

IoT enabled Smart Banking System – a Technological Revolution



M. V. L. N. Raja Rao, T. Sumallika, P.V.M. Raju, V.Alekya

Abstract: *The main proposal of the Smart Banking System by using IoT is to develop a System that could be easy to use and accessible. IoT solutions make certain Banking & Financial Services (BFS) companies for improved tracking and analysis of client's behaviors and requirements. In the dominion of interconnected "things", banks are testing better approaches for associating with clients to give them exhortation, and might exhibit money related offers through their cell phone as they stroll past specific stores. They could use a similar way to deal with give direction on sending a notice to "skip Starbucks" as the client overspent on sundries the current month's savings. In the coming future, banks will have an extensive task to perform in managing and control of payments. IoT helps banks in many ways ,ie: facilitating consumers by communicating with right information about different offers especially in banking/finance, and solve different day to day issues of consumers and retain them for longer period. The customer data available through the IoT will identify the financial needs of the client and its value chain that also helps banks provide the value added services and customized financial products to ensure Win-Win situation .This banking system enabled with IoT improves customer loyalty by playing as a powerful facilitator .It transforms the business in the future. Banks must convert IoT data into valuable information that helps in increases their market share and provides better solutions to their customers. As the banking system has become part of a human day to day activity, it efficiently offers many benefits, such as operating a payment system, granting loans, taking deposits and helping with investments etc.*

Index Terms: Smart Banking System, Wearable, Payment system, CRM, Retail Banking

I. INTRODUCTION

A. Internet of Things (IoT)

Internet of Things (IoT) is developing and remains the latest and became a buzz word in the field of Information Technology in the world.

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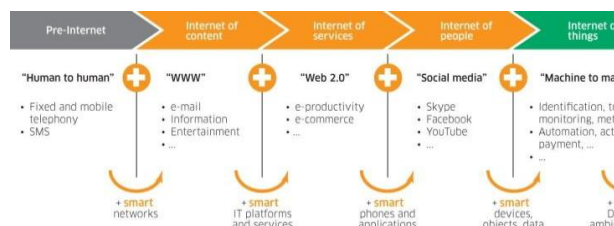
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In the recent past , the term Internet of Things (IoT) got the attention while anticipating a worldwide foundation of physical articles into the system, permitting network whenever, anyplace, and not only for anybody.

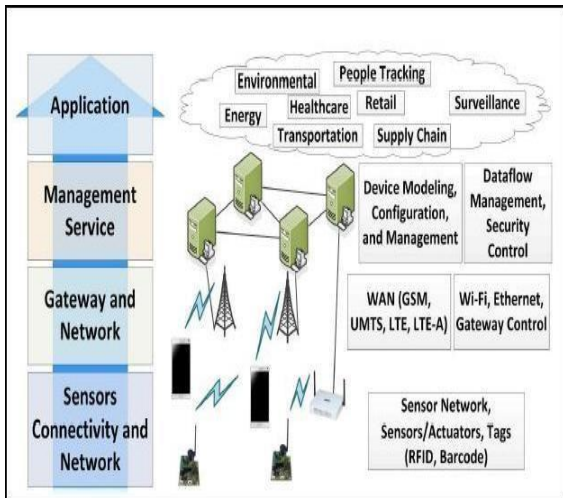
The Internet of Things can likewise be considered as a worldwide system that permits correspondence between man and man and among things that can be anything on the earth giving a unique character feature to each article. IoT depicts a reality where almost everything can be associated and impart wisely more than ever. Many of us think that they are "related " as far as electronic gadgets are concerned, examples: Web servers, Personal computers, smart phones , laptops , tablets, and other advanced mobile phones. Web innovation that associates devices, machines and instruments to the Internet by means of remote advances. IoT is the system of physical devices that impart, see or collaborate with their inside states or with the outer condition. The IoT is basically a bridge between the physical and the latest world. The technology enabled world associates with the physical world utilizing countless and actuators. For this information and interconnection, IoT gadgets are furnished with coordinated different sensors, actuators, microprocessors and handsets. IoT is definitely not a solitary innovation; rather it is an aggregation of different advancements cooperating all in all. Sensors and actuators are gadgets that assistance to connect with the physical state. The data gathered by the different sensors must be put away and prepared in a savvy approach to get helpful inductions. Note that we characterize the term sensor generally; a PDA or even a microwave can be viewed as a sensor as long as it gives data on its present status (interior status + condition). An actuator is a device that is used to roll out an improvement in the present world, for example, the high temperature regulator in a system of air conditioner. The right definition of IoT is “An open and comprehensive network of intelligent objects that have the capacity to auto-organize, share information, data and resources, reacting and acting in face of situations and changes in the environment”.

