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Electronic payment system: A complete guide

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Abstract. In contrast to the previous century when the concept of electronic transfer was proposed, nowadays, electronic payments are drastically increased due to the rapid increase in online shopping or Internet-based banking. Electronic payments became the first option for transferring money to/from payer/payee in the twenty-first century. Visa cards, master-card, smart cards, debit cards, credit cards, e-check, and e-wallet, are the options for e-payments. Behind the acceptance of the new payment system depend upon the three factors- cost, time, and security per transaction take the place of each other. This paper will highlight the background study, types of electronic payment systems available, and which payment method users should choose considering the cost, time, and security factors. This research will also identify the issues and challenges of e-payments and suggest solutions to improve performance and quality in developing countries. This review paper aims to introduce the reader to electronic payment and update the reader with the current state of the art in the electronic payment system and provide an overview of past efforts and future trends of electronic payment transfer.

Keywords*: e-payments, e-transaction, e-transfer, types-of-e-payments, future trends in e-payments*

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1. Introduction

The transfer of payment electronically is an alternate mode of paying payments to the payee; in such cases, the electronic payment system arises as the third party serves the payee and payer. In other words, we can say that e-payment is a type of service that serves the customer who buys the goods over the internet via online shopping portals available at their local countries or globally, and it adds value to the online shopping provider and increases the ratio of sell.

Concerning previous research work, the current amount of research work in this field is increasing day by day, but there is a lack of systematic literature review which is not yet addressed; therefore, this research work will contribute to the systematic literature review part as this study will be helpful for the upcoming research work within the field.

Research work was motivated by previous studies' gap; the primary motive of this systematic literature review over the 'e-payment system' is to introduce electronic payments. The secondary objective of this study is to (I) systematically collect, analyze and synthesize all previously available studies within the domain for specific keywords that satisfy the study area in a somewhat manner in order to summarize the previous work, (II) Provide a list of payments systems available globally, (II) provide a compare and contrast table for the different factors named cost, time and security per transaction for the globally available payments system, and (III) Highlight the issues and suggest some solution for improvement of performance and quality.

Research questions (RQ) of this experiment were: RQ-1: Creating a background of different payment (including traditional and e-payment) methods and comparisons of currently available electronic payment methods. RQ-2: Table of Differentiating between traditional payments and e-payments in terms of security. RQ-3: Discussing the proposed models/algorithms for implementing the e-payments method from the literature. RQ-4: Defining Electronic Commerce (E-Commerce), its categories, and size of the business in each category.

2. Materials and methods

In this study/review paper, we give an overview of an electronic payment system, discuss the background history, highlight current available payments system against e-commerce, individual features of each payment system in a tabular form, highlight the security flaws, and finally identify issues, and suggest a solution based on study and understanding.

2.1. Defining the e-payment system

The developments taking place in information and communication technology are increasing competition in financial institutions worldwide. Thus, the deployment of advanced technologies is essential to achieve a competitive advantage. In the world of banking, the development of E-Banking has an enormous effect on the development of more flexible payment methods and more user-friendly banking services [1,2,3,25]. Payment is the transfer of monetary value. A payment system consists of a set of transfer systems that ensure the instruments, banking procedures, and, typically, interbank funds circulation of money [1,2,22,30]. Furthermore, for extending the payment system in detail– the payments system is a third-party that helps payer and payee transfer and receive money respectively, or in other words, we can say that payment system is a backbone for creating a connection between payer and payee [2,31].

2.2 Characteristics of e-payment systems

Electronic payment systems are required to bring the necessary infrastructure to facilitate payment over the internet. They are becoming an essential part of, and are greatly necessary for, further development of electronic commerce and electronic business, and of course, payment must have the following characteristics to become accepted around the world [4,5]. Atomicity must ensure that no loss of existing money and the new transaction can be made [5,37].

Confidentiality/information kept secure: The record of transactions kept in the organization as safe as can be, and it should only be available to the intimate level if there is any need for traceback at some stage.
Security: The system must ensure the possibility of fraud within the system.
Availability: The system must be available during the said working hours.
Cost-effective: The transaction cost must obey the rules as per authority.
The ability of integration: The system must ensure that it can work with all other existing payment systems that resemble the properties, and they must be integrated with the new payment system within the same environment [5,37].

3. Review method

This section provides details about how we begin with our systematic literature review process; the following subsection is detailed about the review method.

3.1. Review protocol

This systematic search begins with a comprehensive review protocol based on the guiding principles and procedures of the systematic literature. This part contains the background history of research, search strategy, research questions, inclusion, and exclusion criteria; the background is already described in the previous section, and the rest of it is an upcoming subsection.

Table 1. Inclusion and exclusion criteria

Inclusion	Exclusion
The acceptance was only English-Language	All other excluded
It must be published between Jan-1999 to Aug-2016	Same as above
If available full text	Same as above
Related to the topic, (All keyword searches included)	Same as above

3.2 Inclusion and exclusion criteria

In this study, we consider research papers from (Journals, conferences, and workshops), published in English-us language, published from January-1999 to August-2016. We excluded poster sessions, presentations, articles, and any material that was found duplicated. Before including any paper, we had ensured that the paper must satisfy our inclusion criteria and be related to the central theme; if not, we excluded it. Table 1 shows further details of the inclusion and exclusion criteria.

3.3 Search Strategy

The search strategy consists of two primary methods (automatic keyword-based search and manual reference-based search), as described in Figure 1. The automatic keyword-based search begins with identifying keywords related to the electronic-payment system with all possible methods of adding punctuations, while the manual search was beginning after the completion of automatic. Automatic search provides us material based on keywords while manual-based search provides us results based on the results of automatic, we manually pick references and search for that if found related material we added it and manually search for all other versions of research work added it if found related. Hence, we named these two searches as primary (PS) and secondary search (SS).

