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Analysis of Centralized Payment Eco-System: A Systematic Review on E-Payments

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Abstract

Nowadays the increasing number of e-commerce systems and online services raises the need for online payment systems. In the future, the number of internet businesses will increase drastically. In recent times because of the outbreak of COVID 19, Online purchase has increased rapidly and we can guess that, in future these increments will remain as high present if not more. Future online businesses will require more efficient and secured payment systems. There are already a large number of payment Methods & Gateways available. The most popular ones are using the traditional centralized approach. Centralized payment gateways use central database for all the records and need a central authority for controlling it. Our primary goal is to analyze the feasibility of these kind of popular online payment gateways. In this paper, we have analyzed the features of centralized payment gateways as well as provide an overview of the cost and reliability of the current payment system. We found how these kind of popular centralized payment gateways are overall helpful and beneficial for the internet businesses and there are opportunities to improve it.

Keywords: *Payment Ecosystem, Payment Method, Payment Processors, Payment Gateway, Payment Aggregator, Centralized Payment Gateway.*

1. Introduction

A Payment system is a procedure where many companies of the same organization manage the incoming and outgoing payments among them. Generally, there are two types of online payment. The first one is the IBPG mode based and the other one is the third-party payment platform \cite{yang2007research}. The first one is a kind of direct payment mode where through the e-business system the customer pays the online payment. And the banking system is connected to the e-business. And the second one is the customer transfers the money to the seller with the help of a third-party payment platform. Online business requires online payments and there is a lot of different type of methods. Centralized payment gateways and aggregators are already well-established company but they charge a high amount of fees. There are obvious reasons for that. Later in the literature review part we have discussed the architecture of these kind of system and now a days, why this is so popular. We also further analyze the future of centralized payment ecosystem if it is beneficial or feasible or not.

The reminder section of this paper as follows we introduced the foundation where we describe about some of the terms that we used in this review such as the payment gateway, aggregator, centralized payment gateway system in Section 2. In the Section 3, the literature selection and literature search process has been described. In Section 4, we introduce the literature review and some well-known international and local payment gateways and system and including the cost and their pros and cons.In Section 5, we

showed some statistical analysis. In section 6, we present the advantages and disadvantages of a centralized payment gateway as result discussion. In the following section 7, we discussed how this kind of payment system can be beneficial in pandemic situation. In Section 8, we presented the challenges and future possibilities. And in the final section, Section 9, we conclude with a short overview and discussion.

2. Foundation

2.1. Types of Currency as a form of Payment:

In most specific form currency is money and money are used as a medium of transaction in any form such as physical money or digital money [2][3] Most people understand currency as paper notes or coins which is centrally controlled by the government. But in this modern era, there is another type of currency known as cryptocurrency which is a private decentralized network based currency. So, there are mainly two types of currencies: *i. Fiat money* and *ii. Cryptocurrency*.

Fiat money is the physical form of currency without idiosyncratic value that has been set up as money, often by government regulations. Fiat money does not have it's any used value, its values are given by the government, and the government maintains its value. Or those parties who exchange the fiat money they agree with the value of it.[4].

Cryptocurrencies are mainly symbolic currency that is used in the virtual world. These also called digital currency which worked on the cryptographic principle. As the name alludes, they are intangible that means there is no elemental existence of cryptocurrency. These currencies exist as a collection of programming codes. And yet cryptocurrencies also provide high security and usability than many existing currencies [5].The use of these cryptocurrencies is described later in this paper in the decentralized payment gateway section.

2.2. Payment Ecosystem:

Any fund transaction needs at least two parties usually they are called as sender and receiver. The system through which is required to happen this transaction is called payment system. This system which is used to transfer fund value is built with central bank, commercial bank, payment service providers and mobile money agents, payment gateways, payment aggregator and payment methods. Inclusion of all these mechanisms is formed payment ecosystem. The payment ecosystem is not a static system; it will change whenever technology or culture changed or thrived [6].

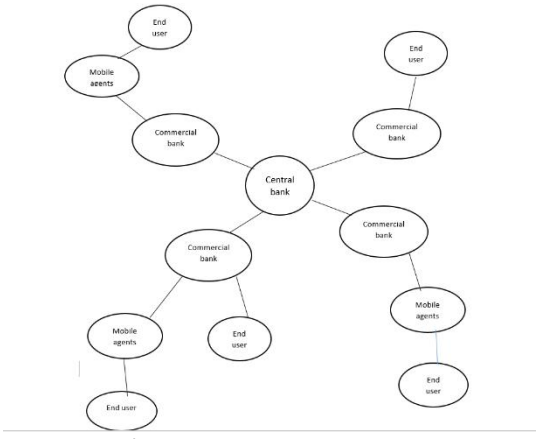

Fig 1: Payment Ecosystem

Ecosystem gives some benefits to the users and these benefits are called as ecosystem services. These are supporting services which is expected condition for provision of other ecosystem services. Other ecosystem services are provisioning services, cultural services

regulating services etc. [7]. As payment ecosystem is built in the basis of natural ecosystem so these benefits also remain in payment ecosystem.

