

A COMPREHENSIVE REVIEW ON ONLINE PAYMENT SYSTEMS

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Abstract— The advent of e-commerce together with the development of the Internet promoted the digitization of the payment process with the arrangement of different online payment methods like electronic money, debit cards, credit cards, contactless payment, mobile wallets, etc. Besides, the services provided by mobile payments are picking up prevalence step by step and are demonstrating a progress by progressing towards a hopeful future of speculative prospects related to technological developments. This paper is aimed at evaluating the present status and development of online payment systems in worldwide markets and furthermore takes a glance at its future. In this paper, a comprehensive survey on all the aspects of electronic payment has been conducted after investigation of several research studies on online payment systems. Several online payment system services, the associated security issues, and the future of such modes of payment have been analyzed. This investigation additionally analyses the different components that affect the reception of online payment systems by consumers. Furthermore, there can be seen a huge development in mobile payment methods all around beating both debit and credit card payments, all due to the convenience and security offered by them. Nevertheless, different obstacles have been identified in the selection of online payment methods; hence, some measures have to be taken for granted this industry a hopeful future. Along these lines, there should be a suitable trade-off between ease of use and security when designing online payment systems so as to pull in customers. Likewise, technical and hierarchical issues that arise in the attempt to achieve interoperability must be taken into consideration by the designers. Actually, the process of developing interoperable and flexible arrangements and universal principles is one of the most troublesome errands in the future ahead.

Keywords—E-Commerce; Online payment system; Online payment developments; Payment gateway; Online payment challenges.

I. INTRODUCTION

E-commerce (or electronic commerce) is among the most well known services that emerged as a result of the engendering of the Internet everywhere throughout the world [1]. The recent advancements in technology for designing mobile devices coupled with the rising Internet speed just as mobile technology have made it possible for users to utilize those devices at any area and time for performing electronic commerce exchanges besides services like reading e-mails and Web perusing [2][3]. In person exchanging of items and services between two parties goes back to before the beginning of written history. With time, as exchange turned out to be more muddled and troublesome, people represented values in a theoretical manner, progressing from barter system through certified notes of money, checks,

payment orders, debit and credit cards, and these days online payment (or electronic payment) systems. Some well-known issues or defects are found in the standard methods of payment: money can be falsified, checks bounced, and signatures forged. As opposed to this, appropriately planned electronic system of payment can really give ideal security over conventional methods of payments, with the added advantage of flexibility in usage [4][5]. The ease of making monetary exchanges and also a more secure and faster access to capital resources, among different other components, has put online payment system on a celebrated stride than the money currency based system [6][7][8]. With intangible exchanges becoming more effective in overall economies and their brief transference at little cost, conventional systems of payment have a tendency to be more expensive than the present-day strategies.

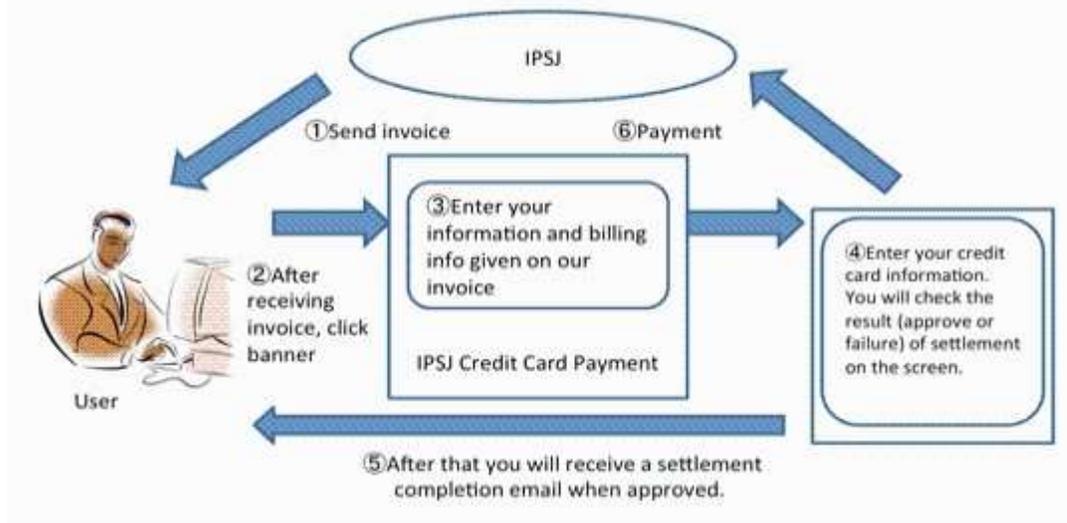
Furthermore, processing on the internet can be of less worth than the smallest estimation of money in the manual world [9].

