

Application of Smart Card Technology in The University of Mumbai Library to Monitor User Behaviour, Library Traffic, Library Planning, Physical Security and Managing E-purse for Cashless Transactions

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Abstract

This paper is aimed at conducting pilot study for implementation of Smart Card Technology for access control to safeguard both physical and intellectual property; and cashless transaction at photocopying centre. The reports are compiled to monitor user behaviour, library traffic and actual use of library resources. The reports are reviewed for effective and efficient collection development, weeding out and library planning policies. SOUL 2.0 software is used for computerizing the library in-house activities. Smart card technology is integrated with SOUL 2.0 software for assigning the user rights as per their credentials for providing various services.

Keywords: Smart Card, e-purse, Access Control System, SOUL 2.0

1. Introduction

University of Mumbai Library, the then Bombay University Library was opened to readers on 27th February 1880 at Fort Campus. Over years University's collection has grown remarkably - books (676330); 85452 bound volumes; enriched with total of 9986 manuscripts (Arabic, Persian, Urdu, Sanskrit, Hindi, and Marathi); and a museum collection consisting of maps, books, valuable personal records, photographs, diaries etc. serving as source material for research. The collection has grown in its scope by way of adding 4835 microforms (microfilms and microfiche), cassettes- audio and video; disks (magnetic and optical); 293 Non-book material and e-resources (books as well as journals-research and abstracting). Thus the medium of storing the information with technological developments invited Library to provide requisite infrastructure like photocopying

machine for providing document delivery services with traditional collection- mainly printed and hand written; microfilm and microfiche reader for reading microforms; VCR for playing Records-audio as well as videos; computers for disks, further exploiting the use of computers initially for internet services and providing hands on experience for learning office management software as well as system software and hardware. With the addition of e-resources in addition to Reading Rooms and Research Carrels Library provided Computer Laboratory with Multifunctional Device (Network Printer, Scanner and Photocopier) for accessing them.

In the year 1976 the ultimate transfer of the University to the new campus at Vidyanagri with large Central Library took place. One storied Vidyanagri campus Library is housing its collection in four Wings of hexagonal structure. Fifth and Sixth wings are yet to be constructed. The mezzanine floors of each wing are used for stacking



the collection and the ground floor for stacking as well as reading purposes. The collection is designated as reference, text book, lending, rare and museum. With growing collection Library's services also expanded in nature from basic-cataloguing, reference, bibliographic and circulation services - to conducting of special lectures for Research scholars; Library orientation lectures for the newly registered post-graduate students at the beginning of the academic year; Current Awareness Services in the form of monthly List of additions and photocopy copies of content pages of select journals to all the Departments of the University and providing bibliographic services on request to individuals and institutions on subject of their interest in and outside Mumbai. In addition the University library also serves teachers and students of 356 affiliated colleges.

University Library's prime objective is thus the acquisition of the documents in all possible forms, their organization and circulation. It is serving its users for last 130 years with rare and precious collection up-dated with latest information using all the required modern gadgets safeguarding it for the generations to come. This is achieved through providing controlled access to its premises and collection.

1.1 Access Control

Access control is the ability to permit or deny the use of a particular resource by a particular entity. It is the mechanism by which a system grants or restricts the right to access facilities (physical access) or computer networks and data (logical access). Access control mechanism can be used in managing physical resources such as entering the library, sections/departments and all types of

physical documents to which only library ticket-holders should be admitted.

1.1.1 Physical Access Control

The term physical access control refers to permission/restriction to be granted, to whom, where and when to a property/building and/or a section i.e. who is allowed to enter or exit, where they are allowed to enter or exit, and when they are allowed to enter or exit.

The Library staff at the first instance gets physical access to its premises by mechanical means of physical key management. The keys are deposited with the Administrative Department. Security guard hands over the key to a Hawaldar who is permitted to open and enter the various sections/departments of the library on noting check-in time and signature in a register. He then permits support staff for cleaning at the beginning of the day and for closing at the end of the day. While Returning the keys Hawaldar signs in the register with check-out time against his name entered while collecting the keys. This information provides management with a report of when and to whom the keys were issued and whether keys are returned or still remain out.