B. Evolution of IoT:



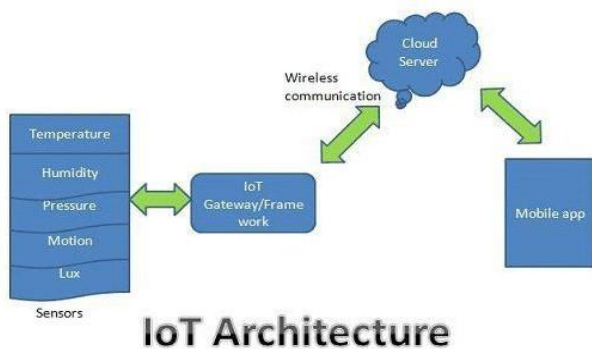
IoT enabled Smart Banking System – a Technological Revolution

Some areas identified as IoT enablers: Radio Frequency Identification (RFID), Nano technology, actuators, computer servers, Sensors, and Smart Networks and the computer communication network form the core infrastructure of an IoT framework.



IoT Architecture and Requirements:

For the effective usage of the IoT, the prerequisites are (a) Demand for dynamic sources (b) Real-time requirements (c) Exponential growth of demand (d) Availability of utilizations (e) Protection of client information and security (f) Efficient application vitality utilization (g) Access to an open and interoperable cloud framework. IoT Calculation (a) Hardware developed with the help of sensors, actuators, IP cameras, CCTV and coordinated equipment correspondences (b) Calculation and capacity on demand of middleware. Devices for information examination with cloud and huge information investigation. (c) Easy-to- comprehend representation and understanding apparatuses that can be intended for various applications, Mobile ,non-IP devices, intermittent connectivity.



IoT Architecture

Characteristic features of IoT: Efficient, measurable and related architecture engineering, unambiguous names and addresses, plenitude of latent hubs,

C. IoT's Market share in the overall industry:

Business / Manufacturing: [40.2%] Real-time analysis of supply chains and equipment, robotic machinery.

Medical and Health care: [30.3%] Portable health monitoring, maintenance of electronic records, pharmaceutical products, security checks.

Retail Industry: [8.3%] Monitoring of stocks, smart phones, purchases, anonymous analysis of consumer choices.

Security: [7.7%] Biometric locks and facial recognition, remote sensors.

II. ELECTRONIC BANKING SYSTEM:

The electronic managing an account framework, otherwise called electronic finances exchange (EFT), is just the utilization of electronic assets to exchange reserves specifically starting with one record then onto the next, as opposed to through checks or money. Electronic finances exchange can be used to:

- Check installment checks kept specifically in the bank or in the record.
- Remove cash from the record utilizing an ATM with an individual ID number (PIN), during an era of solace for the client, day or night.
- Ask the bank or monetary foundation to naturally pay month to month charges in our record, for instance, vehicle advances or home loan portions.
- Transfer supports each month from the client record to the shared reserve account.
- Control of standardized savings advantages or assessment discount kept straightforwardly in the client's record.

III. RESEARCH METHODOLOGY:

The present research work is an applied report in "IoT enabled Smart Banking System– a technological Revolution in India ". Along these lines, the specialist has embraced a subjective research system. As indicated by (Ader et al., 2008), there are no autonomous factors or representatives engaged with a subjective report on the grounds that a subjective procedure isn't of a trial nature. (Saunders, M, et al 2003), states that with regards to theoretical research, it is critical to audit past research on the related topic. A qualitative research permits a versatile procedure amid which it is conceivable to make changes and incorporate research. This particular research adopts absolute qualitative strategy this exploration includes a dependent variable (Banking System) and its effect on the independent variable [Internet of Things (IoT)].

IV. OBJECTIVES OF THE STUDY:

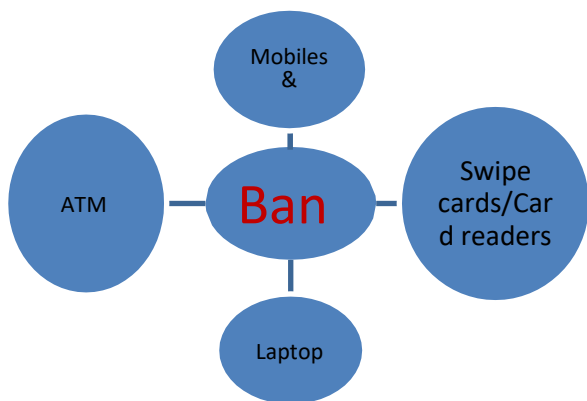
- To understand the IoT technology and it's Implications on Present Banking system in India
- To analyze the potential areas of Banking in which IoT can be used.

