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**Analysis of Payment Start-ups in the world: an empirical  
study of the current players and the anticipated trend**

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## **ABSTRACT**

The world is an ever-evolving enclosure of life that is always brimming with technological innovations every second. In a setting like this it would only be fair that the payments ecosystems also evolve from the traditional cash and coins system to a more advanced non-physical monetary form. This global modification has been on the rise for the past few years but we experienced its greatest push to be adopted in our daily lives during the high density spread of covid-19 pandemic in 2020. Ever since, there have been tremendous number of innovations. To better understand the whole enclosure and to see if we can study the potential trends that might occur here, we analyse a large database of around 2,296 start-ups that have been founded in past 5 years. The focus of this study is to understand the global payment start-ups in all aspects personal to it. By categorising them according to the area of its operational focus, we arrive at a number of categories and sub-categories, this also helps us use better terms while addressing the start-ups. Later, we look into all the categories for their area of operation, customer target, regional origin and annual trends. Mobile Wallets have the highest contribution of 296 start-ups (27.2%) with an interesting rise in their sub-categories of All-in-one-platform and Digital Banks. Another sub-segment of curiosity is that of Buy-now-pay-later services which have been on the rise since their introduction recently. Globally, we observe that as expected North America (381 start-ups) dominates with the highest contribution of start-ups but a noticeable inclusion is that of Asia-Pacific which has made it to top 3 and is a region that is tremendously growing in the digital payments enclosure.

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## **EXECUTIVE SUMMARY**

Financial transactions occur in tremendously in everyone's lives every day, at varied levels of transacted amounts. Given its very crucial nature and with monetary wealth being one of the most significant aspects globally, it would only make sense to have an appreciable system of making these exchanges. This study focuses on the overall global payment systems and how it has evolved in the recent past coping up with the drastic technological changes being adopted simultaneously in all aspects of living.

### **Literature Review**

A standard method of payment now, as opposed to the previous cash only or sometimes a card payment has transformed into payments using mobile applications, dedicated e-wallets, online bank payments, cryptocurrencies and more. These processes are assisted by several supporting features and physical tools making these services heavily accessible to the customers, merchants and everyone in between. Thanks to the start-ups which, given their innovative and new approaches to this concept have been introducing more possibilities of offering diverse payment options to the public.

**Payment acquisition:** Payment acquisition is the process of accepting, processing and storing the payments that are made. This includes the specific payment options provided, the supporting tools used and the experience provided. A consumer uses their payment card at a merchant's POS machine to initiate the payment of the invoice generated for the purchase. *Payment gateways* are payment processing services connecting the terminal to a processor providing several means of payments using debit, credit cards, e-banking and wallet systems. *Buy-now-pay-later* (BNPL) services are the newer forms of credit systems that offer traditional instalment payments in 3 to 5 fragments of re-payment.

**Mobile payment services:** Mobile payments are a mode of performing financial transactions through a mobile device such as a cell phone or a tablet using a scanner or NFC Technology. Digital wallets perform the act of storing cards in digital format, enabling their remote use. Also allowing consumers to transfer and store digital cash which can be regulated by the user banks through the wallet service providing portals.



Unified Payments Interface (UPI) is a regulated pathway of payment which is capable of performing payments between several banks through a single interface of interaction connecting the user to all possible payment methods.

**Cross-border Payments:** Cross border payments are financial transactions that occur between parties who are based in different countries. These payments have to be passed through a few more layers when compared to a standard payment. Multilayering is due to the payments occurring between two or more countries and the different set of regulations that apply in each one, making it a very taxing and expensive process, usually taking several working days to be processed. This results in the whole process lacking transparency, leaving both the sender and receiver unaware of the overall charges incurred during the whole process.

Transactions with multiple layers also create room for a lot more actors to be involved. This directly also gives a lot more space to be several times allowing a lot more fraudulent activities to operate with the monitoring activities getting severely complicated. This has been one of the focuses of several start-ups, to make global payments accessible to everyone, almost like a local payment system, without much hassles, cost and complications.

**Blockchain and cryptocurrency transactions:** A blockchain is a Distributed Ledger Technology oriented towards creation of a chain of blocks containing information to form a permanent link. A blockchain is a chain of blocks where each block has its own stored data, a hash that is particular to the block and the hash of the previous. The data that is stored in the block depends on the type of the blockchain desired to be created. Hash is an identity of a block that is being calculated as the block is being processed and any change being made on the block in turn causes the hash to change accordingly. This allows us to track any changes made on the block. The hash of the previous block is also present here and this makes the overall blockchain very secure. The high security arises when someone tampering with one of the blocks, this in turn changes the hash of the block, but then will invalidate the remaining chain as the next block would still have the older hash for the previous block stored.

Cryptocurrency, is a virtual currency that can be used as a mode of exchange for goods or services online. These can be further classified as: Payment Coins, Privacy Coins and

Stablecoins. Token, unlike coins are also a form of virtual currency but differ in the essence that they represent another entity which backs the value of this said currency. These similarly can be further classified as: Utility Token, Security Token, Asset Token, Non-Fungible Token and Decentralised Finance Token.

**Open banking initiatives:** PSD2 is the improved set of regulations aimed at enhancing the whole banking and finance sector by making it more secure and convenient for the customers. Amongst the several significant laws proposed, the underlying scheme was aimed at technologically improvising banking by integrating financial organisations, Fintech start-ups and traditional banks. While both are severely restructured due to the previous regulations, the PSD2 gave more free room for all entities and promoted collective working, allowing private organisations to beat the regulative caps and providing the lacking financial authorities with the right set of tools.

Under this initiative we have four impactful changes: Integrating Open API, Account Information Services, Payment Initiation and Card Payment Issuance.

**The Pandemic and Fintech start-ups:** From an economic perspective, most traditional systems were standstill during the onset of 2020 Covid-19 pandemic, mainly due to the complete inaccessibility for a while, only operating in an online modality, pushing for more enhanced services to be made available remotely to the whole public.

The whole payments enclosure has taken a major turn, with several new start-ups providing the best of services possible. Technologically, financial companies have had a major boost in the method of operation, specifically being boosted from the socially obstructing pandemic of 2020. Not only did this allow the room for creation, but it also pushed for the customers to be highly receptive and in-fact more interested to adapt high forms of technological adaptations to traditional finance.

## **Methodology**

The initial data required for us to initiate the research and support this analysis was obtained from Crunchbase, a platform dedicated to providing informational database and basic insights on companies. To obtain a more refined set of companies for the analysis we apply the constraints as follows: (1) *Founding Date*: start-ups that range

between the founding year of 2018 and the first half of 2022. (2) *Activity Status*: companies that are still active in business while the database was extracted. (3) *Funding Status*: Start-ups having the latest funding date within the last two financial years.

We then proceed to the next step of smoothing out the data, since our focus is on payments, we look for companies that are aimed at essentially assisting in payments, but payments is quite a broad sector to operate in.

**Operational scope categories:** We proceed by segmenting them based on the start-up’s scope of operation (Figure 1) and then further divide it narrow down to the correct segment of service offered. Apart from the specific categories, we have another segment called “Other” which is also split based on the common possible sub-categories.

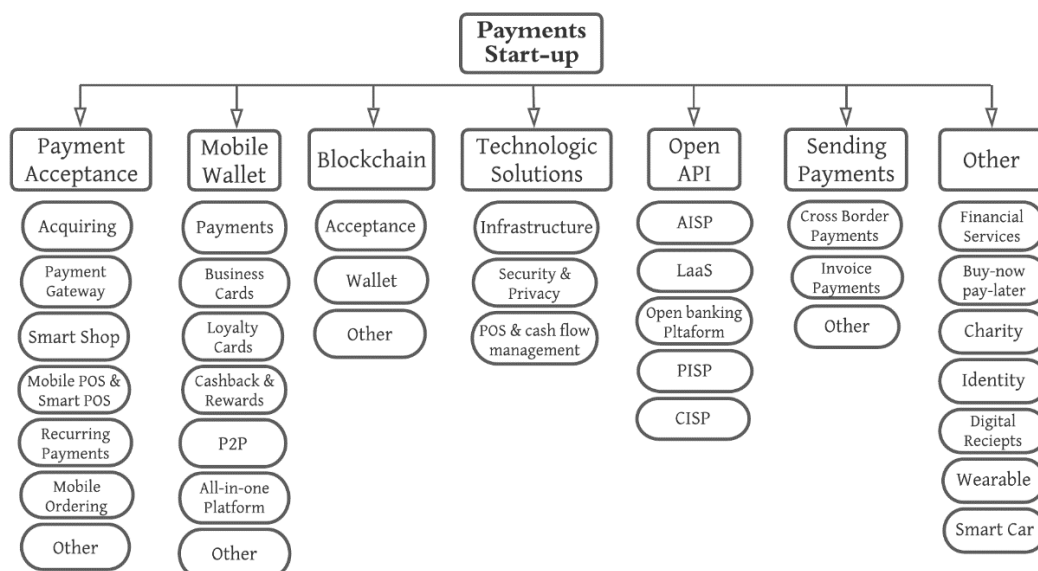
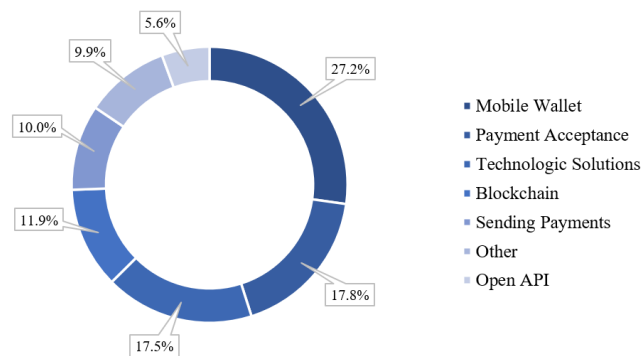


Figure 1: Classification of working areas of payment start-ups

**Customer Target Categories:** After classifying the start-ups into their specific areas of operation we also designate each of them with the typology of the customer segment they serve into four categories: Business to Business (B2B), Business to Consumer (B2C), Business to Business to Consumer (B2B2C) and Business to Business and Business to Consumer (B2B, B2C)

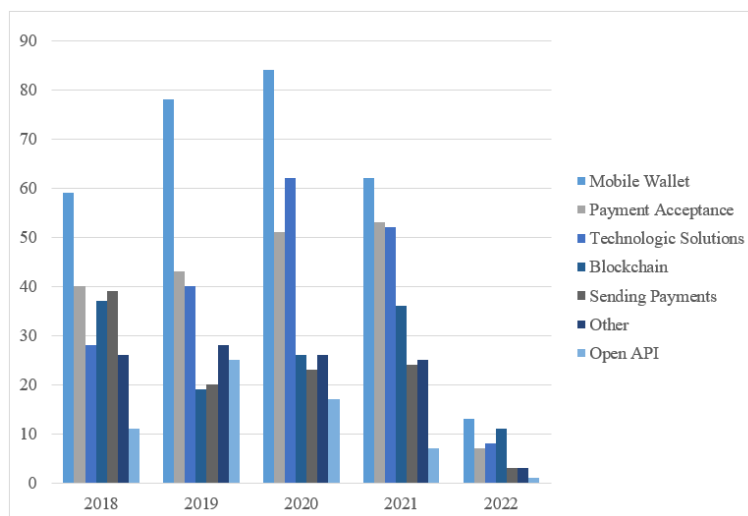
## Analysis

We took the initially pre-filtered extraction of database and proceed by assigning them as 'In Scope' for the companies that are focused on payments and assigning all the other ones as 'Out of scope'. We found 1,087 companies (47%) in scope and 1,209 companies (53%) out of scope. We then began look at their individual numbers and the percentage contribution of these to the global payments segment.



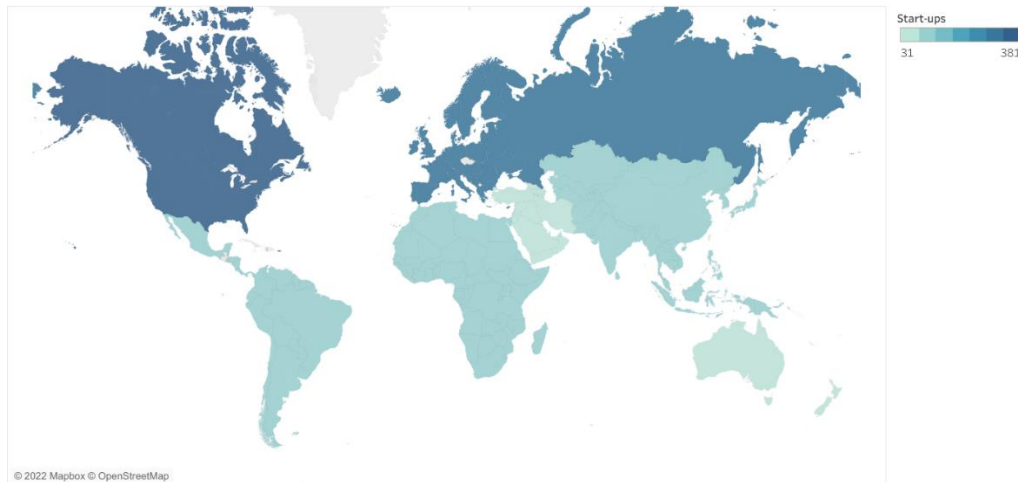
*Figure 1: Categorical impact of the start-ups*

In our main analysis we have also further looked into the contribution of each sub-category but to summarise these are the main segment split-ups: Mobile Payments 296 (27.2%) Payment Acceptance 194 (17.8%), Technologic Solutions 190 (17.5%), Blockchain 129 (11.9%), Sending Payments 109 (10%), Other 108 (9.9%) and Open API 61 (5.6%).



*Figure 2: Segmented representation for each year*

In figure 3, we can observe the categorical trends annually, this follows the overall sum-up of yearly start-ups which are as follows: 2018 – 240 start-ups, 2019 – 253 start-ups, 2020 – 289 start-ups, 2021 – 259 start-ups and 2022 – 46 start-ups.



*Figure 3: Global representation of Start-ups*

Observing the global trends, to summarise the regional contributions indicated in Figure 4, we counted the numerical contributions to be as follows: North America – 381 start-ups, Europe – 283 start-ups, Asia-Pacific – 130 start-ups, South America – 110 start-ups, Africa – 87 start-ups, Middle East – 65 start-ups and Australia – 31 start-ups.

## **Conclusion**

While all the previous data clearly points to the dominance of Mobile Wallet globally, there are specifically two extremely interesting aspects that contribute to it, All-in-one-platforms and Digital Banks. Both the sub-categories are similar in their reasoning of capturing our interest, these sub-categories serve the purpose of having a single point of access to all the associated features. Another sub-category that has been on the rise in the past few years of its introduction is the Buy-now-pay-later (BNPL) sector. These deferred payments point of sale loan services are slowly becoming a basic offering in payment method at most retail businesses. Globally, we observe that North America dominates the start-ups sector, but from our analysis and the literature we observe the highest rise in start-ups that origin from Asia-Pacific.

## **CHAPTER 1: LITERATURE REVIEW**

### **Payments system**

Given the advancements in technology, it is perceptible that even the world of payments would evolve accordingly, while cash still plays a significant role in everyday payments, there has been a radical shift in the way that people imagine payments occurring. A standard method of payment now, as opposed to the previous cash only or sometimes a card payment has transformed into payments using mobile applications, dedicated e-wallets, online bank payments, cryptocurrencies and more. These processes are assisted by several supporting features and physical tools making these services heavily accessible to the customers, merchants and everyone in between.

Innovation in payment methods is highly driven by the increase of the internet evolution and its high accessibility. As observed statistically (EY 'Pay rise: trends shaping the payment evolution for consumers', 2021) the highest population of transactions are performed by millennials, followed by Generation Z and as a result of their inclination to the quick-paced lifestyle, there is a very high value placed on digitization of everyday activities, and inherently, even the payment processes. These young adults, being very aware of the importance of the data they provide, prefer to gain high levels of security, personalisation and reap the benefits of complete financial stability. The driving factor for the shift in payments processes can be highly attributed to the ability to perform or obtain financial transactions, be able to manage the flows efficiently and have the most exclusively personalised experience accessible from any remote mode of usage chosen.

Thanks to the start-ups which, given their innovative and new approaches to this concept have been introducing more possibilities of offering diverse payment options to the public. (Gimpel, Rau and Röglinger, 2018) The increase of the actors and the possible inclusion of more actors makes the network of payments severely complex but this also could be a way to possibly monitor the process with a lot more scrutiny through the help of the supporting services provided along. Most of the innovations surrounding payments are highly focused on its integration with every aspect requiring it in our everyday lives, promoting financial sustainability to the public. (Kania, 2019)

And resulting from these, a major shift of payments to a cashless modality is expected to increase severely (Figure 5), higher than the double of its current situation by 2030 (PwC, 2021). As depicted in the graph shown below, the assumed percentage projections will increment from 2020 to 2025 by 82% overall and by a 61% overall between 2025 and 2030, when compared region wise, the highest contributions can be observed from the Asia Pacific population, with numbers almost close to 60% of individual annual contribution, indicating to us the rapidly increasing willingness to switch to a cashless economy. The remaining 40% of global cashless payments forecasted for 2025, categorised again based on the regions, have a major contribution from Europe of 17%, followed by US/Canada with 11% cashless payments. The final and almost equal payment contributions are from Africa and Latin America with about 6% each.