This is a manual/primitive method of lock and key - in which key possession is tracked and/or controlled by a sign out register and the supervision of administrative and/or security personnel. This method of tracking of the key is labor intensive and susceptible to human error. More over non-return of the key by stipulated time and tracing the person with whom the key not returned is tedious and time consuming. Mechanical locks and keys do not provide records of the key used on any specific door at a given time period; whether keys

are copied or transferred to an unauthorized person. Also when a key is lost or the key holder is no longer authorized to use the protected area, the locks have to be changed.

Access to library users is to be controlled in the same way as physical access control system is executed for the library staff. In the library a Hawaldar or security personnel in a strict sense permits physical access only to the card holders; and on exit checks that each user leaves the library with properly charged out documents by collecting 'pass-out'. The rest of the users are directed to 'May I help you?'/ 'reference counter' situated at the entrance of the library. A library professional at this counter grants permission as per the library rules enrolling them either as casual visitor or permanent member. This is achieved generally by issuing them library ticket/membership card. Once identified as bonafide user the user enters his/her name library card number, course and check-in time.

This permits users to enter the premises of the library for accessing information stored either physically or logically. Adequate access to documents is the bedrock upon which the whole structure of the modern library rests. It is therefore, the duty of the Library professionals to be efficient and helpful. There must be an active desire to supply what the borrower wants and to arouse in him a desire for better reading, fuller knowledge and broader understanding and to satisfy them through the use of the library. This includes guidance to the use of card cataloguing system and search documents with the access points like by author, by title and by subject. Once location (call Number and accession number/s) of document sought is known, the library staff apprises them with the arrangement of the documents on the shelf

as library uses Open Access system. This helps users to discover the document/s of whose existence they have been unaware and which opens new world of knowledge, power and inspiration for them. Once again the user is granted permission to actually use these materials either on premises or for lending depending upon his/her rights and credential. In the manual system this is noted on the library card with the date of expiry, lending section membership number (for students) and for staff (teaching/Non-teaching) number of books that can be borrowed. Students' card without lending section membership and staff cards without number of books to be borrowed are permitted only on-premises reading.

This system of physical access entry register runs a shortfall of providing the exit time, actual use of a particular section of the library, services availed by a reader, and multiple number of times authentication. It encountered human error of skipping date of expiry of the membership Recording of making available resources on premises as well as for home lending though full proof had limitations. Maintaining records of all types of transactions (reading on premises, reservation, home lending, fine paid and collected) were tedious and time consuming. With the help of SOUL software recording of transactions on-premises and home lending became easy, compiling of statistics of user profile and document became easy and precise. With log-in and log-out module of SOUL 2.0 the actual usage of the library premises also became possible. Access to e-resources (electronic journals) and databases (bibliographic as well as full text) is controlled through Logical Access Control system.

1.1.2 Logical Access Control

Logical Access Control refers to permission/restriction to be granted for accessing digital and

e-resources such as library databases of collection and users stored on a computer, software (system, application and library management software), internet, the university/library websites, all full text and bibliographic (indexing and abstracting) databases and e-journals subscribed by the library as well as enabled by INFLIBNET Centre.

This is achieved by recording date, user's card number, name, time at which entry into computer laboratory is made and the leaving time. This service – accessing, downloading and making it available in hard copy - is charged on hourly basis against issue of payment receipt. The access to web resources is granted through structured networking and Active directory server.¹ Users are assigned rights based on their credentials. The existing system though secured physically and logically lacks property of single sign-on resulting into password fatigue, phishing and frequent re-setting of password in the event user forgets due to too many passwords to be remembered. As single sign-on provides access to many resources once the user is initially authenticated, it runs a risk of misuse in case the credentials are available to other persons. Therefore, single sign-on requires full protection of the user credentials, and therefore, should ideally be combined with strong authentication methods like smart cards and one-time password tokens.

