities markets are preparing to change the pricing format under which equities and options are traded. Using a phased-in approach beginning in 2000, the current pricing format in fractions will be converted to price increments in decimals. Although this is expected to decrease the minimum price variation and result in favorable pricing for investors, the increased message volume at one cent increments necessitates substantial additional system capacity, especially for high volume or volatile periods. “Assessing the Impact of Message Traffic of Trading Equities and Options in Decimal Increments,” SIA Decimalization Study, SRI Consulting, April 6, 1999.

spawn increasingly complex challenges for the technological infrastructures for the industry. These are complex building blocks under which there must be a well-defined and firm foundation.

In the paragraphs that follow, we detail actions that the firms and regulators, including the SEC, NYSE and NASD should consider to strengthen our capital markets' foundation for the electronic, point and click era. The importance of maintaining investor participation and confidence that markets are unstained by issues relating to system performance requires that e-commerce firms make pertinent, accessible disclosures about their own systems. The disclosures we envision will be a stimulus for the firms to improve their systems, and will herald a departure from the invisibility the firms sometimes appear to prefer.

To foster the debate on these issues, this Office will offer to host a series of roundtables of SEC officials, SRO representatives and industry members to illuminate potential solutions. Further, to foster enlarged and better-informed public participation in these new Internet linked markets, the industry has agreed to expand their investor education efforts and will sponsor special industry developed advertisements and materials to educate investors.

#### **A. Telling the Truth About Technology and Services**

Assuring online investors and shareholders of online brokers that the requisite foundation exists to accommodate future demands requires relevant, current, and material disclosures about a firm's systems. This vital information is not entirely available in the information currently published about the industry. Competition should include not only a battle for brand awareness, but also dissemination of reliable indicia of the service quality that is being offered to the online investor. The public requires a mechanism that communicates the relevant metrics for the performance of a firm's technology, customer service and maturity of technology development and management processes in an updated, accessible manner. We believe this is best accomplished by a combination of standardized self-reporting and independent third-party reviews. The disclosure of such information will achieve benefits for all market participants.

**1. Performance measurement.**

We are persuaded that those who constantly measure and assess their performance sow the seeds of their success. Online brokers follow this strategy today -- they just don't share the results with their customers or investors.<sup>265</sup> The 21st century demands that this approach be terminated. Mutual vulnerabilities and interdependencies demand that quality and performance measures be visible to all market participants. Yet, the comparative quality of individual technological infrastructures will be unrealizable without developing a standardized metric to measure the performance, capacity, and service provided by the

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<sup>265</sup> Simon and Buckman, "E-Broker Outages are Difficult to Track," Wall St. J., p. C1, November 15, 1999.

online trading system.

During the course of the inquiry, we determined that the development processes of several online brokers were characterized by ad hoc, even chaotic processes, where procedures were poorly defined, and success was dependent on individual heroics. We found some online brokers installed new systems into the operating environment without adequate testing, while others had no centralized scheme to keep modifications, patches and upgrades organized. We found much evidence of online brokers operating at a low level for the development of quality software processes.

In e-commerce, business processes and operator errors caused approximately 80% of unplanned downtimes, while technical architecture or design caused the remaining 20%. Thus, performance and/or availability of an online trading system is, in large part, impacted by business processes. Glitches, slowdowns and outages could be better contained with a combination of improved technology and mature development processes.

This not-so-unusual mode of operation in the early part of 1999 has been improved somewhat by online brokers who have sought to enhance their quality assurance processes and upgrade their testing and deployment processes. Many online brokers now have working groups, task forces or other specialized units created for the sole purpose to coordinate the testing and implementation of upgrades in a planned and orderly process. However, such efforts to improve the performance technology must be capped-off by independent review.

Measuring, or benchmarking as it is sometimes called, the maturity level of organizations producing technology solutions is not a radical paradigm. As discussed earlier, widely respected models exist that can easily be applied in the context of the online brokerage, and are already utilized by premier financial organizations such as Citibank and J.P. Morgan. The five level Capability Maturity Model by the Software Engineering Institute of Carnegie Mellon is one such model. Another is the ISO certification standard for software applications. Thus, all e-commerce participants should be required to report the maturity level of their technology development and deployment process.