This very significant change in the overall global cashless economy growth rate motivates us to want to study the reasons behind this shift by firstly understanding the various types of payment facilitation procedures that are currently in use, the basic architectural build of their operations, analysing the possible places of including meaningful actors and then to project how they would potentially progress in the near future. To do so, we begin our study by understanding the theory backing each of the available options in the following subdivided parts.

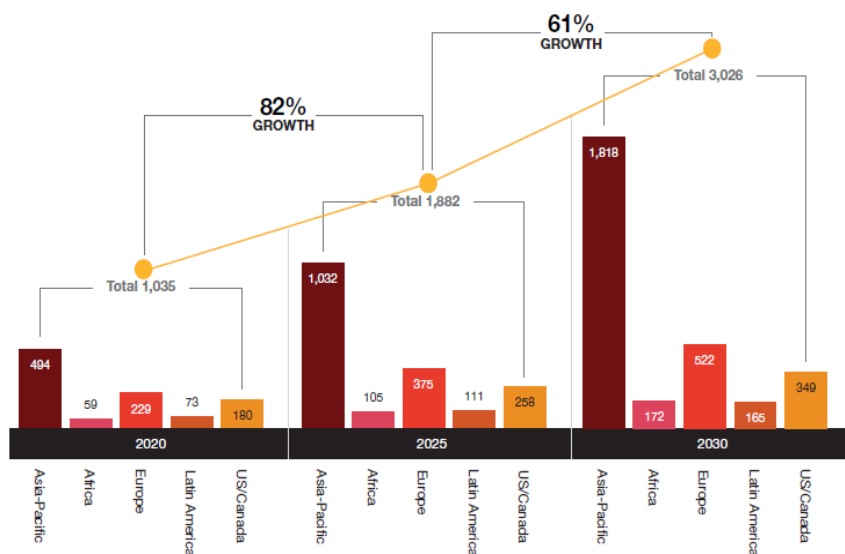


Figure 4: Cashless payments growth projection (Source: PwC, Strategy & global payments model, 2021)

### **Payments acquisition methods:**

Payment acquisition is the process of accepting, processing and storing the payments that are made. This includes the specific payment options provided, the supporting tools used and the experience provided. The parties included here would be (1) the service providers, who supply the possibility of using these tools to the merchants; (2) the merchants, who establish the concerned form of payments as an accepted method in their retail enclosure and finally (3) the customers, the end users who choose the method they would like to use to complete the following transaction. From a retailer's perspective, it could be through a traditional method of cash payment, the use of several forms of point of sale (POS) technologies assisting in transactions using Credit and Debit cards, Online bank payments and so on. Offering these payment options is crucial for the operation of all these businesses, from both the customer value offering and for the convenient functioning of businesses. (Byrne and Hanson, 2014)

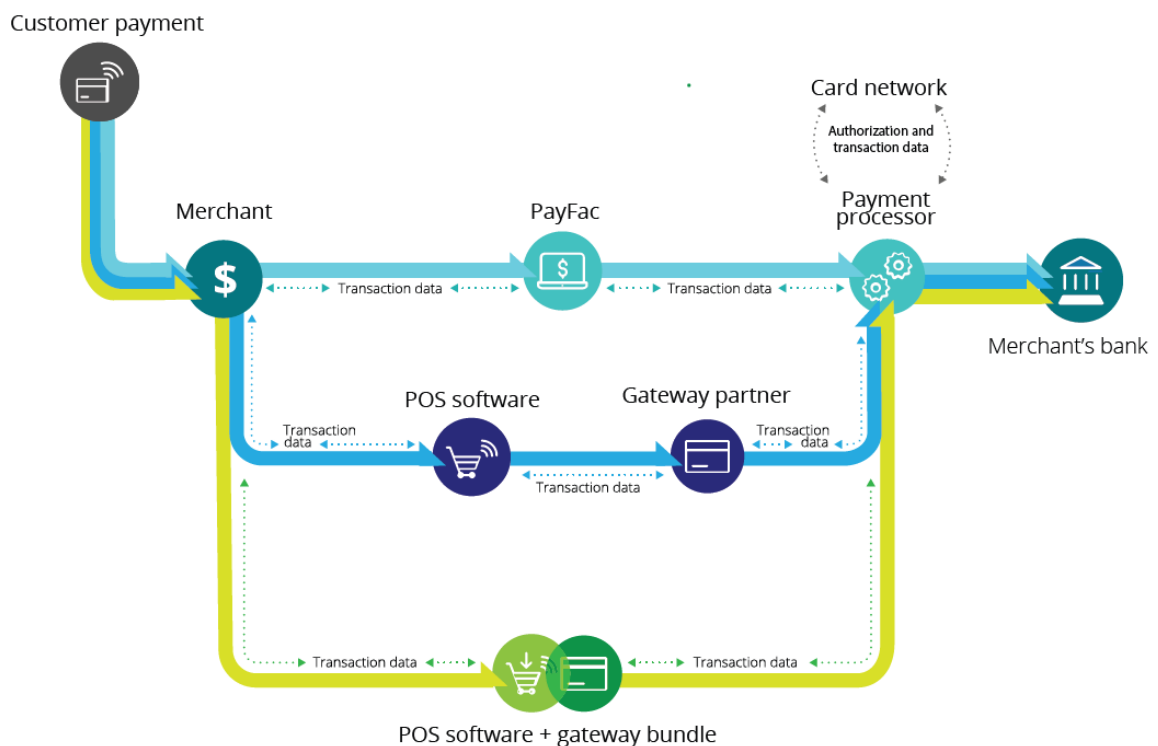
The observable evolution of payment systems is prominently due to a shift in the essence of payments from a mere way of exchanging goods and services to an overall experience aimed at both the customers and the merchants. The radically incrementing modes of transactions, the users, and the support services, directly contribute to making this whole enclosure extremely dense and complicated. (Deloitte 'Moving toward integrated payment solutions Making payment processing part of the business', 2022) Firstly, focusing on the POS method, we can begin by understanding the working methodology behind this, highlighting the actors involved and the possibility of interception by technologies to improvise and assist the whole experience.

A consumer uses their payment card at a merchant's POS machine to initiate the payment of the invoice generated for the purchase. There are three ways (Figure 6) the transaction can proceed. First, through a traditional payment facilitation process. In this case, the data is assisted by the facilitator, which is the means of connecting to the merchant account to proceed to the payment processor. The second method is where the POS machine connects firstly to software that it is backed by, which is then redirected to another gateway portal which assists in conducting the transaction, moving the extracted data to the processing system. The third method is where the two actors from the previous course of action are provided by the same provider in an integrated format



to help move data to the processor. After the data has reached the processor, the transaction is made and the data is transferred to the merchant's bank from the customer's bank, initiating the payment.

The actors involved here are all the services required to conduct a basic Merchant payment transaction. These are also the points of innovation for most of the upcoming start-ups that are focusing on revolutionising and changing up the whole payments' enclosure. And the specific focus on integrating all of these to work collectively helps the merchants build a better and well-rounded relationship with their customers.



**The evolving payments ecosystem**

- Traditional PayFac solutions
- Gateway payment solutions
- Fully integrated payment solutions

*Figure 5: Payment process at merchant transactions (Source: Deloitte, Moving toward integrated payment solutions, 2022)*

As previously mentioned, along with more technologies at the back process of the payments being accepted, the process of acquiring has evolved tremendously. Instead of a normal POS terminal, a lot of the newer start-ups focus on providing merchants with smart or mobile POS. These POS systems, in addition to their functionality, enhance the

management part of the businesses and the customer relations. These software also assist in the integration of payment methods, merchant accounts and invoice management systems, backing the standard POS systems with all-round services, enhancing the value shift on the payment experience.

Innovation technologies applied in merchant services has impacted the earnings by increasing them very noticeably in the small and medium sectors of businesses, providing them with the mean of integrating all aspects, from receiving customer payments to the management of logistics and invoicing operations. This has also in turn promoted a lot of businesses and is a point of encouragement for several individuals to turn their ideas into fully functioning businesses.

Payment gateways are another significant actor in the payment processing segment. These are services that assist in merchant payment transactions. They provide a rail system, by connecting the terminal to a processor offered, assisting in the transaction by providing several means of payments using debit, credit cards, e-banking and wallet systems. Apart from being a gateway, they utilise the innovative systems they run on to provide several omnichannel supporting services to the merchants, in turn promoting business growth.

Buy-now-pay-later (BNPL) services are the newer forms of credit systems that finance start-ups offer as a service to all of their users as an alternative to the traditional instalment payments (Gerrans, Baur and Lavagna-Slater, 2022). These payments are a form of short-term simple credits without any incurred additional charges. Usually having a 3 to 5 fragments payment, buy-now-pay-later is a very rapidly increasing mode of payment being offered at several merchant platforms. BNPL is mainly aimed at the young adult demographic, to promote financial responsibility while also allowing them to experience the benefits a credit card system would usually provide them. This system has one major issue to consider, while the customer completes a purchase without paying initially and the merchant receives the payment the responsibility to ensure payment falls on the service provider. The traditional instalments payments such as credit cards would be accepted at every payment point which has an available card terminal. It would incur a certain fee, abiding the customer to payment agreement and the one responsible at the risk's end would usually be the credit card issuer, who are

well backed heavy licensing and regulatory needs. But a BNPL service is only accepted at certain partnering merchants and has much lower security to the risks incurred, with a comparatively small fee being paid only for missed or late payments. (Bain & Company, 2022)

BNPL is a rapidly evolving service not only due to its lack of additional charges but also because of the ease of using it without having any pre-economic requirements (as opposed to obtaining credit cards) which is a very open market to target for the providers. This does not mean that the pay later option is used only by people with a poor credit score, these are several very high margin payments which occur through the pay later models of payment (McKinsey & Company, 2021).

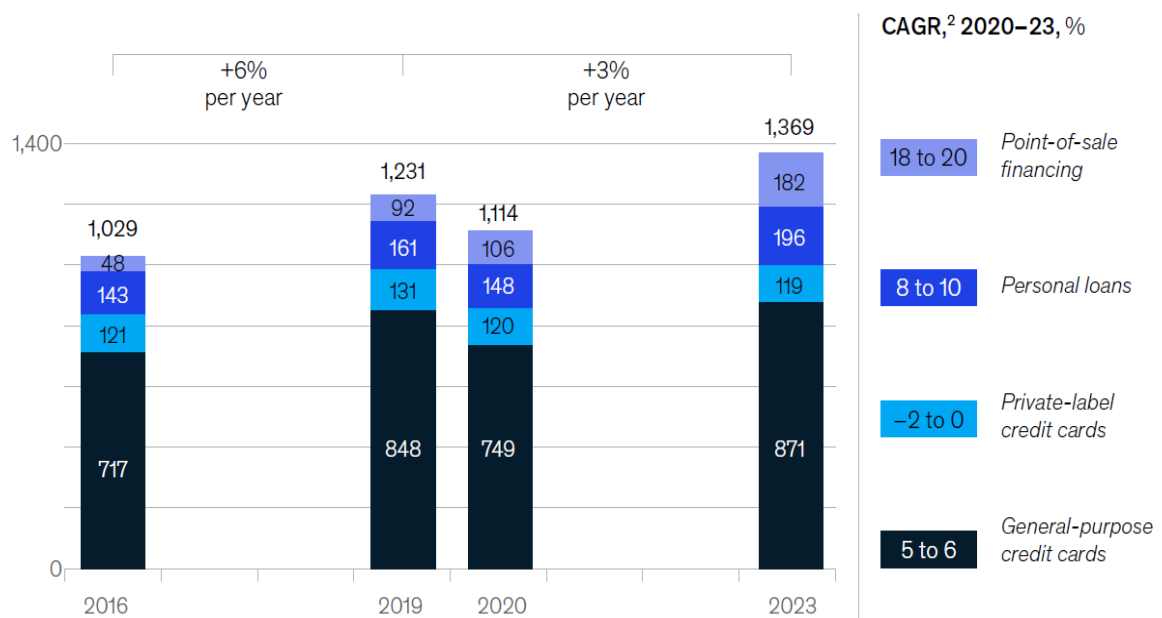


Figure 6: Growth in POS Financing (Source: McKinsey, Buy now, pay later: Five business models to compete, 2021)

BNPL service allow the associated merchants to incur a very low cost of customer acquisition and obtain a fairly well-placed positioning for their brands. BNPL is the fastest growing lending service at the point-of-sale method as it is one of the quickest to respond as opposed to banks and other financial institutions. Figure 7 represents the annual growth, specifically highlighting the increase between 3 years. While there is a growth in all 4 categories from 2016 to 2019, we can notice a decline in the numbers for all categories except POS financing in 2020. This variation is possibly due to the

pandemic isolation which acted as a noticeable push for buy-now-pay-later schemes. 3 years past the shocking irruption, most of the categories in consideration have recovered to their previous normalcy except for private label credit card segment, which, can be observed to have hit a slight decline. Regardless of the other segments' fluctuations, the POS Financing category has benefitted severely, to observe a much higher growth than before, a CAGR of up to 20% between 2020-2023.

BNPL services when integrated with its omnichannel aspects are the perfect option to follow a customer thought their journey with the service offered, allowing businesses to enhance their experience and keep their customer relations at its best by providing assistive solutions throughout, hence making it one of the most sought-after business models for merchants in the recent times. As a result, it is also an offer that banks and traditional financing institutions are planning to offer but they may not be able to reap all the benefits due to its structuring with restrictions and the heavy loads of expected customer traffic.

### **Mobile payment services:**

Mobile payments are a mode of performing financial transactions through a mobile device such as a cell phone, tablet or other similarly functioning devices. This is another method of performing a regulated digital payment either through an installed application or service which allows it to perform functions such as a digital wallet or uses the Contactless near field communication technology.

Mobile wallets are digital wallets which as an actual wallet performs the act of storing your cards in a digital format, enabling you to use them remotely without having to carry them around with you. Additionally, these wallets also allow consumers to transfer and store digital cash which can be regulated by the user banks through the wallet service providing portals.

Near field communication is a technology that utilises proximity sensor to enable the required actions, which when used in a payment environment would consist of the user having the wave the enable mobile device near the accepting reader to initiate the

payment, this usually would not require any additional authorisation, even if it does, it is only the PIN number on the reader machine.

Acting on the concept of zero contact, instant payment and easy accessibility to all the payment options, mobile wallets are one of the most used methods of cashless payments making it the quickest adoption in the digitization of everyday operations. Not only is this easier to use but this also allows the regulating bodies to monitor the cash flows in a legal format, promoting the right constraints on illegal transactions. This mode of payment is also highly beneficial from the merchants' side as this helps them store maintain and record all the transactions in one single point of access. Several applications are specifically designed with merchants in mind, allowing them to manage not just payments but also automate several processes and monitor them collectively. Given the ease of access that comes along with a portable maintaining service that is easily affordable to most population, mobile payments are encouraging several small businesses to flourish and enhance their business operations on a bigger scale.

One other highly used functionality of a mobile payment system is to perform transactions by merely scanning the QR code of the merchant, which is usually supplied to the merchant by the service provider. When the customer scans this QR code on their respective supported application, the payment process is automatically initiated and then authorised by the consumer using one of the several available identification facilities (face recognition, unique PIN etc).

Apart from being an option for spending cash securely, several applications in collaborations with institutions have introduced loyalty cards and other relevant business card services allowing employees and members to encash the benefits of using their services through rewards, points and cashbacks. This also is a method of maintaining and balancing the everyday resource flows. Loyalty cards are a common concept at supermarkets and other essential commodity marketplace, and the integration of these services together optimises the whole experience for the users. The huge frequency of these purchases allows the users to encash this, making these points act as its own form of currency in a way.

Several of these applications allow its users to integrate their services with the users' bank or the banks themselves directly provide the user with this accessibility,

authorising the user to perform most of the online banking actions without having to access the webpage each time. This also helps the users benefit heavily by offering them a single point of tracking all their financials easily. From a banking perspective, this allows the banks to retain more customers by providing them with several added bonuses over the basic services.

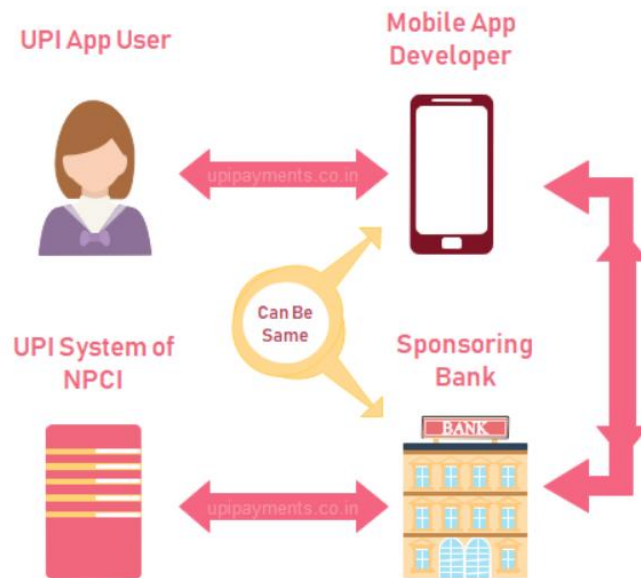
Most of these facilities can also be accessed using technologies that support a traditional mobile device such as smart watches and other remote wearables. There are several start-ups that specifically focus on providing customer with the technological infrastructure that supports payments made through remote modality on the basis of proximity services. (Julian Barnes, 2021) These mobile payment applications are also enabled with location sensing to understand the particular store the user is in and then suggests the user to pay using the application after automatically cross checking for the store's payment acceptance.