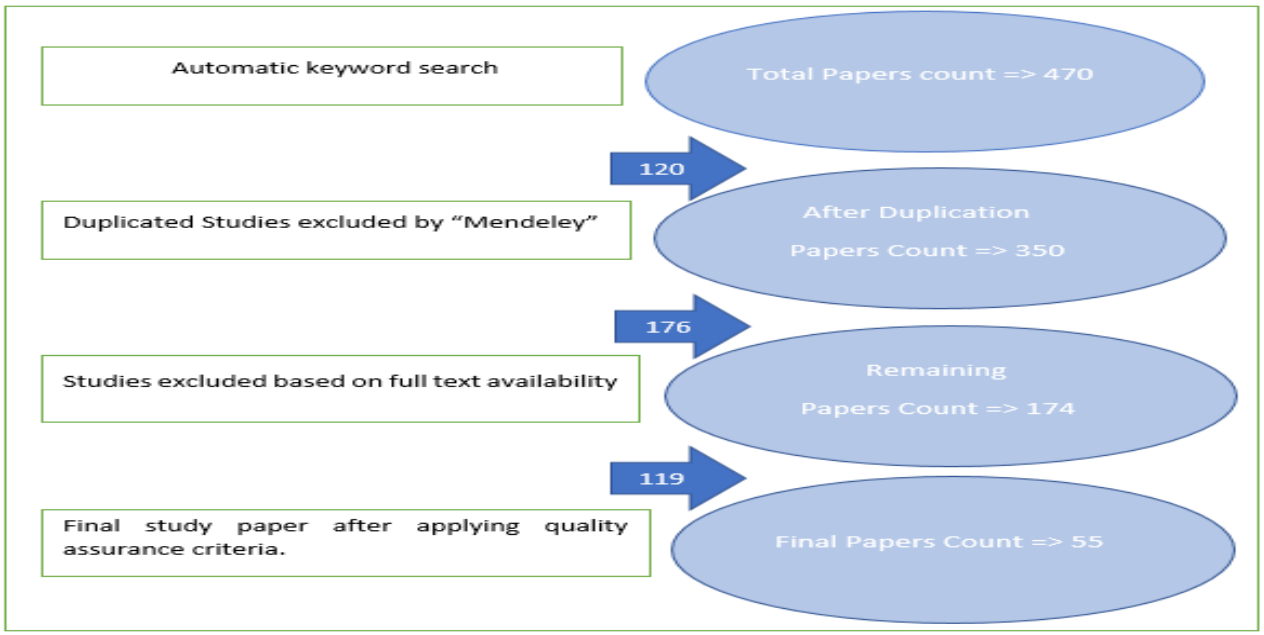

Figure 1. Search Strategy

3.4. Study selection process

The study selection process was based on the toll-gate approach as described in [6,7,8]. First, we noted down the number of keywords to search; then we began our search strategy in all searches as mentioned earlier engines; using the selected keywords, we found 470 counts as a primary search (automatic keyword-based search). We added all the founded searches in Mendeley (a tool for managing the bibliography of publications). Out of these 470 searches, 94 were found duplicates and merged. Further, by applying the inclusion and exclusion criteria mentioned in Table 1, we finally develop 174 studies. We began our steps towards the secondary search mentioned in the previous section; we identified another 55-paper related to the keywords. After applying inclusion and exclusion criteria, we remained with 55 papers, and the total count is only 55. Here, 55 studies were identified as a source for moving forward to the literature review, and all the papers are listed in the reference section.

Table 2. Studies distribution of different publications before and after applying quality assurance criteria

Source of study	Count before QA	Count after QA
Google scholar used only (for secondary search)		
IEEE explore	1	1
Springer link	390	6
Science Direct (Elsevier)	73	27
Research Gate	1	1
Unknown source	-	17

The distribution of search strategy before and after the selection is mentioned in tabular form in Table 2, and here we can see that before the selection process majority (390) of papers were found in Springer link followed by Elsevier (73), followed by research gate and IEEE explore (1 and 1). On the other hand, after applying quality assurance criteria, we were left with count 27 searches of Elsevier followed by count 17 as an unknown source of publication; our reference manager could not recognize these seventeen paper/studies, followed by 6, 1, 1 springer link, research gate, and IEEE-explore, respectively.

3.5. Quality assessment (QA)

The objective of the quality assessment criteria based on quality questions (QQ) is to decide on selecting study papers. In order to find the quality paper, the following question was applied to each selected paper.

QQ-1: Are the topics and finding addressed in the paper related to our literature review?
QQ-2: Is the research context clearly defined in the study?
QQ-3: Is the research methodology mentioned clearly in the study?
QQ-4: Is the data collection method clearly defined in the study?
QQ-5: Is the data analysis accurate and properly referenced?

These five QA criteria are taken under the inspiration of [8]; this design is divided into three levels (high, medium, and low) for differentiating these studies. These three-level criteria were based on some scaling measures as we awarded a score of 2 to support a high level, followed by 1 awarded to support medium level and 0 for low. We awarded score individually every study based on quality questions- collectively if a study scored more than 5 we categorized as high, and if a study cored greater than 3 and less than or equal to 5 we categorized as a medium, and finally we categorized as low if a study earns not more than 3. Even this quality assurance assessment is a highly subjective one, in counterpart, we also read almost all the research studies, and now we can comment about QA assessment, as this study will be a complete guide towards the electronic world of payments. See Figure 2, which shows the percentage and count for the studies after applying quality assessment.

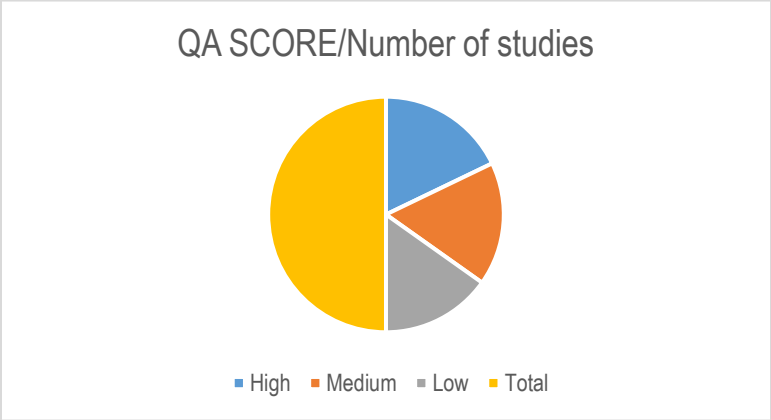

Figure 2. Quality assessment score sheet

3.6. Data extraction and synthesis

The process of data extraction and synthesis was beginning by reading carefully and extracting valuable data related to the topic from the selected study papers count as 50 listed below in the bibliography section. This step's purpose was to maintain an MS excel sheet for creating statistics (tables) and figures to present in human-readable. The following list of columns was considered in this study: Paper ID (P_1, P_2, … and so on) to identify study id, study title, the authors, date of publication, database provider, publication source, research context, document type, a topic addressed, and citation count.

These lists of columns were used to synthesize data and provide a human-readable form, and it was also easy to maintain a record of each study against these attributes; after this step, we have Excel Sheet which is maintaining all this information for us. Table 3 listing those columns and describing more about these columns.