2.3. Payment Method:

The payment method is a way to compensate someone for the goods or the service he/she provides and both parties agrees upon it. Traditional payment methods are cash or checks. But online it is called payment services. There are three kinds of e-credit: E-cash, E-checks, E-Credits [8]. Here E-cash can be compared to the online wallets. E-checks are kind of internet banking/bank transfer and E-credits are for credit/debit cards.
Some different types of payment methods are [9]:
i) Credit/Debit Cards ii) Mobile Payments iii) Bank Transfers iv) E-wallets v) Prepaid Cards vi) Direct Deposit vii) Cash

For Example, here customers got some online services from the receiver. Now the customer wants to pay the receiver. If each party has access to the same payment method and agrees to receive payment through that then they can use that method. Customer and receiver both must have their online wallet of that particular method. So, the customer sends his money to the receiver using that method. That's how basic payment methods works.

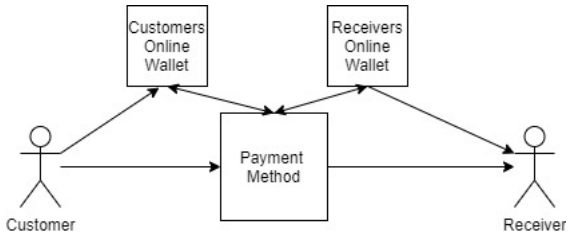

Fig 2:Simplified Credit Flow Online Payment Method

In online, there are some payment services which are basically payment methods. They act as E-wallets. Some example of these kinds of services are [10]:
i) PayPal ii) Google wallet iii) Apple pay iv) Payoneer v) Payza etc.

2.4. Payment Processor:

Payment processors are the intermediary companies that connect specific payment methods and process them. For example, one company can process all the debit and credit cards. They take those credentials and connects to the bank and processes the transactions. They usually work with the physical form of payments like, swiping the card in a POS (Point of Sale) interface and process that instantly [11].

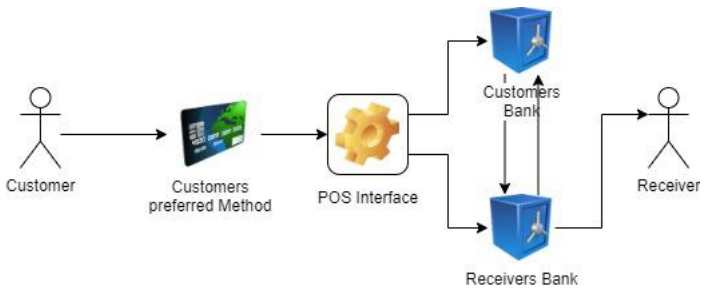

Fig 3: Basic Operation of Payment Processors

In **Figure 3**, a customer wants to send money to the receiver and they both have a different bank account. So, for that, they need to use a different method. That is where

payment processors come in. Here customer wants to pay using a card, then receiver uses that particular POS interface which is connected to that payment processor. Then it handles all the bank transfer processes.

2.5. Payment Gateway:

A payment gateway is almost the same as payment processors but it is an online service that helps merchants or any other receiver to receive payments online. It accepts any kind of online method other than cash or cheque. In contrast, payment processors need different POS interfaces. In payment gateway, all the processors and other interfaces are present or connected in one place. It connects customers and merchants and transfers money easily. Payment gateways merges all kinds of payment processors and other banks. Without integrating different types of payment methods if someone integrates any kind of payment gateway then all the methods will be integrated there.
Here what a payment gateway does:

- When a customer gives payment through a card or digital wallet or internet banking to pay for goods or services, their payment goes through a gateway.
- The payment gateway connects to the customers' bank and connects to the merchant's bank. It deducts the amount from the customers' account and sends it to the merchant's account in a really short time.
- A gateway is important because it verifies customers' information in every step and also verifies information to either a successful process or decline transactions. This is done in a matter of milliseconds.

But payment gateways must be very secure in terms of sending sensitive personal information and keeping them safe. It needs high secure process and algorithms to keep them safe and avoid the loss or prevent a potential thief from stealing these data.

Fig 4:Basic operation of payment gateway[12]

The best thing about a payment gateway is that it supports almost all the online payment methods in one place. It automatically processes everything and connects customers and merchants directly and transfer money without any problem whether their bank is the same or different.

2.5.1.Centralized Payment Gateway System:

Here one company which is a third-party act as a central point and maintain all the incoming and outgoing money transaction between any e-commerce organization or those types of organization which supports online transaction. Most of the payment gateways are currently centralized. It is easy to develop a centralized payment gateway. But less secure if the organization becomes bigger. Centralized payment gateways are great for small business or personal use. If someone has huge business and has to deal with a large number of transactions from a different location, type and amount then it's great to have a payment aggregator of their own, as most of the centralized payment gateways charge a high amount of fees per transaction. Centralized is easy to maintain but for that, it has higher charges.

2.5.2.Decentralized Payment Gateway System:

Here no third-party organization is needed. The transaction is occurred directly from merchant to client or peer to peer. Here every transaction is validated by doing mining through miners. Payment gateways can be done in a public network like Ethereum \cite[13]or private networks like Hyperledger Fabric \cite[14]. There are other public or private blockchain-based decentralized networks. They can be permissioned or permission less or both. Whichever network is used or not the decentralized network is hard to develop. As there are no middle man and everything is automated to reduce time and cost also make it secure, this kind of decentralized payment gateway is very challenging. Once it is deployed its hard to make changes. But once it is operational it serves way better than a centralized network. The same type of payment will happen here but there will be distributed ledger and every party will be transparent. Also, every transaction will be highly encrypted so that no one can steal or change the ledger. As a result, these kinds of payment gateways are very secure, transparent, reliable & Cost-effective.