Unified Payments Interface (UPI) is a regulated pathway of payment which is capable of performing payments between several banks through a single interface of interaction connecting the user to all possible payment methods. UPI provides the user with a unique ID which is linked to multiple bank accounts, allowing the user to access all accounts with a single authenticator through an associated mobile application. This use of singular identification is approved by the National Payments Corporation of India (NPCI), making this an available service from all banking organisations. Not only it allows the users to transact remotely, but also facilitates a transaction that incurs no fee for the transactions to be made. (Gupta and Kumar, 2020)

Acting as a single point of contact for all the transactional processes, this allows the whole flow to be traceable, assisting the governments to monitor cash flow with utmost efficiency and accuracy. As a user, one could also keep a track of their finances through any of the UPI supporting applications utilised. (Fahad and Shahid, 2022) These UPI applications act as a wallet for cards, allowing customers to link their bank accounts or store money by instantly transferring some virtual cash to their account without linking their cards, in a way acting as a single use check out system.

UPI, along with the convenience of a single point also offers several other benefits such as reduced interbank transactional costs, high security and noticeable accountability for

the performed transactions. The working model of this technology can be simplified as represented in Figure 8.



*Figure 7: Process flow of UPI Payments (Source: UPI Payments, How To Use UPI Apps, 2018)*

When the consumer uses an application enabled by the UPI Technology (which may or may not be offered by the same institution), a transaction notice is initiated which is then sent through to the single interface for verification and connecting to the payment processor to initiate the payment.

Several merchants and organisations promote the use of UPI payment options by providing people with a discount, cashback or coupons to be used for the products / services sold by partnering companies when used as the mode of payment. This also helps the merchant instantly receive the money in their account and reduces the use of middlemen (credit and debit card transactional charges). Promoting the use of mobile wallets also brings in more crowd allowing both the ends to reap the benefits of a large user crowd. Not only is UPI technology utilised in everyday payment transactions but it is also designed to support other relevant services like FASTag, a service allowing vehicle owners to pass through tollgates and performing the toll payments by having

the sensors automatically scan the RFID tag placed on their car without having them stop to perform these activities.

### **Cross-border Payments**

Cross border payments are financial transactions that occur between parties who are based in different countries. These payments have to be passed through a few more layers when compared to a standard payment. These several layers are due to firstly, the payments occurring between two or more countries, we need to take into account the different set of regulations that apply in each one, making it a very taxing and expensive process, usually taking several working days to be processed. In this day and age where everything occurs with just one touch of the screen, this is a pretty outdated way of operation. Additionally, given the multiple process steps involved, the whole process lacks transparency, leaving both the sender and receiver unaware of the overall charges incurred during the whole process.

Transactions with multiple layers also create room for a lot more actors to be involved, this directly also gives a lot more space to be several times allowing a lot more fraudulent activities to operate with the monitoring activities getting severely complicated.

Given the ever-increasing globalisation and the tremendous demand for global e-commerce businesses, cross border payments are as essential as everyday payments and the lack of a concrete infrastructure to administer them could prove to be very detrimental. This could not only disturb the payment process, but it also in turn affects the client-company relations and the competitive advantage an organisation would like to possess. Global payments are one of the key features all developed companies seem to have well set and is what growing companies are looking to perfect. This has been one of the focuses of several start-ups, to make global payments accessible to everyone, almost like a local payment system, without much hassles, cost and complications.

The start-ups (Wu *et al.*, 2022) providing services in this area are a better choice when compared to a traditional bank transfer or other similar platforms as their main focus is to firstly optimise the whole pathway, reducing the actors and the informational and



exchange gap that exists between the two ends. The use of newer technologies allows these start-ups to offer very giant range of services that other previous regulative systems struggle to achieve due to their concretely built organisational structure, which results in a lot of restructuring following any variation in operations.

Global cross-border payments flows split by use case

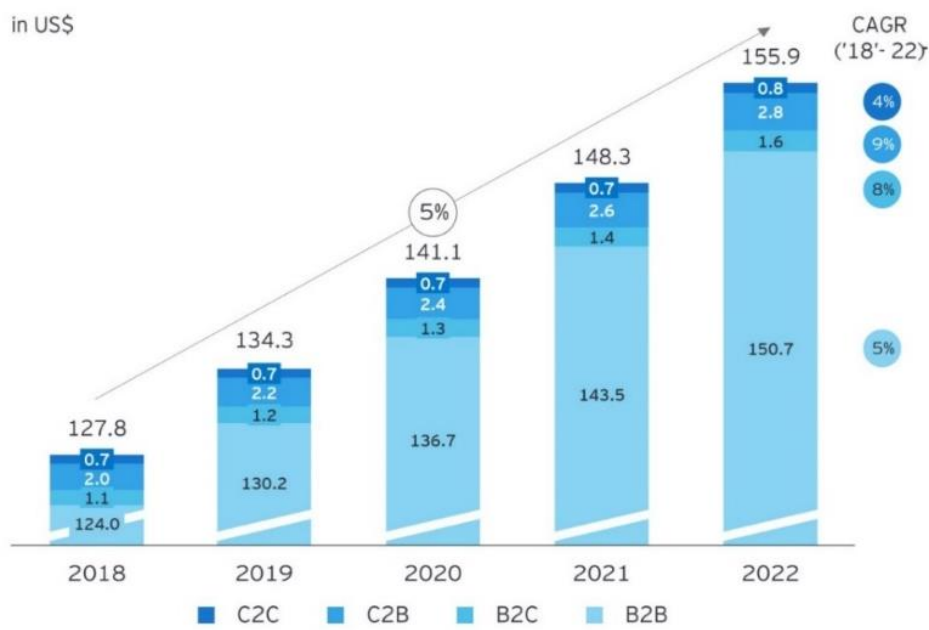


Figure 8: Cross-border payment contribution by category (Source: EY, How new entrants are redefining cross-border payments, 2021)

In Figure 9, EY indicates the 2022 updated the annual growth of cross border payments having a range from last 5 years. With an overall increase of 5% between 2018 and 2022, this data can be organised based on the customer categories they serve. The customer categories can be classified as B2B, the companies focused on serving other companies / businesses, B2C, companies with a focus on direct consumers. C2C, representing the customer to customer or P2P transactions and C2B, the payment transactions occurring from the customer to the merchant. The category with the highest CAGR of 9% is the one that constitutes of the payments that flow from consumers to businesses, possibly merchant payments made purchases of goods and services. This is definitely explained by the increase in global e-commerce sites, especially in the year following the initial wave of the Covid-19 Pandemic. The next

category is that of B2C with a close second by overall 8%, representing the cash flows that occur from the business to the consumer, it could for very similar reasons as explained above. Cross border payments among businesses are ranked next with an overall 5% growth, given the rise of companies that would like to achieve a global reach, it is common for them to transact with other businesses, possibly also global or local in a different country, this growth is a direct reflective of organisational growth. The least increase is of customer-to-customer transitions with a 4%, this is also a major growth for a category that focuses only on inter personnel exchanges. This could be due to the increased mobile payment applications that assist in easy global transfers of currency and other assistive services.

### **Blockchain and cryptocurrency transactions:**

A blockchain is a Distributed Ledger Technology oriented towards creation of a chain of blocks containing information to form a permanent link. This acts as a single source of truth for every source, especially when all these said sources tend to have their own version of it depending on the purpose. Developed in the 90s, Blockchain technology was initially aimed at providing a timestamping solution for documents to have incredibly secure verification process. A while after not being practically implemented, this technology was then used by Satoshi Nakamoto to introduce the concept of digital cryptocurrency “Bitcoin”. ( IBM, 2022)

To understand how this works, let us begin by breaking this down and looking into a single block. Each block has its own stored data, a hash that is particular to the block in consideration and the hash of the previous block that it joins to create the said chain. The data that is stored in the block depends on the type of the blockchain desired to be created. Hash is a sort of identity of a block that is being calculated as the block is being processes and any change being made on the block in turn causes the hash to change accordingly. This allows us to rack any changes made on the block. The hash of the previous block is also present here and this makes the overall blockchain very secure in the sense that as a blockchain is a collection of blocks, the basic information present on it is what makes it valid and in turn a chain as it marks the hash of the previous block also in the current block. As the first block does not have a previous hash to register it is

called the Genesis block. The high security comes from the situation of let's say someone tampering with one of the blocks, this in turn changes the hash of the block, but then will invalidate the remaining chain as the next block would still have the older hash for the previous block stored.

Given the advances in technology there are several rapidly coding software capable of recalculating all the block hashes and modifying them almost simultaneously, allowing the block to still function despite it being tampered with. (Mohanty *et al.*, 2022) To handle this situation, blockchains have a safer system of operation called the proof of work, this slows down the creation of block and also the process of any modifications that occur. The high security of blockchains is also enhanced by its distributed nature, in simple words, instead of being managed by a single entity, this allows a peer-to-peer method of working of monitoring. Here, the platform is accessible to everyone who is interested to join, giving them each a copy of the complete blockchain. So, when a new block is made, it has to be verified by each peer and after it has been accepted it is added to the blockchain. In this way, if one wants to tamper with any block on the chain, they would have to make that change on every copy of it, which is a very complicated and almost an impossible task. As a result of this, a blockchain can only accept new information but does not allow deletion of any, making it strictly permanent and as a result this acts a very a secure store system for all forms of information. (Civelek *et al.*, 2021)

This technology can be implemented in several fields such as in cryptocurrencies, digital certificates, notarisation, complete product tracking, smart contracts and so on. The two majorly used adoption of these are cryptocurrencies and smart contracts. Smart contracts are very much similar to everyday paper contracts but have one significant variation, which is that they are digital in nature. These digital contracts are stored in the blocks of a blockchain and in essence are a form of a small collection of programs which is initiated by meeting a certain set of criterion. After the criteria has been met, the desired program is run on its own in an automated format without the user having to manually run it by keeping track.

Cryptocurrency, is a virtual currency that can be used as a mode of exchange for goods or services online. What makes this unique from a regular currency is that it works on

the blockchain technology, allowing it to function in a decentralised manner, that is to function without having any regulatory authority acting in the middle. This in result makes the payments never fail and also incur very less fee when compared to traditional transactions. As mentioned earlier, each block in any blockchain contains relevant information, for cryptocurrencies this would be the transactional details such as the amount sent, the sender information and the receiver information. Being an open-source system gives it the transparency it requires by allowing everyone to partake in the blockchain while also maintain the highest forms of security with their integrated hashing and proofed systems.

Token, unlike coins these are also a form of virtual currency but differ in the essence that the represent another entity which backs the value of this said currency. As opposed to a cryptocurrency coin, these have a varied offering and a lot more range. (Coinbase, 2022) Further delving into cryptocurrencies and tokens, we can classify them as follows. (SoFi, 2022)

*Payment Coins:* These are the currencies as their name suggests are specifically made to be used in transactions to used in exchange for goods and other desired services. These which can also be considered as a form of value token, have some assigned value associated with it as the information. The payments coins as a normal currency also have a dedicated gateway which allows merchants and organisations to provide their customers with this payments option.

*Privacy Coins:* Privacy coins are cryptocurrencies which is very similar to physical cash in its functionality, specifically how it is majorly untraceable after withdrawing it from the ATM machines. These privacy coins are accounted for only when they are converted back to any other form of traceable cryptocurrency. This gained its popularity to protect cryptocurrency users from the data collection issues faced from the third-party organisations that play a major role in transactions, allowing them to easily access data without the user being completely aware.

*Stablecoin:* This is a form of cryptocurrency which is backed by an actual asset having certain value associated with it. For example, a stable coin issued by a company X could be assigned a value equivalent of \$1, giving it not just the derived value but also the said stability from this. In this way, although a standard currency still plays a role in its

functioning, this allows the user to reap the benefit of the transparent and secure infrastructure that comes with cryptocurrencies. This is a significant coin as it counters the high volatility issues that other cryptocurrencies

*Utility Token:* Blockchain technology can be used to create several decentralised apps which are based on their particular blockchain platform. And these platforms have their own utility token, which is the only accepted transactional token on that particular blockchain. This is a sort of a gateway to access the facilities available on the said blockchain. Conceptually similar to a security token, the major difference between them both is that a utility token is unusually unregulated, whereas a security token is a highly regulated. These two tokens are differentiated using the Howey test, and if falling into the security category, the previously believed utility token is then regulated as would classify as a profit gaining token.

*Security Token:* Similar to equity shares, these tokens represent an organisations security that is distributed in the form of token. One the purchase of this, the user reaps the same benefits they would get as from a share from that company. The major difference between an equity shares and token is the issuing authority. While shares are issued in a centralised manner and can also be transacted only on the assigned platform, these tokens do not have a restricting authority to buy and sell them on, allowing a larger part of the public to part take without much rigidity. One other benefit of this over the standard shares is that this allows its owners to own fractions of physical assets to the point which wouldn't be made available

*Asset Tokens:* These tokens are backed by assets representing financial stability such as art, a real estate or such other commodities. The value of these tokens is derived from that particular asset that backs it. This can be further classified into two groups, real-world assets and Native assets. Real world assets are the tokens that represent physical assets that usually have legal papers entitling the said person to experience the complete ownership rights of that asset, and hence to tokenise this asset there is another authoritative entity required. For native assets which usually exist on blockchains, the asset tokenisation is documented on the blockchain itself. This allows investment accessibility and high governance, helping avoid fraud.

*Non-Fungible Tokens:* NFTs are token that belong to the blockchain and symbolises the ownership of unique items. As opposed to standard digitalised documents which could be copied and claimed by everyone, an NFT is unique and carries along its own hash, a name and a symbol. This can then be sold on the block, which will then record the transactional details such as the amount it was sold for and the new owner. But the buyer des not receive a physical copy of the art, but only the ownership is legally stored on the blockchain, while the original artist still owns the copyrights of reproducing it. This art is also usually accessible to be downloaded for free to the public

*Decentralised Finance Tokens:* The traditional currency exchange system that we commonly use in our everyday lives is of the Centralised form, which means, the issues, the value and other relevant flows are all controlled be a centralised authority. This incurs us charges at every step which we pay to the said authority for the convenience of use. Apart from the fee, our transactions are also highly monitored, require us to go through several processes and in turn also results in some time delay. Decentralised finance on the other hand, uses the blockchain technology to offer us applications which cater to all our needs. And these operate on the particular token that they are backed by.

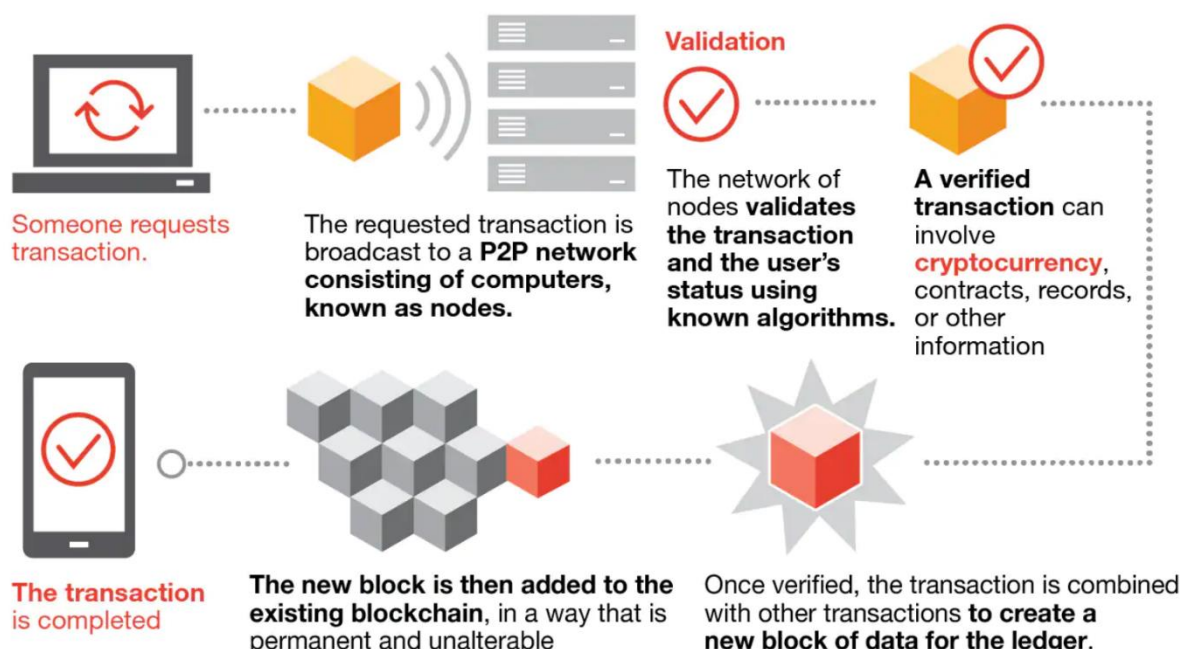


Figure 9: Working diagram of Blockchain Technology (Source: PwC, Making sense of bitcoin, cryptocurrency and blockchain, 2022)

Focusing solely on the payments, let us understand how a transaction using blockchain would work. As observable in Figure 10, the user initiates the transactions by sending in a payment request, which is then forwarded to the particular peer to peer blockchain platform being used. Each of these peers, called nodes, check for the authenticity of the sent request and verify it. After a complete verification of the transaction which could be in any of the above-mentioned acceptable forms, the request is considered valid and the block is added to the blockchain. Hence, completing the initiated transaction. This is just a surface level explanation of a blockchain payment process.