Table 3. Data extraction criteria for each study

Name of the attribute used to extract data	Description
Paper ID	Uniquely identification of paper
Study title	Title of the study paper
The author	Author of study
Date	Date of publication of the paper
Database provider	Availability of paper with free access
Publication source	Who is the publisher of the selected study paper?
Topic addressed	Is this study addressing the topic of study?
Citation count	Count of the citation of the selected study paper.

4. Results of SLR

This section aims to provide details about the work done before beginning with a systematic literature review. Here, in this section, we provide results from spreadsheets- in detail, this section highlights the publication resource, publication type, citation count, research methodologies, and methods of study. In the end, in this section, we present the context of research that has been conducted. The following subsequent sub-section describes the study further in detail.

4.1. Publication source overview

Most of the studies were published in high Impact Factor journal articles, and leading conferences can be noted from the citation count of each paper one of them is considering the highest cited in our case. Thus, the selection of such papers will result in the quality of systematic review and overall assessment of findings. The distribution of studies/papers is sown in the following Figure 3. In Figure 3, as we can see, the majority of studies were published as journal articles 48 studies from 56 that is 86% of the whole after that conference proceeding and followed by book chapter and the last one unknown data publication (might be available somewhere but our reference manager fails to found it). However, due to topic relevancy and citation count, we have to keep these studies as these studies passed from our inclusion/exclusion criteria.

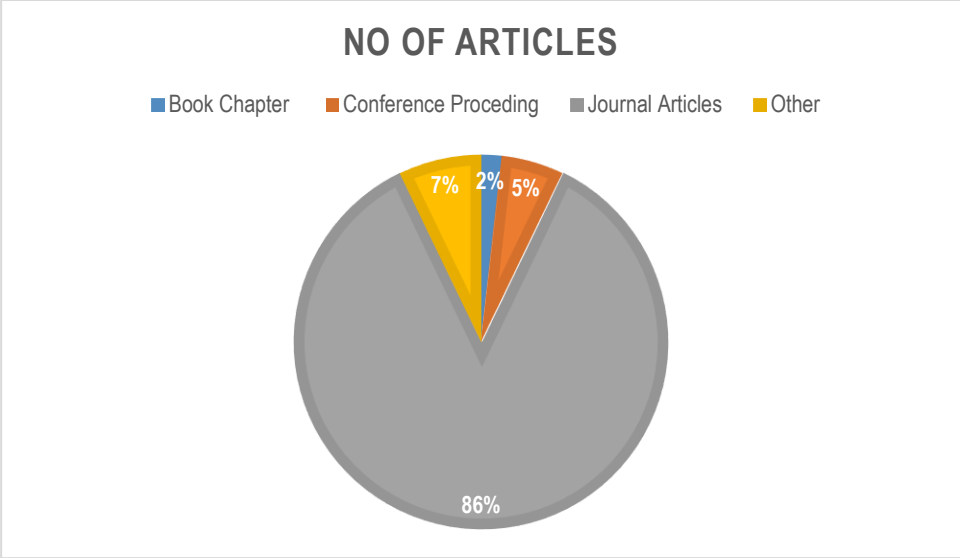

Figure 3. Publication source

4.2. Citation status

Generally, talking about all selected studies' citation count is good enough; this leads to the quality of papers included in this systematic literature review, and of course, it is an indicator of the studies' good impact factor. Figure 4 shows the citation count of included studies. The statistics of citation count were obtained from Google Scholar. The information provided here is not meant to claim citation count statistics; it may differ in results by comparing with another data provider. The data provided here is just a rough idea of citation count.

As shown in Figure 4, our statistics are relatively equal in all categories we have decided to measure. Among 56 studies, 5-studies were founded highly cited that fall in more than 40 citations, followed by 17 studies that fall under the citation category between 10-40. On the other hand, 23 studies were found in the category of 1-10 citation count, and finally, 11 studies were found zero citation this does not mean these papers are not valuable, but these papers are published in recent 2-3 years, so it is not expected to get high citation count in short term period.

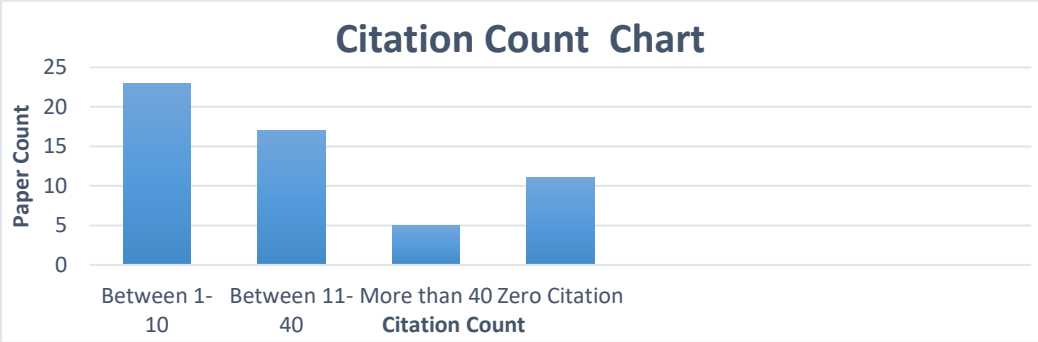

Figure 4. Citation count chart (x: Citation count, y: Paper count)

4.3. Temporal view

The distribution of studies against year wise is presented in Figure 5. Figure 5 shows that the gradual increase in the number of publications in the era of electronic payment since 2000 since we noticed as the years passed the work has been conducted more and more and it is evident because of e-commerce/e-business. Thus, it is noticed that a gradual increase has increased since 2006 and it is observed that suddenly increase in since 2015.

From the picture only one study was found in the year 2000, followed by 6 studies were found in the year 2001, continuing 2, 2, 2 studies were found in 2002, 2003 and 2004 respectively, in continuation 1-study found in 2005, after that 6 studies were found in the year 2006 and so on, Figure 5 clearly shows year wise count of publication.

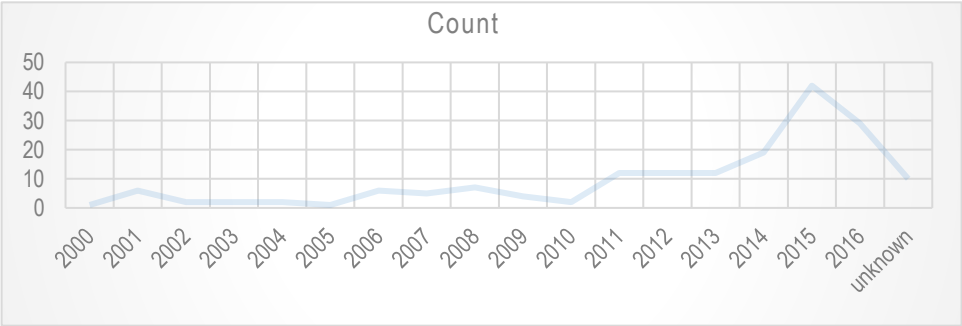

Figure 5. Publication per year

4.4. Research methodologies

The distribution of the included studies is shown in Figure 6 regarding the research methodologies found in studies. It can be seen that both qualitative and quantitative methodologies were found in most papers. A mixed methodology was also used in 5% of the papers. Figure 6 shows 56-studies from them 34% were mixed methodology research studies and 31% of studies were qualitative, and 14% were quantitative, followed by the last 5% studies were unknown (their research methodology strategy was not present in the paper), and 16% were conceptual papers.