With the immense support of the web in our everyday life, people feel accustomed to online exchange in E-Commerce for selling and buying of items and ventures. People are paying money electronically over the Internet [10]. Moreover, the rise of web-based business has led to new money-related necessities that all things considered can't be feasibly satisfied by the standard methods of payment. Following to this developing trend, related people are investigating different online systems of payment including issues encompassing the online system of payment and digitized currency [5]. Every single exchange that takes place online is made by means of payment gateways which go about as focuses at which the money related associations can be accessed. Payment gateways authorize and

validate details of payment between different parties and the different money related associations [10].

II. ONLINE PAYMENT SYSTEM

As exchanges among different partners of business keep on proffering on the e-commerce stage, the previous money based system of payment was gradually replaced by the electronic payment systems [11]. The appearance of this advancement in the worldwide business stage prompted most business establishments to normally change from the standard paper-based money exchanges to an electronic system of payment which is generally known as the online payment system or e-payment system. All around, these electronic systems can be seen as a method of making payments for merchandise or services which have been established online utilizing the internet [12] [13].



An Electronic Payment System or online payment system can be defined as a type of inter-authoritative data system (IOS) for money related exchanges, connecting numerous affiliations and individual clients. A need of complex interactions might be required among the partners, the environment and the technology. The exclusive attributes of EPS/IOS likewise separate it from the conventional internal based systems of data; technologically, relationally and organisationally, it is more intricate and complicated [14][15][16], featuring the significance

of cooperation and the need to unite all aspects together [17].

Prominently, the worldwide yearly non-money exchanges facilitated by online payment and mobile payment (m-payment) had been on the upsurge over the years, except for 2012 where it decelerates from a yearly development rate of 8.6% in 2011 down to 7.7% in 2012 [18]. Furthermore, in 2014, volumes of worldwide non-paper exchange went up to 8.9% reaching 387.3 billion, the most noteworthy development rate since the primary distribution of

World Payments Report. The development was chiefly determined by quickened development in newly shaping markets. The higher worldwide development is anticipated to have kept up in 2015, with assessments of a development rate of 10.1% which will make the non-paper exchange volume reach 426,300,000,000 [19]. Online payment systems are significant mechanisms used by individual and associations as a secure and convenient method of making payments over the internet and at the same time a gateway to technological advancement in the field of world economy [20]. Likewise, it has additionally become the major encouraging engine in e-commerce through which electronic business success relied upon. Online electronic systems of payment had likewise realized proficiency, reduced rate of cheats and resourcefulness in the systems of world payment [13][21].

Verifiable Background

The historical backdrop of online payment can be traced back to 1918 the time when currency was first moved in the United States (U.S.) by the Federal Reserve Bank with the guide of telegraph. However, that technology had not been widely used in the US until the time when their Automated Clearing House (ACH) was incorporated in 1972. Since that time, the electronic money turned out to be quite mainstream. This enabled U.S. commercial banks and its central treasury came out with an alternative to check payment [13].

Credit card industry can likewise be traced back to 1914 when department stores, oil companies, Western Union and hotels started giving cards to their customers to enable them to pay for merchandise and enterprises. After around 40 years of credit card evolution, there have been increasing numbers of credit card usage as they have become more acceptable by people as a medium of payment, especially in transportation. At first, credit cards were all paper-based payments, until during the 1990s when such cards were transformed to electronic completely. Due to the increasing number of credit card usage, the business has developed quickly which lead to the presentation of a debit card as well. Debit and credit cards are currently used in exchange

payments for a wide range of purchases or services rendered everywhere throughout the world [13][5].