Such an initial standardized report of a firm's technology development and management expertise will furnish an invaluable snapshot to online investors. Further assessments of the online trading systems need to be done on a periodic basis. Our inquiry has already demonstrated that such assessments often become outdated almost as soon as they are completed. Evaluating the needs of a system as it expands and grows is necessary in this industry of quick-silver changes.

Annually, auditors with certified expertise should provide an independent assessment of management's presentation of the firm's financial condition. The risks to customers and investors reliant upon a firm's mission critical systems require that technology systems also be assessed by an independent party and given the same "bill of health." Such independent reviews, or benchmarking, of an online broker's infrastructure offers investors valuable, relevant and material information on the "technology fitness" of a company.

Presently, firms use self-evaluative mechanisms as well as consultants and vendors. These are all appropriate but fall short of the added protection provided by annual, independent, and hence objective, reviews. As with financial reports, the firm's IS staff should prepare the initial annual report inclusive of a performance review of system availability, speed and capacity and a forward-looking assessment of challenges ahead. Thereafter, however, the condition of the company's technology cannot be kept behind closed doors. Indeed, when firms such as Schwab, Merrill Lynch or E\*Trade experience a system outage, it is immediately apparent to the world. "Technological fitness" of an e-commerce firm is material information that the marketplace is demanding. Assessments could include measurements for system availability and response times and system degradation format.

## **2. Customer service metrics.**

To help investors evaluate its technological fitness, an e-commerce firm also should define metrics for its business processes. All brokers dealing with the public over multiple channels must develop metrics from which to measure their business processes and customer satisfaction level. To do this, they must look at how their business touches the public. For instance, Help Desk functions could be broken down into quantifiable metrics, and less defined areas such as "customer satisfaction" can be measured by looking at average time to answer the phone. Average time investors are on hold, percentage of questions answered completely on the first call, and any satisfaction ratings gathered from the online

investors are other quantifiable metrics.

### **3. The advertising and investor education initiative.**

As we have reported, ubiquitously aggressive advertising messages can be alluring in their oversimplification of the trading process. In this time of frenetic growth, online brokers should not only devote time, money and energy to acquiring more online accounts and to accumulating more assets, but also to educating novice online investors about this new financial landscape. To address this need, the Attorney General recommends that online brokers devote a substantial percentage from their advertising expenditures specifically for the purposes of investor education. These efforts should be closely correlated with the experience and knowledge of the investors going online. To this end, all firms should assess the educational needs of their customers.

Moreover, online brokers should ensure that their advertising campaigns not contradict, conflict, or otherwise bypass the import of these investor education messages. Many online brokers have numerous educational materials available through “investor education” links, tutorials, newsletters and brochures while, simultaneously, running high-flying advertising campaigns that at times counter their otherwise sober explanations of online investing. Online brokers should be careful that such explanations are not lost in the din of the marketplace and that such communications are prominent, clear and concise.

### **B. Best Practices: Improved Disclosures for Online Investors**

Regulatory guidelines such as the NASD’s Notice to Members 99-11

recommend that online brokers provide “adequate, clear disclosure to [online investors] about the risks arising out of evolving volatility and volume concerns and any related constraints on firms’ ability to process orders in a timely and orderly manner.”<sup>266</sup> The Attorney General believes that disclosure requirements such as these aid in the understanding of online trades, and that online brokers can further improve the disclosure of certain items, a few of which are outlined below.

**1. Outages as they occur.**

Online brokers remain subject to outages, delays and other downtimes. Online investors should be informed of such occurrences by the online broker as soon as possible. In times of trading difficulties, the online broker should inform investors on the website home page immediately. Online investors should not have to proceed through most of the trade entry process before learning that the system is unavailable. Rather, such information should be imparted to investors as quickly as possible in a clear and prominent manner. Disclosure of a firm’s outages is material to online investors and prospective investors alike in assessing an online broker’s relationship. Moreover, as firms complete post-incident analyses of mission critical outages, summary information on such events should be posted to the firms’ websites. The summary outage description contained in the May 1999 DLJdirect prospectus is a good model.

