

XIII**PAYMENT AND SETTLEMENT SYSTEMS
AND INFORMATION TECHNOLOGY**

13.1 The information technology revolution has thrown up powerful synergies with banking and finance. In particular, there are four key areas in which the financial system has experienced the benefits of the technology revolution: product development, market infrastructure, risk control and market reach. In the process, technology has changed the contours of three major functions of financial intermediaries: access to liquidity, transformation of assets and monitoring of risks. The Indian financial system is adapting itself to these developments and is acquiring a customer-centric focus. The proliferation of Automated Teller Machines (ATMs), networking of these ATMs and Shared Payment Network based ATMs have been features which have been welcomed by the banking public. Other innovations already within the domain of banks and financial systems in India include Internet Banking, Electronic Funds Transfer and 'Anywhere/Anytime Banking', all of which have a high level of technology embedded in the systems offering these services. Many of the older banks are moving towards the implementation of Core Banking or Clustered Solutions which would contribute significantly towards increasing customer satisfaction. In all this, business process re-engineering becomes an essential concomitant to ensure best results out of technology enhancement.

13.2 In recent years, the Reserve Bank has assigned priority to upgrading the technological infrastructure of the Indian financial system. Efforts have been made to modernise clearing and payment through Magnetic Ink Character Recognition (MICR) based cheque clearing, Electronic Clearing Services and Electronic Funds Transfer (ECS and EFT) and the Centralised Funds Management System (CFMS). A key prerequisite for the development of the financial system is a modern, efficient, integrated and secure payment and settlement system. The goal is to put in place systems which conform to international standards and best practices. The strategy adopted by the Reserve Bank consists of:

- Development, consolidation and integration of payment systems.
- Encouragement of movement towards efficient electronic mode of payments.

- Making the net settlement systems more secure.
- Implementation of a Real Time Gross Settlement (RTGS) System for minimising systemic risk.
- Increased efficiency of the paper based clearing systems.

13.3 In order to provide policy direction to the process of reforms in payment and settlement systems, the apex level National Payments Council met three times during the year and provided key inputs on various aspects like EFT based systems and usage of networks for domestic message transfers. The major policy decisions taken at the meetings included:

- Using wireless links to overcome the last mile connectivity issue for bank/branch networks;
- Integrating the Structured Financial Messaging Solution (SFMS) with banks' own application software;
- Two-way inter-city clearing among the 17 centres where the Reserve Bank has its Deposit Account Departments (DADs);
- Integrating the EFT Scheme of the Reserve Bank with internal funds transfer schemes of individual banks;
- Implementing the Funds Transfer module of the CFMS contingent upon the Public Key Infrastructure (PKI) based security and digital signature based message transfers;
- Core banking solutions by banks;
- Implementing National Settlement System (NSS);
- Shared Payment Network for ATMs by Third Party (non-banks).

Payment Systems

13.4 At present, key large value payment systems such as the Negotiated Dealing System (NDS) and foreign exchange clearing adhere fully to the Core Principles for Systemically Important Systems of the

ANNUAL REPORT

Table 13.1 : Characteristics of Payment Systems in India

Type	Characteristics of Transaction	Mode	Compliance with Core Principles	Other Key Features
1	2	3	4	5
Large Value Payment Systems				
Inter-Bank Clearing	Inter-bank instruments	Paper based; debit instruments	Partial	Deferred Net System (DNS); Mechanised settlement
High Value Clearing	Customer instruments	Paper based; debit instruments	Partial	DNS; Mechanised clearing and settlement
NDS	Inter-institutional transactions	Electronic mode; DVP	Full compliance	Secured DNS; Guaranteed settlement
Forex Clearing	Inter-bank transactions	Electronic mode	Full compliance	Secured DNS; Guaranteed settlement
RTGS (proposed)	Inter-bank transactions	Electronic mode	Full compliance	Real Time Gross Settlements
Retail Payment Systems				
MICR Clearing		Paper based; debit instruments	Partial	DNS; Mechanised clearing and settlement
Non-MICR Clearing		Paper based; debit instruments	Partial	DNS
ECS-Credit	Bulk; one to many funds transfer	Electronic mode; credit transfer	Partial	DNS; Automated Clearing House (ACH)
ECS-Debit	Bulk; many to one funds transfer	Electronic mode; debit transfer	Partial	DNS; ACH
EFT	One to one fund transfer	Electronic mode; credit transfer	Partial	DNS; ACH
Cards	Customer transactions	Electronic mode; credit cards, debit cards, smart cards	Partial	DNS; Automated clearing and settlement

