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**Inter - Connected Market System  
Feasibility Report  
The Federation of Indian Stock Exchanges**

**Financial Institutions Reforms and  
Expansion (FIRE) Project**

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# Inter-Connected Market System

## Feasibility Report

by Bill Gorman, Consultant

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# Inter-Connected Market System

## Feasibility Report

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### 1. Executive Summary

The stock exchanges in India are on the path of a fundamental and irreversible transformation of the way they do business. Regional exchanges, who once had a secure niche of their own, are facing possible extinction despite significant investments in trade automation. Technology and competition are eroding their market share. Member profitability is declining. Trading volume is declining. The regional exchanges must adapt and meet the needs of the market or they will perish. To address these needs, the exchanges have mooted creation of an Inter-Connected Market System (ICMS).

This document is a review of the proposed ICMS. We have not performed any analysis of costs as that is beyond the scope of this effort. Nonetheless, we recommend that FISE vigorously pursue the inter-linking of the Indian Stock Exchanges. Our recommendation is based on the postulate that competition will be served and the health and robustness of the Indian capital markets will be enhanced if the exchanges pool their order books in an efficient manner (i.e. enable inter-market trading).

#### 1.1 Background

The Federation of Indian Stock Exchanges (FISE) has proposed creation of a Inter-Connected Market System (ICMS) and have asked the USAID-FIRE Project (administered by Price Waterhouse) for technical assistance in reviewing the feasibility of the proposed system.

This document is an evaluation of the ICMS and attempts to answer the following questions:

1. Is the concept sound and correct?
2. What are the possibilities?
3. If the concept is viable, what are the next steps which should be taken?

#### 1.2 Objective

The purpose in building ICMS is to create a superior market system. This is defined as:

- fair, orderly and efficient;
- inexpensive and cost efficient;
- transparent;
- liquid;
- a level playing field;
- able to compete with the larger markets;
- able to serve the grassroots investor;
- able to support the small as well as the larger companies.

### **1.3 Alternative Approaches**

Linking the Indian Stock Exchanges together into an efficient Inter-Market Trading System (ICMS) is certainly feasible. It would be technically quite simple to build. The potential impediments to success are cost, willingness of the exchanges to participate, ability to address the risks associated with cross exchange trading and settlement and ability to move quickly.

The existing options to achieving inter-market connectivity are:

- Shared National Automated Trading System;**
- BOLT Nationwide Expansion;**
- Linked National and Regional Automated Trading Systems;**
- Linked Regional Exchange Automated Trading Systems.**

We recommend choice three, linking the various exchange automated systems with a National Limit Order Book with a minor variation. We suggest that it may be preferable to have the trades executed by the existing trading systems rather than the National Book system. This would be the simplest and least expensive approach. It uses existing systems and involves minimal changes to those systems. More importantly, it would provide significant benefits to the investors who use the regional exchanges and to the small low capitalisation companies which list on those exchanges.

### **1.4 Advantages**

An Inter-Connected Market System would deliver the following benefits:

- Improve the price discovery process.
- Enable investors in any region of the country to buy or sell securities listed on any participating exchange.
- Simplify market access for regional investors.
- Enable the regional exchanges and their members to be more competitive.
- Provide wider exposure for small less well capitalised companies.
- Reduce market fragmentation and expose customer orders to a wider market.
- Expand the market reach of the small regional broker.
- Pool liquidity.
- Improve transparency and market efficiency.
- Leverage investments made by the regional stock exchanges.
- Enable trading at very competitive costs.
- Improve settlement services.

### **1.5 Impedimenta**

The biggest barriers to inter-connectivity between exchanges are:

- Differences in card value across different exchanges. Members of the Bombay Stock Exchange value their cards at a crore or more. The differences in card values between exchanges is obviously more of an impediment for the larger

exchanges, especially the Bombay (Mumbai) Stock Exchange (BSE) than it is for the smaller exchanges. It is difficult for BSE members to contemplate giving the smaller exchanges access to their, BSE's, market and order flow without some sort of quid pro quo. Over time, the obvious advantages of participation in a broader national market will be an attractive draw for BSE members.

- Fear in dealing with unknown members
- A lack of common rules. The trading and settlement rules and procedures employed by the exchanges differ from one exchange to another. These must be harmonised if the ICMS is to be successful.
- Cost to build and operate. A key impediment to building an ICMS is cost and affordability. The approach we recommend is the least expensive of the available choices. While no solid cost data is available, an educated guess suggests that an ICMS is affordable and that the benefits warrant the expense. One potential vendor (CMC) has proposed a solution which would link 8 exchanges at a cost of Rs. 5 to 8 Crore. Two other vendors have indicated an ability to implement a low cost solution. In terms of affordability, it appears that some of the vendors would consider building the system on a BOO/BOT (Build Own Operate or Build Own Transfer) basis. Therefore one of the first steps FISE should take is to develop some reliable cost estimates.
- There may be a modest drop in Listings revenues. This would occur if a company currently listed on multiple exchanges opted to list only in the market in which they are headquartered. The GM of the Vadodara Stock Exchange has suggested charging a higher fee for an inter-market listing. The companies then need only file with their home exchange to enjoy trading privileges at all ICMS exchanges.

Another impediment is the delays inherent in making a decision. Exchanges by their very nature are slow in making infrastructure investments. Members are like shareholders with one important difference. They hold their card (shareholding) for the purpose of participating in the market rather than as an investment. Thus members must be convinced that any proposed investment is good for their business and not just an expense which could be avoided.

## **1.6 Recommendations**

We hold that a major role of the regional stock exchanges is to support local investors and local companies especially the smaller, less well capitalised companies and to assist in their growth. The ability of regional exchanges to support local growth is dependent upon their ability to provide efficient price discovery. This (efficient price discovery) is the *raison d'être* for inter-connecting the Indian markets.

It is the opinion of the author that building an ICMS is critical to the survival of the regional exchanges and to the market's ability to serve the small low capitalisation companies. It is the general consensus of most observers that the smaller exchanges will slowly wither away. The larger markets are not waiting for the regional markets to propose or develop an efficient market mechanism. They are aggressively pursuing an oligopoly role for themselves.

Time is of the essence. If the regional exchanges are to retain a role for themselves in the Indian Capital Market Structure, they must act quickly. To use an old expression, they must:

**Do it! Do it right! and Do it right Now!**

## **2. FISE Goals & Objectives**

### **2.1 Meeting India's Needs**

The culture of the Capital Markets has caught on in India. Investors, market intermediaries, politicians of all stripes, ordinary citizens want a robust, vibrant and fair market for India. The markets are needed to address India's development and business requirements. Above all, the markets must be fair and provide a level playing field. The concepts of market inter-connectivity is intended to meet these needs in a positive and attractive manner.

### **2.2 Creating an ideal Inter-Exchange Market**

While it is common wisdom, that technology and competition are posing serious threats to regional exchange survival, those forces bring significant opportunity as well. It is with the help of technology and the spur of competition that the FISE exchanges can develop a superior market system. To be truly superior, the inter-exchange market must be:

- fair, orderly and efficient;
- inexpensive and cost efficient;
- transparent;
- liquid;
- a level playing field;
- able to compete with the larger markets;
- able to serve the grassroots investor;
- able to support the small as well as the larger companies.

Inter-connectivity is the sine qua non in building a superior market system using multiple dispersed markets as a base. Indeed, linking may be the only way for the regional exchanges to survive or to compete, prosper and serve their members, clients and listed companies.

Ideally, the market system should bring all orders together so as to achieve more efficient price discovery. At the same time, it should provide an environment in which the exchanges can compete effectively. It should enable the trading of any and all securities from any of the participating exchanges. It should expose an investor's orders to as broad a market as possible. The result would be increased transparency and improved market liquidity.

Providing efficient markets for smaller companies is a key goal of ICMS. The Bombay Stock Exchange (BSE) lists approximately 6900 companies, 5000 of which trade only very infrequently. The market for those securities is obviously inefficient. They escape the notice or purview of the average BSE broker. A nationwide ICMS would provide far greater exposure for these companies..

