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DESIGN OF A SMARTPHONE BASED MOBILE FINANCIAL SERVICE

MEMORIA PARA OPTAR AL TÍTULO DE INGENIERO CIVIL
INDUSTRIAL

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RESUMEN EJECUTIVO

Las redes de pagos electrónicos constituyen uno de los pilares del comercio moderno. El acceso a estos servicios permite al usuario mejorar su calidad de vida al enfrentar menos inseguridad cuando el manejo del dinero, el acceso a nuevos productos y servicios que sólo están disponibles a través de plataformas de comercio electrónico y reducir el tiempo dedicado a la realización de pagos y el retiro de dinero en efectivo.

La alta penetración de teléfonos inteligentes en América Latina, donde los pronósticos predicen que para el año 2017 más del 44% de la población será el propietario de un Smartphone con internet móvil, presenta una oportunidad desafiante para proporcionar nuevos servicios basados en la tecnología de una manera más accesible y ubicua.

Por otro lado, las redes de pago electrónico actuales presentan altos cargos para los comerciantes, que van desde 1,5% a más del 5%, mientras que se subvenciona el lado comprador. Por otra parte, la baja capilaridad de las redes existentes empuja una gran demanda de dinero en efectivo que llega a más de USD \$ 40 mil millones por año en Chile y USD \$ 30 mil millones al año en Perú.

Ambos factores han incentivado el creciente interés de los usuarios en los servicios financieros móviles, ya sea para cuentas personales, pagos de facturas o servicios de prepago. El reciente desarrollo de protocolos criptográficos como Bitcoin y Ripple permite a los desarrolladores crear servicios financieros móviles de bajo coste derivados de la utilización de protocolos de transacciones distribuidas.

Este trabajo presenta Dine: un Servicio Financiero Móvil basado en Smartphones y habilitado por el protocolo de monedas criptográficas Ripple. En base a un enfoque centrado en el Delta Model, Customer Discovery y Lean Startup se presenta un análisis del mercado y las hipótesis de desarrollo de servicio que guiarán el modelo de negocios del emprendimiento.

Un plan de negocios es presentado junto con la primera implementación de un prototipo funcional limitado para la aplicación Smartphone y plataforma web.

EXECUTIVE SUMMARY

Electronic payment networks constitute one of the backbones of modern commerce. Access to these services allows user to improve their quality of life by facing less insecurity when handling money, accessing new products and services that are only available through e-commerce platforms and reducing the time spent on making payments and retrieving cash.

The high penetration of Smartphones in Latin America, where forecasts predict that by 2017 over 44% of the population will own a Smartphone with mobile internet present a challenging opportunity to provide new services based the technology in a more accessible and ubiquitous way.

On the other hand, established electronic payment networks present high fees to the merchant side of the market, ranging from 1.5% to over 5%, whereas the buyer side is subsidized. Furthermore, the low capillarity of existing networks pushes a high demand for cash that reaches over USD\$ 40 billion per year in Chile and USD\$ 30 billion per year in Peru.

Both factors have incentivized users' growing interest in mobile financial services, whether for personal accounts, bill payments or prepaid services. Recent development in cryptocurrency protocols such as Bitcoin and Ripple allow developers to create low cost mobile financial services derived from the use of distributed transaction protocols.

This work presents Dine: a Smartphone based Mobile Financial Service supported by the Ripple open source cryptocurrency protocol. Based on the three part approach derived from the Delta Model, Customer Discovery and Lean Startup methodologies three product hypothesis are presented that aim to serve different use cases/segments of prepaid mobile financial services.

A business plan is presented alongside the first implementation of a limited functional prototype for the Smartphone application and web platform.

CONTENTS

1	Introduction.....	1
1.1	Motivation.....	1
1.2	Overall and specific objectives	2
1.3	Methodology	3
1.3.1	The Delta Model.....	3
1.3.2	Customer Discovery.....	6
1.3.3	Business Model Canvas.....	7
1.3.4	Lean Startup	7
1.4	Thesis structure.....	8
2	Preliminaries and Background	9
2.1	The Smartphone market in Chile and Latin America	9
2.1.1	Smartphone penetration rates.....	9
2.1.2	Operating systems	10
2.2	Mobile Financial Services Market.....	11
2.2.1	Smartphone Based MFS	12
2.2.1.1	Additive Smartphone Based MFS	12
2.2.1.1.1	Direct Link.....	12
2.2.1.1.2	Indirect Link	13
2.2.1.2	Transformational MFS.....	14
2.2.2	Cell Phone Based MFS.....	15
2.2.2.1	Additive MFS.....	15
2.2.2.2	Transformational MFS.....	16
2.3	Payment Networks	17
2.3.1	Two sided markets.....	17
2.3.2	Transaction volume.....	19
2.3.2.1	Chile.....	19
2.3.2.2	Peru	20
2.3.3	Alternative payment networks	21
2.3.3.1	Meal benefits payment network in Chile and Latin America.....	21
2.3.3.2	Prepaid payment networks in Latin America.....	23
3	Cryptocurrencies	26
3.1	Electronic Cash.....	26
3.1.1	Bitcoin:.....	27
3.1.2	Ripple.....	30
4	Business Plan.....	32

4.1	Market analysis	32
4.1.1	The industry structure: understanding external forces	32
4.1.1.1	Threat of new entrants in the prepaid MFS industry	33
4.1.1.2	Threat of substitute services in the prepaid MFS industry	34
4.1.1.3	Bargaining power of customers in the prepaid MFS industry	34
4.1.1.4	Bargaining power of suppliers in the prepaid MFS industry	35
4.1.1.5	Intensity of competitive rivalry in the prepaid MFS industry	36
4.1.1.6	General evaluation of the prepaid MFS industry	37
4.1.2	Strategic positioning	37
4.2	Customer discovery	38
4.2.1	The mission: startup scope and competencies	38
4.2.2	Startup hypothesis	39
4.2.2.1	Customer hypothesis	39
4.2.2.1.1	Types of customers	39
4.2.2.1.1.1	End users: individual buyer	39
4.2.2.1.1.2	End user: corporate buyer	41
4.2.2.1.1.3	End user: retailer/merchant/service provider	42
4.2.2.1.1.4	Recommenders and Influencers	44
4.2.2.1.1.5	Economic buyer and/or decision maker	44
4.2.2.1.1.6	Saboteurs	45
4.2.2.1.2	Customers problems	45
4.2.2.1.3	Return on Investment (ROI) justification	46
4.2.2.2	Product hypothesis	46
4.2.2.2.1	Product features	47
4.2.2.2.1.1	Smartphone based mobile account: Dine_account	47
4.2.2.2.1.2	Corporate prepaid services: Dine_corporate	47
4.2.2.2.1.3	Retail/Merchants/Service providers: Dine_commerce	48
4.2.2.2.2	Product benefits	48
4.2.2.2.2.1	Smartphone based mobile account: Dine_account	48
4.2.2.2.2.2	Corporate prepaid services: Dine_corporate	49
4.2.2.2.2.3	Retail/Merchants/Service providers: Dine_commerce	49
4.2.2.2.3	Intellectual property	50
4.2.2.2.4	Dependency analysis	50
4.2.2.3	Channel and pricing hypothesis	50
4.2.2.3.1	Channel	50
4.2.2.3.2	Pricing	51
4.2.2.3.2.1	Dine Account	51
4.2.2.3.2.2	Dine Corporate	51

4.2.2.3.2.3 Dine Retailers	51
4.2.2.4 Demand creation hypothesis	52
4.2.2.4.1 Creating customer demand.....	52
4.2.2.5 Market type hypothesis	52
4.2.2.6 Competitive hypothesis	53
4.2.2.7 Operational cost and revenue hypothesis.....	53
4.2.2.7.1 Costs	53
4.2.2.7.2 Revenues.....	54
4.2.2.8 Business Model Canvas.....	54
4.3 Financing	58
5 Minimum Viable Product Design and Prototype	59
5.1.1 The Lean Startup Cycle.....	59
5.1.2 Technological Support	60
5.1.3 Minimum Viable Product	60
6 Conclusions and Future Work.....	62
7 Bibliography.....	63
8 Annexes	67
8.1 Annex 1: “Ripple: A Primer”.....	67
8.2 Annex 2: “Gateway integration guide”	80

Index of Figures

<i>Figure 1: Segmentation according to different degrees of value added. Source [14]</i>	5
<i>Figure 2: The three strategic positions as a guiding framework. Source [14]</i>	5
<i>Figure 3: The customer Discovery process. Source [4]</i>	6
<i>Figure 4: The Lean Startup Infographic. Source [40]</i>	8
<i>Figure 5: Operating systems market share on the internet as of 2013. Source [27]</i>	10
<i>Figure 6: Existing payment network structure. Source: Adapted from [25]</i>	18
<i>Figure 7: EU countries and Chile payment network fees. Source: Adapted from [25]</i>	18
<i>Figure 8: Transaction volume in the Chilean formal financial market. Source: Adapted from [38]</i>	20
<i>Figure 9: Transaction volume in the Peruvian formal payment network. Source: Adapted from [3]</i>	20
<i>Figure 10: Corporate prepaid services business model. Source: Adapted from [7]</i>	22
<i>Figure 11: Public key cryptography scheme. Source [41]</i>	27
<i>Figure 12: (A) Bitcoin chain of signatures. (B) Bitcoin blockchain. Source [26].</i>	28
<i>Figure 13: Bitcoin USD trading prices on Bitstamp. (A) Since the beginning of operations. (B) Six months October 2013 – April 2014. (C) 10 days April 7 – April 16. Source: Adapted from [bitcoincharts.com]</i>	30
<i>Figure 14: Preferred M-Commerce provider. Source [10]</i>	41
<i>Figure 15: Competitive diagram of Dine against existing payment networks. Source: Prepared by the author.</i>	53
<i>Figure 16: Business Model Canvas Dine Commerce. Source: Prepared by the author.</i>	55
<i>Figure 17: Business Model Canvas Dine Account. Source: Prepared by the author.</i>	56
<i>Figure 18: Business Model Canvas Dine Corporate. Source: Prepared by the author.</i>	57
<i>Figure 19: Lean Startup Cycle for Dine. Source: Prepared by the author.</i>	59
<i>Figure 20: Dine’s MVP positioning. Source: Adapted from [35].</i>	60

Index of Tables

<i>Table 1: Profiling the three strategic options. Source [14]</i>	4
<i>Table 2: Smartphone market in Latin American countries. All figures in millions. Adapted from [13].</i>	9
<i>Table 3: Smartphone operating system market share and shipment volumes for 2013. Adapted from [13].</i>	10
<i>Table 4: Examples of MFS based on the classification proposed by Telefonica. Source: Prepared by the author.</i>	12
<i>Table 5: Principal Apps, downloads and ratings from Google Play Store. Source: Prepared by the author.</i>	13
<i>Table 6: Successful Cell Phone Network MFS. Source: Adapted from [28].</i>	15
<i>Table 7: Financial indicators for some Latin American countries. Source: Adapted from [42]</i>	19
<i>Table 8: Financial results from Sodexo and Edenred. Source: Adapted from [8] and [37].</i>	22
<i>Table 9A and 9B: Current legislation referring to electronic cash and prepaid financial instruments in Latin America. Source: Adapted from [citas citas citas]</i>	24
<i>Table 10: External Analysis. Entry Barriers. Source: Prepared by the author.</i>	33
<i>Table 11: External analysis. Exit barriers. Source: Prepared by the author.</i>	34
<i>Table 12: External analysis. Threat of substitute services. Source: Prepared by the author.</i>	34
<i>Table 13: External analysis. Power of customers. Source: Prepared by the author.</i>	35
<i>Table 14: Bargaining power of suppliers. Source: Prepared by the author.</i>	36
<i>Table 15: Competitive rivalry. Source: Prepared by the author.</i>	36
<i>Table 16: Five force's general evaluation of the prepaid mobile financial services industry. Source: Prepared by the author.</i>	37
<i>Table 17: Mission statement. Source: Prepared by the author.</i>	38
<i>Table 18: Chilean SMB as of 2012. Source Internal Revenue Service. Source [36].</i>	42
<i>Table 19: Business Income according to economic activity. Source: Adapted from [17].</i>	44
<i>Table 20: proposed fee structure for retailers. Source: Prepared by the author.</i>	51

1 INTRODUCTION

1.1 MOTIVATION

Payment systems are an essential component of human societies. Early civilizations traded on the base of the physical exchange of goods and services for other goods to which they assigned an equivalent value. Later, metallic tokens were created as a means of interchange between individuals. Coins were certified by the local authority with a distinctive design in order to assure the participants of the transaction that the amount of metal in the coin was uniform. This was a great advantage for the flow of goods and services since the transaction's friction was reduced due to third party independent validation of the coin value, making unnecessary the need to perform further tests in order to assure the amount of precious metal. However, since coins were actually made of the precious metal, they could be melted and transformed into other objects which gave a high instability to the exchange market, introducing variability money supply. As a consequence the fiat money system was created in certain societies where a face value is assigned to a certain object that has a much lesser real value than the one it represents. A third step was taken in the 20th century where the fiat money stop being a representation of a precious metal or any other good, but a mere compromise between the participants of the payment network to back up the exchange of value. This system became the foundation of all modern western economies after the Nixon Shock in 1971 that cancelled the direct convertibility of the United States Dollar to gold. Since then, all financial transaction systems are based on fiat money which is non-convertible and requires two main attributes: **trust** in the emitting entity and **counterfeit** barriers to reduce the incentive to duplicate the fiat money. This change in the global monetary system concurred with the development of private computer networks in the seventies that allowed the first electronic transactions between participants of the network (banking institutions); thus setting the basis for the creation of new money transaction systems and new money representations, based mainly on network protocols and cryptographic functions, that aimed to reduce transaction costs while simultaneously maintain high security standards.

