

Automating the Business Process Case: Cairo Alexandria Stock Exchange

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ABSTRACT

Automating the business process in today's organizations is becoming a vehicle for competition and an important tool that helps provide a more effective and efficient service for its customers and employees alike. This paper demonstrates the findings of a market study¹ that was conducted in Egypt that focuses on the automation of the Cairo Alexandria Stock Exchange (CASE) and its implications on the operations of the exchange in terms of services offered, efficiency and effectiveness. The paper focuses on evaluating the trading process for brokers and investors both before and after the automation process of the exchange and identifying the impact of automation on the dissemination of information among the different stakeholders. Finally, the paper reports on a set of recommendations and conclusions that highlight the lessons learnt from the experience of the exchange in Egypt and provide guidelines for future implementations within similar environments.

INTRODUCTION

Stock Exchanges (SE) are the physical place, where stocks are traded, i.e. where they are bought and sold by brokers and dealers for other people's accounts who represent the investors. The stock exchange's main aim is to provide facilities for trade of company stocks and other financial instruments. Stock exchanges are usually found in central locations to keep it easy to record transactions. However, nowadays trade is much less connected by these physical places, as modern exchange stock markets are electronic networks with the evolution of information and communication technology infrastructures, which gives them speedy and less costly transactions (Helen, Hawkins and Sato, 1997). Such organizations are approved and regulated by the Securities and Exchange Commission (SEC). Stock exchanges are also called Bourses in European markets. Examples of famous stock exchanges are New York Stock Exchange (NYSE), which is probably one of the biggest stock exchanges in the world, London Stock Exchange (FTSE), Deutsche Börse (DAX), Tokyo Stock Exchange (TSE), and Cairo Alexandria Stock Exchange (CASE). The role of stock exchanges has been remarkably transformed over the last couple of decades due to the increasing and effective role information and communication technology platforms play.

Historically, stock exchanges first started in the 17th century. During that time, goods were traded and exchanged in central locations and the settlement of payments occurred at the end of the fair. Settlement days became more independent, eventually forming an autonomous market place. In the past, a number of steps as shown in table 1 used to take place in order to execute any transaction on the trading floor of stock exchanges (Helen, Hawkins and Sato, 1997).

However, the process of clearing and settlement became obsolete such that no more physical transfer of securities is required. Nowadays, the process became much

easier when the automation of the process started. Figure 1 shows the traditional process of trading on NYSE trading floor.

Information systems have had a major influence on the different aspects of life leading to the integration of many processes and leveraging the performance of different organizations when properly designed and delivered. The capital market was not an exception and benefiting from the advantages that the information and communication technology infrastructure presents was a good opportunity to capitalize upon (American Chamber of Commerce in Egypt, 2004). There were several reasons behind automating the capital market on a global scale. This included a number of conditions such that having a perfect market would entail a strong automated capital market, which does not depend on the exchange of physical goods anymore as the digital transactions are dominating. Moreover, the fact that having an automated system transaction became very standardized made it easier to exchange securities all over the world and rendered the market more capable to compete and more effective in providing its services. Finally, having 24 hours access to information about the capital market became a priority and a necessity to compete in today's global environment and marketplace (Picot and Roehrl, 1995). It is important to note that with the information and communication technology evolution coupled with the growth of the digital environment, trading is becoming easy, accessible and a few clicks away from any potential trader.

The automation of stock exchanges started in the early 1970s, and the transaction of securities became electronically traded through the support of information and communication technology. Automating the capital markets did not only benefit one of the players of the financial trading game, however all the players in this sector gained from such technological breakthrough. After the automation, investors were not entitled to go and deal directly with stock exchanges, they did not have to go to a stock broker's office or deal with the hassles of calling him/her on the phone. As mentioned before, in the past, investors had to compete for the broker's time through regular and continuous access. The application of information technology allowed the investor to reach the information he/she requires any time anywhere. Moreover, investment decisions have become easier for the investor as more information became available around the clock (American Chamber of Commerce in Egypt, 2001). Post the automation process, the operation of the capital market transaction became classified as shown in table 2. The trading process post the automation of its components is demonstrated in figure 2.