Given the increase in the users interested in the whole set of blockchain technologies, and as a result in adopting the blockchain backed financial services in their lifestyle for the increased security, freedom of activities, transparency and the very low transaction fees, more companies are also looking to provide this as an accepted form of payment. This benefits the companies as well, firstly drawing in more customers as this inclusion allows more payment flexibility for the customers. This also as a result allows the merchants also to incur lower charges, from transactions, management of the flows, authenticity of the process along with fraud protection. In fact, including blockchain technology would allow them to bridge any functional gaps that currently exists in their everyday operations, acting as a major indication of the company's competitive advantage, allowing the organisation to grow more technologically and also draw in more collaborative start-ups to perform supporting activities, enhancing the overall enclosure of business.

### **Open banking initiatives**

The ever-growing number of fintech start-ups focused on revolutionising the payments enclosure and the consumers demand for a well-integrated user focused service has motivated several governments to encourage inclusions of technology in the traditional systems of operation and one such major initiative was the PSD2 by the European Union. PSD2 (Revised Payment Services Directive) is a highly evolved follow up to the earlier release of PSD in 2007. Being effectively passed in late 2015, PSD2 were the improved set of regulations aimed at improving the whole banking and finance sector by making it more secure and convenient for the customers. Amongst the several

significant laws proposed, the underlying scheme was aimed at technologically improvising banking by integrating financial organisations, Fintech start-ups and traditional banks. (EUPC, 2019)

In an era where almost every banking facility provides its users with a complimenting banking mobile application, allowing the users to perform net banking without necessarily following the browser approach, FinTechs, companies specifically focused on implementing advanced technologies in the most innovative systems specifically for finance and insurance services. (Narayanan, 2022) While both were severely restructured due to the previous regulations, the PSD2 gave more free room for all entities and promoted collective working, allowing private organisations to beat the regulative caps and providing the lacking financial authorities with the right set of tools. (Lopez-rubio, 2016)

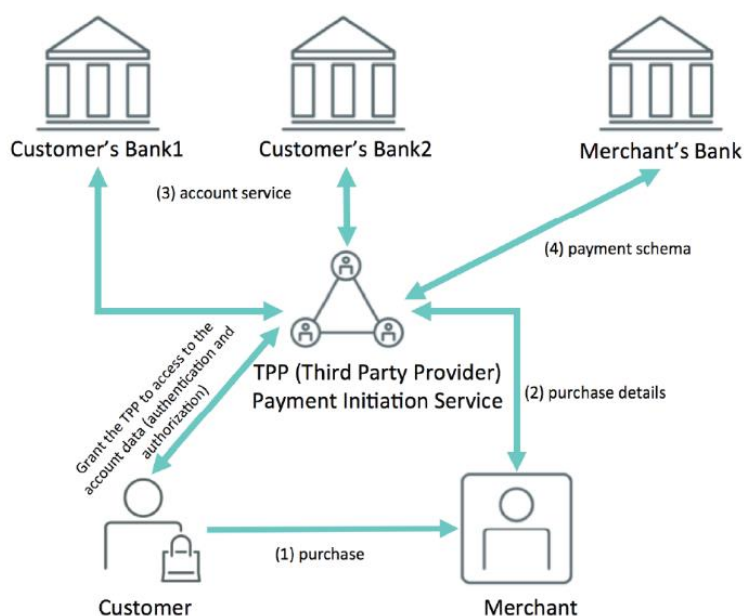


Figure 10: Payments under the PSD2 regulation (Source: CA Technologies, PSD2: Igniting Digital Payment Innovation, 2016)

(McKinsey & Company, 2018) To endure the new rules a smaller organisation would have to perhaps offer an integrated solution to its customers, which would probably need them to amicably operate with a third-party specialising in that aspect while a well-established bank may be capable of launching its own ecosystem with several



services. Regardless of the scale of working, all banking organisations have been pushed to implement this all-round approach. One of the mandatory requirements is to implement a unified interface, allowing firstly all data to be accessible from one point. This not only provides everyone with a sound infrastructure but also creates a fraud proof enclosure to operate in.

Before delving into how exactly this interface works, let us begin by understanding how this changes the basic payment layout. (Figure 11) When a customer makes a purchase from a merchant and initiates the payment process, these details are firstly shared with a trusted third-party provider, who is the said unifying interface acting in the middle. This third party acts as an initiating service, from the received information, the request is then forwarded to the customer's bank, which verifies and processes the payment, forwarding it to Interface TPP, which is then forwarded to the merchant's bank after cross checking for the details. After the payment is processed the TPP sends the verification to the merchant and the customer.

This whole system operates on the open Application Programming Interface (Open API) technology. To understand this better, let us look into what an API is. API is a service interface which process the communication between interconnecting platforms to obtain the data required for the platform (called the End point) that is in contact with the user. Each endpoint has its own requirements of basic information to process the request. Every API has its own unique API key which has to be supplied to allow the functions to occur as desired.

Open API is a language description which acts as a readable interface for both the computer machine and humans. This interface is readily accessible to everyone, allowing developers and organisations to strengthen their applications with all the required data. This allows business to operate in more of an innovative manner with lesser informational restrictions and more access to all the services they would like to offer their customer. Additionally, this also enhances the customer touchpoint interaction making it more polished, benefitting tremendously from the resulting customer satisfaction. Services offered by the trusted third party TPP pertain to 3 broad categories:

*Account Information Services:* This category houses the actors that are associated with all of the data services involved in the payment industry. They provide services which include authorisation information, access to all the account details and other relevant financial information which might be essential for the user or the transacting entity. This is a very integral part of the initiative as data is the most valuable knowledge available but also the most highly restricted entity based on the user it belongs to.

*Payment Initiation:* These services comprise of initiating the requested transaction by the transfer and verification of the provided details. This category is highly focused on ensuring the smooth processing of the payment and also safeguarding it to avoid any fraudulent activities. Payment initiation services focus on the complete enclosure of the middle point transaction passing after the initiation request is sent out from the customer and merchant.

*Card Payment Issuance:* This category of services that are oriented towards all the activities that involve the use of financial cards to process payments. This could be either monitoring, allowing or assisting a payment performed by either a debit /credit card or acting as a point of access for these to be collectively operated from. This category also involves services which themselves issue customers payment cards of any form that can be used to perform financial transactions and regulate its usage.

From the customer's perspective, from the very first step of accessing their portals, they go through a very secure system providing them with multi-factor authentication. All the further actions they perform is always well assisted and is done with complete clarification and consent of the user. Allowing them to take more control over the data they provide and be well aware of what is being done of all the data they share and the actions that would occur as a result. This makes the interactions and using the services a lot more seamless, fast paced and convenient in nature. The entire process has an architecture focused around the customer while giving more place to the players to operate well to bridge the gap in service provision and in the technological limitations that exists.

## **The Pandemic and Fintech start-ups**

The onset of the Covid-19 pandemic was one of the most chaotic events globally, shutting down our everyday lives completely, keeping us in confinement in fear of possible contact to the virus in public. Which initially was a very complicated situation given that most people needed to bring at least the basic necessities to survive, only occurred at some accepted level of contact. This pushed most of the organisations to push the already existing contactless facilities to be used more prominently. This was a point in time where most organisations were looking to overcome this major disruption that was onset. Having to severely adopt to a completely different way of operation with only the limited resources accessible at that time, a few organisations instantly crashed, a few managed to stay afloat, while several others recovered rapidly and overcame it with a much more positive outlook than before.

From an economic perspective, most traditional systems were standstill given the complete inaccessibility for a while, only operating in an online modality, pushing for more enhanced services to be made available remotely to the whole public. This is when the pre-existing technologies such as mobile wallets and bitcoin transactions were the most used form of payments. Not only did the consumers see this as a way of operating remotely, going no contact, this also was a lot more efficient for them allowing users to travel only with their mobile phones without having to deal with the hassle of physical currency. Even with the increased use of e-commerce purchases, wallet infrastructure proved to be a lot more beneficial allowing the user to access everything with one touch. All these services were not only aimed at making the transaction but also managing finances, making secure investments, safeguarding wealth and enhancing the overall security of all the relevant processes. This also gave opportunity to several start-ups to come up with several innovative technologies assisting the user and encouraging them to go cashless without worrying about the lack of privacy or having to deal with a complicated infrastructure.

Focusing on the rapid evolution of payment technologies during the pandemic globally, we can observe figure 12, as it represents the extent of change observed, with the darker colour indicating quick adoption and the least colour indicating towards a slower approach towards the shift. Beginning with the quickest to adopt, Asia, already having a

strong foundation in digital payments, they focused more enhancing the security and providing better infrastructure but still faced some restraints due to the interruption in inflow for the start-ups to operate in and the regulatory laws. The next is South America, which despite facing a severe recession and having increased cybercrimes still managed to have a very rapid adaptation to blockchain technologies, allowing start-ups to cater to the customers with varied services despite the reduced margin.



*Figure 11: Global adoption of cashless ecosystem (Source: Deloitte, Global payments remade by COVID-19, 2020)*

EMEA, follow in after, due to their slower adoption from the heavy regulatory norms present and the major involvement of big organisations allows only little place for the innovative start-ups to represent themselves. North America being next with a slower pace of change adoption from its high focus being on secure processing rather than a complete innovative transformation. Finally, the Oceania, having a severe economic situation slowed down with the complete digitisation but had the highest case of Buy-now-pay later scheme adoptions. Overall, the whole payments enclosure has taken a major turn, with several new start-ups providing the best of services possible. Technologically, financial companies have had a major boost in the method of operation, specifically being boosted from the socially obstructing pandemic of 2020. Not only did this allow the room for creation, but it also pushed for the customers to be highly receptive and in-fact more interested to adapt high forms of technological adaption to traditional finance.

## **CHAPTER 2: METHODOLOGY**

### **Data Collection**

To begin any form of analysis, accurate data from a legitimate source is the most crucial requirement. Accordingly, all the initial data required for us to initiate the research and support this analysis was obtained from Crunchbase, a platform dedicated to providing informational database and basic insights on companies, specifically start-ups of all kinds. This platform helps us access factual details of a company such as their websites, a short summary of their specialisation and other numerical information relating to the funding, the list of investors and so on. The information accessible from this website is directly updated by the company founders, allowing us to obtain first source of knowledge on the required companies, but also brings in the issue that this is not verified and hence increases our data cleaning process by having to we also had to look through the actual web portal of several of these pages to get more of an in depth understanding of their actual product offering.

Given how enormous the database is, it is obvious for us to apply certain constrains to limit our focus of analysis on to the criterion we are interested in analysing. This can be done by the very helpful set of requisites that we can apply while extracting data on Crunchbase in the form of available filters accessible while searching any data. The specific criteria we focused on to obtain a more refined set of companies for the analysis where:

*Founding Date:* To understand how the start-up space is evolving it is logical for us to want to know how the current space is populated. This can be done by looking into the start-ups functioning now but to analyse the trend of it all, it would only make sense to have the span of these functioning for the past few years, this is the motive behind us specifically selecting the start-ups that range between the founding year of 2018 and the first half of 2022.

*Activity Status:* While it would be interesting to focus on all the start-ups that have been established recently, it is more essential for us to understand also the perspective of the users in the sense that this could be a clear indication of how the trends have resulted in the past years and what exactly is its operational status currently. To have clear

evidence of this we set up a filter to display only the companies that are still active in business.

*Funding Status:* To further refine the previously set active status, we would like to make sure that the start-up is still up and running to its full capacity through its activity with its investors. To satisfy this criterion, we made sure to set the boundaries such that the start-ups would also be the ones that would have the latest funding date within the last two financial years.

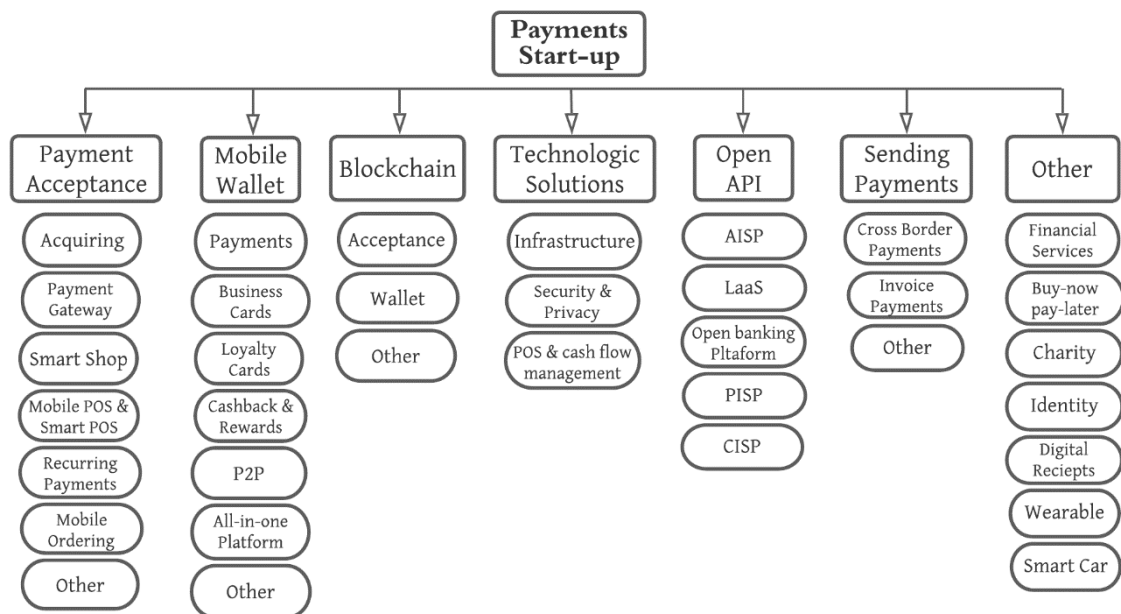
Having set these conditions in the data extraction process we receive a set of data that is more in line with our analysis. We then proceed to the next step of smoothing out the data, since our focus is on payments, we look for companies that are aimed at essentially assisting in payments. But as previously indicated through our literature review, payments is quite a broad sector to operate in. To have a more concentrated focus on these we proceed by analysing them with two aspects in particular, the start-up's scope of operation and the particular customer category the cater to. Which are then further divided to narrow down to the correct segment of service offered.

For initial search of the companies, the descriptive tags that were maintained throughout the search queries were: *Mobile Payments, Payments, Payment and Transaction processing.*

Apart from the focus on their specialisation, we would also like to understand the regional impact of all these to study the adoption and consider its trends as well. To limit the research, we reduced down the detail of the location of the headquarters to the continent they cater to which can be observed from our analysis representations which will be indicated later as: North America (This includes the United States and Canada), South America (All the Latin American Countries), Europe (Mainland Europe, Scandinavia and United Kingdom, Russia), Middle East (The Balkans), Asia Pacific (China, Eastern and South East Asia) and Australia (Australia and New Zealand).

**Operational scope categories:**

To understand the working areas of these start-ups, it is extremely essentially for us to be theoretically clear about the categories in the first place. According to our understanding of the payments enclosure which stems both from the extensive theory of the literature review and from the database itself, we have organised the following categories (Figure 13) and have further segmented them to house specific sub categories as well. For the start-ups that were handful and did not specifically fall into any of these, they have been assigned the category or the sub-category of “Other”, which can be observed in the following segment of the chapter.



*Figure 12: Classification of working areas of payment start-ups*

**Payment Acceptance:** This category includes all the companies that focus on the process of payment acceptance from the merchant perspective, as in all the services required to successfully initiate a transaction from the customers chosen mode of payment and perform the activities required to deposit the transacted amount into the merchant’s bank account. These can be further classified based on the particular activity of assistance as follows.

*Acquiring:* Acquiring is the process of accepting payments made in both in store and through online channels. This service is often provided by another service provider acting solely as a point of permitting and accepting the transaction performed by the payee. All the activities associated with assisting in process recording the transaction at the merchant's account can be noted as acquiring.

*Payment gateway:* As the name suggests, payments gateways are connecting middle track of a payment process where it would accept the customer's credit or debit card by authorising it and then proceed by processing it for e-commerce platform and e-businesses. These are usually embedded to act following the check-out of the desired goods or service at the company's website, essentially acting as a first level interface between the merchant's website and the payment processing bank, allowing direct payment processes.

