

A CASE STUDY OF SMART CARD USAGE IN DRIVING LICENSE

Sudesh M. Duggal, Northern Kentucky University, duggals@nku.edu
M.P.Gupta, B.N.Chakravorty and Rajesh Taneja, Indian Institute of Technology,
mpgupta@dms.iitd.ernet.in

ABSTRACT

The objective of this case study is to access the impact of Management of Information Technology in the issuance of driving license by a Government agency like Road Transport Authority (RTO). In a rapidly evolving new market scenario it is a necessity, not luxury, for a company to update itself about the current trends and scenario as well as to strive to acquire & adopt them. Mapping this idea to the area of driving license we see the evolution from paper booklets to plastic cards and finally to smart card technology.

Keywords: Smart card, driver license, smart card as driver license, SAP-LAP analysis

INTRODUCTION

Smart cards, a French invention, provide data portability, security and convenience. The Smart Cards can be classified by its chip type – *memory or microprocessor* or by reader usage type – *contact or non-contact*. Memory cards simply store data – like a floppy disk with limited security. A microprocessor card, on the other hand, can add, delete, manipulate and encode information in its memory on the card. *Contact smart cards* are inserted into a smart card reader for read-write operations (3,4). They have a small gold plate about ½" in diameter on the front, called the micro module. When the card is inserted into a smart card reader, it makes contact with electrical connectors that transfer data to and from the chip. *Non-contact smart cards* are presented near an antenna for read-write operations. The chip and an antenna are embedded inside these cards. The size of the card, the physical characteristics of the card body plastic, position of the electrical contacts and the electronic communication protocol of the chip is governed by the international standard ISO 7816 (2). Europay, MasterCard, and Visa (EMV) have also defined a number of standards for specific applications like for credit card functions and by Mondex, Proton and Visa Cash for electronic purses (5).

Government and Government bodies across the world have found smart cards very useful in managing large databases of records created around utility services offered to people (1). Of noteworthy mention are the efforts towards the issue by the implementation of smart card based driver's license are by the Argentinean Government at Mendoza province in 1995, at El Salvador, at Gujarat in India and at Chandigarh in India. Similar database management with smart card as an IT tool has been done at Mexico but for vehicle registration only. The positive effect and popularity of the implementation is evident from the fact that a lot many Governments are in the active process of evaluation, tendering or implementation stages like the Madhya Pradesh State Government, the Rajasthan State Government and the Uttar Pradesh State Government in India who have tendered for the same. With various smart card players operating worldwide like Gemplus, Schlumberger, Orga, De la Rue, Bull etc. it becomes necessary in a country like India to go in for some sort of standardization of the various issues involved so that cross compatibility between the cards of the different companies being used in different states.

The Ministry of Surface Transport of India had appointed National Informatics Center (NIC) of India to standardize these issues. NIC in turn had asked Smart Card Forum of India (SCAFI) to help them in understanding the various types of card technology available and the benefits and drawback of each.

This paper presents a case study of the use of smart card in issuance of driving license. Figure-1 presents a non-exhaustive schematic showing data/information flow in a Road Transport Office (RTO). The management of driving license data and its issuance pertains to collection of data in manual forms consisting of applicant name, age, sex, address, blood group, fingerprint and so on. Then the data is stored on a central server and checked for duplication and fraud from other parts in the state. The activity of learner's license driving test and its outcome is recorded and finally the permanent license issues. Other activities like renewal, issue of duplicates against damaged or lost licenses, issue of International Driving Permit (IDP) etc, are parallel activities involving a lot of raw data and summaries to make it into information. Also the in event of a driver being caught and fined for driving offences, a lot other data need be checked like his previous offence history, validity of license, cases of forfeiture/confiscation of license previously, records on vehicle tax, insurance etc. This involves not only shifting through amounts of data but also to take steps at the level of traffic police check units to prevent frauds and short changing the state exchanger by paying lesser fine in case of repeat offence due to lack of data on the spot.