With the evolution of e-commerce and technological advancement, electronic cashless payments are currently used conventionally even however having being set during the 1960s [36]. The research network has made relentless efforts resulting in the development of different online payment models like the N. Asokan model and the JW model. In the JW model – a conventional payment system, sellers just as buyers require some sort of involvement for completing a specific exchange [37]. The N. Asokan model was launched in 1998 and involves the interest of a bank besides the seller or buyer in exchange processing lest one of them is absent in any exchange [8]. Another model viz. 3e model that is based on the N. Asokan model includes electronic check, electronic money and credit card payment models [7], the most well known being the credit card mode of payment [9].

The concept of transferring subsidizes electronically utilizing the Internet progressed with the intend to transfer money instantaneously among peers. For supporting this objective, several possible arrangements have been proposed, for example, ATM networks and wire transfer. So as to complete money transfers internationally, different quick and well known frameworks have been given. Cryptographic forms of money, for example, Litecoin and Bitcoin can be used for transferring money to anyone in the entire world inside no time; however, the wallet holder's identity and the Bitcoin exchanges are not monitored by any central association. Thus, Bitcoins can be used by scammers for their illegal interests on the Internet. Presently, the notoriety of operating systems like iOS and Android has likewise developed in the recent years. With the concept of mobile banking and mobile wallets, peer to peer transferring of money has moved to a higher stage of development since it made possible services like ticket booking, peer-to-peer (P2P) money transfer, charge payment, mobile recharges and money withdrawals [40]. The earliest mobile financial service dates back to 1977 when Merita Bank in Finland used a SMS – short message service

[41] for permitting people an easy and quick access to their facilities; it has been witnessed that mobile phones are used by half people however mobile banking is accessed by 37% just [42]. The advantages and need of mobile banking has been studied by researchers [43]. Many finance companies provide advanced cell applications that permit users to pay anyone, anytime and anywhere. However, with constant use, hackers discovered them as easy prey and were successful in performing fraudulent exchanges. Furthermore, a stretchable and ultra-

flimsy stamp is presently available which users wear on the skin and can be employed for payment while being connected to an advanced cell.

C. Order of OnlinePayment Systems

There are quite a number of online payment services that have been developed inside the payment system around the world. These include electronic checks, e-money, credit cards and electronic store transfers.