*Buy-now-pay-later:* This payment service is a deferred payment alternative i.e.; where the customer pays for the product or service after the purchase of the good but is usually spread over the time span of 3-5 months with the payment intervals being fixed. BNPL is a POS instalment loan being offered only at a select few merchants for purchases of smaller amounts and has no added interest fee to avail this transaction alternative.

*Smart shop:* This category includes start-ups that offer products which allows the merchant to organise a technologically enhanced self-checkout system in physical stores. Devices and applications acting supportively in-store operations by allowing customers to pay for products and skip the checkout and the queues.

*Recurring payments:* All payments that occur frequently in fixed intervals can be termed as recurring, the start-ups that provide users with an easier single point management for such subscription services are placed in this category. Few examples are automated billing, subscriptions, periodic payments where a merchant automatically charges a customer for goods or services on a prearranged schedule.

*Mobile POS & Smart POS:* Point of sales system providers for merchants who offer terminals connected directly to the merchant's smartphone allowing credit and debit card acceptance. In the last years, Smart POS are becoming predominant in the market



thanks to an operating system which host different value-added applications and to accept the most Innovative payments.

*Mobile ordering:* Technological systems allowing restaurants, cafes and takeout organisations to accept orders and manage payments through a mobile phone or online, without requiring a human middleman operating in between can be classified as Mobile ordering.

*Other:* Other payment acceptance applications and systems not classified in the previous sub-categories.

**Mobile Wallet:** All monetary activities that can be performed with the help of any mobile device can be classified as a mobile wallet. The start-ups that offer several varied services associated with its primary point of operation through a mobile device is explained through the sub-categories mentioned below.

*Payments:* The process of performing any form of payment for the purchase of the desired goods or services through the use of any mobile wallet app that allows to transactions to occur through smartphones.

*Business cards:* Payment cards designed for corporations to offer their employees a hand at managing their expenses on behalf of the company through a dedicated efficient dashboard. This allows the user to have all data of expenditure, information on the affiliates and have a single point of tracking all the expenditure, several times even encash the payment salary.

*Loyalty cards:* Card providers that allow customers to earn points and be part of fidelity programs can be grouped here. These services allow the customers to convert the collected points through their purchases, which is a form of their indication of brand loyalty, into rewards such as discounts, free products/ services, and special customer treatment, allowing the merchants to create a strong engagement with the customers.

*Cashback & rewards:* Applications that allow the user to make payments for purchases and in turn receive a certain percentage of the made payment as a cashback or obtain

rewards which can either be encashed at the same merchant or can be used at any associated in the form of discount coupons.

*P2P:* Mobile wallet applications exclusively aimed at offering a platform to perform peer-to-peer transactions, which can be either between two wallets or directly to the other's bank account usually at a zero cost of transaction.

*All-in-one-platform:* All-in-one-platforms are applications that act as a one stop shop for all needs relating to one particular field of operation. This allows both the user and that service provider to manage all the data, access all the required documentation, utilise the relevant services and manage payments along with schedules.

*Other:* Other mobile wallet applications and services relevant to the payment industries not classified in the previous sub-categories.

**Blockchain:** Start-ups that offer payment technologies and services enabled blockchain for both customers and businesses can be categorised as Blockchain. Given the diversity of services provided, these can be further classified as follows.

*Acceptance:* The service providers offering solutions for merchants to accept payments with cryptocurrencies and provide retail customer with the technology to perform digital currency transactions Payment applications based on Blockchain & Distributed Ledger technologies. These technologies are key elements to.

*Wallet:* To use the cryptocurrencies owned, they have to be stored in a dedicated wallet having its own unique address based on the particular cryptocurrency. These wallets are accessible with a public key and a private key specific to the user allowing them to make transactions using it. This subcategory consists of start-ups focused on providing users with an accessible mobile wallet for cryptocurrencies and other associated services. Which also facilitates payments management between suppliers and customers and provides solutions to transfer of money for specific events. As with any form of currency, peer to peer transactions occur at a noticeably high frequency and that is also another base designed to serve the purpose of exchanging the owned cryptocurrencies among each other.

*Other:* Other Blockchain & Distributed Ledger based applications focused on payments not classified in the previous sub-categories.

**Open API – Payment Services Directive 2 (PSD2):** Open API is the service offered under the improved banking services directive by European Union aimed at providing customers with seamless, advanced and safe services with the inclusion of technologically advanced players in the industry. The specific sub-categories of operations can be termed as follows:

*AISP:* The Account Information Service Provider (AISP) allows the customer to manage the transactional details of different bank accounts in a single unique online platform. The AISP technology allows the users to have the benefit of using third party application for their payments and still experience the seamless process due to this single information point.

*LaaS:* License-as-a-Service is a form of operation which provides non-banking companies with a possibility to operate in the open banking ecosystem, allowing them to have enormous freedom to bring their technological advancements to consumers.

*Open banking platform:* This sub-category indicates the start-ups that essentially operate as application developers of programming interfaces (API) for banks and new financial entities. This creates a method of data sharing among all the relevant financial authorities and third-party service providers.

*PISP:* Payment Initiation Service Providers (PISP) are organizations that adopt the PSD2 regulation and allow payment initiation services without using you credit or debit card through a third-party provider directly connected to your bank account.

*CISP:* Card Issuer Service Providers (CISP) issue payment cards connected to a different credit institution or bank account. The CISPs do not directly hold client funds but can previously interrogate the bank where the account is active, to verify the availability of the funds involved in the transaction, all of this process is carried out with the consumers' consensus

**Technologic solutions:** This category represents all the start-ups that offer technical architecture for all the other payment features to be operated on. This can be specifically segmented further as follows.

*Infrastructure:* The start-ups providing total infrastructure for the functioning of payment systems and digital solutions to integrate and generate communication within different terminals of operations, unifying relevant systems to function coherently. This also can be a representation of the basic system for the performance of all financial services required in the payments enclosure.

*Security & Privacy:* Start-ups providing services for the protection of user data, offering customers enhanced privacy for all their financial operations, assist in secure data transactions and furnish protection against cyber-attacks.

*Point of sale and cash flow management:* These applications and systems are aimed at allowing the merchants to offer their customers technologically advanced methods of payments and simultaneously help the merchants themselves to have a secure system to store cash experience digital transactions and perform advanced accounting management.

**Sending payments:** The process of being able to initiate and successfully send payments as desired also requires the users to have the right tool to do so. This category focuses on start-ups that provide solutions specifically aimed at initiating these payments from a sender.

*Cross border payments:* Start-ups offering a platform of operation which allows the users to exchange money and digital currencies internationally. This is a complex mode of money transfer not just due to the existence of different currencies but also due to the increased layers which the payment has to pass through.

*Invoice payments:* Invoice payments are transactions made in the scheduled format to pay back for the received goods or services. These start-ups provide Invoice management systems which include services to collect invoices and manage their payments.

*Other:* Other applications based on sending payments which cannot be classified in the previous sub-categories.

**Other:** This category includes all the remaining start-ups which work in the payments sector but could not be classified into the previously mentioned categories of operations:

*Financial services:* Start-ups focused on providing financial services such as loans, credit collection, lines of credit and factoring.

*Charity:* Start-ups which cater to providing platforms assisting in the payment and collection of donations made with the purpose of community goodwill.

*Identity:* This service pertains to products which are aimed at allowing the user to store or recognize digital identity. This could be for securing certain operations or for an easy access of all essential details at one point.

*Digital receipts:* Start-ups that allow the users to access and record all their receipts in a digital format at a single platform. Not only does this promote cash flow management, but also allows organisations and consumers to be more ethically aware of their unsustainable actions towards the planet.

*Wearable:* Physical devices that can be used as a substitute to make payment transactions of any kind in place of traditional cash, cards or mobile phone can be termed as a wearable in this context and the start-ups that provide these services can be categorised here.

*Smart Car:* Services or products offered by these start-ups that allow its users to perform financial transactions of the desired kind directly from their car.

## **Customer Target Categories**

After classifying the start-ups into their specific areas of operation we also designate each of them with the typology of the customer segment they serve and this allows us to further breakdown our set of start-ups with more scrutiny into four categories as mentioned below:

**Business to Business (B2B):** A B2B company focuses on exchanging services, products and information with other companies. These said other companies could either cater to another company or directly to a customer, but our focus is only on one layer and hence we stick to the B2B aspect. These transactions occur when the other business is in need of materials to build their products, require services to perform activities or when they completed products as assistance. This is the functionality layer before every B2C organisation.

**Business to Consumer (B2C):** B2C companies directly provide products and relevant services to the interested client. The individual This is the next layer after a B2B where the company sells their product to a business and this business then sells that product to the customer at a mark-up. These companies are more towards the downstream and in direct contact with the consumers.

**Business to Business to Consumer (B2B2C):** A B2B2C company, as its name indicates streamlines the methodologies of the previous two categories to create one model of operation where it provides services to a retail client through another business organization. This collaborative process benefits the entities involved due the combination of both the business-oriented approach and the consumer-oriented approach and allows the organisation to cut down on the short comings that would exist while operating separately.

**Business to Business and Business to Consumer (B2B, B2C):** This category includes all the start-ups that focus on catering to the needs of both, businesses and clients but without streamlining them to form a combined model. Instead, these companies are serving both the customer groups by benefit from a similar ideology of a B2B and a B2C.

## **Analysis procedure**

Before delving into the results or the actual analysis, we need to firstly understand what procedure would we have follow to perform the study. Given the aforementioned humongous data set we obtained, it is essential to firstly look into if they fall under the scope of our area of interest or not. When we look into the database of 2296 start-ups, we noticed that all of these companies were in fact aimed at catering to financial industry in several aspects, but considering our interest in payments in specific, we had to separate out the ones that weren't essentially payment companies. As mentioned, there were several companies that could definitely be classified into our operational categories but they were excluded due to their inability to satisfy our soul requirement of offering a product service pertaining to the payments industry. This also could be indicated as the most taxing part of the analysis. We took the initially pre-filtered extraction of database and proceed by assigning them as 'In Scope' for the companies that are focused on payments and assigning all the other ones as 'Out of scope'. To understand the significance of how many companies had to be discarded, we found 1,087 companies, which constitutes for around 47% of the overall global start-ups to be in scope and the remaining 1,209, resultingly the left over 53% of the dataset as out of scope for our study.

Now we have the set of companies that are in scope for us to proceed with further classification. Initially we assign the scoped set of companies into the first layer of categories i.e.; Payment acceptance, Mobile wallet, Blockchain, Technologic Solutions, Open API, Sending payments and other. Each of these first level categories are still considered to be very broad to understand and analyse its trend, for this reason we proceed to further segment them with aptly titled subcategories to clearly represent their specific working segment. i.e.; Acquiring, Payments Gateway, Wallet, Open banking platform, Cross-border payments etc. This concludes our level two classification of the companies.

Then we proceed by further understanding the services or products they offer by looking into the customer segments they cater to, and this is done by assigning them into each section of customer serving segments i.e.; B2B, B2C, B2B2C and B2B, B2C. This concludes out clustering process based on the company's profile. As a final manual

categorisation, we need to make, we also specify the regional continent in which each of these 1,087 start-ups function in. For this, several companies had specified the location of their headquarters which helped us extract the details based on the information from Crunchbase, remaining information was found by going through their official website.

### **Dealing with missing information**

As previously mentioned, all of this information is uploaded by the start-up founders themselves, which inherently leaves us with the job of cross-checking the information. But the more difficult aspect of this was to find the information that was not provided there, such as the information about the operational location or the description of the service provided. The complications with the data collection were also increased due to the fact that several of these companies did not have a working website we could go to, or were rebranding their offline housing.

Another detail to be specified is the issues we faced while mapping several companies that originated from the Asia Pacific region, as they had their websites in their own language with little to no information or were not easily accessible to us. To match the information of such companies, we scoured the internet for relevant articles, the official LinkedIn pages of the company and the founders and even some of their official Twitter pages. A final point to be kept in mind would be that several of these start-ups that were officially launched in 2022 could not be included in the data set as we firstly have included only the start-up companies that were launched within the first quarter of the year. But more importantly, as the data here is manually updated



### **CHAPTER 3: EMPIRICAL ANALYSIS**

To now understand the payments enclosure better, we need to begin with the actual analysis of the segmented information. As in we need to now start looking at the predefined categories that we elaborated earlier specifically and understand the significance each of the hold and their contributions. This would clearly set out of path of seeing what has been an ongoing trend with the start-ups and what has been new, or also understand if any sector is experiencing any form of a decline.

While we as users might have experienced all these segments and might be aware of certain features being more popular than the other, the whole focus of this study is to have a solid backing in the form of analysed data which can support the arguments we would like to make and even help us notice what we might have just assumed and still been unaware of. The trendlines and graphical representations will add and understandable value to all our supportive commentary.

Secondly, since our aim was to focus on payment start-ups at a global level, we also deem it fit to separately look into the region wise impact of each of these start-ups and what is the current focal point in each area specifically. Which again is done on the common base of the pre-segmented categories for a more refined outlook, yet add more information that just the plain old numericals.

Customer segment categories are also an impactful factor to look into as it would help understand what customer focus do each of these start-ups have and how the categories impact the focus of customer targets. Another interesting perspective would be to focus on the funding that these start-ups have received at an overall level, and how have the highest funding has helped these start-ups perform since its introduction to the market. Obviously, this gives the companies a higher advantage and since we have the required dataset, we also would like to see the kind of segments that investors seem to be more interested in.

### **Impact of the operational categories**

After methodologically segmenting the 1,087 start-ups that can be considered in focus for our study, we then began look at their individual numbers and the percentage contribution of these to the global payments segment.

<b>Categories</b>	<b>Start-ups</b>
Mobile Wallet	296
Payment Acceptance	194
Technologic Solutions	190
Blockchain	129
Sending Payments	109
Other	108
Open API	61
Total	1087

*Table 1: Categorical impact of the start-ups*

Breaking down the values indicated in Table 1 and from further observations from Figure 14, we can understand the impact of each of these segments. The highest contribution of payments start-ups can be attributed to the Mobile wallet segment with a total of 296 start-ups, making it around 27.2% of the overall start-ups. There was an evident need for the payment systems to also change along with the technological advancements and one of the most impactful modifications was observed in the digitisation of currency wallets. This not only allowed the users to fully go digital with a cashless environment but this can also be arguably the highest point of interaction the general public would have with payments.

This very high number is then followed by Payments Acceptance with 194 start-ups, contributing to the next 17.8%. Payments Acceptance is a significant sector as it is the pathway required to make the payments, they can only be processed and completed if there are equally advanced acceptance technologies.

And as a perfect follow up for the previous reasoning, we can also note that the next category of start-ups are companies that provide Technologic Solutions with around 190 organisations which is 17.5% of the overall numbers. Given the significance of a need to reroute the payments sector to a more advanced environment, it is essential to provide everyone with the requisites of having a pathway to make these said payments. If only

companies can offer these services to their customers, can the begin adopting to this modality. This reasoning explains the high number of companies falling into this sector, concluding the three big segments of operation for companies to provide solutions in.

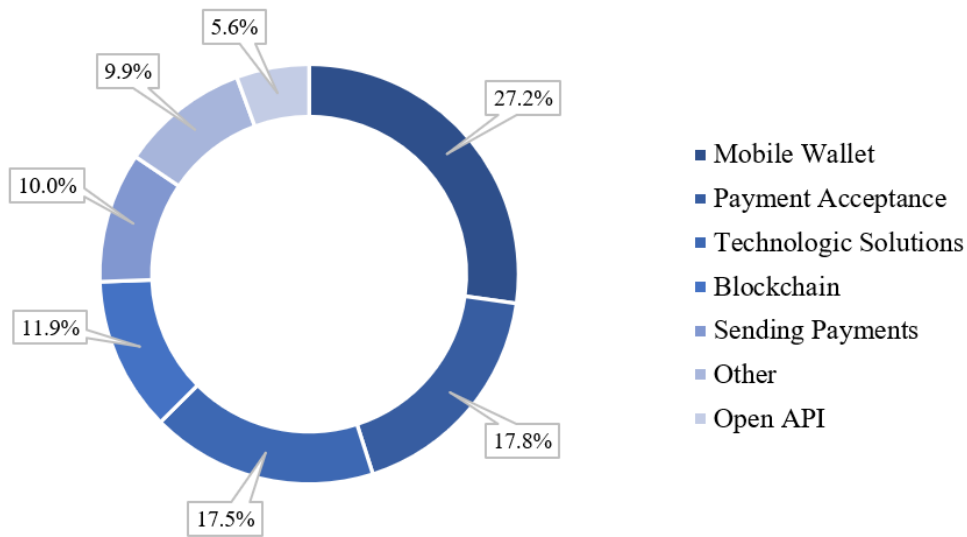


Figure 13: Categorical impact of the start-ups

As we have all observably noticed the rise in popularity of the blockchain technology and also can vouch for the fact that it has very rapidly turned into a household term globally, it would only make sense for this category to be one of the major contributors. Although not in the top 3, due to its arguably recent introduction into the laymen’s payment methods, it boasts a pretty high number of 129 start-ups in the last 5 years, making it 11.9% of the overall composition of companies. Blockchain and cryptocurrencies are definitely tremendously in use but are newer as a payment method, which can possibly be attributed to the fact that this would need a major modification at the POS points to have the required foundations for these payments to be accepted and recognised.