As stated, all the players of the capital markets gained from the application of information technology in the stock exchanges. Generally, the automation process achieved a number of positive implications including; reduced interfaces, avoided media disruptions, and allowed disintermediation of middlemen like the agents on stock exchanges. Communication became more effective, efficient, faster, and wider and less costly in accessing information. As a result, transaction costs of trading were reduced. Automation allowed more transparency of information

Table 1. Traditional trading floor steps (Helen, Hawkins and Sato, 1997)

An investors calls a broker and orders the purchase of shares
When the order is noticed, the broker communicates with the relevant trader for order execution
Floor trader receives the order and calls a booth colleague who supplies the order to be executed
Floor trader goes to the pit in the middle of the trading floor where shares are traded and sends the order for execution
Execution is settled when the counterparty is found
Both parties record the transaction in their trading book
Simultaneously, the buyer reports the transaction to the trade reporting system and the trader makes a call to the booth to inform the broker to notify the client about the execution

Figure 1. Traditional process of trading at NYSE (Helen, Hawkins and Sato, 1997)

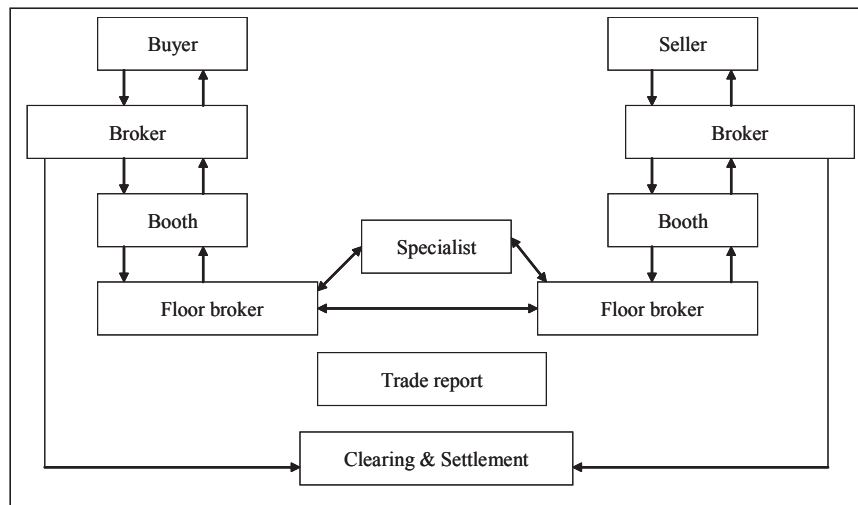
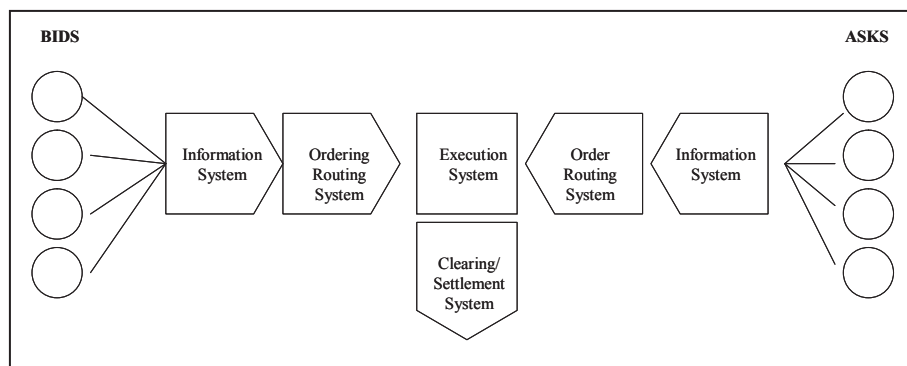