2. Objective of the Proposed Smart Cards System for the Library

The objectives of this pilot study of implementing smart card system combined with Fingerprint Biometrics are:

- 1) Single Sign-on solution to provide internet services; access to e-journals, databases – online and CD-Rom, securely and with accountability.

- 2) Provide various free and fee-based library services as per the credentials of user;
- 3) Combine with 3M library security system to safeguard physical collection; and
- 4) Study the results for further implementation to various other services.

Smart card system consists of consumables, various hardware and software for its functioning. These are described below with specifications and functions.

2.1 Consumables

SC-01: Smart Card

Contactless Smart card

Conforming to ISO 14443 Type A, Mifare

Conforming to ISO 7810 for Physical dimensions

Memory capacity – 4KB

Card surface compatible for Dye sublimation printing

2.2 Hardware

The hardware consisted of smart card readers, turn stiles, e-purse credit terminals, e-purse debit terminals, Biometric finger print reader, smart card printer, digital camera, Electronic Signature Pad, Power Supply Unit data converter and MFD Multifunctional Device (Network Printer, Scanner, Photocopier). The hardware specifications are described below:

There are 5 types of smart card readers used; for access control, card personalization, connecting to computers, e-purse debit terminals and e-purse credit terminals. They all in common should have following technical specifications and application specific specs are described at HW01 to HW05.

Mifare (ISO 14443-A) standard card read facility
Internal Integrated antenna with 70 – 80 mm card sensing range

Visual indication: Bi color LED for indicating access state

Card processing time < 100 ms

Operating power supply: 4 to 14 V DC

Operating temperature: 5 – 55 Deg C

2.2.1 HW-01: Smart Card Reader – Access Control

RS 232/ RS 485 for host interface

Internal door relay output

Facility to log up to 25000 transaction events

2.2.2 HW02: Smart card Reader/Writer – Card Personalization

RS 232/ USB for host interface

Operating power supply: 4.8 to 5.1 V DC

2.2.3 HW03: Smart Card Reader – PC Linked Readers

RS 232/ USB for host interface

2.2.4 HW04: Smart card readers – e-Purse Debit Terminal

Serial TTL for host Device interface

TCP/IP interface for Transaction data connectivity to Middleware server

Operating power supply: 4.8 to 5.1 V DC

Application Specific Firmware for e-Purse Debit Functionality

2.2.5 HW05: Smart card readers – e-Purse credit Terminal

TCP/IP interface for Transaction data connectivity to Middleware server

Operating power supply: 4.8 to 5.1 V DC

2.2.6 HW06: Biometric Fingerprint Reader

Full speed USB interface

Power supply: USB powered

CMOS active capacitive pixel-sensing technology

Sensor area with protective coating

Active sensor size: 12.8mm x 18.0 mm

Image resolution: 508 DPI

BioAPI compliant interface

CE certification

2.2.7 HW07: Card Printer

Print Mode: Edge to Edge printing, Color dye sublimation and Monochrome Thermal transfer

Integrated Ribbon saver for monochrome printing

Print speed: 150 cards/ Hour in full color (YMCKO) and up to 1000 cards/hr in monochrome

Resolution: 300 dpi

Compatible with windows 95,98,NT4.0, 2000 and XP

Card types: PVC, Composite PVC, PET, ABS

Card Format: ISO 7816

Card thickness: from 0.25mm to 1.00 mm

Card feeder capacity: 100 cards – 0.76mm

Card output hopper capacity: 50 cards – 0.76 mm

Connections: USB and Centronics parallel ports

2.2.8 HW08: Digital Camera

USB Interface

CMOS sensor

Still image 800 x 600 SVGA

Compatible to Windows 98/2000/XP

Digital camera is attached to the separate computer on which all the photographs are stored with user ID so that while printing the card it can be matched and merged for printing.

