# Smart Cards: The Future Technology

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***Abstract*— Smart Cards are one of the rearmost operations of Information Technology. This composition covers all information about it as history, origin, advantages, disadvantages, and forthcoming trends in smart card technology. The government wanted to replace everything which we carry in the portmanteau will be replaced by a smart card. As smart cards and other chip-grounded cards advanced, people set up new ways to use them, including charge cards for credit purchases. numerous diligence has enforced the power of smart cards into their products similar to GSM digital cellular phones to television- satellite decoders.**

***Keywords*— GSM digital cellular phones (***keywords***)**

## I. INTRODUCTION

A Smart card, chip chard, or integrated circuit card(ICC), is any portmanteau-sized card with bedded intertwined circuits which can reuse data. This implies that it can admit input that is reused by way of the ICC operation and delivered as an affair. A smart card, a type of chip card, is a plastic card bedded with a computer chip that stores and transacts data between druggies. The smart card may be effective with reference to attendance but it can also be applied in the same expressway in other seminaries other colorful places can also be acquainted and improve there-existing norms. New functions may carry utilizing smart cards to pierce indoor facilities, parking parcels, and cafeterias. By introducing this system, we can ameliorate the security levels of parking parcels, easier to identify the person who, for illustration, bloodied the futsal court by penetrating the entry history of the smart card, and scholars may now store plutocrat in smart card precisely like the Touch N ' Go card for cafeteria operation and mostly improves the luxury of smart card druggies [2] As experimenters and manufacturers struggle to develop and distribute products in step with the rearmost technological advances, confusion over the language of new bias arises. For purposes of discussion, this document will use the following description of a smart card a credit-card-sized device containing one or further intertwined circuit chips, which perform the functions of a microprocessor, memory, and an input/ affair interface. The bias which aren't of standard credit card size( i.e., plastic keys and dog tags, or cards that are thicker than the standard credit card), but which else conforms to this description, will be appertained to in this document as" smart commemoratives."[1]

## II. LITERATURE REVIEW

Now if we talk about the history of mileposts in the development of smart card technology.1970 —Dr. Kunitaka Arimura of Japan filed the first and only patent on the smart card conception. These are times were further invention takes place for smart cards Roland Moreno patented the memory card in 1974. By 1977, three commercial manufacturers Bull CP8, SGS Thomson, and Schlumberger, started developing smart card products. In March 1979, Michel Hugon from Bull CP8 was the first to design and develop a microprocessor-grounded card combining a processor and original memory. He constructed the motorized smart card.1979 early developments for the banking sector.1995 first public eID card( Finland ID).1999 first smart cards for transport.2001 the department of defense first issued military cac credentials for physical access control and secured logical authentication.2003Micro-SIM launched 2005 first ICAO-biddable electronic passport( Norway passport) 2012 Nano- SIM introduced 2018 first biometric contactless payment card, eSIM, launched(consistency is< 1 mm or0.039 in) 2019 First 5G SIM available.

## III. SMART CARD ARCHITECTURE

The architecture of a smart card included three elements Like the following elements are

- I/O SYSTEM :
- CPU or Central Processing Unit
- Memory

Smart cards must have certain units to perform I/O functions. Normally, a smart card has some logic circuit that, in conjunction with the microprocessor, controls the timing and flow of data transferred into and out of the smart card's memories. To exchange data smart card must have a physical structure through which it can interface with a reader/writer device to connect to other computers. There is generally two types of physical interface takes place for smart cards

1-contact type

2-non-contact type(contactless)