Nowadays traditional financial services and networks face a new scenario where users are no longer passive actors, they have decision power and are always looking for new and better services that can facilitate the management of their personal finances. Open networks such as the internet have created the possibility to reduce physical interaction with a traditional financial provider to a minimum, thus creating a distance between new generations and traditional financial institutions. Even more, after the 2008 world crisis, citizens have taken matters in their own hands and the cryptocurrencies revolution began giving people a completely open and decentralized financial system that does not depend on any government or institution: the Bitcoin¹ protocol. This

¹ www.bitcoin.org

represents the greatest change in financial systems and networks since the Nixon Shock, transferring the trust of users from institutions to a distributed network of servers running a script.

There is a new set of conditions in the financial services market that facilitates the creation of new services, due to technological and cultural changes in the last 20 years. The main motivation behind this work is the design of a mobile financial service that seizes the market opportunities created by the recent confluence of information networks, mobile technologies and cryptographic currencies. The internet protocol serves as an open network on top of which transaction protocols have been released as open source tools. In addition, the increasing mobile internet access made possible by an ascending Smartphone penetration rate in the World, and Latin America in particular, create the appropriate conditions for the design of open financial services that can provide ubiquitous access to electronic money transactions.

1.2 OVERALL AND SPECIFIC OBJECTIVES

The main goal of this project is:

- Design a mobile financial service based on a Smartphone application and postulate a business model for the sustainable operation of this service.

The specific goals of this work are therefore:

- Determine the attractiveness of relevant segments and business models in the mobile financial services industry.
- Formulate a state of the art description of cryptographic currencies.
- Define a strategic positioning and business model hypothesis for the mobile financial service.
- Design the basic components for the mobile financial service platform and implement them in a limited functional prototype.

1.3 METHODOLOGY

To achieve the stated goals the following methodologies will be applied:

- Perform a bibliographic research on mobile financial services and cryptocurrencies. Secondary source information from google scholar, specialized websites and government agencies will be presented.
- Access primary sources through interviews with key players of the market.
- Combine a Delta Model Analysis of the market, Customer Discovery and Business Model Canvas methodologies in order to define the strategic positioning, value proposition, key aspects of the service and the business model.
- Design the Minimum viable product (MVP) according to the Lean Startup methodology and apply programming techniques and tools to develop the service's first prototype.

In order to establish a common ground, brief descriptions of the methodological approaches are presented next.

1.3.1 THE DELTA MODEL

Developed by Arnaldo Hax and Dean Wilde [15], the Delta Model is a strategy framework that places the customer at the center of management. It examines the primary options available to establish customer bonding and proposes three main strategic options:

- **Best Product:** the “classical view”, where the inherent characteristics of the product itself are viewed as the most important aspects when it comes to attract, satisfy and retain the customer. The major driving forces are cost reduction and differentiation that can be translated into a temporary advantage until the product is commoditized.
- **Total Customer Solution:** The focus of attention switches from the product to the customer. Portfolios of products/services that represent a unique value proposition are offered to particular customer segments. There is an active engagement with the extended company (including the customer and key suppliers) that becomes the combined value chain. What guides the company isn't product economics, but customer economics, since the goal is help the customer enhance his financial performance and utility.
- **System Lock-In:** the full network is the relevant scope, gaining complementor's share and system economics as the driving force. When a customer lock-in is assured simultaneously there is a competitor lock-out. Once the lock-in is reached it is hard to be taken away because of the network effects, which then creates the proverbial virtuous circle: users want to use the service that is accepted by most merchants, and merchants want to accept the service that is preferred by most users.

The goal of every company should be reaching a system lock-in of the market, in order to do it Hax identifies three ways: (i) proprietary standards, (ii) dominant exchange and (iii) restricted access. A business positioned as a dominant exchange provides an interface between buyers and sellers, or between parties that wish to exchange information or goods. Once this business achieves a critical mass it is very hard to displace, e.g. all markets that benefit of the network effects, especially payment networks.

Descriptive Dimensions	Best Product	Total Customer Solutions	System Lock-In
Strategic Focus	Product The business, its industry and its competitors	The Extended Enterprise The firm, its customers, its suppliers, and complementors	The Network of Firms The interconnected web of companies that are part of the network
Driving Force	Competitors	Customers	Complementors
The Customer Value Proposition	Product focus Product economics	Customer focus Customer economics	System focus System economics
Product Offerings	Standardized products	Customized bundle of products and services	Portfolio of products and services extended by complementors
Relevant Supply Chain	Internal supply chain	Integrated supply chain: The firm, the suppliers, the customers, and complementors	System supply chain: The interlocking network of companies
Relevant Channels	Generic channels of mass distribution	Targeted direct channel	Massive direct channel
Impact on Brands	Product orientation Brand explosion	Brands harmonized around the customer Coherent portfolio of brands centered on the customer	Brands harmonized around the System Coherent portfolio of brands centered on the system
Innovation Focus	Internal product development	Joint product innovation with customer	Open architecture, complementors as key innovators
IT Role	Internal support e.g., SAP	Customer, supplier, and complementor support; e.g. e-business and e-commerce	Total network support e.g., e-system
Degree of Customer Bonding	Very small Depends exclusively on the product characteristics	Potentially high Reinforced by customization and mutual learning	Potentially the highest Reinforced by competitor lock-out and complementor lock-in

Table 1: Profiling the three strategic options.
Source [14]

The framework proposed by the Delta Model allows setting the strategic direction the company will undertake in order to align its resources and competences. One of the key aspects of the framework is properly executing customer segmentation. The five generic dimensions for customer segmentation are: (i) Customer attitudes and willingness to do business, (ii) Different degrees of value added to different segments, (iii) customer life cycle, (iv) varying buying patterns and (v) alignment with distributor channels.

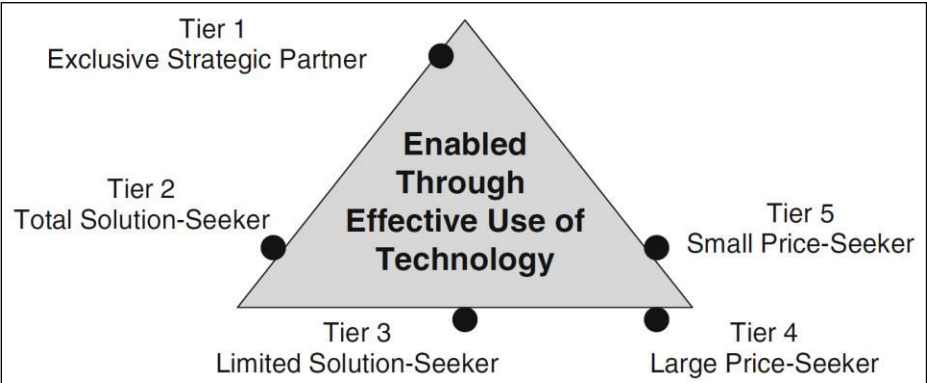


Figure 1: Segmentation according to different degrees of value added.
Source [14]

Commoditization is seen in the context of the Delta Model as the result of an inept strategy. By clearly segmenting the customer base and stating a strategy to serve the identified segments it is always possible to make a difference and therefore move away the company from a commoditized industry.

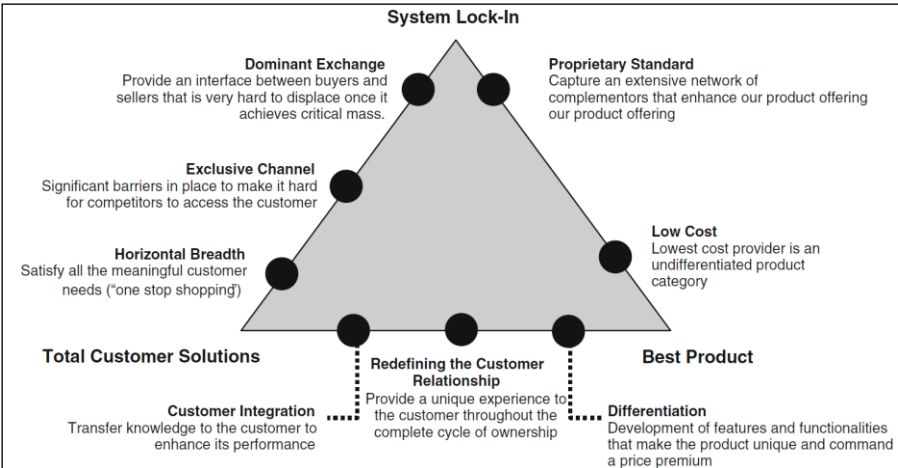


Figure 2: The three strategic positions as a guiding framework.
Source [14]

The Delta model allows defining different value propositions accordingly to the characteristics of the customer segment. Therefore a same company may position itself simultaneously on different positions of the framework.

1.3.2 CUSTOMER DISCOVERY

The customer discovery methodology was proposed by Steve Blank in his book “The four steps to epiphany” [4]. The main purpose of the methodology is that every startup should begin their journey through an exhaustive process of customer discovery and validation, i.e. formulate hypothesis about the product, customer and value proposition. Test them and pivot when the results do not confirm the hypothesis.

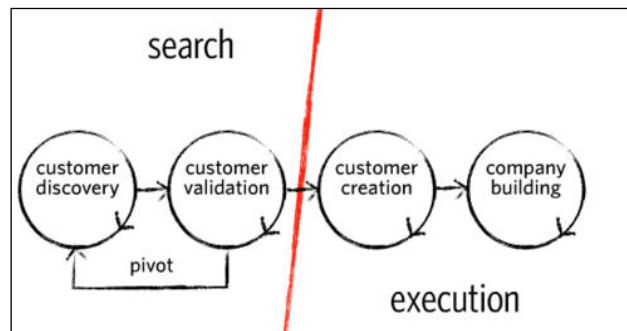


Figure 3: The customer Discovery process.
Source [4]

As can be seen on Figure 3, the methodology proposed by Blank is cyclical. It's based on a series of hypothesis formulation and quick testing against the market environment. Thus the startup has the ability to pivot if the hypothetical value offer doesn't resonate with the identified customer segment. The process consists of four linked stages: customer discovery, customer validation, customer creation and company building. The scope of the present work reaches only customer discovery and aims to lay the ground for the customer validation phase.

The main questions the customer discovery stage answers are:

- Have we identified a problem a customer wants solved?
- Does our product solve these customer needs?
- If so, do we have a viable and profitable business model?
- Have we learned enough to go out and sell?

The customer discovery will be the framework to state the first hypothesis for the service.

1.3.3 BUSINESS MODEL CANVAS

The business model canvas is a methodology for making business plans, as stated by Osterwalder [29] “A business model describes the rationale of how an organization creates, delivers and captures value”. They propose a methodology that consists of 9 basic building blocks that are interrelated and help describe and visualize the main components of the business model.

- **Customer segments:** an organization serves one or various customer segments.
- **Value proposition:** It seeks to solve customer problems and satisfy customer needs with value propositions.
- **Channels:** Value propositions are delivered to customers through communication distribution and sales channels.
- **Customer relationships:** Customer relationships are established and maintained with each customer segment.
- **Revenue streams:** Revenue streams result from value propositions successfully offered to customers.
- **Key resources:** Key resources are the assets required to offer and deliver the previously described elements...
- **Key activities:** ...by performing the key activities.
- **Key partnerships:** Some activities are outsourced and some resources are acquired outside the enterprise.
- **Cost structure:** The business model elements result in the cost structure.

These basic blocks are organized visually and presented on a canvas as will be seen in further sections. For each service hypothesis formulated the corresponding Business Model Canvas will be presented and described in order to explicit the basic building blocks of the business models. The Business Model design is an iterative process, just as the customer discovery, it requires the formulation of hypothesis, fast experiments and then evaluation of the results in order to adjust the model to the constraints of the market and the customers. The result of such iterations is validated knowledge that drives the company's value proposition. The scope of this work is limited in this sense since it will present the first Business Model hypothesis that might not be the final form of the startup company.

1.3.4 LEAN STARTUP

The last methodology to be employed is the Lean Startup [33]. Developed by Ries in his homonymous book, it proposes a similar approach of the customer discovery for building a startup, but focused on the build-measure-learn cycle. Every hypothesis is transformed into a Minimum Valuable Product (MVP) which is designed to test hypothesis, by presenting it to customers and measure actionable metrics in order to learn from the experiments. The “lean” part is focused on doing it with the least amount of resources possible and maximum flexibility in order to pivot the company to respond to customer needs instead of building a product that no one will use. The main aspects of the methodology are condensed in the following infographic.