FISE's primary goal is to provide the means by which the regional stock exchanges can continue to serve the investor community (especially the small grassroots investor) and the listed companies. A second goal is to address those issues, problems and opportunities which are best addressed by the exchanges as a group rather than individually (e.g. harmonisation of rules, risk management, depository participation, industry standards, etc.).

### **2.3 Benefits of Inter-Connected Markets**

Linking the regional exchanges in India into an Inter-Connected Market System would deliver significant benefits to all market participants. It would:

- Improve the price discovery process at all participating exchanges. It would widen and deepen the market.
- Enable investors in any region of the country to buy or sell securities listed on any participating exchange.
- Simplify market access for regional investors.
- Enable the regional exchanges and their members to be more competitive.
- Provide wider exposure for small less well capitalised companies.
- Reduce market fragmentation and expose customer orders to a wider market.
- Expand the market reach of the small regional broker.
- Pool liquidity, thereby improving it and reducing spreads. Once a market has liquidity, everyone tends to go there.
- Improve transparency and market efficiency.
- Leverage investments made by the regional stock exchanges.
- Enable trading at very competitive costs.
- Improve settlement services.

### 3. Present Situation

#### 3.1 Historical Background

There are 22 stock exchanges in India (see figure 1). They are on the threshold of an irreversible transformation of the way they do business. Regional exchanges, who once had a secure niche of their own, are facing possible extinction. Technology and competition are eroding their market share. Member profitability is declining. Trading volume is declining.

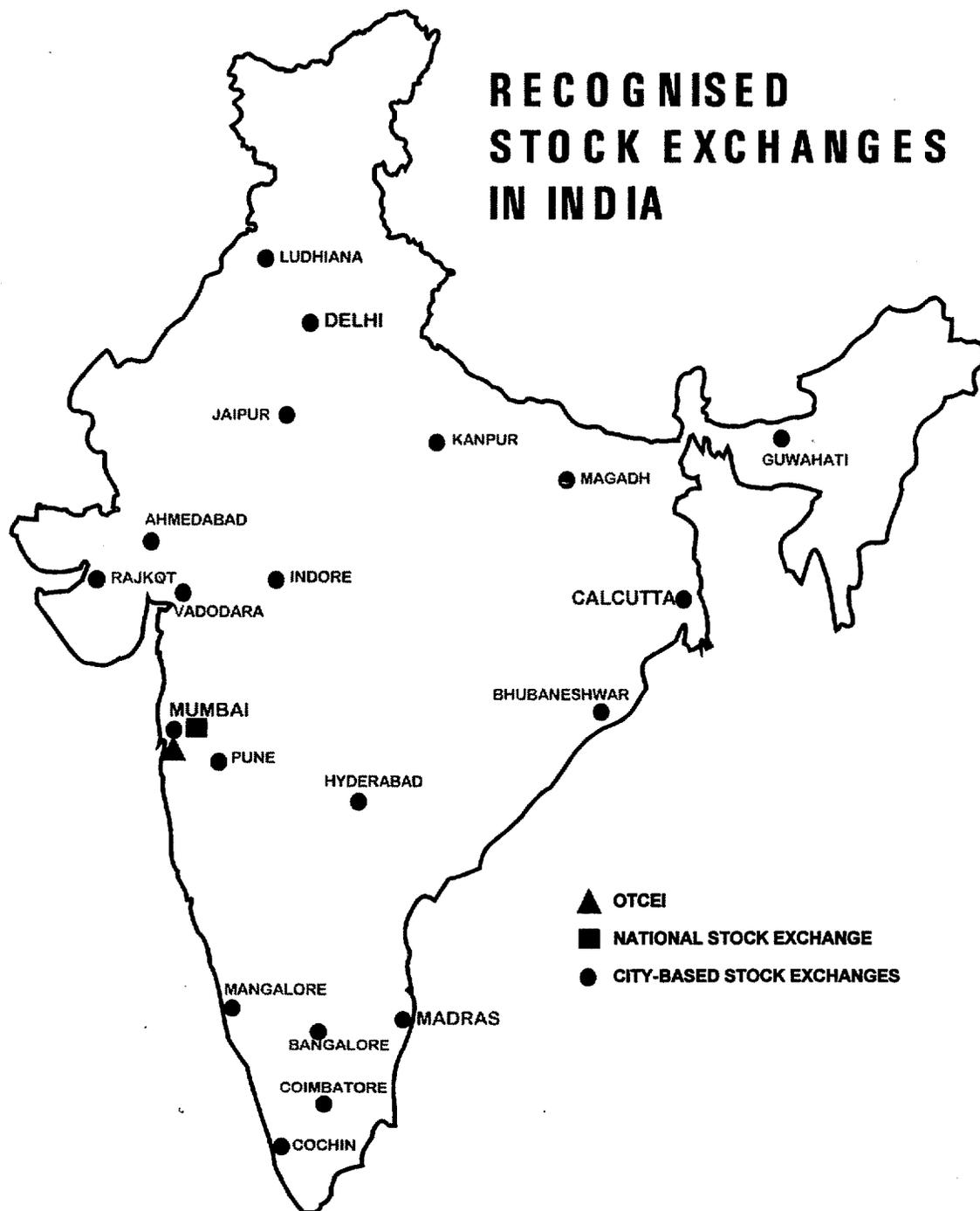


Figure 1. Stock Exchanges in India

### **3.1.1 Infrastructure**

In the past, poor infrastructure (e.g. banking, telecommunications, manual settlements, etc.) and government policy favored regionalisation of the securities markets. Bad and fraudulent deliveries made participants skittish about taking securities from other participants who they did not personally know. Exchanges (by legislation) dealt only in their own city /region. The BSE, because of its history, was the premier exchange in the country.

Brokerage operations were generally small and confined to a single location. Being small, they found it preferable to deal with a local exchange rather than a larger entity in a distant location. In many other large countries, brokers have a more national character than have the Indian firms. In those countries, brokers have tended to establish particular niches (e.g. nation-wide full service, discount firms, specialty houses and regional boutiques).

In India, few brokers have ventured beyond their own locale. Most brokers do not have the resources to expand nationally. Instead, the exchanges (NSE and now BSE) have expanded nation-wide. As an alternative, Sub-Brokers are used to service a dispersed clientele. NSE and BSE expansion plans reflect an expectation that brokers will remain local in nature and without communications facilities of their own.

### **3.1.2 Manual Processing**

Trading, settlement and share transfer was manual. Generally an investor did not know until the end of the trading day or the start of the next what trades he was able to effect and at what prices. Because of the nature of physical settlement, settlement was based on account periods. When it wasn't possible to settle physically, the exchange enabled carry-forward (badla) trading. To ease delivery problems, settlements were sometimes postponed or bunched.

Share Transfer was also manual. Most scrip is issued in lots of 50 or 100 shares. The sheer volume of paper coupled with the requirement for a Company Board to approve transfers lead to significant delays in transferring shares from seller to buyer. Because of those delays, many investors simply passed on scrip they had bought without seeking to transfer it. This had the effect of hiding bad deliveries and fraudulent shares from market participants.

### **3.1.3 Birth of the National Stock Exchange**

The Government of India moved to establish a more market oriented economy. The government engendered creation of the National Stock Exchange (NSE). It gave the exchange a mandate to create a nationwide automated trading system. NSE was given a professional management. Members did not have the final say in the exchange's development.

NSE's automated trading system was an early success. Because it was automated, it was also transparent. With NSE's system, investors would know the price at which they could trade. They found it easy and fast (indeed immediate) to execute a trade. This immediacy and transparency encouraged profound changes in trading patterns. It was now possible to trade the market on a real-time basis. Because delivery of shares was not required until the end of an account period, a new breed of trader /speculator was born. Volumes increased dramatically while delivery percentages declined in an equally dramatic fashion. These practices will change dramatically whenever Rolling Settlement is introduced.