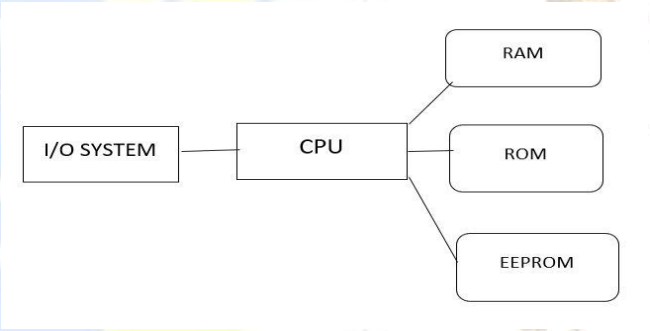



Fig no-01 Architecture

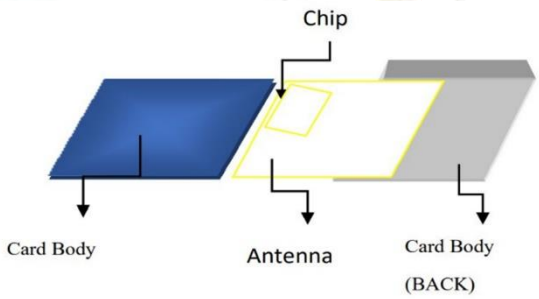



Fig no 2 CONTACTLESS SMART CARD

The discrepancy, a smart card with an anon-contact type interface can transmit information to and admit information from an anthology/ pen device without a physical connection. anon-contact type interface may be enforced using capacitive plates placed inside or on the face of the card. When placed within a short distance from an anthology/ pen device containing corresponding

capacitive plates, information can be changed. With the anon-contact interface, problems similar to electrostatic discharge and impurity of physical connections( dirt, grease, etc.) may be avoided. ( RSKI 87,p. 16) still, a smart card with a non-contact interface may bear fresh factors which may increase the card's vulnerability to internal breakage. ISO isn't presently working on homogenizing any non-contact ICC interfaces.[1]

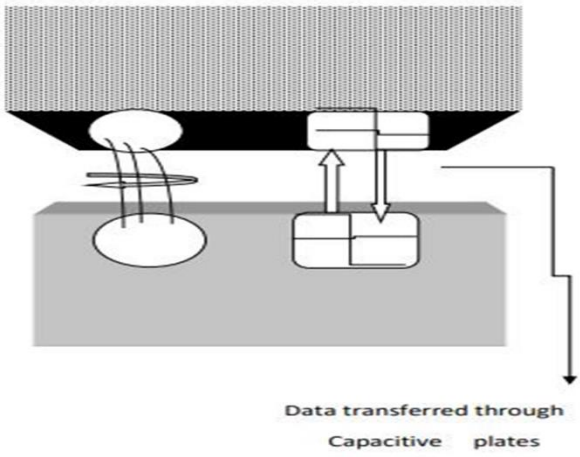



Fig no-03 Non-Contact Type[1]

A contact smart card must be fitted into a smart card anthology with a direct connection to a conductive contact plate on the face of the card( generally gold-plated). Transmission of commands, data, and card status takes place over these physical contact points, this interface consists of an 8- contact connector, which looks like a small gold circle or series of places on the shells of the card. Memory for storing the data & nearly all the recollections presently used in smart-card microcomputers are manufactured from the semiconductors accouterments. Semiconductor recollections correspond of matrices of cells formed by transistors to store information. By varying the composition and cell configurations of semiconductor accoutrements, recollections with different characteristics can be produced. Four types of semiconductor memory used in smart cards are bandied below. Random Access Memory( RAM)-Smart card RAM is generally manufactured from essence oxide- semiconductor silicon. RAM is nonpersistent memory, it's used as a temporary working space for storing and modifying data. Smart card RAM is generally unpredictable in nature(That, it'll lose its stored information incontinently if power to the memory is removed). RAM, the fastest type of memory, is frequently used as a " scrape pad ", buffer, or another type of temporary storehouse. Smart card ROM is a semiconductor memory that is non-volatile ( i.e., its stored information is retained indefinitely without a nonstop power force to the memory), it's used for storing the fixed program of the card(.eg., operating system, endless data). Erasable Programmable Read-only memory( EPROM)-Smart card EPROM is a Non-unpredictable semiconductor memory that can be originally programmed at the stoner's installation rather than at the ROM manufacturer's factory. Data and programs can be loaded into the smart card EPROM via a smart card anthology/ pen device; the transfer of the information is controlled by the smart card's microprocessor. When it's used in other types of computers, EPROM can be canceled ( by exposure to ultraviolet light) and reprogrammed. EPROM may be used in other types of computers, EPROM can be canceled ( by exposure to ultraviolet light) and reprogrammed. EPROM may be used in a smart card to permanently store an inspection trail, and a complete history of the operation of the card. Then in EPROM only we can tack the data not to cancel the data from smart card EPROM, it may ultimately come full, and therefore, the smart card will expire ". Electrically Erasable Programmable Read ONLY Memory( EEPROM)-Smart card EEPROM is anon-volatile semiconductor memory that can be electrically canceled and reprogrammed via an anthology/ pen device at the stoner's installation. We can save data content when power is turned off. Reading from EEPROM is as fast as reading from RAM, but writing to EEPROM is 1000 times slower than writing to RAM. Reliably accept at least 100000 write cycles, and retain data 10 times. Then's a selection of parameters from some of the smart cards on the request moment. Smart cards like these are programmed is assembly language and don't important in the way of coffers. To keep down costs, they don't get resources.[3]