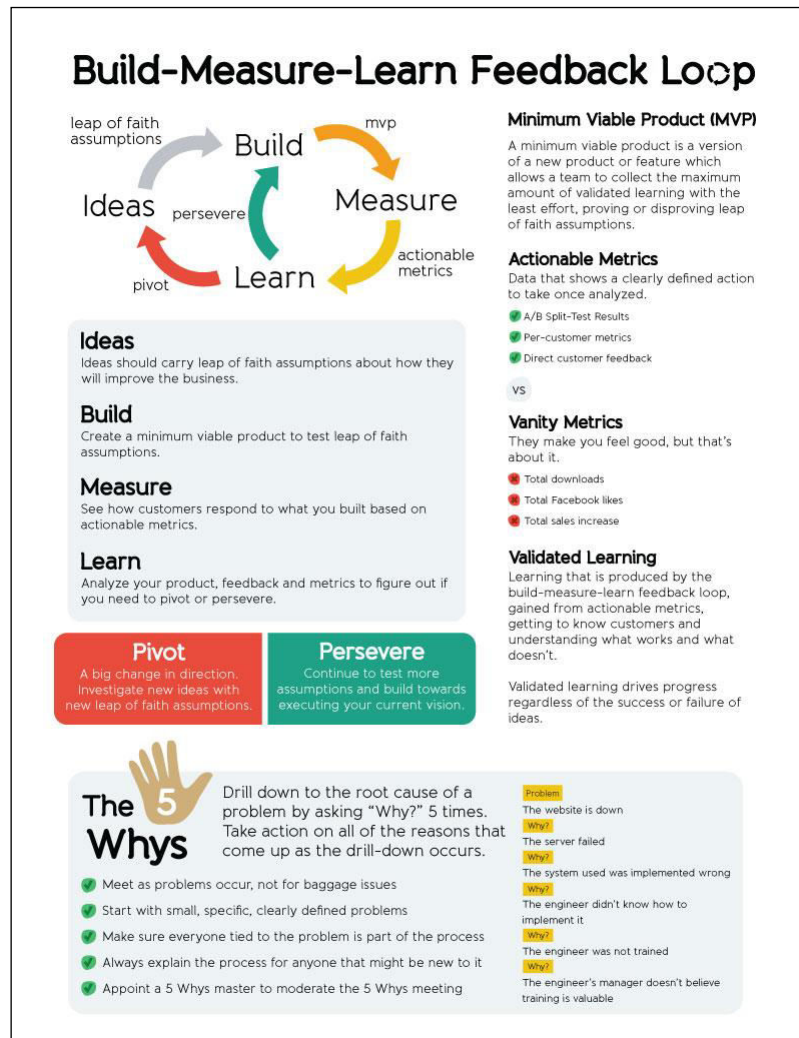


Figure 4: The Lean Startup Infographic.
Source [40]

1.4 THESIS STRUCTURE

The next sections are organized as follows:

- In Chapter 2 an analysis of the Smartphone market in Latin America, mobile financial services, payment networks and financial inclusion and is presented.
- Chapter 3 introduces a state of the art review of the main cryptographic currency protocols.
- Chapter 4 presents the business plan based on the Delta Model, Customer Discovery and Business Model Canvas Methodologies.
- Chapter 5 displays the design and proposed implementation of the minimum viable product based on the Lean Startup methodology.
- Finally in Chapter 6 conclusions, future work and actions are discussed.

2 PRELIMINARIES AND BACKGROUND

In this chapter introduces an analysis of the Smartphone market and existing mobile financial services with a focus in Latin America, with special focus in Chile and Peru. The case of Bolivia, Brazil, Colombia, Paraguay and Uruguay are similar and main conclusions can be extrapolated (adjusting to the population and transaction volume of the markets). Argentina and Venezuela are excluded due to their economic and politic instability.

Chile, Peru, Colombia and Mexico have created the Pacific Alliance treaty. The agreement is aimed at strengthening commercial links and consolidating a regional economy with strong ties to Asia Pacific markets². Therefore this market is proposed as a first center of attention for Dine's mobile financial services development.

2.1 THE SMARTPHONE MARKET IN CHILE AND LATIN AMERICA

2.1.1 SMARTPHONE PENETRATION RATES

Smartphones are one of the fastest growing technologies in the history of mankind [6]. Since the launch of the iPhone in 2007, Smartphones have evolved to ubiquitous mobile computers with access to cell phone, WiFi, Bluetooth and other networks. Smartphone prices have constantly declined and it is possible to find today devices for under USD\$100 that give users access to a broad range of applications [13]. This has pushed the Smartphone penetration rate in 2013 to a 20% in Latin America, 27% in Chile and 17% in Peru. By 2017 is expected to reach 44% in Latin America. Nowadays, mobile connectivity is available in 98% of the Chilean territory [1] and by 2006 over 45% of Peruvian homes had access to mobile services [12].

Country	Total Population	2013 Unique SIM Subscribers	2013 Smartphone Penetration	2013 Smartphone Users	2017 Projected Smartphone Users
Brasil	198.7	112.5	21%	41.7	87.4
Mexico	120.8	46.3	22%	26.6	53.2
Colombia	47.7	24	16%	7.6	21,0
Peru	30	15.1	17%	5.1	13.2
Chile	17.4	11.6	27%	4.1	7.7

Table 2: Smartphone market in Latin American countries. All figures in millions. Adapted from [13].

² www.alianzapacifico.net

As stated in [13] “Mobile operators have invested significant amounts in building out networks and increasing capacity over recent years”. This investment is reflected upon high penetration rates and subscriptions although multiple SIM ownership may distort the rates. This shows that prepaid cell phones are the business model that still dominates in the Latin American market accounting for 80% of total SIM connections by 2012. In most markets of the region, Smartphone data plans have presented a decline of over 50% on their prices. In 2013 the average price for a low end Smartphone with a 250MB data plan is USD\$8.3 per month.

2.1.2 OPERATING SYSTEMS

According to the International Data Corporation (IDC) [16], the main players in the Operating Systems arena are Android and iOS that represent more than 95% of the market. Nevertheless, on the low end Smartphones segment, Android is a clear dominant with an average selling price under USD\$300.

Operating System	2013 Market Share	2013 Volume(millions)
Android	78.1%	793.6
iOS	17.6%	153.4
Windows Phone	3%	33.4
BlackBerry	0.6%	19.2
Others	0.7%	10

Table 3: Smartphone operating system market share and shipment volumes for 2013. Adapted from [13].

Nevertheless, iOS users have a higher rate of usage of their devices which accounts for nearly 50% of mobile browsing in the web, despite having only a 17% of the market share.

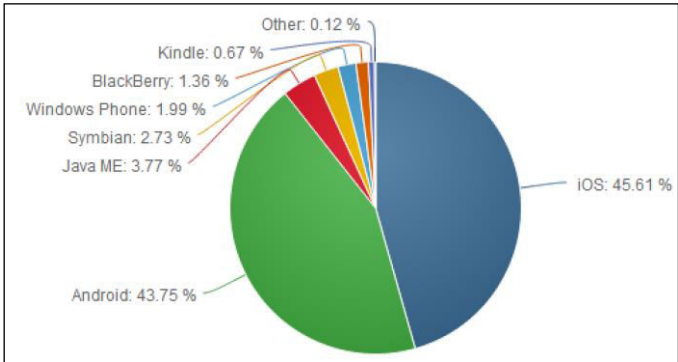


Figure 5: Operating systems market share on the internet as of 2013. Source [27]

This scenario reveals the different usage patterns of users in the Smartphone market; Android users are less intensive than iOS users but account for a much higher volume. Thus, an app developer must release versions of his app both for Android and iOS, despite the market shares, mainly because iOS users are evidently power users in the Smartphone ecosystem.

2.2 MOBILE FINANCIAL SERVICES MARKET

Mobile Financial Services (MFS) have reached a significant development in recent years due to the high penetration of cellphones globally. They present a new means of implementing an efficient assignment of financial resources and provide a novel, safe and ubiquitous electronic payment system to the population. Since in Latin America almost 60% of the population still remains unbanked [13], therefore MFS present a great opportunity to expand financial access. Telefonica [28] proposes a classification of MFS in two sets:

- As a function of the type of service provided to the final user: additive and transformational services.
 - Additive services: are those directed to established clients of traditional financial institutions (banks) to whom the mobile channel is a new way to access the services offered by the bank in the web portal or physical location.
 - Transformational services: are financial services directed to the non-banked population.
- As a function of whether they create a direct relation between the user and a traditional financial institution or if they favor financial inclusion without establishing a direct link.

Clearly, all MFS that are additive establish a direct link between the user and a financial institution. Transformational services can create an indirect link between the user and the bank or can even provide the service without the participation of an established financial institution.

Another way to differentiate MFS is based on the technological support they have, distinguishing two major groups: those based on internet connections and those supported by other cell phone network protocols that require the direct participation of Mobile Network Operators (MNO). This separation is translated into practice by distinguishing MFS supported by Smartphones or traditional cell phones.

Technological support	Smartphone		Cell Phone	
Type of service	Additive	Transformational	Additive	Transformational
Examples	Bank App Google Wallet PayPal Khipu	Bitcoin	Cuenta Entel-Banco de Chile Daviplata	M-Pesa Oi-Paggo

Table 4: Examples of MFS based on the classification proposed by Telefonica.
Source: Prepared by the author.

As seen on Table 4 there is a clear distinction between MFS based on the technological support, type of service and the relation to financial institution. As exhibited, Bitcoin, like all other cryptocurrencies traded on open exchanges, are the only Smartphone based transformational service that are not linked directly to a financial institution. Next a description of some of the above mentioned examples is presented in order to understand their value proposition to users.

2.2.1 SMARTPHONE BASED MFS

These services make use of mobile technologies and internet connectivity as the communication protocol with the financial service purveyor. They do not depend directly on MNOs since internet connectivity can be obtained from different networks such as fiber optics, Wi-Fi, Bluetooth, 3G, 4G and others. Certainly, MNO provide the easiest access to the internet from a Smartphone, but it's not exclusive.

2.2.1.1 Additive Smartphone Based MFS

Traditional financial institutions facilitate this kind of service as a mean to consolidate a new channel of communication or means of payment with their clients. Therefore, as a requisite, the user must have an open account on a bank.

2.2.1.1.1 Direct Link

Nowadays almost all banks in the world have a mobile application (App) to provide their users the same services they can access through the web site of the bank. A particular case is the BBVA Bank App BBVA Link that provides a connection with the Facebook account of the user thus changing the interface to make money transactions within the user's Facebook network and with less security requirements. This app has under 5000 downloads in Chile.

	Bank	Downloads	Rating
Chile	Banco de Chile	<500000	3.7/5
	Banco Falabella	<100000	4.3/5
	Banco Santander	<100000	3.8/5
	BBVA	<50000	4.2/5
	Itaú	<50000	4.2/5
	Scotiabank	<10000	3.8/5
Peru	BCP	<100000	3.7/5
	Interbank	<100000	4.1/5

Table 5: Principal Apps, downloads and ratings from Google Play Store.
Source: Prepared by the author.

Search on Google Play Store reveals that fewer than 800 000 Android users have downloaded a bank App in Chile and under 200 000 in Peru. Apple does not give the download statistics for their apps, but from the previous sections it is possible to estimate that the number of iOS users of bank apps is similar to Android users (see Figure 5). That would amount to approximately 1.5 million users in Chile and 0.5 million in Peru of Smartphone based additive MFS with direct link to a financial institution, i.e., a 37% and 10% of the total Smartphone users to date in each country.

2.2.1.1.2 Indirect Link

These Apps are primarily mobile wallets that serve as aggregators of debit and credit cards issued by banks. They offer the user a more convenient way to handle payments and money transfers through the Smartphone, thus creating the first culture around Smartphone based payments. Some of the most representative services are:

- Google Wallet³ is one of the main applications under this model. It's an electronic wallet app for credit and debit cards that synchronizes with the user's bank account. For merchants Google Wallet integrates with their existing credit/debit card processing platform, therefore it doesn't change the cost structure they already face. For users there are no fees except when sending money through their credit or debit card (2.9% + USD\$0,3). It has more than 10 million downloads on the Play Store.
- LevelUP⁴ is a similar service from the user point of view, with the difference that they only charge the merchant for processing transactions at the Point of Sale (POS). They use QR codes that serve as transaction identifiers and charge 2% per transaction on the POS and USD\$50 per POS. They pay business the next day after receiving a payment. They currently have over 1 million users and 5000 businesses.