2.6.Payment Aggregator:

Payment aggregator is mainly the inclusion of all payment gateway.Payment aggregator is mainly known as third party aggregator. Payment aggregator is mainly worked as monetary service provider which makes digital currency transferring between the merchant and consumers using different types of payment methods such as bank transfers or any types of card transfers [15]. Among a lot of third-party aggregator PayPal is the best one. An aggregator allows a merchant to accept card payment or any kind of bank transfer without having to set up a merchant account with a bank or credit card [16]. For this reason, it is very helpful for the small or start up business. This is also very cheap money transfer method. A payment aggregator is very easy to set up and open a merchant account. And those merchants who are using this type of payment aggregator they don't need to wait many days to get money only few days need to transfer. A payment aggregator is very beneficial because of some characteristics. Those are very easy application, instantly accept payments and most importantly very cost effective. That's why these types of payment aggregator are very useful for the low budget businesses.

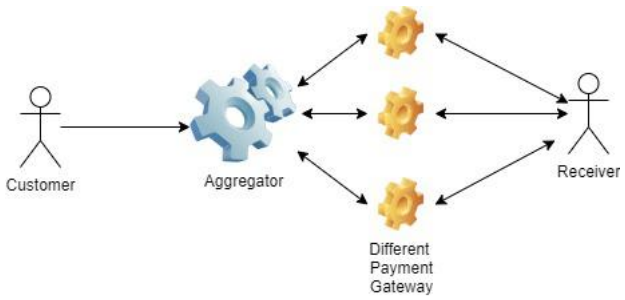

Fig 5: Basic Operation of Payment Aggregator

For example, if any business company wants to integrate all the payment methods and wants to receive money from clients easily then without integrating individual payment methods or gateways, they can use aggregators. These aggregators have several gateways integrated. So, clients don't have to think about the methods. Aggregators will handle all of them.

Though aggregators are combination of gateways but most of the popular aggregators call themselves payment gateways. So, in this paper we are going to use the gateway term while describing them

3. Literature Review process

By doing literature review this paper follows the established guideline. The literature review is on the payment gateway system. Here we considered some highly used payment gateway systems. We tried to make a review on the payment gateways and payment methods which are popular in developing countries in Asia and also some international payment systems. In next step we tried to reach a decision that if centralized payment systems are feasible or not and is there any alternatives.

3.1. Literature Search:

Here we used many databases to cover the most important paper and journals.Paper was searched based on the title, abstract and keywords. After searching we found 223 paper based on payment gateways.But we found many information but could not find all necessary info that we needed to review in this paper. That's why we used some official web pages and blogs of many payment gateways to gather the information. Finally, we used those papers, official pages and blogs which were relevant to our research topic or review topic.

3.2. Literature selection:

The collected papers and articles were explored based on the title, keywords and abstract. And those papers which were selected met two basic criteria and those two were 1) those article, paper, blogs or official web pages which were based on the centralized payment gateways. 2) some web links and paper based on the description or analysis of different types of existing payment gateways. As a result, 34 papers were decided for further review and many papers were excluded if the information was not trustworthy. Or if we felt any doubt on the selection of paper or articles, those papers and articles was kept for full text analysis. In the very first step we select 32 papers and articles for the review. But for extending the coverage of literature review we searched more paper and we update the initial search based on the literature selection. In this paper we mainly took those papers, articles, blogs or any information from web pages which were very recent. Very few paper is before 2016. And by following all the selection criteria at last we choose 51 articles for doing this review.

4. Literature Review and Related Works of Payment System

4.1. Popular Payment Methods:

There are many popular payment services which works as a payment method. The common feature of these services is they have their own online wallets. Here are some of them:

PayPal:

PayPal is a payment method that aimed to remove the need of using credit card information to make any payment. From the invention of PayPal, its rapidly grow its popularity among the world. In 2019, 37.3 million new active accounts were created raising total active accounts to 305 million with 12.4 billion payment transactions and $712 billion total payment volume [17]. Overtime PayPal has become an essential method for payment all over the world. PayPal enables customers to make payment without the need of providing credit card number, which helps the customer who hesitates to provide any confidential information like credit card number to a new website the customer never visited before. This increases the sales of small business and startup business significantly. In terms of security, PayPal is one of the most secure payment systems, which is capable of preventing identity theft and online fraud. [18]

Pros:

- User can make payment without providing credit card information.

- Minimal amount of charge to make payments.

Cons:

- User can sometimes encounter account suspension which can freeze fund for a long time
- It can be difficult to contact customer service.

Apple Pay:

Apple Pay developed by Apple is a mobile payment digital wallet service where Only the device of iOS like iPhone, Apple watch, iPad and Mac users can get the benefit of Apple pay. The main transaction is point-of-sale terminal by which a credit card, debit card, chip and PIN for transaction. In Apple Pay, online payment is so simple for the customer because same credit card and authenticates with Touch ID it uses with the information that is stored in the participating apps which the Apple API already adopted. It is also used for Digital Secure Remote Payments (DSRP) [19] and also for contact-less Europay, MasterCard and Visa (EMV) [20] payments at PoS.

