

# SHUBHENDU PARTH

With over seven years of experience as a Technology journalist, Shubhendu Parth quit his job at Dataquest as Executive Editor to take up consulting, research and implementation projects in the ICT for Development space. Together with his colleague at CyberMedia, a former Executive Editor of Voice&Data, he set up Blue Slate Media Pvt Ltd and launched [www.igovernment.in](http://www.igovernment.in), a portal focused on Good Governance, in September 2007. Shubhendu began his career as a freelance theatre critic for dailies like Navbharat, Dainik Hindustan, Janasatta, Saptahik Hindustan, following which he joined Assam Express as a reporter. He had stints with the Sunday Observer and The Indian Express before joining Dataquest. Shubhendu has worked closely with the DIT and the IT Secretaries of several States to develop the Dataquest e-Gov 10-Point Agenda for India. A graduate in English from Patna University, Shubhendu completed his Postgraduate Diploma in Journalism from Bhartiya Vidya Bhavan.

Shubhendu won The PoleStar Award titled, 'IT for Competitive Advantage', for 2000 for his article, 'Smarter Cards', which appeared in Dataquest.

# SMARTER CARDS

Global smart card usage has shot up five times in the last six years, and touches 2 billion now. In India, new uses of the technology are being explored-from empowering citizens to creating smart enterprises

Contrary to the general perception, smart cards have already touched the lives of the common citizen in India, even though the market for smart cards is yet to explode in the country:

- The Jaipur Dairy All-women Cooperative uses milk testers integrated with a smart card reader to maintain accurate individual milk supply records, as well as secure payment transactions on the chip-based card.
- Panchayat officials at Chittoor, Vizag, Rajgarh and Raisen districts use electronic data cardex or smart cards to record details of bore wells and tube wells in their regions - from the well structure, pump particulars, water level and quality updates to repair and maintenance log.
- For more than 720,000 drivers in Gujarat, their driving license is a smart card that carries a digitized version of their fingerprint, their picture and a signature, as well as such information as name and address. The chip also contains a record of past violations. Globally, millions of people, organizations and even governments have been using smart cards for numerous applications - from stored-value transactions to using it as an authentication tool and even as portable records to store information and data. Smart cards have found application in areas like transport, social security, identification and health, usually to store information about bonafide users. On the other hand, the cards being used in the financial sectors are basically debit cards or e-purses.

## Global trends

While the SIM card in the global system for mobile communication (GSM) has for long been the prime driver of the smart card movement across the world, the chip card industry has of late been pushing the issue of replacing magnetic-stripe credit cards with this smarter version. The adoption of smart cards in the transport industry has also just begun. What's more, they are becoming cheaper due to mass production and standardization. At the same time, the smart card microprocessors are becoming more powerful, enabling the rapid development of new applications with the benefit of a standardized operating system and high-level development today. In fact, the new processors can also handle multiple applications in one card: credit, debit, e-purse, metro, parking, toll, payphone, frequent-flyer and library-card functions.

## Prime drivers

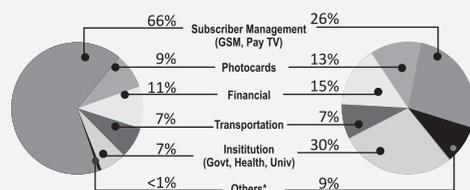
The pro-smart card lobby offers three basic arguments in favor of the chip. First, reduced fraud because chips are harder to duplicate than magnetic stripes and the chip can hold customer data thus providing added security. Second, reduced processing costs as merchants reduce the frequency of calls into a central database to check a cardholder's credit. Third, new features on smart cards to generate revenue and to retain customers.

In general, the countries adopting smart cards faster are those facing growing fraud losses or high operating costs. This includes most of Europe and parts of Africa and Latin America. In such markets as the US and Australia, however, where the business point of view is secondary to revenue generation, there has been little action. Experts feel there would be a selective adoption of smart cards in the US as the country does not need to focus on migrating to chips to solve a payment problem or for cutting cost. Rather, banks in the US are looking at the chip technology as a tool to generate new revenue.

## Asia-Pacific: Huge potential

According to a Frost & Sullivan report, the Asia-Pacific region is impressive not only in terms of the number of cards sold - approximately 150 million in 1998 - but also the market share the region holds in terms of revenue contribution. Indeed, Asia-Pacific generated over 17% of revenues in the worldwide smart card market, coming in second after Europe (70%) and beating out Latin America (7%). Frost & Sullivan estimates that by 2004, the region will command at least 25% of the revenue worldwide, with China by itself commanding nearly 33%.