³ www.google.com/wallet

⁴ www.thelevelup.com

- PayPal⁵ is one of the most known apps that allow doing money transfers and paying in associated businesses. For money transfers commissions vary depending on the country between 2.9% and 3.9%. For businesses the seller must pay a commission in the range of 4.4% and 5.4% + USD\$0.3 in Chile and between 2.2% and 3.9% + USD\$0.3 in USA.
- Square⁶ is a device that transforms Smartphones into POS through a card reader dongle. Thus every Smartphone with internet access can serve as a POS for credit/debit cards. They also provide account management services for merchants. The rate per operation is 2.75% and they reimburse the merchant the next day after the purchase.
- In Chile, Khipu⁷ is a startup that provides a simple platform to make bank account money transfers. It integrates with ecommerce web sites to process transactions. They charge 1% to the receiver of the money transfer with a threshold of CLP\$200. They have less than 10 000 downloads on Google Play.

In summary, Smartphone based additive MFS that provide an indirect link to banks base their revenue model on a standard commission that is near 3% when processing credit cards and over 1% when processing money transfers.

2.2.1.2 Transformational MFS

In Chile, Multicaja S.A., a relevant player in the payment networks infrastructure launched a service named Multipay: an app for buying airtime and other services such as meal benefits by generating a dynamic password to be entered at the POS by a cashier. According to Gonzalo Bernstein, Chief Planning Officer at Multicaja, the app was discontinued due to poor user reviews and warnings from the *Super intendencia de Bancos e Instituciones Financieras (SBIF)*. Once they presented their project, SBIF issued warnings since the system operated as a multi-purpose prepaid payment network.

The only Smartphone based transformational MFS that is available are cryptocurrency wallets for transaction of Bitcoin, Litecoin⁸, Dogecoin⁹ among many others. They are all free of charge and have high security standards. These electronic wallet applications can store the private and public key of the user and make cryptocurrency transactions by reading the QR code representation of the receiver's address. They will be described in more detail in the next chapter.

⁵ www.paypal.com

⁶ www.squareup.com

⁷ www.khipu.com

⁸ www.litecoin.org

⁹ www.dogecoin.com

2.2.2 CELL PHONE BASED MFS

Mobile Financial Services based on Cell Phone networks communication have had a great impact on many under banked societies where there is a lack of physical infrastructure and connectivity to provide traditional financial services to the population.

	Smart Money	Gcash	M-PESA
Country	Phillipines		Kenya
Debut	2003	2004	2007
Value system	e-cash	e-cash	e-cash
Main services	Air-time, bill payments, money transfer	Air-time, bill payments, money transfer	Air-time, money transfer
Main driver	MNO and Bank	MNO	MNO
Technology	STK	STK	STK
Distribution and account creation	MNO branches, banks and affiliated merchants	Agent network	Agent network and MNO branches
Regulation	Bank	Central Bank ad-hoc regulation	Central Bank ad-hoc regulation

Table 6: Successful Cell Phone Network MFS.
Source: Adapted from [28].

GSMA has done an extensive research¹⁰ on the main aspects that favors a successful implementation of MFS by Mobile Network Operators. Since they must select the appropriate platform to deliver the service [28], many technical and design problems arise that have impacted negatively on previous deployments of MFS: payment switches, biller systems and Point of Sale devices [24]. Also there is the key question about why would MNO participate in a different business than their core business and the required match between functionality and business strategy.

2.2.2.1 Additive MFS

Many joint ventures between banks and MNO have tried to provide MFS to the population with different objectives and success rate [28]. Their strategy is somewhat unclear since users must subscribe a contract with the bank and open an account. In Chile, Entel and Banco de Chile launched the service *cuenta móvil*¹¹ in 2010. The main

¹⁰ <http://www.gsma.com/mobilefordevelopment/programmes/mobile-money-for-the-unbanked>

¹¹ www.cuentamovil.cl

benefit for users is the possibility to make money transfers through their Cell Phone's SIM menu to other users that are subscribed to *cuenta móvil* free of charge. They can pay for one gas service provider, one highway toll company and buy air time from Entel. To make ATM withdrawals users must pay a fee that amounts to over USD\$1 per transaction. It wasn't possible to get actual data on the number of users but it is most likely that it hasn't gain acceptance.

2.2.2.2 Transformational MFS

These services provide a new form of access to formal financial instruments to the unbanked population. They are a consequence of the high penetration of mobile technologies in low-income areas and the broad agent network that Mobile Network Operators (MNO) have to serve their prepaid clients. In Latin America there have been many attempts [13] to provide such services but there are only two companies that have a high traction among the population, Oi-Carteira¹² in Brasil and Tigo Money¹³ in Paraguay [24]. The most known success story worldwide is Kenyan company M-Pesa¹⁴, a venture of MNO Safaricom that has gained a wide acceptance among users [9]. It's basically a service of electronic money transfer, bill payments and in-store payments through a balance that is stored on the Cell Phone SIM card. Users must identify themselves at the agent offices to make cash-in and cash-out operations, consequently the service requires a extended network of agents to act as intermediaries between electronic money and cash.

The traditional financial system is involved only in the side of Safaricom and the agent network. The business model of this service is based on commissions on user transactions and payments to agents for maintaining a stock of floating currency to serve clients. In Africa and other underbanked regions, people prefer cash over electronic payment methods, so they generally make cash-outs shortly after receiving a money transfer [22]. By 2013 over 93% of the Kenyan adults have a mobile financial service account. However, there is a timeframe of 76 days between registration and the first transaction, 86 days to the second, 56 to the third, 41 to the fourth, 33 to the fifth and 27 to the sixth, when the service begins to have a monthly use. This reflects that for the Kenyan population MFS are a remittance services that is cheap, safe and reliable (in comparison to previous methods such as bus drivers, friends and family), but it is not an electronic payment system.

As presented, there isn't a standard for Mobile Financial Services. Depending on the region different technologies have reached a dominant position, while they all present a similar business model based primarily on a transaction fee charged to the merchant. Transformational services that have been successful have the common

¹² <http://www.oi.com.br/oi/oi-pra-voce/oi-para-comprar/oi-carteira>

¹³ <https://www.tigo.com.py/tigo-money>

¹⁴ www.safaricom.ke

characteristic of allowing bill payments, buying air-time and making national peer-to-peer transfers.

2.3 PAYMENT NETWORKS

Access to electronic payment networks has a great impact on financial inclusion amongst the unbanked population [25]. Amongst the principal benefits are lower transaction costs; increased security; facilitate distribution, payment and tracing of social benefits; and the promotion of electronic commerce, tourism and tax compliance from sellers.

2.3.1 TWO SIDED MARKETS

Payment networks are two sided markets [34], where the “chicken or the egg” problem is most relevant. On one side you have buyers that must use the payment platform and on the other sellers that must accept payments through the platform. Therefore the decision of both parties to participate in the transaction using a particular platform creates network externalities. Payment networks become more valuable to both parties as long as an increasing number of participants on both sides use them. The work of Rochet and Tirole [34] shows that in credit/debit card payment networks the subsidized party in the platform are buyers that don’t pay extra costs for accessing the network¹⁵, and the paying segment are sellers. This is the price strategy that has been followed by payment networks to attract both segments to the market. This has no direct link to the payment network cost’s structure, but is related to the externalities that a segment creates by joining the network. That is why big retail companies pay smaller commissions since they bring more buyers to the network. Therefore a price that’s below or above the marginal cost can be competitive, considering externalities.

Existing payment networks present different actors: buyer, seller, emitter and acquirer. The role of the emitter is the relation with buyers (understanding buyers as the paying customer in a retail transaction) and the acquirer manages the relation with the seller (the retail for example).

¹⁵ At least the debit card case. In Chile Banco Estado’s *Cuenta RUT* is free of charge to users as long as they don’t retrieve money from ATMs. In the credit card case fees are payed through the commission.

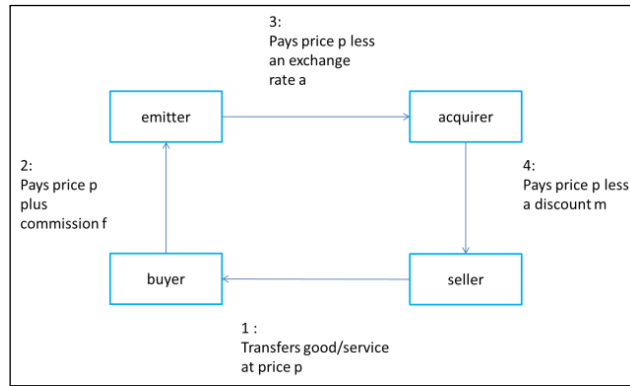


Figure 6: Existing payment network structure.
Source: Adapted from [25].

As can be seen every part of the network adds a friction to the transaction by charging a fee. To buyers this fee is usually hidden in the emitter general fees of providing a financial service. Depending on the country's legislation there are different institutions that can perform the above mentioned roles and sometimes the exchange rates or commissions are defined by a regulator.

In the particular case of Chile, the payment network as a whole is a bank-owned natural monopoly (Transbank S.A.), so buyers are captive in the network and sellers must accept discount conditions. Except for retail emitted payment cards where the transaction network provider is a different company (Multicaja S.A.). Nevertheless, the price structure is moderately similar to countries where there is no such monopoly [25], especially concerning credit card fees but more expensive on debit card fees (see Figure 7). Unfortunately only average fees are informed in [25] but not the statistical mode information that could be of great interest due to differences in fees between big and small business.

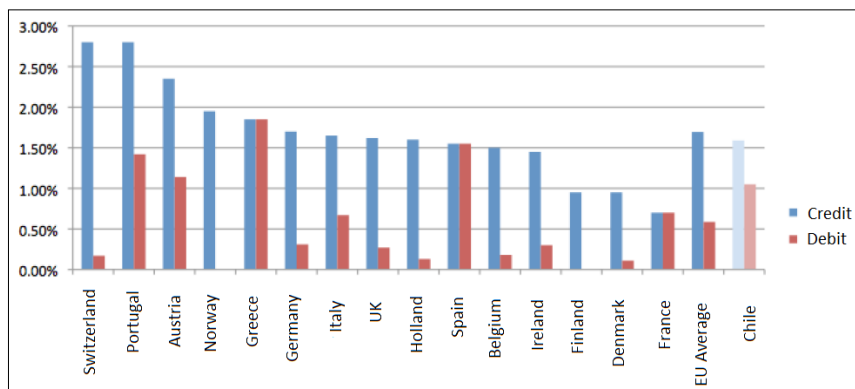


Figure 7: EU countries and Chile payment network fees.
Source: Adapted from [25]

In Peru Banks have an intricate fee structure for electronic transactions that ranges between USD\$0.3¹⁶ and USD\$75 depending on the amount transferred, origin and destination of the funds¹⁷. In the case of payment networks, the only identifiable actor is Visanet¹⁸ that charges a commission that ranges between 5% and 2% depending on sales volume.

2.3.2 TRANSACTION VOLUME

Transaction volumes alongside macroeconomic indicators provide a general view of a country's financial payment networks.

	Chile	Peru	Colombia	Brazil	Mexico
GNI Per Capita, Atlas Method (current USD\$)	\$ 15.415	\$ 6.572	\$ 7.020	\$ 11.630	\$ 9.640
GNI, Atlas Method (current Million USD\$)	\$ 268.278	\$ 200.292	\$ 334.789	\$ 2.311.146	\$ 1.165.050
Point-of-Sale terminals (per 100000 adults)	450	40	N/A	1471	400*

*(per 100000 persons)

Table 7: Financial indicators for some Latin American countries.
Source: Adapted from [42]

As can be seen, the capillarity of POS terminals is still limited in Chile compared to other high income Latin American countries like Brazil with over 1000 POS/100 000 adults. On the other hand, the reach of electronic payments in Peru is extremely scarce. Next transaction information on the Chilean and Peruvian markets is presented¹⁹.

2.3.2.1 Chile

The main means of payment in Chile are respectively Checks, Cash, Credit and Debit cards. Figure 4 shows that the amount withdrawn from ATMs has grown at a 15% average rate between 1998 and 2011. After checks, cash is the most important means of payment in Chile, with an average withdrawn per transaction of nearly USD\$90 and an annual volume of over USD\$40 billion²⁰ in 2011 [38]. This shows that users still have a great need for cash, even though credit and debit card operations have increased every year. P2P bank transactions (made exclusively from one person to another) increased 2.8% in 2013 with an average amount transferred of USD\$2.8 billion per month.

¹⁶ 1 PEN = 0,35 USD

¹⁷ <http://www.bcrp.gob.pe/docs/Sistema-Pagos/Transferencias-electronicas.pdf>

¹⁸ <https://www.visanet.com.pe/>

¹⁹ Debit and credit payments are considered to be non-cash withdrawals, which are summarized under ATM transactions.