Pros:

- User Authentication: The cardholder of apple users verify their IDs by Bio-metric Fingerprint verification which is Touch Id. It ensures the security of user and also prevents the fraud interruption. After five unsuccessful attempts if the fingerprint does not match, pass code authentication will be arrived on the device.[21]
- Data Protection: The unique derived key, the apple pay applets , tokenPan which is the account ID ,certified issuer payment applets all are stored securely in a secure Element (SE). Near Field Communication (NFC) controller is used to control the secure element communication and the restricted design.[21][22]
- Because of Fingerprint and PIN based CV during transaction Apple pay does not need any internet connection.
- Does not take any extra credit card transaction fees.

Cons:

- Requires iPhone 6 for transaction.
- Transaction speed is low
- API support is not up to the mark

Google Pay:

Also known as Google Wallet. It is a peer-to-peer service. This payment method is developed by google. Google Wallet users can access directly in their online account through their debit card [4]. The method is so easy for transaction because user only need the email or number. Google pay is a decentralized peer-to-peer solution [23]. Google Wallet later merged with another payment system introduced by Google called Google Pay. This enables the customers to pay with their Near Field Communication (NFC) enabled Android devices using tap-to-pay or in-app [24]. The Near Field Communication (NFC) is a standard that uses a specific frequency of Radio Frequency Identification (RFID) which allows communication between active reader, passive tag and peer-to-peer active readers. An NFC enabled phone can read tag, receive and send data to another NFC enabled phone [22].

Pros:

- Faster payment with tap-to-pay feature.
- Offers API to third-party developers to integrate with their applications.

Cons:

- Uses telemetry to collect information like location, time etc.

- Requires Android device 4.4 (KitKat) and above.

Comparison of some Major Payment Method [25] [26]:

Here we showed some online payment method (Those who act like E-wallets and has their own credit) based on type of their architecture, how much country they cover and which options they use for payment**Table 1**

TABLE 1 :Some Popular Payment Methods

No	Company Name	Availability	Payment Options
1.	Paypal	190 Countries	Major Cards, Bank Transfer
2.	Apple Pay	69 Countries Mostly in Europe	Credit card, debit card
3.	Google Wallet	U.S. Only	Major Cards, Bank Transfer

4.2. Current popular payment gateway:

At present there are two main types of payment gateway available, 1) centralized, 2) Decentralized. The Centralized Payment gateway is widely used and very popular among people worldwide. This kind of method is secure and quite fast but costs quite high due to its maintenance and inner cost. It needs a centralized server and other computing power to process and also a centralized control system with proper authorization [27] As a result, it becomes costly. On the other hand, Decentralized payment gateway doesn't need any centralized server rather it needs a platform like Hyperledger Fabric, Ethereum [28]or similar kind of decentralized platform where the control is distributed over the network and need authorization from the majority. Its building cost is high but once deployed it needs very minimal cost to maintain which makes it a cheaper option for the customer, merchants, and businesses. But in this review we are going to focus on the centralized payment gateway only.

At present, there are two main types of payment gateway. The architecture of the centralized payment gateway is quite simple and straightforward. Here [29] shows the basic structure.

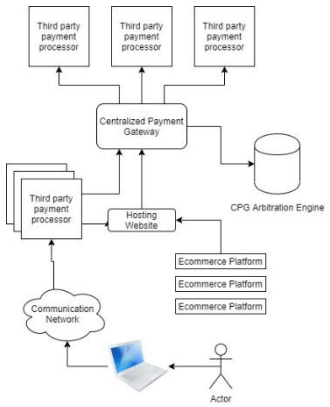

Fig 6:Simplified Structure of centralized Payment gateway [27]

In this structure, it is very clear how it works. As customers (online platform) can't use all the different payment processor, this centralized server takes care of all the third-party processor and gives service as needed to the customers. Because of the central server, a central authority is needed to maintain it and there are some other costs like maintenance, operate and some other costs. It has its advantages and also some major drawbacks especially for the customers.

Note: Though some of the following companies call themselves payment gateway, of them are aggregator.

4.2.1 International Gateways & Aggregators:
Currently, worldwide most used centralized Payment gateways are:

PayPal:
PayPal also works as a payment gateway. Besides their online wallet, they also provide a solution for payment processing.
PayPal Checkout provides several benefits which include [21]

- All the information regarding the credit card is stored in a secure environment. It uses and maintains a firewall to defend against hackers. Also, the card data and transmitted data are encrypted.
- Using PayPal's "One Touch" payment system, PayPal maintains the conversion rates.
- It provides the option to directly pay from the product page which results in higher sales of the merchant.

Pros:

- Offers high security transaction. While signing up at PayPal, a credit card needs to be associated with the account. After that the user does not have to provide card details in any PayPal enabled payment system [30].
- For standard checkout options PayPal does not charge any monthly fees.
- For standard checkout options PayPal does not charge any monthly fees.
- The developers can customize the checkout option according to their website or store.
- There are a lot of integration options including extensions and add-ins available for various e-commerce platforms.

Cons:

- PayPal has a poor customer support over the phone. Especially when any suspension issue occurs, it takes a long time to fix.
- While any transaction the user is redirected between PayPal and merchant website which makes harder to track customers interactions.
- he international conversion fee to pay cross-border is higher.

Authorized.net:
A leading payment gateway where more than 430,000 merchants are present. And over $149 billion payments and 1 billion transactions are handled every year. This payment gateway mostly used in America, Australia, Canada, Europe. Takes payment through online all over the world. Authorized.Net is fully owned the co-operation of Visa. It accepts electronic and credit card payments which make it simpler. [31]

Pros:

- E-check Processing - allows to accept electronic checks from bank accounts via website (online store) or the Authorize.Net virtual terminal.
- Automated Recurring Billing – accept and manage recurring or subscription-based payments via web storefront.
- Advanced Fraud Detection - identify, manage and prevent suspicious and/or fraudulent transactions, with customized rule-based filters and other tools.More than 300 fraud detectors also included biometrics and IP geolocation in Cyber Source. So that Around the world person can payment.