As of October 31, 1996, NSE have installed 1014 VSATs in 50 cities<sup>1</sup>. 34 of these cities have no stock exchanges. The VSAT count in the first 25 cities is as follows:

Centre	#	Centre	#	Centre	#	Centre	#	Centre	#
Mumbai	286	Pune	36	Coimbatore	10	Lucknow	3	Chandigarh	2
Delhi	268	Hyderabad	34	Jaipur	10	Rajkot	3	Nagpur	2
Calcutta	120	Bangalore	21	Cochin	7	Secundarabad	3	Salem	2
Madras	70	Baroda	19	Surat	5	Vijayawada	3	Varanasi	2
Ahmedabad	58	Indore	13	Kanpur	4	Bhopal	2	Vizag	2

In addition, there is one NSE VSAT in each of the following 25 cities: Agra, Allahabad, Alwar, Amritsar, Batinda, Bhilwara, Dehradun, Eluru, Gandhinagar, Guntur, Jamshedpur, Jodhpur, Kakinada, Karaikudi, Karnal, Ludhiana, Madurai, Mysore, Nellore, Rohtak, Tenali, Trivandrum, Udaipur, Ujjain, Warangal. Several NSE members plan on shifting their operations (VSATs) to other centres in an effort to generate greater business volumes. NSE plans call for increasing their national coverage to a total of 3000 VSATs.

Foreign Institutional Investors (FIIs) pushed the Ministry of Finance, and later SEBI (Securities Exchange Board of India), to attack the problems of physical settlement. A Depository Act was passed and the NSE actively promoted creation of a depository.

The regional exchanges enjoyed a brief spurt of success. They are now confronted with the prospect of BSE and NSE making serious inroads into their business. To explore how best to improve their own businesses, the regional exchanges formed themselves into a federation (FISE). In one of its first moves, the federation mooted the idea of market inter-connectivity as a means of improving market efficiency.

### 3.2 Competitive Threats

NSE's success and the prodding of SEBI led the other exchanges to implement their own automated trading systems. NSE's growth caused it to outstrip the BSE's trading volumes. The two exchanges are even now locked into a battle for supremacy. Bombay sought, and after some delays received permission to expand nationally.

As of this moment, neither of the two largest exchanges (National and Bombay) have joined FISE. In general, those exchanges see the regional exchanges as unnecessary and lacking viability as can be seen from the following quotes (from 1995).

- "Regional bourses can die unlamented"  
- Dr. R H Patil, NSE Managing Director
- "Just as the dinosaurs disappeared when they lost their fitness criterion to survive, if some entity died in the course we should not shed tears"  
- Dr. R H Patil, NSE Managing Director
- "The other exchanges will get marginalised and their chances for survival are not bright"  
- Mr. K Kabra, ex President BSE (1995/96)

<sup>1</sup> Source: [www.nseindia.com/htdocs/news/oct96.htm](http://www.nseindia.com/htdocs/news/oct96.htm).

These views have lead the regional exchanges to address what is perceived as serious competitive threats to their existence. Despite this apparent antagonism between the goals and objectives of the larger versus smaller exchanges, there exists ample reason for cooperation and coordination between them.

### **3.3 Current Status**

All of the exchanges are automating. Automation is changing trading patterns. Immediacy of execution and reporting is favoring exchanges with large order books. Each regional exchange's book is only "One of Many". NSE and BOLT are vigorously competing. They are offering coverage the regionals cannot, at this moment, provide. As a result liquidity on the regional exchanges is low and trading volumes are declining. This has contributed to an overall reduction in member profitability.

The nature of brokerage operations has changed. Survival is very difficult and will continue to be so. A few brokers are going national, others are specialising. Most brokers are finding it easier and less risky to expand in their own immediate area. Competition in those areas is more dispersed and weaker. Such developments should favor regional exchange members.

No mechanism currently exists by which a buyer in one region can easily buy scrip available only in another region. Some 1550 companies are quoted under 5 rupees. It has been reported that more than 50 % of listed securities are quoted under par. The smaller companies have not gained market exposure to the same extent as have the larger companies.

The Indian Capital Markets remain badly fragmented. The fragmented nature of trading in multiple disconnected markets has lead to inefficiencies in price discovery. This has in turn lead to huge increases in arbitrage. The existence of arbitrage between exchanges points out the very reason for an ICMS.

### **3.4 Future Direction**

Many of the original assumptions which dictated the structure of the Indian Capital Markets are no longer valid.

Further change is inevitable. The regional exchanges cannot avoid the competitive onslaught. They must compete or they will perish. The key is to create a superior, cost-effective market for their clients (i.e. brokers, investors and listed companies).

The regional exchanges are unlikely to survive without some sort of inter-market trading system. Linking them is technically quite simple as indeed has been shown in other countries. One example is the Intermarket Trading System (ICMS) in the US. Other markets which have seen an inter-connectivity or merger of markets are Australia, Germany and the Philippines. The major consideration for the regional Indian exchanges is cost and benefit.

One consideration is what will happen to the brokers. At present, there is enormous pressure on commissions with some brokers charging only a few Paisa per trade. Will the brokers themselves become nationwide and therefore prefer one or two national exchanges or will they remain small local entities. Experience in other countries favors the former. However, many observers believe that, because of infrastructure, financial and legal difficulties will tend to keep most brokers small and regional. If this is true, then linking the exchanges becomes even more important as that would enable those brokers to compete and prosper.

## 4. Alternative Approaches

Linking the Indian stock exchanges into a national Inter-Connected Market System is entirely feasible and technically quite simple. Several approaches have been mooted. These can be summed up in four basic variations which are:

- ❑ **Shared National Automated Trading System;**
- ❑ **BOLT Nationwide Expansion;**
- ❑ **Linked National and Regional Automated Trading Systems;**
- ❑ **Linked Regional Exchange Automated Trading Systems.**

The key differences between these approaches are: where (at the local exchange system or a central processor) data (e.g. bids, offers, orders, etc.) are held, where trade matching occurs and how automated is the interface between systems. An ancillary consideration is the degree to which the local exchange systems must be modified. Each of these approaches has similar goals. Other than requiring commonality of settlement rules, they are unaffected by whether settlement is centralised or distributed.

### 4.1 Shared National Automated Trading System

#### 4.1.1 System Description

This is a centralised trading system, not an inter-connected market (see figure 2). This approach replaces the individual exchange automated trading systems with a single national system. The local Limit Order Books would be replaced by a single National Limit Order Book. This is rather like building another NEAT (National Stock Exchange Automated Trading) system for the regional exchanges.

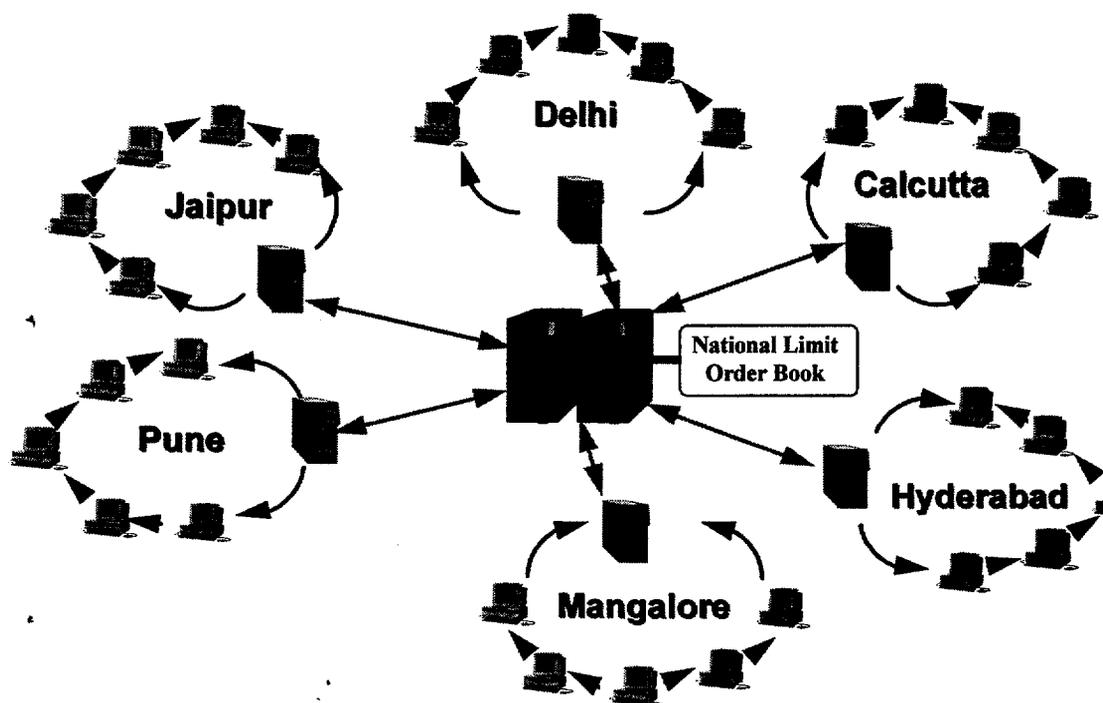


Figure 2. Shared National Automated Trading System

### **4.1.2 Advantages**

The basic advantages are:

- The system would provide improved price discovery. A wider population of orders (i.e. all orders from all participating exchanges) would participate in the Price Discovery process.
- All participating exchanges would share a single national book.
- A National BBO would be published.
- No local exchange automated trading systems are needed.