V. RELATED WORK:

The objective of the study was to explore the long- term perspective of IoT in banking services. And to identify trends and issues related to IoT, potential opportunities and risks and challenges. With IoT developments in the banking sector, organizations can create innovative devices for the convenience of customers and businesses. For example, imagine using your bank on your wrist and making quick payments with the movement of your hand, with devices like Fit Pay.

Although these devices need a lot of thought, inventiveness and, of course, data, they are no longer elements of science fiction. And they do not have to be just for the convenience of their customers. Some IoT devices in the banking sector, like smart glasses, are used to detect false checks. By connecting portable devices to a computer, a bank can automatically process control credentials. After comparing the routing numbers and the bank account details with the database records, the glasses send an automatic alert to the employee, indicating to them whether to approve or reject the check. With access to large groups of vital historical data, banks and other financial organizations can form a complete and accurate overview of their clients. This, in turn, can help them make decisions. Ultimately, customer profiles, as well as transaction and transaction information, provide banks with all the information they need to complete more calculated businesses and acquisitions. This eliminates the risk of making critical business decisions. The Industrial Internet of Things (IIoT) market is expected to exceed \$ 176 million in 2022, according to a new report by the Market Research Engine analyst. Market Research Engine suggests that the IIoT market will increase at a compound annual growth rate (CAGR) of more than eight percent over the coming five years, with key factors driving technical development in semiconductors and electronic devices, IPv6 standardization, growth of cloud computing and government support. According to Forrester Research's report on IIoT software platforms, C3 IoT, Microsoft, PTC, SAP and IBM are the industry leaders and C3 IoT offers the strongest platform in general, and IBM is far ahead of other providers in the strategy.

How Banks Collect the Customer Data:



Modes of Data collection by banks

Data generated by IoT adds value for banks and customers:

IoT applications enable banks to enhance their guaranteeing procedures and achieve new markets. They foresee that physical, execution and social information created by biometric and positional sensors for individuals and control sensors for delivery and generation for organizations, offer new open doors for guaranteeing credits, especially for those sections of clients who are absent of a record as a consumer.

Product planning and Management: The board and arranging: with IoT innovation, banks can dispatch better and increasingly explicit administrations contributions. Will it

help the keeping money division to comprehend which item to dispatch? It additionally chooses the correct time to dispatch the item.

Personalized Marketing: Customized advertising is the most ideal approach to keep the client in a focused market. IoT innovation has empowered the bank to screen all customer exercises and offer an item and administrations as indicated by their requirements.

Cyber security: With developing Internet saving money, security is a noteworthy test for any managing an account division. IoT innovation guarantees that the whole managing an account encounter must be secure. IoT innovation guarantees that the client's close to home information to money related information can be kept secure on the moving system.

Maintaining customer relations: the IoT can enable banks to comprehend their current financial conditions and offer administrations to the customer, if important every once in a while. This will guarantee the upkeep of a solid association with clients and a superior client encounter.

Proactive Services: IoT innovation has empowered the managing an account and money related industry to recognize any administration disappointments and convey it to the bank's thoughtfulness regarding handle the issue before it turns out to be excessively genuine. With the IoT, the innovation bank can likewise screen past exercises and client conduct.

Thusly, any strange action in the customer's record winds up mindful of the banks.

Data Analysis: IoT innovation in the saving money and life partners division gathers information by means of versatile applications and advanced sensors. All banks have versatile saving money applications that give expansive scale information that assistance the managing an account and monetary part break down client conduct and needs and help organizations decide.

Advanced sensors are another wellspring of social affair client data through ATMs and other robotized gadgets put in physical units to investigate client conduct, which thus enables banks to produce new, imaginative plans to give potential clients.