Smart Card Revenues: Asia-Pacific's Share in Global Markets



\* Includes network security which accounted for less than 1% share in 1998 and is likely to grow 8% in 2004  
Source: Frost & Sullivan

## Diverse regime

A quick look at the breakdown of the smart cards market according to their application in the region also reveals a great diversity of programs and projects. Though SIM cards still dominate in terms of units with 50% market share, subscriber identification applications like GSM handsets and pay TV set-top boxes take the lion's share with over 66% market share in regional card sales. "Indeed, the GSM segment has been the honey in the card manufacturer's revenue pot since the early 1990s, and this segment will continue to grow even sweeter," says the Frost & Sullivan report.

According to the report, up until this point, digital cellular SIM card sales have been principally dependent on the growth of the GSM market within Asia-Pacific, but in the future SIM cards will find their way into dual-frequency phones if the universal mobile telecom system initiative has anything to do with it. What this means is that smart cards will ride the explosion not only of GSM handset technology, but also of the code division multiple access (CDMA) handset technology. Having a SIM card serving a CDMA handset is a key success factor when considering that cellular phone powerhouses such as Japan and Korea already have or are moving towards the CDMA standard. Frost & Sullivan telecommunications research says the combined CDMA and GSM handset market will be over 200 million handsets in 2002.

## Growing institutional sales

A vertical market of immense interest for the region is the institutional card market, which encompasses card issuance for government, university and health identification. Another pleasant surprise is Malaysia's continued efforts in the multimedia super corridor project with the intended issuance

of a citizen's multi-application card. Taiwan and Singapore are also key governments pushing nation-wide smart cards. On the other hand, the University of Hong Kong is running a project whereby students are using their multi-functional combi-cards to do everything from withdrawing cash to accessing campus buildings.

In the health segment, an interesting project is Thailand's SynergyNet, which aims to convert its magnetic stripe medical card network into a smart card one, resulting in a potential market of five million cards in 2002. Given such a high level of activity in the institutional smart card markets for Asia, it is not a surprise that Frost & Sullivan expects this vertical market to earn 30% of revenues from the region in 2004.

## Network authentication: major push

According to experts, though a major part of the network authentication market will belong to North America and Europe, the Asia-Pacific network security markets nevertheless are likely to do well. From being a market with less than 1% unit market share regionally, this vertical market is expected to achieve nearly 10% unit market share in the next five years. Though other two-way authentication hardware methods such as USB tokens are likely to provide stiff competition, smart cards are expected to dominate the hardware token market for Asia-Pacific. The key target customers in this arena will be the plethora of large electronics and IT firms located across the region. These corporations will not only want to increase security levels in the face of increasing global electronic terrorism and espionage, but also use smart cards to take advantage of electronic B2B commerce based on intricate and complex intranet, extranet and Internet models. As a result, the smart cards currently used for network

authentication will tomorrow be a dynamic multi-functional card carrying the necessary programs to enable company workers to engage in onsite secured e-commerce.

## India: New areas of usage

So, how will the smart card change the scenario in India? As in Asia-Pacific and the rest of the world, smart cards in India have traditionally been driven by the SIM card market. However, what seems to be really driving the smart card business in the near future is the transport sector - the Gujrat government driving license project leading the way.

Since December 1998, the state has been issuing one of the most sophisticated driver's licenses in the world. With more than 720,000 chip-based licenses issued and 50,000 more being issued each month, the state is on its way toward converting all licenses to smart cards by 2002. In fact, not only did the program attract the attention of other state governments, the central government also convened a meeting of transportation officials in July this year to discuss replicating the project in other states. The government has also constituted a committee of state transportation officials to ensure compatibility between chip-based licenses in different states. According to available reports, Uttar Pradesh is set to follow Gujarat. Once implemented, the project will involve approximately 8 million smart cards.

Meanwhile, encouraged by its initial success, the Gujarat government is now planning to expand the use of chip cards by issuing 50,000 stored-value smart cards to truck drivers, enabling them to pay local levies and toll taxes electronically. Add to this the recent decision by the Calcutta and Delhi Metro authorities to issue smart card-based tickets, as also the intentions of the respective authorities of the Noida toll bridge and the

Mumbai-Pune highway and one can well visualize the growing number of smart cards. Not to miss the fact that the Brihanmumbai Electric Supply and Transport (BEST) has already completed its project with smart cards for its passengers.