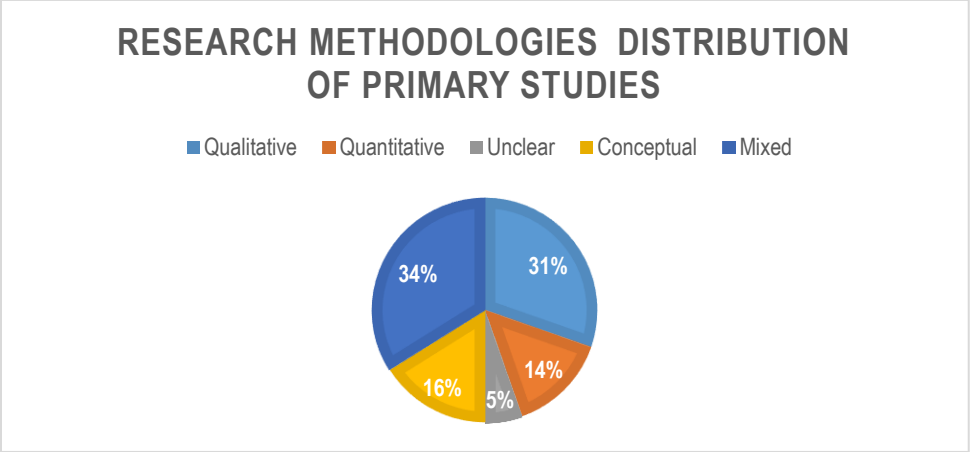

Figure 6. Research methodology

4.5. Research Methods

For classifying the research method against their research methodology, we applied the classification technique suggested by [9] as shown in the table below named Table 4. Figure 7 shows the distribution of research methods.

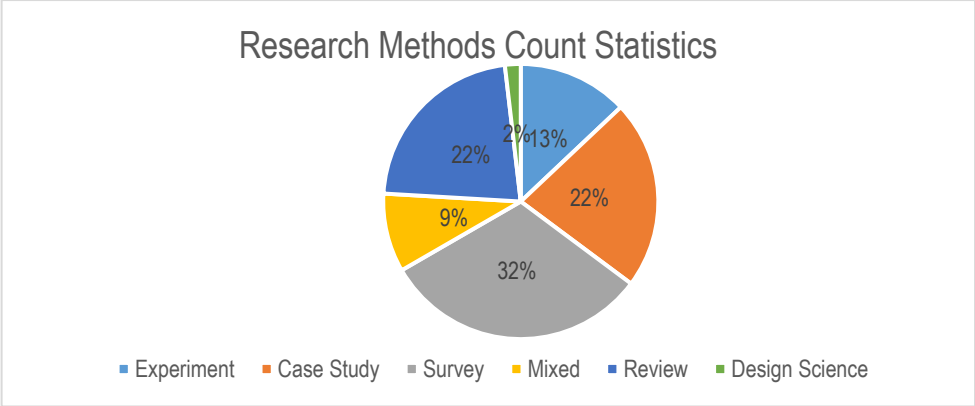

Figure 7. Research method distribution

Table 4. Research methods

Research methods	Description
Case study	Several techniques have been applied in this paper, mainly workshop, interviews, and documents. One or a few contexts are located in this category.
Experimental	Those studies were included in this category which are either field or laboratory experiments.
Design science	Studies that develop systems or tools fall into this category.
Survey	Those studies fell in this category, those who have use interviews or questionnaires to survey practices, opinions, and so on from a large population.
Mixed method	The mixed methodology is a combination of two studies, i.e., qualitative and quantitative.
Delphi method	Studies that report experts' opinions were used in the field of study, including participation in meetings and other workplace activities.
Review	Those studies fell into this category, which analyses the existing studies, typically exploring the domain and understating the concepts.
Not mentioned	Studies that do not mention any methods, either implicitly or explicitly, are counted as not mentioned.

5. Research questions results

After applying all the procedures that one researcher must follow to begin a systematic literature review, it is now possible to answer the questions for completing this study from a selected no of studies that were analyzed—creating a background of different payment (including traditional and e-payment) methods and comparisons of currently available electronic payment methods.

5.1. History of payment

From literature, the authors wrote about the history of payments as in the very beginning of the world people used to exchange goods and services in return for goods and services [9,10]. Then, the author discussed the second form of payment. People used to exchange money in return for goods and services. The earliest form of money was called commodity money; it was formed physical money because physical commodities were exchanged to pay for services and goods. The next step of the payment progression was using tokens like paper notes, which were backed by a deposit of gold and silver held by the note of the issuer. This technique is referred to as adopting a commodity standard.

Traditional payments

Payment type	One line description	Used by/For
Cash payment	It is the most commonly used form of payment– it is simple– it is easy, and no time is taken along with hand to hand transfer of money, so the expectation of high risk of robbery rises and the problem of cash saving [11,35,36].	Stores/Shops anywhere in the world.
Check payment	It is an easy and safe method for both parties but must have a bank account with one side effect know as time-consuming. This paper does not cover check bounce and other false conditions with check transfer [35,36].	Person to person. Person to merchant or company
Credit transfer or Grio	The giro payment system is a type of payment that simply means "Circulation of Money." It is somehow resembling with check payment but depends upon certain conditions [11,35,36].	Person to person. Person to merchant or company. Merchant to Government.
Automated clearing house (ACH)	A well knows form of transaction for low value [12].	Person to person.
Wire transfer services	It handles payment transactions between businesses and banks and to and from Government.	Business to Business Business to Govt.
Payment using cards: Type-1: Electronic purse (pay before purchase)	The electronic purse also is known as pay before the purchase. In this system, the buyer will pay before to the service provider and receive goods/services after that [11,13,15,53].	Person to Business. Person to Business.
Type-2: Pay now	This system also is known as the Debit Cards system; in this, we purchase the goods/service that we must pay for purchases at the time of purchase [11,12,14,53].	
Type-3: Pay later	This system is also known as the Credit Cards system; we purchase the goods/service rather than pay dues on our own or depend upon the service provider [11,12,15,53].	