Sending payments is the next segment with 109 start-ups under its set with an overall contribution of 10%. This category is specifically aimed at sending payments solely, which could either be cross-border or invoiced transactions. As this sector is very specific, it explains the lesser number of start-ups in this category. Globalisation is very rapidly occurring phenomenon, with individuals frequently moving or travelling all around the world, making the need to have global transfer of money also increasingly

important. To understand this better, we would need to look into this category on its own and also analyse its indicated annual trends.

Open API contributes to the last 5.6% with 61 start-ups, which is the least among all the discussed categories. It is extremely essentially for traditional banking systems to make drastic movements towards complete digitization but this is also highly complicated due to their strongly knit system of operation. One little modification, would require them to make several resulting changes. This was also a motivation behind the PSD2 directive by the European Union to support the up-and-coming start-ups who have an expertise in the technological aspect to collaboratively work with traditional banks. This could explain the lower number of contributions to this segment as these start-ups might have a lot of regulatory obligations, as well as they would have a slower progress than they would expect to have. Several others might prefer to work independently despite the lack of stability that it would have given them working with banks.

Before the Open API segment falls the category of Others with a 9.9% overall, which is 108 start-ups to the count. Since this category houses all the companies that could not classified with the wide range of start-ups that we fixed as a standard in the previous chapter, it explains the lesser contribution from them. This segment is also one of the seemingly interesting ones as many start-ups that fall into this could potentially become the segments that would make the fixed category. This could account to the rise of newer trends which might become an essential few years down the line.

This concludes the discussion on understanding the compositions of overall start-ups in the first level of operational categories. Moving on, we can look into each of the 6 categories in detail by analysing singular sub-categories. This would help us understand the trends and the working of the payment's enclosure as a whole.

### **Mobile Wallet**

From the previous text we understand that Mobile Wallet has the highest contributors of start-ups, to interpret this segment better, we need to understand how the dissection of this category looks like and which is the most substantial one of these sub-categories. For that purpose, we have indicated in Table 2 the split-up contribution to each of the

subcategories but for easily understanding of the numbers comparatively, we have also used a donut chart in Figure 15. This shall be the same format of representation in explaining all the sub-categories that shall follow after this.

Payments being the highest contributing segment of 38% start-ups can be supported by the argument that due to the provision of this facility, several users have switched to remote modality, helping them avoid using physical cards or even cash. Purchases are one set of action that is commonly carried out by everyone, every day, and given how mobile phones are a contraption that everyone necessarily carries with them, it is an obvious explanation behind these high numbers. This is a similar reasoning for the Wallet's 32 start-ups i.e.; 11% of the overall composition of Mobile Wallet category.

<b>Mobile Wallet</b>	<b>296</b>
Payments	111
All-in-one-platform	51
Business Cards	38
Wallet	32
Cashback & Rewards	21
Digital bank	13
Other	12
P2P	11
Loyalty Cards	7

*Table 2: Sub-category composition under the Mobile Wallet segment*

All-in-one platforms are the next new trend that has noticeably been on the rise, not just while focusing on this category but also in the context of payments as a whole. These are a great new approach at allowing users to have one single application which caters to all their needs related to one particular field. This lets users have access to all documentation, perform the required procedural tasks and make payments all at one place. The reasoning behind its popularity can be explained by the convenience it brings which is an added to the fact that it can be accessed easily from a mobile phone application. Business Cards' next 13% can be explained with the new approach of office working that companies have been gravitating to as of recently, these help them provide everyone with smarter management and greater rewards.

In return, this also allows the organisations that use these to be perceived as technologically forward and as a whole have a simple platform to manage everything.

Cashback & Rewards barely makes it above the 4 percentiles with a mere 7%, but all these can be grouped together for their reasoning which could be due to the fact that this category is solely focused on performing an action which are also a feature provided in other applications such as payments or a wallet.

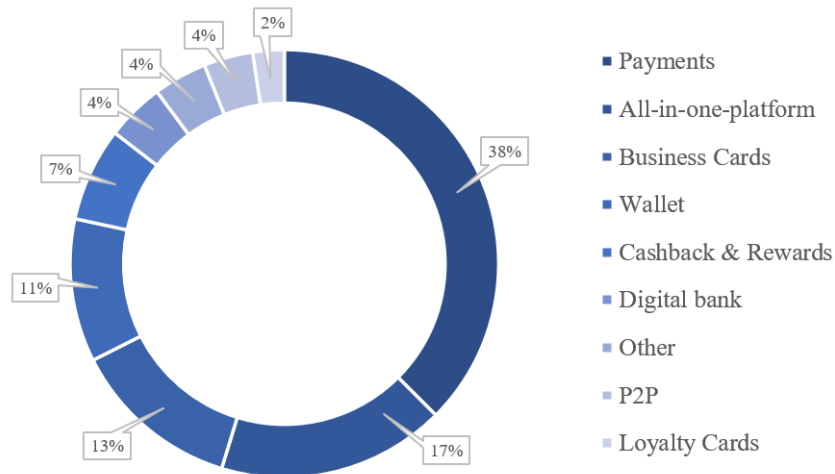


Figure 14: Sub-category composition under the Mobile Wallet segment

This includes P2P and loyalty cards. Even though others falls in the same segment, the reasoning behind its low number is due to the fact that these are unique in nature and definitely cannot be included in other major subcategories. Digital bank is an interesting approach which has concepts similar to certain other segments but it is a segment that is observably on the rise in the recent years. For a population that prefers convenience and quick pace, these companies are devoid of slow processes followed by traditional banking systems.

**Payment Acceptance:**

Payment acceptance is a very detailed category that houses a good number of subcategories and to make the explanations simpler, we can group certain sectors together mostly from their similar natures or from having a same reason behind their numbers. Table 4 and Figure 16 explain the following.

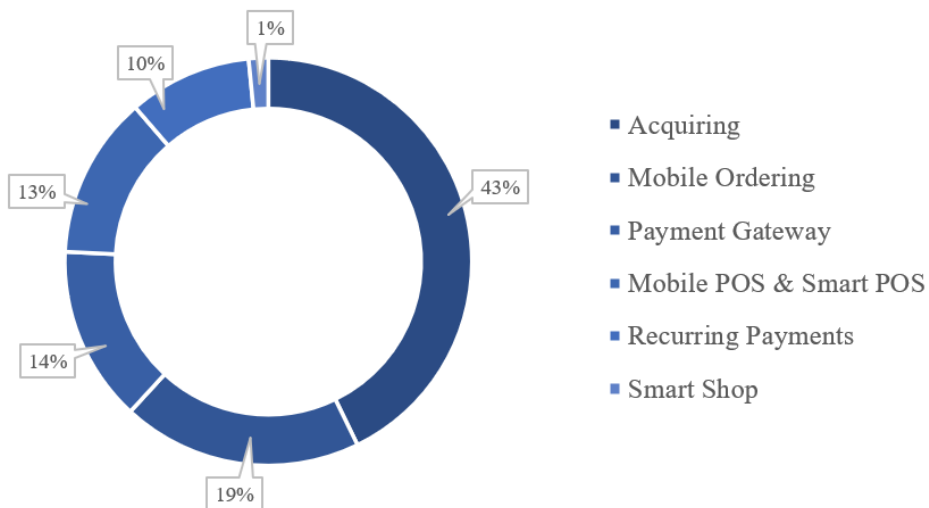
The highest segment with 83 start-ups (43%) are focusing mainly on the acquiring aspect of payments. Given that most transactions occur at a merchant point, it can be

used as an explanation of why this has so many operators functioning here. With such high demands and a global requirement to innovate, there are several new companies that occupy these work opportunities. This is the same case for Payments Gateway 27 (14%), but there are already several start-ups that provide this as a bundle with other segmental services, and Mobile POS & Smart POS segment, which has just 25 start-ups (13%) but is on a slow rise, especially due to the switch in payments such as wallets and other mobile devices.

<b>Payment Acceptance</b>	<b>194</b>
Acquiring	83
Mobile Ordering	37
Payment Gateway	27
Mobile POS & Smart POS	25
Recurring Payments	19
Smart Shop	3

*Table 3: Sub-category composition under the Payment Acceptance segment*

Mobile ordering is the next prominent sector with 19% which are around 37 start-ups under its belt. This is another good representation which is due to high intensity of café's, restaurants and other food ordering portals. Since the high demand of operations from these, we can understand that, as previously mentioned, there are several start-ups that operate in this segment.



*Figure 15: Sub-category composition under the Payment Acceptance segment*

Recurring Payments have an understandable number of 19 start-ups (10%), the reasoning for these start-ups having a decent number of actors could be due to convenience they bring in for the users, especially as every individual would have a few recurring payments they would need to manage, either it could be from everyday bills to subscriptions. The last set of start-ups, all with an equivalent or less than 1% of a contribution are Smart POS, smart shop & other. Given that they are very different service than we are used to, it can be expected that it would take a while for them to shine as expected and even to have a greater number of companies operating here that are not major incumbents.

**Technologic Solutions:**

This segment as explained before has a high number of start-ups catering there due the imminent requirement of wanting a technological basis to allow companies to operate in this format and for them to offer services with such payments. The need for these are ever increasing and could be deemed, atleast for the near future as a segment that if not indicating high increase, it will indicate a stable representation of the companies.

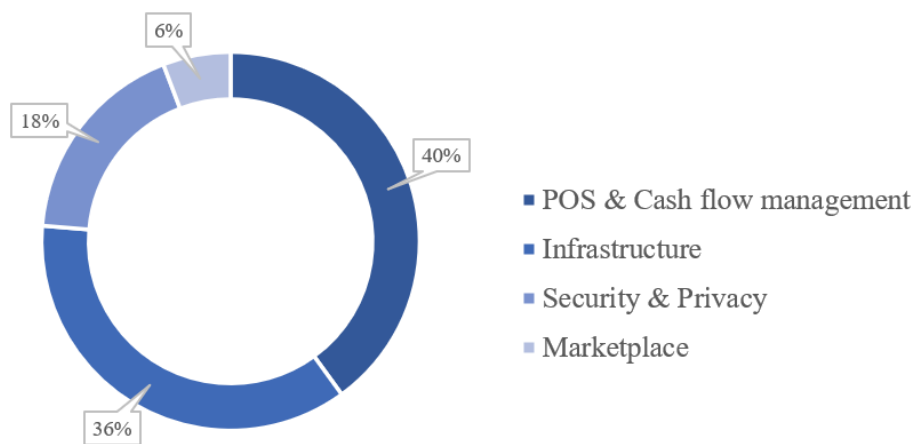
<b>Technologic Solutions</b>	<b>190</b>
POS & Cash flow management	76
Infrastructure	69
Security & Privacy	34
Marketplace	11

*Table 4: Sub-category composition under the Technologic Solutions segment*

The pure technological approach of these companies allows to them cater for an extremely wide segment and also allows them to have a better market positioning that lets them face any radical change with convenience or even be capable enough to be the ones to introduce that change.

POS & Cash flow management are a very direct company in their proposal of operation and given their specific work of catering to the main segment of payments, which is devices and services that allow merchants transactions and similar payments, we can denote to their high 40% contribution.





*Figure 16: Sub-category composition under the Technologic Solutions segment*

Infrastructure has the next highest number of start-ups that fall into this category, accounting for 69 companies (36%). The extreme number of companies providing an overall infrastructure of any kind to their clients without pertaining to one particular field of specification, this gives them a broader group to cater to and even allows them to keep certain stability. Another point to be noted about their operation could be that they will have a completely versatile team of individuals working with them, which adds a lot from the value perspective.

Security & Privacy is a sector that has been experiencing a steady growth in its numbers and this is one of the major concerns that the current youth has been terrifyingly concerned with. Having one's identity, details and other significant information compromised makes individuals vulnerable to the point that they are all inclined to revert to such technical contraptions to help them with their Privacy. This overall also helps them keep their assets secure from invasion, allowing this segment to cover an overall of 18%.

The least contribution of 6% comes from the Marketplace, which is a very low segment for this particular category, specifically because of how much value online marketplaces hold in an individual's life. But their low number does not mean these aren't performing well, this could be due to how specific these are in their domain of operation. But another factor that adds on to this could be that there are already enormous marketplaces that offer customers with almost everything they would need.

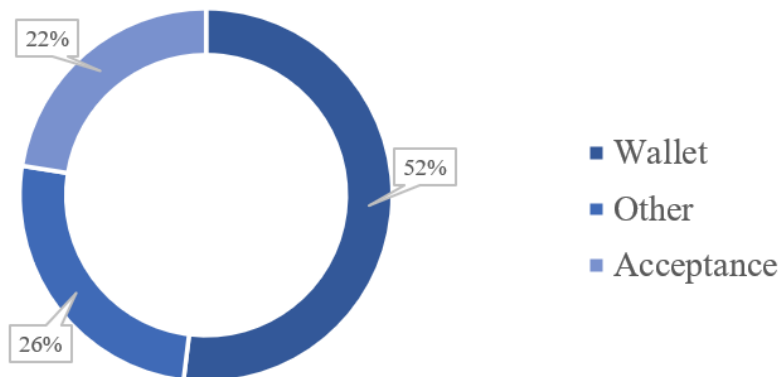
## **Blockchain:**

Dissecting the 129 start-ups that come under the blockchain category further we observe their one point of dominance. As indicated in Table 5 and Figure 18, we noticed that the highest sub-category with 67 start-ups, contributing to 52% of the overall in focus blockchain companies was that of wallet. This is an understandable trend as to be able to use their coins or other currencies that operate under the blockchain technology it is quintessential to firstly own a wallet.

<b>Blockchain</b>	<b>129</b>
Wallet	67
Other	33
Acceptance	29

*Table 3: Sub-category composition under the Blockchain segment*

The wallet encapsulates features that allow the users to buy, store and exchange the currencies, acting as a basic platform for getting to use them as a form of payment.



*Figure 17: Sub-category composition under the Blockchain segment*

Acceptance is another sub-category of blockchain which is specifically aimed at allowing merchants to accept blockchain backed payments. There are 29 start-ups in our dataset, contributing to 22% of the blockchain organisations. The middle 26% is populated by start-ups which fall into the other category. The incredible potential that blockchain technology holds is the main motivation behind several start-ups coming up with market new ideas to assist and completely transform the process of performing payments.

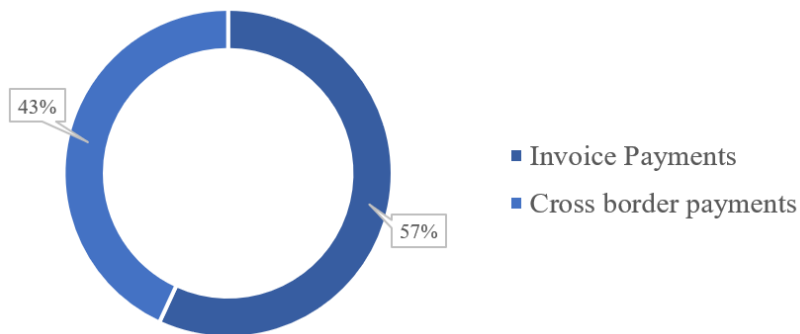
### **Sending Payments:**

Sending Payments has two prominent sub categories which are Invoice Payments with 62 start-ups and Cross border Payments with 47 start-ups. Invoice payments have a higher contribution as they are very essential for merchant businesses to manage their monetary transactional.

<b>Sending Payments</b>	<b>109</b>
Invoice Payments	62
Cross border payments	47

*Table 4: Sub-category composition under the Sending Payments segment*

The 57% of contribution that comes from this sub-category is purely due to the impact overall management platform that these companies provide which make merchant businesses easier to be handled and also helps them experience a reduced middle fee that would be incurred to process these transactions.



*Figure 18: Sub-category composition under the Sending Payments segment*

The next 43% are occupied by Cross border payments, which are comparatively high in the overall sub-categories. The increased globalisation is the reason for the steep rise of companies that operate within this segment of product and service provision.

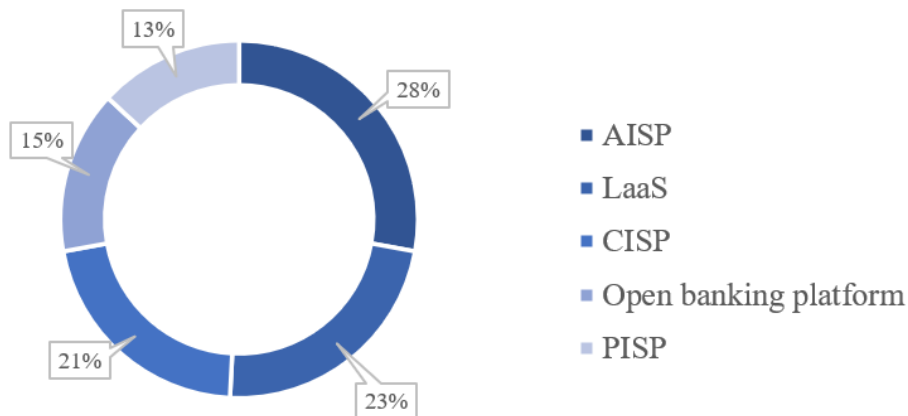
### **Open API:**

Open API is a segment with noticeably few, in fact the least number of start-ups overall. Having 5 sub-categories working under it, let's see the contribution and the possible reasoning behind them with the help of Table 7 and Figure 20.