Table 2. Automation of the capital market (American Chamber of Commerce in Egypt, 2001)

Operational System	Definitions
Information System	Mainly electronic (digital) replacing the traditional “pink sheets” system with information available and accessible around the clock
Order Routing System	Electronic transmission of orders to relevant recipients replacing individuals using hand signals and moving back and forth on the trading platform, currently all transactions are transmitted via electronic networks leading to remarkable increase in the volume of trading
Execution System	Automation facilitated the process and rendered it more effective and more efficient
Clearing and Settlement Systems	Process became easier and faster

Figure 2. Process of trading (American Chamber of Commerce in Egypt, 2001)



and faster reaction time from both the investor and the broker ends. It is worth mentioning, that automation increased the volume of traded stocks in vast amounts and handled more trade faster. Moreover, automation improved and accelerated the decision making process for both investors and brokers. Overall, the operational efficiency of the market climbed after the automation and the transactions rates in terms of efficiency was remarkably improved.

From an investor's point of view, using the Internet is an invaluable advantage that supports the investment decision by getting quotes digitally and real-time from

the World Wide Web (Parl and Yun, 2004). Investors can get extensive resources about the latest financial and stock news, search press releases and recognize any company declarations in a timely manner within a globally information-push environment. Investors as well can track the performance of the portfolios they create and continuously calculate the value of their investments and make changes as they see appropriate. Many of them use online brokers and execute their trading activities from home realizing another benefits and implications of the information and communication technology evolution and that is telecom-

muting with more expected to be introduced in the marketplace contributing to the diffusion to smart homes and users alike. Respectively, it became more convenient for investors to access huge amounts of stock market information at any time around the clock. Furthermore, investors are not subject to get outdated news like before from newspapers, radio and even television as financial news are available on the Internet instantly rendering the concept of information dissemination a way of life and helping the concept of information-push to become the way to do business.

The massive penetration of the Internet worldwide allowed investors to send trading orders in a few seconds instead of waiting for stockbrokers. Moreover, analytical tools for stocks are available for investors to evaluate their stocks and assist in the investment decisions on a real-time basis. Examples of such tools include graphs, charts; historical data, technical analysis, and portfolio tracking in addition to the possibility of an automatic execution of sale or purchase orders that are triggered by special events. However, it is important to note that although there were many positive implications for the introduction of automation to the exchanges, which led to the creation of many opportunities, there were a number of challenges faced globally. These challenges include regulating the exchange competition; regulating the costs incurred; regulating across-border trading; and security of the trading process since it became more difficult after the introduction of the automation process to control fraud and manipulative activities. Following is an overview of the research methodology deployed and the study conducted on the Cairo-Alexandria Stock Exchange with a focus on assessing the implications of the deployment of information and communication technology on the performance and productivity of the exchange.

RESEARCH METHODOLOGY

The methodology used was based on empirically testing the research questions through a field study instrumented via the use of a questionnaire and the conduct of a set of interviews. The process started with an in-depth interview with both the current and ex-chairman of CASE to get an understanding of the process of trading. Interviewing the ex-chairman was valuable since the process of automation occurred during his tenure. The questionnaire was distributed among different investors and brokers with an attempt to reach the largest sample of brokers and investors available. It should be noted that it was not easy to find many investors or brokers especially after filtering those who were busy, unwilling to cooperate, or do not have much knowledge about using information dissemination for trading. This is a problem in research in most developing countries; the availability of information and willingness of information holders to share it with others for research purposes.