As we have already discussed different types of payments in the above paragraphs. Before listing the e-payments methods which are in practice now, the reader must clear some of the terminologies–

Payment gateway/Payment system/Payment method is the three interchanging words; however, payments gateway differs from the two in terms of definition.

A payment gateway creates a connection between **Payer** and **Payee** over the internet.

Payer knew as the payment sender while **the payee** knew as the payment receiver; in other words, the payee is the merchant; however, the payer is the consumer.

Before discussing the e-payment system further, the reader must know about **e-commerce**; e-commerce is a primary method for conducting commercial business over the internet, e-commerce is primarily divided into five stages. However, there are some more levels which is none of the local business concern– local business means a standard consumer/registered company and a merchant/e-commerce service provider [13,39].

Types/Levels/Models of E-Commerce	High Level of E-Commerce
B2B - Business to Business E-Commerce	B2G – Business to Government
B2C - Business to Consumer E-Commerce	
C2C - Consumer to Consumer E-Commerce	
B2E - Business to Employees E-Commerce	
C2B - Consumer to Business E-Commerce	

How e-payment works: Following Figure 8 depicts the working of the basic e-payment system, and there are many more versions of this model, which is not our concern, so the author does not include other models.

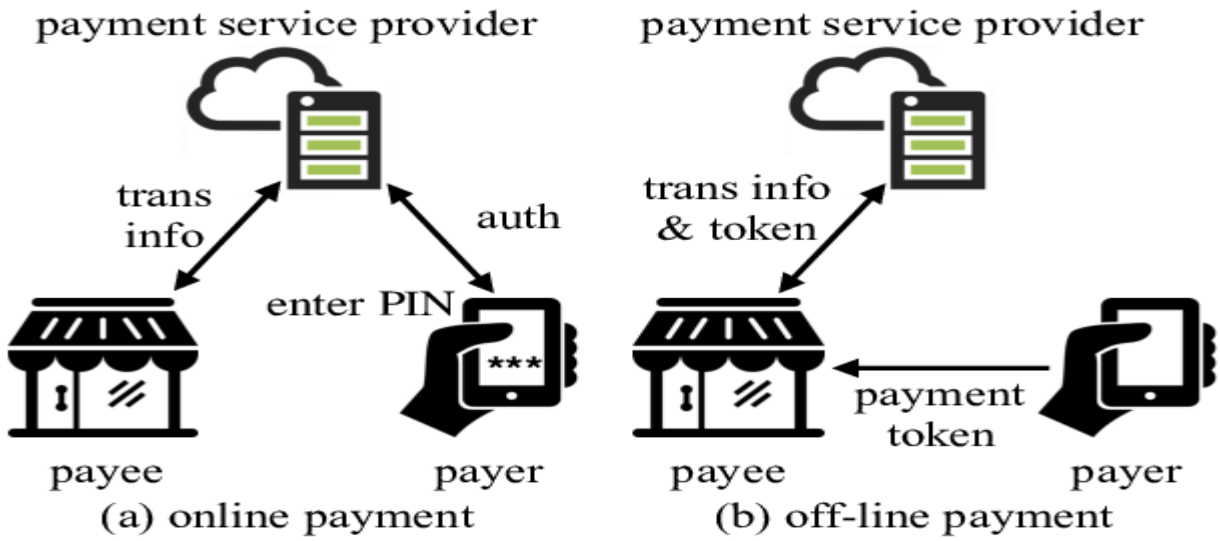

Figure 8. How e-payments works

5.2. Comparison of electronic payment systems

The electronic payment system can send cash/money electronically for products and goods purchased via the internet. E-payments are dependent upon e-commerce, or in other terms, we can say e-payments are an integral part of the e-commerce business. One of the significant reasons for becoming famous in e-commerce transactions is perhaps the rapid development of e-payments systems. In developed countries, credit card has been used most of the time even before the advent of the internet. E-payments can be grouped into three categories 1) e-cash systems, 2) credit card payment system, and 3) e-cheque system. E-payments system has various requirements to become famous worldwide; some are listed below, commonly seen in the literature. These are security, acceptability, convenience, cost, anonymity, control, and traceability. Therefore, instead of focusing on the technical specifications of various electronic payment systems, scholars have distinguished electronic payment systems based on available features. Table 5 [14] presents a comparison of various electronic payment systems.

Table 5. Comparison of electronic payment systems, Source: [25]

Features	Online credit card payment	Electronic Cash	Electronic Cheque	Smart Cards
Actual payment time	Paid later	Prepaid	Paid later	Prepaid
Transaction information transfer	The store and bank check the status of the credit card	Fee transfer. No need to leave the name of the parties involved	Electronic checks or payment indication must be endorsed	The smart card of both parties makes the transfer
Online and offline transaction	Online	Online	Offline allowed	Offline allowed
Bank A/C involvement	Credit card account	No involvement	Bank account	Smart card account
Users	Any legitimate credit card users	Anyone	Anyone with the bank account	Anyone with bank or credit card a/c
Party to which payment is made	Distributing banks	Store	Store	Store
Consumer's transaction risk	Mostly born by distributing banks	The consumer at risk if stolen or misused	The consumer bears risk but can stop check	Consumers-risk of stolen, lost, or misused
The current degree of popularity	Credit card org. Checks for certification and total purchases. Thus, used internationally.	Unable to meet internet standards in the areas of potential expansion & Intel.	It cannot meet international standards, so not so popular.	Like online credit cards, and is becoming more widely used.
Anonymity	Partially or entirely	Entirely	No anonymity	Entirely, but if needed by the central processing agency can ask.
Small payments	Transaction costs high. So, not suitable.	Low transaction cost. Suitable	It allows stores to accumulate debts until it reaches the limit before paying for it.	Transaction costs are low, like electronic cheques.
Database safeguarding	Safeguards regular credit card information.	Extensive database & records S. No's of use etc. Cash.	Safeguards regular account information.	Safeguards regular account information.
Transaction information face value	It can be signed & issued freely in compliance with the limit.	Face value is often set & cannot be altered.	It can be signed & issued freely in compliance with the limit.	It can be deducted freely in compliance with the limit.
Real/Virtual world	It can be partially used in the real world.	It is an only a virtual world.	Limited to virtual but share checking a/c in the real world.	It can be used in real or virtual.
Limit on transaction	It depends upon the credit card limit.	It depends upon how much prepaid.	No limit.	It depends on how much money is saved.
Mobility	Yes	No	No	Yes

5.3. Table of differentiating factors between traditional payments and e-payments in terms of security

As discussed in the previous section that traditional payments were named 1) cash payment, 2) check payment, 3) credit transfer or Grio, and 4) automated clearing house (ACH), and generally, the electronic payment system was divided into five categories 1) pre-paid card, 2) electronic-cash, 3) debit cards, 4) credit cards, and 5) electronic checks [16-22,28].