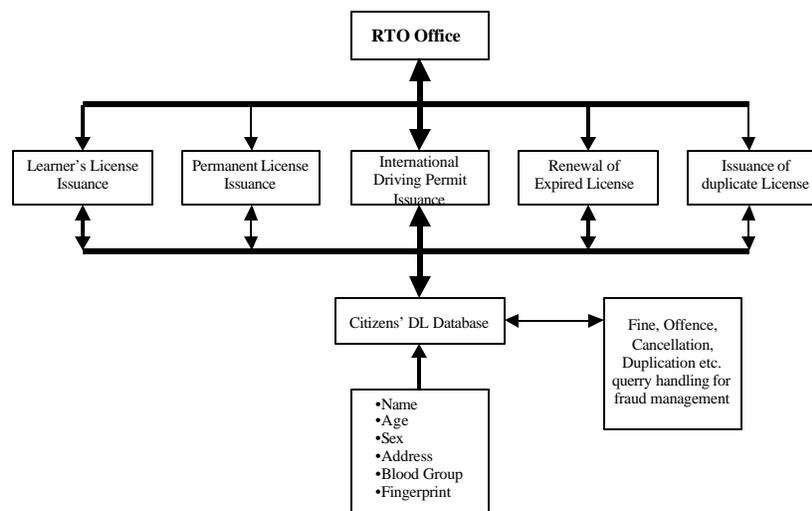


Figure 1: Non exhaustive schematic showing Data/Information Flow in a RTO

PROBLEM BACKGROUND

Paper license booklet was found prone to wear and tear and plastic cards license was not able to store all relevant information needed. Also, the lack of adequate telecom infrastructure prohibits online data collection from field to match against those stored in remote servers throughout the state/country for accurate fraud management and law enforcement. An evolution of smart card is presented in figure 2.

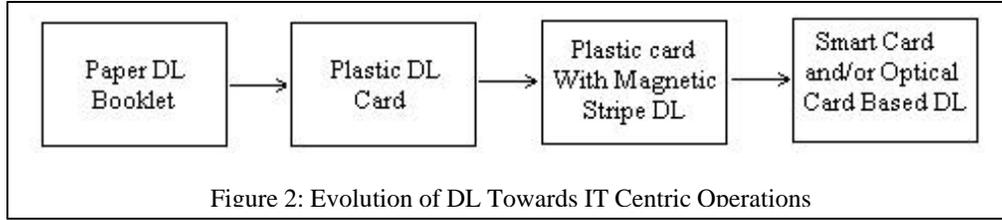


Figure 2: Evolution of DL Towards IT Centric Operations

Smart Cards thus are a great medium to store offline data in a chip embedded in a credit card sized plastic card. It is flexible, rugged, and durable thus having all virtues of a simple plastic cards driving license (DL). The main issues concerning identification media like driving license are:

- Gathering of all data
- Storage of the above data so that it can be accessed fast
- Retrieval of the data into meaningful information as an when queried
- Prevention of issue of duplicate DL as frauds and clones using the database for counter checks

The data captured is so huge that handling and storage becomes a major issue. During the retrieval for checking involving cases of accidents or periodic check runs, the task is slow and painstaking in case of manual system. Finally during issues of payments of road tax and fines, the same data is needed by the authorities again for updating. An on-line search and retrieval procedure for such vast data banks, if done, will be extremely slow plus the software needed for one-to-one matching and one-to-many matching will be very costly.

BUSINESS CASE

The smart card is used to store driving license application data, allowing off-line control by police personnel or authorized entities. Organizing the data in 5 groups according to the five following functions does the effective management of information:

<p>1. ID-card/application function Identify the card and the application. Data are stored in the card during production and pre-personalized stage made by the manufacturer.</p>	<p>2. ID-driver function: card holder identification Identify the driver of the driving license:</p> <ul style="list-style-type: none"> • Full name of the driver • Address of the driver • Date of birth • Place of birth
<p>3. ID-driving function Identify the category of driving license:</p> <ul style="list-style-type: none"> • Type of document (driving license, car registration document) • Driving license number • Date of expiry • Driving license category (car, motorcycle, bus) 	<p>4. ID-offense function Read and update the offenses. For each offense:</p> <ul style="list-style-type: none"> • Offense control data for recovery • Police station or policeperson identifier • Offense place identifier • Offense number • Kind of offense • Offense date

5. ID-accident function

Read and update the accidents. For each accident:

- **Accident control data**
- **Police station or policeperson identifier**
- **Accident date**
- **Driver responsibility**
- **Number of dead/injured**

A snapshot of the management of IT with all these data can be given as below:

- Access is not allowed for all functions, the access protection depends upon the card technology used. *The level of protection is enhanced when using a microprocessor card as compared to a memory card, especially if payments are considered.*
- The police can only add a new fine in the driving license. The software of the police terminal is able to manage three types of operation viz., read and display driving license data, new fine capture and record (write in memory) in driving license and fine transfer to police management system (database).
- The payment terminal is only used to recover the fines, it means, to update the flag 'Paid' for a given fine.
- Authorized offices all over the country deliver cards. Beyond the electronic and graphic personalization, those offices can also manage preliminary verification of identity of the applicant, medical examination for driving capacity with a doctor, driving test capacity with administrative person, driving license issuing and delivery to applicant by administration.
- During a police control, police personnel uses their 'police terminal' to authenticate the driving license by reading the card references written in the non-erasable memory, authenticate the driver by reading and displaying identity data of the card (name, first name, driving license number), check the history of the driver by reading and displaying offenses and accidents historic stored in the card, write the new offense or accident in memory of the card and the 'police terminal' memory.
- At the end of the police control period all offenses and accidents, stored in the 'police terminal', are collected and transmitted to the police central database. A communications network, or a smart card ensures the transmission of the offense and the accident with a large capacity of memory. The police terminal is re-authorized, when the central card acknowledges all the offenses and accidents. A black list of cards could be downloaded at that time in the police terminal.
- The driver will pay their fine at a payment terminal. After the payment, the flag of the fine is updated to 'paid' and the acknowledgment is stored in the payment terminal. All transactions are completed with the date, the reference of the place.

- Often (every day, week, or when the payment terminal counter is empty), all transactions are collected and transmitted to the payment central database. A communications network, or a smart card ensures the transmission with a large capacity of memory.

SAP-LAP ANALYSIS

Field studies are conducted in those situations where it is required to study a situation deeply. In a field study questionnaire, structured and unstructured interviews and observations are taken to develop case studies. Case studies developed are analyzed by culling out typicality rather than uniqueness of the situation. Focus on typicality leads to meaningful generalizations and scientific abstraction whereas uniqueness would preclude these. Case studies look deceptively simple, but they require thorough familiarity with the existing theoretical knowledge of the field of inquiry by the researcher and also the skill to differentiate significant variables from insignificant ones. An unbiased approach is mandatory. Unsystematic approach to the analysis of a case study till recently prevalent was as thorough and as deep as the analytic capability of the researcher. Occasionally, bias would creep in, some significant factors may be lost sight of, some factors even though not significant may get more attention, faithful longitudinal approach would not be taken, etc. Sushil, (2000) has recommended a formal analysis methodology for critically examining a case study in the *International Journal of Management Decision*. This methodology consists of two phases as follows. In SAP analysis we describe the case through three basic components that define the dynamic interplay of reality in flexible systems management paradigm. These are situation, actor, and process (SAP). They interact flexibly on multiple planes in the ambiguous reality and help us in understanding the reality.

Context: Context defines the background and the environmental norms that impinge upon the reality. The components operate in it.

Situation: The present status, potential for growth or decay, accelerating and decelerating forces, present and future state of the art, etc. taken together define the situation.

Actors: The participants who influence the situation and alter it by their actions or inaction are termed as actors. Actors may be both extra and intra-mural, since both can influence the situation.

Process: The procedural steps taken by the actors, which alter the situation, are termed as the process. Some processes may be explicitly identifiable while some others would be implicit. Any dynamic behavior that alters the situation has the potential of being a process.

Synthesis succeeds SAP analysis helping us to identify the learning issues. Learning issues emphasize the typicality of the situation as well as some features of its uniqueness. Learning issues also lead to action. While learning issues derived out of a particular case are applicable to similar other cases, this application should be preceded by proper adoption. Learning issues lead to the actions which when taken would lead to improved performance. This should result in positive growth and enhance productivity and profitability. Improved performance is the sum

total of the SAP analysis and LAP synthesis. In defining performance various end results, which are to be achieved, should be itemized and delineated.

A SAP-LAP analysis is presented (Table 1) for the introduction of smart card based driving licenses to centralize personal information database and automate fine collection.