2.2.9 HW09: Electronic Signature Pad

USB Interface

Electromagnetic

2000 LPI Resolution

Compatible to Windows 98/2000/XP

2.2.10 HW10: Tripod Turnstile

Half Height Tripod Turnstile

SS or MS Powder coated; Strong & Rugged, Tie Bar, Linkage free self centering with Hydraulic damper

Gate open time: 2 to 10 seconds, user selectable

Bi-directional

Anti pass back: prevents reverse rotation once rotor moved 25 degrees from rest

Configure: Fail safe/ fail lock

Power: 115V/60 Hz or 240V/ 50 Hz, 150 W

2.2.11 HW11: Data Converter

RS 485 – TCP/IP data converter

Network interface: 10 base T RJ45 F connector

Device Configuration: Serial/ Telnet/ Windows GUI program

Protocol Supported: TCP, UDP, IP, ARP, ICMP, MAC, Telnet, DHCP

2.2.12 HW12: UPS (Uninterrupted Power Supply Unit)

SMPS based 12 V 5Amp

Battery backup for uninterrupted power supply up to 1 hrs

2.2.13 HW13: MFD (3Units) specifications are tabulated in Table 1

Specifications	Digital Multifunctional Printer/Copier
Std Inbuilt	Functions Network Print –Colour Scan & Copy , Auto copy duplex, 512 MB memory, 40 GB HDD with facility to create Document boxes, W I S E C O R E true multi-tasking for fax, print and scan data processing simultaneously while copying, Colour wide touch panel with adjustable view angle, Colour thumbnail display for saved documents, e-rotate sort, N up copy, Split Copy , Cover Mode, Page numbering, Box Image over lay, Margin Shift, Border Erase, 2 X 500 sheet Universal Paper Tray and 200 sheet multi purpose bypass tray, Original size up to A3 for print –scan and copy, Copy size from A6 to A3,
Max Monthly Duty Cycle	100,000
Resolution	Copy: 600 x 600 dpi Print:1200 dpi fast (1800 level x 600 dpi),2400 dpi level x 600 dpi with KIR Scan: 600 X 600 dpi
COPY/PRINT Speed	30 CPM/ PPM

Scan Speed (with DUAL SCAN DOC FEEDER)	50 originals per min (B/W) 25Originals per min (Colour)
Inbuilt Print Functions	<p>a) Processor- Power PC 750 FL/600 Mhz (System Shared)</p> <p>b) Emulations- PCL 6 incl, P JL, KPDL 3 (PostScript 3 compatible), KC-GL, Diablo 630, IBM ProPrinter X24 E, Epson LQ850, Line Printer, PDF Direct print</p> <p>c) Fonts-80 outline fonts(PCL6), 45 types of one dimensional barcodes plus two dimensional barcode(PDF417)</p> <p>d) Interfaces- IEEE1284, USB2.0, USB Host interface dedicated for USB flash memory, 10 base T.100 base T, CF Slot, MIC</p> <p>e) USB memory plug and print for PDF without computer connected to the machine</p> <p>f) Poster printing in pieces for original print document bigger than A3 size to get life size print without reduction</p> <p>g) Security water mark to prevent unauthorized duplication and to differentiate original and copies.</p>
Scanner Functionality	<p>a) Scan to email, scan to SMB/FTP, Scan to BOX, Network Twain, BOX Twain.</p> <p>b) 100 one touch keys</p> <p>c) 50 programs to SEND jobs to multiple destination</p> <p>d) Intelligent multi send to PC, e-mail, FTP and fax simultaneously.</p>
e-Purse Communication port	Inbuilt communication port RS232C or equivalent to communicate with e-Purse for Smart card application. The software for interfacing such port with e-purse will be provided by the university.
Toner Yield	40000
Imaging Unit Yield	4 Lac copies
FCOT	3.9sec
Dual Scan Doc Feeder	Optional
Fax System	Optional with 33.6 Kbps w/ Auto Fallback