Bank for International Settlements (BIS). Retail payment systems comply partially with the Core Principles (Table 13.1). Efforts are on to make these systems also fully compliant to the Core Principles by providing a legal basis for netting and provision of risk reduction measures for netting systems.

Large Value Payment Systems

13.5 The Inter-Bank Cheques Clearing system, the High-Value Cheques Clearing systems, the NDS and the Inter-Bank Foreign Exchange Transactions Clearing and Settlement System (Forex Clearing) constitute the main Large Value Payment Systems (LVPS) of the country. All of these are considered as Systemically Important Payment Systems (SIPS). These systems constitute 68 per cent of the total value of transactions processed in the major payment systems (Table 13.2).

Retail Payment Systems

13.6 Retail Payment Systems account for a substantial portion of the country's funds flows in terms of volume, with 99 per cent of the total volume of payment transactions. The major components of the retail payment systems include the MICR Cheques Clearing Systems (MICR Clearing) now

Table 13.2 : Payment System Indicators : Annual Turnover in 2002-03

Component	Volume (000s)	Value (Rupees crore)	Features
1	2	3	4
Systemically Important Payment Systems (SIPS)			
1 Inter-bank Clearing	1,039 (1,026)	60,65,825 (67,52,166)	
2 High Value Clearing	7,207 (6,988)	28,86,263 (21,66,757)	Cheques of Rs. 1 lakh and above
3 NDS	144	1,32,128	Settlement through CCIL
4 Forex Clearing @	200	6,58,035	Settlement through CCIL
Total SIPS (1 to 4)	8,590	97,42,251	
Others			
5. MICR Clearing	4,79,189 (5,52,332)	18,43,726 (21,03,992)	At 27 centres
6. Non-MICR Clearing	3,61,400 (3,38,953)	27,45,307 (19,65,583)	Includes all other paper based clearings
7. Electronic Clearings	23,660 (17,770)	10,222 (6,123)	Comprises of ECS and EFT
Total Others (5 to 7)	8,64,249 (9,09,055)	45,99,255 (40,75,698)	
Grand Total	8,72,839	1,43,41,506	
@ Forex Clearing started live operations only during 2002-03 and data pertain to December 2002-March 2003.			
Note: Figures in brackets are data for 2001-02.			

**PAYMENT AND SETTLEMENT SYSTEMS
AND INFORMATION TECHNOLOGY**

available at 27 commercially important centres and the Non-MICR Cheques Clearing Systems (Non-MICR Clearing) in 1,020 centres. Other emerging retail systems include the Electronic Clearing Systems (ECS) (comprising of the ECS-Credit and the ECS-Debit Systems) in operation at 45 centres, the Electronic Funds Transfer System (the EFT System) available at 15 centres, Card Payment Systems (including credit, debit and smart card based systems) and the ATM based retail delivery systems. ECS (Credit Clearing) registered a rise of 26 per cent in terms of volume while ECS (Debit Clearing) recorded an even larger growth of 63 per cent. There was a ten-fold rise in EFT transactions in both volume and value terms.