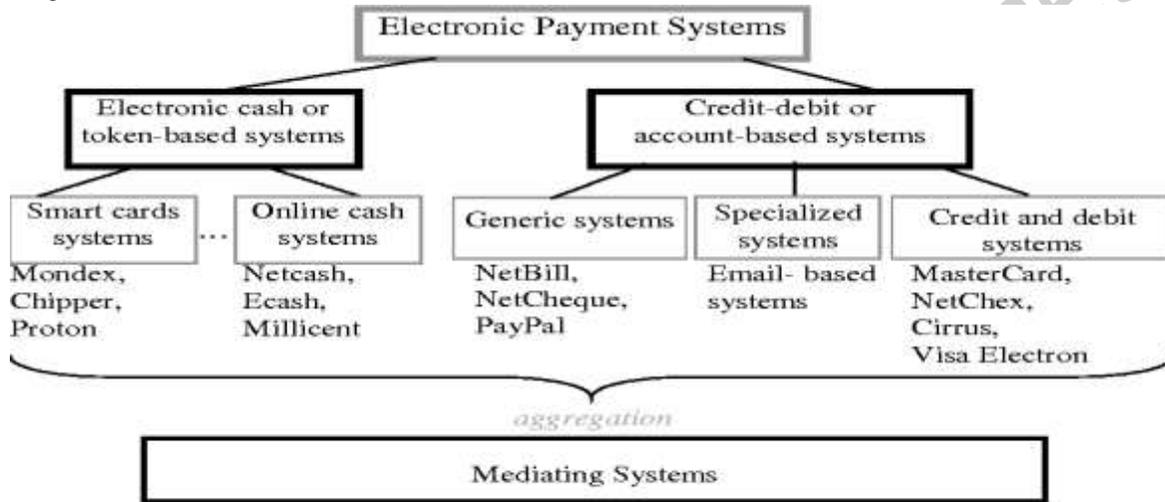


Fig. 1. Classifications of electronic payment systems

Several types of online payment systems have been studied by [47] who classified them into electronic currency and record based systems. In account-based systems, users are allowed to pay utilizing their own ledgers while the latter permits consumers to pay just with the help of some electronic currency. Both the systems provide numerous payment methods, for example, I) Electronic payment cards (credit/debit and charge cards), ii) Mobile payments, iii) E-wallets, iv) Smart and dependability cards, v) Virtual credit cards, vi) Stored value card payment, and vii) E-money

On the evaluation of the online payments systems by [48], several features of varied online payment methods have been accentuated as:

1) Credit Cards

Credit cards are by a long shot the most well known mode of online payment. In the beginning, security

concerns hampered their reception yet gained customer trust later when security features were provided for each exchange. Credit card pertinence is one of the strongest components which contribute to its extensive use everywhere throughout the world. Nonetheless, it isn't considered feasible for making little payments or private ventures since they require huge fees [8]. The most significant advantage of credit cards is the ease-of-use they provide in performing exchanges online from any piece of the world and in a matter of moments. Moreover, they can be obtained easily without the burden to possess any extra hardware or software for making them work. The authentication of card-holder is essentially provided utilizing credit card number, a name, and expiry date. So as to keep the personal data of users secure, complementary systems, like Verified by Visa and MasterCard SecureCode have been developed with credit card companies. Moreover, this payment mode offers users with the arrangement of secret key

creation which they use for shopping online by means of credit cards.

2) Debit Cards

Debit cards are picking up notoriety as time passes and have become the most mainstream cashless payment methods everywhere throughout the world [9]. As compared to credit cards, the payments made by means of debit cards are pulled back from the consumer's personal financial balance and not from any intermediary account. Along these lines, users neglect to have extra security in their debit accounts thereby alarming them while dealing with payment disputes. However, just the record number is required for making debit payments with no need to produce a card number or a physical card. Despite the fact that debit cards have a huge user base in several countries they are not widely used on merchant websites due to their failure to fulfill international customers [48]. The expenses incurred by the usage of debit cards are lower as compared to credit cards which makes them feasible for micropayments. Furthermore, they have a higher level of security than credit cards due to the requirement of extensive identifications demanded by banks.

3) Mobile Payments

As per [50], the payments that are made by means of wireless devices, for example, advanced cells and mobile phones are assumed to offer reduction in exchange fees and an increase in online payment security and convenience. Such a payment method has facilitated businesses in the collection of valuable data regarding their customers just as their purchases. As indicated by [48], mobile payment systems are applicable all inclusive as a result of their shocking development and the out and out attack of mobile devices in contrast with other telecommunication infrastructure.

Mobile payments have been seen as feasibly used for both online purchases and offline micropayments. Since mobile phones have a huge consumer base, online traders are potentially attracted to this payment method. The usage of mobile payment services reduces the overall exchange costs just as provides better security [5]. Nonetheless, their powerlessness

to suffice international payments and security has led to several issues in increasing a huge user base.

4) Mobile Wallets

As indicated by Doan (2014), "Mobile wallet is formed when your smartphone capacities as a leather wallet: it can have computerized coupons, advanced money (exchanges), advanced cards, and computerized receipts" [1]. Utilizing mobile wallets, users are allowed to introduce the application in their advanced cells which they can employ for making offline just as online purchases. In the future, mobile wallets are assumed to offer more convenience to customers in making exchanges with the help of technologies that connect advanced cells and the physical world through sound waves, cloud-based arrangements, NFC (Near Field Communication), QR codes, etc. [2].

5) Electronic Cash

In the underlying phase of online payment system presentation, electronic money systems by the name CyberCash or DigiCash.

