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THE EFFECTS OF INFORMATION TECHNOLOGY ON THE MARKET EFFICIENCY OF TURKISH SECURITIES MARKETS

A Master's Thesis

Presented by

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to

the Graduate School of Social Sciences

of Middle East Technical University

in Partial Fulfillment for the Degree of

MASTER OF BUSINESS ADMINISTRATION

MIDDLE EAST TECHNICAL UNIVERSITY

ANKARA

September, 1993

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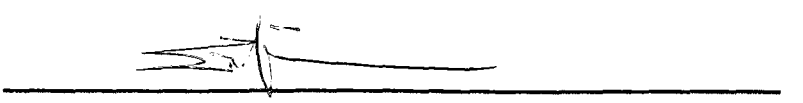

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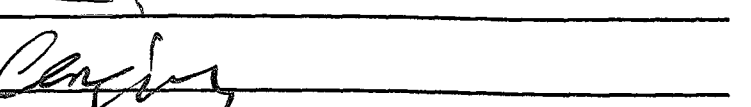
Prof. Dr. Cengiz Erol 

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ABSTRACT

THE EFFECTS OF INFORMATION TECHNOLOGY ON THE MARKET EFFICIENCY OF TURKISH SECURITIES MARKETS

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Master of Business Administration

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1993, 121 pages

The experiences of the 1980s have led many developing countries to reconsider their approach to development. Though countries differ in the scale of government intervention and in the extent to which they have already stabilized and restructured their economies, most have decided to rely more upon the private sector and market signals to direct the allocation of resources. To obtain all the benefits of greater reliance on voluntary, market-based decision making, they need efficient financial systems. Turkey is one of these countries. Starting from 1980s, Turkish economy has moved from the mixed framework to a market oriented economy. Parallel to this transformation, Turkey started to establish an information-based economy. In this period, several steps were taken to improve the information content of the economy. Most of the actions were concentrated on the automation of financial sectors. In this study, the efforts of automating Turkish Financial Sectors are displayed, and the effects of information technology on market efficiency in Turkish Securities Markets are examined.

Key-words: Market Efficiency, Information Technology, Securities Markets.

Science Code:215.01.02

ÖZ

BİLGİ TEKNOLOJİSİNİN TÜRK SERMAYE PİYASALARINDA PAZAR ETKİNLİĞİ ÜZERİNDEKİ ETKİLERİ

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Tez Yöneticisi: Prof. Dr. Erkut Göktan

1993, 121 sayfa

1980li yılların tecrübeleri, gelişmekte olan birçok ülkenin kalkınma çabalarını yeniden gözden geçirmesini gerektirmiştir. Bu ülkeler, devletin ekonomiye müdahalesi, ekonomik düzeylerindeki istikrar ve ekonomilerinin yeniden yapılanması gibi konularda farklılık göstermekle birlikte, büyük çoğunlukla, ekonomide özel sektöre daha fazla yer verilmesi ve kaynak dağılımını piyasa koşullarının belirlemesi konularında görüş birliği içerisinde olmuşlardır. Bu ülkelerin serbest piyasa stratejilerden yararlanabilmeleri için etkin finansal sistemlere ihtiyaçları vardır. Türkiye bu ülkelerden biridir. 1980lerden başlayarak, Türkiye karma ekonomiden pazara dayalı ekonomiye geçmeye başlamıştır. Bu değişime paralel olarak Türkiye, bilgiye dayalı bir ekonomiyi yerleştirmeye başlamıştır. Bu dönemde ekonominin bilgi içeriğini arttırmak için bazı adımlar atılmıştır. Bu konudaki çabaların büyük çoğunluğu finans piyasalarının otomasyonu üzerinde yoğunlaştırılmıştır. Bu çalışmada, Türk Finans Sektörlerinin otomasyonu için sarfedilen çabalar sergilenmekte ve bilgi teknolojisinin Türk Sermaye Piyasalarında pazar etkinligi üzerindeki etkileri araştırılmaktadır.

Anahtar Kelimeler: Pazar Etkinliği, Bilgi Teknolojisi, Sermaye Piyasaları.

Bilim Kodu:215.01.02

ACKNOWLEDGEMENTS

I would like to express my indebtedness to the members of my thesis committee. I would especially like to thank my thesis supervisor, Prof. Dr. Erkut Göktan for his supportive guidance, Prof. Dr. Cengiz Erol for accepting membership on my committee, and Prof. Dr. Ergün Yener for spending a lot of time, and making valuable contributions to my study.

I would also like to express my gratefulness to Seza Danışoğlu, Alp Tekince and Sevdil Yıldırım from CMB, and Ergin Ergut from ISE, for their help in gathering required articles, reports, and studies for the literature survey of my study.

Special thanks to Filiz Hüseyin, Kerem Oba, and Rasim Karas, for their help in printing my study.

Finally, I would like to thank to my family and Şirin Okyayuz for being beside me when I needed their support, kindness, and love.

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LIST OF ACRONYMS AND ABBREVIATIONS

EMH	Efficient Market Hypothesis
AUTEX	Automated Exchange System
INSTINET	Institutional Networks Inc.
NASD	National Association of Securities Dealers
NASDAQ	NASD's Automated Quotation System
OTC	Over-the-counter
CATS	Computer Assisted Trading System
NSTS	National Securities Trading System
SCOREX	Pacific Stock Exchange Order Routing System
SuperDOT	Revised Designated Order Turnaround System
CAES	Computer Assisted Execution System
MAX	Midwest Automated Execution System
ITS	Inter-market Trading System
OARS	Opening Automated Reporting System
NYSE	New York Stock Exchange
AMEX	American Stock Exchange
OECD	Organization of Economical and Cultural Development
CML	Capital Market Law
CMB	Capital Market Board
ISE	Istanbul Stock Exchange
IBE	Istanbul Bond Exchange
BCP	Bookwater, Perrin
VDMK	Varlığa Dayalı Menkul Kıymet (a tool for securitization)
VEN	Güven Menkul Değerler A.Ş.
TYT	T.Turizm Yatırım ve Dış Ticaret Bankası A.Ş.
KOÇ	Koçbank A.Ş.
SEM	Semih Menkul Kıymetler A.Ş.
TÜT	Tütünbank A.Ş.
BMD	Boğaziçi Menkul Değerler A.Ş.
TAN	Tan Menkul Değerler Ticaret A.Ş.
DER	Derborsa Borsa Bankerliği A.Ş.
YAT	Yatırım Finansman A.Ş.
TEB	Türk Ekonomi Bankası A.Ş.
AOG	AOG Menkul Kıymetler A.Ş.
IMP	Impexbank - T.İthalat ve İhracat Bank A.Ş.
VAK	T.Vakıflar Bankası A.Ş.
BTA	Beta Menkul Kıymetler Ticaret A.Ş.
SEC	Securities Exchanges Commission
BOBİM	Borsa Bilgi İşlem Merkezi (ISE Data Processing Center)
TCAM	Vancouver Automated Trading System
ATM	Automated Teller Machine

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1- INTRODUCTION

This thesis is a study on the effects of computerized information and trading technologies on market efficiency. Within the study, conditions of the Turkish Securities Markets, and the approaches of various sectors in establishing a nationwide computerized trading system for the securities markets are considered.

In the study, examples of automated trading systems are displayed, and their effects on market efficiency are questioned in order to clarify how computerized trading systems can help enhance the efficiency in the securities markets.

This study is composed of four main parts. In the first part, the notion of market efficiency is explored, and the information needs in securities markets are considered. The degrees of market efficiency are also summarized. Among the three different types of market efficiency, the semi-strong form is studied to a greater extent since it is expected that the computerized trading systems will show their effects mainly on the publicly available information, which is the relevant information set for the semi-strong form of market efficiency.

Secondly, the concept of information technology is explained by showing the need for well designed markets for maintaining the efficiency.

The fact that information technology is very useful in establishing and maintaining a healthy market structure, is supported. This study aims at displaying both the negative and the positive effects of information technology on market efficiency.

In the third section, the transformation of the Turkish economy from a mixed-economy framework to a market-oriented economy, is explained. The increasing importance of "information" during this transformation process, is also emphasized. The changes that took place in the structure of the Turkish Securities Markets during the economic transition period are presented in order to emphasize the link between the economy and the infrastructure of the markets. The need for new technologies in order to automate the manual trading procedures of the Istanbul Stock Exchange is explained in the sections that follow. Moreover, the methods of selection and development of these new technologies are exhibited also by presenting several alternative technologies and systems which were accessible by the Istanbul Stock Exchange. The design of the automated trading system which is already selected by the Exchange and the system's components are examined and the steps to be taken to attain market efficiency by the help of this automated system are also proposed.

In the last section all the preceding analyses are combined in order to determine the effects of information technology on the efficiency of the Turkish Securities markets.

2- RESEARCH METHODOLOGY

This study is conducted with the aim of displaying the effects of information technology on the efficiency of Turkish Securities Markets. Since the proposed automated trading system has not been put into use by the Exchange authorities as yet, the data needed to draw conclusions about the effects of this system on the efficiency of the market, could not be extracted quantitatively. Thus, this study became a qualitative one. The necessary data is gathered by a literature survey and by interviews with experts from almost all the financial sectors of Turkish Securities Markets.

An extensive literature survey is needed to acquire the necessary information on the subject. As a part of the preliminary works, certain foreign financial periodicals, such as the Journal of Finance, Finance and Development, Financial Analysts Journal, Journal of Banking and Finance also are examined and some articles are selected according to their relevancy to the subject.

In the chapters that follow, first, the concept of market efficiency is described mainly based on the studies of Ball et al.(1989),Fama(1969), and Keane(1985). Secondly, the concept of information technology is displayed from its evolution until the present day, with emphasis on the market crash of 1987 and the reasons of this crash. The core of the literary surveys dates back to the studies made after the market crash of 1987. The literary works

of Amihud et al. (1985), Lucas and Schwartz (1989), are studies in which the ideas of different people before and after the market crash of 1987, are gathered under one title. The report of the Presidential Task Force on Market Mechanisms (Brady Report, 1988) which is submitted to the President of the United States, and other published studies of the U.S. Congress are used as references in order to display the effects of the crash on the markets.

The third section is composed of ideas related to Turkish Securities Markets, based upon various reports and research studies published by the Capital Market Board, the Istanbul Stock Exchange, Citibank, and some Turkish financial periodicals. Since the literature on the technology requirements of Istanbul Stock Exchange is limited, information is also gathered through interviews with experts from different financial market institutions. The interviews include those conducted with the members of the Istanbul Stock Exchange, Capital Market Board, and Intermediary Institutions. The last section is a summary of the first three sections and the conclusions to be drawn according to this interrelated data.

3- MARKET EFFICIENCY IN SECURITIES MARKETS

A market is a place where individuals can exchange economic goods and services. Officer and Finn (1989 :3) believed in markets and explained the motive for persons to participate in an exchange as the fact that they will end up as well as or better off than they were before the exchange took place. Markets can create an environment for the efficient allocation of resources. Securities markets just like any other markets, have a role to perform in the efficient allocation of resources. A securities market's role is to allocate capital among the market components of stocks, bonds, mutual funds, government securities, corporate securities, etc., which are competing for funds.

Investors interact in securities markets to maximize their wealth. Their primary concern is what they can expect to get from their investments, in other words, their return. This interaction among the investors operate to determine the price of a particular security and it is equal to the expected net present value of that security. The net present value, or the price is computed by discounting the expected net cash flow from the investment by a discount factor that incorporates the time value and the risk of the investment.

There exist a large number of variables which affect the expected return from a security. Any new information about the future returns will be

relevant to current prices and therefore relevant to the investment decisions. At this point the efficiency of the market, which states how quickly the market responds to new information, gains ground.

3.1- The Concept Of Market Efficiency

"Security prices change in response to new information that alters investors' expectations about the future returns from securities markets investments. This relationship gives rise to the notion of the efficiency of the securities markets" (Officer and Finn, 1989:5). The term "market efficiency" implies how successful the market is in establishing security prices that reflect the worth of the securities. "Success" can be defined, whether the market incorporates all new information in its security prices in a rapid and unbiased manner.

There are two aspects of market efficiency: quality and liquidity. The "quality" aspect of market efficiency can be defined as the quality of information that the market is reacting to.This means that each successive trade is made at a price close to the preceding price, and the market can absorb large volumes of security trades without any fluctuations in the price. The "liquidity" aspect is the measure of the speed with which the market responds to new information.

The type of efficiency exhibited by a market depends on the source of the information. The information source, in return, is related to the cost that the investors are willing to pay for that information as Lorie et al.(1985:56) stated; "The degree of efficiency shown by a market is measured by the speed with which the market incorporates the new information into its price structure".

3.1.1- Efficient Market Hypothesis

The Efficient Market Hypothesis (EMH) assumes that "information travels in a random, independent fashion and that prices are an unbiased reflection of all currently available information " (Hirt and Block, 1986:254). Fama (1970) was the first to address the EMH in an article in which he presented empirical results regarding this hypothesis. The Efficient Market Hypothesis has three different forms, each of which are also tested in three different ways. Each form relates to a specific set of information which is increasingly more comprehensive than the previous one. This means that the lower level efficiencies should be established for the higher level efficiencies to hold true.

3.1.2- Degrees Of Market Efficiency

As indicated above, there are three different degrees of market efficiency and these are defined according to the information set that is utilized in testing the hypothesis. This section focuses on these three types of market efficiency.

3.1.2.1- Weak Form Of Market Efficiency

The weak form of the EMH suggests that there is no relationship between past and future prices of securities. If the market is efficient in the weak sense, share prices fully reflect the information shown by all the prior price movements. The price movements in effect are totally independent of the previous price movements.

Because the EMH maintains that current prices reflect all available information and that information travels in a random fashion, it is assumed that there is little or nothing to be gained from studying past prices.

`Random Walk' hypothesis explains the weak form of market efficiency in the same manner, by declaring that past market price trends have no effect on future prices. The theoretical basis of the Random Walk hypothesis

rests on the two assumptions of Berkman (1978:32-50). The first assumption is "rational expectations" of investors. "They use all the current information that they think is worthwhile and relevant in forming their expectations (Berkman 1978:33)". Secondly, it is assumed that additional information is quickly reflected in changes in prices. The Random Walk hypothesis does not suggest that investors cannot make money in the stock market. It rather suggests that it is hard to earn more than it can be earned by buying and holding a group of stocks with specified risk levels.

3.1.2.2- Semi-strong Form Of Market Efficiency

Under the semi-strong form, current prices fully reflect not only all the past price information but also all the public information which is stated in earnings reports, dividend announcements, stock splits, macroeconomic information, etc. Semi-strong form asserts that all public information is already impounded into the value of a security. As a result, fundamental analysis, which is the valuation of stocks based on fundamental factors, such as company earnings, growth prospects, etc., cannot be used to determine whether a stock is undervalued or overvalued. This further proves that, investors cannot earn abnormal rates of return by utilizing trading strategies based on publicly available information.

Fama, Fisher, Jensen, and Roll's (1969:2–21) classic test of the semi–strong form EMH examined the effect of stock splits on stock prices. Fama et.al. continued their researches, and many other researchers, such as Scholes (1972:179–211), Dodd (1981), Reilly and Drzycinski (1981:64–77), followed these studies. In most of these studies a different form of public information was utilized, in which the semi–strong form hold true each time. Although the semi–strong form of the efficient market hypothesis has strong research support and would generally be considered valid, there are several exceptions to this support.

In his study on Price/Earning (P/E) ratios, Basu (1975:53–64) found out that the returns on stock with high P/E ratios were less than those with low P/E ratios in both a non–risk–adjusted and risk adjusted basis. Since a P/E ratio is publicly available information that could be utilized to generate superior returns, Basu's results can be stated as an exception for the semi–strong form of the efficient market hypothesis to hold true. Similarly, in their researches Banz (1981:3–18), and Reinganum (1981:19–46) find that small firms tend to provide higher returns than larger firms even after considering risk. Considering all the relevant ideas, it can be concluded that still the semi–strong form of the efficient market hypothesis would support the notion that there is no problem in the dissemination of information and the market does not utilize all the publicly available information while forming security prices.

3.1.2.3- Strong Form Of Market Efficiency

Copeland and Weston (1983:254) defines the strong form efficiency as follows: "A direct test of strong-form efficiency is whether or not insiders with access to information which is not publicly available can outperform the market". The strong form of the efficient market hypothesis goes beyond the semi-strong form to state that stock prices reflect not only all public information, but all information. Thus, it is hypothesized that insider information is also immediately impounded into the value of a security. Officer and Finn (1989:16) define the insider information as the information that is only likely to be known and available to the officers of the company to which the information relates. In his study which was published by the Securities Exchange Commission (SEC) of U.S., Jaffe (1974:93-121) suggested that trading on inside information is widespread and insiders violate security regulations. Insider trading is illegal in all the exchanges throughout the world.

Strong form of market efficiency is different from the two preceding forms market efficiency, as it depends on the goodwill of human beings.

3.1.3- Levels Of Market Efficiency

Market efficiency ranges from perfect efficiency to total inefficiency. In order to classify a particular market, Keane (1985:23-32) uses the following terms: perfect efficiency, near efficiency, and inefficiency. Furthermore, each of the three types of efficiency which are explained in the preceding section can be characterized by one of these degrees. At the semi-strong level, perfect efficiency is obtained when prices are very close to their semi-strong worth. In such a situation, even the financial experts cannot earn an excess return as a result of their efforts. Near efficiency is obtained when prices are sufficiently close to their semi-strong worth. This makes it simple for all investors other than the experts to follow an active trading strategy. The experts under these conditions earn only enough excess returns to cover transaction costs and reward them for their efforts. If inefficiency exists, then even the nonexpert can spot mispriced securities, and benefit from this situation. When the market is inefficient, any nonexpert can also make use of the recommendations of the expert who spots the mispriced securities and earn excessive returns. Keane (1985:27) explains the necessity of such classification as follows:

> Classifying efficiency into three degrees as well as into three levels may appear unnecessarily confusing. This classification is necessary because it is possible that the market could be perfectly efficient at the weak level, near efficient at the semi-strong level, and inefficient at the strong level.