**2. Heightened margin requirements and order cancellation procedures.**

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<sup>266</sup> See NASD Notice to Members 99-11, February 1999.

Many online brokers have imposed higher margin requirements on certain volatile stocks, mostly speculative Internet stocks. However, investors may not always be aware of the heightened margin restrictions. This is because the list of stocks is usually located only on a jump from the home page, or an alert at the log-in stage. Investors would benefit if they were reminded of those stocks with higher margin limitations at the time of order entry. Similarly, if “order cancellation” procedures were clearly explained at the order entry screen it would reduce the frequency of order duplication or other needless order entry errors.

### **3. Communicating market conditions.**

The online brokerage industry constantly extolls the advantages of online investing because of its “transparency,” that is, market conditions are more visible to customers via information integrating web tools. Volatile market conditions can be seen by investors with quote streaming, stockcharts and market alerts. This “transparency” of markets needs to be maintained at all levels, including information that markets and market makers supply to online brokerage firms. This information is not uniformly made available to online investors. Examples of such information include market conditions for individual securities and curtailment of automated execution procedures by market makers receiving the online investor’s order. For instance, investors should be notified of potential hazards about a stock’s trading at the order entry screen through “pop-up” boxes or other instant message mechanisms. Such information would aid an investor in making an informed

decision on whether to use a market or a limit order. Such notices could also inform online investors when their orders are being subject to manual review. Presently, these types of notifications are not sent back to the online investor. Such information would let the investor know in a meaningful and immediate fashion that a specific order may be subject to delays.

#### **4. Buying power of online investor accounts.**

Investors have complained in various instances where online brokers allowed a transaction that was disproportionate to or far exceeded the value of the account. A warning that a trade will exceed the buying power of an investor's account would assist both the investor and the online broker. Indeed, firms should strongly consider blocking the execution of orders in accounts such as IRAs which, if executed, at prevailing market conditions, would require either a deposit of funds to the account or the sale of other account assets. Some brokers offer intraday updates of portfolio activity and account balance, others do not. Regardless, the trade that results in an amount that is far above what an account can cover may be both an imprudent action by an online broker and harmful to the investor. Ultimately, steps to avoid such potentially skewed liability amounts would protect both the online broker and the online investor from undue risk.

#### **C. Regulatory Changes for Electronic Brokerage**

The online trading revolution has out-paced the regulations appropriate to markets of an earlier era. However, we do not suggest that regulatory handcuffs be placed

upon this industry. Its ability to develop new products and services for investors must be encouraged, not restrained. However, several important regulatory adaptations are appropriate for consideration by the SEC and the self-regulatory bodies, the NYSE and NASD.

**1. Document and retain system outage information.**

Our inquiry found that when online brokers suffered outages, delays, and unscheduled downtimes they kept inconsistent or inadequate records or documentation of such mission critical events. Many firms had no records available to analyze, catalogue or evaluate such information. Online brokers must ascertain the nature and cause of their problems if they are to assess what is indicative of continuing problems and what is merely a minor flaw in the online trading systems. Moreover, this issue affects financial firms and e-commerce sites. Accordingly, we recommend as follows:

- The SEC should amend its rules for all registered brokers specifying required records to include relevant information about material service outages or delays.
- Self-regulatory organizations (SROs) should require prompt filings by broker-dealers of mission critical failure including the duration and nature of the event.
- SROs should maintain such outage information on a searchable database accessible to the public.

## **2. Document and retain system performance metrics.**

As we observed about system outages, no rules mandate that firms retain records about the transaction loads and related performance data for their customer transaction processing systems. Consideration must be given to specifying what records should be maintained for what period of time.

## **3. Document and retain customer service data.**

No online broker should operate without providing investors with adequate alternative trading channels -- such as touch-tone phone trading or contact with a customer service representative -- for use when system problems arise. As an integral part of assessing the capacity of their trading systems, online brokers must ensure that if they offer alternative channels for online investors to access their accounts during outages, heavy volume or volatile conditions, the alternative channels must in fact be available and responsive. This requires that firms track and retain records of the responsiveness of phone service assistance and other trading channels.

However, during our inquiry we discovered instances where brokers had not retained important statistical information, such as call abandonment rates and hold times, during the Market Storm. Many online brokers have now increased phone staffs and have employed telecommunications systems that balance phone demands and track resolution of calls.