- Secure Customer Data Management – allows to tokenize and store customers' sensitive financial information on Authorize.Net secure environment. The information is stored and encrypted within firewall.

Cons:

- Extra Charges – Authorized.net has extra cost for maintenance than other gateways.
- Lots of Requirements – To accept any payment from the customer, lots of requirements need to be fulfilled.

2Checkout:

2Checkoutisaglobalpaymentplatformandbecome a digital commerce ledger. It cooperates with the international market for digital goods. The digital commerce deals for global business. Around more than 200 countries use this payment gateway.[32] The costing per transaction is around 3.5%+$0.35 andin15languagesand87currenciesitcanprocess [33]. It supports 8 types of cards or payment methods like PayPal, Visa, Master Card, JCB, American Express, Diner's Club, Discover, and debit card [32]. 2 Check out is off site payment processing.[34]

- Standard Check out Option– For a larger amount of traffic and orders, one can host an ordering engine.
- Inline Checkout Option–New business startups can start using this option to support small amount of transactions.

Pros:

- 2 Checkout has a very secure fraud protection system. It uses multi-tier strategy to detect the fraud and the activity which impact the system.
- There is no one time fee or setup fee in 2 Checkout.
- No annual fees needed to support its offer.
- Does not requires SSL.
- No need to have a separate merchant account.[34]

Cons:

- Transaction cost is high.

Skrill:

In Skrill, one can transfer money to anyone through email. Using the email and Password user can easily send money, receives money and pay conveniently. The costing per transaction is different for domestic and globally. It is available for more than 40 countries.[35]

Pros:

- Skrill provides one click check out option which enables customer to make payment with ease.
- Skrill supports recurring payments which reduces delay of payments a lot.
- Allows to send payments to a group of people which is helpful in scenarios like monthly salary payments.

Cons:

- The merchant services of Skrill has lack of information online.
- Skrill charges on each refund.
- Forbanktransfer,Skrillchargesafeeof4€

Braintree:

From Brain tree people can paid through any device and using any payment methods. Around more than 45 countries, with more than 130 currencies, merchants can accept the payment. It supports many payment methods for transaction like PayPal, Venmo, Debit/credit card, Visa card, Apple pay, Google Pay and soon.[36]

Pros:

- Supports recurring payments.
- Accepts a large variety of payment methods including PayPal, Credit and DebitCard.
- Has a reliable customer support.
- Mobile payments are also available.
- Brain tree provides a simple and straight forward pricing.

Cons:

- Programming knowledge is required to integrate with existing website.
- Charges a large list of hidden charges.
- Separate account is required for running the system.

• **Mollie:**

Mollie is payment gateway for Netherland, Belgium and other European countries. It supports all credit cards, PayPal, iDEAL, Bitcoin and some other local payment methods. Mollie uses API key and plug ins to integrate with existing e- commerce platforms. The integrationisPaymentServiceDirective2(PSD2)compliantwhichhelpsreducingfraudpaymentsandsecuring legitimate payments. It supports 41 shopping cart plugins. It supports recurring payments. It offers only pay per transaction, so there is no minimum cost and no hidden cost. They charge different amount depending on the payment method. For credit cards they charge €0.25 fixed and 1.8%-2.8%pertransaction[37].

Pros:

- Support Recurring payments.
- Automatic detect location and localization.
- Data are stored in secure Dutch data centers.
- Custom branding with logo and backgrounds former chant.
- No additional charge and Cancel at any time policy

Stripe:

Stripe was launched in 2011 and at present it has over 2000+ employees working over 14 global offices, serving Millions of stripe Users. It is considered one of the best payment gateways for online business because of its easy sign up process. They mainly support bank transfer and major credit and debit cards. In over 120 countries Millions of Companies uses stripe.[38][39]

Pros:

- Easy to use, No paper work needed.
- Quickpayout,onlyin1-2workingdays.

Cons:

- Some times accounts gets cancelled or frozen
- Developer skills may be required for customization.

Some of other payment gateways are*: Pay Mill, D wolla* etc.

4.1.2. Local Gateways & Aggregators:

In the small developing country like the countries in south Asia don't really have the benefit of using the worlds top payment gateways. Also it is hard to used by the small organizations and the currency conversion is complicated and fees for the international clients are really high. So,there are a lot of local payment gateways to serve in these countries. Here, local gateways aggregators represent those payment system which used in the Asia.

SSL Commerz:

The most popular online payment gateway service in Bangladesh and e business solution website. In SSL Commerze, the customer can get the facility to pay in Bangladeshi Taka.

Using cards like Visa, Master card, AMEX, DDBL (Datch Bangla Bank Limited) Nexus Card and also the bank accounts or mobile card, the customer will be able to pay. As there aremultiplepaymentoptioninSSLcommerzethecostingpertransactionisdifferentfordifferent modules [40].

Pros:

- Multiple payment option.
- Net Banking facilities(DBBL).
- Cardverificationwithin3to7seconds.
- Merchant can sell product globally.
- High Data security because it use the most popular data security consent PCIDSS v3.2 of payment card industry and also SSL(Secure Sockets Layer) technology for data encryption and secure internet communication.