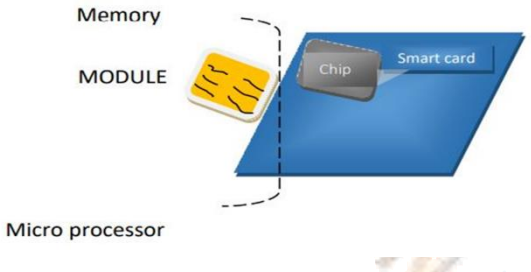



Fig no-04 Contact type [3]

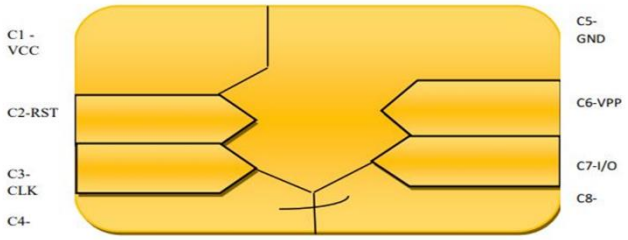



Fig no -05 Pinout micro module[3]

| Smart card | Word size | ROM | EEPROM | RAM | VOLTAGE | CLK | Writer/erase cycle | Transmission Rate |
|---|---|---|---|---|---|---|---|---|
| InfineonSLE44C10S | 8-bit | 9k | 1K | 256GB | 2.7-5.5V | 5MHZ | 500000 | 9600BAUD |
| Orga ICC4 | 8-bit | 6K | 3K | 128B | 4.7-5.3V | | 10000 | |
| Gem Combi | 8-bit | | 1K | | 4.5-5.5V | 13.6MHZ | 100000 | 106kbaud |
| DNP Resonant | 8-bit | | 1K | | 5V | 13.6MHZ | | 9600baud |
| Ama Tech Contactless | 8-bit | | 1K | | 5V | 13.6MHZ | 100000 | |
| Schlumberger Cyber flex | 8/16-bit | 8k | 16K | 256b | 5V | 1-5MHZ | 100000 | 9600baud |

Table -01 Selection Parameter for smart card[1]

## IV. CENTRAL PROCESSING UNIT

The CPU or the microprocessor is the unit component that distinguishes the smart cards from other cards which are designed to simply store data. The microprocessor in association with the operating system enables the smart card to "make its own decision " concerning where the data is stored in its memories and under what circumstances it should transfer information through its input/output interface.

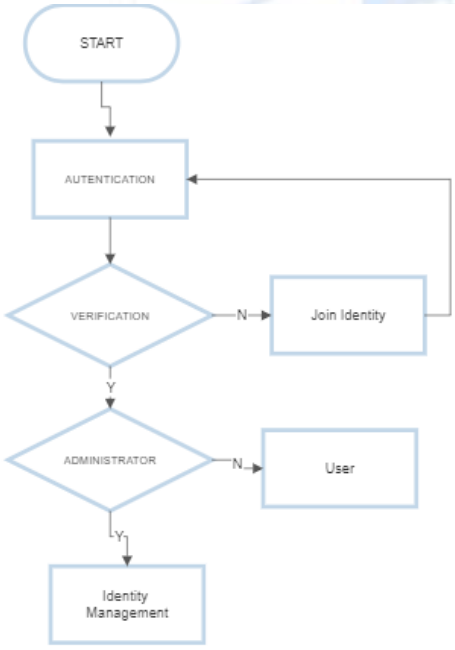
The microprocessor consists of three majors components:

- Arithmetic logic unit: The ALU provides the basic logic and arithmetic functions for the microcomputer.
- Control unit: The control unit assures that the timing of events in the various parts of the bus provides a link between the smart card and the computer.

Bus: The configurations for the bus, which may be comprised of several segments of the microcomputer are coordinated.