## **4. Capacity and reliability.**

As discussed above, the SEC initially proposed and withdrew a rule that would require a broker to cease operation if it lacked adequate systems to accommodate its customers' transactions. But the public requires functioning brokers, not shuttered brokers. We believe a successful approach to the capacity and reliability issues lies in the goal-oriented approach of NASD Rule 1120, which addresses the continuing education needs of firms and representatives.<sup>267</sup>

Technology changes too fast to expect that rulemaking can prescribe solutions to the question of how reliable and how much capacity a broker must have. Rather, rulemaking should prescribe an effective and accountable process within the firms. These elements would include:

- Requiring each firm to designate an officer responsible for the firm's assessment of its system reliability and capacity needs.
- Mandating each firm continuously evaluate its reliability and capacity needs in light of its customers' activity levels, the firm's marketing efforts, and relevant industry forecasts of market activity and volatility.
- Requiring firms to document these self-assessment processes.
- Requiring the designated capacity monitoring officer to approve all significant marketing campaigns.

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<sup>267</sup> Pursuant to NASD Rule 1120, member firms must maintain a updated continuing education program for their covered registered persons. "At a minimum, each member shall at least annually evaluate and prioritize its training needs and develop a written training plan. The plan must take into consideration the [firm's] size, organizational structure, and scope of business activities, as well as regulatory developments . . . ."

## **5. Disclosure guidance for information technology.**

The SEC has issued interpretative guidance to issuers of securities and securities market participants regarding the risks and remediation costs arising from millennial bugs. The bigger issue, however, for the markets and issuers of securities is the adoption of programs to continuously assess a firm's technology risks. The risks will vary from firm to firm but an assessment should be made upon undertaking the following:

- internal development and deployment of new technology;
- acquisition and deployment of new technology;
- scalability of systems and risks associated with managing growth;
- risks to a firm arising from strategic business partners, vendors and outsourcing arrangements; and
- attracting, developing, motivating, organizing and retaining the human capital necessary for businesses to function in the electronic era.

This is not a call to revive boilerplate Y2K disclosures. The IS challenges that firms face change constantly and will vary with the nature of the firm and its competitive landscape. Forward-looking disclosure about the challenges facing firms combined with relevant data such as the firm's IS employee turnover must become a feature in firms' "Management Discussion and Analysis" sections of their periodic reports. Online brokers are defined by their technological infrastructure and competence in the realm of information technology. Hence, issues relating to information systems capacity and reliability materially

affect the products, services, or competitive conditions of nearly all and must be disclosed clearly and concisely.

#### **6. Disclosure of information systems (“IS”) costs.**

As we have reported, there is an absence of transparency of IS costs, both for development projects and routine operation of systems. Yet, these costs are clearly material in amount at the enterprise level and material to online investors reliant upon the performance of a firm’s system.<sup>268</sup> Further, there is no uniform method of reporting such technology costs -- and online brokers disclose such amounts in vastly different manners.

These technology costs should be disclosed in a consistent and uniform manner. As of today, technology businesses and online brokers have received little guidance as to the manner of disclosing such costs in their financial documents.

If reporting of technology development and operational costs were standardized, it would give the investors and shareholders the ability to assess or benchmark the depth of any e-commerce firm’s commitment to technology.

#### **7. Service bureau regulation.**

As we have observed, many online and conventional broker-dealers are reliant upon either ADP or Beta Systems for mission critical transaction processing functions.

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<sup>268</sup> The SEC Staff Accounting Bulletin No. 99, August 12, 1999, emphasizes that the standard of review for materiality is the “significance of an item to users of a registrant’s financial statements. A matter is material if there is a substantial likelihood that a reasonable person would consider it important.” See [www.sec.gov/rules/acctreps/sab99.htm](http://www.sec.gov/rules/acctreps/sab99.htm).

These firms are not presently registered with either the SEC, the NASD or NYSE. If the SEC re-proposes operational capacity rules for broker-dealers, such rules should apply to outside service bureaus as well because of their integral role in the online trading process. Similarly, the service bureaus should have to follow the same disclosure and record keeping practices required of the brokerage firms.