Table 1

2.3 Location and purpose of the Hardware and consumables described above is tabulated in Table 2

Item	Specifications	Location and purpose
Smart Card Reader - Access Control	HW-01	These readers as per the specifications are mounted on both sides of the Turnstiles for enabling entry and exit of the library.
Smart Card Reader/Writer – Personalization	HW-02	These readers as specified enable writing and reading of the card. This include taking smart cards on stock whereby Mifare Number provided by the manufacturer which is unique in nature is noted; personalization of the smart cards first reading this Mifare number and writing on it the name, category of the staff/user, unique membership number and validity of the card from the database of the staff/user created for the purpose.
Smart Card Reader - PC Linked	HW-03	These readers as specified are connected to all library service station computer systems. These are the computer terminals which provide circulation –(on-premises as well as lending) and reservation services.
Smart Card Reader: e-Purse Debit Terminal	HW-04	These readers are connected to MFD and all those computers from where charged services would be provided like internet access, fine payment, downloading in hard copy and any other.
Smart Card Reader: e-Purse Credit Terminal	HW-05	These readers will be connected to those computer systems which will manage the e-purse system i.e. balance money, adding to the balance, deducting the amount paid by e-purse and enable refund of the balance money.
PC Linked Biometric Fingerprint Reader	HW-06	These fingerprint readers are connected to all those computers mainly in the computer laboratory which provide web based services like accessing CD-Roms mirrored, e-journals, on-line and CD-Rom chemical abstract services using single sign-on.
Card Printer	HW-07	This printer is connected to the same computer on which smart card personalization operation is to be done.
Digital Camera	HW-08	Digital camera is attached to the separate computer on which all the photographs are stored with user ID so that while printing the card it can be matched and merged for printing.
Electronic Signature pad	HW-09	Signature pad is attached to the same computer to which digital camera is attached and stored with the same name as photograph for printing the smart card.

Half-Height Bi - Directional Turnstile	HW-10	These bi-directional turnstiles are to be located at the entrance of two main wings of hexagonal one storied library building which leads to the total of four stacking and reading rooms - two on each side – keeping centre of the hexagonal structure open to house help desk, OPAC terminals, display of the jackets of newly added books, List of the journals subscribed and files of current contents. The objective of keeping turnstiles little interior is to keep the doors of the library welcoming to knowledge hungers and give free access to the catalogue of the library collection depending on which the user - especially visitor - decides to avail membership against payment of library fee as per the rule.
Data Converter	HW-11	These converters help transferring of the data on smart card to the computer terminal to which smart card reader is connected.
Power Supply System	HW-12	Power supply is intended for the power requirements of single access control node consisting of Two Bi-Directional turnstiles and four smart card readers.
MFD	HW-13	These MFD units are to be kept in each wing to avoid issuing of the book outside the respective section however issued on premises. Students can self operate using e-purse facility for photocopying. This is 978-93-81232-02-6 connected to e-purse with the number of tokens to be deducted. One token is equal to the charges of photocopying per A4 size page.
Smart Card	SC-01	These smart cards are used to store Mifare number, name of the user, category of the user called personalization of the card. Category helps assigning credentials like duty/visiting hours enabling physical access to the library, validity of the card, type of material that can be issued, maximum items that can be borrowed, loan period, services that can be availed free or fee based.

Table: 2

3. The software to be developed for various function are based on:

- 3.1. Server – Client architecture with optional Browser interface for Reports Module
- 3.2. Compatible to Windows 2000/ XP/ 2003 server
- 3.3. Backend - MS SQL
- 3.4. Front-end: VB.NET, ASP.NET
- 3.5. Hardware Link: C#
- 3.6. Development platform: .NET framework 2.0
- 3.7. Reports: Crystal Reports 8.0
- 3.8. Interface with Hardware modules –Smart card Reader/ Writer.
- 3.9. Acquire Access Control Reader data via Data Acquisition Middleware
- 3.10. Generate reports for MIS requirements

3.2 SW1: Card Lifecycle Management System Specifications

- 3.2.1 Develop server side process module Enabling to develop software modules for staff/users database for Smart card personalization, Visitor Management system through Data Access Middleware;
- 3.2.2 Interface with Software modules of Smart card personalization, Visitor Management system,
- 3.2.3 Function:
 - 3.2.3.1 Manage and track the inventory, data and status of all the smart cards for the lifetime of the cards by ‘Taking cards on stock’ registering the MiFare unique no. This no.

is stored in the patron database, so that in the event of card lost/suspended it is not given the same membership number, and if found is not misused or reused.