## Opportunities galore

The smart card technology that originated in the heart of affluent Europe has traditionally found usage for the elite around the world, bringing conveniences such as mobile telephony, loyalty systems across international airlines and hotel chains, Internet and mobile banking. However, India has been trying to re-invent the smart card usage to tackle various socio-economic issues. Today, the country has many unique success stories in terms of usage of the smart cards - down to the grass-root level, from the Jaipur Dairy project and the village-level drinking water management project to the Smart Rupee System (SMARS) project at IIT Mumbai.

"Unlike in developed countries, smart cards hold out immense possibilities of improving the lives of all one billion Indians if only it could achieve cultural internalization by moving away from the center, to the peripheries of the Indian societal manifold," remarks Sanjay Dharwadkar, head, systems marketing, Smart Chip, a Delhi-based company that provides

Country	Project description	No of Cards (in million)	Launch Year
Germany	Health card	70	1993
Belgium	SSI health card	10	1997
Spain	TASS benefits card	2	1997
France	Health card	40	1998
Slovenia	Health insurance card	2	1998

Russia	Health and benefits card	3	1998
Argentina	Driver's license	2	1998
India	Gujarat state driver's license	0.7	1998
United States	Department of defense	4	2000
Brunei	National ID card	0.3	2000
Taiwan	Health card	24	2001
Malaysia	Government multi-purpose card	2	2001
South Africa	National ID card	30	2001
Mexico	Card registration project	14	NA
Canada	Health insurance card	10	NA

smart card solutions. According to him, the country has taken two specific approaches to initiate this approach. The first is to find appropriate smart card-oriented solutions to augment grass-root development processes (see case study: Social Welfare). The second is to find mass applications that transcend social classifications, like that of a citizen identity card.

The smart card has immense potential of finding effective large-scale use as a citizen ID card. Such an application requires handling of large numbers under conditions prevalent in India such as inadequate communication infrastructure and wide area networking. Dharwadkar says, "The smart card-based driving license is one such successful application and can be considered a live prototype of a full-fledged citizen ID card." Such a smart card could easily be extended for use in election ID, ration card, income tax, pension, land records and a host of other applications, including disbursement of subsidies. Experts estimate that around Rs 1,000 crore can be saved per year by implementing integrated citizen smart cards for the entire nation, which could be done within five years. Citizen smart cards, as an authentication medium at public Internet kiosks, could also be a gateway to the Internet for millions.

## E-purse for Indians

While Frost & Sullivan projections show the Indian smart card market swelling to three million by 2005, it is ironic that there are only 3.5 million credit cards in the country. This, experts believe, has been due to the lack of guidelines and standards. The issue, however, has been sorted out to a certain extent by the RBI-sponsored SMARS project at IIT-Mumbai. Experts believe that SMARS was a right step towards standardizing smart card-based payment systems. Unfortunately, the recommendations were marred by controversy and the RBI has asked the Bureau of Indian standards (BIS) to review the report of the working group constituted to study the recommendation.

However, experts believe that unlike credit cards, smart cards in the form of e-purse can become all pervasive if a killer application can be found. According to Sanjeev Sharma, country business manager, service automation division, Ascom India, "The killer application for India is typically the payment of utility bills for electricity, water and gas. Every household in a city is a consumer of electricity. Most of the consumers would be happy to have an e-cash smart card and would welcome someone to come to their house to acquire the bill amount from their smart card onto a smart card terminal." Or at least, they should have the facility in the neighborhood, say, at an STD kiosk, to accept the e-cash smart card and pay their utility bills through the POS terminal at the kiosk. Experts believe that this convenience is bound to extensively popularize the use of e-cash smart cards in the country.

Small-value transactions are another application that can really push smart cards' growth. With the average credit card transaction in India worth Rs 1,000 to Rs 1,200, the cost of such a transaction on the buyer works out

Rs 15 to Rs 20. Thus, buying items like groceries does not work out to the buyers' advantage. This is where the smart card comes into effect. Moreover, while obtaining a credit card requires a number of formalities and has certain minimum eligible criterion, store-value smart cards do not have such hassles.

The market for smart cards seems wide and deep. The first potential users will be car owners, because they have to make regular fuel purchases. The second-largest base would be of the public transport commuters where the average purchase size is between Rs 5 to Rs 200. This is the area that BEST and Bharat Petroleum (BPCL) are targeting. While BPCL has already netted 500,000 customers for its petro card, BEST has sold 13,000 cards on select routes. Likewise, banks and financial institutions—Bank of Baroda and IDBI—have been considering the use of the smart card as the "money of the future". So, the transformation of the monetary system in the country is inevitable.