13.7 The Reserve Bank is in the process of implementing the National Electronic Funds Transfer (NEFT) System - a nation-wide electronic funds transfer system - to provide for transfer of funds electronically across a large number of bank branches in the country. As a first step, a Special Electronic Funds Transfer (SEFT) System was implemented with effect from April 1, 2003. The System is designed to provide for same day inter-bank transfer of funds between accounts maintained in any of the designated participating branches which are networked so that SEFT messages could be transmitted electronically. SEFT provides for multiple daily settlements, with three settlement cycles on weekdays (at 12:00 noon, 2:00 p.m. and 4:00 p.m.) and two settlements on Saturday (at 12:00 noon and 2:00 p.m.). The System also facilitates timely funds settlement for the T+2 based rolling settlement introduced for settlement of securities at the stock exchanges.

Payment System Infrastructure and Utilities

13.8 The Reserve Bank established a secure, closed user group network infrastructure for the financial system - Indian Financial Network (INFINET) - in 1999 along with the SFMS. During 2002-03, the network was upgraded in the form of higher capacity inter-city terrestrial communication lines. By end-March 2003, 158 members of the INFINET had set up their gateways, with connectivity to the central Inter-Bank Payment Systems Gateway of the Reserve Bank at Mumbai. The CFMS also commenced its operations from the central Gateway during 2002-03. There were 54 banks using the facilities of CFMS at end-March 2003.

13.9 Backup systems were set up for the Payment Systems Processing Centre which provide

processing capabilities for the NDS, CFMS, SSS, SFMS and RTGS. To address connectivity related disruptions, all members are required to provide a separate connection to the backup site in addition to the main site. The main site and the back-up site are inter-connected with sophisticated high-capacity dark fibres to ensure uninterrupted connectivity. This would ensure synchronised databases at both the sites to ensure business continuity with the least time gap and uninterrupted communication even if one of the connectivity points between the member and the Reserve Bank were to fail.

Settlement Systems

13.10 The imperative for ensuring the integrity of settlement systems stems from the need to minimise risks inherent in payments. The settlement of foreign exchange clearing operations, which commenced from November 2002, is guaranteed by the Clearing Corporation of India Ltd. (CCIL). Effective May 1, 2003, all inter-institutional over-the-counter (OTC) transactions in Government securities, whether outright or repo, are traded through the NDS only. Other initiatives taken during the year to promote safe settlement systems included:

- MICR-based clearing, with facilities for capturing the images of cheques, extended to Mangalore and Patna during the year, taking the total number of MICR based clearing centres to 27.
- Backup MICR centres set up in Delhi and Kolkata during the last quarter of 2002-03 as a part of disaster management and business continuity plans for clearing houses managed by the Reserve Bank in all metropolitan centres.
- Amendments to the Negotiable Instruments Act, 1881, providing for cheque truncation and e-cheques aimed at reduction in time taken for cheque realisation.
- Multi-Application smart card project under the aegis of the Ministry of Communications and Information Technology with active participation of the Indian Institute of Technology (IIT), Mumbai, industry participants and banks being supported by the Reserve Bank.

13.11 The BIS Working Group on Securities Settlement Systems, a joint Group of the International Organisation of Securities Commissions (IOSCO) and the Committee on Payment and Settlement Systems

ANNUAL REPORT

Box XIII. 1

Core Principles for Securities Settlement Systems

With securities markets becoming an increasingly significant channel for intermediating flow of funds between borrowers and lenders, Securities Settlement Systems (SSSs) have assumed critical importance in financial markets. In view of soaring trading and settlement volumes in securities markets, weaknesses in SSSs can impact not only on the securities markets themselves but can also spill over to other payment systems of which SSS is a sub-set or has inter-linkages. This underscores the need for international standards to promote improvements in the safety and efficiency of SSSs.

The first major initiative in this direction was the Group of Thirty's Report "Clearing and Settlement Systems in the Worlds' Securities Markets" (1989). A decade later, the Committee of Payment and Settlement Systems (CPSS) of the BIS created a Task Force comprising 28 central bankers and securities regulators. The Task Force identified minimum standards that would enhance financial stability,

reduce risks, increase efficiency and provide adequate safeguards for investors.