The research team selected a sample of brokers from CASE itself, as well as sample brokerage firms including EFG-Hermes, Sigma Capital, HC Securities and Okaz brokerage, which are all local and regional firms operating in the financial market in Egypt and the region. Additionally, a number of banks that were involved in brokerage activities including the Commercial International Bank were also part of the study. In terms of investors, a random selection process was used through family, friends, and university professors and via brokers when facilitated. The sample used is not as large as anticipated, but it was sufficient to base the findings upon it and to deduct some insights to the workflow of CASE before and after the automation process. However, it is important to note that looking at the overall volume of individuals investing in CASE; it was an enormous challenge to find investors who are willing to collaborate. The research did not intend to study information dissemination for corporations since there was no single person responsible for the trading of corporations as well as the fact that the researchers believed that corporations are more privileged in attaining information, and might not be so willing to share as much or be as transparent in their feedback. After distributing and collecting all questionnaires and conducting all interviews, the process of analyzing data and coming up with findings, generalizations and conclusions took place. This was followed with a meeting with CASE chair and his senior staff. The purpose of the meetings was to focus on the vision for the future and the proposed recommendations and directions that can help CASE be more efficient and effective in information dissemination for all those stakeholders interested to use its services (www.egidegypt.com). It is important to note that this research represents phase one of a much-extended research that is currently addressing the needs and implications of information and communication technology on the stock exchange and its effects on the economy at large.

RESEARCH FOCUS

The focus of the research could be identified in four major directions and that included the following:

- A. To evaluate how the use of information and communication technology allows and assists in the efficient and accurate dissemination of information to brokerage firms as well as to individual investors.
- B. To assess the existing trading process at Cairo Alexandria Stock Exchange through in-depth interviews with its different stakeholders
- C. To identify the drawbacks and the negative implications of automating CASE
- D. To test whether the technology acceptance model (TAM) and theory of diffusion of innovation were applied throughout the process of automating CASE

The above-mentioned issues represented the basis for the research questions addressed through the study and leading to the assessment of the automation of CASE and the deployment of the state-of-the-art technology infrastructure. Following is a demonstration of the history of the Cairo Alexandria Stock Exchange (CASE) and the recent developments that took place in its management and functions with a focus on the deployment of information and communication technology.

OVERVIEW OF THE CAIRO ALEXANDRIA STOCK EXCHANGE (CASE)

During the last few years, the financial sector in Egypt including the capital market, the stock exchange market, the banking and insurance sectors went through a number of structural adjustments and reform programs to improve the overall national performance of the economy including massive investment in its information and communication technology infrastructure. Additionally, the government of Egypt had to stop intervening in the financial sector leaving the market to be determined according to the forces of demand and supply. According to the American Chamber of Commerce in Egypt, the state of the financial sector in Egypt can be summarized as follows; a) the stock market was ranked the 2nd in its size among the African and Middle Eastern stock markets in June 2000; b) the newly automated trading system that was introduced is capable of handling 100,000 transactions per day resulting in increasing the level of the trading volumes and increasing the liquidity; c) more encouragement to additional investments and decreasing the restrictions for the foreign access is underway; d) significant efforts are currently being exerted to boost the privatization process and various bonds were issued to facilitate the growth of the stock market (www.egyptse.com).

Moreover, the market experienced an increase in the activity of mergers and acquisitions during the last four years reflecting the interest of foreign firms in the market in Egypt, which was mainly reflected in the penetration of international banks in the local market. It is also important to note that there has been a remarkable improvement in the number of firms traded in the stock market where the capitalization used was estimated to be around 1.6 billion US dollars and increased dramatically over the last few years to 12.5 billion US dollars reflecting how the stock market is moving on the right direction and excelling in its performance as a result of a number of adjustments including information technology transfer and proper deployment in the financial sector (www.usaid-eg.org).

During the 19th century, Alexandria's futures market was one of the oldest in the world. The first local recorded cotton transaction took place in 1885 in Alexandria's Café de L'Europe where cotton merchants met and cut deals based on supply and demand for long and short staples. The first cotton dealmakers eagerly waited for the weekly arrival of the newsheets from Europe to guide future operations. Reputation counted for everything. From Café de L'Europe cotton dealmakers formulated the Association Cottonniere d'Alexandrie (later the Alexandria General Produce Association-AGPA) for trading in cotton, cottonseeds and cereals in the spot and future markets. In 1899, during the reign of Khedive Abbas Hilmi II, AGPA became the Alexandria Bourse and representing the focal point of the city's financial community.