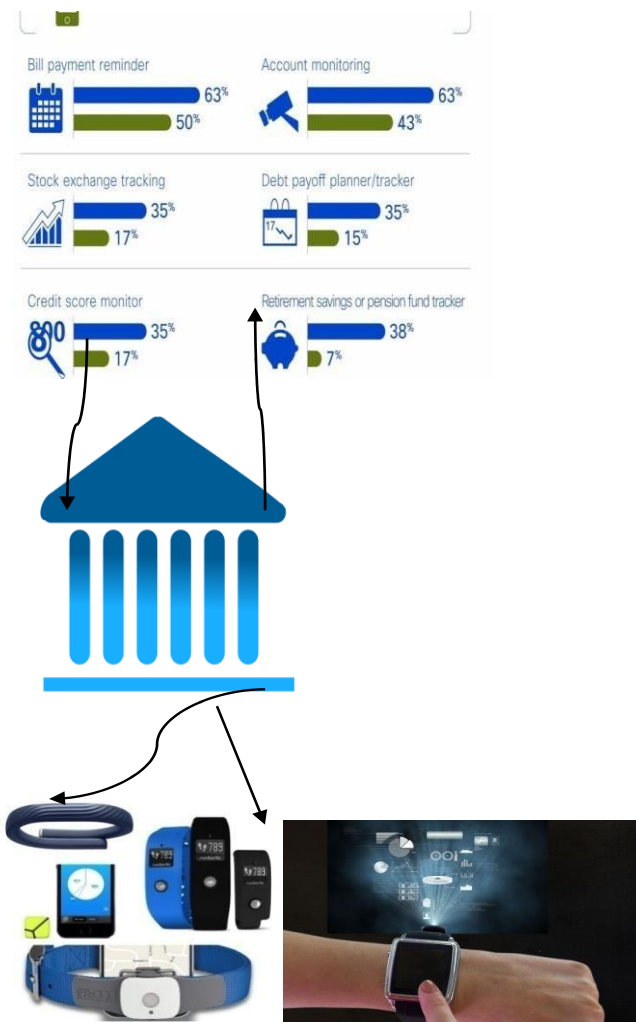
Visa mobile location Confirmation: Additional services are being offered through banks by smart banking system applications to its consumers. The administration uses the client's portable geographic area continuously as extra contribution for the examination of extrapolated visa fraudulent usage. For instance, if the cardholder's mobile position is same to that of payment location, the issuing bank affirms the exchange with certainty.

Alfa Bank Sense: This IoT application is more customized than some other mobile banking application and imparts as Facebook does. Buying of Food from Master Card: It is an IoT application that permits the buy of basic provisions effortlessly. The purchase is made through either directly or Shop Rite online business

platform **Wearable devices at Banking:** Compact devices were the least demanding triumph for banks. Numerous banks have begun giving an application to well-known convenient devices, for example, Apple Watch and Fit Pay. Banks have started even launching their own mobile devices. For example, the Barclay's Bill payment, which empowers portable contactless payment arrangements. It is going to be a great transformation in Fintech.

Financial Institutions, money lending service organizations for example such as, banks and Insurance companies have existed for a considerable length of time. Yet, all of a sudden, the saving money and monetary transactions have been tested by GAFA (Google, Apple, Facebook and Amazon) and by the new Fintech organizations. As indicated by the Fintech Mundial de Cap Gemini 2017 report, 50.2% of clients state they have just picked no less than one non-traditional financial company. Hence, banks and financial institutions must be more consumers centric and enhance the knowledge about digital world to sustain in the competition.

IoT enabled Smart Banking Model



VI. BENEFITS OF IOT IN THE FINANCIAL / BANKING SECTOR:

- **Cost reduction and effective risk management:** As long as banks and financial institutions analyze data generated by IoT, they can gain a better understanding of customer

resource management practices and alleviate credit risks. Take the manufacturing industry as an example. Companies that accept loans from banks generally offer raw materials and finished products as collateral. As an alternative to the manual monitoring of resource prices and customer turnover, a credit institution could install smart sensors in production and warehouse facilities to ensure that the loan is paid in a timely manner and in accordance with the agreement. Car loan companies also implement IoT solutions that lend money to customers with a limited credit history.

- **Improvement of customer services:** In 2015, Barclays, the UK's largest banking and financial services company, partially brought the functionality of its mobile application to smart watches. According to Steven Roberts, director of the company's strategic transformation, some users of the Barclays mobile application verify their balance up to 50 times a day; they can now access information on their portable devices. The bank has also built three personalized mobile devices that allow users to make contactless payments. A similar solution is currently being developed by Giesecke & Deviant, a German company that plans to distribute payment and fitness devices in China. And here's another Internet application of things in the banking sector. West Pack, a New Zealand-based bank that heavily invests in new technologies, implements the beacons to identify customers once they enter a branch and greet them personally;
- **Increased security in payment transactions:** IoT providers implement a wide range of tools to guarantee payment transactions, including tokens, secure and biometric magnetic transmission and smart phone verification. Last year, Citigroup and Diebold introduced a smart ATM that analyzes a customer's iris to verify their identity. The machine has no touchpad or screen. Instead, a customer must log in to their mobile banking application, enter the amount they wish to withdraw and approach the ATM with their eyes open (literally). Although the technology is still being tested, it could be a big step towards the financial future without cash, with less cards and insurance.