Why we need security in e-payment: The trust upon the e-payment method is solely dependent upon security because a **strong** and **long-lasting** relationship is entirely dependent upon security [23]. The online transaction does not mean to develop the business over the internet, but it is more critical to create trust over the internet because there are lots of fraud methods, so security requirements are part of strong customer relationship [13,22-24,28]. For the most part, security is a set of techniques, systems, and computer programs to verify the source of data and guarantee the trustworthiness and protection of the data (information) to go without this situation to prompt to a hardship (monetary) of information or system assets. The below table list down the security components mostly used to implement the e-payments system [13,22,23,25].

Table 6. Basic building blocks of security mechanisms

Name of security mechanisms	Description
Encryption	It provides confidentiality, authentication, and integrity.
Digital signatures	It provides authentication, integrity protection, and non-repudiation
Checksums/hash algorithms	It provides integrity and authentication

Table 7. Table of differentiation factor between conventional payment type and electronic

Type of security factor	Description
Systems security	The technical infrastructure and implementation should be as secure as needed to protect loss.
Transaction security	The information should be kept safe as described on the manual or website page.
Legal security	A legal frame for electronic payment.

Listed above are the factors that differentiate a traditional and electronic payment system. Figure 9 [22] describes the overall picture of security-related factors.

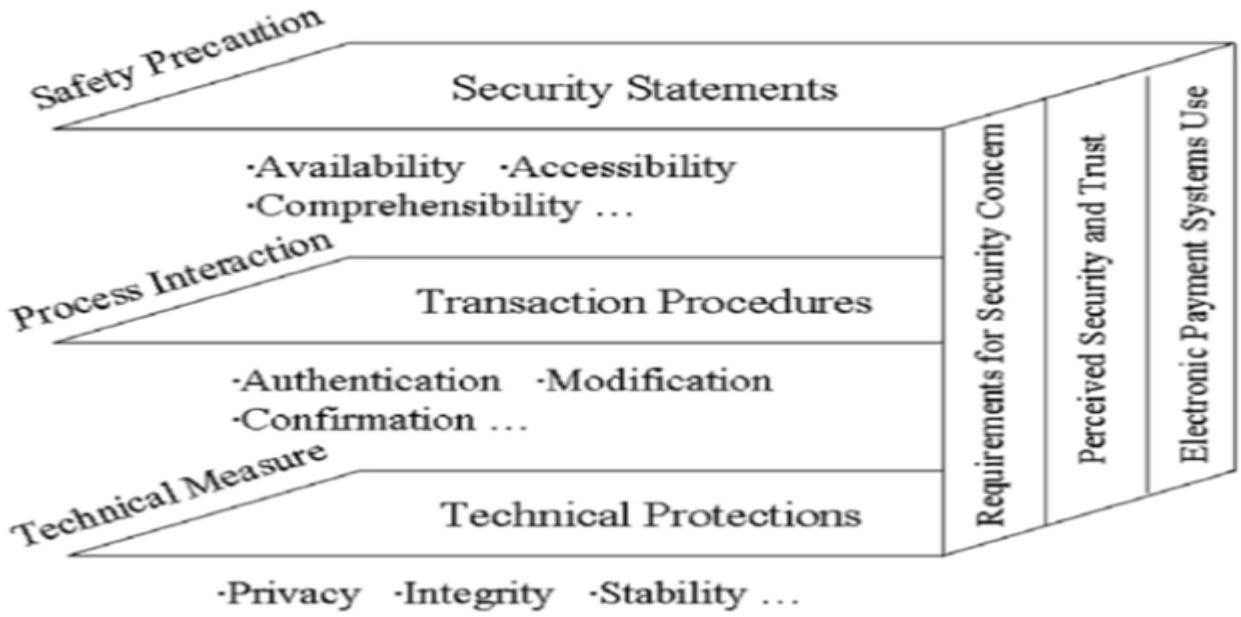

Figure 9. Diagram of factors that influence perceived security and perceived trust in *EPS use. - *EPS- Electronic Payment System -Source [22]

From the literature, we can classify the aspects that influence consumers' observation about security and trust in electronic payment systems into three main categories [24-26,32]: 1) Security statements- As described earlier, security statements refer to the information provided to consumers in association with EPS operation and security solutions, 2) Transaction procedures- Transaction procedures refer to the steps that are designed to facilitate the actions of consumers and eliminate their security fears, and 3) Technical protections- Technical protections refer to specific and technical mechanisms to protect consumers' transaction security.

RQ-3: Discussing the proposed algorithms/models for implementing electronic payment known as a secure electronic payment protocol

EPS: Electronic Payment System Secure E-Payment Protocol

There were too many other protocols that were presented in literature from which three are mostly identified in the literature listed below name and working off those three secure-electronic payment protocols.

The most essential and open-source protocols are SSL:/TLS- secure socket layer/transport layer security.

Netscape Inc. originally designed this protocol as a method for secure client-server communication over the internet environment. On getting fame now, it is implemented in most web browsers [22,26]. SSL was designed to achieve two main objectives. These are a) to ensure privacy, by which means encryption of data being transferred to and from client and server, and b) to provide validation/authentication of the session partners using the RSA Algorithm. Furthermore, SSL protocol is subdivided into two categories [13,26,27], such as SSL Handshake protocol and SSL Record protocol. It is known that SSL/TLS is the most widely accepted and deployed protocol for implementing a secure electronic payment method/system. SSL/TLS is an intermediary protocol that sits between TCP and higher-layer. It can be deployed over any application layer running TCP (Transmission Control Protocol), including HTTP and HTTPS.

The SSL communication starts by sending requests/handshakes to the client and sending a certificate in the response. A certificate is nothing else than a piece of secure data that includes an encrypted key associated with the server, other related information knowingly owner's certificate, expiry date, and the server's domain name. Market acceptance and user confidence became the most highly factors for being famous in a secure electronic protocol environment, so the use of this protocol is very high. It is also worth noting that SSL/TLS is sufficiently secure for the vast majority of consumers and uses it today to guard everything against credit card transactions and electronic banking; Figure 10 shows the working of SSL/TLS protocol.