<b>Open API</b>	<b>61</b>
AISP	17
LaaS	14
CISP	13
Open banking platform	9
PISP	8

*Table 5: Sub-category composition under the Open API segment*

Open API is a category which is mainly dominated by start-ups that provide collaborative banking and financial services catering to both institutions and its users. The top 3 segments are AISP, Laas and CISP with very similar number of start-ups working in there i.e.; 17 (28%), 14 (23%) and 13 (21%). Not only can they provide customers with the solutions enhanced from Open API but also through the help of the PSD2 directive which allows start-ups and traditional financial institutions to work collaboratively.



*Figure 19: Sub-category composition under the Open API segment*

The remaining 2 segments are of Open banking platforms and PISP. Open banking platforms are the highest in this category with 9 start-ups having a contribution to only 15% of Open API start-ups. Open banking platforms is a way for companies to enter this market without having had a previous traditional financial market backing. PISP has the lowest number of 8 start-ups (13%). These low numbers of the overall category can be due to the amount of collaboration with banking services these start-ups would have to do. While it is great opportunity, this might also slow down their anticipated

pace of functioning for all the companies and also, they would have a huge burden of integrating very old traditional services to their newly proposed model.

**Others:**

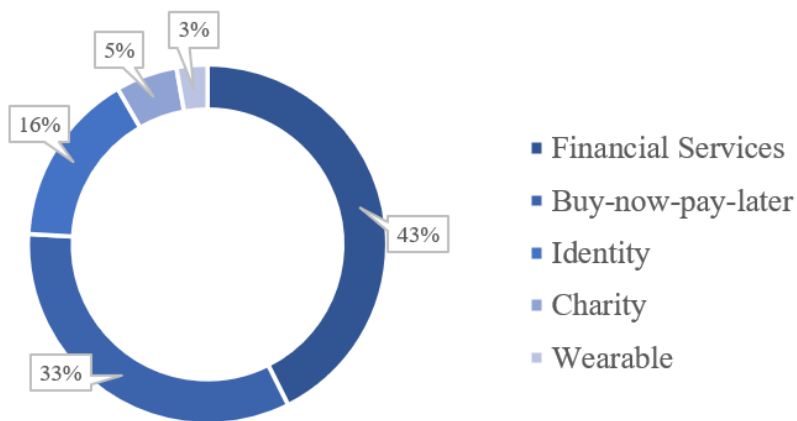
This sector, despite having extremely unique companies that would definitely be lesser in number with the major contributors, this segment is not last in the list of start-up segments. The highest contributors to this category are the 46 start-ups that provide services relating to financial services with 43%, this phenomenon could be explained by the wide range of services that fall in this category and the significance financial services has in all segments, either for other companies or for individuals.

<b>Other</b>	<b>108</b>
Financial Services	46
Buy-now-pay-later	36
Identity	17
Charity	6
Wearable	3

*Table 6: Sub-category composition under the Other segment*

Buy-now-pay-later is a delayed payment service which boasts a good number of 36 companies (33%). Coming in second, this is an interesting segment to operate in given the consumer-focused approach this has when opposed to its traditional methods of heavily fined instant loans, credit cards and other financial repayment services. Not only is this convenient, but it also broadens the payment options offered at the Point of sale at the affiliated merchants.

Identity has the next 16% with 17 start-ups. This rise of these start-ups could have a similar reasoning to the ones mentioned in having a secure infrastructure for management of funds and other assets. But adding another layer of security should not over complicate things. For this reason, we can acknowledge the rise of start-ups that focus on providing single access identification systems.

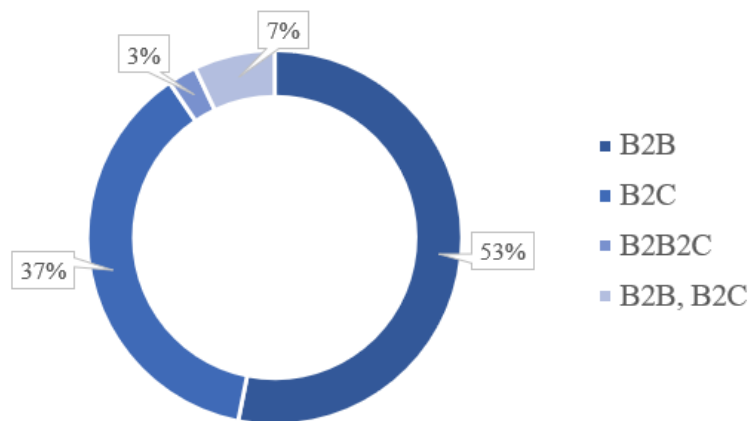


*Figure 20: Sub-category composition under the Other segment*

Finally, the remaining of start-ups focusing on Charity and Wearable have a low number of working companies i.e.; 6 (5%) and 3 (3%). The reason for their extremely low representation is mainly due to the fact that either these services are already being provided in combination with other services or that they have older more major companies dominating the market.

**Customer target areas:**

Shifting out focus from scrutinised analysis of categories and sub-categories, we should now focus on the specific customer target split-up. Let’s firstly have an overall look at the number of start-ups that are contributing to each segment through Figure 19. The highest segment of customer focus is B2B with 53% and this is obvious given the high demand from a business perspective to have the most advanced payment technologies as it is the essence of their functioning. The next segment is of B2C with 37%, this again can be reasoned out as accurate as after businesses the next major segment would be to provide to individuals either for them to participate in the earlier mentioned transactions with businesses and amongst themselves. The next two segments, both with the least contributions of 3% and 7% are B2B2C and B2B, B2C. These low numbers could be explained by how essentially, they need to cater to both the segments and this could be too intensive of work and also sometimes could take away from their main focus on one of the both.



*Figure 21: Categories of customer segments*

Now that we are done with the overview of segments, let's focus on them in the aspect of the operational categories to understand which trends under each segment and to try and explain them better with the help of Figure 20.

Mobile Wallet, given how handy it is from individual payments perspective it has an obvious major dominance from the B2C sector with 199 start-ups. B2B here has around 79 start-ups, which could be explained from how these concepts of individual convenience can also be applied to businesses at a similar scale. The next two segments of B2B, B2C and B2B2C are both as justified in the section with low values of 10 and 8 respectively.

The segment of Technologic solution would have an opposite approach when compared to previous segment, which would be to focus more on B2B sector with a total of 171 start-ups. Technologic solutions as an operational sector provides the technological base and the overall structure for the feasibility of digital payments. For the same reason as the point of this category is on pathway of these payment processes with very less direct consumer focus, there are only 7 start-ups that fall under the B2C segment. The next two lower segment of B2B, B2C and B2B2C have a very low representation of 10 and 5 start-ups in this section.

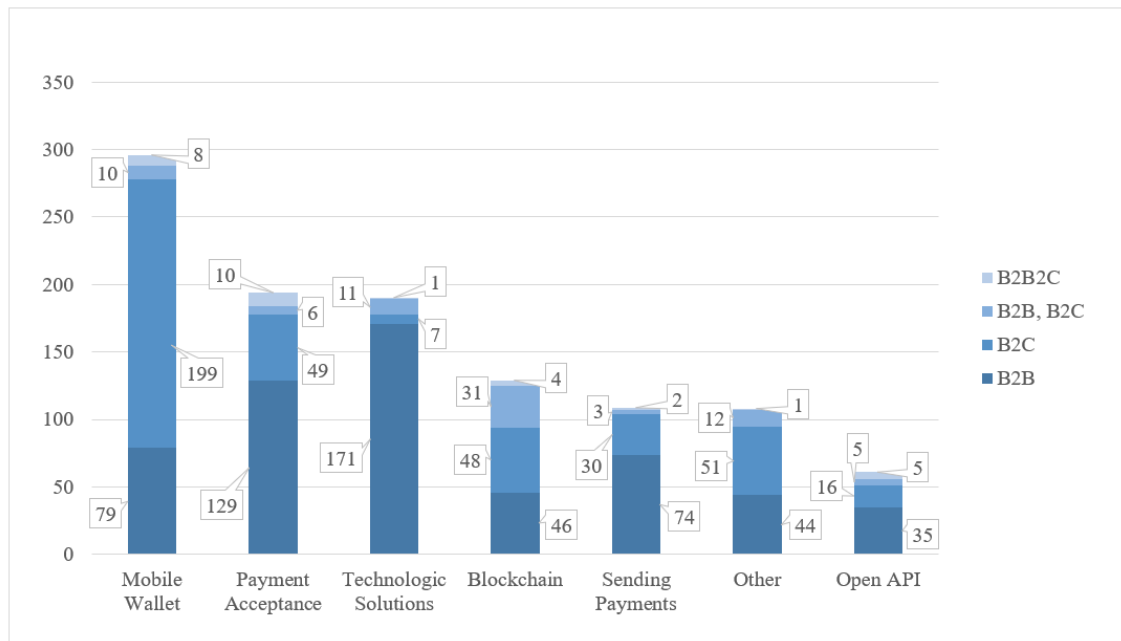


Figure 22: Customer groups under each operational segment

Payment Acceptance, despite having a similar provision of payment pathway, caters equally to both the segments. This can be as this while allowing merchants to accept payments, it also lets the users make the said payments, having a double focus. From this reasoning, B2B has 129 start-ups with B2C segment closely following up with their 49 start-ups. The last two sections of B2B, B2C and B2B2C have a similar situation to previous section with 10 and 6 start-ups.

The blockchain segment, given their newer inclusion explains the equal interest towards both sides of the customer target ranges specifically due to its wallet nature, allowing the users to make payments. But since this is a possibility, there also has to be provision for businesses to accept these payments. Following this logic, B2C has 48 start-ups, with a good follow-up the B2B sector has 46 start-ups. As opposed to the similarity present in all other segments, here B2B, B2C has an extremely good representation of 31 start-ups, possibly due to its double focus. B2B2C segment has 4 start-ups.

The invoice payment sub-category's high influence makes the Sending Payments very helpful to the start-ups that focus on the B2B sector which explains the higher representation with 74 start-ups. But also, the inclusion of cross border payments, allows the B2C category to hold-up for itself with 30 start-ups. As explained, the other two sectors of B2B, B2C and B2B2C have 3 and 2 start-ups.

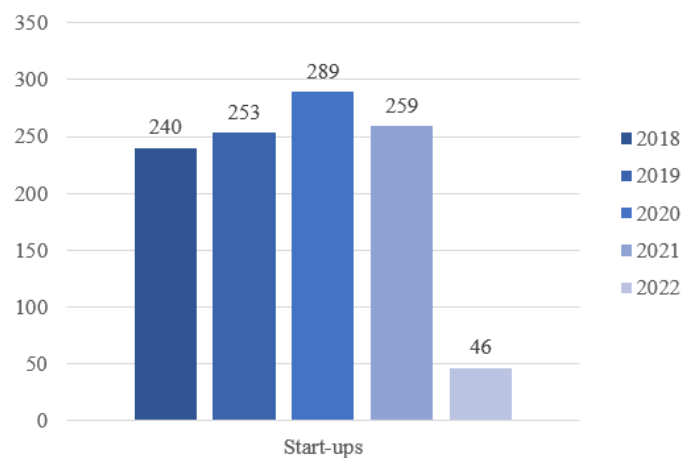


Start-ups that fall under the other category have almost similar representation of 44 start-ups for the B2B sector and slightly dominant 51 start-ups in the B2C sector. As for this segment generalisation of customer focus would be complicated given its undecided nature, it is a perfect representation to see equal numbers. B2B, B2C and B2B2C have a very untrendy representational number of start-ups with 12 and 1.

The final section of Open API, from its heavy backend influence is more for Businesses to adopt these services and products and being strengthened from this perspective we can support the argument that there is a higher B2B focus with 35 start-ups and a lower customer focus with a B2C representation of 16 start-ups. The least two contributing sectors of B2B, B2C and B2B2C have an equal number of 5 start-ups each.

### **Annual Trends**

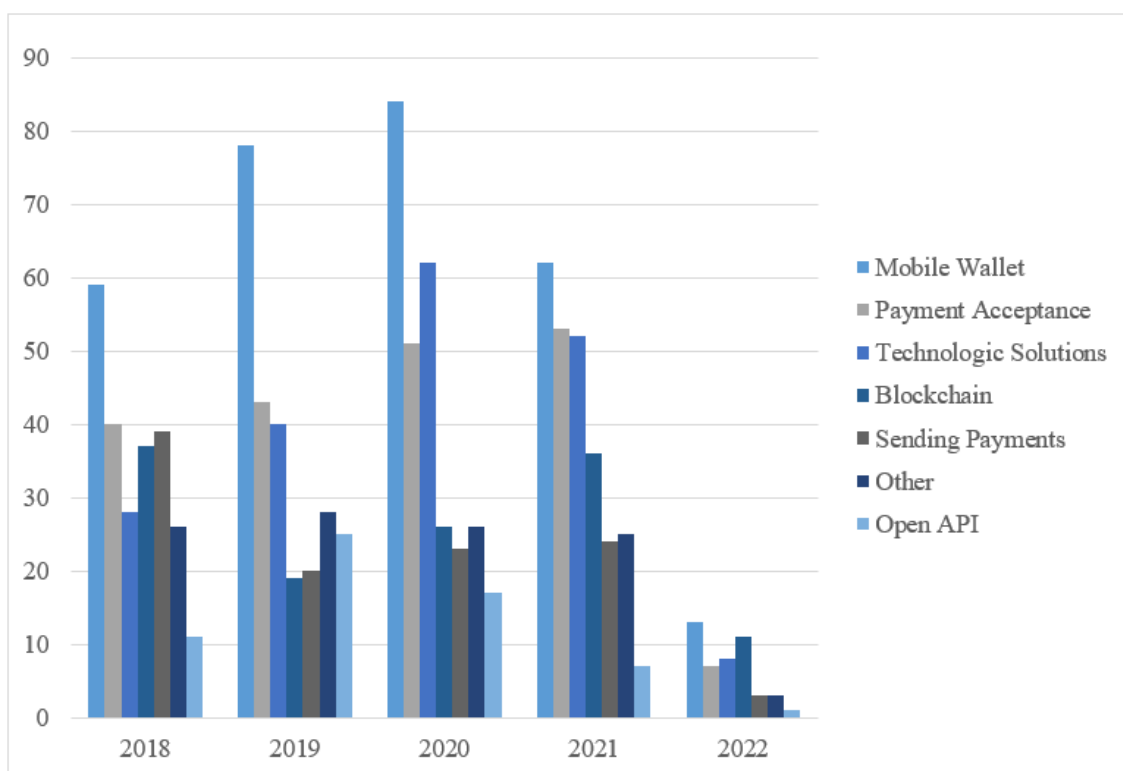
Since we also have access to the founding years of these start-ups, which was also one of our major criteria for data selection and filtering, it would be great to understand the trends also using the annual representation. Given our reasoning behind purposely including 5 years for having enough data to get some information for mapping it out, we have an observable trend to focus on in Figure 24.



*Figure 23: Annual trend of Start-ups*

From year 2018 to 2019, as expected, we notice a linear rise in start-ups from 240 to 253. From the interesting turn of events during the pandemic and the desperate push for the need of more advanced systems of assisting the payments sector, we notice a steep

rise from 253 to 289 start-ups which is a very drastic increase but can be supported by the critical year that 2020 was. The number of start-ups in general and as a result in the payments sector reached their all-time high in the pandemic. The isolation in so many ways required the public to revert to digital means and this is when the demand for digital solutions began their peak.



*Figure 24: Segmented representation for each year*

In 2021, we notice that when compared to the years before the onset of covid-19 (2018 and 2019), there was still a noticeably high increment in the number of start-ups (259) following the rising trend. But as a follow up from 2020, we could assume some of the possibilities for a not similar increase but a decrease to origin from the fact that the high release of solutions was still being digested by both businesses and the public or even that the push for change was very drastic in 2020, needing more quick paced solutions and 2021 would just be a slower follow up, which changes the whole enclosure for the better. The low number of 46 start-ups in 2022 are due to the fact that the data base was collected only till the initial section of 2022, also as Crunchbase is updated by the start-up owners themselves, several of them sign up only after one year of their founding.

This concludes our general trends overview, now let's take a deep dive into each category through Figure 25 which clearly depicts the yearly situation from a categorical point of view.

Looking at the mobile wallet category, we see a similar trend to that of the overall annual representation but comparing them to the other categories that exists, we notice that in all 5 years of the collected database, this segment overtook the others in having the highest number of start-ups, which could be from the ongoing digitalisation that in general was occurring. The technologic solutions follow the exact trend as the overall apart from the previous mentioned clash with mobile wallet.