### **4.1.3 Disadvantages**

While this approach might have been an appropriate choice two or more years ago, today it is impractical in the extreme. It would be very difficult to achieve any agreement among the exchanges. It would negate their investments in automation and require a much larger additional investment in a new system. Why indeed would they spend any monies to replace what they have only just implemented? Other disadvantages are:

- The system could be very expensive to build. If this course were chosen, it might make more sense for interested participants to join the NSE rather than to build a competing system especially given the long lead time enjoyed by NSE and the lack of a suitable advantage in building a system which emulates that market.
- It would have a heavy processing and telecommunications load and could be expensive to operate.
- It would negate the investment the exchanges have made in automation.
- The system would not foster competition between exchanges. Instead it would tend to eliminate such competition.
- Building such a system would be time consuming and disruptive to the market.
- It does not offer any significant advantages that would warrant the expense.
- Listings income would probably decline.

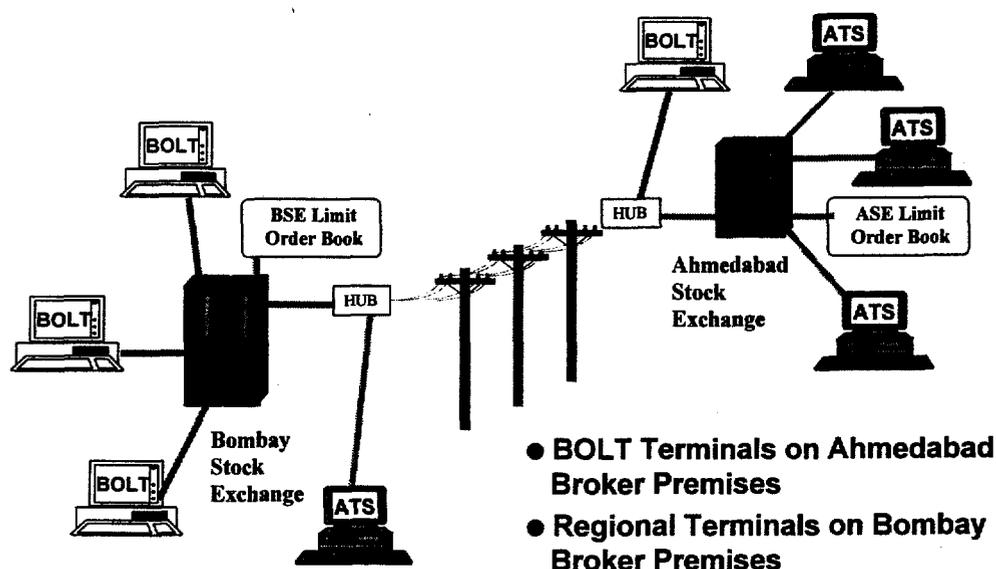
## **4.2 BOLT Nationwide Expansion**

### **4.2.1 System Description**

Bombay Stock Exchange have proposed expansion /extension of their automated trading system BOLT (BSE OnLine Trading) on a nationwide basis (see example shown in figure 3). Under their proposal, BSE would provide BOLT trading terminals to certain members of those exchanges with which BSE have signed an agreement and BSE members would be allowed trading terminals from those exchanges on a reciprocal basis.

BOLT is not an Inter-Connected Market System. The interface between systems is manual. BOLT will not be linked in any manner to the automated trading system of any exchange. Linking of orders and trades is via manual key entry into the different systems. In addition, use is restricted to a few selected parties.

BSE propose to set up a shared communications link between the BSE building and the premises of the individual exchange with which it has struck an agreement (Memorandum Of Understanding or MOU). That link would be used to provide BOLT terminal access to a member or members of the other exchange. It would also allow a reciprocal arrangement wherein the other exchange provided access to its trading system to a BSE member(s).



**Figure 3. BOLT Expansion**

A regional exchange member who wants to trade on BOLT must have a working relationship with a BSE member who would act as trading counterparty. This limits the arrangement to strictly those brokers who have struck a deal with a BSE member. BSE will deal with its member and none else for all trades.

BSE members will be able to trade on the automated trading systems of as many exchanges as they are willing to have agreements. Members of the counterparty exchanges that have a BOLT terminal will have access only to their own exchange's book and the BOLT book. They cannot see or interact with the books of any other exchange.

Only members of those regional exchanges who have signed MOUs with BSE would be able to set up BOLT terminals in their respective city. BSE members would not be permitted to install BOLT terminals in those cities.

The broker in the regional exchange would enter their orders /trades on BOLT but would not be the direct counterparty for those orders /trades.

#### 4.2.2 Advantages

The advantages that accrue from participation in BOLT expansion would be available to only those members who managed to strike an agreement with a BSE member.

- The regional stock exchange's system would enable a BSE member with a trading system terminal a way to trade in scrips for which the regional exchange was the listing exchange or for scrips not listed at the BSE.
- Members with BOLT terminals would receive BSE prices on a real-time basis.

- No software changes are required of any system.
- A modest sharing of communications cost could result.

#### **4.2.3 Disadvantages**

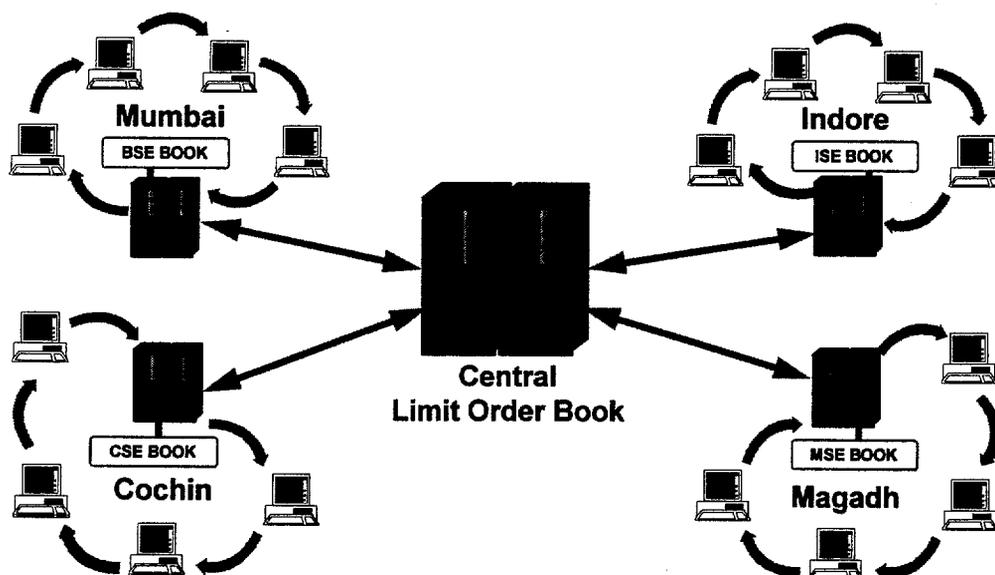
From the perspective of a regional exchange, the disadvantages of this approach far outweigh the advantages. Indeed it is difficult to see what are the advantages to BSE or its members.