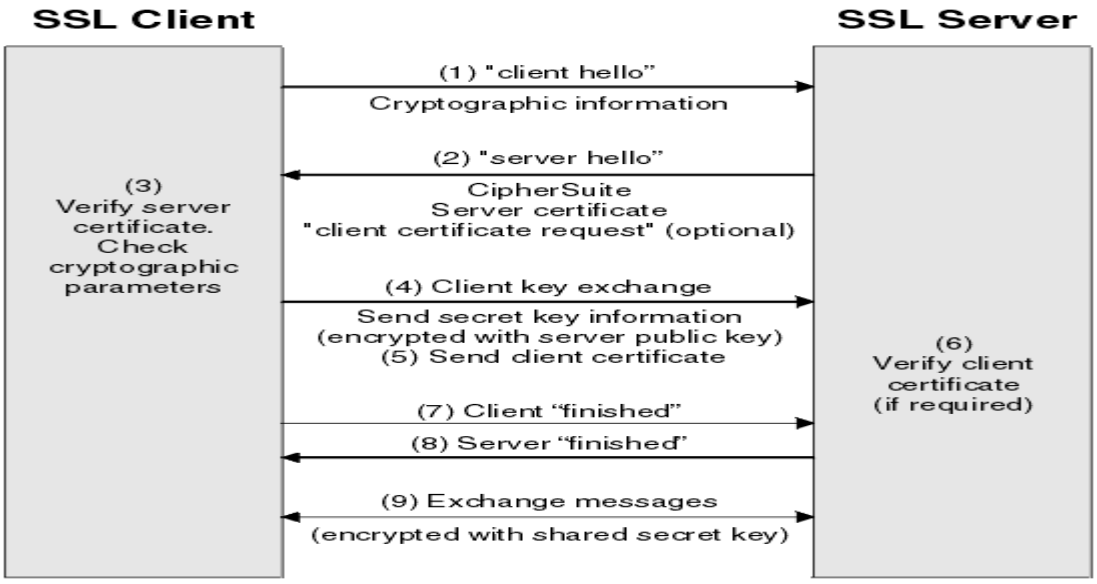

Figure 10. Overview of SSL/TLS messages exchange between client and server

SET– Secure Electronic Transaction

The author "*Arnab"* wrote in his paper that back to 1996, there were two leading credit card companies, Master Card and Visa Card, became together along with IBM and other companies to create a standardized payment and security process, in the result, they form Secure Electronic Transfer– SET [28-34]. Secure Electronic Transaction Protocol: Financial sectors wanted a very immediate solution to how a credit card works to successfully perform a transaction without facing security and trust, business-related groups, and communities [27]. SET is known as a very secure electronic payment handler; it prevents fraud, and it was one of the main objectives behind the appearance of the set [13,33-36]. As we saw in our previous protocol, SET uses different techniques to prevent fraud using rigorous authentication measures and encryption. SET, Secure Electronic Transaction provides a high level of security and privacy for its customers and ensures that the information will only see by the Bank. Furthermore, Figure 11 depicts the working of the SET protocol [13,33,34].

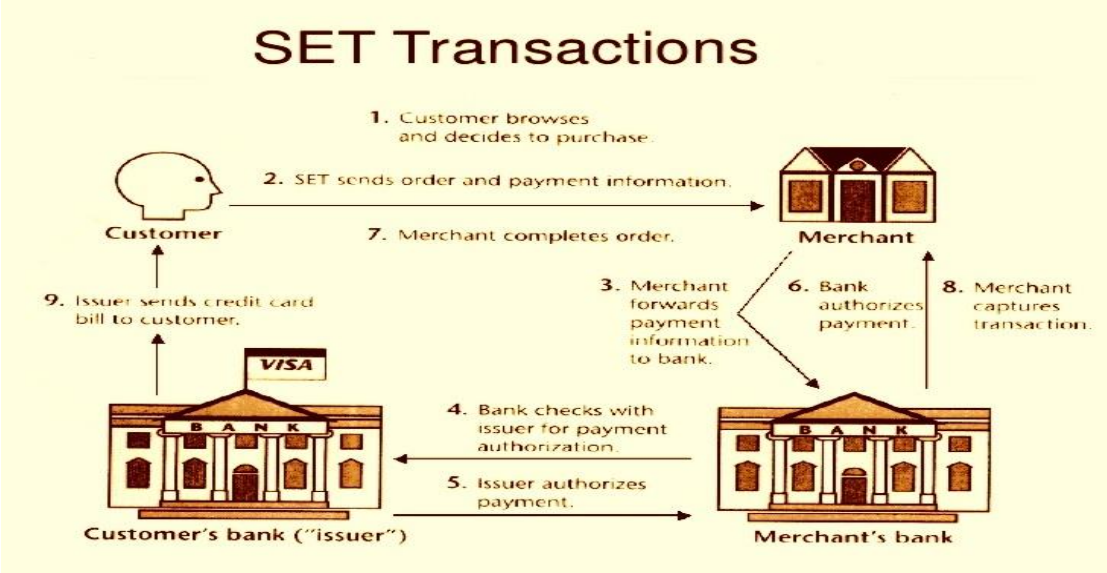

Figure 11. SET Transaction steps

Table 8. Comparison of SSL/TLS and SET (secure electronic protocol)

Key point	SSL	SET protocol
Security	Less secure	More Secure
Technique	Encryption/Decryption	Encryption/Decryption with dual signature
Merchant security	Less	Yes
Client security	Less	Yes
Payment gateway	No	Yes
Channel security	No	Yes
Use of digital certificate	No	Yes

IOTP: Internet Open Trading Protocol

Last but not least, IOTP is known as an internet open trading protocol; this protocol provides an interoperable framework for C2B- consumer-to-business internet-based electronic commerce. It was designed to replicate real-world transactions where consumers can select their choice products, vendor and choose their payment method (w.r.t to vendor's availability) even arrange delivery on their own choice. The originators of IOTP expect that this convention will be the most widely used language of Internet business known as e-commerce, similarly as EDI has turned into the standard document language for real commerce.

Benefits of IOTP:

Payments Types: IOPTP gives a standard structure embodying payment protocol; this implies that it is easier for payment products to be consolidated with IOTP solutions. Therefore, the payment method will be more widely available [13].

Vendors: They will have more capacity to offer more a more extensive number of payment brands. They can be increasingly sure that the client will have the software to finish the purchase. By receiving payment and delivery receipts from their clients, vendors will give customer care knowing that they are dealing with the individual or organization they initially traded [13]. Figure 12 demonstrates the general flow of an IOTP-based purchase. Note that it may be more appropriate to relate IOTP as a shopping protocol instead of a payment protocol [13].