Cons:

- Transaction fees is too high.

Surjo Pay:

Surjo Pay is a leading payment gateway in the Bangladesh. It provides the benefits to access debit card, Master card, credit cards, Am Ex, Nexus, Diners Club, Q cash and the local payment systems. It is a secured gateway as many banks verified the transaction. The costing pertrans action of credit card, master card or Nexus pay is 3.5% for corporate level and 1.5% for education (Except Nexus). And for An Expert transaction cost is 3.5% for corporate and for education 1.5%. For mobile wallet cost is 2.0% for education it is 1.5%. The signup fee is BDT10, 000.[41]

Pros:

- No monthly maintenance fee.
- Refund facilities available.
- No hidden charge.
- Easy to integrate
- To monitor the transaction there is a merchant dashboard.

Cons:

- Payment can be received but cannot sent through Surjo Pay for international transaction.

Pay Here

Pay Here is an Internet Payment Gateway Service in SriLanka which accepts payments all over the world. It provides free to apply and no setup fees [42]. It also has a sandbox environment to test which can be used just by creating a free account. It accepts payments from all global cards, local mobile wallets (Genie, Frimi, eZcash) and local Internet banking. It supports 5 currencies including USD, EUR, GBP and LKR. It provides API for websites and plugins for shopping-cart platforms like Shopify, Magento,OpenCartetc. It also supports recurring payments and provides a separate API for that feature.

Themerchantcanreceivepaymentwithin2daysafter customer makes payment. PayHere Links provide one click payment using URL. The service fee is 39 LKR per payment and payment processing fee is 2.9%to3.9%. PayHerehas3serviceplanstochoose from. BASIC plan does not have any monthly fees butlimitedtoonly50,000LKRworthoftransactions. The PLUS and PREMIUM plans have higher transaction limit but costs more monthly fees and per transaction fees.

Pros:

- API and Plug in support for large variety of technologies.
- Supports Recurring Payment.
- Pay Here Links for easy payment.
- Instant notification for both customer and merchant.

Cons:

- Payment charge is higher.
- Transaction limit can stop an ongoing payment.

Paytm

Paytm is one of the most popular payment gateways in India. Their specialty is in mobile payment solution. They accept payments from customer in form on Cards, Digital Credits and Bank Accounts. They areconnectedtoabove7millionmerchantsallover India. They introduced the QR based payment system in India. Paytm have their own e-commerce website which sales goods, transportation tickets, movie tickets etc. They also have support for local stores, transports, fuel pumps, bill pay and DTH recharge [43]. For the time being, live online streaming channels are accepting donation. Paytm is the most used payment system in India for accepting streaming donations. The reason for this is the QR payment system made payment much easier and faster. They also have their own online shopping service[44].

Pros:

- QR based payment processing for faster and easier transaction.
- OTP on mobile for secure payment.
- Payment for local stores, petrol pumps, taxis and autos.
- Paytm Coupon and promo code for discount.

Cons:

- Available only within India.
- Cannot make payment without mobile.

Instamojo:

Instamojo is a multi-channel payment gateway and for this multi-channel payment it is also used for small business management. Payment is simple in Instamojo because user can pay by creating payment link and share the link with the customer through whatsapp, sms, facebook, Email, Websites or any other option and get paid. It is also provides NEFT RTGS, Bank Transfer, Debit Cards, Credit cards, Net bank-ing , wallets, UPI. The per transaction cost is free for NEFT, RTGS, Bank Transfer and for cards, net banking , wallets and the methods it takes 2% + 3 rupee per transaction and for digital products and files it costs 5%+ 3 rupee per transaction. International credit cards are available on request. [45]

Pros:

- No set up fee.
- No maintenance fee.
- Secured transaction. 128-bit encryption, PCI -DSS compliant payment gateway environment is used for secure payments along with RBI reg-ulations.
- Easy payment option through social media.
- User also can manage multiple bank accounts.
- Using the Dispute Resolution Center feature user can manage refunds related issues.[46]

Cons:

- No confirmation If transaction fails. And it creates problem for both buyer and seller.
- Transaction cost is high for low cost products.

iPay88
A renowned payment gateway available in Malaysia and Philippines and The Mobile88 group of Companies is the owner of it. iPay88 is also integrated with a large number of shopping carts. It provides 26 currencies. More than 30 payment methods offered by the iPay88.Payout also can be executed through it [47]. The costing of iPay88 SME pricing RM488 one time registration fee and RM500 per year and for individual plan pricing one time registration fee is 488 but there is no maintenance fee.[48]

Pros:
- Multi-currency payments available.
- Reduce the risk of online fraud using Automated fraud Screening.
- Using Virtual Terminal merchant can accept payments.
- Security is international standard.
- Refund facilities.
- Token generation process in which the customer's bank card detailed are encrypted by linking with digital token.
- Email payment which is fast and secure and real time successful.

Cons:
- One bank can have and use one type of mode of internet Payment.
- Less than RM50,000 may not be required to de-posit.