SSSs, *i.e.*, the "full set of institutional arrangements for confirmation, clearance and settlement of securities trades and safe keeping of securities" cover corporate bonds, money market instruments and gilt edged securities. A set of 19 recommendations of the Task Force is designed for the management of diverse kinds of risks associated with securities markets, *viz.*, legal risk, pre-settlement risk, settlement risk, operational risk and custody risk. Other issues associated with SSSs relate to governance of central counterparties and depositories, access criteria for SSSs, transparency of operations and procedures, efficiency of operations, standardisation of communication procedures, regulation and oversight of SSSs by regulators and risk reduction in cross border settlements.

Reference

Recommendations for the Securities Settlement Systems, BIS (2000).

(CPSS), released its recommendations in the form of the Core Principles for Securities Settlement Systems (SSS). The Reserve Bank would make the significantly important securities settlement systems conform to these Principles (Box XIII.1).

Legal Framework

13.12 An indicative draft for the Payment and Settlement System Bill was approved by the Committee on Payment Systems (Chairman: Dr R H Patil), providing adequate legal framework for the

regulation and supervision of the evolving payment and settlement systems (Box XIII.2).

Information Technology (IT) in the Reserve Bank

13.13 All activities of the Reserve Bank are getting increasingly IT-enabled. The implementation of IT in the Reserve Bank is based on the mission "IT for Overall Efficiency and Excellence". The Reserve Bank aims to bring in transaction processing and analytical capabilities at the desk top of each official in order to equip the functionaries to complete transactions in a

Box XIII.2

Committee on Payment and Settlement Systems

A set of "Core Principles for Systemically Important Systems" was developed under the aegis of the BIS in 2001. The Reserve Bank has been taking steps towards achieving these international best practices as part of the overall reforms in the financial system.

In the absence of an appropriate legal framework for the conduct, regulation and supervision of payment and settlement systems in the country, most of the systems currently function under the Contracts Act, 1881. "Finality of settlement" needs to be precisely defined in view of the increasing concern about systemic risks. Furthermore, the financial sector all over the world, including India, has adopted "multilateral netting" as the primary means of settling payment obligations among the participants. This lacks precise legal foundations and has led to increased settlement risk, especially in the face of default

and insolvency. It is in this context that the Core Principles focus on the need for an explicit legal framework for payment and settlement systems.

The Committee on Payment Systems, constituted by the Reserve Bank under the chairmanship of Dr. R.H. Patil with a broad based representation from the banking industry, recommended enactment of a separate statute for regulation and supervision of the payment and settlement systems in the country. The draft Bill approved by the Committee provides for a legal base for netting, finality of netting and powers to formulate regulations. It also provides for separate roles for the Reserve Bank (as a regulator, operator, system provider and participant), apart from separation of operation functionalities and provision for multiple players.

**PAYMENT AND SETTLEMENT SYSTEMS
AND INFORMATION TECHNOLOGY**

timely and accurate manner and to make informed decisions. This will also usher in a Less-Paper Office. Furthermore, the Reserve Bank is committed to providing efficient customer service to the Governments, banks, financial institutions and general public, using the tools and solutions offered by information and communication technology.

13.14 The overall system architecture for the Reserve Bank comprises the following components:

- Operational capability at the desk top of each official;
- Integrated application systems at each functional unit (*viz.*, the department);
- An On-Line Analytical and Decision Support System and an Enterprise Knowledge Management System (EKMS) at the institution level; and,
- Multi-channel delivery of services to customers of the Reserve Bank through branch-, tele- and internet-banking.

13.15 For the Central Office Departments of the Reserve Bank, the existing disparate systems are being integrated and enhanced using Relational Data Base Management System (RDBMS) based solutions. The Off-Site Monitoring and Surveillance System (OSMOS) and the Computerised-OSMOS (COSMOS) have already reached a high level of IT-enhancement. For transactions in Government and bank accounts as well as other accounts maintained with the Reserve Bank, an Integrated Accounting System (IAS) is being developed along with the RTGS project. For the Public Debt Offices (PDO) and internal debt management system, a centralised system encompassing the PDO/NDS/SSS system was implemented during 2002-03. The Centralised Data Base Management System (CDBMS), a data warehouse, was also implemented. The first phase of enhanced systems was implemented in key functional areas such as external investments and operations, regulation and supervision of urban banks, human resource development and general administration. Initial processes have been put in place in the areas of monetary policy operations, exchange control and currency management, including issue offices.