Historically, the origins of the Cairo Alexandria Stock Exchange (CASE) goes back when Moïse Cattaui Pasha, a renowned figure in investment and brokerage chose the old Ottoman Bank as an official headquarter of the newly incorporated Bourse and Banking Company of Egypt Limited on May 21st, 1903 (www.egyptse.com). Later on, an international competition started for the best design of a bourse to be located in the center of Cairo. When the process was completed

and the design was selected it was known as the Cairo Bourse (later became the Cairo Alexandria Stock Exchange-CASE) that was once among the world's top stock exchanges and leading the way in most of the times. During that time, the number of firms trading had reached 299 with a capital of 15.9 million US dollars. In Alexandria, the official stock exchange was established in 1888 indicating that it was even prior to the Cairo Stock Exchange that was established in the 1940s. The Alexandria stock exchange was ranked fifth worldwide in 1903. It is important to note that both exchanges were active and were functioning separately independent from each other. However, the adopted social and political policies in the 1950s led to huge reduction in the performances of both exchanges. This state remained declining from 1961 until 1992, where the stock exchange lost its position and status (www.egyptse.com).

As indicated earlier, both exchanges were working separately; each had its own chair and committees responsible for managing the stock exchange affairs. The chairs were appointed by the general assembly composed of brokerage offices and banks. Both were governed by the same rules and regulations. However, on 6 March 1997, the legal structure was redefined and both Cairo and Alexandria stock exchanges were merged becoming one operating in Cairo and Alexandria, headed by the same chair and governed by one board of directors. The new structure indicates that the chair is appointed by the prime minister for a period of three years. The board of directors includes 60% that are elected from brokerage firms and investment banks and the remaining 40% are chosen from the Central Bank of Egypt (CBE), the Capital Market Authority (CMA) and two additional members from the Bank's Association. CASE is a public person who has no shares that are issued or owned by others. Although the government has the ownership of CASE it is still managed as a private entity. On 14 May 2001, the exchange market started using a software trading system leading to having both exchanges using the same system for trading securities. It is important to note that CASE is the only registered stock exchange market in Egypt with a mission to become the leading stock market in the Middle East and Africa and to expand its role regionally and globally through technology links and cooperation agreements, thus increasing market liquidity and provide the fastest, cheapest and best execution of transactions.

CASE DEPLOYMENT OF INFORMATION TECHNOLOGY

Prior to the automation of CASE, the stock market was an auction, where everyone manually places his/her order, which was normal in the past because there was not so much activity, but later on there were so many transactions so there was a need for a comprehensive process that is efficient and that could be comparable to similar exchanges around the world. Therefore, during the period 1996-1997, CASE set the first basic framework of the vision of the new automated system which was a trading system where everyone places his/her order on the system and it automatically matches the trade. Later on, the system was replaced by a more advanced version with added features and capable of absorbing much higher capacity (up to 50000 transactions per day).

CASE set its plans to apply technology on its trading system and become an automated order-driven system. The process of automation was introduced through two main stages. First, the Capital Market Authority (CMA) was responsible for developing the automated trading system being the market regulator. The process included the regulatory framework, an automated trading system, a surveillance system and upgrading the clearance and settlement systems. The regulatory framework was developed in order to improve the market pace which required crucial amendments in the capital market law. These amendments led to the introduction of new rules and regulations to guarantee transparency, efficiency and fair competition in the capital market. The surveillance system built allowed online trading at CASE and offline surveillance system at CMA. One of the assignments of CMA was to establish a comprehensive database for the companies that are registered on the stock market. The database included; a) companies' statements and information about their status, growth, and activities; b) detailed daily reports on the companies' stock issuance and licensing; c) financial disclosure of registered companies and investment funds; and, d) other information that could benefit investors and brokers (www.mcit.gov.eg).