II. ONLINE PAYMENT SYSTEM DEVELOPMENTS

Globalization in this day and age is the result of innovative technological endeavors. The advancement in technology has changed the skyline of payment systems, moving towards e-World [8]. Decisively, current development has changed standard systems of payment into a more proficient and viable system, which is free from the money and-convey disorder. The effectiveness of executing budgetary exchanges and furthermore a Core secure and faster access to assets, among different other components, has put e-payment system on a more celebrated pace than the paper money based framework [6][7]. Interestingly, in Nigeria, online payment framework is getting eminence to the degree that clients have now wanted to do budgetary exchanges without setting off to the banks. Along these lines, time of money based payment framework is gradually obscuring out as the cashless economy dominates present day budgetary systems . Lately, online payment system has turned into a standard through which financial element moves

advantageously, especially in a developing nation like Nigeria where it is ongoing to convey money. In such a nation, the online payment system has shaped into a significant beginning stage of her present-day economy; a well-working system of online payment has been perceived to have a lot of pertinence to budgetary strength, overall money related movement, and monetary strategy [8]. Meanwhile, the initiative for an economy that isn't based on money will be preferred in the new era just when it is supported with age advantage, great education, ownership of significant innovative establishments, among different other components, appropriately set up by every concerned individual of the economic system and proficiently managed before compelling the citizens to go along.

A number of researches were done on the systems of online payment and development of economy in the current time. Newstead (2012) inspected cashless systems of payment and monetary development and found a connection between cashless payment and the pace of money related development. The review discovered that cashless payment volumes are developing twice as snappy in the developing countries as they are over the world [1]. Likewise, World Payments Reports (2012) investigated the state and advancement of worldwide non-paper money systems and discovered non-money payments make it less demanding and speedier for people and associations to purchase items and enterprises, pushing money into the framework quicker and adding to the GDP [6]. The finish of the review was like that of Hasan et al. (2012) who investigated head connection between online retail payment and general monetary development using data from over 27 European countries from 1995 to 2009 and came to realize that relocation to proficient electronic retail payment empowers general money related development, use and exchange [8][3].

Aside from the safety and convenience, online payment systems also have a noteworthy number of money related advantages [64]. Their chief money related advantage involves preparing investment reserves and guaranteeing a large part of the money accessible to the country and with the banks, making supports accessible to borrowers (associations and people). Moreover, an online system of payment can

follow spending of a specific individual; to disentangle the framework of services offered by the banks. This information is likewise helpful to the organization when settling on monetary selections. Online payment system likewise can reduce the expense on money taking care of and costs on printing. As per (Moody's Analytics, 2010), genuine worldwide GDP on an average increased by an extra 0.2% per year considered to what it would have been without the use of cards. Fundamentally, the use of cards develops a country's GDP by 0.2% every year [64].

III. ONLINE PAYMENT SYSTEM AS A BOON

Without precedent for history, a review by the Federal Reserve Financial Services Policy Committee shows that electronic payment exchanges in the United States have surpassed check payments. In 2003, the all out number of electronic exchanges were equivalent to 44.5 billion dollars, while the amount of checks paid were equal to 36.7 billion dollars. Evidently, a pattern among buyers can be recognized; purchasers are seen to be more ready to work with online electronic exchanges and employing an automated medium to do their businesses.

As indicated in a review by Fiallos and Wu (2005), the ingress of the web has put electronic payments and exchanges on an exponential development rate [4]. Customers could purchase merchandise from the web and send credit card numbers in an unencrypted structure over the system, which made the exchanges quite vulnerable to threats and fakes. With development in online payment systems, a wide assortment of new secure systems of payments have come up as customers turned out to be more aware of their protection and security. As argued by Cobb (2005), Online Payments have remarkable number of money related benefits notwithstanding their safety and ease of operation. These advantages when expanded can go far in contributing hugely to budgetary improvement of a nation [5].