According to Keane (1985:27) the need for such division is necessary, as Fama's definition of the three forms of market efficiency is inadequate to underline the practical purposes for the investors in the market.

> For the concept of market efficiency to hold, the market would presumably need to be perfectly efficient at all three levels. For market efficiency to hold for most practical purposes, however, it is sufficient for it to be near efficient at the first two levels.

3.2- Indicators Of Market Efficiency

The concepts of an "efficient market" and a "perfect market" are different. It is assumed that a perfect market is a place where every investor is rational. Investors in a perfect market have immediate and free access to all relevant information. If a market is perfect,it must have pricing efficiency, operational efficiency, and allocational efficiency. West (1981:21) defines Pricing efficiency as follows: "In a market that prices securities efficiently, prices at any point in time are said to fully reflect all available information relevant to the determination of values". According to West (1981:23); " A market that is operationally efficient permits buyers and sellers of securities to obtain transaction services as cheaply as possible, given the cost associated with providing these services". Lev (1974:212) defines allocational efficiency as follows:

> An efficient capital market is defined as one in which security prices always fully reflect all publicly available information concerning the securities traded. Such a market is efficient in the sense that it properly fulfills the primary role of a capital market - the allocation of resources.

Considering all the definitions about market efficiency until now a summary can be made about an efficient market. A market can be described as efficient when;

1- there exist free availability of information,

2- prices adjust rapidly to new information,

3- each successive trade is made at a price close to the previous price,

4- investors have homogeneous expectations on security prices,

5- investors are permitted to obtain transaction services as cheap as possible,

6- the market can absorb large amounts of securities without destabilizing the price.

These assumptions are very important. In order to define the effects of information technology on market efficiency, these indicators should be established.

3.3- The Role Of Information In Markets

As stated above if a market is perfect, it must follow that its pricing mechanisms, and its information dissemination, will also be efficient. In reality, the markets are generally imperfect. Henning et al. (1988:395) declares the situation as follows: "...evidence from studies indicates that the stock market is not very efficient...Moreover there is extensive evidence of mispresentation and manipulation..."

Investors gather information in order to benefit from the inefficiencies of the market. The utilization of this information assists in the optimal allocation of resources within the market. However, even if all the inefficiencies are removed, the condition of the market is still uncertain. It is true that prices reflect expected returns but returns are not perfectly predictable in advance. Therefore, in an efficient market, although it immediately incorporates all known information into the prices, these prices are based solely only on "expectations" about future returns. Furthermore, expectations are rarely a precise description of actual occurrences.

Information is not costless. Furthermore, there are usually transaction costs of operating in the share market. These costs, together with the information costs, can outweigh the expected benefit from using that information. In such a situation, there would be no incentive for investors to operate purely on such information and thus the market price would not reflect all relevant information. Cohen and Schwartz (1989:17) explain this situation as follows:

> Investors do not seek to trade unless they are sufficiently dissatisfied with their portfolio holdings to incur the transaction costs of trading, and transaction costs are not inconsequential.

The perfect market example stated in the preceding section is mostly hypothetical. As supported in the next section, mostly markets are unstable and investors are not fully rational. Since investors are not fully rational, they may act inefficiently in a market surrounding and can thus cause problems and even market crashes.

3.4– The Concept of Market Failure and the Crash of 1987

When investors act inefficiently in the market, the probability of market failure increases. Lucas and Schwartz (1989:2) explain market failure as :

> ...traders act inefficiently in a marketplace, and that a free, meeting of sellers and buyers does not produce a desirable equilibrium price or an optimal redistribution of resources across market participants.

The most striking example of market failure is the crash of 1987. In October 1987, all major world markets declined substantially. Of the 23 markets throughout the world, the indexes of 19 declined more than 20 per cent. Asian markets, excluding Japanese markets, experienced a severe decline on October 19. The first sign of the decline was detected by a number of European markets followed, shortly after by North American and finally by Japanese markets. Most of these markets, however, had experienced significant but less severe declines in the latter part of the previous week. With the exceptions of the U.S. and Canada, markets throughout the world continued to fall through the end of October, and some of the declines were as large as the great crash on October 19. Various institutional characteristics of exchanges have been blamed as contributors to the crash. Roll (1988:19) explains some of these characteristics as follows:

> Univariate regressions indicate that the presence of an official specialist, computer directed training, price limits and margin requirements were associated with less severe stock market declines in October 1987, while continuous auctions and automated quotations were associated with larger declines. In multiple regressions, several of these variables were found to be insignificant.

The crash of 1987, and fluctuating share prices during the crisis show that it is rather hard to claim that markets are stable. The crash of October 1987 has drawn attention to the weaknesses of the markets. Cohen and Schwartz (1989:15–58), explain these weaknesses by stating that the markets are typically thin, illiquid, and unduly price–volatile, even under relatively normal conditions. Due to similar reasons, a near–crash has been observed in 1989. Although the outcomes of the 1989 near–crash were not as severe as those of the 1987 crash, it was proven that the markets are subject to possible crashes at any period of time.

The stock market crash in October 1987 and the near–crash in 1989 revealed three serious problems. These problems are addressed on the publications by the U.S. Congress (Electronic Bulls and Bears, 1990:9) and these are:

> 1– the limits of technological systems when trading volume spikes,
> 2– limits on the ability of market makers to function when markets are under stress,
> 3– recurring excessive short term volatility that may promise further crashes.

These certainly are not the problems of the U.S. markets only, but the problems of all world markets, for two reasons. Firstly, securities markets interact with each other because of the globalization of financial sectors, and even a minor problem in one of these markets can cause a disastrous crash in the whole system. The movement of prices in many of the world markets at the time of the 1987 crash can be shown as a good example of the vast interaction of these markets. During the 1987 crash, the earliest significant declines occurred on October 14 in the North American markets, France,

The Netherlands, and Spain. Most of the world markets experienced at least some decline for the period of October 9–16. In the U.S. markets and in most of the European markets (Belgium, France, Germany, The Netherlands, Sweden, and Switzerland) by far the largest daily decline occurred on October 19. The Asian markets of Hong Kong and Malaysia experienced declines on the 19th and the 20th of October, preceding the U.S. decline by more than 12 hours. The Japanese market declined only slightly on October 19, but it joined Australia and New Zealand for a major drop on the 20th of October. U.S. markets preceded these declines by a few hours. Roll (1987:19–35) states that there seems to be some evidence against the widely expressed view that the U.S market pulled down all the other world markets on October 19.

Referring to the second and the third problems of U.S. markets which were stated by the U.S. Congress, the following can be concluded. Reilly (1986:165), explains the market makers as follows: "Market makers are known as specialists and they are members of the exchange who apply for their positions by asking the exchange to assign stock to them." Specialists act as a broker or perform the dealer function. Although the existence of market makers is not a common characteristic of exchanges, automated systems and short term volatility can be seen in any of the markets. In addition, most often the distribution of information is not equal across investors. Consequently, the interaction of orders in the market may not give perfect world results. Rather, market failure can be explained to be

happening as a result of investors trading non-optimal amounts at disequilibrium prices.

3.5- Market Architecture

Recognition of the possibility of market failure calls attention to the importance of a market's architecture; which is composed of the procedures, rules and regulations that determine how orders are handled and trades are made. Neither orders nor trades are independent of the market architecture. Recognition of this reality is very important. Since it suggests that market performance can indeed be improved by market design.

There exist some strategic problems in the securities markets and these prevent the preservation of a healthy market architecture. Although many of the developed countries have more healthy markets, the effects of sudden crashes and economic problems showed that all the markets, even the developed ones, should have strategic and business contexts. They must be integrated into the changing economic, regulatory, tax, and operational environments. Most of the developed countries have established their structural contexts. Because of the globalization of the world economy and similarly of financial sectors, establishing these structural issues play a vital role for the developing countries.

Being a developing country, Turkey feels the lack of such contexts. The "Aide Memoir of the World Bank Identification Mission" has identified (CMB Modernization Study, Citibank, 1991:5–6) some important issues for Turkey such as tax, regulation, infrastructure, and organization. In the report it is stated that a deeper liquidity in the corporate securities markets is necessary for both primary and secondary markets. Also, a greater balance between the government and corporate securities markets is needed. A balance should also be achieved between brokerage business and banking. For markets to achieve healthy conditions, timely adjustments and the introduction and enforcement of market regulation in accordance with the changing business dynamics of the capital markets are required. And finally, broader institutionalization of the market place, including the market authorities, the investor base, the market participants and the exchanges, are necessary. Market architecture can only be considered when such conditions are created. Although the conditions may differ from country to country, these issues can be generalized as the problems of developing countries.

Considering all the issues that are displayed above, an important aspect of the market design can be the use of information technology to disseminate floor information, to support decision making, to handle orders, and to translate orders into trades. In the following section these will be further explained.

4- INFORMATION TECHNOLOGY

4.1- The Concept of Information Technology

Langevoort (1985:747-803) explained information technology as a term used to describe electronic mechanisms for gathering, storing, retrieving, and transmitting data. Due to the technical advances that occurred after the Second World War, several streams of technology have supported the development and the use of computerized services. Many of these technologies were developed for financial services and they include:

1- Computer readable information,

2- Powerful time-sharing computers,

3- Interactive computer programs,

4- Rapid access storage devices,

5- Telecommunications networks. (On-line Data Bases, 1987:ix)

Since computerized financial services have been developing, there has been an increased recognition of the role that information can play in meeting the needs of professionals in corporations, educational institutions, public agencies, and in financial services. In this text, the computerized financial services in securities markets are examined in detail.

4.1.1- The Use of Information Technology in Securities Markets

There are many researchers who debate on both the use of information technology in securities markets, and the securities markets themselves. Phelan (1985:119-129), describes the securities industry as one of the most highly automated and intensively comprehensive industries in the world. Amihud et al. (1985:1-15) points out two important characteristics of securities markets. The first one is the price determination, which is concomitant with the trading process. The second one is the change of market prices which are already constantly subject to changes in supply and demand. Gupta and McCoy (1990:337-349) state their views on these two characteristics of securities markets by claiming that the securities markets are environments of rapid change and flux. The use of information technology in securities markets is offered as a solution to facilitate the activities in securities markets.

Since securities markets engage in record keeping, communications, and computation, Figlewski (1986:91-94) states that these three basic functions that are stated above, make them suitable for the use of information technology. Lucas and Schwartz (1989:3-4) comment on the profound impact of the information technology on the securities industry:

> 1-Computer programs make it possible to create and manage extremely large portfolios. With computers and derivative products, it is feasible to regard the portfolio, not individual securities, as the object of interest.
> 2-Systems in place on the exchanges facilitate trading baskets of stocks.
> 3-Computer-based systems provide price information and

the ability to discover price discrepancies between markets, thus making possible a wider range of arbitrage operations. 4–Technology makes it possible to clear and settle extremely large volumes of trades.

Given the functions of the securities markets and the possible uses and needs for information technology in these markets, the task now is to examine the evolution of information technology in the markets.

4.1.2– The Evolution of Information Technology in Securities Markets

Although there had been numerous attempts to introduce electronic trading technology into securities markets, Quatron Inc. was the first corporation which provided its subscribers with a timely transmission of stock prices, bond prices, news reports and interrogative capabilities in 1957.

The earliest comprehensive outline of an automated securities trading system is the National Book System proposed by Peake, Mendelson, and Williams. Although it is claimed (Peake et al.,1989:159–199) that the system they propose combines the best features of both auction and dealer markets. The Peake, Mendelson, and Williams (Mendelson et al. 1979) proposal, also known as the PMW proposal, was never implemented but it has had considerable influence in the design of several automated trading systems. In reference to the ideas of Marshall and Carlson (1985:285–300), the era

beginning with the introduction of Quatron was the first stage of technology in the securities markets. Other then Quatron, the examples of early innovation in electronics include: AUTEX (1969), INSTINET (1969), and finally NASDAQ (1971). Each of these services provided the world with news information and up-to-the-minute quotations on recent stock and bond prices. Among these services NASDAQ, the National Association of Securities Dealers Automated Quotation System, was the most important as it provided market making information on nationally traded over-the-counter (OTC) securities. NASDAQ developed the first electronic trading markets for individual securities where market makers could enter their latest bid and offer prices on securities.

In the era started by the execution of NASDAQ technology progress was made beyond the basic reporting of past information towards the provision of bid and offer price information prior to executing trade, which can be called the second stage of technology in the securities markets.

Marshall and Carlson (1986:289) explained the third stage in the evolution of electronic trading as the movement of the securities industry beyond the timely delivery of information toward improving the actual security transaction. In this stage, the use of electronic trading systems were encouraged by the 1975 Securities Act amendments. These amendments were put forth with the anticipation that telecommunications and computers would ensure investors of the best execution of their transactions through

competition among markets and among dealers. CATS (1977), NSTS (1978), SCOREX (1979), CAES (1980), and AUTOPER (1983) were examples of such competition. These are national, regional and OTC market attempts to provide cast saving electronic trading to brokers.

Computer Assisted Trading System (CATS) is the world's first fully automated exchange system. The system became operational in 1988 in the Toronto Stock Exchange. As in the PMW proposal, CATS is an open–limit order book system with strict enforcement of price and time priorities. The price and size of each individual order, as well as the broker number of the member firm that submitted it, are public information. Any trader may choose to conceal any portion of his order beyond 100 shares but the cost of doing so would be the undisclosed portion of that order loses time priority.

The Toronto CATS has been successful and well accepted by the traders. A variant of this system was implemented in 1982 for all stocks on the second section of the Tokyo Stock Exchange. In 1986, the Paris Stock Exchange implemented a modified version of the Toronto CATS.

As the trading volume has grown, the share markets have become even more dependent on information technology. The reasons for this dependence differs from market to market, as they belong to different economical structures, and since not only the trading procedures but also the trading volumes of share markets show different characteristics.

Information technology has both functional and fundamental effects on securities markets. These effects results from the use of computers extensively in advisory and research capacities, and thus the effects on market structure considering the issues of efficiency.

It is possible to think of the entire industry as a single system consisting of exchanges, institutions, investors, brokers, etc. Within these various components, there are many subsystems that employ information technology. These systems have been created to meet immediate and well–defined demands, but when the subsystems interact, there is a possibility of unintended effects to appear. Edwards (1989:376) explains the situation as follows:

> While a continuous succession of innovation in financial markets has steadily reduced transaction costs and encouraged more trading, ...,the result has been greater irrational speculation. Rather than making markets perform better, such speculation has driven away from fundamental values and increased price volatility.

Referring to the claims of two critics (Summers (1989:5–6) and Stiglitz (1989)), Edwards (1989:373–380) pointed out that the innovations in financial markets created risk rather than reducing it, distorted the allocation of investment, and limited the information content of asset prices.

Although technology contributes to some of today's problems in such bodies, it still has a major impact on markets. The information technology itself is neutral, thus, it cannot manipulate the whole system by itself. As it is argued before, many exchanges have developed some systems to cope

with large volumes of transactions but not to destabilize the markets. Individual investors, institutions, and traders use computers to develop and implement investment strategies for their own use and they do not perceive the cumulative impact the systems altogether may have on the market. The cumulative impact of information technology itself is an effect of the individual systems that are developed to meet specific needs. These effects may entail an increased demand for liquidity.

4.2.- The Effects of Information Technology on Market Efficiency in Securities Markets

According to Amihud and Mendelson (1989:60), the role of securities markets is to provide liquidity, that is:

> ...to enable traders to obtain immediacy at a lower cost, to reduce the expected time to execution at a desirable price, or to increase the probability of execution within a given time at a desirable price. As such, securities markets increase economic efficiency.

Economic gains may be the most important aspect of information technology for individuals. These gains may result from increases in revenues, and/or decreases in costs that are in excess of the technology adoption cost. Although the economic gain from the information technology is clear, in many of the exchanges, the automation of the trading systems followed an unplanned route. Instead of developing a system whose components are

integrated, considering the amount of investment that they were going to make, the exchanges have automated individual functions, especially those where pressure has built up or those which seemed open to automation. When such a route is chosen, the system's components may be uncoordinated, each capable of handling a different level of input and each delivering a different level of output. Such systems can function efficiently under normal conditions, but they may malfunction under pressure.

Another problem is that the existing computer–based systems apply the very same trading methods and procedures that were applied before automation. Amihud and Mendelson (1989:61), describes this problem as follows:

> Rather than redesigning the system to take full advantage of information technology, the exchanges have chosen to replicate the old system, with automated components replacing manual ones. While the old trading system was adequate for the past levels of information and trading intensity, it fails to be optimal for today's markets, where the relevant trade–offs are quite different from those that prevailed years ago.

Computerized trading systems are expected to improve market liquidity and to reduce volatility by combining the application of superior technology with trading mechanisms that take full advantage of it. Additionally, most of the time, information is incomplete and unreliable in securities markets. The manual reporting of many transactions can not cope with the pace of trading, so it is often impossible to know whether an order is being executed or not. This makes the placement of limit orders even more risky because of the traders on the exchange floor have more

information than the traders who are not there. Furthermore, even if traders have the information and can process it, they cannot physically place their orders or change them fast enough because most of them do not have access to a system that enables order placement directly to the exchange floor. As a result, there is a great deal of inequality in the ability of traders in terms of gaining access to the market. This is a missing aspect of competitive markets, having many traders who are small relative to the market as a whole, with none having an appreciable impact on market prices.