WEBXPAY
Sri Lanka's most convenient and safest payment gate-way. It provides a powerful dashboard which man-ages the transactions, disputes, refunds and also make dynamic business decisions by inform real time trans-actions. Multiple payment options like Visa, Mastercard, AmEx, eZcash, mobile wallets.There is also EMI facilities it provides. Not all Some of the renowned banks are partner for payment. Using XSELL which is a payment link generator anyone can accept payments through social media at anywhere. Also, by Email payment can be accepted by using XDIRECT feature. The costing per transaction is 2.5% upwards. And there is also registration fee LKR 15,000 and sub-scription fee LKR 1,990 for 12 months.[49]

Pros:
- Foreign currency transaction fee is zero.
- Payout free.
- Monthly transaction unlimited.
- Accept the online payments in US Dollars. So from anywhere payment can be done.
- Help large purchase convert into EMI section.
- Receive cash back on every purchase.

Cons:
- The transaction limit is LKR 999,999 so it will be problem for large transaction.
- Inconvenient to return the products.

DOKU
DOKU is a popular payment gateway mainly based in Indonesia. Transfer, sales, payment, lend is possible in DOKU. It provides credit card, Visa, Master Card, E-wallet, E- commerce banking, ATM Facilities. Payment can also be done via link payment. The link can be accessed through social media whats app, facebook also through messaging. It

has also tokenization process by which the customer can pur-chase anything without giving the input the card de-tails or any personal information. Because the customer gives the information for the first time DOKU stored the information in secured form and give the merchant a token by which merchant can link with the customer login information. And it gives the benefits to the customer to get a fast transaction. Customer also get the refund of any cancellation. The costing per transaction bank fee of DOKU is 1.5% for digital banking, 3% for credit, VISA and Master card.[50]
Some other Payment gateways are: *Easy Pay, Shurjo Pay, Port Wallet, Wallet mix ,Payza.*

5.Statical Analysis:

5.1. Statistics of International provider

Here we showed some statistics of the popular inter-national payment gateways based on their type, country coverage, payment options and fees and cost for each transaction in **Table2**. (Most of the data were collected from the official website of these companies)

Table 2:Current pricing of diff erent companies:

No.	Company Name	Type	Availability	Payment Option	Cost
1	Paypal	Centralized	203 Countries	Major Cards, Bank Transfer	2.9% + 0.30
2	Skrill	Centralized	40 Countries	Major Cards Bank Transfer	1.9%[d] 2.5% [c]
3	2checkout	Centralized	over 200 Countries	Major Cards, Bank Transfer	3.5% + 0.35
4	Stripe	Centralized	U.S., Canada, Belgium, France, Ireland, Netherlands Total 25 Countries	Major Cards, Bank Transfer	1.40% + 0.20 (Europe) 2.9% + 0.20 (Non-Europe)
5	Authorized.net	Centralized	33 Countries	Major Cards, Bank Transfer	2.9% + 0.30
6	Payza	Centralized	190 Countries	Major Cards, Bank Transfer	2.90% + $0.30 3.5%-5.49% + $ 0.65
7	BrainTree	Centralized	Including U.S., Canada, Australia, Europe Total 46 countries	Major Cards, Bank Transfer	2.9% + 0.30
8	WePay	Centralized	U.S.	Only Major Cards, Bank Transfer	2.9% + 0.30
9	Paymill	Centralized	39 Countries	Major Cards,	2.95% + 0.28 €

				Bank Transfer	

[d] Domestic: Within Same Country
[c] International: Convert Currency for Foreign Country

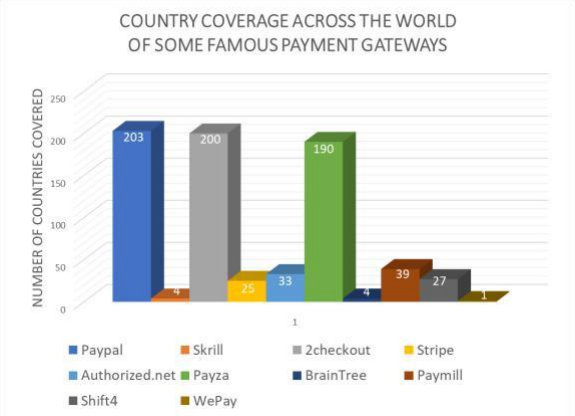

Figure 7: *Country Coverage Comparison of some famous payment gateways.*

Figure 7 is a representation of the worldwide cover-age of the current popular online payment gateways how much country they reached. In the figure 7 we can see that PayPal is the highest reached centralized payment gateway company. PayPal, Payza and 2checkout these are famous all over the world and has serves over 250 million active users each[51].

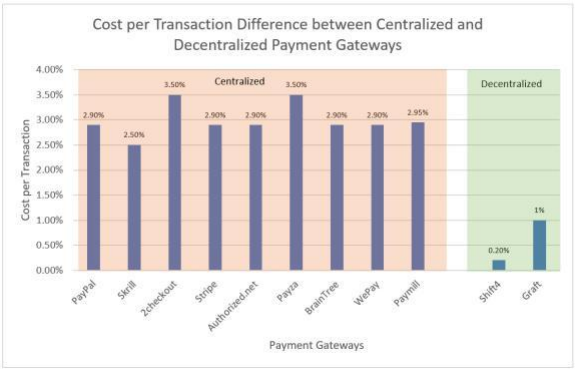

Figure 8: *Comparison based on cost per transaction.*

In the above (Figure 8) we can see that there is a huge noticeable difference between the centralized and decentralized payment gateway in terms of cost per transaction. 2Checkout and Payzacharge more cost (3.5%) than any other payment gateways this is because these two are available in most of the countries. Skrill charge 2.50% which is the lowest one. But skrill is not so popular because it's not available in most of the countries. From fig 9 it is seen that country coverage of skrill is lowest than any other payment gateway.