Additionally, CMA created a system to announce exchange rates and market reports on the exchange markets on daily, weekly and monthly basis. Furthermore, the CMA established for CASE an online presence through their website that provides different stakeholders with information on real-time basis. During the second stage of CASE automation, an agreement was concluded with a Canadian Software

Company to handle the design and delivery of the automated trading system and to guarantee conformity to international standards and state-of-art information and communication technology. CASE started using EFA software trading system in 2001 allowing brokers to enter orders from either location or from the offices of licensed brokers. On the Cairo trading floor, there are 123 terminals and 19 more terminals in Alexandria in addition to 65 terminals in the brokers' offices. Orders are queued into the database to be automatically matched by the trading system (www.egyptse.com). The deployment of the new automated system required the establishment of an advanced information and communication technology infrastructure within CASE in addition to the development of state-of-the-art information network, training of staff and also organizes training sessions for brokers and individual investors interested amongst other activities. The system was gradually introduced during the period 1998-2000 through a testing phase with a lot of mocks, trainings to brokers until the first version of the system was installed at the end of this period (www.egyptse.com).

RESEARCH FINDINGS

The initial target sample of questionnaires was 200 for investors and 30 for brokers. However, after filtering out the ones that are not completed and ensuring that the ones used were valid and could be included in the analysis, the sample covered was reduced to 66 investor questionnaires and 20 broker questionnaires representing 33% and 66% respectively of the original plan. It is important to note that the total number of individual registered investors is one million however; the number does not reflect those that are actually active investors, which is around only 20% (200,000 active investors) of the total number of investors.

The demographics of the investors constituting the sample were mainly 85% males and 94% local citizens (Egyptians). The sample comprised of bachelor degree holders (65%), master degree holders (18%), high school degrees (3%) and PhD holders (2%). In terms of satisfaction of the newly installed automated process and its implications on information dissemination, the respondents were almost equally divided. Relating their satisfaction level with their educational achievement, it is observed that the more senior the respondents were and the more they were educated, the more their satisfaction level was confirmed. This can be attributed to being either a coincidence that occurred as a result of not having enough respondents or maybe because those with higher educational achievements have more access or sources of information and appreciate more its value and its contribution in rendering the investment decision making process more effective.

With regard to the actual sources of information that investors mainly relied upon, it was observed that most investors rely on their brokerage firms to provide them with information and updates about market trends and statistics. Investment banks trailed by far as the second most preferred source whilst CASE did not even make it to the fifth spot. This was indicated through the fact that while 70% of the respondents deemed various sources of information to be important, only 2% acknowledged accessing information through CASE due to various reasons. It is also interesting to note that word of mouth proved to play an important role as a source of information for investors which also explains why investors had a problem with the accuracy and reliability of the information. Table 3 demonstrates the sources of information as ranked by the sample examined in the study.

Although it was difficult to find investors who had invested before and after the automation of CASE, from those that were available, it was found that the

Table 3. Sources of information

Source of Information	Percentage
Word of Mouth	3.5%
Investment Banks	4.5%
www.yahoo.com	1%
www.gn4me.com	2%
Egypt for Information Dissemination	10%
EFG-Hermes	9%
Cairo Alexandria Stock Exchange	14%
Brokerage Firms	12%
Arab Finance Corporation	7%

automation process did not inflict real implications on the process of information dissemination. The culture of using information and communication was not yet well diffused within the marketplace. The findings indicated that those who were unsatisfied with the quality of information provided be it accuracy, speed of diffusion, timeliness or ease of use more or less did hold the same position post the installation of the automation process. Table 4 shows the factors preventing investors from making effective trading decisions as indicated by the responses of the sample. The main problem that was raised by the respondents was the time-lag between the time when events occur and the time when investors actually receive the information.