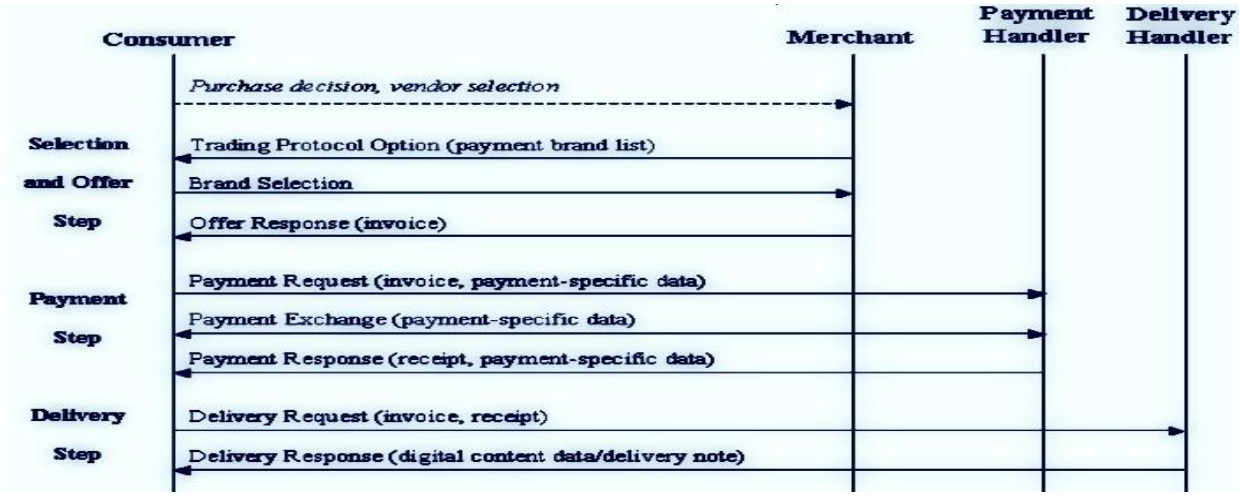

Figure 12. General flow IOTP protocol

RQ4: Defining Electronic Commerce (E-Commerce), its categories and size of the business in each category

The term E-commerce is termed as electronic commerce, the world of e-business termed as an electronic business. E-commerce is a service provided by merchants for their consumers. Consumers can purchase electronically without the influence of any physical activity; it may or may not include payment electronic payment method from which merchants can receive payments electronically [38-44]. Electronic commerce is purely connected with business and its types– the term business is known as an activity between buyer and seller known as business activity [43]. Electronic Commerce entirely depends upon the types of business that occur in daily life.

Categories/Types of electronic commerce

There is a total of seven categories which we come found from literature from which four types are in use of regular use without the interaction of any governmental body known as [45-49], and each of categories has different characteristics. The size of business depends upon the amount of order or quantity of order [17,50].

a) Business to Business (B2B) describes transactions between businesses, like transaction commerce between manufacturers and wholesalers or retailers and wholesalers. The amount of price depends upon the quantity of the order. The value of business or volume of business is highly greater than contrasting business terms such as business to the consumer, which is small in the amount of business. Business to Business was also known in the context of communication. Because nowadays, many businesses use social media for advertising their products and targeting their consumers for generating business; however, in this case, their consumers are also other business parties, so this category is known as business to business. The short term B2B was originally invented to describe the electronic communications between businesses or traders to differentiate it from the communications between businesses to consumers [17,38-43].

b) Business to Consumer (B2C)– The term business to consumer is sometimes also known as business to the customer; it distinguishes by the relationship between the customer, either it could be business or consumer. This type of business has developed too fast because of the fame of the web, and various online stores exist earlier and making business in Million Dollar per day. An example of a business-to-consumer transaction could be a customer buying an electronic mobile device from a retailer when the product is made available for a customer. This type of transaction is known as business to the consumer, while the massive amount of product/item was made available to retailers known as business to business [39-43].

c) Consumer to Business (C2B)– Consumers to business is terminology in which individual consumers offer their product and services to the companies and buy their product. This type of business model differs from business to consumer, or it is reverse in operation. An example for this category would be like this an individual author offers his book on Amazon.com. However, the percentage from that sold book can be transferred to the author in return for services or goods [39].

d) Consumer to Consumer (C2C) – Consumer to Consumer is a business model in which consumers themselves sell their services or goods over the internet. Buyer trust over the provider of that service in other terms electronic commerce website or online portal where the product was being offered or auctioned. An example of this business model could be a consumer post his services or goods, and one of the needy consumers bid that post, the third party will apply some flat commission charges for providing a platform [39-45]. These are 1) Government to Business (G2B), 2) Government to Consumer (G2C), and 3) Peer to Peer (P2P).

There is no need for face-to-face conversation/operation and all transactions made through electronic commerce [38]. Most of the literature only describes the basic four models; hence, we define four models and left three models as undefined. Table 9 depicts the general types of electronic commerce in a graphical representation [39,42].

Table 9. Types of e-commerce

Type	Name	Short Description
B2B	Business to Business	Online business, selling to other businesses.
B2C	Business to Consumers	Online business, selling to individuals.
C2C	Consumers to Consumers	Consumers are selling to other consumers.
P2P	Peer to Peer	Peer-to-peer technology is a communications model in which each party has the same capabilities, and either party can initiate a communication session.
M-Commerce	Mobile Commerce	Use of wireless digital tech devices to perform transactions over the internet for business growth.

Size of Business

The models in terms of business size are micropayments such as the amount between ($1 to $10) mainly conducted from consumer and business to consumer e-commerce. Payment amount between ($10 to $500) considered as business to consumer model. Payment amount more than $500 is mainly conducted in business to business model P2P and C2C. Both models fall into the same category, and both are relatively small in terms of an amount compared to business to business and business to consumer. Furthermore, authors Cavarretta and de Silva [50] also add three more categories to categorize the e-commerce model in terms of business. These are i) Tiny value transactions: below $1 ii) Medium value transactions: between $ 1 and $ 1,000, and iii) Large value transactions: above $ 1,000 [14,50].

6. Conclusion

This study presented an overview of electronic payments by conducting a systematic review study on articles published during the year-2000 to year-2016. A multi-step model was used to include and exclude the studies depicted in Figure-1; these studies were searched from the highly reputed database using keywords related to our study; all the things were presented in the above tables. In order to answer each question, we identified many studies from which we extracted and summarized the data related to our study.

Conflicts of interest. There is no conflict of interest.

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