The primary impact of the technology on the securities markets is a functional one. The technological development reduces the cost of storing, retrieving, and analyzing investment-related data. Market efficiency can be strengthened as a result of reducing the cost of searching for the information, and thus there will be an increase in the size of the investors having access to new data.

Reducing the cost of information search should increase the number of markets for which the efficient market hypothesis holds true. In order for the market prices to quickly reflect information about an issuer, there must be sufficient interest among analysts to establish relatively constant monitoring. To the extent that automation lowers the cost of gathering, analyzing, and communicating information, the benefits of information search can outweigh the costs for more and more companies. As a result, analysts

can observe a broader range of issuers.

The reduction of search costs can also enlarge the number of investors who have quick access to new data. Many more investors can be able to obtain such data either through electronic advisory services or directly from the issuers. This increase in access to information could result in a more rapid assimilation of the relevant data in the price of the security, since more and more investors will now have the opportunity to react to developments shortly after information about them is made publicly available.

In his article, Stone (1985:114) states that electronic trading systems proved their efficiency. Stone explains this situation by giving an example from Inter-market Trading System (ITS).

> This is evidenced by the fact that over 50% of all trades occur at no price change from previous trades, and over 99.4% occur at a change of 25 cents or less. Electronic execution of trades at a price within one-eight of the previous trade will allow for an even more efficient trading mechanism.

The computerized technology and its proper use can provide the key to the solution of the following problems:

- incomplete and unreliable information,
- traders' inability of processing or accessing their orders,
- the high cost of information.

A computerized trading system that is chosen carefully and considering the necessities of a securities market can help resolve these

problems by making information available on-line for all transactions, by processing it immediately following traders' specifications, and by generating orders that take into account current market conditions as well as traders' portfolio positions. By the help of information technology, investors can generate economic gain from exchange operations. These gains include speed, profit, system reliability, quality of execution, and new service opportunities.

In the following section, the trading process in U.S. markets is displayed. The system in the U.S. Securities Markets is a good example as it both displays an electronic trading mechanism and conventional floor trading mechanism.

4.3 - Trading Process in U.S. Markets

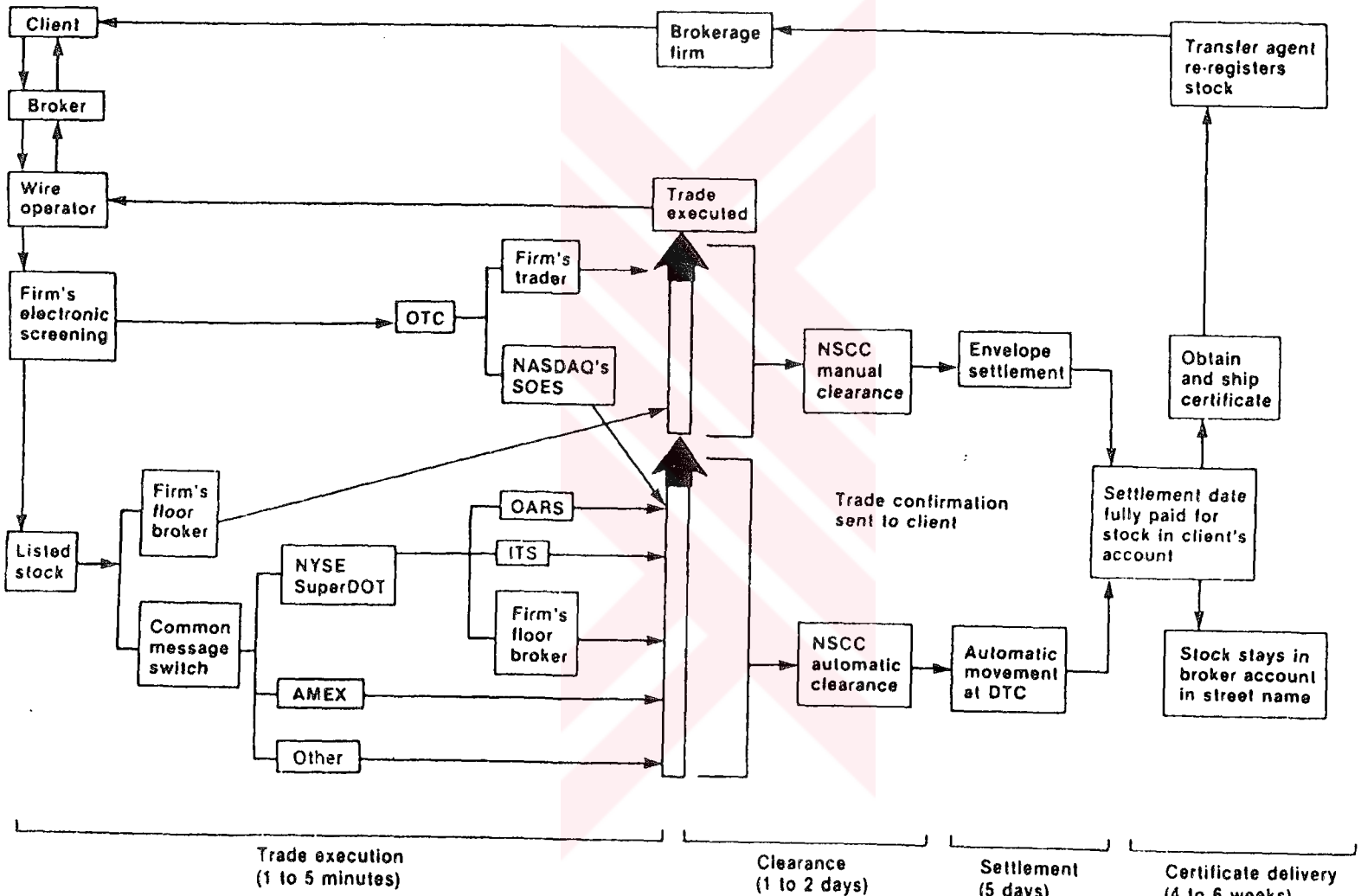
Figure 1 shows the trading mechanism in U.S. Securities Markets. In the U.S. market, when bids and offers come, an account officer writes an order ticket, filling in the details about the stock. The market order is passed to a teletype operator who keyboards the information and sends it immediately to an electronic system linking broker, to various exchanges and over-the-counter dealers.Most orders in New York Stock Exchange (NYSE) listed stocks are routed to the NYSE's SuperDOT 250 system, where orders

of fewer than 2000 shares are executed.

Through SuperDOT, market orders to buy or sell,On a typical day, between 15 and 20 percent of all orders are executed at the market opening. routed to the specialist post prior to the market opening, are automatically paired with opposing orders. The specialist, after matching buy and sell market orders and checking outstanding limit orders and larger opening orders, sets an opening price for the stock. The specialist then executes all paired orders at one price and sends confirmation notices to originating brokers within seconds of the market opening, through the Opening Automated Reporting System (OARS). In many of the automated exchanges even the setting of the opening price is done through computerized systems.

Orders that arrive at the specialist's post through SuperDOT after the opening can be filled in several ways. Orders up to 2099 shares are usually filled at the best quoted price or better in the Inter-market Trading System (trading unit "lot" contains 100 units of shares in US markets). This system connects NYSE, AMEX, other regional exchanges, and NASD's Computer Assisted Execution System (CAES). ITS quotes are displayed at the NYSE specialist's post for all floor traders to see. An order sent to ITS will be filled within 1 or 2 minutes at the best price among any of these markets.

FIGURE 1 TRADING MECHANISM IN U.S. SECURITIES MARKETS



SOURCE: *The Individual Investor*, vol. 3, No. 3, June/July 1989.

At the broker's floor booth, these orders are translated into floor tickets containing the essential buy/sell information necessary to make the trade. Floor clerks pass the details to floor brokers by hard copy. The floor broker than presents the orders at the specialist's post. There the stock is traded with another brokerage firm, or with the specialist, who may be acting as an agent for a client on his books, or who may be acting for his own account. Or the floor broker may execute the trade on another exchange, if there is a better price posted on the ITS screen over the specialist's post.

After the trade activities, and the process depends whether the trade was executed manually or electronically. Generally the trade confirmation is sent back to the broker through the same pathway by which the order arrived, and the broker calls the customer to confirm the transaction. Executed trades are also reported immediately to the brokerage firm's purchase and sales department and to the exchange, so that the transaction will go on the Consolidated Ticker Tape. By this tape it is visible to the investors, and to the exchange's and regulatory agency's surveillance analysts.

As it is stated before, the U.S. system is a good example as it displays the functions of both automated exchanges and manual exchanges. The trading procedures is different in many other exchanges, considering quotas, auction types, price limits, margin requirements, etc., but the core of the trade is the same, which is the matching of buy and sell orders.

Appendix 1 displays these differences in the trading procedures of different exchanges.

5- TURKISH SECURITIES MARKETS

Application of a carefully-chosen computerized trading mechanism will help Turkish Securities markets to resolve their problems without question. Before explaining such technologies and their use it is necessary to discuss the history and the nature of Turkish securities Markets, and to clearly define the transformation of Turkish Economy into an information-based economy.

Beginning in the 1980s, Turkey succeeded in taking a short cut to a more information-based economy. The transformation of Turkish economy to an information-based economy can be explained as both the cause and the reason of parallel changes in Turkish Financial Markets. With these changes, Turkish Securities Markets not only made an effort to adapt its procedures and its technology to modern exchanges but also took a step to liquidate its operations. In the following section, this transformation process is explained in detail.

5.1- Transformation of Turkish Economy into an Information-Based Economy

The capital market is the basic tool for the allocation of resources to the efficient sectors of the economy. Because of the economical crisis in the late 1970's a stabilization program was prepared with the aim of improving Turkish economy and Turkish Financial Markets. This program was implemented to reduce the inflation rate and to eliminate the bottlenecks in the balance of payments. In his paper, which was prepared for the International Symposium on Turkey's experience in developing a market economy and its relevance for the reforming countries of Central and Eastern Europe, OECD Secretariat Imai (1991:304) explained the economic portrait of Turkey before the introduction of stabilization programs as follows:

> The financial system in Turkey before 1980 was underdeveloped even compared with countries at a similar stage of industrialization. Capital markets were virtually non-existent and deposit and loan markets were highly regulated. Ceilings on interest rates on deposits combined with high inflation meant that real interest rates were negative for savers. This encouraged savings in the form of commodity stocks, gold and real estate and also the development of financing on the curb-market.

By the introduction of the stabilization programs, starting from the early 1980s, the Turkish economy has entered into a stage of rapid transformation. The economy has moved from the mixed framework to a market oriented economy. Parallel to this transformation, a similar transformation is observed in the information content of Turkish economy. Turkey started to establish an information-based economy. Information-based economy can be defined as an economy in which economic structures

are determined largely by their information efficiency.

The first steps to establish an information-based economy were taken by the public sector. Most of the information intensive activities were accomplished by the public sector because of the reluctance of private sector to invest in information technology in the beginning. The private companies were reluctant as they could still earn high profits without investing in information technology, but it did not take a long time for the private sector to become aware of the benefits of information technology. After 1985, private sector got involved with investing in information technology. There were three factors for the private sector which stimulated its investment. First, government decided to increase public investment in the communications infrastructure. This investment not only stimulated a significant supply response from the Turkish private industry but also served to catalyze large complementary investments in terminal and computer equipment. Second, the tariff on computer equipment was reduced from over 50% to a duty exempt category. Table 1 shows the private investment of some countries in information technology during the 1980- 1990 period.

TABLE 1 PRIVATE INVESTMENT IN INFORMATION TECHNOLOGY 1980–1990

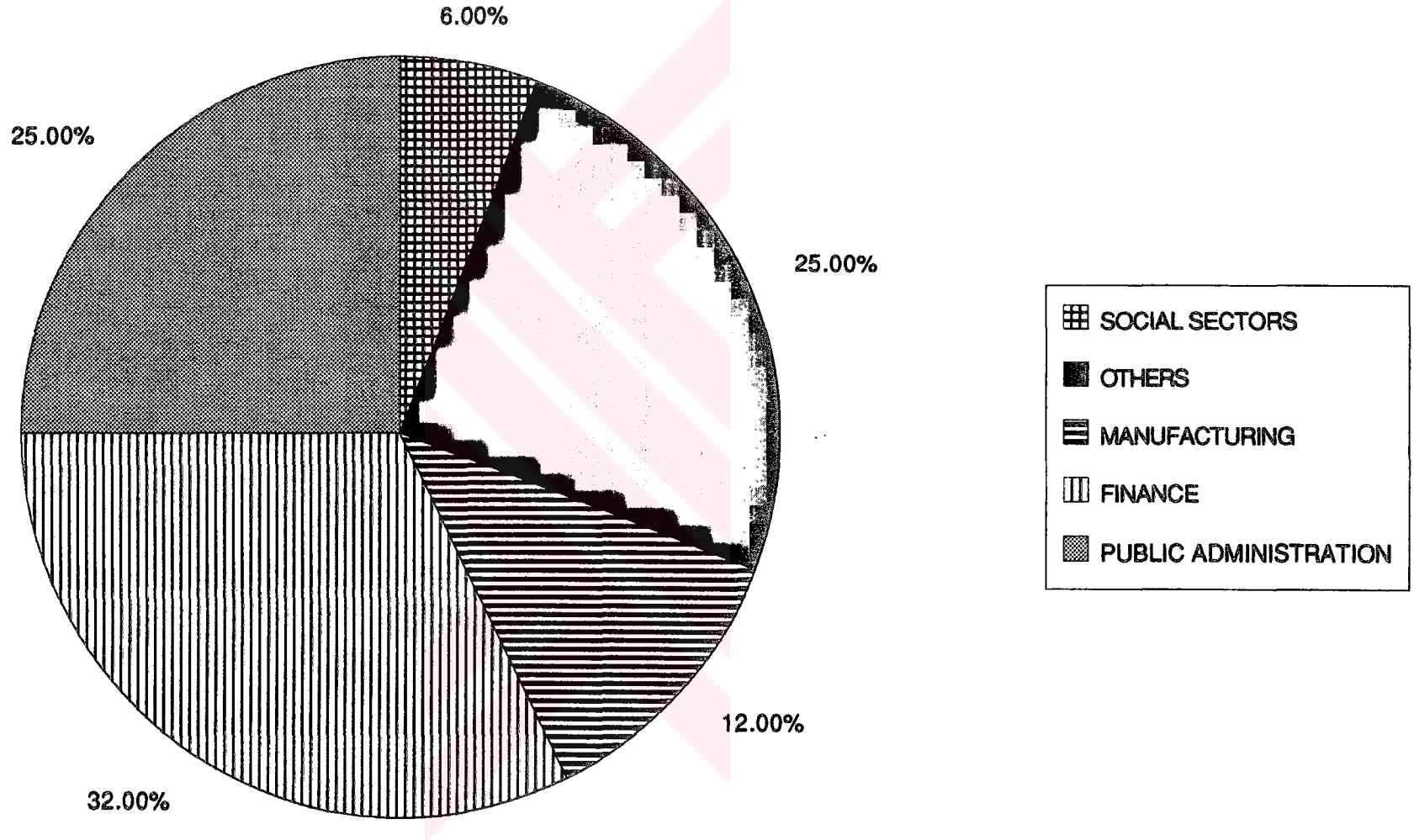
	USA	JAPAN	SPAIN	MEXICO	KOREA	TURKEY
Information Market						
IT Investment per Capita	400	400	110	14	45	12
Software as % of IT	42	35	31	36	24	13
PCs/Total Computers	45	30	50	55	40	44
It Exports $Billions	21	17	N.A.	.5	3.5	.02
Communications Infrastructure						
Telephone Lines per 100	52	41	31	6	29	14
Telecom Investment/GDCF	2.8	1.9	2.4	.5	4.5	3.4
Human Capital						
White Collar/Total Work-force	67	55	43	33	44	23
Professional & Technical/T.W.	16	11	9	7	8	5
Computer Student/Million	1000	830	550	230	1100	160
R&D/GNP	2.9	2.9	.7	.1	1.8	.2
Information Services						
Newspaper/1000	259	566	75	124	208	70
Television/1000	812	589	380	124	203	172
Advertising Revenue per Capita	479	281	151	N.A.	N.A.	11

Finally, as the information technology market in Turkey grew and became more attractive to international suppliers, Turkey benefitted from increasing price competition, product differentiation, and improved vendor services. The result of these open market policies is that Turkish companies have unrestricted access to a globally competitive information technology.

Investment in information technology has remained relatively concentrated in those sectors of the economy that are information intensive in nature. These sectors include; the financial sector, travel, and higher education. Figure 2 shows the Sectoral Composition of Computer Use in Turkey.

In summary, beginning in the 1970s Turkey has examined stabilization programs. The need for an information based economy is the result of such programs, but this transformation forced the Turkish Financial sector and the Turkish Securities Markets to reorganize their structures. These changes can be comprehended by examining the effects of the stabilization programs of 1970s on the Turkish Economy. In the following section the history of Turkish Securities Markets after the stabilization programs of 1970s are examined.