The responses of the investors showed little but gradual trust in the newly introduced system with 15% not really trusting the newly introduced automated system. This can be the result of a number of factors mainly related to the use of information and communication technology and the human resource capacities trained and prepared to use different automated applications. With respect to the responses of the brokers, the number of brokers has been steadily increasing since the introduction of the automation process due to the relative improvement in the process of information dissemination. The overall response seemed to be favorable of the new automated operation when compared to the traditional system which was confirmed by 90% of the responses. Brokers were more positive with respect to the role of the exchange as a primary and reliable source of information when

compared to other sources. The findings of the research indicated that while CASE is not considered by most investors an important source of information, it is the main source of information for brokers who are themselves the main source of information for investors. This in reality implied that while CASE may actually be a good and valid source of information and knowledge about the financial market, investors do not really feel its presence or importance in terms of effectiveness and efficiency. Table 5 demonstrates the importance of information and its level of demand from the brokers and its transformation before and after the automation of the exchange.

With respect to the issue of investors relying mainly on brokers and their sources of information, the results were mainly moderate with no inclination to any major trends. Based on the interviews, the results were slightly different indicating that investors were gradually becoming more mature and less dependent on their brokers for information; alternatively, they seek information themselves and make their own decision. Table 6 shows the average investors relying on brokers for information to take a trading decision.

With respect to the span of time it took information to reach the investors, brokers indicated that in the majority of the cases 1-2 days were needed which may not seem that long. However, from an investor's point of view this duration could be the difference between a profit or a loss and they believed that there is an urgent need to cut down such duration substantially. Table 7 demonstrates the assessment of brokers of the duration it takes information to reach investors.

Table 4. Factors preventing investors from making effective trading decisions

Information Assessment Elements	Number of Respondents
Information not easy to use	26
Information is not useful	17
Unequal opportunity	19
Inaccuracy	28
Time-lag	47

Table 5. Levels of demand for information

Level of Demand	Findings
No demand	2%
Low demand	30%
Medium demand	35%
High demand	30%
Intense demand	3%

Table 6. Average investors relying on brokers for useful trade information

Level of Demand	Findings
Not at all	2%
Partially	28%
Mostly	52%
Entirely	18%

Table 7. Duration it takes information to reach investors

Duration	Findings
1-2 Seconds	0%
1-2 Minutes	12%
1-2 Hours	25%
1-2 Days	55%
1-2 Weeks	8%
1-2 Months	0%

RECOMMENDATIONS

Based on the number of issues discussed and the findings of the research conducted, one of the main debatable issues was the amount of time it was taking for real-time information to reach the investors to be able to take a trading decision. Therefore, the recommendation made relates to the development of a module for brokerage firms to help them overcome the information dissemination problem and at the same time serve both investors and brokers. The wealth of knowledge needed to be shared on a timely basis to capitalize on the benefits of information and communication technology. The model situation usually occurs when a broker gets feedback from a reliable source about any of the company's new decisions that would affect the stock prices and that appears to be important for their investors. Then the decision is to contact all investors at the same time to offer them the best opportunity to buy or sell stocks. It takes a very long time for the investors to be informed about the new changes in the stocks and when they start to react either by a decision to buy or sell, the price of the stock is usually altered. Therefore, investors have to be informed of changes that take place in order for them to be aware of their surroundings and be able to trust the brokerage firm when investing their belongings in the stock market.

The recommendation that was suggested was the development of an information base that can be used by brokerage firms and placed on a high-end server that is updated on a timely basis and linked to news networks that cover and relate to stock news and that can have implications on investors' decisions. News would automatically be updated into the information base which would instantly send electronic mails (email) and short message services (SMS) informing brokers that a change had taken place in the market that would be ultimately be important for investors and might result in them taking appropriate actions. With the diffusion of information and communication technology and media convergence, such inflow of information and knowledge and its timely and real-time access is becoming more of a reality. Respectively, brokers in seconds would inform their investors about all changes taking place through an email or an SMS (based on the investors' choice), giving him/her the opportunity to reply instantly and take an immediate action by either buying or selling. Such process is estimated to take a cycle of around 7-9 minutes taking the process to be as real-time as possible irrespective of time or distance barriers.