²⁰ 1 USD = 500 CLP

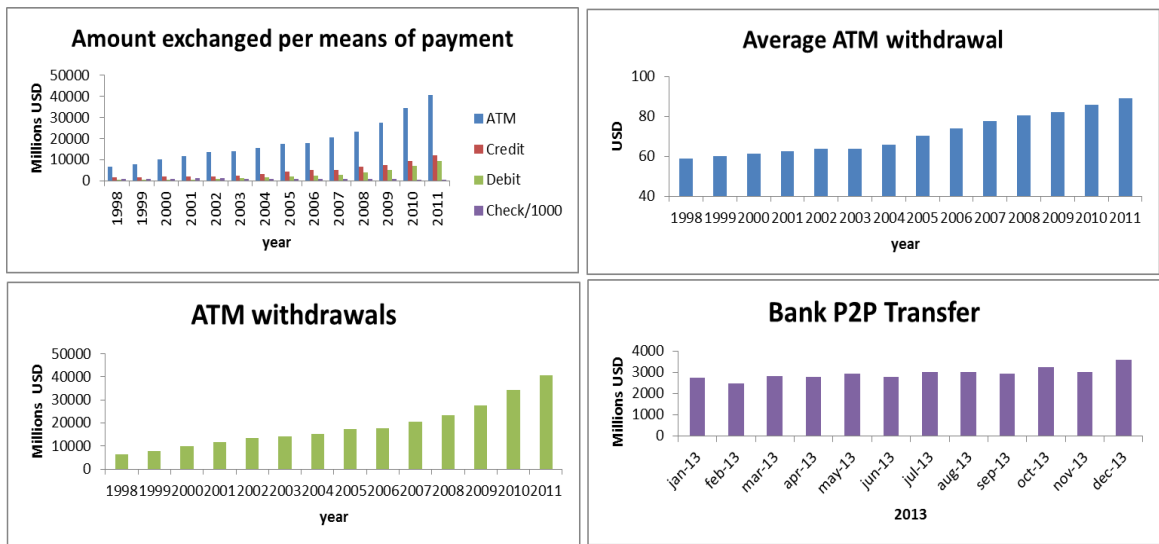


Figure 8: Transaction volume in the Chilean formal financial market.
Source: Adapted from [38]

2.3.2.2 Peru

According to the information delivered by the Peruvian Central Bank, checks also are the main means of payment in the Peruvian network. Debit and card payments have increased transaction volume year after year. Money transfers under USD\$60 000, both P2P and B2B (and even between accounts of the same individual), amounted to over USD\$14 billion in 2013 despite World Bank statistics [42] that indicate a lower financial inclusion: 20% in Peru against 42% in Chile (ages 15+). ATM withdrawals reach similar levels as in Chile and also show a growing trend.

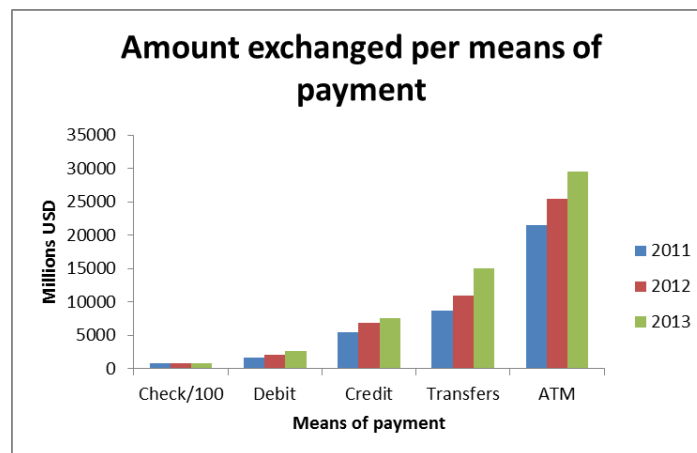


Figure 9: Transaction volume in the Peruvian formal payment network.
Source: Adapted from [3]

2.3.3 ALTERNATIVE PAYMENT NETWORKS

In parallel to bank-based payment networks there exists the prepaid financial instruments payment network. In Chile, these networks have the particular characteristic of being closed networks, i.e. once you buy a prepaid instrument it can only be used on that specific network. Therefore the main players on this type of networks are big retail companies that issue “giftcards” to its clients, and the meal benefits payment network whose key players are French companies Sodexo and Edenred.

2.3.3.1 Meal benefits payment network in Chile and Latin America

Sodexo and Edenred base their offer on financial intermediation services between companies seeking to give benefits and rewards for their employees and businesses that provide these services. One of the first products of this type was developed by Edenred in the 60's in France with the *Ticket Restaurant*. It's a meal voucher that employees can redeem at restaurants and retails affiliated to the network. In this way the company benefits from the increase on its operational costs with a consequent reduction in earnings and thus obtaining VAT credit for the purchase. In turn, restaurant and retail partners benefit from a flow of captive customers. Shortly after, Sodexo developed an equivalent service, *Cheque Restaurant*. Today Edenred is only focused on the market for prepaid corporate services, while Sodexo has various business areas around the outsourcing of business services.

As mentioned, prepaid financial services constitute a parallel payment network that has the same intrinsic characteristics as described before: a two-sided market that benefits from externalities of scale. Nevertheless they present a difference between open payment networks; the purchase decision is made by the employer, not the final consumer (the employee). Once the employer selects a prepaid service provider the beneficiaries are captive on the selected network. Edenred and Sodexo have a duopoly strategy; they charge the same fees to corporate clients (1%) and have very similar commission structures towards associated merchants.

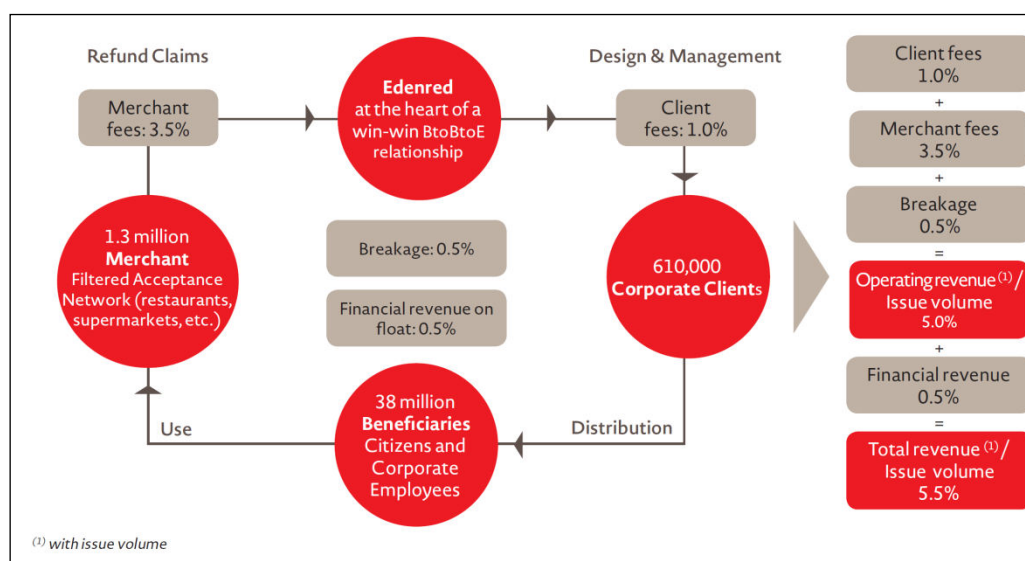


Figure 10: Corporate prepaid services business model.
Source: Adapted from [7]

As can be seen on figure 10, their income is based on fees to every participant of the market, buyer and seller, plus revenue on float money and breakage from outdated/invalid vouchers. It is relevant to note that for small merchants fees can go up to 8%.

	Edenred 2012		Sodexo 2013	
	WORLD	LATAM	WORLD	LATAM
Issue volume M USD	22153,81	11709,32	21280	10810,24
Operational income M USD	1298,08	637,07	1050,7	601,16
Financial income M USD	121	52	N/A	N/A
Total costs M USD	858	N/A	646,38	N/A
EBIT M USD	488,11	323,19	N/A	N/A
% Income of issue volume	5,859%	5,441%	4,938%	5,561%

Table 8: Financial results from Sodexo and Edenred.
Source: Adapted from [8] and [37].

As Table 7 shows, by 2013 the Latin American corporate prepaid services market amounts to over USD\$ 22 billion/year in issue volume and over USD\$ 2.3 billion/year in operational income, almost half of the world total. Countries such as Brazil and México are key players in this market and represent over 50% of issue volume in the region [8]. The corporate prepaid services market is estimated to be worth 170 billion euros globally, which leaves an enormous potential for development in other Latin American countries such as Chile, Peru and Colombia. For instance, in Chile Edenred's payment network has only 9700 affiliated merchants and Sodexo's 8500. Considering that most of the time they are serving the same merchants (in order to reduce differentiation and

consolidate the duopoly) the actual reach is of less than 10000 affiliated merchants to the network, which is very limited compared to Transbank's average of 450 POS/100000 inhabitants.

The main operational costs Edenred and Sodexo face reside in attracting corporate customers, retail partners, account management, reimbursement and administrative processes. Corporate clients will incur in an administrative costs for the management and distribution among employees of meal vouchers. And associated merchants must spend in collecting and delivering vouchers to Sodexo/Edenred headquarters for reimbursement. In recent years the process of digitalization of meal vouchers has seen great advances. As of 2013 Edenred issues over 58% in electronic vouchers under the form of magnetic cards that require a POS at merchant's location. This has been their strategy to reduce costs associated with logistics of physical vouchers, and they expect to reach 70% of digital issue volume by 2016. However they haven't developed any type of mobile wallet for electronic vouchers, and neither has Sodexo. The operation of POS networks is done by an external company, in the Chilean case Multicaja S.A., which charges around USD\$250 /year to merchants for maintenance of the POS machine and connection.

Besides corporate clients, governments are an important buyer of prepaid services. In Chile JUNAEB²¹ distributes the meal benefit to students through Edenred and Sodexo, as for many government employees. Furthermore, it is expected that prepaid services will become a channel for distribution of social benefits to low income families [25].

2.3.3.2 Prepaid payment networks in Latin America

Most of Latin American countries have a different strategy towards prepaid payment networks than Chile. In recent years they have enacted new legislation that aims to the development of electronic money services under the figure of a prepaid account. This way non-banking institutions can issue prepaid electronic money accounts with the aim to increase financial inclusion and expand access to mobile money.

²¹ *Junta Nacional de Auxilio Escolar y Becas: government agency in charge of distributing meals and other social benefits to public school students.*

A	Peru	Brasil	Mexico
Legislation	Yes, Entidades Emisoras de Dinero Electrónico, January 2013.	Yes, Institucao de pagamento, May 2013.	Yes, Banco de nicho, December 2009.
Capital requirements	USD 750 000	N/A	USD 14, 6 Million
Can funds be intermediated?	No	Yes, specific bonds and deposits.	Government bonds.
Connectivity with bank networks	Unspecified	Unspecified	Yes, It's a bank
Access to Telecom infrastructure	Yes	Yes	Unspecified
Special incentives	Tax free for a 3 year period	Undefined	No
Source	http://bit.ly/1jj07CA	http://bit.ly/QMZpAR	http://bit.ly/RVehhO
B	Colombia	Chile	
Legislation	Project, Sociedades Especializadas en Depósitos Electrónicos, May 2013	Project, Instrumentos de pago con provisión de fondos, November 2013.	
Capital requirements	USD 3 Million	N/A	
Can funds be intermediated?	Yes, bank deposits.	N/A	
Connectivity with bank networks	Unspecified	N/A	
Access to Telecom infrastructure	Unspecified	N/A	
Special incentives	No	N/A	
Source	http://bit.ly/1gljCic	http://bit.ly/1g8QZja	

Table 9A and 9B: Current legislation referring to electronic cash and prepaid financial instruments in Latin America.

Source: Adapted from [citas citas citas]

As presented on Tables 9 A and B, several Latin American countries have recently adopted electronic money legislations that relate directly with prepaid financial instruments and expanding access to financial services through MFS. Thus non-banks can participate on the MFS scenario by way of electronic cash accounts. Capital requirements in Peru are the lowest in the region and is expected that the Chilean law will adopt a similar structure. Multipurpose prepaid financial services have been identified as an effective way to provide electronic means of payment to under banked people and as a first approach to financial inclusion [25].

This chapter presented a general view of the different Mobile Financial Services and payment networks that exists nowadays in Latin America with special focus on Chile and Peru. The main conclusions to be drawn are:

- In Latin America Smartphones have a great growth potential and in a couple of years will reach over half the population.
- Mobile internet access is more affordable every day and in constant expansion.
- Cell Phone based MFS present many limitations on network interoperability, user experience and dedicated infrastructure requirements [21].
- Smartphone based MFS have not created new services, but constitute an additive offer over existing traditional financial services.
- Established financial networks present high transaction volume, but low POS capillarity that leads to a large ATM usage.

- On the other end, merchants face high commissions since the buyer side is subsidized under the current business model. Both in Chile and Peru payment networks are monopolized, and in Peru commissions charged to small merchants are very high (5%).
- The prepaid meal benefits payment network is a duopoly in Latin America where merchant fees are over 3.5% and client fees are flat at 1%.
- There isn't any Smartphone based electronic wallet for prepaid services.
- Recently enacted legislation favors the development of mobile financial services based on electronic cash through Latin America.
- Prepaid financial services are a new form of financial inclusion that can contribute to expand the reach of electronic payment methods, savings and credit. Thus contributing to the development of Latin American markets.