Smart cards can also help reduce the amount of loose cash lying with the public. This money can then be utilized effectively by the banks. Also, electronic money allows one to transact without taking money out of the banking system. Banks benefit because, by the time one actually spends money, one can create credit by lending the money. Transactions are simpler. At the end of the day the seller connects to the bank through a modem and withdraws money from the various accounts into his account. This way the consumer keeps his money safe and the vendors have low infrastructure costs. An extrapolation done by Orga, Kartensysteme, GmbH, Germany, shows that by 2015 India would have a base of about a billion card users. No wonder, smart card players in the country are optimistic about India's potential. Experts believe that by 2005, the country will be amongst the two biggest markets for smart cards in the world.

## Smart Cards Usage

Cards can be used to authenticate cardholders and card readers, thus allowing cardholders to gain access to a system to make transactions and electronically sign the transactions locally. It can rid the delay in online processing to gain access to a building and its facilities.

## Stored-value transactions

A smart card can be used as an e-purse. Units of value are stored on the card as the electronic equivalent of cash and later used for purchases. It can also be used to store value as credits for goods and services like ticketing or canteen facilities. Smart cards are increasingly being used as loyalty cards to provide incentives to customers by storing a token value when purchases are made - the electronic equivalent of trading stamps.

More sophisticated smart cards can be recharged with value. Others can be disposable-types that can be discarded when the credits are used up. In either case it removes the handling and record keeping associated with collecting, collating or issuing of cash or items of value.

## Data and information

Smart cards can be used as portable records to store information, which needs to be independent of fixed locations.

Portable records might be required for objects as well as for individuals - for example, vehicle or equipment maintenance. They could be used for any application where information about the object needs to travel with the object. While passports and driving licenses are some of the likely

candidates for the use of smart card technology, several countries are also planning to use it for payments of social services benefit schemes.

While the smart cards are broadly divided into the above three categories, experts believe that in future, for greater convenience, more than one of the above three main uses will be combined to offer multi-purpose stored-value cards.

## Transport: License on a Chip

Obtaining a driver's license in Ahmedabad, Gujrat, used to be a bureaucratic nightmare that took two weeks to a month. Frustrated motorists routinely paid middlemen to handle the process. Worse, the 5.2 million paper licenses held by drivers in Ahmedabad and the rest of Gujrat were of little use to police officers. Unlike advanced countries, police officers could not rely on sophisticated computer networks to check the validity of a license, or quickly know how many times a motorist had been convicted of speeding. The minimal paper records that existed were bundled together and stacked in overflowing storerooms.

Poor records meant repeat offenders went unpunished, indirectly encouraging reckless driving. The traffic toll in the state reached nearly 40,000 accidents and 5,000 fatalities in 1998. However, since December 1998, the state has been turning around that sorry record by issuing one of the most sophisticated driver's licenses in the world. Each license is a smart card, and the chip carries a digitized version of a driver's fingerprints to prevent others from using that license. The chip also contains a record of past violations. The card carries a photo of the driver and his/her signature as well as such information as name and address. The information can be accessed through hand-held terminals that the traffic police are equipped with.

Each officer also carries a sophisticated smart card terminal with an on-board microprocessor that allows him to write information - such as recording a speeding ticket - onto a motorist's card. The motorist cannot change the data on the chip. Data on traffic violations are also captured by the officer's mobile terminal and downloaded at the end of the day into the transportation department's computer system. About 300 such data files are captured each day.

## Social Welfare: The Grass-root Route

A rural project in India that has made waves globally is the initiative taken by the Jaipur Dairy All-women Cooperative. The very fact that the project was showcased during the visit of US president Bill Clinton to the country, is proof enough of its relevance and credibility.

While the smart card-based system helps the cooperative's members maintain authentic and accurate individual milk supply records, it also doubles up as a secure payment mode for them. In fact, there were times when spouses or other male relations of the members would collect dues on their behalf, leaving them with barely anything. Not anymore. The payments to these women are now directly loaded on their membership card that acts as an electronic passbook for them.

The card also comes handy as a transparent system of milk testing and pricing. These are determined by accurate volumetric measurement of milk supply, along with on-the-spot computation of fat content based on specific gravity. The testing is done through specially designed milk testers that have smart card readers integrated into them. The smart card also enables the cooperative to establish correct ID of the milk producer, exact

date of transaction, volume of milk, fat content (in %), and prevailing rates as well as the total value of the transaction. The system also enables automatic reconciliation of supplies with payments.