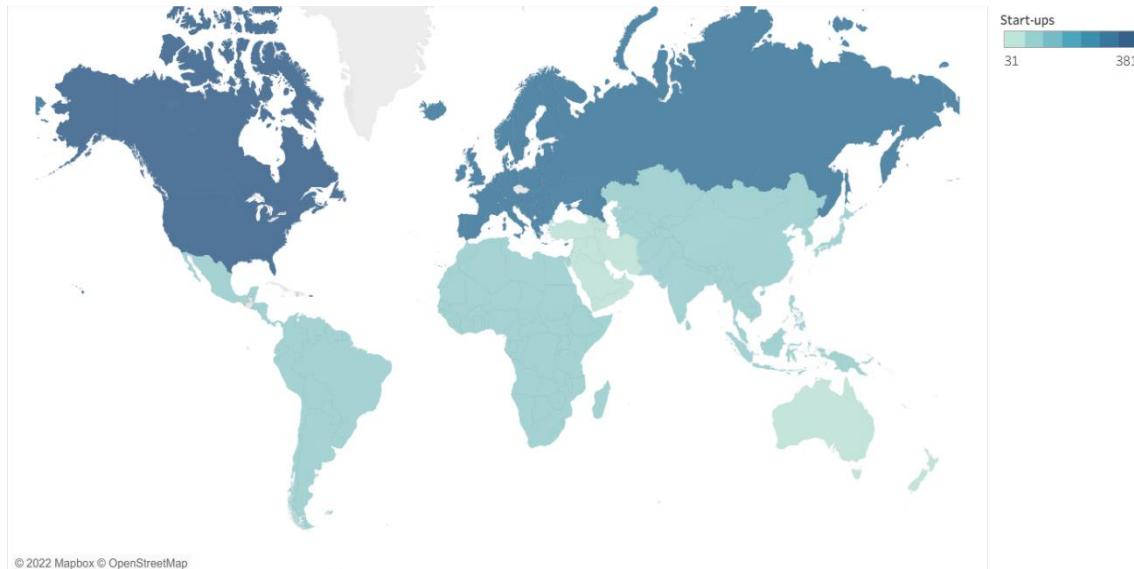
The Payment Acceptance segment indicates a slight increment in their numbers in all the years, maintaining their second position in almost all years except in 2020. Here we notice their close follow-up i.e.; Technologic Solutions finally catchup to them. But one major reasoning for this could be the pandemic, this adverse incident pushed for all entities to drastically evolve in their modality of operation. This not only increased the demand for such technologies but also gave space to major innovations to occur in the payments enclosure in general.

As for blockchain payments, we see a very large number of start-ups rising in the payment's environment in 2018, but has a drastic fall in 2019 from where it has been observing a steady increase. Sending Payments has a no observable pattern that we can explain, while the number of start-ups here are high in 2018, it notices a major fall in 2019. From 2019 to 2021, it has a steady increase. This possibly could be due to other segments having this feature included along with their own product value proposals.

Open API faces a steep decrease after its peak in 2019, for the following years till current. The only possible explanation of its highs in 2018 and 2019 could be that the PSD2 law was brought into action strictly around that time and as time passed the start-ups focusing on that fell down to a low. The other segment also has an unexplainable pattern with a steady increase from 2018 to 2019, a drastic fall in 2020 and then another increase in 2021.

## Regional Influences

We also decided to focus on the region of implementation of these start-ups to check if we could also pin-point to any possible regional trends that the payments enclosure might have.



*Figure 25: Global representation of Start-ups*

From the global map represented in Figure 26 which depicts the saturation of start-ups in each of these regions, categorised based on continents they operate in or have their headquarters housed in. The range scale used shows the number of start-ups on a scale of the blue hues deepening in 7 shades from 31 (Australia) to 381 start-ups (North America). We understand that North America has the highest number of start-ups with about 381 of the overall in-scope 1087. Europe comes in second with their 283 start-ups which is followed by Asia-Pacific region with 130 start-ups. This concludes the top 3 regions, moving on the remaining numbers, we see South America come in with their close 110. Followed by Africa with 87 start-ups, the final spots are taken up by the Middle-east with 65 start-ups and lastly, we have Australia with 31 start-ups.

Let us now try to see how the regions impact the categories that we have assigned. While still following up the major numbers of dominance indicated before, we can also study each of these continents in comparison with each other from the perspective of operational categories. Looking at Figure 27, We can observe that North America Peaks with Mobile Wallet and follows it up with a significant dominance in the Technologic

Solutions category. While all other numbers are high for North America, it falls below Europe in the Open API segment.

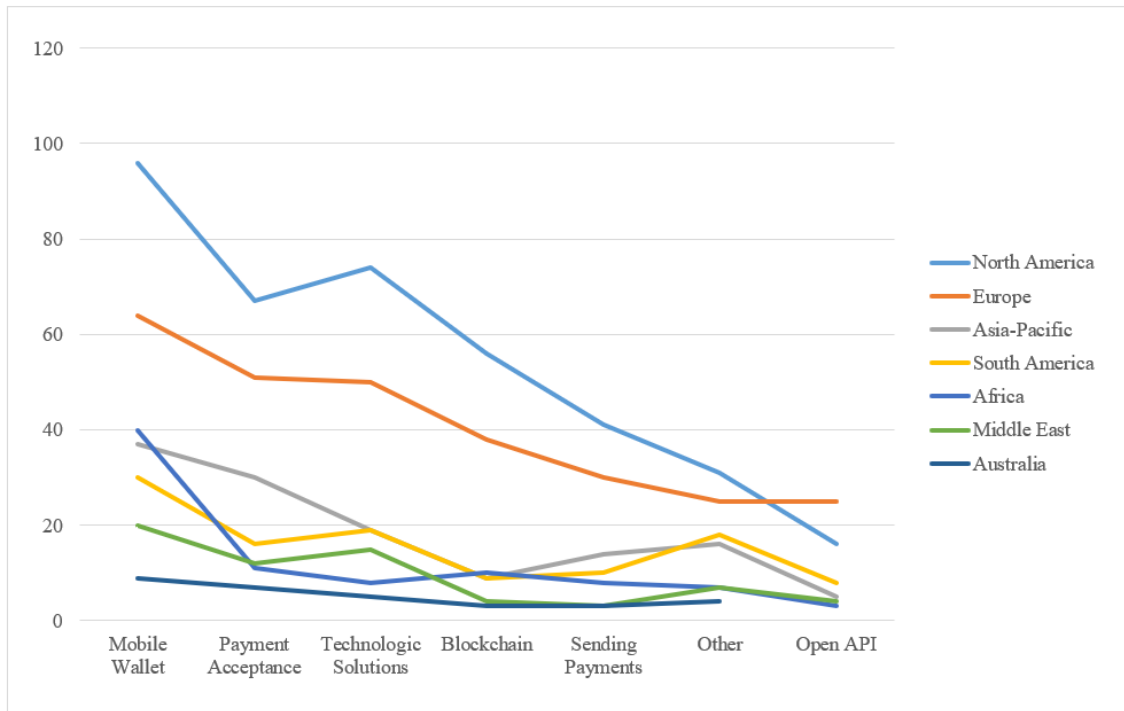


Figure 26: Regional significance by each Category

Which can obviously be explained by the strictly enabled PSD2 directly applied to all financial entities, allowing Europe to dominate here. Europe coming in second overall, similarly to North America also peaks with Mobile Wallet, then with Technologic Solutions following a similar slope in the other segments. Asia-Pacific region also has its personal dominance in the Mobile Wallet sector amongst all other domains they operate in. South America, Australia, Middle East and Africa have their personal highest in Mobile Wallet sector but interestingly show a spike in Technologic solutions and in the very vague category of Other.

**Start-ups with highest funding**

Following the trends single individually, we understood the categories by their own. From a practical point of view, it would better to probably also take into consideration the overall funding provided to the companies. For our analysis, we consider only the top 10 highest funded start-ups and they have been indicated in Table 9.

Companies	Overall Funding in USD	Investors	Category 1	Category 2	Target
C6 Bank	\$ 2,29,01,47,150.00	1	Mobile Wallet	Digital bank	B2B, B2C
Ramp	\$ 1,36,00,00,000.00	39	Technologic Solutions	POS & Cash flow management	B2B
SaltPay	\$ 1,09,00,00,000.00	8	Technologic Solutions	POS & Cash flow management	B2B
Fireblocks	\$ 1,03,90,00,000.00	29	Technologic Solutions	Security & Privacy	B2B
Capchase	\$ 94,96,00,000.00	21	Sending Payments	Invoice Payments	B2B
Bakkt	\$ 93,25,00,000.00	17	Blockchain	Other	B2B2C
CRED	\$ 80,14,92,149.00	34	Mobile Wallet	Cashback & Rewards	B2B2C
Scalapay	\$ 72,74,79,971.00	11	Payment Acceptance	Buy-now-pay-later	B2C
BharatPe	\$ 68,05,34,194.00	23	Payment Acceptance	Acquiring	B2B2C
Deel	\$ 67,90,00,000.00	44	Sending Payments	Invoice Payments	B2B

*Table 7: Top 10 funded companies*

C6 Bank is the has the highest funding of \$2.29 Billion USD. As indicated it falls in Mobile Wallet category and specifically in the Digital Bank segment, allowing them to cater to both B2B and B2C. Another interesting point to notice is that the number of investors for this company is only 1. The next two start-ups (Ramp and SaltPay) both operate in POS and cash flow management sector under technologic solutions. Having funding of \$1.36 Billion USD and \$1.09 Billion USD. Fireblocks comes in 4<sup>th</sup> place with a funding of \$1.03 Billion USD, also operating in the Technologic Solutions segment, they specialise in the Security & Privacy. All of the 3 previous start-ups target the B2B segment.

The next set of companies fall below the \$1 Billion USD mark. Capchase, specialising in the Invoice Payment sector, obviously catering for B2B target have a funding of \$949.6 Million USD. Bakkt is a blockchain focusing company, catering to B2B2C having received an overall \$932.5 Million USD. CRED, a mobile wallet service offering cashback & rewards on credit payments, catering to the B2B2C sector has a funding of \$801.5 Million USD. Scalapay and BharatPe both operate in the Payment Acceptance, the first is BNPL service (funded \$727.5 Million USD) with a B2C focus and the second is more focused on Acquiring allowing them to be a B2B2C company having a funding of \$680 Million USD. Lastly at 10<sup>th</sup> place we have Deel with a funding of \$679 Million USD, operating in Invoice payments for a B2B targeted sector.

Finally, we can again go back to our categorial focus and observe that Technologic Solutions has a total funding of \$3.5 Billion USD, Mobile Wallet of \$3.09 Billion USD, Sending Payments of \$163 Billion USD, Payment Acceptance of \$141 Billion USD and Blockchain of \$932 Million USD.

## **CHAPTER 4: CONCLUSION**

The analysis has presented us with a lot of information and has certainly indicated to us the predominance of certain fields in the payments industries from a global perspective. From dissecting each working category, we understand which trend dominates currently and how it has progressed over the span of 5 years. But to digest all of these analytical points, we need to put them in a logical perspective for better comprehension.

### **Interesting segments and their possible trends**

While all the previous data clearly points to the dominance of Mobile Wallet globally, there are specifically two extremely interesting aspects that contribute to it, All-in-one-platforms and Digital Banks. As mentioned in literature and the analysis, the mobile wallet segment has an obvious motive of convenience and ease of access as their main points for their great success. And all of this is still seemingly on a dominant rise. Both the sub-categories in consideration are similar in their reasoning of capturing our interest, these sub-categories serve the purpose of having a single point of access to all the associated features. With the digital bank application, the users can access all their banking needs easily through one mobile feature without needing to go to the bank or even fire up their laptops to use the browser version. It is quicker, more convenient and does most of the essential activities that a user would need every day. This clearly reflect in the rising number of start-ups dedicated to providing users with this service.

All-in-one-platforms is the other interesting sub-category on the rise for very similar reasons due to its identical essence of functioning. This is unique in a way that each of these applications, even though they combine all the requirements such as paper working, formal procedures, connections and payments, they are each meant for one specific need. For example, it could be an application solely dedicated to healthcare, having all contacts, assisting in booking appointments, selecting services, managing all relevant paperwork and making payments all at one point. Boiling it down to needing only one application to access all healthcare required. These have a great potential to grow, possibly with a similar trend to that of a marketplace.

Another sub-category that has been on the rise in the past few years of its introduction is the Buy-now-pay-later (BNPL) sector. These deferred payments point of sale loan services are slowly becoming a basic offering in payment method at most retail businesses. Similar to a credit card convenience but specifically meant for a lower monetary purchase allowing the user to not pay any extra fees on these 3-5 instalment expenditures.

One important point about any loans service would be how it affects the individual's economic health and their credit score, this certain times does more damage than help, due to the heavily incurred interest rates, drowning the person in debt. This is where BNPL comes in as a helpful source for a small loan, usually reserved for merchant purchases and not a direct in-hand cash loan. Allowing the merchants also to benefit from the collaborative effort of retaining the customer and growing their business. This acts as a great provision of increasing efforts in customer service.

From our analysis we see around 36 start-ups that have stepped their foot in this sector of working. Also, from the literature we see that around 40% of young adults have used this service in the last year as opposed to the 2020's 33% (Bain & Company, 2022). This not only points to its steady rise, but it also indicates the evolutions in all aspects of payments (credit services) from a customer perspective. Allowing the users to reap the best benefits without falling to the commercial loopholes.

### **Start-ups rise from the Pandemic**

As represented in our analysis segment of Annual trends, we observe a drastic increase in the number of start-ups by almost 15% which was three times the normal trend being followed previously. The sudden onset of covid-19 in 2020, pushed for a global adoption of remote services in every field. As for payments, there was a lot more inclusion of technological advancements with an overall goal of achieving contactless payments. From wallets to NFT services, all of them were more accepted after the worldwide isolation than they were before. This created a thirst in users for a more advanced yet well integrated system of payment operation, giving rise to tremendous



number of start-ups catering to an extremely varied range of services. Be it mobile payments, banking, cryptocurrencies or POS loan services.

While 2020 indicated a giant increase in the curve of start-ups, the following year of 2021 saw a lesser number of start-ups. Although, it is still in line with the previous numbers (years before 2020) it is observably lower than the heavy number of 2020. This is possibly explained by the fact that the successful saturation of start-ups during covid-19 is still being digested by the public to this day. This in no way means the sector is saturated, but that there was an abnormal push for technologies in that year which would not probably be repeated as this was observed during a global period of not having a complete system of advanced payment as a significant option anywhere, which definitely was an adverse condition of operation.

### **Regional trend in payments start-ups**

Globally, we observe that North America dominates the start-ups sector with its 35% contribution to the overall start-ups in the database, but from our analysis and the literature we observe the highest rise in start-ups that origin from Asia-Pacific. Having the highest segment of young adults, Asia-Pacific experienced the biggest shift to digital payments contributing to a whopping 40%. In 2019 itself, there were about US\$243.6B digitally transacted in Asia-Pacific (EY, 2021). As for the cryptocurrency exchanges, out of the top 50 transactions, Asia-Pacific contributed to a major 40% in 2019. This supports our argument of APAC rising in their base of digital payments. The number of start-ups operating went up to a peak of 40 start-ups in 2020 and has seen a major increase from the initial of 15 start-ups in 2018.

Africa, although not making it to the major 3 regions, contributes majorly to the overall start-ups with 87 companies. It is a segment which is similar to Asia-Pacific in the sense of its slow rise in digital payments. With the major part of the population falling in the young adult segment, most of population is inclined to incorporating rapid technology in the payments sector, specifically several of them aimed at cross-border and wallet payments. While it is an overall trend in the start-ups segment to have a higher number of start-ups in 2020 and a reduced number in 2021, possibly due to the previously

mentioned saturation. But Africa is the only region where the digital payment atmosphere observed a rise in start-ups from 22 in 2020 to 25 in 2021. In fact, there has been a constant increase in the African region by 3-4 successful start-ups every year (only based on the years considered). Stemming from the indicated numbers, we can anticipate a great number of start-ups arising from both these regions dominantly.

### **Limitations**

The data we use is only till the date of first quarter of 2022, if we would have access to complete data of 5 years, it would help us draw the trends out better. We could also observe the true effect of start-ups ecosystem post covid-19 pandemic. It would be a suggestion to keep our data limited to 2021, but this would clearly cut away on understanding how the payments technologies are evolving. Moving behind in time (use data from year 2017 or prior) would cause the same issue as the major technological push in the segment began only in very recent years. Apart from the limitations of the duration, we also had to deal with the inability to access certain webpages indicated on CrunchBase despite them being posted by the start-ups themselves. Several of these are under reconstruction or have very limited information to the service offering.

### **The potential for future research**

Since most of our research was conducted in a categorical perspective, a lot of the analysis was done at a surface level, mainly due to the previously mentioned limitations. Given more time and a fuller set of data, it would be very interesting to have a deeper look at all aspects of the mentioned sub-categories as well. This just being an initial study, presents a lot of room for further research as there would be more current data and having passed a few more months into this extensive globalisation, there would be a wait and see benefit for these newer trends, as they would have panned out very well to understand the developments and stability of these segments. It would also be beneficial from the point that most of these start-ups that have begun recently would be officially updated on the database in the coming months and would have functioned in the payments sector to analyse a more in-time situation of operation.

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