The identification of the above mentioned issues is the first step of this work. In order to have a complete background for understanding the proposed service, a brief introduction to cryptocurrencies and distributed payment networks is presented next, with special focus on Bitcoin and Ripple.

3 CRYPTOCURRENCIES

To understand the future elaboration of the business plan it is necessary to make a brief presentation of electronic cash and protocols that are currently available on the internet in order to present all the premises that backup the service strategy and design.

3.1 ELECTRONIC CASH

The problem of developing electronic cash (e-cash) has been addressed since the 80's. The precursor and creator of the first cryptographic currencies is David Chaum [5] who created the first company that had a clear chance of becoming the standard for electronic payments. Nevertheless, after a series of negotiations with different banks and internet companies the project failed in 1998. A relevant facet is that communication networks weren't already developed extensively to allow a greater penetration of the system. Internet access was still rare and mobile access points haven't been created yet. All the same, the designed system is still valid and is considered as the foundation for cryptographic currencies over which are based many of the posterior developments.

The system designed by Chaum is sustained in the 3 building blocks of electronic money: Hash functions, Public/Private key cryptography and digital signatures.

- **Hash functions** take a string of characters of any length and transform it into fixed length string. In particular, 256 bits Secure Hash Algorithm (SHA-256), transform any sequence of characters into a 256 bit hexadecimal string. They don't present collisions, so two different inputs will always result in a different output. That way very large data sets can be compared or compressed easily by matching their hash numbers in order to verify their authenticity.
- **Public/Private key cryptography:** It's an asymmetric encryption method that can be described by the scheme in figure 7. With this technique, Alice can encrypt a message using her private key and Bob's public key so Bob upon receiving the message can decrypt it by using his private key. Public keys are open to the world; therefore they serve as identifiers to the receiver of a transaction as long as the private key is kept secret.
- This design permits the use of **digital signatures**, where a document is hashed into a fixed length string and then is signed with the emitter's private key. Under this scheme the authenticity, integrity and non-repudiation of the message are assured, characteristics that are desirable in electronic money transfer services.

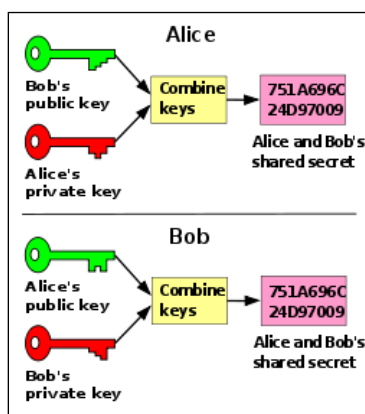


Figure 11: Public key cryptography scheme.
Source [41]

By combining these three building blocks it is possible to create a cryptographic coins transference system. The coin is defined on the base of a serial number, and then it is transferred by digitally signing this number using a Public/Private key every time a transaction is made between two parties. Nevertheless, this design doesn't resolve the double spending problem, where an individual could clone the same coin to use it in more than one transaction. The traditional solution involves the participation of a central bank that maintains a record of spent coins and therefore must be accessed every time a transaction is made. When the electronic cash is used to make micropayments, this creates a massive burden on the central bank server, thus creating the main bottleneck for electronic micropayments: high latency time to verify transactions.

Many implementations of electronic cash have been devised, but none of them has gained yet wide acceptance. In fact one of the first business models for the Internet was to pay-per-link, in a model where micropayments thanks to Chaum's design of electronic currencies will be made possible. The project didn't succeed, despite the involvement of IBM and other major participants [39].

The most innovative solution for the central bank problem has been the one proposed and implement by Satoshi Nakamoto in the Bitcoin protocol [26].

3.1.1 BITCOIN:

Bitcoin is a decentralized peer-to-peer payment system introduced to the cryptographic community in 2008. A Bitcoin is defined as a chain of digital signatures, where the bearer of the coin can transfer it by digitally signing a hash of all previous transactions recorded in the system, concatenated with the public key of the receiver, adding it to the end of the coin. Electronic payments are thus made by transferring Bitcoins between peers. The participants in the transaction are referenced by pseudonyms, their Bitcoin addresses, which are mapped by a transformation function to

a unique Public/Private key pair. The receiver of the coin can verify the signatures to check the chain of ownership of the coin.

Every 10 minutes transactions are aggregated into blocks that are transmitted to the whole network that is executing the Bitcoin client. The distributed system employed to avoid double spending is based upon Proof-of-Work, i.e. the intensive use of computer resources in order to solve a problem. The problem at hand is finding a number sequence (nonce) that once hashed with information contained on the block to be validated, along with a timestamp, matches a given value defined by the network (that depends on the computing power available in the network: more power, the harder it is to find the nonce). When a node in the network finds the nonce value it broadcast it to the nearer nodes along with the block information, therefore the other nodes can verify the correctness of the nonce, add the block to the existing chain of transactions, and the protocol then rewards the node that solved the problem with 25 Bitcoins. This way the longest blockchain is the one that has more computing power incorporated, making it very hard to alter transaction history since it would be necessary to redo the entire blockchain which is too expensive computationally. Consequently this process is called Bitcoin mining and serves two purposes: avoiding the double spending problem by introducing Proof-of-Work to the transaction chain, making the longest chain the valid one since it has more work put into it, and generating the coins in the system by rewarding nodes that run the client and solve the nonce problem.

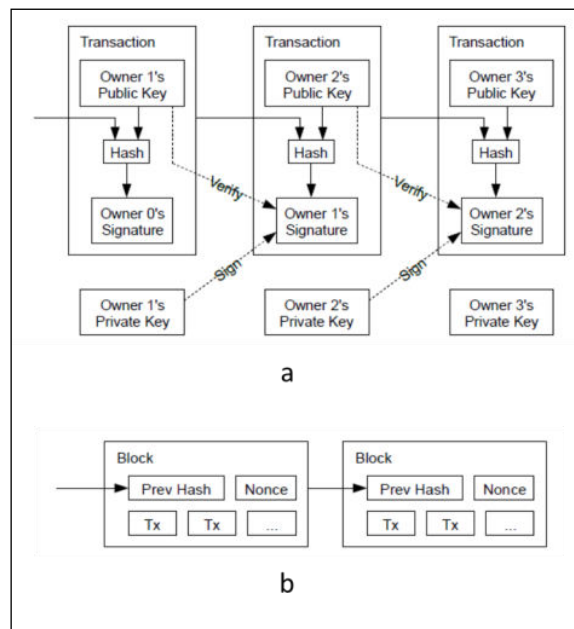


Figure 12: (A) Bitcoin chain of signatures. (B) Bitcoin blockchain.
Source [26].

The Bitcoin protocol is maintained by a group of developers working collectively on the available Github repository²². The current definition of the protocol provides many of the desired characteristics of electronic money [20], even though some concerns have arisen regarding the capacity to avoid double spending [19] and anonymity [32]. However, Bitcoin is not designed to serve as a micropayments instrument due to non-negligible transactions fees paid to miners in order to accelerate transaction confirmation times. If no fees are paid, confirmation times might span from 10 to over 60 minutes [19] making the service unfeasible for in-store payments. Furthermore, since Bitcoins are not backed by any institution, the value of one Bitcoin is dictated by the supply and demand of Bitcoins that meet on online trading platforms such as Bitstamp²³ and BTC-e²⁴. This creates a high volatility on the value of one Bitcoin, which makes it very unstable to perform payments making it more suitable as a commodity or reserve currency.

As can be seen on Figure 13, the high volatility of Bitcoin since its widespread adoption in 2013 has made the prices oscillate between USD\$330 and USD\$1000 per Bitcoin in the last 6 months, making Bitcoin an unsuitable network protocol for payments [43] since buying power can be altered considerably in just a few minutes and the switching costs faced by merchants associated with changing to a completely different asset for storing value [23]. Nevertheless it is an interesting investment instrument and certainly a revolutionary service. Since 2008 many other cryptocurrency protocols have arisen that look to tackle some of the inconveniences of Bitcoin like Litecoin²⁵, Dogecoin²⁶, Novacoin²⁷, etc., but yet none of them have successfully gained such a widespread adoption as Bitcoin nor served as an effective means of payment.

²² <https://github.com/bitcoin>

²³ www.bitstamp.net

²⁴ www.btc-e.com

²⁵ www.litecoin.org

²⁶ www.dogecoin.com

²⁷ www.novacoin.org



Figure 13: Bitcoin USD trading prices on Bitstamp. (A) Since the beginning of operations. (B) Six months October 2013 – April 2014. (C) 10 days April 7 – April 16. Source: Adapted from [bitcoincharts.com]

Still, the development of Bitcoin and other cryptocurrencies encouraged other developers to propose new solutions for the creation of modern financial services and payment networks.

3.1.2 RIPPLE

Amidst the jungle of cryptocurrencies, there is one project that differentiates itself from the rest: The Ripple payment network, www.ripple.com. The main advantages Ripple offers are:

- **Cheap** payments: each Ripple transaction costs around USD\$ 10^{-7} , thus allowing also micropayments.
- **Fast** payments: transactions made through the Ripple protocol are cleared in less than 2 seconds, anywhere in the world.

- **Currency exchange:** the protocol integrates a currency exchange algorithm that matches buyers and sellers with the lowest rate.
- **Accessible** finance: only requires an internet connection to make payments anywhere.
- **Distributed** network: the Ripple protocol is distributed amongst all the computers that connect to the network making it more secure, safe and resilient to attacks or sudden raises in transaction volume.
- **Integration** with existing financial markets: the protocol considers from the start the existence of intermediaries between traditional financial networks and the Ripple network through *gateways* that establish a link between customers and merchants.

One of the main advantages Ripple has to offer is that is designed as a transaction protocol rather than a cryptocurrency. Therefore the value of the ripple electronic coin, XRP, is not subject to such drastic variations in its price as is Bitcoin, Litecoin and other trading-oriented cryptocurrencies. Even more, one does not need to actually transfer XRP between parties, there is the possibility to issue balance between users that hold a minimum of 25 XRP on their accounts: the “price” to pay for having an account on the Ripple network (which is equivalent to USD\$ 0.1 approximately). Under this scheme, users can act as gateways to the network, receiving funds in national currency and then issuing balance to users on the Ripple network. This way Dine will act as a gateway to the Ripple network, acting as intermediary between fiat currency and electronic currency. The Ripple protocol offers a new solution to the double spending problem by reaching a distributed consensus on the transactions implemented on the Rippled software. The consensus is reached by a majority of the network that validates the transactions, if so, the transaction is valid. Otherwise it would be rejected. This way there is no central database that stores information and neither Proof-of-work is required. The distributed Ledger serves as the central repository and changes to the ledger are valid only if a majority of the network agrees on the transaction.

The Ripple network is in active development under the guidance of Ripple Labs, a San Francisco based company amongst whose investors are Google Ventures and Andreessen Horowitz. On www.github.com/ripple the code is available for developers to contribute and is actively being updated. In the context of this project, minor contributions have already been made to the ripple gateway code which will serve as a building block for Dine’s services. The fact that all the code is publicly available assures that if Ripple Labs stops his active involvement in the project in the future, the ripple protocol will still be available and valid.

For a complete description of the Ripple protocol and payment network please refer to Annex 1: “Ripple, A Primer”.

4 BUSINESS PLAN

Based on the state of Mobile Financial Services, Smartphone market penetration and cryptocurrencies protocols it is possible to propose a novel Mobile Financial Service that captures the advantages of decentralized cryptocurrency protocols; the expanding reach of mobile internet on Smartphones across Latin America; the latent market opportunities derived from the high cost of transactions in traditional financial networks and Latin America's low financial inclusion rates. In the present chapter the creation of a Startup company is proposed in order to respond to the market opportunities described previously. As a way of crystallizing the ideas behind the startup the name **Dine** is chosen (as an abbreviation of "dinero"). Next the market opportunities derived from the previous exposition are presented, and then in the context of the Delta Model and Customer Discovery methodologies strategic definitions and hypothesis will be formulated. Finally the business model hypothesis will be presented accordingly to the Business Model Canvas methodology.

4.1 MARKET ANALYSIS

As presented in previous chapters, Smartphone based Mobile Financial Services (MFS) have not yet attained widespread adoption worldwide and in Latin America in particular. This is due in part to low penetration of traditional financial services in the region and the low financial inclusion (since MFS are primarily additive services on top of existing traditional financial services). Even more, the explosion of Smartphone and mobile internet penetration is very recent, circa 2013, which also gives count of the novelty of the market.

4.1.1 THE INDUSTRY STRUCTURE: UNDERSTANDING EXTERNAL FORCES

According to the Delta Model framework, sound analysis of the prepaid Mobile Financial Services industry structure captures the principal external forces, their future trends and their impact on a business. Porter's five forces are a good model to understand the strategic implications of industry structure. Through the Delta Model, rivalry is replaced by bonding of customers in one instance and of complementors in the other. In the following points a brief analysis of the prepaid mobile financial services industry under the scope of Porter's five forces [31] is presented. Each table presents a relevant dimension for the analysis alongside an appreciation of the degree of attractiveness for **Dine** (High, Medium and Low) based on previous chapter's information.