On the other hand, thanks to Unicef, a village-level drinking water management project was taken up in 1998 in four districts - Chittoor and Vizag in Andhra Pradesh, and Rajgarh and Raisen in Madhya Pradesh. Under the project, smart cards have been provided for maintaining information on bore well and hand pump maintenance as well as on water quality and water levels of these utilities.

The project has the potential of providing a sustainable village-level information system to ensure the well-being of about three million rural drinking water sources, which affect the lives and health of nearly 500 million people.

Other projects include smart cards for maintaining data on rural health centers including first referral units, primary health centers and health sub-centers.

A project is also being formulated for providing smart cards to women and infants in selected districts as a health card that manages various services provided for reproductive and child health, child survival and safe motherhood as well as immunization.

The common thread among all these projects is usage at the grassroots level, which enables data to be captured electronically, using mobile field terminals, which can then be transmitted to computer networks at district and state headquarters. These projects invariably deal with areas of deep concern, such as the high infant and material mortality rates prevalent in many parts of the country.

## Enterprise: The LML experience

Kanpur-based two-wheeler maker LML is one of the biggest enterprise-wide smart card users in India. The company has provided smart cards to its employees, vendors, distributors and service stations. Globally, Benz (Europe) and Nissan (Japan) have implemented similar projects.

While over 2,000 executive employees at LML's Kanpur plant use smart cards to log in their attendance, a more dramatic application has been the introduction of smart cards for the 100-odd just-in-time (JIT) vendors who deliver more than a dozen truck-full consignments per head per day. A similar smart card-based system has been used for vehicle dispatches. The company is also using smart cards for maintaining service station data.

Smart card terminals have been provided at the various gates of the factory and office, where the time-in and time-out is logged and then transmitted to a central server for instant integration with the personnel MIS and payroll systems. At certain locations, the smart card also acts as a means for authentication and secured access control. Employees also use this smart card at the canteen, simplifying the canteen accounting and linking it to the various cost centers for improved accounting. Shortly, the same smart card will be linked to in-house cash-dispenser facilities for employees to draw wages and allowances.

LML has provided JIT vendors with compatible software, which enables them to encode the details of consignments onto smart cards that is sent along with the delivery trucks. By inserting the smart cards at the entry gates, the vendors can ensure that the consignments are correctly identified, directed to the correct unloading bay and the material receipt

documentation is instantly prepared. This has resulted in substantial space saving by minimizing the turn-around time of the incoming vehicles. Thus, a truck that used to spend about 60-80 minutes waiting for entry and documentation now does so in less than 15 minutes. The smart card goes back with the empty vehicle as proof of receipt and thus of payment processing.

LML's decision to use a smart card-based system for vehicle dispatches has been triggered by the typical nature of its consignment containing hundreds of two-wheelers of different models and colors. Also, it is necessary to send the individual details of each vehicle consisting of engine and chassis numbers. This system is used for dispatches to the company's own depots, as well as to dealers' locations.

The company is also evaluating the possibility of providing smart cards along with each vehicle as a service and warranty card.

## Retail and Loyalty: Offering customer delight

During the last two years, smart card-based retail and loyalty applications have taken off in various parts of the country. While Bharat Petroleum (BPCL) has launched a petro card called Petro Bonus, Singh Motors, a petrol pump near New Delhi's Nehru Place, has implemented its own pre-paid smart card for 1,000 of its regular customers.

The Singh Motors' smart card carries cash value pre-paid by the customer. As and when the cardholder drives in to refill his vehicle, the cash value is calculated and reduced on the smart card. BPCL's Petro Bonus on the other hand is part of the company's loyalty program. The petro card is a stored-

value card that can be used to buy fuel and lubricants at the company's retail outlets as well as other products and services like purchases at the bazaar outlets in some petrol pumps. Also, the card can be used at fast food outlets, dhabas, restrooms, automated teller machines and internet kiosks and earn loyalty points in the course of making purchases. The card, costing Rs 250 initially, can be loaded with amounts of higher denominations too.

On the retail front, stores like Akbarallys in Mumbai, and Snowwhite and Home Saaz in Delhi have also launched similar cards. All these companies are using these cards to offer loyalty programs where the customer gets additional mileage points for using the card. The purchases are recorded on the card itself and customers can redeem the accumulated points to get gifts and discounts thus promoting repetitive buying habits among customers. ■■■■