FIGURE 2 SECTORAL COMPOSITION OF COMPUTER USE



5.2- The History of Turkish Securities Markets after the Stabilization Programs of 1970s

> The balance-of-payment crisis in the late 1970s heightened the recognition that a better functioning financial system is a necessary condition for sustained industrialization and balanced economic growth in Turkey. (Imai,1991:304)

In order to restore the economic growth several steps were taken on the real side of economy. Parallel to the changes on the real side of economy in the 1970s, the institutional structure of the economy was reorganized by sub-stabilization programs with which financial innovations were introduced. At the same time the deregulation of the tax system and banking sector was taken into consideration.

Taking the securities markets into consideration, the liberalization process was initiated by the creation of a legal framework with the enactment of the Capital Market Law (CML) in 1981 and by the establishment of the Capital Market Board (CMB) in 1982. The Capital Market Board is responsible for the regulation and supervision of primary and secondary markets. Before the Capital Market Board was established, the financial system collapsed due to the absence of any regulations to protect the investors. This period is called the "Brokers System (Bankerler Dönemi)". In 1980's brokers were established businesses with the aim of borrowing public money by attractive yields and lending the same money at high interest rates. Because of the high inflation rate the income from deposit

accounts and bonds became negative and the investors were seeking positive income sources. This was the reason for the popularity of the brokers system. The system collapsed in 1981 when brokers had difficulty in collecting loans and thus fulfilling their obligations. As no regulation existed to protect investors large losses evolved. This crisis was one of the reasons of the enactment of the Capital Market Law. After the brokers crisis, the regulatory power of the monetary authorities was strengthened and banking activities became subject to closer control.

The enactment of Capital Market Law and the establishment of The Capital Market Board was the first turning point for the Turkish Securities Markets. Then a series of steps were taken to establish a sound base for the smooth functioning of these markets. The general framework of securities markets was built and the essentials of the market mechanism were established and during the 1982–1986 period. This period was very important as the necessary regulations and the infrastructure of the markets were almost completed in this period. In order to develop primary and secondary markets, several steps have been taken. In this period, the capital market instruments were defined, the main principles for the financial intermediaries and for the scope of their operations were set; rules for issuing securities were specified, and regulations concerning the secondary markets were introduced. In May 1985, auction was introduced in issuing government securities and finally, at the end of 1985, the Istanbul Stock Exchange (ISE) was inaugurated.

During the period following the establishment of ISE, new financial instruments were introduced and arranged. These instruments were profit and loss sharing certificates, convertible bonds, bank bills and bank guaranteed bills, finance bills, and floating rate bonds.

The changes that occurred during 1986–1988 were not significant as the chances in the establishment period. In the second half of 1987 mutual funds operations commenced. At the same time, tax incentives were provided for investors to profit from mutual funds. In this period the Capital Market Board accelerated its efforts on implementing the effects of the liberalization policies in the Securities Markets, and the Central Bank launched open market operations in government securities in order to control the liquidity of the financial system.

1988 was an important year as the implementation of the privatization program started with the sale of the shares of a telecommunications firm, TELETAŞ, to the general public. In 1988, the rules for external auditing were set. Simultaneously, the operational conditions and rules of the institutions which were authorized for auditing were also determined. The CMB established accounting standards in order to increase the quality and accuracy of information in the markets. The Central Bank established Foreign Exchange (FX) Market in order to complete the infrastructure of the financial system.

In 1989, the changes in the economic and regulatory infrastructure provide a substantial increase in the number of new share issues. This development can be attributed to; (a) an increase in corporate demand for funds and, (b) changing corporate mentality with respect to capital structure policies. According to the Capital Market Board Bulletin of March 1991, total market capitalization has risen from $ 940 million in 1986 to $ 18.8 billion at the end of 1990. The peak being $ 26.3 billion during the third quarter. Due to these figures the Turkish Securities Markets became one of the fastest growing stock market amongst the emerging stock markets. This growth rate was very impressive considering the daily 2 hours trading period at the Istanbul Stock Exchange. By the changes in the legislation which allowed direct and portfolio investments of nonresidents, the interest of foreign investors to Turkish Securities Markets grew.

The number of companies listed at the ISE has risen from 350 at the end of 1986 to 1092 at the end of 1991. Similarly, the number of companies whose shares were traded in the ISE has risen from 80 to 134 over the same period. Furthermore, according to the ISE statistics in 1991, 10 of these 134 shares actively traded issues accounted for over 35% of the contracts traded and over 50% of the trading value on the average.

In June 1991, Istanbul Bond Exchange (IBE) became operational in order to complete the infrastructure of the Turkish Securities Markets. The Istanbul Bond Exchange differs from the Stock Exchange in that, the Bond

Market is a computerized-order driven market, whereas the operational infrastructure of ISE is fully manual. Although the Bond Market was very recent, its success in computer applications and screen-based order book system encouraged the automation processes of the Istanbul Stock Exchange.

In 1991, although the Exchange was in rapid development, fluctuating share prices and shallow nature of the market brought negative returns to the investors. This losses can be explained by the nature of the economy, fluctuating interest rates, positive returns of foreign currencies, and the negative attitude of investors toward the Exchange operations. In this period it is hard to claim that the Exchange achieved efficiency in its market operations. The securities market has effectively outgrown its manual infrastructure and some of its current procedures. There exists an imbalance between the manual infrastructure and growth needs of the Exchange. Because of this market risks and operational inefficiencies have increased inevitably.

The number of corporations whose shares are traded in the Exchange was doubled in the 1991-1992 period. The total market capitalization has grown over 300 times since 1986. In order to balance the growing trading volume and the market infrastructure, several steps were taken by the CMB, ISE, and the government in 1991-1993 period. To improve the market efficiency of secondary markets, ISE started an automation program by

which all the market operations would be handled automatically. In order to ensure the quality of information in the markets, ISE has established a Data Bank in the first quarter of 1993. The CMB introduced new financial instruments and markets some of which became operational in 1992 and in the first half of 1993. These instruments are: securitization (VDMK), risk capital, real property funds, futures and options markets, gold market, index sales, and the market of preferential rights.

The new Tax Law was accepted in the "Plan and Budget Commission" in June 1992 by which tax exemption to A grade investments funds investing at least 25 % stocks was introduced. The new Capital Market Law (no:3794) was enacted in May 1992 in which some precautions were introduced with regard to insider trading. These two changes triggered the securities markets, and in 1993 a quantitative jump observed in ISE. The number of companies listed at the ISE has increased to 1286 in the first half of 1993. The nominal value of the stocks has grown over 70 times from 1986 to 1993, reaching to 57.992 billion TL. In Appendix 2 the development of Turkish Securities Markets from its beginning until the present day is displayed. In the following section the Istanbul Stock Exchange Which can be described as the main body of the Turkish Securities Markets is examined.

5.3– Istanbul Stock Exchange

The Istanbul Stock Exchange began functioning in 1985. Full operations were started in January 1986. The ISE is an autonomous public entity, run by an Executive Chairman who is appointed by the Government, and an Executive Committee.

The Istanbul Stock Exchange is an exchange where each stock has one or more physical boards in which the representatives of the Intermediary Institutions write down bids and offers.Security transactions are supervised by the Exchange specialists under competitive conditions of matching "ask" and "bid" orders. The trade occurs by the matching of bids and offers by a "multiple price – continuous auction" method, and all trades occur on the floor. The equities market structure is a floor based public limit order book system.

The Exchange is open on weekdays, from 9:15 to 10:00 for trading in the primary market and 10:30 to 12:30 for trading in the secondary market. Odd–lot trades are treated separately. The core of the trade involves the bids and offers of the representatives of the Exchange members. These bids and offers come from the customers. The orders of customers should be given in written format, but orders coming by telephone or similar telecommunication devices are also accepted by the Exchange members if they have full information as required by ISE Regulations (Article 20). The

required information for giving or accepting orders are displayed in Table 2.

TABLE 2 THE REQUIRED INFORMATION FOR GIVING OR ACCEPTING ORDERS

1- Name, surname, or trade name of the Exchange member receiving the order
2- Name, surname, or trade name and address of the issuer of the order
3- Side of order (ask / bid)
4- Type, number and nominal value, if available, of the security to be traded
5- Whether the order is limit price or best price order
6- Limit price in limited orders
7- Validity period of the order (if desired)
8- Time and location of the order (date, hour, minute)
9- Whether the order is to submitted at the first or the most suitable upcoming session
10- Customer order number

SOURCE: CMB

A customer may either personally determine the price or may assign this task to the Member. Prices are fixed according to "limited" or "free price" option. In a limited price order, the buyer sets the highest and the seller sets the lowest prices for their shares. Such levels are called as limit prices. If the price evolved on the Exchange is lower than or equal to the limited price in the ask order and higher than or equal to the bid orders, the trade occurs at the market price. If a customer liberates the Member in setting the price, a "free price order" is submitted. The given member submits this type of order in favor of the customer. (Article 21)

Validity period in orders is set according to the wishes of customers. When this date expires, the orders lose their validity. Orders having no such time limitations submitted during the session are valid during that session or until the end of that day; otherwise, on the next session or until the end of that day, following the submission of the order. As of the date of submission of such orders, the customer may assign a validity period. While as long as an order is assigned such a time constraint, expiration can be avoided by extending the validity. (Article 22)

The Exchange has a "Board System", where every board belongs to a single stock. On every board the name of the stock is written on the upper center. On the upper left corner the previous day's Weighted Average Price (WAP) of the stock; and on the upper right corner the Price Margin for the current trading period is written.

The shares that are traded in the Exchange mostly have nominal values of 1000 TL (there exist some shares having nominal values of 500 TL). During the process of writing orders into the boards, instead of using nominal values, a " lot " which is a trading unit of 1000 shares each having 1000 TL nominal value, is used.

The weighted average price of a stock is calculated by considering all the normal bids and offers which are subject to different prices and the quantities. Table 3 displays the weighted average price of a stock.

TABLE 3 WEIGHTED AVERAGE PRICE OF A STOCK

$$\text{Weighted Average Price} = \frac{\Sigma\ (\text{Quantity} \times \text{Price})}{\Sigma\ \text{Quantity}}$$

SOURCE : ISE

Price movements of a stock is defined by calculating the previous Weighted Average Price of the stock. Table 4 shows the price movements of stocks in ISE. Price Margin of a stock is the range between the maximum and the minimum values which can be offered for the current trading period.

Representatives who want to buy (sell) stocks write down their bids (offers). The member's identification, quantity that they want to buy (sell), and the price are written under the buying (selling) section of the board. All the bids for a stock are displayed on the right side of the board and offers on the left side of the board. Figure 3 displays writing orders on TELETAŞ board.Representatives stand in line in front of each board to record their bids and offers, one at a time. This leads to an open auction where bids and offers are known to all traders, and are matched first by price and then by time of entry.

TABLE 4 PRICE MOVEMENTS OF THE STOCKS

PREVIOUS WAP OF THE STOCK	PRICE MOVEMENTS OF THE STOCKS
TL - 1000	TL 25 AND MULTIPLES
1001 - 5000	TL 50 AND MULTIPLES
5001 - 10000	TL 100 AND MULTIPLES
10001 - 20000	TL 250 AND MULTIPLES
20001 - 50000	TL 500 AND MULTIPLES
50001 - 100000	TL 1000 AND MULTIPLES
100001 - 500000	TL 5000 AND MULTIPLES
500001 -1000000	TL 10000 AND MULTIPLES
1000001 -	TL 50000 AND MULTIPLES

SOURCE: ISE

Matching occurs by taking into consideration the rule of price–time priority. This is a rule for the execution of transactions of shares in the order of their arrival time at the trading arena within each price range. Under a price–time priority system the fist bid at a price, would be executed ahead of all later bids at that price. If the price–time priority for all the stocks are equal then customer order priority, and priority of fractions are taken into

FIGURE 3 TELETAŞ BOARD

7200	TELETAŞ	8200 7300

ALIŞ			SATIŞ		
ÜYE	ADET	FİYAT	FİYAT	ADET	ÜYE
VEN	40	7300	~~7600~~	TYT ~~4~~	~~AOG~~
KOÇ	2 100	7400	~~7700~~	SEM ~~25~~	~~VAK~~
TÜT	5	7400	~~7700~~	SEM ~~5~~	~~TYT~~
~~VEN~~	BMD ~~10~~	~~7500~~	8000	5	VAK
~~CRS~~	AOG ~~1~~	~~7600~~	8000	2 100	BTA
TAN	BMD ~~25~~ 23	7500	~~7600~~	SEM ~~25~~	~~IMP~~
~~DER~~	BMD ~~1~~	~~7600~~	7700	TEB ~~20~~ 15	IMP
~~SH~~	DHA DHA ~~25~~ ~~24~~	~~7600~~			
YAT	5	7500			
~~TEB~~	~~5~~	~~7500~~			
~~SH~~	AOG IMP ~~25~~ ~~22~~	~~7600~~			
~~TEB~~	~~5~~	~~7600~~			

SOURCE : ISE

consideration. When match occurs, the offer and bid are crossed out from the board and subsequently recorded manually on agreement tickets. One copy of the ticket remains in the Exchange, one is given to the buyer and one to the seller. This ticket contains all of the information used for clearing and settlement. Figure 4 shows the agreement ticket.

Trade information is entered manually by clerks into the Stock Exchange host. The host of the Exchange is a Motorola Supermax system capable of absorbing the daily transactions. Through telephone lines terminals are linked to the host. There are two uninterrupted power supplies for the host. In case of a brake-down, one of the power supplies is adequate to continue market operations. The historical data is stored on high density diskettes. Copies of these diskettes are stored in the Exchange and in the Central Bank.

There are four clerks in the middle floor who communicate with the Exchange experts at the Boards. These experts observe best bids and offers and at the end of the day they transfer the closing prices to the clerks. The clerks manually enter the closing prices and broadcast them through Reuters screens three hours after the closing.

FIGURE 4 AGREEMENT TICKET

ALIM – SATIM SÖZLEŞMESİ

İşlem Gören

Menkul Kıymetin Adı : .....

.....

Nominal Değeri : .....

İşlem Fiyatı : .....

Portföyden Satış : ☐

Portföye Alış : ☐

Alan Üye : ..... Satan Üye: .....

İmza : İmza :

5.4- Istanbul Bond Exchange

The Istanbul Bond Exchange (IBE) become operational in June 1991. The Securities and Money Markets Directorate of the Istanbul Exchange is responsible for the day-to-day functioning of the market. All intermediaries that have been approved to deal in the ISE also have the technical right to do so in the IBE; however, only 110 of the 165 firms have applied for permission. While all applications have been accepted, the IBE's requirement that a deposit be left with the exchange in accordance with the trading limits assigned to each intermediary. In the first quarter of 1992 there were only 67 eligible intermediaries. Only four-fifths of these intermediaries were active. Currently, Government Bonds, Treasury Bills, and Corporate Bonds are traded on the IBE.

Trading in the IBE occurs through authorized intermediaries who use a screen-based system. The IBE itself gives data on the current best bids and offers for any given maturities. The matching is done by the IBE and intermediaries cannot see their counterparts. Trading is between 10:00 and 17:00; on weekdays, the settlement for transactions with current day values occur in practice until 12:00 and those for future values until 17:00. Settlement is generally made through bank transfers.

In the following section the problems of Turkish securities markets are displayed.

5.5- Problems of Turkish Securities Markets

In this section when we talk about the problems of Turkish Securities Markets , we mostly refer to the problems of Istanbul Stock Exchange. The reason behind this limitation can be explained as follows. Istanbul Bond Exchange which was established to complete the operational infrastructure of Turkish Securities Markets, is recent. Istanbul Bond Exchange is an automated in which most of the operations are handled by computers, thus, IBE is not facing with those problems that ISE suffers because of its manual trading procedures.

Istanbul Stock Exchange is an emerging exchange which is only seven years old. Although The Exchange has achieved a rapid growth stage, it is still facing the problems of emerging capital markets. ISE can be called as an active market but it is informationally inefficient, and volatile. In Turkey the importance and depth of capital markets is rapidly increasing, so it is necessary for the exchange to establish a healthy market structure and overcome the problems. Chichilnisky (1990:2) explains the problems of Turkish Markets as follows:

> Capital markets are valuable assets, and their efficiency is a high priority. This efficiency is hampered by a number of problems which can be corrected by the adoption of procedures and technologies best adapted to today's trading activity and environments. There are other problems derived from certain characteristics of Turkish markets, which constrain the surveillance required for efficient market performance.

The problems of Turkish Securities Markets can summarized as regulative infrastructure, lack of public access and education, and problems emerging from the manual trading infrastructure.

5.5.1- Regulative Infrastructure

The foundation of Turkey's Capital Markets is the Capital Markets Law (no: 2499) enacted in July 1981. The purpose of the law is as follows; enabling the operations of the capital markets in an atmosphere of trust and clarity, ensuring the protection, organization, and supervision of investors' rights in order to encourage the widespread and effective participation of investor in the economic development of the country. As the markets have outgrown their regulatory infrastructure since 1981, the CMB initiated studies directed toward the reevaluation of the CML. As a result the new CML was enacted in May 1992 (no:3794).

As mentioned before, the size and the structure of the securities markets has effectively outgrown their manual infrastructure and some of the current procedures and appears to be at or beyond their capacity to absorb significant additional peak transaction flow. There appears to be imbalance between the market process and largely manual infrastructure.

Market participants have commented that the introduction of new regulation and the administration of existing regulation by the CMB is not always in balance with the rapidly changing business environment. Members from Brokerage houses declared the new Capital Market law was unjust. Muharrem Karslı, ex-president of ISE, and president Altın Securities Company points out the law contains many reforms but it is still inadequate to meet the expectations of the market (Aracı Kurumların Dediği Olmadı, Ekonomist, 1991:49).