Computerized electronic payments help develop deposits in banks and in this manner, increase reserves accessible for business credits – which is considered as a driver of budgetary achievement. As

per [5], advantageous and secure electronic payments convey with them a noteworthy scope of full scale budgetary advantages. "The effect of acquainting online payments is associated with utilizing the gears on a bicycle. Include an efficient electronic payments system to an economy, and you kick it into a higher gear. Include better-controlled consumer and business credit, and you indent up economic velocity even further".

Online payment system can be helpful in evacuating shadow economies, carrying masked exchanges into the financial system and help in bringing straightforwardness, cooperation, and confidence in the economic system. What's more, as specified by Al Shaikh (2005) in [5], there is a relationship between the rise in demand deposits and increase in purpose of sales volumes. "Automated electronic payments go about as a gateway into the financial sector and as a powerful engine for development. Such payments coax money unavailable for general use and into the financial balances, giving ease finances that can be used to help bank lending for investment – a driver of overall economic action. The process creates greater transparency and responsibility, leading to greater efficiency and better economic performance".

In a comparative record in [6], online payment is extremely helpful for the buyer. More often than not, the user is required to enter his record related data - for example, credit card number and delivering address - once. The information is then kept on retailer's web server's database. When the client returns to the webpage, he essentially signs in with his username and secret word. "Completing an exchange is as simple as clicking your mouse: All you have to do is affirm your purchase and you're done".

Hord (2005) in [6] also underlines that online payments cut down expenses of associations. Less money is spent on paper and postage with increasing number of online payments. Presenting the choice of online payments can likewise help associations enhance client preservation. "A customer is more likely to return to the same e-commerce site where their data has already been entered and stored".

As indicated by [5], "Electronic payments would thus be able to lower exchange costs stimulate higher utilization and GDP, increase government efficiency, support budgetary intermediation and improve money related transparency". The creator moreover states, "Governments assume a basically significant role in creating an environment where these benefits can be achieved in a manner consistent with their own economic development plans".

Humphrey et al., 2001 likewise bolster the reality that use of online payment systems holds the guarantee of tremendous advantage to the two vendors and buyers as expenses are reduced, more ease of use and higher security, dependable means of payment and settlement for a potentially immeasurable scope of items and enterprises offered worldwide over the web or other electronic systems [7]. One such advantage is that online payment systems empower bank clients to deal with their everyday money related exchanges without visiting their nearby bank office. Online payments could save dealer's time and cost in dealing with money [8].

As signified in [9], the asset cost of the payment framework of a nation can represent 3% of its GDP. Since most online payment systems cost just around 33% to half of the paper-based non-money payment, clearly the social expense of a payment framework could be impressively lessened in the event that it is computerized [8]. Mechanizing and reshuffling electronic payments produced utilizing self-serve channels, for example, ATMs, retail location (POS) systems, and branch office terminals can lessen paper-based mistakes and expenses.

An examination work completed by Visa Canada Association as a team with Global Insight (A principle monetary and budgetary counseling firm) discovered that online payment systems give proficiency in exchanges to purchasers, traders, banks and on the whole the economy. Online payments have contributed \$C 107 billion to the Canadian economy since 1983 and comprise of about 25% of the \$C 437 billion aggregate development in the Canadian economy over the said period. Over the same two decades, \$C 60 billion of the expansion in Personal Consumption Expenditures was specifically inferable from online payments, with credit card having a

significant share in this development (\$C 49.4 billion) in contrast with debit cards (\$C 10.4 billion) [8].

SECURITY OF ONLINE PAYMENT SYSTEMS

In all data systems, the security of information and data is of huge importance. Information Security involves methodology, technology and practices which guarantee that information is secured from

- 1) alteration or unintentional change (integrity),
- 2) unauthorised access (confidentiality), while
- 3) promptly accessible (accessibility) to approved clients on demand.

The online payment systems need to have all the above security features; an online payment system which isn't secured won't be trusted by its clients. What's more, trust is extremely essential to guarantee acceptance from the clients. The online banking and online payment applications have security issues as they rely upon essential ICT frameworks that make vulnerabilities in economic associations, businesses and can hurt clients [4].