- No national BBO is provided.
- The system does not provide improved price discovery. It is more akin to assisted arbitrage than to linked trading.
- The link between BOLT and a regional exchange's trading system will be manual. Those systems will not be electronically linked. As a result, a broker who wished to send an order from his local system to BOLT (or vice versa) must key enter the transaction in both systems. This process will be needlessly cumbersome and would in many cases make one trade into two. This could lead to a case where only one side of a trade was executed because of the timing delays inherent in key entering an order in two systems.
- Every regional exchange member who wants BOLT access will have two terminals (their own exchange's and a BOLT terminal). BSE members could be even more encumbered. If the BSE member were to strike a deal with members of 5 different regional exchanges, he would need a minimum of 6 terminals for trading (1 BOLT terminal and 1 terminal for each of the other exchange's system).
- The system requires separate agreements between every pair of participants.
- Only a very few regional stock exchange members would gain access to BOLT. Even then they would find themselves sharing commissions as their BSE counterparty would quite reasonably expect some compensation for acting as the trading counterparty. Others who wished to trade would be required to go through an intermediary. This could have the negative effect of bringing additional intermediaries into every trade, thus raising its costs.
- Added intermediation is likely to add to market spread.
- This system is anti-competitive. Only BSE members would be able to reach all of the participating exchanges and then only if the member had a presence at each participating exchange and had a terminal on each participating exchange's system. BOLT expansion would (theoretically) enable participating BSE members to access every exchange. The reverse would not be true however as members of the other exchanges would have access only to BOLT. They will not be able to trade with any other exchange or indeed even to see another exchange's quotes.
- The system will not expose any orders to the entire marketplace.
- Settlement would be between brokers and would not involve either BSE's or the counter-party exchange's Clearing House.

### 4.3 Linked National and Regional Automated Trading Systems

#### 4.3.1 System Description

This scheme introduces a National Limit Order Book (automated trading system) and links it to the automated trading system of each participating exchange (see figure 4). Each exchange would send to the National system its BBO data and those orders which its members wanted included in the National Book. The National system would publish a National BBO, disseminate open order information and execute trades.



**Figure 4. Linked National and Regional Order Books**

One variation would be to maintain a National Order Book at a central server but to send orders to the individual exchanges for matching and execution. A National Market Watch would be established to continually seek possible matches.

This scheme would function in the following manner:

1. **Market Data Dissemination.** Each participating exchange currently records its open orders and its BBO data on a real-time basis. Orders which a participant wanted entered in the National Book and all BBO data would be routed to the National Trading System computer. That computer would publish a National Consolidated BBO (or alternatively a National Book) Broadcast. That broadcast would be sent to each participating exchange where it would be used to report National BBO (or open order) information.
2. **Order Entry and Routing.** An exchange member wishing to trade against a National BBO (or book order) would send a commitment to trade to the National Trading System computer.
3. **Trade Execution and Reporting.** All trades would be executed on the National Trading System computer. Alternatively, that computer could route incoming orders to the exchange with the best bid or offer, for execution. The National Trading System computer would report the trade to both counter-parties.

4. **Clearing and Settlement.** Each Inter-market trade would consist of 3 logical settlements. Buyers and sellers would each settle against their local exchange. The exchanges would settle against each other. Residuals would settle via physical delivery. Money settlement would be via a national settlement bank. Each exchange would guarantee its member's trades

#### 4.3.2 Advantages

- The system would provide improved price discovery. A wide population of orders would participate in the Price Discovery process.
- All participating exchanges would share a single national book.
- Market depth (of the National Book) could be easily shown.
- A National BBO would be created.
- Local markets would continue (nearly) in their present form.
- This approach uses the existing systems of the regional exchanges although it requires development of a National Automated Trading System.
- It may be that the regional trading systems will not need to upgrade their hardware to support ICMS until there is a significant increase in trading activity.
- A system which provided true inter-market execution, improved liquidity, managed risks and efficient execution of the less well capitalised stocks would appeal to the larger exchanges (e.g. BSE et al).

#### 4.3.3 Disadvantages

The major disadvantage of this system stems from its complexity. It would provide the same services as would a Shared National Order Book but with an added layer of complexity. In general the disadvantages are:

- A National automated trading system must be built. This could be very expensive, although preliminary estimates from experienced vendors of trading systems seem reasonable and affordable.
- Because of the need to maintain synchrony between the National and local books, the system would be more complex to build and operate than would a Shared National Order Book.
- The processing and telecommunications load could be quite heavy and therefore expensive to operate. This makes the system's design crucial.
- Each participating exchange must modify its automated trading system. The degree of change required could be significant.
- Legal approval may be needed. SEBI may choose to regulate ICMS as an exchange.

## 4.4 Linked Regional Exchange Automated Trading Systems

### 4.4.1 System Description

This is a true linked trading system. The primary difference between this approach and the Linked National /Regional Automated Trading Systems is the presence /absence of a National Order Book (see figure 5). This system is a simple network linking the exchanges to each other. No National book exists. Only a Hub computer system need be created. Its function would be to act as an intelligent message switch and a market data dissemination system. All trades would be executed by the individual exchange automated trading systems.

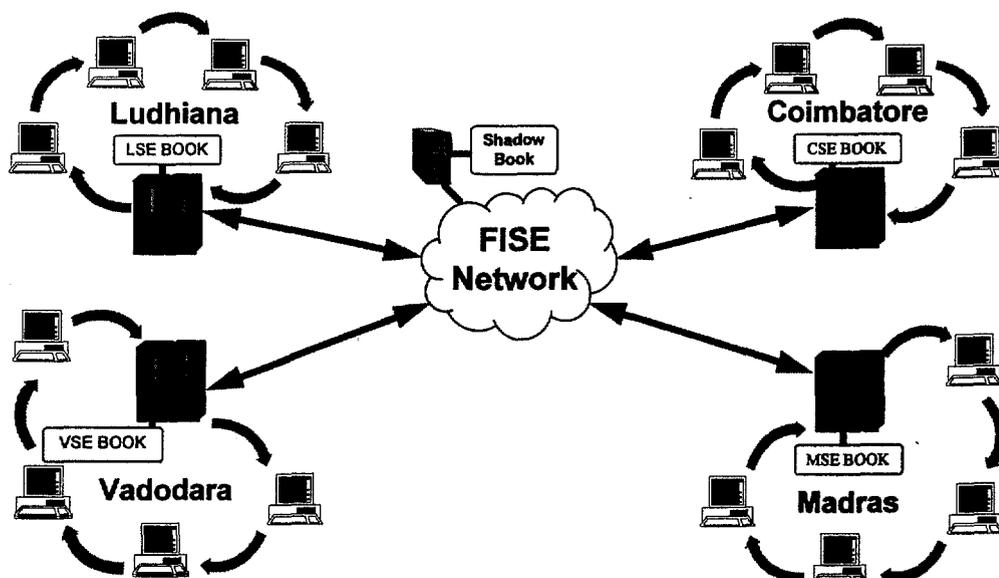


Figure 5. Linked Regional Trading Systems

This scheme would function in the following manner:

1. **Market Data Dissemination.** Each participating exchange currently publishes its Best Bid and Offer (BBO) on a real-time basis. These data would be routed to a FISE Hub computer where they would be combined to create a National Consolidated Market Data Broadcast. The consolidated broadcast would be sent to each participating exchange for use in reporting National BBO information.
2. **Order Entry and Routing.** An exchange member wishing to trade against a National BBO would send a commitment to trade to an FISE Hub computer. That commitment would be routed to the exchange(s) with the Best Bid or Offer.
3. **Trade Execution.** All trades would be executed on the receiving exchange's automated trading system. That system would report the trade to its local counterparty and via the FISE Hub computer to the remote counterparty.
4. **Clearing and Settlement.** Each Inter-market trade would consist of 3 logical settlements. Buyers and sellers would each settle against their local exchange. The exchanges would settle against each other. Residuals would settle via physical delivery. Money settlement would be via a national settlement bank. Each exchange would guarantee its member's trades

#### **4.4.2 Advantages**

- The system would provide improved price discovery. A wide population of orders would participate in the Price Discovery process.
- All participating exchanges would share a single national book.
- A National BBO would be created.
- Local markets would continue in their present form.
- This approach capitalises on the existing systems (and those being developed) of the regional exchanges.
- It appears that none of the regional trading systems will require upgraded hardware to support ICMS until such time as ICMS traffic causes at least a doubling or more of current trading activity.
- The system is the simplest alternative and would be easily built.
- The costs to build should be moderate.
- Operational costs would be the lowest of the various alternatives.
- The user interface can be made very simple and straightforward.
- The central site computer hardware and software requirements are minimal.
- The communications requirements of this approach is considerably more moderate than that of the other approaches.
- A system which provided true inter-market execution, improved liquidity, managed risks and efficient execution of the less well capitalised stocks would appeal to the larger exchanges (e.g. BSE et al).