The removal of the code stating the securities departments of banks should be organized as separate legal entities from the CML proposal in the Council of Ministers can be accepted as an example showing the controlling power of the banks in the Turkish securities markets, and that the new CML is inadequate to meet the expectations of the market.

Some of the complaints of market participants are accepted by the members of both the Capital Market Board and the Istanbul Stock Exchange. But both of the parties complain about the overlapping areas of responsibility. ISE is a legal entity, but it suffers from its dependant statue. Degree in law 91 states that ISE is under the control of Capital Market Board. The right of calling the General assembly of the Exchange into meeting belongs to CMB only. President of the Exchange is selected among the candidates who are proposed by CMB. Although the trading rules are determined by the ISE Board of Directors, they can only be operated by the

approval of CMB.

These complaints coming from both CMB and ISE are important. But they can easily be solved by the a careful division of responsibilities between them. In many countries this problem is handled by allowing the Exchange the monitoring of market procedure, and authorizing the regulator (Board) to review the market law. Cox and Kohn (1986:7–17) argued about the role of Securities and Exchange Commission (SEC) in U.S. markets. Their description of the role of SEC as "improving information flow and otherwise reducing barriers to competition or by attempting more actively to shape the securities markets" make it is obvious that the managing power belongs to Exchanges and the exchanges are controlled by SEC authority.

When the infrastructure of the Securities Markets is taken into consideration, it will be necessary to introduce modifications to market regulation. For an efficient market the information needs of the public should be satisfied by the public and private corporations. The only publicly available financial and business information about corporations are the formal quarterly and annually announcements of the Balance Sheet information of the corporations. The Capital Market Board prepared a communique about the "Principles and Rules of the Financial Tables and Reports in Securities Market" but as these principles and rules are not binding and the accounting standards that exist are not universally adopted, the corporations change the accounting conventions from quarter to quarter

which make the comparison between the liquidity and performance of these corporations impossible. Many of the corporations can give inadequate information about company earnings and/or balance sheet items. It is necessary to introduce consistent accounting conventions for Turkey, for the reporting of quarterly and annual financial performance.

Another modification can be established in the Turkish Capital Markets are the Rating Agencies. A rating is an independent evaluation of an issuer's ability to pay the interest and principal of its obligations in a timely manner. Cacchione (1990:2) defines the role of rating as follows: "...when a rating is in place, the investor is aided with information, guidance, and a ranking system which will help determine if he is getting a proper return for the risk he is taking." The establishment of independent Rating Agencies will increase the liquidity and the accuracy of the publicly available information without any cost.

5.5.2- Lack of Public Access and Education

A major problem of the Exchange is the lack of confidence and trust of investors in the operations of the Exchange and Intermediary Institutions. The reasons for this problem are twofold:

1- The investor base is low, and investors are uneducated on the issues concerning Securities Market operations;

A critical requirement for the successful development of an equities market is an educated investor base that has confidence and trust in the market process. Knowing that the Turkish investor has a particular need to be educated about the market, the Istanbul Stock Exchange introduced an educational public relations program in the beginning of 1992; and in March 1992 the Information Office of Istanbul Stock Exchange became operational. In the Public Relations program informative video cassettes were prepared and distributed to the public. Members from the Exchange participated in seminars in many sectors of the business such as private and public corporations, universities, chambers, etc. to improve the overall image of Istanbul Stock Exchange. Although these efforts seem to appeal to the public interest, as far as the Exchange is concerned, they are inadequate to create and educate a consistent investor base.

2- Due to the fact that there exists no real time, electronic execution and reporting system of trades, the investors can not keep track of their orders to the intermediaries.

Investors do not trust the transactions of the Intermediary Institutions as they can not keep track of the trades after they placed their orders. This problem can be corrected by the introduction and enforcement of tighter

regulation procedures and oversight for improving the transparency of Intermediary Institutions.

Investors are in the favor of the automation study of the Exchange as they feel and express that the most important result of the study will be the established transparency of the transactions.Before commenting on the second group of problems, it is not surprising to see the first group of problems are correlated to the structural issues that are necessary for a healthy market structure. If these problems are not covered, information technology can become a hindrance to the market development and may delay the modernization program.

5.5.3- Problems Emerging from the Manual Trading Mechanisms

The Stock Exchange suffers from the lack of information. It is very hard in Istanbul Stock Exchange to provide efficient access to investors who wish to trade in an auction market environment.

There is a very limited information being disseminated prior to trading, either on prices, bids, or offers. The only recording of best bids and offers is done at present by manual entry by clerks at the Exchange. This data is based on information provided to them by the Exchange experts on the floor

who carry portable telephones. Information about closing prices is disseminated two or three hours after the closing of the Exchange, which takes place at 12:30 daily, through Reuters screens.

Trade recording and matching is still handled manually by the representatives of the Members. On the floor, Boards are monitored by the Stock Exchange experts. For heavily traded stocks there exist market distortions because of queues leading to wait of about 20–25 minutes for registering bids or offers. The same is true for the manual registration of tickets which records the deals. Errors can happen in manual entries. Although these errors are corrected by backing out the transactions a few hours later, this provides unfavorable results for the traders who lost the chance of bidding for the stocks. Technology plays an important role in the development of a transparent and accessible market. The auction market needs an on–line real time market price reporting system

Manual and paper based clearing and settlement leads to errors, slow settlement, and even price manipulation by parties who wish to extract themselves from executing trade when prices turn in their favor.

5.6- Istanbul Stock Exchange Trading Technologies Requirements

The automation needs of the Istanbul Stock Exchange became visible with the growth of the trading volume in 1989. In the beginning of 1990s the trading technologies requirements were defined by the Exchange authorities. Istanbul Stock Exchange conducted meetings with suppliers of exchange technology and exchange consultants from automated exchanges about the development of new technology for the Istanbul Stock Exchange in this period. ISE outlined the problems in its Istanbul Stock Exchange Trading Technologies Requirements reports. For the problems concerning clearing and settlement several other reports were prepared. These reports put stressed on the fact that there was a dramatic growth from the beginning till the present in ISE and this had stretched existing resources, both in terms of daily trading operations and in terms of the ability to develop new technology. In their report Bookwalter, Croskey, and Perrin (BCP Report, 1992) stated that growth of ISE and the corresponding demand for immediate,and accurate information processing drove towards the need for improvement of information Systems in ISE.

Other important factors stressed in the report were the instability in time costs and reliability. In these reports it was stated that the market was already constrained by support facilities and the next growth phase would require the implementation of new systems. Reliability was also an important issue. The loss to false starts will be serious to the overall success of the

market. The BCP Report underlined ISE's need to identify and implement automated systems that would improve its overall operations, particularly in the areas of trading support, market data distribution, clearing and settlement processing and depository management. In their report it was stated that automated control functions supporting market management, surveillance and risk management should be implemented.

Because of the shallow trading volume in ISE, hurried investment in new technologies became a controversial issue among the market participants during the stated period. One constraints argument was that the priority should be given to the bottlenecks of the existing systems and procedures. Another group of the representatives and Exchange members stressed on the fact that the first group of problems that are explained in Section 5.5.1 should be solved before the implementation of an automated system. In both of the arguments the need for an automated trading system was accepted but the timing and the priorities were questioned. Since both of the parties accepted the need for an automated system, the Istanbul Stock Exchange continued its selection process of the system.

Parallel to the studies of the new technology, the Exchange developed semi-automated procedures for comparing trades between buying and selling members. Some of the operations were computerized for performing trade netting activities. Most important Istanbul Stock Exchange,itself, developed an automation project for heavily traded stocks.

This project was prepared by BOBİM, which is the Data Processing Center of the Exchange. The main goals of this project can be explained as follows:

1- To maintain a computerized system operating with the current trading rules.

2- To minimize utility time, and to disseminate information to the trading floor.

3- To inform brokers immediately after the bids\offers are entered into the system.

This project was important as it had the capacity to inform and prepare the market for the new automated trading system, before it became applicable. In consideration of all the studies and reports mentioned above, the project of BOBİM has not yet been implemented.

5.6.1- Selection of the System

These reports clarified the key objectives in the development of the new technology which were as follows:

1- Continuation and enhancement of floor based trading while allowing for future use of screen based market structures

2- Improving trading and back office efficiency through trading and clearing integration

3- Increased capacity in the market and higher quality market data.

The recommendation that ISE favored for the initial phases of development was to acquire the necessary technology from other exchanges or from vendors who have implemented systems at other exchange markets. The criteria for the selection of the systems were set by the managers of ISE. These criteria are as stated below:

1-The system should be currently running at a stock exchange for at least one year.

2-The system should be offered commercially.

3-The system should have been installed in more than one exchange.

4-The system should operate on computer hardware which is currently supported with local hardware support staff in Istanbul.

5-The system should have been subsequently implemented in a

language different from the language in which it was originally developed.

As the rate of expansion of the market, the growing sophistication of the investment community, changes to the regulatory framework would all work to keep the technology in a rapid state of change for a considerable period of time, part of the difficulty faced by the Exchange was that the functionality needed by the Exchange would change almost as solutions are implemented. A summary of features and capabilities must therefore address the short, middle, and long term requirements. These requirements are exhibited in Appendix 3.

Exchange members, representatives from intermediaries, and CMB experts studied the systems and sources which could satisfy all or most of the requirements.It was decided that the Exchange was better of if it acquired proven exchange technology supported which could be by experienced professionals. There were at least 5 systems which generally meet these criteria available in the market. These are:

1-CATS (Toronto, Brussels, Paris, Madrid)

2-TCAM (Mexico City, Caracas, Vancouver)

3-FEMCON (Boston, San Francisco-Pacific, Athens)

4-MAX (Chicago-Midwest, Amsterdam, Bangkok)

5-OSLO (Oslo, Copenhagen)

These systems offered a selection of hardware, market structures and overall capabilities which addressed the general needs of the Exchange without substantial modification, both in the present and in the future. Several systems were designed to be easily changeable.

For the selection of the system and the automation process ISE hired an American company for advisory services which was the Financial Markets Development Company. After examining all these systems in the last period of 1991, Exchange members declared the TCAM system in Vancouver would be the best choice as the system that would be applied by the Exchange. This system would cost $5 461.2 billion to the Exchange; $4 billion of this amount would be spent for the program and the rest would be spent for the equipment.

5.6.2- System's Architecture

In Section 3.4 a system architecture for a healthy market structure is displayed. Before the establishment of the technological architecture of trading mechanisms, the architecture of the overall system must be formed. For the overall system architecture several factors gain importance. These factors are:

1- The Requirements for the system to function at full capacity,

2- The Market Infrastructure,

3- The Communications Infrastructure,

4- The Structure and the Geographical Distribution of the Market Participants.

1- The Requirements for the system to function at full capacity; in Table 5 and Table 6 the present conditions and full capacity status of the system are compared. Table 7 shows the average daily trading volume and the average daily number of stocks traded since 1986. In 1993 the average daily trading volume reached 594.7 billion TL. Beginning from 1989 the increase in the trading volume was immense. The statistics about the average daily number of shares traded display a similar portrait. In the first half of 1993 the average daily number of shares traded in ISE is 93.1 billion TL. When the present selected system is put into use it will function at a low capacity. This will suffice for the next several years but if the increase in the trading volume and the number of stocks traded follows the present trend the system will shortly be operated at a higher capacity. This will not create problems if the system is designed not to cause bottlenecks even at an accelerated capacity.

2- The Market Infrastructure ; In BCP Report the system architecture is designed to consist of five components. These components are: User interfaces, Communications Gateway (Communications Front End), Market Information Center (Ticker Plant), Trading Engines, and Market Databases. Figure 5 displays the system's architecture.

TABLE 5 PRESENT VOLUMES OF THE SYSTEM

VOLUMES	PRESENT AVERAGE	PRESENT PEAK
Orders	20000	48000
Trades	5000	12000
Inquiries	30000	75000
Stocks Traded	120	120
Bonds Traded	300	600
Total Stocks in Market	1105	1105
Brokers	112	112
Banks	50	50
TERMINALS AND INTERFACES		
Floor-based Member Terminals	300	500
Floor-based Trading Post Terminals	20	40
Market Expert Terminals	10	20
Market Management Terminals	5	10
Surveillance Terminals	3	5
Systems Management Terminals	2	3
Systems Development Terminals	10	20
Upstairs Broker Office Terminals	250	500
Terminals Outside the Exchange	500	1000
Mainframe Interfaces	0	0
Incoming Data Feeds	2	4
Outgoing Data Feeds	3	6
Floor-based Display Boards	5	9
Floor-based Monitors	40	60
RESPONSE TIMES		
Trading Terminals	< 2 sec	< 5 sec

SOURCE: BCP REPORT

TABLE 6 TRADING VOLUMES OF THE SYSTEM AT FULL CAPACITY

VOLUMES	CAPACITY AVERAGE	CAPACITY PEAK
Orders	80000	200000
Trades	20000	50000
Inquiries	120000	300000
Stocks Traded	1500	2500
Bonds Traded	1000	3000
Total Stocks in Market	2500	5000
Brokers	200	300
Banks	100	125
TERMINALS AND INTERFACES		
Floor-based Member Terminals	600	1000
Floor-based Trading Post Terminals	50	100
Market Expert Terminals	30	50
Market Management Terminals	10	20
Surveillance Terminals	8	12
Systems Management Terminals	4	6
Systems Development Terminals	30	40
Upstairs Broker Office Terminals	500	1000
Terminals Outside the Exchange	1500	3000
Mainframe Interfaces	10	30
Incoming Data Feeds	5	10
Outgoing Data Feeds	8	15
Floor-based Display Boards	15	30
Floor-based Monitors	100	200
RESPONSE TIMES		
Trading Terminals	< 2 sec	< 5 sec

SOURCE: BCP REPORT

TABLE 7 DAILY AVERAGES

	AVERAGE DAILY TRADING VOLUME (BILLION TL)	AVERAGE DAILY NUMBER OF STOCKS TRADED (MILLIONS)	NUMBER OF CONTRACTS TRADED (THOUSANDS)
1986	0	0	-
1987	0.4	0.1	-
1988	0.6	0.1	112.1
1989	6.8	0.9	246.8
1990	62	6.2	746.7
1991	144	18.4	1446.5
1992	224.7	41	1681.9
1993	594.7	93.1	1146.6

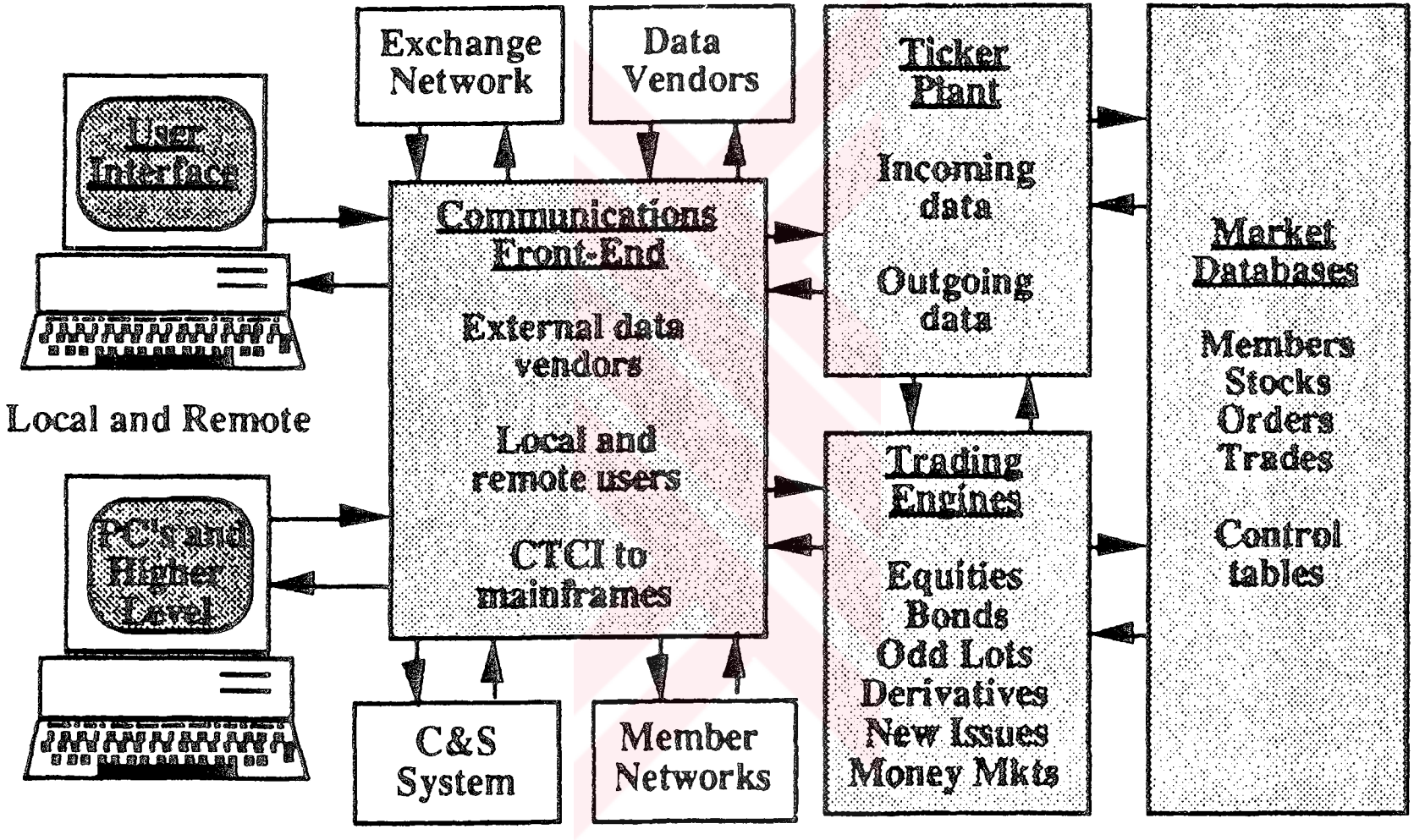
SOURCE: ISE BULLETINS

Communications Gateway can be considered as the most important component of the system, as all the devices are connected to the system by this gateway. All the data are entered into the communications gateway from terminals, computer interfaces, and network connections. These data are then, transferred to the market information center via an on-line system, where news announcements, market statistics, company news, market information from other exchanges, performance data, and index calculations are prepared. These data include a combination of pre-trade, and post-trade price information from the Exchange floor and from the trading engines. The required data according to feedback from market participants is displayed in Table 8.