## V. Smart Card and Identity Management

A Smart card can be used to securely hold user information, and to provide two-factor or three factor authentication. Smart card technology enables distributed and federated applications in lieu of a central database of all user identity and other personal information. The use of smart cards and federated data with standard based protocols would allow academic institutions, medical practitioners, the police , telecommunication and other government agencies to have
access to data across multiple data stores with an assurance that: The smart card user identity is authenticated ;
The records of the user retrieved will be analysed for approval if it matches with the data in the chip or rejected if there is mismatch. Only the agencies registered under the
government and have need of the data have access to the central data base.[1]
In the case of user data access, proper security controls and restrictions must also be implemented around the application, database, and environments that house the electronic data. Smart cards can be effective in supporting numerous organizational programs in the country such as SIM card registration, voters card registration, healthcare applications and many more , with or without a unique identifier[1]




## VI. Smart Card Help to Protect the Privacy

Smart cards offer a number of features that can be used to give or enhance sequestration protection in the system. Smart cards give mechanisms for authenticating others who want to gain access to the card. These features can be employed by a system to cover sequestration by, for illustration, icing that a banking operation has been authenticated as having the applicable access rights before penetrating fiscal data serve on the card.

Secure data storehouse. Smart cards give a means of securely storing data on the card. This data can only be penetrated through the smart card operating system by those with proper access rights. This point can be employed by a system to enhance sequestration by, for illustration, storing particular stoner data on the card rather than in a central database. Smart cards give a robust set of encryption capabilities including crucial generation, secure crucial storehouse, mincing, and digital signing. This protects the dispatch communication from latterly being tampered with and provides the dispatch philanthropist with an assurance of where it began. The fact that the signing key began from a smart card adds credibility to the origin and intent of the signer. Secure dispatches. Smart cards give a means of secure dispatches between the card and card compendiums. analogous in conception to security protocols used in numerous networks, this point allows smart cards to shoot and admit data in a secure and private manner. This capability can be used by a system to enhance sequestration by icing that data transferred to and from the card isn't interdicted or tapped into. [1]
Biometrics. Smart cards give mechanisms to securely store biometric templates and perform biometric matching functions. For illustration, storing point templates on a smart card rather than in a central database can be an effective way of adding sequestration in a single sign-on system that uses point biometrics as the single sign-on credentials. .particular device. [2]
Personal device A smart card is, of course, a particular movable device associated with a particular cardholder. The smart card plastic is frequently substantiated, furnishing an indeed stronger list to the cardholder. For illustration, a healthcare operation might handpick to store medicine radiation information on the card rather than in paper form to ameliorate the delicacy and sequestration of a case's conventions., and instruments. numerous of moment's smart cards have been certified they misbehave with assiduity and government security norms. They gain these instruments only after completing rigorous testing and evaluation criteria by independent instrument installations. These instruments help systems cover sequestration by icing that the security and sequestration features and functions of the smart card tackle and software operate as specified and intended.[1]

## VII. CONSUMERS PRIMED TO USE SMART CARD

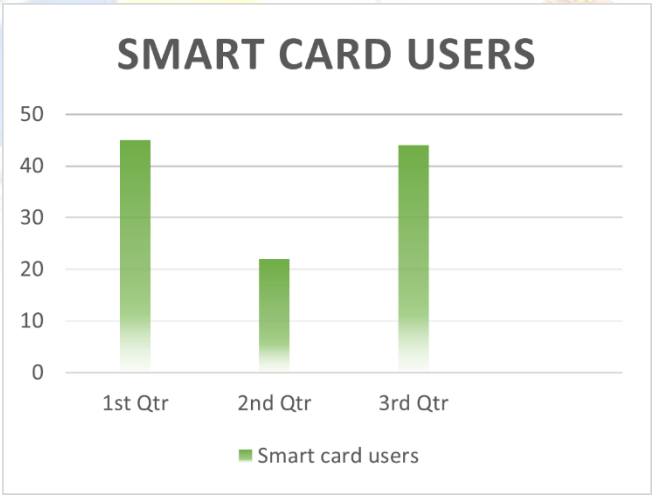



Fig no -06 Identity authentication for smart card[4]