#### **4.4.3 Disadvantages**

- There is a strong likelihood that crossed markets could occur.
- This system shows participants only the best bids and offers of each exchange. Since it does not contain a book, it does not show market depth.

## **5. Recommended Solution**

We recommend that FISE build a National Limit Order Book system and link it to the automated trading system of each participating exchange. Trades could be executed (i.e. matched) either by the central system or by the individual exchange systems. That choice would be dictated by considerations of cost, complexity and whether SEBI would require registration of the central system as an exchange.

### **5.1 Inter-Connected Markets**

To be successful, ICMS must show market depth. Just providing BBO data is insufficient. The BBO could hide useful market information. For example a 100 share order could hide orders worth many thousand of shares if only the best nation-wide prices were shown.

The National Order Book should:

- include all securities traded (6000 to 8000 scrips) by the participating markets;
- show market depth (i.e. aggregate volumes available across all participating markets at each of the top three (or five) bid and top three (or five) offer prices);

In order to better distribute the load between the national and regional computer systems, the National Order Book should:

- enable each participating exchange to maintain a continuously updated book for the most active (e.g. top 100) securities (i.e. broadcast on a real-time basis updates to the book for certain selected securities);
- provide a real-time inquiry /response capability for the remaining securities using standard computer messaging techniques.

The four primary functions of an Inter-Connected Market System are:

- Collection and dissemination of Market Information;
- Order entry and routing;
- Trade execution and;
- Clearance and Settlement.

### **5.2 Market Data Collection and Dissemination**

Inter-Market trading can function only if its participants have real-time information on the prices at which they can trade. Currently, each exchange's automated trading system has price information only for their own local market. In order to support cross exchange trading, a national market data collection and dissemination system must be developed. That system would perform the following data functions:

- Collection;
- Validation and Consolidation;
- Transmission;
- Display

### **5.2.1 Data Collection**

Each participating exchange would transmit its Best Bid and Offer (BBO) prices and order book detail to a central computer on a real-time basis. All securities traded by the exchanges would be reported. The following data would be transmitted: Security Name /Symbol, Bid Price and Volume, Offer Price and Volume. Last Sale data (i.e. trades) should also be reported as that would enhance the value and salability of the Market Data Feed.

This should not require any significant changes to the various exchange systems. Basically the exchange systems already collect these data. The change would be to output selected data to another port.

### **5.2.2 Data Validation and Consolidation**

The central computer would receive and validate each message. It would use those messages to create a consolidated real-time market data feed. The feed would consist of the National BBO for each security traded plus book data on the most active securities.

There is a potential for "locked" or crossed markets. It would thus appear prudent for the individual exchange trading systems to be modified to notify a trading party that an order entered into the local book was executable on the ICMS.

This is an entirely new function and new hardware and software would need to be developed to perform it.

### **5.2.3 Data Transmission**

The consolidated market data (both BBO and book information) would be broadcast to each participating exchange. It may be desirable to limit the amount of book data being broadcast (e.g. cover only the 100 most active securities). Data on the other securities would be sent on an inquiry /response basis. This would be done to minimise transmission requirements and to reduce the load on the regional exchange systems. The composite data feed would attract participation from the larger exchanges once it gained acceptance.

Data Transmission is a function of the network created to interlink the exchanges.

### **5.2.4 Data Display**

Each exchange system would receive the broadcast data and make it available for use by its members on both a display and a query basis. Those systems should also provide their members a way to receive and display order book data for those securities which are not included in the broadcast.

Handling the broadcast data should require only modest changes to the local systems. Two approaches are possible, modifying existing market data displays or creating a separate window showing the national market. Providing a National Order Book inquiry /response capability on the local systems may be a significantly larger task.

## **5.3 Order Entry and Routing**

Inter-market trades occur only when a member of one exchange routes an order to the system for execution.

In the regional execution model, the central system is merely a conduit and acts as an order routing (messaging) system. It maintains a "Shadow Book" but does not execute trades. It sends the orders it receives to the appropriate exchange system for execution. The receiving exchange's automated trading system will treat the incoming order in the same manner as it handles its internal orders.

In the National Book execution model, the National system executes the trade. This would require implementation of an electronic order matching system..

Routing will require development of a new system regardless of the model used.

## **5.4 Trade Execution and Reporting**

There are two stages to trade execution:

- **Trade Execution;** (on local system or on the national system);
- **Trade Reporting;** (on local and central systems).

The executing exchange would send a trade report to the local trade counterparty, to the local clearing house and to the hub system. The hub would forward the report to the order's originator and to the consolidated market data feed. The order originator's system would report the trade to the originator and to the local Clearing House.

If the execution is performed by the individual exchange systems, the required changes should be minimal. If the execution is to be performed by the National system, order matching software is required. It will be necessary to modify that software to maintain file synchrony between the National and local systems.

## **5.5 Clearance and Settlement**

### **5.5.1 Basic Procedure**

Using ICMS, a member of one exchange can execute a trade at another exchange without being a member of that other exchange. In order to ensure the safety of the system and the certainty of settlement, each exchange's Clearing House (CH) will novate (substitute) itself as the counterparty to all ICMS trades affecting that exchange. This will result in dividing each ICMS trade into 3 logical transactions (buyer to exchange, seller to exchange and exchange to exchange). With Novation, a trade guarantee mechanism must be put into place.

To the extent possible, trades would be netted locally at each exchange. The sellers system would generate receive /deliver tickets for use by the local Clearing House (CH). These tickets would be used by the local CH to provide a packing list for instructing the delivering exchange on where shares are to be delivered. The CH would receive the scrip from their participants, check them and send it to the receiving exchange via overnight courier. The receiving exchange would deliver the shares to the member.

Once shares become depository eligible, cross exchange trades should be far simpler to execute and settle. The basic principles would remain the same however.

### **5.5.2 Money**

Money settlement would be handled by a common settlement bank based on instructions generated by each system and confirmed by each counterparty. It would be desirable to use a

bank with a comprehensive network and ability to transfer funds in a timely fashion. State Bank of India might be an appropriate settlement bank. Counterparty creditworthiness becomes extremely important in a cross exchange trading system.

### 5.5.3 Minimising Risks

In order to protect the integrity of ICMS and its participants, FISE has established a set of requirements for joining ICMS. Each exchange seeking to join must:

- establish a Clearing Corporation which will guarantee the exchange's trades;
- take insurance to cover risks of fraud, theft, etc.;
- adopt a common margining system as proposed by SEBI;
- adopt common good and bad delivery guidelines as proposed by SEBI;
- create a Bad Delivery Cell for processing inter-market bad deliveries.

These requirements are necessarily only a beginning. Clearance and settlement is a "zero sum" game. In a netting environment, the failure of one participant can cascade through the system (i.e. systemic risk) and cause other participants to fail or otherwise suffer serious losses. To protect themselves and their members, the ICMS exchanges must establish suitable, and substantial, risk minimisation measures.

International standards for clearing and settlement should be observed where possible and practical. The recommendations of The Group of Thirty (see Appendix A) should be adopted. Risk handling procedures that have been successfully employed in other countries are outlined in IOSCO's (International Organisation of Securities Commissions) "*Securities and Settlement Blueprint*".

FISE is asking its participants to establish uniform rules for settlement. Given the differences that exist, this can be a long and arduous task. With the advent of the depository and the expected change to rolling settlement, this is an on-going task.