5.2 Statistics of Asian provider

Here we showed some statistics of the popular payment gateways in Asia based on their type, payment options and fees and cost for each transaction in **Table 3**

Table 3:Current pricing of different companies in Asia:

No.	Company Name	Type	Payment Option	Cost
1	SSLCommerz	Centralized	Local/International Cards (Visa/Master/nexus) American Express Mobile Wallet	2.5%
2	Shurjo Pay	Centralized	Local/International Cards (Visa/Master/nexus) American Express Mobile Wallet	2.5% 3.5% 2.0%
3	Easy Pay	Centralized	Local/International Cards	2.5%
4	Port Wallet	Centralized	Visa, Mastercard, American express	2.0% Depending on the provider
5	Wallet mix	Centralized	Visa Mastercard American express Mobile banking	2.9% - 3.5%
6	CashFree	Centralized	Visa master card, Paytm, Rupay. Local Banks	1.75%
7	Paytm	Centralized	Credit Cards, Mobile Wallets,Local Bank	1% Inclusive of GST
8	PayHere	Centralized	All Global Cards, Local Internet Banking, Mobile Wallets(Local)	Small Business 2.9%, Medium 2.99%, Large 3.9%
9	Instamojo	Centralized	Visa, master, Debit Card, Social Media, Net Banking	2% + 3 Rs./ Transaction
10	IPay88	Centralized	VISA / MASTERCARD, Malaysia Online Banking, E-Wallet payment services	For cards 3%, For others 2%-4%
11	Mollie	Centralized	All Major Cards, Paypal,Bitcoin, Other local payment Method	0.25€ + 1.8%-2.8%
12	CoinPayments	Decentralized	Over 70 types of Cryptocurrency	Vary with each currency + 0.5% for every transaction

6. Result Discussion:

So, if we bring all the advantages of the centralized payment system:

- These are easy to integrate.
- Easy to maintain.
- Faster in some cases.
- Policies can be updated from time to time.
- Wide range of choices for merchants that is suitable for them.
- Easier on the payee side rather than the receiver.
- In Small Business it is very easy to integrate and maintainable.
- A lot of payment methods are already available as it is a well-established way of processing online payment.
- Less time is needed for troubleshooting.

Though there are a lot of advantages in the centralized payments system, there are some disadvantages:

- As these are centralized it is less trustworthy. If some-one wants to change something or hamper data in the database they can.
- These systems are not cost-effective. From our cost analysis, we can see that these systems cost way more than any decentralized system.
- Receivers get their money very late. As there are manual input is needed it takes time to process. And most of the company don't provide instant payment receive.
- For large scale business where a lot of big amounts are paid every day and a lot of payment methods are involved centralized system are a huge drawback. For large scale organizations, the cost is high and the security of their money is not always up to the mark

7. Payment Systems In Pandemic Situation:

In global pandemics like COVID-19, payment systems are essential to make any purchase, as most of the purchases including food are done in online shopping platforms. In any shopping platform, payment gateway is the only way to make the payment. Corona virus has changed the way of shopping drastically. It raised the urge to make every payment cashless as it can prevent COVID-19 from spreading through physical contact with money. Some of the companies like Amazon have closed their physical stores 11and increased share of online market. Many shops also closed their physical shops and started online marketplace.COVID-19 have negative impact on cross-border purchase. Hotels, airline, travel agencies revenue dropped and trans-actions done online have dropped as a result. Many air lines are forced to cancel their flights. As international purchase is closed, some company faced drops in ecommerce activity. In COVID-19 pandemic situation, the number of phishing sites increased drastically resulting high card fraud risk. Payment system providers have to take continuous measuresfor fraud control and high amount of transaction.

8. Challenges And Future Possibilities:

The increase of online platforms raises the need for easily accessible and fast payment system. Current payment systems are providing great service to a lot of users all over the world. Although the payment system provides transaction with a small amount of cost, it can sum up to a higher value for large amount transactions. To tackle this situation, some payment methods uses some alternate methods, like storing the transacted money to bank and gain interest from that money. But this method has its

own flaw, as it delays the money to be able to withdrawn. This method greatly hampers the productivity of the merchant.
Current payment systems use token-based authorization and different encryption algorithms to secure each transaction. But still there are some security concerns that can lead to major security issues. The database can be compromised and altered if anybody can gain access to the database.
New technology like blockchain can reduce the transaction cost significantly due to its low maintenance cost. It can also enable merchant to receive money as soon as the transaction is verified. It comes with a special algorithm that can make database immutable providing more secure payment environment.

9 .Conclusion:

In our paper, we have reviewed various payment methods and gateways which uses centralized architecture. From the research it was found that centralized payment systems has both advantages and disadvantages. The transaction cost also varies for different organizations. And different company uses different payment option. Also, the company has different strategies to complete the transaction. While the centralized payment systems offer a large variety of features, they cost more and tends to be less trust worthy. But as the number on online businesses are increasing and online payments are becoming more famous day by day, the disadvantages are more noticeable. Block chain based decentralized payment systems can be a great solution to overcome the lackings of centralized payment systems. For large scale businesses, decentralized system can be beneficial as it can provide high level security with less cost. So though centralized payment systems are doing great for the current online transactions, in future, block chain based decentralized payment solution could raise high because of it prominent potentials.

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