13.16 In addition to computerised operations, Inter-Active Voice Recorder based systems for account enquiries are available in many regional offices of the Reserve Bank as a part of the strategy for enhancing the level of customer service. Touch-screen based inter-active Information Kiosks were installed in several

**Table 13.3: Information Technology
Implementation in the Reserve Bank**

Component	Impact
1	2
Standardisation of hardware, operating systems, system software, netware platforms and data bases	Integration of and inter-operability between functional areas
Developing human resources for using, maintaining and administrating the hardware, software and netware systems	Increased productivity
Outsourcing of both development and maintenance of software and facilities management	Systemic efficiency in managing complex computer and application systems
Establishment of a Disaster Recovery Management System (DRS) and Business Continuity Plans (BCP)	Continued availability of technology services with least disturbance in terms of time and data

regional offices and the Central Office Building during 2002-03. Computerisation strategies in the Reserve Bank are driven by a four pronged approach (Table 13.3).

13.17 In terms of hardware, common, shared, high-end and high-availability servers were installed at each Regional Office of the Reserve Bank in 2002-03. These systems are equipped with fault tolerant systems and are capable of being scaled upwards in case of enhanced requirements, so as to avoid quick obsolescence.

13.18 Local Area Networks (LANs) have been made operational in each building of the Reserve Bank in all centres. Communication across different buildings of the Reserve Bank takes place through the Wide Area Network (WAN) facilities provided by the INFINET. Communication across functional units and various offices takes place through the Corporate e-mail system. Functionaries at various levels are able to log on to the Internet. For critical and sensitive areas of operation, the SFMS is proposed to be used to facilitate message based information transfer on a secure basis and Straight Through Processing (STP).

13.19 As part of Disaster Recovery Systems (DRS) and Business Continuity Plans (BCP), steps were initiated during the year to ensure that all the critical areas of operation would remain unaffected in any unforeseen exigency. These efforts would culminate in the establishment of a Data Centre which would be a small replica of all the processing capabilities of the Reserve Bank as a whole. This will facilitate quick recovery and resumption of operations.

ANNUAL REPORT

Box XIII.3**Indian Financial Systems Codes**

The INFINET, VSAT-based satellite and leased line network, is for the exclusive use of the banking and financial sector. Standardisation of message formats is a concurrent objective along with optimising the use of the INFINET. Consequently, the Structured Financial Messaging Solution (SFMS) has emerged as the Electronic Data Interchange (EDI) system for banks, allowing exchange of secure and structured messaging within the banks and between banks using the INFINET.

After a detailed study of message formats available in other systems such as the Society for Worldwide Inter-bank Financial Telecommunication (SWIFT), UN/EDIFACT and COMET standards, the choice has devolved on SWIFT message formats for intra- and inter-bank communication message transmission with suitable modifications. Alongside, the Indian Financial Systems Code (IFSC), a uniform coding structure, was developed to uniquely identify every bank branch in the country in routing of payment messages and Straight Through Processing (STP). The pattern adopted has also been drawn from that used by the SWIFT. The IFSC system can also be effectively used for national routing of SWIFT international messages with the help of a suitable interface at INFINET.