Efficient clearing and settlement could provide significant competitive advantages to the regional exchanges. Some examples are:

- elimination of Auctions through use of an efficient Lending /Borrowing mechanism;
- combined electronic and physical settlement (eliminates the need to trade depository eligible securities in two tiers);
- shared clearing corporation (could provide a significant reduction in settlement costs).

FISE as a group has one significant advantage over any single exchange or clearing house, namely local presence and local staff. This brings trading and settlement services closer to the ultimate user (e.g. the brokers, investors and listed companies).

Because of the magnitude of the task and its importance, we recommend that FISE establish a Clearing and Settlement Committee to guide this effort.

## 6. Issues

This section discusses the major issues surrounding creation of ICMS.

### 6.1 Market Data

Some questions related to market data are:

- Should the National BBO be placed in a separate window or should it be appended to an existing display?
- What data elements should be included in the regional broadcast? The author recommends that the ICMS BBO broadcast include the following elements: Security Symbol, aggregate Best Bid Price and Volume, aggregate Best Offer Price and Volume, date, time and transaction sequence number for all securities traded at any participating exchange. The national book broadcast should provide the same information (plus 4 additional bid and offer price data) for the 100 most active securities.
- Should the entire book be published or limited to a depth of 3 to 5 price levels?
- If BBO volumes are aggregated, identification of the exchange is misleading. If each exchange's BBO is separately broadcast, the receiving exchange can aggregate the BBO prices when more than one exchange offers the same price. In some cases identification of the exchange submitting the best bid is a significant piece of information especially for those market participants who have knowledge of who holds /trades certain scrips in certain areas. On the other hand an exchange and its members may want it known that their exchange trades aggressively.
- How should Opening and Closing prices be calculated?
- Should a Composite Index or Indices be generated?

### 6.2 Trading

- Should Market Orders be accepted? If yes, what provisions should be made for wildly out of range executions?
- Priority should be Price then Time. Should size be a deciding factor in cases where large orders meet?
- Should counterparties be identified?
- How should the Opening auction function?
- Should provision be made for including client account number or other non trade information? This would be a useful function especially to enable participants to handle institutional trades and trade affirmations.
- How are special conditions (e.g. AON, IOC, FOK, etc.) to be handled?

### 6.3 Surveillance and Margin

- How are ICMS trades to be monitored?
- What information must ICMS provide to the exchange surveillance departments?

## **6.4 Clearing and Settlement**

Efficient clearing and settlement is crucial to the success of ICMS. Some of the questions are:

- Are there any legal problems in treating Inter-market trades as legal contracts?
- Should Trade for Trade settlement be permitted?
- How is the cost of physical handling and physical transfer of securities from one market to another to be allocated? One of the objections which can be leveled against an ICMS is the need for, risks encountered as a result of and difficulties associated with physically moving scrip from one market center to another. In a way, this is occurring today without the risks being covered.
- Should auctions be conducted at a national or local level?
- How might Stock Lending /Borrowing function for inter-market trades?
- Should mechanisms be devised to measure exchange (and individual member) performance (e.g. poorest rate of delivery, highest rate of objections, etc.)?
- Would a shared clearing and settlement system be beneficial? If yes, what would it cost to implement a shared system?

## **6.5 Depository Interface**

Depository settlement promises to be the single most important development in the Indian markets during this decade. Depository settlement will be crucial to smooth running of the proposed ICMS. Its success will determine how and whether existing settlement deficiencies are addressed. The exchanges must examine whether to participate in NSDL and/or to sign up for one of the alternative depositories being discussed. Because of its importance, FISE should devise a way in which its needs and that of its participants are addressed.

## **6.6 Technical Issues**

The key technical requirements are:

- Back-up must be an integral part of the system. System failures cannot be tolerated. A Disaster Recovery / Contingency Plan must be carefully constructed. It should explain the procedures to be followed if the central server, an exchange system, a communications line, etc. fails
- Fault Tolerance should be provided by the selected computer system.
- The system must be secure and tamperproof.
- International standards for securities numbering and messaging should be followed.

## 7. Costs and Funding

### 7.1 Transaction Estimates

It is very difficult to properly estimate the cost of building the proposed system. To assist, we have gathered some transaction data from the exchanges. At present, these data (see figure 6) are considered an early draft. FISE are developing more sophisticated estimates. These data can then be used to estimate the traffic volumes associated with ICMS.

	Exchange	# Brokers		Listed	# Trades	Automated Trading	In use?	NSE
		Total	Active	Issues	/day	System		VSATS <sup>1</sup>
1.	Ahmedabad	303		3,100	3,298	EFA, IBM	Dec/Jan	58
2.	Bangalore	235		557	1,100	TCS, Stratus		21
3.	Bhubaneshwar	236		69	300	Ilanos Systems		
4.	Bombay	650	636	6,893‡	77,000*	BOLT, CMC, Tandem	Yes	286
5.	Calcutta	888	662	3172	27,666	BOLT, CMC		120
6.	Cochin	508	230	235	1,000	Vector, CMC	Feb 97	7
7.	Coimbatore	195	186	3,800	5,000	STOCX, Vector, CMC	Yes	10
8.	Delhi	379	250	3,858	28,000	Dots, ISM, Tandem	Yes	268
9.	Gauhati	194	113	271	400	GOTS	No	
10.	Hyderabad	269		779	3,202	Vector, CMC	Dec	34
11.	Jaipur	600		926			31 Dec	10
12.	Ludhiana	286	150	448	2,500	Vector, CMC	Yes	1
13.	Madhya	183	52	370	11	Vector, CMC	3-4 mo	13
14.	Madras	184	144	1,739	3,500	Mantra, Tandem	Yes	70
15.	Magadh	191	124	1,560	2,500		3/97	
16.	Mangalore	135	62	44	633	MOST, Elind, HP	Yes	
17.	National	1,500		1411±	83,398*	NEAT, Stratus	Yes	
18.	OTCEI	785					Yes	
19.	Pune	187	110†	260	2,500	Vector, CMC	Yes	36
20.	Saurashtra-K	439	206	478	310	CMS	3/97	
21.	Uttar Pradesh	507	227	880	2,469	Vector, CMC	Yes	
22.	Vadodara	337	200	535		Vector, CMC	Yes	19
	Totals	9,191	3352	8,000?	244,787	n.a.	n.a.	953

† with terminals ‡ 4,300 not traded ± Interest shown in only 200 scrips

\* First 11 months 1996 average: BSE 131,232; NSE 85,100 (both experiencing substantive change)

<sup>1</sup> NSE have a total of 1014 VSATs installed.

**Figure 6. Indian Stock Exchange Statistics**

Some observers believe that approximately 50 % of the currently traded volume (from the participating exchanges) would flow through ICMS. This would be the result of a wider availability of trading opportunities and should contribute to attracting far greater order flow.

## **7.2 Cost Elements and Issues**

This review is not a cost analysis. It focuses on business and technical feasibility. Building an ICMS is clearly feasible as evidenced by functionally similar systems in use in other markets. Rough estimates from interested vendors are in the Rs. 3.5 to 9.5 crore range. FISE plans on developing cost estimates as part of its business planning efforts.

CMC, in a presentation (to FISE) on Inter-Connected Markets have estimated their solution to be in the 5 to 8 Crore Rs. range. This would be for a 128kbps shared network covering eight exchanges. They estimate that their proposed system can be operational 6 months after a signed agreement and framing of the business rules. They would offer a Facilities Management service for the computer and network operation and support. It should be noted that CMC's Vector (Versatile Engine for Centralised Trading and On-line Reporting) are vendors for around 70 % of the automated trading systems in use or being implemented by the regional stock exchanges.

Other vendors, notably Tata Consultancy Services, Wipro and Elind Computers Pvt Ltd. have also made informal offers /estimates for an ICMS. FISE is planning on developing a high level functional requirements document (with business rules) and invite proposals from a pre-qualified list of vendors.