#### **8. Enhancing NASDAQ liquidity.**

Presently pending before the SEC for approval is a proposal to make certain changes to the way that NASDAQ national market (“NNM”) securities are traded.<sup>269</sup> A portion of this proposal addresses the need (discussed above in section V(D)(4)) for increased ability of providers of liquidity via auto-ex to access liquidity of other market makers by auto-ex trades. The proposal would raise both the amount of shares and the frequency with which one market maker (such as one extending auto-ex at levels in excess of NASDAQ minimum trades) may seek an automatic execution against another market maker. The current NNM order maximums (e.g., 1000, 500 or 200 shares) would rise to 9,900 shares and the current 17-second interval delay between automatic executions against the same market maker would be reduced to five seconds. We recommend that the SEC approve this proposed NASDAQ rule change as an important enhancement in the liquidity of the NASDAQ market, and thus a benefit for all investors.

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<sup>269</sup> Notice of Filing of Proposed Change by the National Association of Securities Dealers, Inc. To Modify Small Order Execution System and SelectNet Service; Reopening of Comment Period on Nasdaq’s Limit Order Book Proposal (SR-NASD-98-17), Release No. 34-41296; File No. SR-NASD-99-11, April 15, 1999, [www.sec.gov/rules/sros/nd9911n.htm](http://www.sec.gov/rules/sros/nd9911n.htm).

## **D. Attorney General's Plan of Action**

### **1. Investor education and industry initiatives.**

Working with the Securities Industry Association (“SIA”) during the upcoming year, the Attorney General will pursue certain important industry and educational initiatives, which include the following:

- The formation of an Online Brokers Committee. The SIA, working with the Attorney General, will form a committee dedicated to the particular issues confronting online brokers. The committee will be comprised of senior legal counsel of the top online firms and will meet regularly to discuss these issues and foster improved investor education.
- In conjunction with the Attorney General's Office, the SIA will publish educational materials for national distribution to assist online investors.
- The SIA committee and the Attorney General's Office will create full-page advertisements to appear in major newspaper publications, both across the State of New York and the nation. The intended purpose of the advertisements will be to educate present and future online investors regarding the benefits and pitfalls of online trading.
- The Attorney General's Office and top online firms will post the SIA educational materials on their various websites.

### **2. Assessing investors' attitudes and needs.**

In an effort to assess the knowledge of online investors and the effect of existing advertising and educational pieces, the Attorney General may consult with a research

group to conduct focus groups to study the present state of investor understanding of the processes and technology risks of online trading. The research will also profile the investing savvy and risk cognition of online investors. The findings of this study may be presented at a later date.

### **3. The Attorney General's e-commerce roundtables.**

The Attorney General also proposes a series of roundtables on the e-commerce issues raised in this report. These discussions will include representatives from the SEC, NASD, NYSE, NASAA, the online brokerage industry, relevant experts, and other interested parties. Topics to be discussed may include:

- The content, preparation and independent review of periodic IS reports for technology dependent firms.
- The value of independent assessment of firm's quality assurance profiles pursuant to SEI's Capability Maturity Models or ISO 9000 standards.
- A common framework of performance metrics for e-commerce firms.
- Investor cognition issues focusing upon findings regarding investor knowledge of various online trading issues, including recognizing the risks unique to online trading, and investor understanding of advertised messages by online brokers.

## VII.

### CONCLUSION

All investors have a responsibility to be knowledgeable about the realities of online investing and exercise prudence in their trading. Further, online brokers must also act responsibly, provide high quality services and faithfully work toward servicing the goals of their investors. Online trading will one day be a mature business vastly larger than it is today. Until then, there is a learning curve that needs to be conquered -- and all firms, customers and regulators must act to address the issues confronting the public.

INTERNET BUREAU

CAITLIN HALLIGAN  
Bureau Chief

JOEL MICHAEL SCHWARZ  
Assistant Attorney General

INVESTOR PROTECTION AND  
SECURITIES BUREAU

ERIC R. DINALLO  
Bureau Chief

WILLIAM H. MOHR  
Deputy Bureau Chief

JEAN MARIE CHO  
Assistant Attorney General