- 3.2.3.2 Generate extensive reports for MIS about number of cards personalized, renewal of the membership, up-gradation of member in terms of post, class, change of course and subject, number of cards lost;

4. SW2: Patron Identity Management and Patron Self Help Kiosk (Browser based) System Software

- 4.1 Manage and operate the process of Patron Data acquisition created at SW1 module for Patron Card generation including printing of the smart card with the Patron specific data and encoding the relevant data on the smart card. Ideally this should be functional on any terminal with the rights given to the users (Library Professionals).
- 4.2 Interface with Hardware modules:
 - 4.2.1 Digital Camera,
 - 4.2.2 Electronic Signature Pad,
 - 4.2.3 Biometric Finger print reader,
 - 4.2.4 Card Printer,
 - 4.2.5 Smart card Personaliser.
- 4.3 Interface with Software Modules:
 - 4.3.1 Administration Module
 - 4.3.2 Data Enrollment Client
 - 4.3.3 Card Personalization Client
 - 4.3.4 Patron Self Help Kiosk (Browser based)

- 4.4** Generate reports for MIS like from which terminal, who, when and how many number of cards printed and issued to members, number of balanced blank card to enable issuing timely purchase order
- 5. SW3: Library Access Management System**
- 5.1** Check unauthorized access to the Library facilities;
- 5.2** Provide exit control when the Tattle Tape detection system alarm is set off;
- 5.3** Allow exit control linked to the On-Premises circulation system when kept on-hold with specified time period by the user,
- 5.4** Manage ‘Anti Pass Back’ system where-in one member can exit only against entry; prevent entry unless exited thereby controlling misuse of the smart card which is prone in Half Height Tripod Turnstile
- 5.5** Interface with Hardware modules –Smart card Reader/ Writer.
- 5.6** Acquire Access Control Reader data via Data Acquisition Middleware
- 5.7** Generate reports for MIS requirements
- 5.8** Modules supported:
- 5.8.1** Administration Module
- 5.8.2** Visitor Management Module
- 5.8.3** Reports Module (Browser Based) and generate following reports as an input to MIS:
- 5.8.3.1** Number of times library visited (entry and exit with time) by a staff/user;
- 5.8.3.2** Report delinquent user - trying to accompany unauthorized member in the library premises, trying to exit without properly charged-out document, without returning all documents taken for on-premises reading/photocopying – at the time of exit as well as entry.
- 5.9** For effective and efficient implementation of the Access Control system using smart card, following library access policy was adopted:
- 5.9.1** All staff as per their designation and duty hours during which he/she can enter the library and few administrative officers with any time access during accidents,
- 5.9.2** Students registered for various courses granted access during library working hours excluding holidays;
- 5.9.3** Other than above two categories are granted access against issuance of:
- 5.9.4** Guest Pass: This card with the above label will be issued to those who will be visiting Library or D N Marshall Hall for various reasons (Special lectures/ refresher courses/ Orientation courses etc). This card will be issued to the responsible authorities with pre-defined no. of visitors with exact hrs for which they will be in the Library. Will bear access as well as exit right.
- 5.9.5** Security Card: Three security passes will be issued to security staff on duty who will work in three shifts viz. 7.00 a.m. to 3.00 p.m., 3.00 p.m. to 11p.m., and 11.00 p.m. to 7.00 a.m.

- 5.9.6 Temporary Library Staff card: will be of three types - support staff, clerical staff and professional staff.
- 5.9.7 Vendor Card: will be given to regular book suppliers, subscription agents, binders, vendors etc. Each owner of the firm will be issued three cards issued in the name of firm for three contact persons.
- 5.9.8 Visitor Card: will be issued to those who will be visiting library for meeting library staff personally or for official purposes. Such cards would bear the name, address, person to whom wishes to meet and the maximum duration for which he can remain in the Library.
- 5.9.9 Temporary Member: will be issued to those who will be visiting Library for Reference/ Study/Research purposes for the duration of one day to one month in contrast to the regular members whose duration is minimum 6 months (one term).