4.1.1.1 Threat of new entrants in the prepaid MFS industry

Entry barriers	Degree of attractiveness
Economies of scale	High. The average cost of serving a customer is decreasing in the number of customers.
Product differentiation	High. Characteristics such as user interface and experience, protocol reliability, security and processing time are key factors for differentiation. Even more a customer-centered company could clearly differentiate itself from current revenue-centered operators.
Brand recognition	Low. Brand hasn't been presented to customers and possible entrants (banks primarily) have a considerable budget for publicity.
Switching costs	Low. A user may switch to another mobile financial service provider with relative ease.
Access to distribution channels	High. Mobile internet and Smartphones are the main distribution channels and their penetration rate grows steadily as shown previously.
Capital requirements	Medium. Main costs are human resources and cloud computing both of which are scalable to service adoption rates. In certain countries required initial capital to operate is high.
Access to latest technology	High. Cryptocurrency protocols are available and an alliance has already been established with Ripple Labs.
Government protection	Medium. The Chilean legislation is still in congress, but there are niche cases that are permitted. In other Latin American countries there are no legal barriers after obtaining government authorization.
Experience effect	Medium. Experience does not play a major role since all processes are already tested. Nevertheless, companies that already have experience on mobile financial services clearly have a head start.
Industry profitability	High. Financial services are one of the most profitable industries.
Summary	<i>From an external perspective the industry attractiveness is medium. There are certain threats of new entrants to the industry, especially from established financial institutions and payment network players, but none of them has given signs of entering the market since their core business is focused elsewhere.</i>

Table 10: External Analysis. Entry Barriers.
Source: Prepared by the author.

Exit Barriers	Degree of attractiveness
Asset specialization	Low. Developed technologies are specific to the service.
Immediate exit cost	High. There are no major costs associated to exit.
Strategic link with other business	High. There aren't links.
Emotional barriers.	High. Initially there is low emotional involvement with customers.
Social and government restrictions	High. There aren't any.
Summary	<i>High. There aren't major complications for exiting the industry.</i>

Table 11: External analysis. Exit barriers.
Source: Prepared by the author.

4.1.1.2 Threat of substitute services in the prepaid MFS industry

Substitutes availability	Degree of attractiveness
Close substitutes available	Medium. There are similar services, mainly traditional banking applications, but there isn't any Smartphone-based prepaid financial service in the market.
User switching costs	Low. Switching services does not imply major costs, except the case when the client is a corporation that could outsource its mobile financial services to Dine.
Profitability and aggressiveness of the substitute provider	Low. Banking and financial services industries are very profitable and aggressive when it comes to defend their interest.
Price-value ratio of substitute	High. They provide an expensive service that is poorly evaluated by customers and merchants in general.
Summary	<i>The threat of substitute services is medium-high, therefore attractiveness to the company is medium-low.</i>

Table 12: External analysis. Threat of substitute services.
Source: Prepared by the author.

4.1.1.3 Bargaining power of customers in the prepaid MFS industry

In the scope of the Delta Model, this dimension of Porter's analysis is viewed under the optic of creating bonds with customers, instead of "fighting" them for a dominant position.

Customer alternatives	Degree of attractiveness
Buyer concentration to firm concentration ratio	Medium. There are no firms that offer the same service, therefore no established buyers, only potential ones.
Substitute availability	Medium. See 4.1.4.2.
Buyer switching costs	Low. See 4.1.4.2.
Menace of buyer's backwards integration	High. It is unlikely that a customer will develop a similar solution.
Buyer information availability	High. They have information in order to decide which service to choose. A sound proposal should reach the customer.
Buyer price sensitivity	High. Buyers and merchants are faced to high commissions from existing banking applications and they respond to price decreases.
RFM (customer value)	High. As showed in Table 7, only the prepaid meal benefits markets amounts to over USD\$ 22 billion/year in Lat. Am. Meal or transport purchases have a daily frequency.
Summary	<i>The power of customers, in this case the potentiality to create bonds with them is medium.</i>

Table 13: External analysis. Power of customers.

Source: Prepared by the author.

4.1.1.4 Bargaining power of suppliers in the prepaid MFS industry

Again, in the scope of the Delta Model, this dimension of Porter's analysis seeks to establish cooperation links with suppliers instead of diminishing or neutralizing their bargaining power.

Supplier's power	Degree of attractiveness
Number of suppliers	High. Cryptocurrency protocols are open and accessible. Cloud computing and/or server infrastructure is diverse and global. Bank operators to link with the established financial network are numerous. Skilled personnel are the only limited input, at least locally.
Supplier substitute availability	High. Main suppliers are cloud computing companies (Amazon, Google, Rackspace, Microsoft, etc.), internet service providers and programmers, although their availability is somewhat scarce, they can be replaced.
Supplier switching cost	Medium. Changing programmers is not that complicated with a well-documented development scheme. Changing cloud computing providers can be difficult due to operating system and hardware architecture differences, but it is not critical.
Suppliers' forward integration	Medium. Some cloud computing companies, such as Google, have already developed mobile financial services, although they are additive services, they could potentially enter the market.

menace	
Industry's backward integration menace	High. There are no clear threats that a customer segment could integrate backwards. They could develop in-house solutions (e.g. Edenred) but hardly will they become a service provider for other companies.
Suppliers contribution to QoS	Medium. Supplier's contribution to QoS is essential. From the user perspective, a low mobile internet QoS affects directly the service. Also, problems on cloud computing suppliers affect directly the QoS. However, these factors are transversal to internet based companies, so they don't constitute a differentiating point.
Impact of suppliers on total cost	High. Cloud computing suppliers present low costs that are transversal to every internet based service, same as programmers and ISP.
Summary	Medium. Suppliers can be incorporated to the value chain. Furthermore, cloud computing suppliers and mobile internet suppliers have on their own interest the development of new services; therefore they support such initiatives and tend to create a cooperation environment.

Table 14: Bargaining power of suppliers.
Source: Prepared by the author.

4.1.1.5 Intensity of competitive rivalry in the prepaid MFS industry

Competitive rivalry	Degree of attractiveness
Number of rivals	Low. Potential rivals are many (banks, corporate prepaid services companies)
Industry growth	High. Financial services industry presents constant growth in transaction volume.
Advertising expense	Low. Advertising expense by other financial services providers is very high.
Degree of transparency	High. Government regulation mandates a high degree of transparency in financial institutions.
Industry's degree of innovation	High. Financial services industry is one of the least innovating industries in Chile and South America, mainly due to the high profitability margins they have with the current scenario.
Summary	Degree of attractiveness is medium. There's high competitive rivalry but the market is continually expanding and innovation-centered companies have a chance of creating and capturing customer's value.

Table 15: Competitive rivalry.
Source: Prepared by the author.

4.1.1.6 General evaluation of the prepaid MFS industry

Porter's five forces	Industry attractiveness
Threat of new entrants	Medium
Threat of substitute services	Medium-Low
Customer's power	Medium
Supplier's power	Medium
Competitive rivalry	Medium
Summary	<i>From an external perspective the industry's degree of attractiveness is medium. This is mainly due to the weak positioning a new entrant has on the market compared to existing traditional financial institutions that could easily enter it.</i>

Table 16: Five force's general evaluation of the prepaid mobile financial services industry. Source: Prepared by the author.

4.1.2 STRATEGIC POSITIONING

Porter's analysis of the prepaid mobile financial services is not very encouraging at a first glance. As described on chapter 1.3.1, the Delta Model states that there are three main possible strategies, all of which can serve as a framework for reaching specific customer segments. In this context, the ideal strategy for a payment network is the *System Lock-In* by consolidating a dominant exchange platform. In fact, this is the current situation nowadays in traditional bank-owned payment networks in Chile and other Latin American countries. Nevertheless, since this project does not incorporate any proprietary standards or is not derived from a dominant market position (as is the case of Banks) the strategy to follow must be focused on building a **dominant exchange platform** from the ground up.

Under this perspective, the dominant design will follow as a consequence of the captivity of users in the exchange platform. The technical characteristics of the Ripple Network make possible the creation of unique currencies and accounts that can only transfer value between them and therefore be associated to an exclusive gateway. That is the actual role that Dine will perform, as a selective bridge between established financial networks and the Ripple network. In order to position Dine as the dominant exchange it must create a 'value gradient' that will encourage users to use Dine services' as a substitute for cash payments:

- Lower cost than existing alternatives.
- More capillarity than existing alternatives.

- More secure than existing alternatives.

The creation of a **Dominant Exchange Platform** is the most suited strategic planning to guide future development. Centered on particular use cases and with a differentiated proposal for each of them. The focus of the company will be the customer, with the final objective of developing a service that will serve a large base and thus drive the company's value. After an external analysis of the Mobile Financial Services Industry, a series of hypothesis will be formulated that aim to propose a Mobile Financial Service and the corresponding business plans to identify the resources, value propositions and expected revenue of each of the hypothesis.

4.2 CUSTOMER DISCOVERY

Both the Customer Discovery approach and the Delta Model go beyond external analysis and put the business's focus on the customer, not the industry nor the available resources. Once you "discover" a customer segment and identify their needs; validate your business model and value proposal, you can start the company based on verified/refuted hypothesis. Finally it comes to apply the scientific method to business creation.

4.2.1 THE MISSION: STARTUP SCOPE AND COMPETENCIES

The first stage is defining the global framework on which the startup plans to develop: the mission statement. In order to define Dine's mission the following aspects will be considered:

Service scope	Prepaid mobile financial services.
Market scope	Finance and Smartphone apps.
Geographic reach	Chile, Peru and Latin America.
Technology scope	Cryptocurrencies, Mobile apps, distributed networks.
Competitive strategy	Total Customer Solution

Table 17: Mission statement.
Source: Prepared by the author

Therefore, Dine's mission can be declared as:

Dine aims to be the main platform for Smartphone-based prepaid mobile financial services in Chile and Latin America. Through the leverage of open cryptocurrency network protocols and the fast growing rate of Smartphone and mobile internet penetration, Dine will focus its service development on providing total customer solutions.

As stated on the mission, the resources and capabilities needed to succeed are centered on cryptocurrency protocols expertise, Smartphone apps development and customer bonding in order to provide a complete solution for every identified segment. The core beliefs that sustain the mission statement are:

- Trust is the foundation of networks.
- The friction-free flow of money between companies and individuals is fundamental to sustainable development.
- Electronic payment networks are the most efficient payment system available in an information society and should be accessible to everyone.
- The main goal of our business is to maximize customer utility.

4.2.2 *STARTUP HYPOTHESIS*

4.2.2.1 **Customer hypothesis**

According to the strategic planning declared earlier, the customer is at the center of the development. Therefore the initial assumptions on which types of customers will be served and what are the problems they face must be written down in order to test them on the next phase.

4.2.2.1.1 *Types of customers*

According to the Customer Development model, there are six different types of customers involved in the purchase decision: end users, influencers, recommenders, economic buyers, decision makers and saboteurs. For each of the proposed products we will explicit the beliefs and knowledge up to date for each type of customer. Since payment networks are a two sided market, there'll always be two end users: the buyer and the seller.

4.2.2.1.1.1 **End users: individual buyer**

As of 2013, the Ericsson Consumer Lab [10] did an extensive survey in 5 Latin American countries focused on gaining insights on the m-commerce market. Their research identified two main segments for end users of mobile financial services.

- **Strugglers:** Six out of ten people in Latin America are unbanked, either because they do not have the possibility to open an account or simply don't have any interest in affiliating themselves with a financial institution. Their income is received in cash or check, sometimes on a day to day basis, and can also fluctuate in the course of a year. For this consumer group, cash is the only means of payment, since they rarely have access, or interest, to other financial services. Cash is considered a transparent and easy means of payment, and a way to control one's spending. They are characterized by:
 - Low income, sometimes fluctuating.
 - Informal workers, 'independent'.
 - Unbanked/underbanked and therefore cash is their only means of payment.
 - They occasionally use credit, but don't like it.
 - Have a feature phone or low end smartphone
 - Present low awareness and use of new technology.

In Chile this segment is served by Banco Estado's Cuenta RUT, a debit account open to all Chilean citizens that charges on a transactional basis: USD\$0,7 per ATM withdrawal or internet transfer²⁸. Despite capturing more than 6 million users, *Cuenta RUT* presents the same problems of access to point of sales and ATM than other traditional financial services. Furthermore the transaction fee amounts to nearly 6% of the daily minimum wage which is far from negligible.

- **Achievers:** Four out of ten people have access to bank products, such as savings accounts, debit and credit cards, even though far from all fully take advantage of these services. These consumers constitute another important segment for m-commerce that is expanding continuously in the region. They are often formal workers, receiving a fixed salary on a monthly basis, deposited into an account. Credit cards and paying in installments are common among achievers, who often are middle or high income earners, and have a higher education level than strugglers. They have the economic margins allowing for leisure consumption to a higher degree, and embrace new technology they can benefit from in their daily lives. They are characterized by:
 - Higher income and monthly salary.
 - They are formal workers or self-employed.
 - Have bank account, are financially included.
 - They prefer cards or bank transferences over cash.
 - Frequently use credit and like it.
 - They have a high end smartphone and embrace new technology.