VII. OTHER POTENTIAL AREAS OF SMART BANKING SYSTEM: INVESTMENT BANKING AND IOT:

Investment banks are intensely put resources into finders of natural disasters and cutting edge climate anticipating forecasting tools, which guarantee they make basic speculations when (or previously) a disaster happens. Items with a computerized name speak to the stream of items from the producer to the retailer. This prompts a critical examination of things to come pay of organizations, which leads better investment plans. Some asset banks go about as high-spending counselors. They can break down financial specialists' interests and speculation models and offer customized investment plans and additionally managing assets in a better way. Personal wealth can be managed effectively with the help of advancement in IoT applications.



For instance, If a man affected by some deceased, He may sell his assets through IoT-empowered medicinal gadgets without depending on an outsider.

VIII. CAPITAL MARKETS AND IOT:

The transfer of data continuously given by the IO will prompt small investments and high-frequency transactions, which limit the risk factors connected to investments in the capital markets. This is a major preferred standpoint for the capital markets, since the variances of the share trading system will be dexterous. An IoT-empowered future will profit for everybody. The undiscovered capability of the IoT in making an incentive from data is gigantic. With the entry of new innovation, A digitized future is never again an outlandish dream. Worries about IoT are little hindrances to an extensive rush of conceivable outcomes and ought not demoralize the monetary area from coordinating the IoT. Investigators have considered open doors for the IoT to additionally computerize their business and speculation exercises, on account of the proceeded with increasing speed in algorithmic exchanging and to the enhancement of this methodology through the use of IoT sensor information.

IX. INSURANCE AND IOT:

The long term effect of adaptation of automotive sensor has developed as a standout amongst the most fascinating scenarios for insurance agencies. The business is as of now tending to the key ramifications of self-driving vehicles, proposing a change from pile up protection, where the driver is to blame, to item risk protection, in which the manufacturer can be considered dependable. Insurers can show signs of improvement data on imperfections in product design to more to all the more specifically quote coverage, but they should be ready to face potential threat of high premiums as accident rate decreases the traditional methods of insurance coverage vanishes.

X. ISSUES AND CHALLENGES FOR THE IOT-ENABLED BANKING SYSTEM:

Among the different security challenges, the most critical difficulties identified with IoT are explained.

1. Data security: information security is the primary test. During the transmission information transmission, it is essential to avoid Internet observation gadgets.
2. Insurance issues: insurance agencies that introduce IoT gadgets in vehicles gather well being and driving status information to settle on protection choices.
3. Lack of unified standards: As there are number of models for IoT devices and IoT producing enterprises. That's why; it is a major challenging task to identify authorized and unapproved gadgets associated with the Internet.
4. Technical viewpoints: because of the expansion in the utilization of IoT gadgets, the traffic produced by these gadgets is expanding. In this way, it is important to build the limit of the system, so it is likewise storing and retrieval of a huge data appropriately not easy always.
5. Safety threats and system vulnerabilities: up until this point, much work has been done in the IoT security

situation. Related work can be separated into System security, application security and network security.

- a. System Security: System security centers basically around the worldwide IoT framework to distinguish different security challenges, structure distinctive security structures and give satisfactory good rules to keep up the security of a system.
- b. Application Security: Application security performs so that the IoT application handles safety issues depends on different situations.
- c. Network security: It focuses on the overall security of the connected IoT devices, when the information is being communicated among the various IoT devices.

XI. PROBLEMS RELATED TO IOT DEVICES:

- Devices are not being recognized because of improper access.
- Devices can be lost and stolen: it makes security increasingly troublesome when the gadget isn't associated
- Devices are not cryptographic instrument: Complex security troublesome without power processing
- The devices have a limited validity period: the credentials must be linked to the duration
- The devices are transportable: they will cross the borders
- Devices must be recognized by numerous users: which information is to be sent to which user?

XII. CONCLUSION:

In developing countries like India, there is a lot of research to be undertaken in the banking sector, because its use is only in the manufacturing, healthcare and retail sectors. Financial institutions / banks that do everything possible and can keep up with the IoT trends. It will be an informative advantage, creating successive effective, timely and profitable opportunities. Even if the interaction of a customer and a bank ends after leaving a branch or accessing an online account page, the flow of information continues to create value. While a single transaction at the point of sale cannot lead to a greater understanding of a client, a number of transactions and their associated information could lead to a significant amount of customer intelligence. Banks should be positioned to exploit this intelligence to seize the opportunity to provide personalized and specific services to their clients.

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