6. SW4: Single Sign-on Solution

- 6.1** Virtual Token architecture is Single Sign-on solution with Biometrics based authentication. Interface with Hardware modules – PC Linked Biometric Fingerprint reader is integrated with Windows Active Directory. They are connected to all the PCs in the computer laboratory through which access to internet, e-journals, on-line chemical abstract services; and chemical abstracts on CD is provided. These PCs are connected to one of the MFD with e-purse debit terminal and are under domain control to enable downloading, printing and

emailing the downloaded information. MFD is also used to scan the hard copy and e-mail on request for an article or part of any other library document protected under copyright.

6.2 Functionality

- 6.2.1** Central administration via Microsoft user management for Passports;
- 6.2.2** Multiple password management;
- 6.2.3** Automatic support for Microsoft logon password expiration and rotation;
- 6.2.4** Password bank for automated application logon procedures;
- 6.2.5** Passport roaming in networks using Active Directory

6.3 Modules

- 6.3.1** Single Sign on Server;
- 6.3.2** Single sign on client.

7. SW5: e-Purse System

- 7.1** Smart card based Closed campus e-Purse application
- 7.2** Interface with Hardware modules – Stand alone e-Purse Charge and Debit Terminals
- 7.3** Acquire Standalone e-Purse Terminal Data via Data Acquisition Middleware
- 7.4** Manage the Reconciliation of the Accounts of the e-Purse system
- 7.5** Generate reports for MIS requirements

Modules

Administration Module

PC based Credit/Charge Terminals

PC based Debit terminals

Accounts Reconciliation module

Browser Based Reports Module

8. SW7: Data Acquisition Middleware

Middleware application for Data acquisition in real time download or in batch mode process from Standalone hardware terminals of Access Control Readers, Standalone e-Purse Charge and Debit

Terminals and interfacing with SOUL software back end for Book and Patron Status query; Maintain Log of all activity through:

Administration Module; and Report Module.

Before implementing the smart card system the library users and potential users' categories were defined with their entitlements with the type of documents that cannot be borrowed and is given in the 'Note' in following Table 3

Library User Category	Library Fees Paid		Entitlements	Loan Period
	In Dept	In Lib	Home	
STUDENT				
BA (FRENCH)			1 BK	
BMS (FY/SY)		300		
BSc IT (I/II/III)		300		
MA (I/II)	300		1 BK	1 week
MCom (I/II)	300		1 BK	1 week
MSc I/II)	300		1 BK	1 week
MSc(Res)	300		1 BK	1 week
MSC IT (I/II)	300		1 BK	1 week
MCJ	300			
MCA				
MMS (I/II)		300		
M Ed	300		1 BK	1 week
Dip in Comp Programming		300	-	
Dip in Yoga		300	-	
Dip Course in Russian		300	-	
Adv Dip in French		300	-	
Certificate course in Arabic		300	-	
Certificate course in German		300	-	
Certificate course in Kannada		300	-	
Certificate course in Sanskrit		300	-	
Certificate Course in Manuscript		300	-	
Certificate course in Buddhist		300	-	

P G Dip in HR	300		1 BK	1 week
PG Dip in Agriculture Business Mgmt		300		
P G Dip in Acturial Science				
P G Dip in Applied Statistics with software				
BLISc	300		1 BK	1 week
MLISc	300		1 BK	1 week
Adv Dip in Counselling		300	-	
P G Dip Computer Programming & System Anaysis		300	-	
PG Dip in Envn Pollution Control		300	-	
P G Dip In Indian Aesthetics				
P G Dip in Mgmt and Insurance				
P G Dip In Mgmt of Education				
P G Dip in Journalism		300		
P G Dip in IT				
PG Cert Course in Research Methodology				
P G Dip in Special Education				
P G Dip in Operation Reaearch mgt		300		
FACULTY			20 Bks	1 term
RESEARCH STUDENTS				
M Phil (dept students)	500		2 Bks	1 month
M Phil (Other university)		500	2 Bks	1 month
Ph D (dept students)	600		2 Bks	1 month
Ph d (other university)		600	2 Bks	1 month
TEACHERS		200	5 Bks	1 month
NON-TEACHING UNIV. STAFF			1 Bk	1 month
GEN. READERS				
Retd Prof.		500	2 Bks	1 month
Jr College Permanent teachers		1000	2 Bks	1 month
Others (SET-NET , Competative Exam, preparing for Phd synopsis, Teachers (CHB/Ad-hoc)		1000	-	