All trading takes place in the trading engines. Trade is conducted by the systems software which automatically matches bids and offers. This replaces the manual process of placing orders on a board. The placement of an order into the book is also done electronically.

Orders are entered into the system by user interfaces. User interfaces are also used for the inquiries. There must be at least one trading engine for the following markets. A public limit order trading for equities, and an order book trading for equity odd-lots and bonds. Market databases contain all the information for operating the market. In Appendix 4, an overview of the systems required by the Exchange is displayed.

FIGURE 5 ARCHITECTURE OF THE SYSTEM



Trading procedures are similar to the current system's features but they are automated. The order entry can be done through floor terminals, or directly by private communication networks. The rules for writing orders are mostly the same but the essential data such as ; brokers ID, time, order number, are automatically added by the system. The end of day process consists of making up trading files and organizing the book for the coming trading day. In Figure 6, Trading Post of the system, proposed by the Citibank Report, is displayed. Although this proposal is never implemented, it is important as it displays the trading post of a modern exchange.

3- The communications infrastructure, and the structure and the geographical distribution of the market participants are interrelated. The explanation for this is the fact that the communications infrastructure provides access to all the market participants to enable market applications. This is an important aspect in view of the fact that the communications infrastructure enlarges the trade opportunities for both Turkish investors in regions other than Istanbul and Ankara, and for international investors.

FIGURE 6 TRADING POST

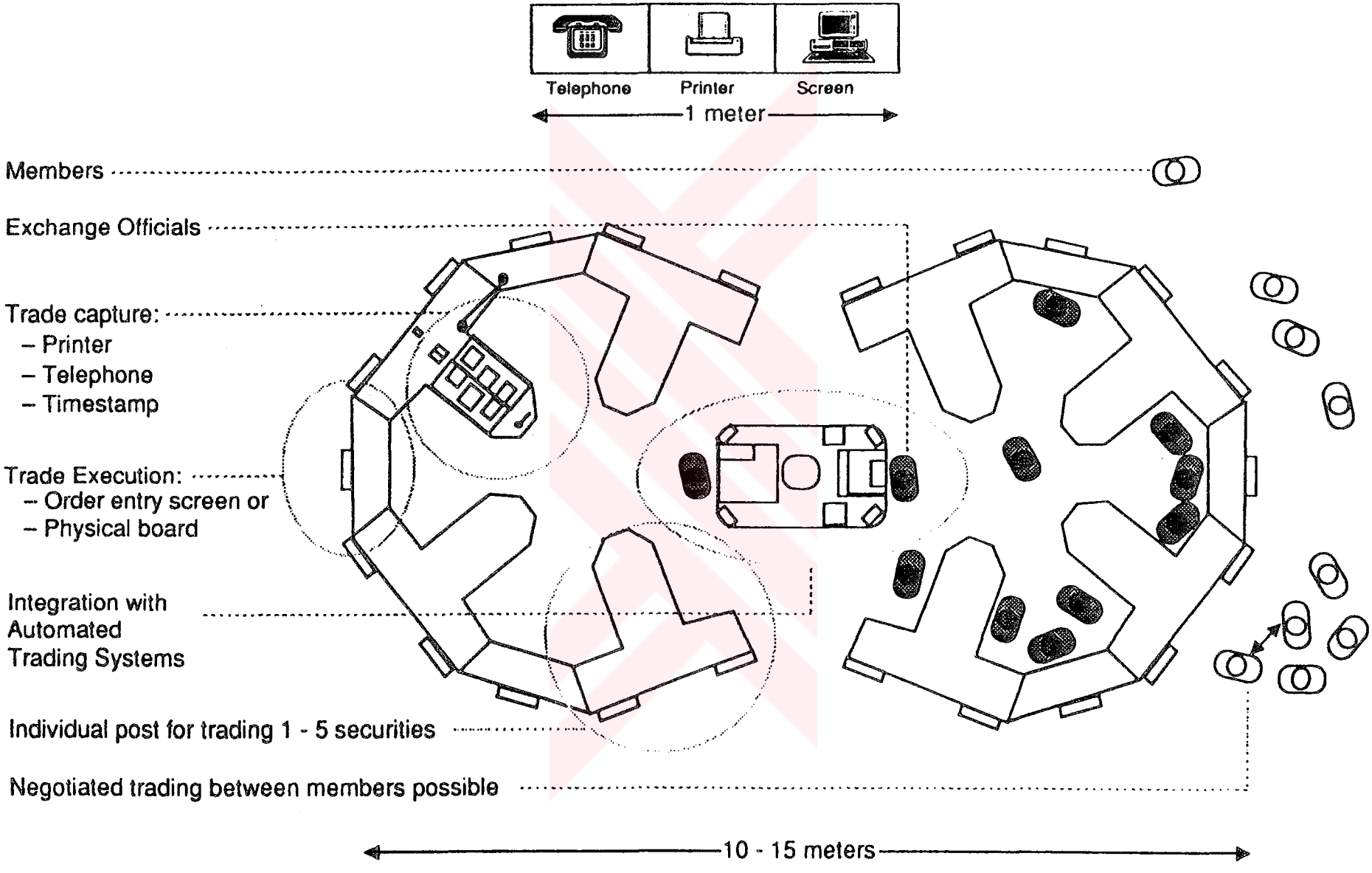


TABLE 8 REQUIRED DATA TO FEEDBACK FROM MARKET PARTICIPANTS

1- Market opening price
2- Daily price limits
3- Last sale price
4- Last sale volume
5- Best bid and ask price
6- The market book
7- Lot size at the best bid and ask price
8- Accumulated lot volume at each price level
9- The number of buy and sell orders in the book
10- The previous day's closing price in each security
11- The day's high and low price in each security
12- The counterpart name at the best price
13- The counterpart names for completed trades
14- Calculation of the market index
15- Accumulated trade volume for the day in each security
16- The number of stocks (rose,fell,unchanged)
17- Headlines of company news
18- Details of company news stories

SOURCE: CITIBANK

In Citibank's Capital Markets Board Modernization Study, it is proposed that the communications network architecture should be differentiated according to the business needs of members and their clients. They recommend two or three possible delivery systems, taking into consideration both time concentration of members in Istanbul but also due to the geographic dispersion of the potential investor base. Figure 7 illustrates a potential network distribution system for the professional market, centered around Istanbul and Ankara. Figure 8 illustrates the retail market distribution. Although this proposition will bring time efficiency for the professional market in Istanbul and Ankara, if this proposed change is put into action the regional and international investors cannot function as efficiently as those in Istanbul and Ankara. This is against the founding idea of a stock exchange which is that all members should buy and sell under equal conditions. In the BCP Proposal the communications infrastructure will be composed of local user work-stations and exchange management terminals, which are connected to multiple local area networks. By third party market data vendor connections and remote user work-stations, market participants from all regions of Turkey and abroad will have market access. Hard-wired PTT lines, microwave or satellite interfaces are the alternatives that are proposed in both the above mentioned and in the Citibank proposal.

FIGURE 7 NETWORK DISTRIBUTION SYSTEM FOR PROFESSIONAL MARKET

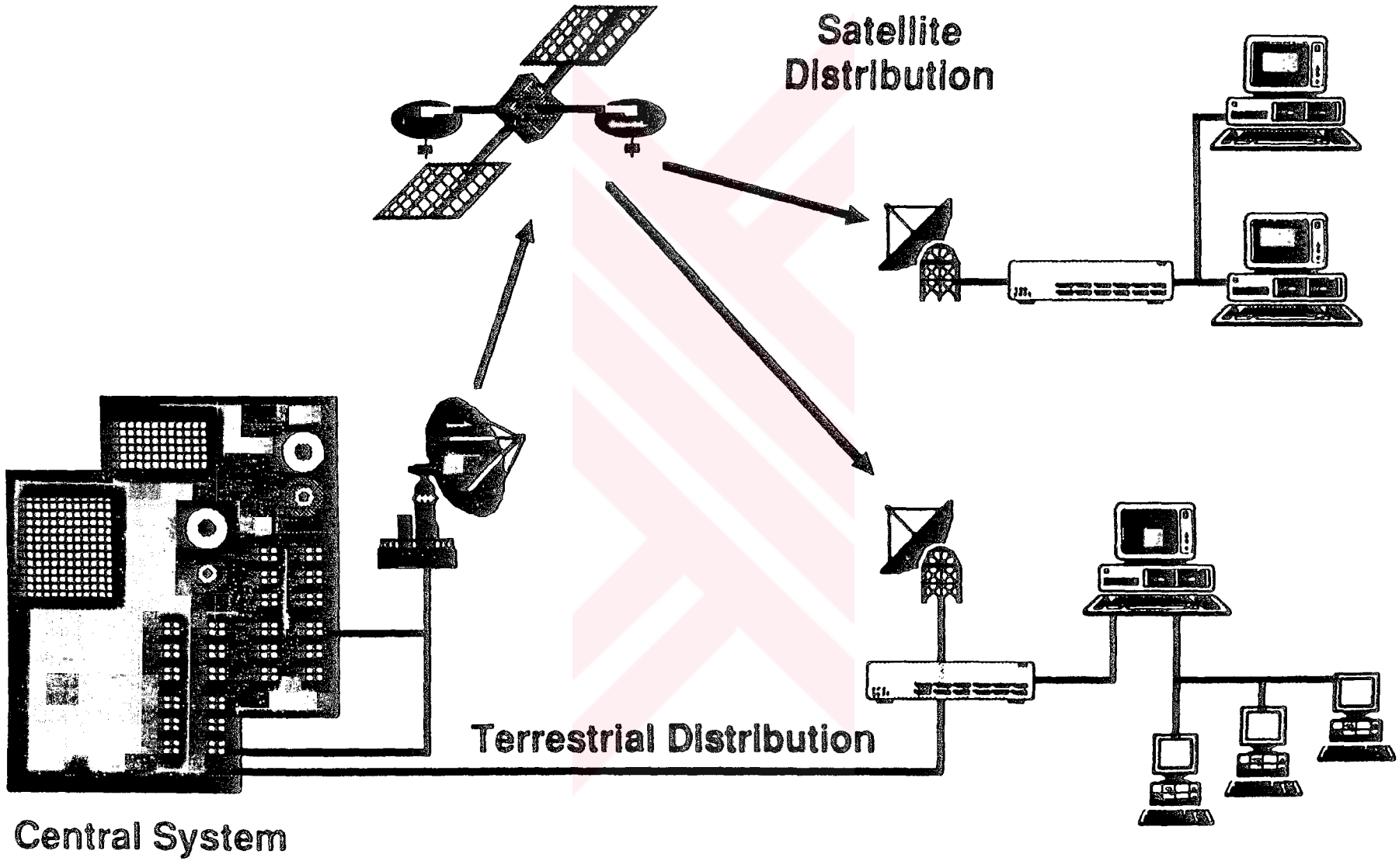
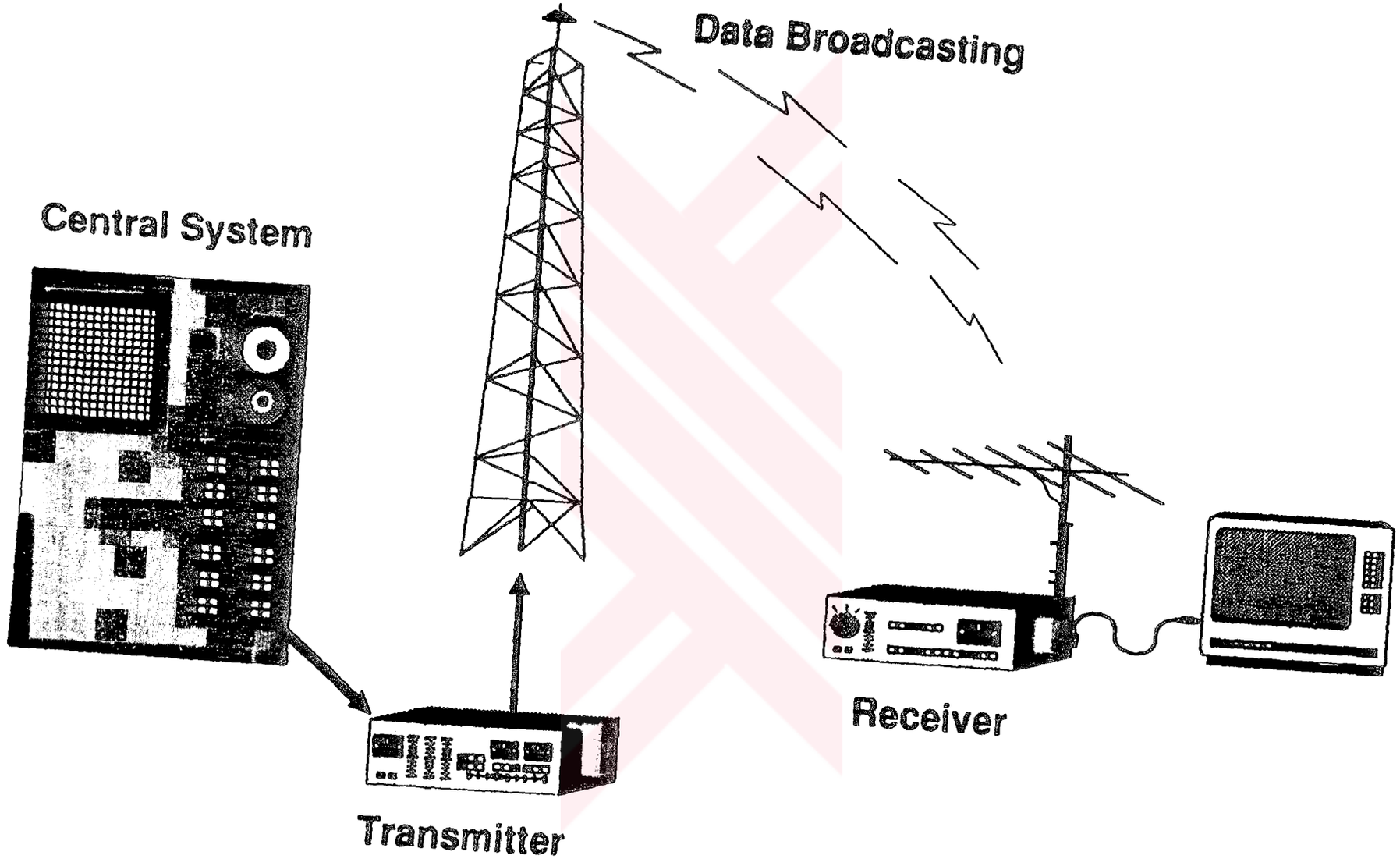


FIGURE 8 NETWORK DISTRIBUTION SYSTEM FOR RETAIL MARKET



5.6.3– General System Functions and Outputs

The general system functions that are summarized in the BCP report are displayed in Table 9.

TABLE 9 GENERAL SYSTEM FUNCTIONS

– order and quote entry,
– market information inquiry,
– order routing and re–routing,
– trading,
– market data distribution,
– clearing and settlement interface,
– order and trade status inquiry,
– market management,
– market surveillance,
– market index calculation and statistical data management.

It is not surprising to see that most of these are taken from the current manual trading system. But some of these functions are very important for the dissemination of information and for the establishment of market efficiency. The inquiry functions will prevent or limit the wrong entries,

which is an important problem of manual trading system. Among these functions market surveillance function can be stated as the most important one. The centralized market surveillance system provides a standard facility with which to investigate the trading activities in all markets. In the BCP Report the main functions of the system is explained as follows:

1– Brokers are always properly capitalized and that their level of collateral is adequate for the level of risk positions they hold. This will prevent brokers to take part in short sales that are beyond their risk positions.

2– As brokers are monitored continuously by the system, they cannot use client funds and securities for principal trading activities.

3– Client orders always receive priority in the market. As clients can observe the actions of brokers, they can keep track of their own orders. The problem of distrust between the investors and the intermediary institutions can be eliminated.

4– Intermediary institutions or other market participants cannot concentrate in any security without monitoring, thus, the speculative actions can be traced and prevented. As no single investor can be able to influence the price of a security, the chance of establishing market efficiency increases.

5– As all trading occurs in the view of the market, the capital performances of investor groups and/or intermediary institutions can be monitored in order to define their tax requirements.

The market surveillance system is very important in establishing efficiency in the market but the outputs of the system will give more information about the possible effects of this system on market efficiency of Istanbul Stock Exchange. As the outputs of the system will be displayed and disseminated among the market participants, investors and intermediary institutions will be reluctant to take part in activities that are against goodwill. The outputs that the system provides are displayed in Table 10.