IMPLICATIONS

The implications of having a smart card as an IT tool in the issuance of a driver's license are:

- Increase in fine recovery
- Immediate knowledge of unpaid fines and driver's profile
- Easy collection of all offenses data even in remote area lacking on-line communication means – management of information using IT
- Thanks to the up-to-date driving record information contained in the card, insurance companies can accurately define their premium – management of information using IT
- The driver can pay his fines in many different places
- Reduction of the accident rate by improving the driver's sense of responsibility.
- Security: smart cards are the safest and most reliable existing media for portable files.
- Less paperwork: no more payment form management or follow Up for recovery.

Table 1: SAP-LAP Analysis for introduction of smart card based driving licenses

<u>SAPLAP</u> <u>Factors</u>	<u>Normal</u>	<u>Important</u>	<u>Critical</u>
Situational Analysis	Existing process cumbersome for printing licenses. Poor license card quality with minimal automation.	No centralized database available for tracking offenses and fine collection. Targeting appropriate technology to provide front-end technology for license production and the back-end system for license management.	No checks on duplication/fraud.
Main Actors	Residents of the state and police personnel as affected parties.	Smart card vendor as identifier of relevant technology and provider of smart cards. Technological partner as provider of front and back end technology.	State government authority as the key decision-maker. Local driving license authorities as the final customer.
Technology Management Process	Existing environment analysis: present internal organization and security processes, flexibility of existing infrastructure, and adaptability to new technology. Technical architecture optimization: identification of suitable software and hardware to be used in a cost-effective manner.	Analysis of customer needs: improved quality of driving licenses, online information tracking, high security and quick turnaround time for license issuance.	Action plan implementation: pilot study with a small number of driving licenses, followed by a phased rollout for the entire driving population of the state. This is very critical, as any all-out deployment in first go will bog down the system debugging processes.

<p>Learning Issues</p>	<p>Core competencies and corporate image: since the core competency of the smart card vendor is in developing different kinds of smart cards it is better to have technological partners in different application areas (driving licenses, health care etc.) rather than servicing them directly. This competence helps build corporate image.</p> <p>Innovation culture and innovation flexibility: adapting technology to local conditions and in different application areas helps foster a culture of innovation and enhances flexibility.</p>	<p>State-of-art technology and cost effectiveness: providing state-of-art solutions supplemented by cost effective solutions improves a firm's technological leadership and helps maintain its competitive edge.</p>	<p>Technology leadership and competitiveness: building on core competencies helps in strengthening technological leadership and in sustaining competitiveness.</p>
<p>Suggested Actions</p>	<p>The smart card vendor should look into setting up a manufacturing plant in the country to meet local needs when volume to cost ratio is justified.</p> <p>Tie-ups with different service providers – banks, health-care, insurance should be increased and the developing market targeted for expansion.</p>	<p>Increasing automation and 24 hour services are increasingly becoming the norm in India and corporate image building should focus on meeting these needs, including the Government.</p> <p>Multiple applications like insurance etc. on a card make it cheaper.</p>	<p>In an extremely price-sensitive market such as in India technological innovations should be encouraged to cut costs.</p>
<p>Performance</p>	<p>No waiting for license. Same day issuance of renewal / duplicate card.</p>	<p>On line information availability. Electronic approval for faster processing.</p> <p>Improved card quality.</p>	<p>Introduction of state of art technology and do away with all manual processes of data storage and retrieval</p> <p>High security.</p>

REFERENCES

1. Allen, C.A., and Barr W.J., Eds. (1997). *Smart Cards: Seizing Strategic Business Opportunities*. Chicago: Irwin Professional Pub.
2. "Background Paper: Smart Card Technology Leading To Multi Service Capability." 1994. <http://www.cardeurope.demon.co.uk/rep1.htm>
3. David C., (1994). "Prepaid Smart Card Techniques: A Brief Introduction and Comparison." <http://www.digicash.com/news/archive/cardcom.html>
4. Fancher, C. H. (1996), "Smart Cards." *Scientific American*, 274, No. 8, 40-45. <http://www.sciam.com/0896issue/0896fancher.html>
5. Martin, H. (1997). "Telecommunications Companies and the Global Payments Business." *Baseline*, January. (<http://www.tsainc.com/tsainc/aci/baseline/telecom.asp>)
6. Sushil (2000), SAP-LAP Model of Enquiry, *Management Decision*, 38/5, pp.347-353.