45 percent of consumers are favorably disposed to using smart cards
25 percent of households would actually obtain these smart cards
44 percent of consumers are likely to use identification-type smart cards (telephone cards, gas cards, automated teller machine [ATM] cards, etc.)[5]

| Attribute | Details |
|---|---|
| Report coverage | Revenue forecast, company ranking, competitive landscape, growth factors, and trends |
| Actual estimates/Historical data | 2014 - 2015 |
| Forecast period | 2016-2025 |
| Country scope | U.S., Canada, U.K., Germany, Russia, India, Japan, China, Brazil, and Mexico |
| Market representation | Revenue in USD Million & CAGR from 2016 to 2025 |

TABLE NO-02 SURVEY ON SMART CARD[4][5]

## VIII. APPLICATION

A smart card is in use in daily life applications are discussed below:

The most commonly used smart cards for domestic purposes are DTH cards. These cards provide authorized access to information received from satellites. The information received by these cards gets encrypted and decrypted within it.

Government purpose:

The government of India issues identity cards to all citizens. An example of such cards is " AADHAR cards", or "Pan cards" provided to all citizens.

Health care purpose:

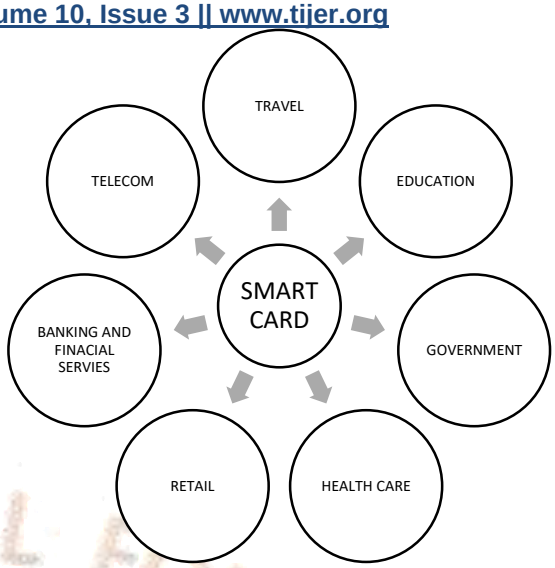
The advent of smart cards in health care sectors has allowed hospitals to securely store patients' medical reports safely and reliably. It helps authorities to access information quickly, can update if required, and immediate insurance processing, and refund.

Financial Transactions:

Smart cards are very handy as a tool for financial transactions both in traditional and web-based applications. A cash value can be stored in smart cards to use it as credit cards. Its potential to support both consumers and businesses against lower rates of transactions widens its applicability in marketing targeted programs in financial services.

Telecom sector :

Providing secure cellular communication is assisted by smart cards. New apps and functions are providing real-time download capabilities by smart cards. A SIM card is given by cellular operators to their subscribers and its use of multimedia




## IX. CONCLUSION

Smart cards can add convenience and safety to any traction of value and data; In this paper, we also discussed the background and the architecture of the smart card. Now if we talk about the future aspects of data in the smart card by the use of biometrics. Smart card readers can be built into future computers on peripherals which will enable the users to pay for goods purchased on the internet. The smart card is not only a data store but also programmable, and portable tamper resistant.

## X. ACKNOWLEDGMENT

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## XI. REFERENCE

1. NIST Special Publication 500-157, "Smart Card Technology: New Methods for Computer Access Control". Martha E. Haykin Robert B. J. Warner, September 1988
2. Ahmad Faiz Asyraf Bin Wan Zurushdi 16585, Mohammad Ashraf Bin Rafiuddin 17917, Muhammad Iman Bin Mostafa 16518, Muhammad Radziamir Bin Mohd Mazlan 16055, Muhammad Zulhemi Bin Azhar 16440, Sivaraj a/l Etiapan 18312," Analysing the Impact of Smart card in Educational Institutions in MalaysiaIntroduction to Management GBB/GCB 20333",August 5, 2014
3. Mike Hendrickson "Technology for Smart Cards: Architecture and Programmer's Guide",16 June 2000
4. hih-Chen Chen1, De-Jou Hong2, Shih-Ching Chen3, Ying-Ying Shih4, Yu-Luen Chen2, "Study of Multimedia Technology in Posture Training for the Elderly" October 2013
5. Loo, W.H., Yellow, Paul, H.P. & Chong, S.C. (2009). User Acceptance of Malaysian Government Multipurpose Smart Card Applications. Government Information Quarterly, 26 (2), 358-367
6. Mitra, Arami, Monika, Koller, & Robert, Krimmer (2004). User acceptance of multifunctional smart cards., ECIS 2004 Proceedings

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