B. Security Requirements in Online Payment Systems

A safe economic exchange electronically needs to meet

some prerequisites as explored by [5]. They might be stated as follows:

an) Integrity and Authorisation

Integrity might be characterized as the legitimacy, exactness and completeness of information as per business qualities and desires. In payment systems, integrity implies that no money is taken from a client lest a payment is approved by the client. Moreover, clients need not accept any payment without the absolute permission of the clients; this is charming

when clients need to keep away from unwanted bribery [6].

b) Confidentiality

their exchanges. Confidentiality in this setting implies the confinement of knowledge about different snippets of information which are related to the exchange; the verification of payer/payee, purchase content, entirety, etc. Generally, members included need to guarantee that exchanges are secret [6] where untraceability or obscurity is looked for, the prerequisite may be to make available this data to just certain specific subsets among the members.

c) Availability and Reliability

Accessibility is guaranteeing that information frameworks and data are prepared for usage when they are required; regularly communicated as the rate of time that a framework can be utilized for profitable work. All groups need to have the ability to make or get payments whenever the need arises [6].

End-user requirements include flexibility, convenience, accessibility, moderateness, speed of exchanges and reliability.

C. Enhancing Online Payment Security

As more and more people are connected to the Internet, the ubiquity of online Nevertheless, the dangers associated with online payment systems are verifiable and increasing step by step. As per the survey conducted by Association of Financial Professionals in the year 2013, it was discovered that around 60 per cent associations fell prey to successful or attempted extortion payments whereas up to 63 per cent associations showed up reception of new security measures or preparation to do likewise in the time to come [88]. Therefore, for their wide acceptance everywhere throughout the world, online payment methods must follow an efficient convention ensuring a higher level of security for performing online exchanges. The most widely recognized strategy for securing online payments is using cryptographic-based developments, for example, computerized signatures and encryption On application, these advancements lessen speed and proficiency and in

this way trade off must be made among effectiveness and security.

Two usually used conventions viz. Secure Electronic Transaction (SET) and Security Socket Layer Protocol (SSL) have been identified after breaking down the investigation of [7] ensuring security of online commerce exchanges. Among these, SSL is seen as the most generally used convention that encodes the whole session between computers involved in the exchange process thereby enabling a safe correspondence over the Web. Along these lines, encryption of correspondence is achieved in SSL utilizing open key cryptography between the client and server. As opposed to this, SET prevents the transfer of the whole credit card number of the user over the Internet by permitting just a piece of it to be transferred during the correspondence process. Furthermore, SET additionally endows the users with the arrangement of business information verification, data integration and sensitive data coding by utilizing latest technologies like information encoding and computerized signatures.

CONCLUSION

An evolutionary succession has been witnessed by payment methods from money to checks, credit cards and debit cards, and currently to electronic commerce and mobile banking. In this paper, it has been studied that online payment methods are increasingly being used for making day by day online just as on location purchases. The issues associated with online payment just as the appropriation of electronic commerce for making payments by customers has been discussed in this paper. Furthermore, the advancements in technology supporting mobile exchanges and making them more convenient and transparent are developing trust among customers who are becoming constant of employing this mode of payment. This change in the behavior of customers indicating a progress from the

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customary to an advanced online mode of payment is apparent in retailing and banking, and with nearly all available mobile devices. The measurements are appeared in this examination connote that the number of customers employing an online mode of payment and making online exchanges are persistently developing, alluding to an everlasting acceptance of online payment systems from academia just as industry. However, the appropriation and deployment of several rising technologies convey new opportunities and challenges to the implementation and design of secure online payment systems in the present day just as in the near future. This investigation concludes that better integration of online payment systems with the present monetary and telecommunication infrastructure is necessary for a favorable future of this payment mode. Furthermore, establishing a typical standard for a variety of service providers, improving the similarity with a large number of customers, overcoming protection and security concerns, and employing the latest technology could facilitate expeditious appropriation of online payment methods and expand the market for such a mode of payment. Future work might be directed towards the legalization of different elements responsible for adding to the efficacious reception of online payment systems everywhere throughout the world.

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