TABLE 10 THE OUTPUTS OF THE SYSTEM

1- Trades by Time,
2- Trade by Broker,
3- Market Concentration,
4- Unusual Trading volume,
5- Insider Trading Report,
6- Trading Trend,
7- Trading Reconstruction,
8- Staff and Connected Persons Trading

SOURCE : BCP REPORT

Trades by time, shows all the trades in a chronological order. By this output an investor can control when his/her order is executed by the intermediary institution.

Trade by broker, shows all trades by a broker in each stock. This prevents brokers to interfere in the formation of prices. As brokers are monitored, they cannot control or direct the trading volume.

Market concentration, shows the positions of intermediary institutions in each stock which have exceeded established guidelines within a day. This control sequence provides Exchange specialists to enforce intermediaries to correct their positions.

Unusual trading volume, shows stocks that have unusually high trading volume or unexpectedly large transactions. As the peculiarity in the trading volume will be visible by this report, speculative actions of exchange members can easily be identified and controlled.

Insider trading report, shows the intermediaries trading in a particular stock or a group of stocks, before public announcements. This report also shows whether the broker is trading on for a client or acting as a principal in the transaction. although it seems very hard to prevent insider trading, this report can decrease the level of such actions. Intermediary institutions taking part in such activities can be questioned, or their trading activities can be prevented. This is an important aspect for the strong form of market

efficiency to hold true.

Trading trend, shows the trends over a number of days in a single security. Although EMH states that studying on trends cannot bring superior information about security price, there exist many technical analysts in the market studying on the trends. This data can be interpreted by these analysts. Also the availability of information about past prices is necessary for the weak form of market efficiency to exist.

Trading reconstruction, can place a trade into the transaction log as it happened in the system. This facility creates the exact image of how events occurred in the system and eliminates arguments over what occurred. If the nature of the trading process permits, correction of wrong entries can be done and added to the transaction log without preventing the execution of other orders. By this function, the possibility of unfavorable results for the traders who lost the chance of bidding for the stocks because of wrong entries, can be eliminated.

Staff and connected persons trading function, checks detailed trading activities of company members, and/or investors who are thought to have insider information, during times when market announcements are made. Together with the insider trading report, this output prevents the actions of insiders, thus, provides the equal dissemination of information among the market participants.

In Section 3.2., the assumptions of market efficiency are displayed. The outputs that the new automated trading system provides are very helpful for these assumptions to hold true.

As the market participant are connected to the system, the information dissemination is instant. This provides the free availability of information. Additionally, the adjustment of prices to new information can be traced by market participants easily. It is assumed that, the faster the price responds to new information, the more efficient the markets. Since the system provides rapid information dissemination, and free availability of information, the efficiency can be established and enhanced in Turkish Securities Markets.

Langevoort (1985:755) states that " the automation would reduce the transaction cost. Moreover, an automated marketplace would enable individuals to transmit their own trading instructions at a very low cost". After the setup costs are covered, investors will be permitted to obtain low transaction costs, which is an other assumption of an efficient market. The main effects of information can be seen on the semi-strong form of market efficiency as the automated system will disseminate publicly available information to all the market participants, but for the strong form of market efficiency human factors should be considered.

5.6.4- Human Factors in the Stock Exchange

When considering an issue which humans have a great role as it is in a stock market, one should consider the human aspect. Commenting on the market crash of 1987, Philips (1989:139) stresses the human aspect in the trading mechanisms.

> The design for future electronic systems will not center on what kind of computer to use, what screen should look like, or even the hours of trading. Rather, the focus of the discussion has shifted to who should be in the system, how to monitor their positions, and how to keep the money moving.

Kubarych (1989:152) points out the probability of volatility when the human potential is inadequate.

> Some of that technology is in the hands of people who are not well-trained, who do not know what they are doing. Some people are reacting by making imperfect decisions based on information that is not really information, but data has been badly interpreted. This creates potential for high tech fast, cheap, efficient order delivery systems to create more volatility.

Considering the studies made on the subject the logical conclusion is that several steps should be taken to constitute for the human aspect. First the system operators should be chosen carefully and they should be well educated in their fields. Secondly, the members of the intermediary institutions should be informed and educated by seminars conducted by the Exchange. Last but not least, the speculative actions of all market participants should be monitored. Together with the system outputs to control insider trading, steps to establish the strong form efficiency in Turkish Securities Markets, can taken.

6- THE EFFICIENCY OF TURKISH SECURITIES MARKETS

Certain stabilization programs were put into use to pressure Turkish Economy in its transformation into an information based economy. This underlined the importance of information technology which is expected to improve market efficiency in Turkish Securities Markets.

The market efficiency is an important concept for securities markets, as "the creation of wealth depends on the optimal allocation of investment capital, and it is achieved through the efficiency of securities markets" (Grossman and Stiglitz, 1980:334). If the stock prices can be relied upon to reflect the economic signals which the market receives, they can also be considered useful in providing signals to both suppliers and users of capital.

The concept of market efficiency, information technology and its possible effects on market efficiency, and developments in Turkish Securities Markets are explained in the preceding sections. In order to clarify the effects of information technology on market efficiency in Turkish Securities Markets, first of all answers should be found to the questions of "which form of market efficiency do Turkish Securities Markets have", and "in which levels of market efficiency the effects of information technology can be observed".

Many studies are conducted about the efficiency of Turkish Securities

Markets, and they are concerned with the mostly over the efficiency of ISE. These studies could not conclude whether Turkish Securities Markets were efficient in any degree of the efficient market hypothesis. Alparslan (1989) has some doubts as to whether the Turkish Securities Markets can be considered efficient in the weak form.

> Although the runs and autocorrelation tests could not refute the weak form efficiency fully, the results of the filter tests showed that, using some trading rules, an individual could have beaten the market; especially for some of the stocks – with respect to buy and hold returns. These large discrepancies between the buy-and-hold and filter returns proving the doubts about the efficiency of Istanbul Stock Exchange.

Başçı (1989) in his study, especially stresses the test of variance-time function. This function causes significant long term dependence for most of the stocks. This causes inefficiency in the weak form. Çadırcı (1990) found similar results about semi-strong form efficiency. Macro-economic variables are important sources of information in shallow markets like Turkish markets. In such markets where the trading volume is relatively low, the performances and publicly available information about the firms whose shares are traded in the exchange are limited and late. Şengül and Önkal (1992) both stated that Istanbul Stock Exchange was not efficient under the current fiscal and monetary policy. Aydoğan et al. (1992) tested the existence of cointegration between price levels and trading volume, and pointed out the rising question about the efficiency of ISE.

It is hard to claim that the Istanbul Stock Exchange is effective in any form of the Efficient Market Hypothesis. Therefore the expected benefits from

information technology should be establishing market efficiency rather than affecting it.

7- CONCLUSION

Market efficiency is stated and tested in three different forms of weak, semi-strong, and strong level efficiencies. Perfect markets are markets which have pricing, operational, and allocational efficiency. Accordingly, market efficiency ranges from perfect efficiency to inefficiency. As it is explained in section 3.1.3, for practical purposes, having near efficient markets in weak and semi-strong forms will be sufficient for securities markets.

As it was stated earlier, this thesis is a study on the effects of information technology on market efficiency of Turkish Securities Markets. In Section 6, the efficiency of Turkish Securities Markets is questioned, and various sources of inefficiency are identified. Therefore, there is a stressing need to tackle the problem of inefficiency in the Turkish Securities Markets. One important prerequisite to establish efficiency is to improve the quality, speed, reliability, and adequacy of market information through the utilization of modern tools of information technology. Information technology should also be used to establish the efficiency of the markets. In order to establish efficient markets a healthy market architecture is compulsory. Amihud et al.(1985:5) explain the situation as:

> Although recent developments have greatly increased the liquidity of securities markets, much is still desired. When all is said and done, we are still in search of a market design that will best serve the needs of customers - both the investors and the corporations whose securities are traded.

In section 3.1.4 the problems of newly developing securities markets are defined, and the need for a healthy market structure is explained. A healthy market architecture cannot be formed, unless institutionalization of the market place is achieved, and introduction and enforcement of market regulations are provided.

The market and its components should be free of political influence. The new Capital Market Law did not satisfy many of the market components and the needs of the intermediary companies. It is seen that the pressures from different groups, and mainly from holding companies which control banks, affected the formation of the Law.

ISE Executives suffer from their inability to control the market. Their proposition to overcome is that the controlling power should be transferred from the Capital Market Board to the Exchange. Transferring the managerial power to ISE can be useful to overcome some of the problems. While saying this it should be kept in mind that the experts of ISE are more aware of such problems which they face every day.

After the correction of these problems, the use of new information technology in the Turkish Securities Markets can achieve its intended objectives. The automation process is likely to alleviate procedural problems that have prevailed. As Cohen and Schwartz (1989:18) comment that "if properly structured, an electronic based trading system should result far in

better market performance".

In Chapter 5, Turkish Securities Markets are examined. The studies of Istanbul Stock Exchange to automate exchange operations are explained in detail in order to clarify the effects of information technology on market efficiency. In Section 5.6.3, the general system features and outputs are displayed. When these outcomes and their functions are compared to the indicators of an efficient market, which are displayed in section 3.2, it is seen that the new system have important effects on market efficiency of Turkish Securities Markets. These outputs will be utilized by rating agencies, individual and institutional investors, tax authorities, and analysts, by which the system as a whole get benefit from these outcomes.

The new market architecture with its underlying improvements relating to information quality, and speed, is likely to contribute to market efficiency at the semi-strong level. Although the new system introduces barriers to insider trading, the strong level efficiency depends on the goodwill of human beings rather than technology. For the market to be efficient in the semi-strong sense it must also be efficient in the weak sense. The reason for this is that, if price movements follow a predictable path observers benefit from this path and prices react slowly to published information. As explained before, the efficiency of Turkish Securities Markets relates to the speed and quality of its reaction to information . If the market reacts efficiently to public information, the price of a security will be equal to its semi-strong worth.

The use of automated trading system in Turkish securities Markets will increase liquidity, by experiencing low trading costs, by the accuracy of price adjustments to new information, price continuity, continuity of trading, depth, and ease and speed of information.

The quality component of the market efficiency should be based on the sources of information available to investors. Although this study mainly focused on the automation process of ISE, the new information technology can also be applied to other segments of financial markets. For the semi-strong form efficiency to be established, the information to be generated by the new system should be widely utilized by investment advisory services, periodicals, journals, and various computer databases. As such, prices are quite likely to respond instantaneously and without bias to new information.

Information technology also increases the competition in securities markets. Tam (1989:345-354) explained that the companies rely mainly on information technology to stay competitive while facing structural changes in the operating environment. Since investors, and intermediary companies seek quality of information in securities markets adaptation of information technology in each segment of the securities markets will increase both the competition among the services that each component performs and the benefit that investors obtain from these services.

When the human factors of the stock exchange are taken into

consideration, it is expected that by the introduction of computerized technology both the quality and the quantity of the work force in the securities markets will increase as the new technology will create new work opportunities and will require more sophisticated and qualified workers.

The Vancouver model (TCAM system), as adapted for the ISE, thus fulfill the requirements for a healthy market structure. It facilitates full capacity utilization, minimizing bottlenecks even at substantially higher future trading volumes. It has the capability to eliminate fully the currently rampant ISE problems, regarding order and quote entry, order routing and re-routing, clearing and settlements, market surveillance, and information dissemination. When introduced, the new system can handle 4800 orders, 12000 trades, and 75000 inquiries. With the desired capacities of the new system, this capacity is quadurpled. Similarly, the new system can handle trading of 120 stocks and 600 bonds, with 112 brokers and 50 banks, at peak, which seems sufficient for today's trading volume. The new system will allow handling of 2500 different stocks and 3000 bonds, with 300 brokers and 125 banks, reflecting a vastly improved capacity. As Tables 5 and 6 indicate the greatly increase terminal and interface capacity is likely to meet the needs of a very rapidly grooving market. To quote an example the number of terminal capacity outside the exchange will increase from 1000 to 3000, substantially raising access to exchange information from outside. In order to magnify the benefits of new information technology to be utilized by ISE various additional structural improvements can and should be added to the

system. For example, a broadcast of the TRT Teletext can be used to achieve the desired dissemination of information. By viewing Teletext all the members would be currently updated at any place, be it their homes, shops, or offices. The information stated on Teletext should be the formation of the prices and the trades at the exact time that they occur. The executing of this would not cost very much and all regions can benefit from it.

In section 5.6.2, the communication infrastructure, and the geographical distribution of market participants are explained, and some alternative structures are displayed. A combination of all these proposed alternatives, such as hard-wired PTT lines, microwave or satellite interfaces, should be considered. Satellite interfaces gain importance, as the Turkish satellite, TURKSAT, will be launched within a year or less. An agreement between TRT and the Exchange can provide the fastest and the widest dissemination of information among the market participants with a little cost. For the communication between the Exchange and intermediary institutions, hard-wired PTT lines is a preferable alternative. The reason behind this comment can be explained as follows. Almost all the commercial banks which are also dealing with intermediary operations, have their own hard-wired connections among their branches. There are some studies to establish a nationwide communication link among some banks (Yapı Kredi Bankası and Pamukbank) with the help of these lines. After the interaction system is established among banks, this system can easily be connected to the system of the Exchange. Brokerage houses can be introduced to this

link, by some restrictions which will permit brokerage houses to activate only in Exchange operations. By the help of this nationwide system Automated Teller Machines (ATM) can be used as input devices to the system. Studies of İş Bank on using ATMs as user interfaces for bidding and offering can be useful for such a system.

To obtain all the benefits of a voluntary, market-based decision making, Turkey needs an efficient financial system. As the Turkish Securities markets are important segments of Turkish Financial System, the efficiency of these markets becomes an important issue. Various structural, and operational barriers to capital market efficiency, as identified in this paper, can easily be removed by the utilization of advanced tools of information technology which would emphasize speed, reliability, and adequacy of information flow.

In summary, the importance of Turkish Securities markets among the world markets, will increase, if the automated trading system of Istanbul Stock Exchange is carefully installed and operated.

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9 - INTERVIEWS

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APPENDICES

APPENDIX 1 INSTITUTIONAL ARRANGEMENTS IN WORLD MARKETS

COUNTRY	AUCTION	FORWARD TRADING ON EXCHANGE	AUTOMATED QUOTATIONS	COMPUTER DIRECTED TRADING	OPTIONS FUTURES TRADING
Australia	contin.	no	yes	no	yes
Austria	single	no	no	no	no
Belgium	mixed	yes	no	no	no [a]
Canada	contin.	no	yes	yes	yes
Denmark	mixed	no	no	no	no
France	mixed	yes	yes	yes	yes
Germany	contin.	no	no	no	Options
Holland	contin.	no	no	no	Options
Hong Kong	contin.	no	yes	no	Futures
Ireland	contin.	no	yes	no	no
Italy	mixed	yes	no	no	no
Japan	contin.	no	yes	yes	no [i]
Malaysia	contin.	no	yes	no	no
Mexico	contin.	yes	no	no	no
New Zealand	contin.	no	no	no	Futures
Norway	single	no	no	no	no
Singapore	contin.	no	yes	no	no [n]
South Africa	contin.	no	yes	no	Options
Spain	mixed	no	no	no	no
Sweden	mixed	no	yes	no	yes
Switz.	mixed	yes	yes	no	yes
Turkey	single	no	no	no	no
United Kingdom	contin.	no	yes	yes	yes
United States	contin.	no	yes	yes	yes

APPENDIX 1 CONTINUED

COUNTRY	PRICE LIMITS	TRANSACT. TAX	MARGIN REQUIR.	TRAD.OFF EXCHANGE	OFFICIAL SPECIAL
Australia	None	0.6%	None	Infrequent	no
Austria	5%	0.3%	100%	Frequent	yes
Belgium	10%/None [b]	0.375% /0.195%	100%/25% [b]	Occasional	no
Canada	None [c]	0	50% [d]	Prohibited	yes
Denmark	None	1%	None	Frequent	no
France	4%/7% [e]	0.3%	100%/20% [f]	Prohibited	yes
Germany	None	0.5%	None	Frequent	yes
Holland	Variable	2.4% [m]	None	Prohibited	yes
Hong Kong	None [g]	0.6% +	None	Infrequent	no
Ireland	None	1%	100%	Frequent	no
Italy	10-20% h	0.3%	100%	Frequent	no
Japan	-10%	0.55%	70% [j]	Prohibited	yes
Malaysia	None	0.03%	None	Occasional	no
Mexico	10% [k]	0	None	Occasional	no
New Zealand	None	0	None	Occasional	no
Norway	None	1%	100%	Frequent	no
Singapore	None	0.5%	71%	Occasional	no
South Africa	None	1.5%	100%	Prohibited	no
Spain	10% [p]	0.11%	50% [p]	Frequent	no
Sweden	None	2%	40%	Frequent	no
Switz.	5% [q]	0.9%	None	Infrequent	no
Turkey	10%	0	yes	Frequent	no
United Kingdom	None	0.5%	None	Occasional	no
United States	None	0	yes	Occasional	yes

APPENDIX 1 CONTINUED

a – Calls only on just five stocks.

b – Cash/forward.

c – None on stocks; 3–5% on index futures.

d – 10% (5%) for uncovered (covered) futures.

e – Cash/forward, but not always enforced.

f – Cash/forward; 40% if forward collateral is stock rather than cash.

g – "Four Spread Rule": offers not permitted more than four ticks from current bids and asks.

h – Hitting limit suspends auction; auction then tried a second time at the end of the day.

i – Futures on the Nikkei Index are traded in Singapore.

j – Decreased to 50% on October 21, 1987 "to encourage buyers".

k – Trading suspended for executive periods, 15 and then 30 minutes, effective limit: 30 – 40%.

l – Authorities have discretion. In October, 2% limits every 15 minutes used frequently.

m – For non–dealer transaction only.

n – Only for Nikkei Index (Japan).

o– Groups of stock are traded continuously for 10 minutes each.

p – Limits raised to 20% and margin to 50% on October 27.

q – Hitting limit causes 15–minute trading suspension. Limits raised to 10 – 15% in October.