Note : 1. Library Fees is to be paid in the A/C section of the library by the PG Students from the colleges/ institutions affiliated to University of Mumbai (term wise/annual).

2. Library deposit (of Rs 300/-) for borrowing is to be paid in the A/C section of the library.

3. Seal of the Department / college / institution and stamp & signature by Head / Director of the Department or principal of the college or Director of the institution is required on the form.
4. User can take 4 books for reading in reference section (includes 2 counter books) but can't bring their personal books in the library.
5. No borrowing (lending) facility will be given to the college / IDE students.
6. Periodicals, thesis, rare books, counter books and reference books cannot be lent out of the library.
7. The Fort library rare collections : Fawcett Collection, A. K. Priolkar Colln, Jeejeebhoy & Cursetjee diaries, Khairmode Colln (Ambedkar Collection), P. V. Kane Colln., Mulk Raj Anand Colln., P. F. Pavari Colln., University Colln., Patkar Colln., Irabatte Colln of newspaper cuttings, Khatkhatai colln., Hamdani Colln., Fyzee colln. of Arabic, Urdu and Persian manuscripts, Moropant Colln., S.V. Shukla colln. on Gujarati manuscripts, Bhadkamkar colln., Ichharam Desai colln., Bhagat Singhji Colln. cannot be lent out of the library.

Table: 3

Photocopying, access to Internet, e-resources, Chemical abstract on CD-Rom, downloading in hard copy are all charged services.

Following observations/conclusions/suggestions were drawn from the pilot study:

9. Observations/Conclusions/Suggestions

- 1) The pilot study was partially successful – in access control system and on one of the photocopying machine;
- 2) It was expected to exploit for paying various fees; coffee/tea vending machines, issuing railway and bus concessions for season tickets, which however requires agreement with Government/transport authorities;
- 3) Before implementing the technology it has to be demonstrated to the staff with the project objective, methodology and expected output;
- 4) The benefits of the system are clearly to be explained for e.g. implementation of access control system is to safe guard library assets and as a by-

product maintaining muster role, monitoring duty hours more transparently avoiding biases from various authorities, and leave account;

- 5) Every section head performing library in-house activities and providing services related to that section i.e. reading, home lending, photocopying should be asked to give input as regards procedure, and reports expected for efficiency and effectiveness of the services;
- 6) Any new system should be implemented phase wise and activity wise to test its success and then to be integrated with the entire library management system so that the working and services are uninterrupted;
- 7) Every section head should be involved with their team to test the system developed before implementation by sample testing;
- 8) The new system should enable to maintain both records –manual and technology based –for testing before replacing the old-one; for e.g. SOUL supports circulation transactions to be printed and

file like manual system to avoid dual burden on the staff;

9) Continued financial and maintenance support is required after warranty period;

10) Staff training is to be imparted on job to gain self confidence and avoid technology phobia;

11) User meets are to be organized;

12) Technical jargons should be avoided or explained in the documents like quotations to avoid disputes at the time of certifying the work;

13) Hardware/Software/ Consumables specifications should be clearly stated with the functions, their role in the system and integration with each other as well as third party software;

14) Tripartite agreement is to be signed between University, smart card vendor and MFD vendor for technical and software integration support.

15) Smart card manufacture should provide software for common applications like Access control, e-purse with the middleware software for sharing common databases like member detail and currency details;

16) Library software developer should come up with such applications as add-on packages;

Success or failure of the system depends on willingness to accept transparency in the system

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