CONCLUSION

Based on the findings of the research, it is apparent that the current attitude of investors towards dissemination of information is relatively conservative with not much of a difference before and after the automation process in terms of information dissemination. There was an obvious difference between the impression of CASE senior management and various investors and brokers with opposing views on the role and effectiveness of the newly automated process. One of the major barriers faced was acceptance of technology especially by senior and relatively

older brokers and investors not really accustomed to the use of information and communication technology. The recommended solution should help realize and meet the requirements of the investors and cater for the need for information dissemination that was not addressed by the automation process of CASE. However, it is important to note that according to the findings of the research, the new automated process brought to CASE transparency, fairness, efficiency, higher volumes of transactions, a more user friendly environment, saved time and effort and became more capable of matching global market needs which was translated into having more foreign investors in the exchange.

To conclude, post the automation process of CASE, there has been a number of objectives realized indicating that more improvement of the process could be achieved with regular analysis of the market needs and continuously introducing customized services to the community of customers. Among the direct and indirect implications of the automation of CASE was providing a regulated and transparent market based on efficient and flexible technology and supply investors and brokers with reliable and real-time information services and attracting more investors from both local and international markets to increase the pool of liquidity in the economy. Moreover, it led to developing new products and services as bonds, raising the awareness campaign and introducing new trading practices that match the needs of investors, and aiding in the establishments of privately owned services that provide operational and technical support to registered brokers. Finally, it paved the way to working on creating the most effective and the best membership rules in the Middle East and Africa.

The awareness and diffusion of the use and benefits of information and communication technology led to the proper deployment of technology to serve the purpose and objectives of CASE. This has enforced the concepts based upon which the technology acceptance model is based. The easiness of using the services and the perceived usefulness were both critical elements contributing to the success of the automation process of CASE. The research study findings indicated, based on the sample covered, that with the automation process and the investment in human resource capacities including all stakeholders, information and communication technology tools will permit CASE to provide useful services to different traders while improving technology processes and infrastructure. Moreover, the analysis indicated that consistent with the technology acceptance model both perceived ease of use and perceived usefulness are playing important roles in defining the acceptance level of different CASE introduced technology-based services. It is

important to note that this research study represents phase one of a much larger research work assessing the implications of the automation and the diffusion of information and communication technology on CASE, trading and the economy at large.

REFERENCES

- American Chamber of Commerce in Egypt (2004) Proceedings of the Reform of the Financial Sector in Egypt Conference, December
- American Chamber of Commerce in Egypt (2001) The Egyptian Capital Market, Business Studies and Analysis Center
- Automated Trading System (2004) www.egyptse.com (website) last accessed 10 May
- Capital Markets Program (2004) www.usaid-eg.org (website) last accessed 20 April
- Egypt for Information Dissemination (2004) www.egidegypt.com (website) last accessed 5 May
- Helen A, Hawkins J and Sato S (1997) Electronic trading and its implications for financial systems, BIS Papers, Number 7
- History of the stock exchange in Egypt (2004) www.egyptse.com (website) last accessed 10 May
- Ministry of Communications and Information Technology (2004) www.mcit.gov.eg (website) last accessed 28 April
- Parl S and Yun G W (2004) The Impact of Internet-Based Communication Systems on Supply Chain Management: An Application of Transaction Cost Analysis, *Journal of Computing Mediated Communication*, Volume 10, Issue Number 1 (Special Issue on Electronic Commerce)
- Picot A, Bortenlaenger C and Roehrl H (1995) The Automation of Capital Markets, *Journal of Computing Mediated Communication*, Volume 1, Issue Number 3 (Special Issue on Electronic Commerce)

ENDNOTE

- ¹ This paper is based on a research study conducted in Egypt in 2004 on the automation process of the Cairo Alexandria Stock Exchange. The research was conducted by Sarah Ayad, Nancy Benjamin, Nahla El Okdah, Hanan Ezzeldin, Mary Habib, Rafik Louis and Khaled Youssry

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