## **7.3 Network**

A nation-wide network is needed. Only a limited number of centres need to be connected. Leased lines or 2-way VSAT (satellite communications) could be used. This should make the ICMS network easy to build and operate. It should be more cost-effective than the NSE network as less than two dozen centres would be connected as opposed to NSE's over 1000 VSAT nodes. FISE is seeking quotations on cost from VSAT service providers.

It is believed that DOT does not permit two Wide Area Networks to link together. It may therefore be necessary to get DOT permission to operate ICMS.

## **7.4 Changes to Local Exchange Systems**

Each exchange's automated trading system will require the following (believed modest) modifications:

- Market Data Collection and dissemination.
- Display of the Regional /National BBO
- Communications with the national system

These changes are considered to be modest as they consist of simple data gathering and data display functions. There are also some order routing and reporting functions which must be handled. Most of the regional exchanges are using only a fraction of the computing power available to them. It is therefore possible to postulate that the exchanges will not need to upgrade their computer hardware. This can be determined only after a full review of the ICMS design and anticipated volumes.

### **7.4.1 Central System Back-up**

An off-site back-up system will be essential once the market achieves critical mass. Vendors bidding to deliver an ICMS system should be asked to provide estimates of the costs to build such a system.

### **7.5 Ideas for funding**

Because of the generally depressed market conditions, few brokers are prepared to contribute money for the purpose of building an ICMS.

Shared funding, BOO /BOT, vendor financing, transaction fee based payment are possible ways to fund the system. The selling of Market Data or the use of special service or transaction fees could be used to recover the costs to build and maintain ICMS.

Individual exchanges, other than the very largest generally find it very difficult to sell their data. A consolidated market data feed containing price data (e.g. best bids and offers, last sale prices, etc.) for all FISE exchanges, however, would have marketable value of its own. That value would be enhanced if other information such as corporate announcements, etc. were included. A Regional Index or set of indices would also enhance the data feed's value.

These data could be sold to market data vendors and other intermediaries. We therefore recommend that the FISE exchanges develop a mechanism for selling their market data. The funds generated could be used to defray /pay operating costs and if any excess exists, returned to the exchanges based on some pre-agreed formula. That formula could be based on such factors as number of trades executed over the ICMS, etc.

## **8. Recommendations**

### **8.1 Actions being taken**

FISE have created a service company to manage the Inter-Connectivity Project. They have established certain criteria for exchanges wishing to join ICMS. Most of those requirements are useful in and of themselves (e.g. establish Clearing Corporations, Guarantee Funds, etc.). A Steering Committee has been leading the ICMS effort, office space has been arranged and a professional staff has been recruited.

Efforts are underway to establish common business (i.e. trading and settlement) rules. These rules are being shared with a small list of qualified vendors. As a result of this effort, the Steering Committee is anticipating that those vendors will be able to be more responsive, and perhaps, able to offer more imaginative or lower cost solutions in preparing their respective proposals for development of ICMS.

### **8.2 Suggested Course of Action**

We believe that inter-connecting the Indian stock exchanges is an appropriate course of action that would benefit the entire market. We have not, however, performed an analysis of the costs. We suggest that FISE prepare a Business Plan. The plan should incorporate the following elements:

- A Cost Analysis with special emphasis on determining how to keep costs moderate and competitive. The analysis should also pay particular attention to the costs the individual exchanges must bear to modify their systems;
- An evaluation of funding alternatives. FISE should have a clear understanding of how the system is to be financed and how the development expenses are to be recouped;
- An analysis of network alternatives. The most likely media are leased telephone lines and the leasing of bandwidth from a VSAT Service Provider;
- Selection of a systems vendor. Building a system through the competitive bidding route can be expected to add 3 to 6 months to the development cycle. A month or more is needed to develop a Request For Proposals (RFP). Respondents need at least a month to prepare their responses and then another month or more is needed for evaluation and negotiation. Given the need to move quickly, special attention should be paid to the careful but rapid selection of a systems vendor.
- Examination of the legal ramifications of Inter-Connectivity.
- An analysis of the risk profile of inter-connected markets and the preparation of suitable protective measures. Both investor and participant risk (i.e. the risks faced by exchanges and their members) should be analysed. Those measures should, to the extent possible, place the costs of managing risks onto those entities which introduce the risks;
- Harmonisation of trading and settlement rules;
- Design of an efficient country-wide delivery /payment system;

- Identification and adoption of international standards (e.g. Group of Thirty, IOSCO, etc.) on securities settlement. A plan should be devised on how to participate in developing standards for the Indian markets;
- Preparation of a plan on how to effectively participate in the Indian depository settlement regime and to influence its design. The fundamental purpose should be to ensure that depository settlement meets the requirements of the regional markets as well as the national market;
- Preparation of an Action Plan for implementing ICMS.
- An analysis of how multiple markets in other countries adapted to changing technology and competition. This analysis could then be used to aid FISE in developing a modern solution for the Indian markets;

The window of opportunity is quite small. It is therefore imperative that an ICMS be implemented quickly. We believe that a primary question that the FISE ask themselves is How might this effort be implemented quickly (as well as efficiently and at low cost)?

The Steering Committee should establish a procedure for rapid decision making and policy formation. A Technical Committee should be formed to oversee the design and creation of the system.

### **8.3 Organisational**

There are a number of organisational issues which must be addressed before ICMS can become a reality. The Steering Committee has assumed overall control and direction over the system. A Technical Committee and a Legal Committee should be formed. Personnel on those committees would oversee their respective responsibilities. Additional staff will be needed to manage development of the system. FISE have asked participating exchanges to second personnel for some of these efforts.

A Central Service Provider responsible for oversight over the computer facilities and their operations is needed. That function could be provided by staff or a contractor.

### **8.4 Other Recommendations**

We further believe that FISE should prepare a Long-Range Development and Automation Plan. By their very nature, FISE members have some advantages not available to larger institutions such as the NSE. The most obvious being local staff and local presence. That advantage should be capitalised upon in devising a long range plan. Some possible ideas are:

- Development of an efficient Lending /Borrowing regime so as to enable elimination of "Fails" and the resultant Auctions;
- The use of a shared Clearing Corporation;
- The combining of physical and electronic settlement. This would avoid the problems of two tier settlement (i.e. bifurcated trading).

## Appendix A Group of Thirty Recommendations

The Group of Thirty is an international committee of settlement experts who have promulgated the following nine recommendations. These recommendations have been accepted by the securities industry as the minimum needed for efficient settlement. The following recommendations reflect certain minor additions provided by the International Society of Securities Administrators (ISSA) June 22, 1995:

1. All comparisons of trades between direct market participants (i.e. brokers, broker/dealers and other exchange members) should be accomplished by T+0. Matched trade details should be linked to the settlement system.
2. Indirect market participants (such as institutional investors and other indirect trading counterparties) should achieve positive affirmation of trade details on T+1.
3. Each country should have in place an effective and fully developed central securities depository, organised and managed to encourage the broadest possible direct and indirect industry participation. The range of depository eligible instruments should be as wide as possible. Immobilisation or dematerialisation should be achieved to the utmost extent possible.

If several CSDs exist in the same market, they should operate under compatible rules and practices, with the aim of reducing settlement risk and enabling efficient use of funds and available cross-collateral.

4. Each market is encouraged to reduce settlement risk by introducing either Real Time Gross Settlement or a trade netting system that fully meets the "Lamfalussy-Recommendations".
5. Delivery versus Payment (DVP) should be employed as the method of settling all securities transactions. DVP is defined as follows:  
  
Simultaneous, final, irrevocable and immediately available exchange of securities and cash on a continuous basis throughout the day.
6. Payments associated with the settlement of securities transactions and the servicing of securities portfolios should be consistent across all instruments and markets by adopting the "same day" funds convention.
7. A rolling settlement system should be adopted by all markets. Final settlement for all trades should occur no later than T+3.
8. Securities lending and borrowing should be encouraged as a method of expediting the settlement of securities transactions. Existing regulatory and taxation barriers that inhibit the practice of lending securities should be removed.
9. Every country should adopt the standard for securities messages developed by the International Organisation for Standardisation (ISO Standard 7775). In particular countries should adopt the ISIN numbering system for securities issues as defined in the ISO standard 6166.