The IFSC has been designed as an 11-digit alpha-numeric routing number. This is in consonance with the number of

digits in the SWIFT coding system which follows the ISO standard (9362) for identifying banks/branches. The composition of bank code and branch code is as follows:

Table : Indian Financial Systems Code

Character Position	Information	Remarks
1	2	3
First Four Characters	Bank Code	Same as Swift (ISO 9362)
Fifth Character	Zero	Reserved for future Use
Last six characters	Branch Code	Banks can use their existing codes with no blank spaces (zeroes prefixed)

The four-digit alphanumeric codes for banks are the same as registered with SWIFT. In the last six spaces, most banks use the Basic Statistical Returns (BSR) codes allotted by the Reserve Bank for reporting statistics while some use their own existing internal branch codes. As a member of the INFINET, the Reserve Bank would use SFMS for financial and non-financial communication between its own offices and the banking and financial sector. For this purpose, the Reserve Bank has assigned IFSC codes for its own departments in the Central Office and Regional Offices.

13.20 In order to address each constituent of the INFINET/SFMS system uniquely, a system of Indian Financial System Codes (IFSC) was designed during 2002-03, similar in approach to that of SWIFT (Box XIII.3).

13.21 One of the important requirements in any system using technology with shared access systems over

networks is security. Accordingly, Public Key Infrastructure (PKI) based digital signatures are proposed for all users in the Reserve Bank, using the certification process of the IDRBT which has been approved to function as a Certification Authority (CA) under the Information Technology Act, 2000. The Reserve Bank would function as a Registration Authority (RA) (Box XIII.4).

Box XIII.4**Registration Authority**

The Controller of Certifying Authorities (CCA) of the Ministry of Communications and Information Technology, Government of India issues licences to the Certification Authority (CA) may be any organisation willing to take on the responsibility of participating in the Public Key Infrastructure (PKI). The Certifying Authority is assisted by the Registration Authority which is created at the level of the organisations subscribing to the services of the CA.

The Registration Authority office is responsible for:

- Enforcement of the practices prescribed in the Certificate Practice Statement which is the bye-law of the PKI.

- Receipt and scrutiny of the subscriber applications for issue of Digital Certification for signing and encryption facilities.
- Maintenance of records of natural expiry of the certificates and alerts for renewals and information / documents relating to the subscriber's application.
- Certificate revocation processes and ensuring that the applications forwarded to the CA for certification at any point of time have not featured in the compromised list.
- Maintenance of the audit trails of RA activity.

**PAYMENT AND SETTLEMENT SYSTEMS
AND INFORMATION TECHNOLOGY****Outlook**

13.22 The Reserve Bank will continue with its efforts to establish a modern, robust, efficient, secure, and integrated payment and settlement system for the country. Significant milestones in this path are the Negotiated Dealing System for transactions in Government securities and the Clearing Corporation of India. The INFINET would emerge as the communication backbone of the financial system. The operationalisation of RTGS System would enable real time funds transfers across different banks and thereby provide for optimal utilisation of funds.

13.23 Introduction of National EFT as a form of credit based funds transfer, and the National Settlement System (NSS) providing for centralised settlement of all net settlements across different clearing houses at a single location, would facilitate funds management for banks. Preparatory work is underway for the migration from SWIFT to IP based protocols. Message formats for new applications as part of SFMS, such as for NSS and RTGS, are likely to be introduced during 2003-04. The finalisation of EFT regulations would help in providing an appropriate framework of safe, secure and sound payment and settlement systems.

13.24 Adequate security is an area of priority in the roadmap envisaged for a modern, technology-intensive payment and settlement system, especially one functioning in a highly networked environment. Legal changes to deal with electronic data interchange and legal wherewithal for participants in the payment system are on the anvil. These changes are intended to enable the benchmarking of payment and settlement systems against international standards. All these would ultimately result in the use of synergies between technology and payment systems to ensure overall efficiency of the financial sector.

13.25 The future of banking and finance hinges around the exploitation of opportunities thrown up by the technology explosion. This requires the combined efforts of all participants in the financial system. In December 2001 the Reserve Bank set out its vision of the road ahead in the document entitled "Payments System in India", to share this vision with all participants and the nature and direction of reforms needed to achieve it. The collective goal should be to make use of synergies between technology and finance to maximise the benefits to society.