Source: Roll, Richard, The International Crash of October 1987

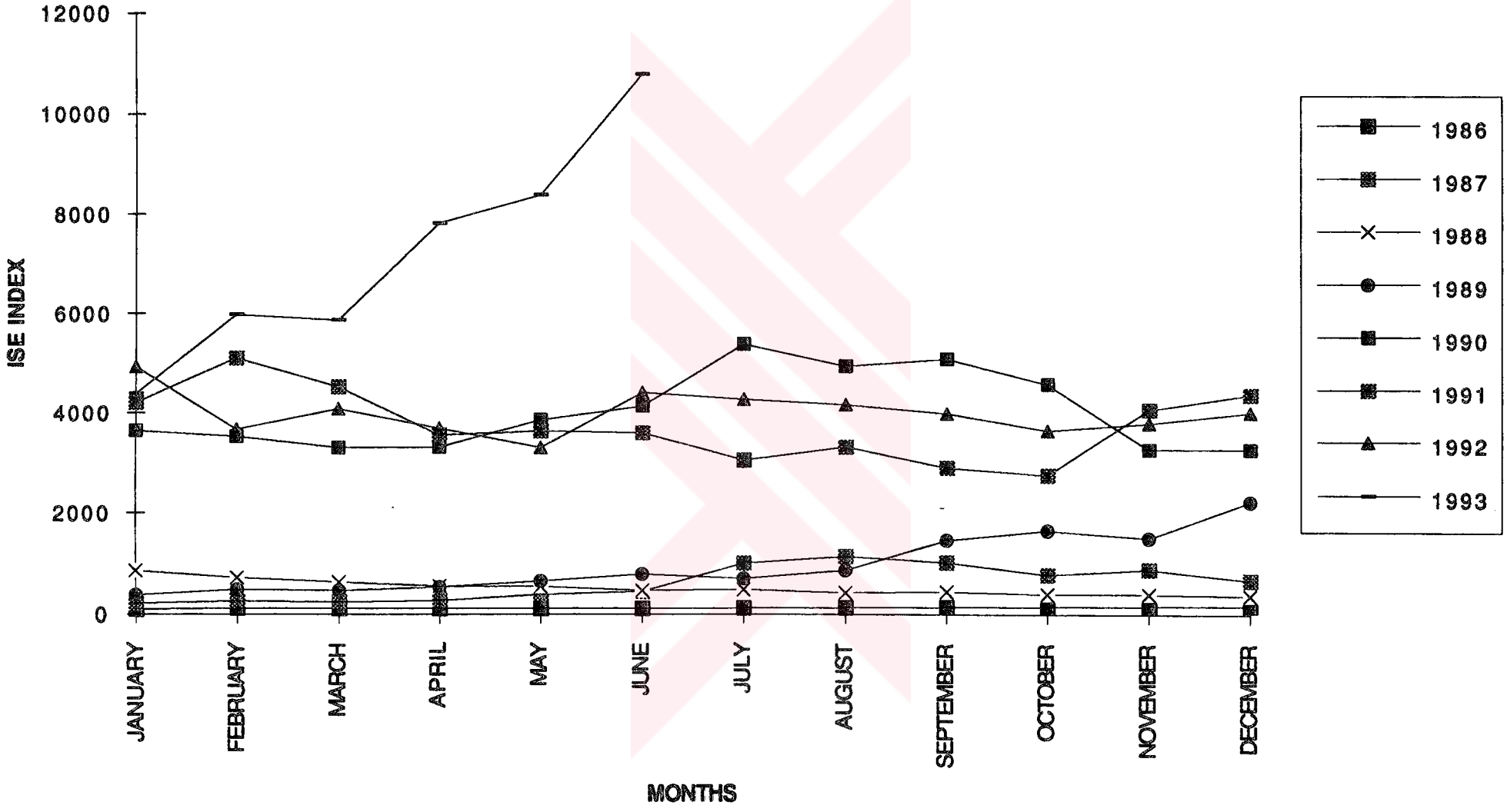
APPENDIX 2 EVOLUTION OF THE TURKISH SECURITIES MARKETS

APPENDIX 2.1.a CHANGES IN THE ISE INDEX

	1986	1987	1988	1989	1990	1991	1992	1993
JANUARY	100	216.9	857.74	379.74	3641.25	4213.48	4926.19	4383.01
FEBRUARY	119.87	260.76	721.03	487.09	3516.12	5102.57	3664.36	5973.61
MARCH	115.75	245.83	635.27	465.9	3294.31	4519.95	4076.62	5864.17
APRIL	112.28	269.4	553.68	533.62	3308.23	3554.25	3686.37	7807.64
MAY	115.13	394.79	553.07	653.95	3853.08	3626.36	3297.36	8375.75
JUNE	115.43	446.31	468.9	795.88	4132.98	3587.36	4407.23	10778.67
JULY	121.45	1012.1	492.88	701.43	5384.48	3041.44	4264.13	
AUGUST	138.6	1149.03	428.06	875.98	4939.23	3301.29	4157.83	
SEPTEMBER	146.67	1029.75	455.22	1475.26	5085.15	2887.33	3979.4	
OCTOBER	150.24	786.38	404.12	1664.01	4570.44	2746.84	3642.7	
NOVEMBER	160.31	890.61	405.84	1507.54	3256.96	4058.47	3786.24	
DECEMBER	170.86	673	373.93	2217.66	3255.75	4369.15	4004.18	

SOURCE: ISE MONTHLY BULLETINS

APPENDIX 2.1.b CHANGES IN THE ISE INDEX

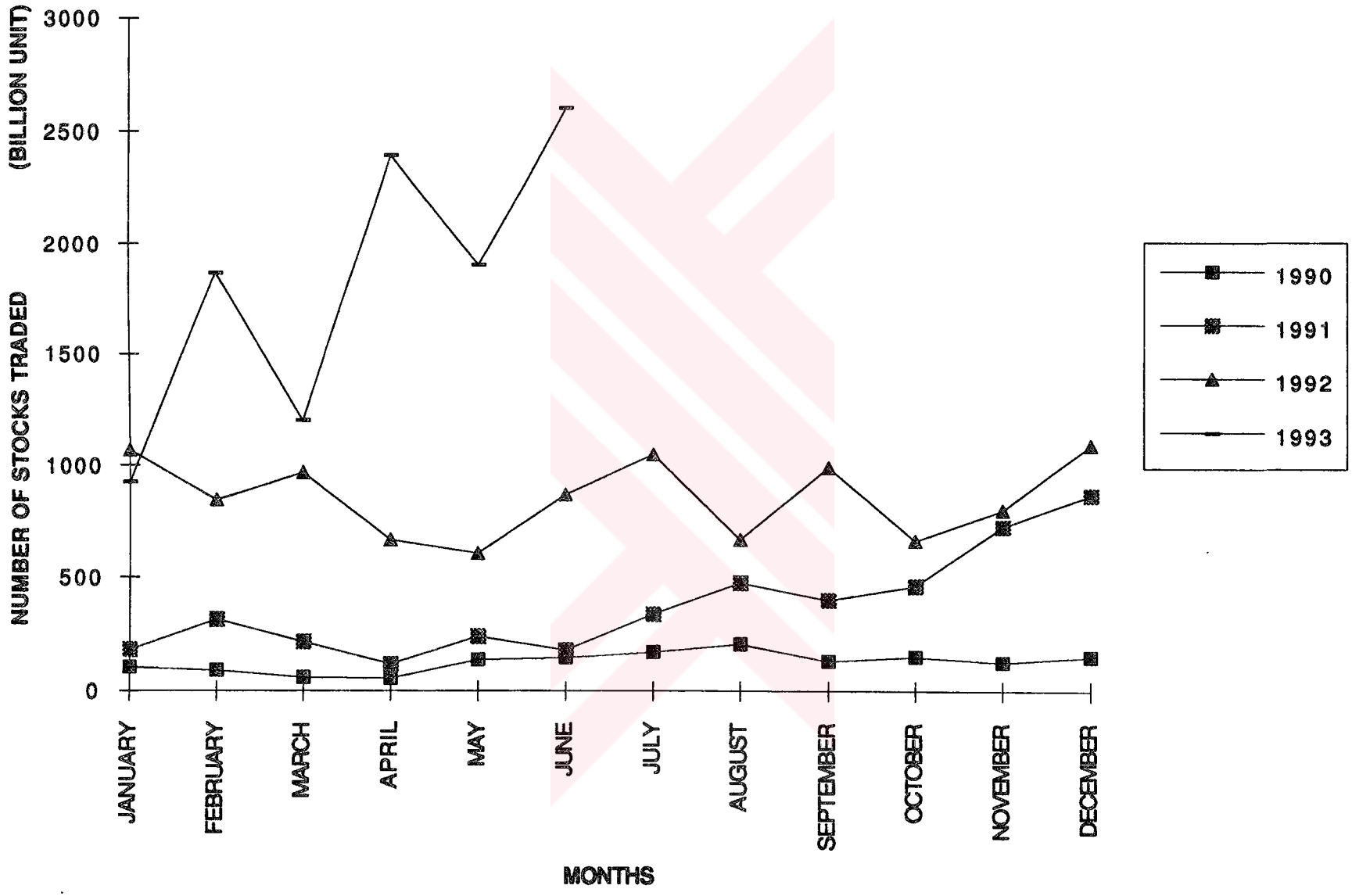


APPENDIX 2.2.a MONTHLY TRADING VOLUME (BILLION TL)

	1990	1991	1992	1993
JANUARY	1128.3	1650.4	7489.3	4657.2
FEBRUARY	1184.4	3891.9	5562.7	11166.5
MARCH	649.7	2755.3	5853.1	6740.6
APRIL	528.7	1405.6	3820.1	15585.4
MAY	1383.9	2971.5	3104.2	13613.8
JUNE	1115.6	1776.8	5071.9	17762.7
JULY	1556.7	2636.5	6627.5	
AUGUST	2018.5	3674.4	3503.7	
SEPTEMBER	1512.3	1960.5	4704	
OCTOBER	1690.4	1905.7	2422.5	
NOVEMBER	1200.5	4944.5	3219	
DECEMBER	1344.1	5893.7	4975.5	

SOURCE: ISE MONTHLY BULLETINS

APPENDIX 2.3.b NUMBER OF STOCKS TRADED

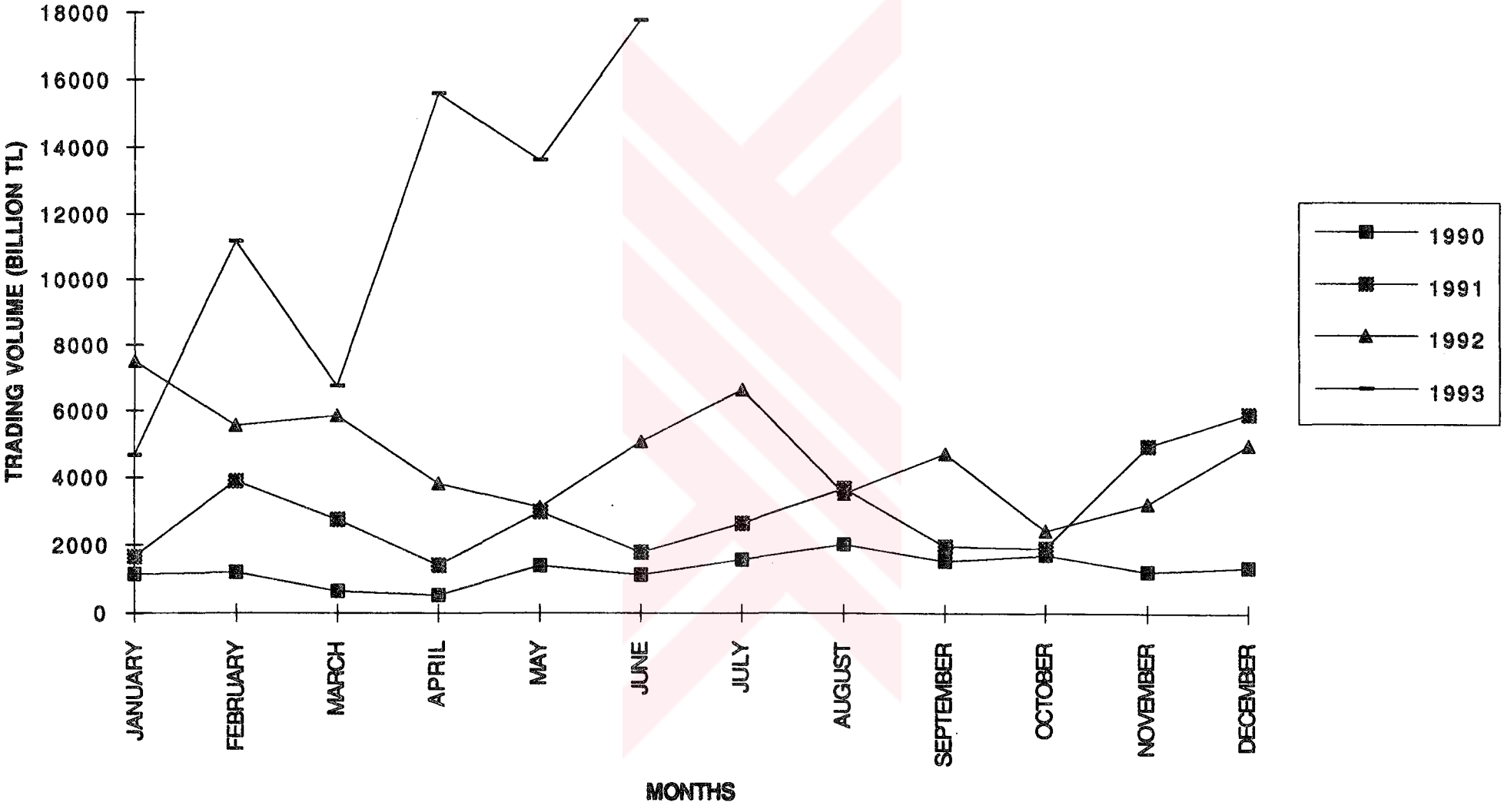


APPENDIX 2.3.a MONTHLY NUMBER OF STOCKS TRADED (BILLION UNIT)

	1990	1991	1992	1993
JANUARY	104.2	183.7	1067.6	924.3
FEBRUARY	91.3	316	845.7	1868
MARCH	61	218.4	969.3	1198.8
APRIL	56.2	120.5	666.9	2394.3
MAY	138.1	242.5	607.4	1903.5
JUNE	146.5	180.6	869.2	2598.3
JULY	171.5	338.2	1047.1	
AUGUST	207.9	476.1	667.9	
SEPTEMBER	130.6	400.9	990.5	
OCTOBER	151.8	463.9	663.6	
NOVEMBER	126.4	725.2	798.9	
DECEMBER	151.9	866.3	1090.6	

SOURCE: ISE MONTHLY BULLETINS

APPENDIX 2.2.b MONTHLY TRADING VOLUME



APPENDIX 3 SYSTEM REQUIREMENTS

A - SHORT TERM REQUIREMENTS (0 TO 6 MONTHS)

Securities Supported

- Equities
- Fixed Income
- Index Calculations (not trading)

Trade Support

- Order and/or Quote Capture
- Order and/or Quote Book Management
- Manual Trade Matching
- Market Opening Support

Market Information Facilities

- Quote Inquiry
  - Best Bid and Offer and Size of Market
  - Depth of Market
  - Average Price to Execute
  - Member id (optional, restricted access)
- Intra-day volume
- Market watch

Communications

- Trade Reporting to Members
- Market Data Third Party Vendor Feeds

B– MIDDLE TERM REQUIREMENTS (6 TO 18 MONTHS)

Securities Supported

Equities

Fixed Income

Index Options (approximately 12 months)

Trade Support

Trade capture terminals in the brokers offices

Market Information

Company News

Historic Price Data

Communications

Computer to computer Interfaces to Member Networks and mainframes

Communications Front End message switch

C – LONG TERM REQUIREMENTS

Securities Supported

Equities

Fixed Income

Index Options

Equity Options

Financial Futures

Trade Support

- On-line Interactive Trading (if desired)
- Automatic Execution of Small Orders
- Best Book (combined quote and order book)
- Institutional Access (if desirable)

Market Information

- Trade by Trade Size Reporting
- Graphics Products
- Real-time Integration of Trade with Company Information
- News Flash Facility

Communications

- Expected Universal Message Switch Facilities

APPENDIX 4 OVERVIEW OF THE SYSTEMS REQUIRED BY THE EXCHANGE

A – TRADING SUPPORT SYSTEMS

Order Routing

Order and/or Quote Management

Computer to Computer Interfaces to Member networks and mainframes

Trade Capture and/or Trading automation

Trade Reporting

Surveillance

Market Administration

B – MARKET INFORMATION

Trade Report Distribution

Index Calculation and Distribution

Best Bid and Offer (either quote or order book)

Company data bases

Price Data Historical Data Bases

C - COMMUNICATIONS FRONT END

Incoming market data for display in the Exchange System and floor displays

Interfaces to Third Party Data Vendors who buy data from the Exchange

Message Switch to Trading Terminals and Member Networks and Mainframes

Interface to the Exchange owned market information system

Interface to off-floor monitors and display boards