²⁸ <http://www.bancoestado.cl/imagenes/CuentaRut/contratoCtaRUT.pdf>

M-commerce services need to be developed based on key drivers for the two segments: control, safety and convenience. For strugglers, basic mobile banking solutions would provide safety and control, while mobile payments would be convenient for achievers, who appreciate not having to handle cash at all.

- Key drivers for Strugglers: safety, no queuing, mobility, independence, control.
- Barriers for Strugglers: lack of knowledge, high service fees, poor security (against theft), unreliable network, absence of transparency, inaccessibility.
- Key drivers for Achievers: independence, no queuing, safety, mobility, control.
- Barriers for achievers: unreliable network, lack of transparency, poor user interface, absence of security (against theft), inaccessibility.

The survey also establishes that in most countries people prefer a banking institution as a MFS provider over a Telecom, phone brand or retail Company. But customer's loyalty to banks is very low; therefore it is not clear where the middle ground between loyalty and trust lies.

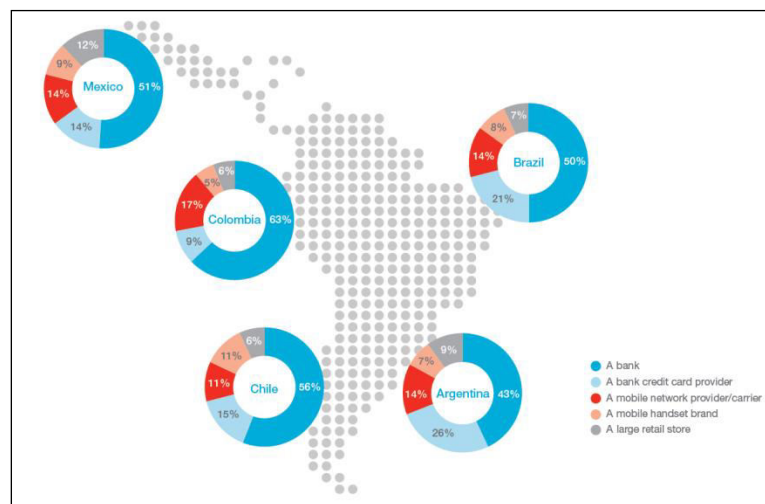


Figure 14: Preferred M-Commerce provider.
Source [10].

4.2.2.1.1.2 End user: corporate buyer

Corporate prepaid services are a very big market when it comes to issue volume with over USD\$22 billion per year in Latin America only. Usually large companies have been served in this segment, leaving aside small and medium business (SMB). This is due to three principal reasons: (i) SMB don't have that much budget to allocate in employee benefits such as meal vouchers, (ii) there is very little information available to SMB and they are not aware of tax benefits derived from this service and (iii) the reach of the corporate prepaid payment network is very limited (mainly to the metropolitan area).

When a company buys corporate prepaid services they can save up to 33% of the amount bought in tax reductions: VAT reimbursement and utilities reduction due to costs increase. Also, an important aspect to retain personnel in SMB is the difference they present with larger companies when it comes to employee benefits. A service that can ease and expand access to employee benefits could help them differentiate themselves while maintaining low costs. Equally, the costs incurred in daily transportation in the city are rarely billed and therefore the VAT is paid as a regular consumer. A service that expands the reach of corporate prepaid payment networks to transportation could provide a substantial benefit to SMBs.

	Number of companies	Number of workers
Micro	637111	552958
Small	171237	1724352
Medium	25737	1445538
Large	12724	4367903
SMB	196974	3169890
SMB as % of the Total	23%	42%

Table 18: Chilean SMB as of 2012. Source Internal Revenue Service. Source [36].

As can be seen on the table, SMBs represent a 42% of the Chilean workforce. According to an International Labor Organization [18] study conducted in Chile, only 9% of Chilean workers receive meal benefits through a voucher or ticket, and most of them are high income employees. One of their recommendations to ameliorate labor and feeding conditions in the workplace is to incentive the use of meal vouchers over cash since this is the only possible way to make sure the proper use of the benefit. One of the drawbacks identified in the meal voucher system is that many companies are not located near restaurants. Therefore employees need to travel further in order to use the system. Food carts can provide the meal service, but current payment networks such as Edenred and Sodexo do not have the technology nor business model to integrate these businesses to their network.

4.2.2.1.1.3 End user: retailer/merchant/service provider

As mentioned, payment networks are two sided markets: the buyer and the retailer/merchant/service provider. The Ericson Consumer Lab report [10] does not study the merchant side of the market, and there is not much information available on this segment. Since they are often subdued to a monopoly from established financial networks, they do not have much options and therefore their participation in the network is seen as a given that can be influenced with premiums for consumers that will drive the use of electronic means of payment. In general the business process behind merchant accounts is not focused on their needs, but solely on minimum compliance with

regulation requirements. Payment systems are disconnected from business management systems, especially in the case of smaller merchants. From informal interviews with over 20 small business owners it is possible to drive the following conclusions:

- Merchants have a negative opinion of payment network providers in Chile (Transbank S.A. and Multicaja S.A.) due to:
 - high costs
 - poor customer service and poor quality of service
 - high latency times

Furthermore, a google search of the term “transbank” shows in the seventh position the link to consumer claims site [reclamos.cl](http://www.reclamos.cl)²⁹ where they have over 50 threads with consumer claims, each of which has over 100 readings. The main complaints are related to contract breaches, poor customer service, wrong payments, etc. Multicaja presents a much lower rate of claims but nevertheless there are some related mainly to poor customer service.

Likewise, prepaid payment networks established by Edenred and Sodexo present similar inconvenients to merchants. Fees are very high and when it comes to physical vouchers the reimbursement process is slow and cumbersome which leaves many small retailers excluded from the network.

Informal interviews with taxi drivers also reflect an interest for having an electronic means of payment more accessible than the alternatives offered by Transbank. Their main concerns are safety, reliability, low cost and integration with their supplier’s payment networks (gas stations).

From this information we can segment the merchants in three categories:

- i) Big retail and service providers that are major clients of existing payment networks, face lower fees and a fair quality of service.
- ii) Small retailers and service providers that are clients of existing payment networks and face higher fees and poor quality of service.
- iii) Small retailers and service providers that are not clients of existing payment networks.

Evidently a new entrant to the market should focus its efforts on attracting segments two and three since they have more incentives to test new services and less operational costs of switching payment modalities. It is hard to estimate the potential transaction volume of these segments. The Chilean *Instituto Nacional de Estadísticas* (INE) [17] has one study from 2011 where they give count of the sales volume of some economic sectors that could be identified as segments (ii) and (iii).

²⁹ <http://www.reclamos.cl/empresa/transbank>

ITEM	Sales (CLP\$ x 1000)
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	23.463.429.521
Retail trade in non-specialized stores	14.421.388.984
Retail sale of food, beverages and tobacco in specialized stores	1.627.449.381
Retail sale of new goods in specialized stores	7.215.661.519
Retail sale of used items	16.611.895
Retail trade not made in stores	99.687.714
Total (thousands of pesos)	46.844.229.014
Total USD\$ (ref 1 USD = 500 CLP)	\$ 93.688.458.028

Table 19: Business Income according to economic activity.
Source: Adapted from [17].

If 10% of those sales is made through electronic means of payment, it would amount to over USD\$9 billion a year. Another way to estimate the size of the market is to assume that 20% of ATM withdrawals are used to pay for such services, which amounts to an annual issue volume of over USD\$ 8 billion in Chile and USD\$6 billion in Peru (see Chapter 2.3.3.1 and 2.3.3.2).

4.2.2.1.1.4 Recommenders and Influencers

Blank describes this segment as people who have a stake on the product purchase decision. For the merchant side, trade associations and guilds are essential to reach directly to a large number of small retailers and merchants. Equally the role of the press, technology reviews and support from trusted companies (such as Google or others) may serve as an indirect influence over the adoption decision of the service.

4.2.2.1.1.5 Economic buyer and/or decision maker

The economic buyer is the one who decides to or directly makes the purchase. In all cases we have the merchant (might it be an individual merchant/taxi driver or the manager of a chain) and the user-buyer. For corporate prepaid services it's the company manager.

4.2.2.1.1.6 Saboteurs

Saboteurs are the people whose current situation is put at risk by the new service offering. They are the reason why it would be more difficult to sell Dine as a platform provider for companies like Edenred or Sodexo, since it would involve the obsolescence of current working posts at those companies. In general the main saboteur will be existing payment networks such as Transbank in Chile that will face competition on merchant segments (ii) and (iii) (See Chapter 4.2.2.1.1.2)

4.2.2.1.2 Customers problems

As shown there is a latent opportunity in developing transformational MFS that can solve the problems of having a:

- **Ubiquitous payment system:** one must have access everywhere and at all times to the payment network in order to make transactions, in a much greater level than the current capillarity of POS networks, without excluding small business from the network. The growing penetration rate of Smartphones and mobile internet suggest that is the most suited means to achieve the goal of ubiquitous electronic payment.
- **Versatile payment system:** the system must allow in an easy and transparent way Peer-to-Peer (P2P), Peer-to-Business (P2B), Peer-to-Machine (P2M), Machine-to-Machine (M2M) and Government-to-Peer (G2P) transactions. Also it must integrate with e-commerce platforms (buying goods/services and paying bills), have the ability to process micropayments (particularly in the P2M context) and to make international money transfers (in the P2P case).
- **Safe payment system:** the system must provide high security standards and integrity to transactions in a much rigorous way than current credit/debit card standards, while eliminating the risk associated to carrying cash.
- **Low cost payment system:** operational cost must be very low to reduce friction in the network, improve economic efficiency and attain a high penetration rate.
- **Open payment system:** the service developed must be open to everybody in order to serve financial inclusion, and minimize subscription requirements while in compliance with Know Your Customer (KYC) and money laundering prevention policies.

The complete requirements of an ideal electronic payment system include more aspects such as anonymity, non-observability, interruption tolerance, etc. (for an exhaustive set of requirements see [20]). The proposed characteristics respond to the above mentioned problems for specific use cases and segments. However, the core

problem Dine aims to solve is the high cost and limited reach of electronic payment networks. The scarcity of cash and low capillarity of POS is a transversal problem. Therefore any payment network that manages to overcome these problems will gain market share.

4.2.2.1.3 Return on Investment (ROI) justification

Since Dine aims to be the least expensive electronic payment network, current users of other networks will always see a net increase of their income when accepting payments through Dine in comparison to other services. The ROI justification will depend on their current fee structure. Nevertheless, for merchants it will always be the most economic payment network available, and for buyers it's free of charge. Furthermore, the net investment is practically zero, since almost every business now a days has access to internet. The costs are associated to a change on their process and familiarizing with the new platform.

- For merchants who are in traditional financial networks they will gain at least 1% more income on every sale made through Dine in comparison to other electronic means of payment due to the lower fees. Furthermore they will increase the quality of service by having faster and more versatile means of payment.
- For restaurants that accept prepaid meal vouchers they could increase their income in over 3% (depending on their current fee structure) for payments accepted through Dine in comparison to those accepted through other prepaid payment networks. Also they will improve the quality of service by having faster and more versatile means of payment.
- For taxi drivers or retailers that are not affiliated to a payment network they wouldn't perceive a net economic benefit. The increased security associated to not handling cash is highly valuable and lost sales due to buyer's scarcity of cash would diminish. This sums up in an improvement in the quality of service given to their customers.

4.2.2.2 Product hypothesis

The market Dine plans to participate in is the Smartphone based prepaid mobile financial services. For each of the identified customer segments a product hypothesis will be formulated:

- Individual buyer: Dine_account.
- Corporate buyer: Dine_corporate.
- Retailer/service provider: Dine_comerce

Next product features, benefits, intellectual property, and dependency analysis are presented for the three possible products.

4.2.2.2.1 Product features

4.2.2.2.1.1 Smartphone based mobile account: Dine_account

The service consists of a multipurpose mobile electronic wallet. The basic features the mobile App comprises are:

- Cash-in: users must load balance into their Dine account. To do this they have at least two options:
 - Bank transfers: the system must monitor every bank transfer done to Dine's master bank account³⁰ and be able to determine which transfer corresponds to which Dine account.
 - Cash deposits: the system must accept cash deposits at Dine's master bank branches. To do so, bank account monitoring and a user interface to enter cash deposit voucher details are mandatory.
- Cash-out: users must have the ability to withdraw their balance. At least two ways should be developed:
 - Electronic transfer to another bank account.
 - Cash out at Dine's master bank branches.
- Know Your Customer (KYC) compliance.
- Peer-to-Peer transfers: the App must have the ability to make transfers between user accounts.
- Peer-to-Business transfers: the App must have the ability to make in-store/web payments through QR code reading and utilities payments.
- Transactions history and send reports via email.

In addition to the mobile App a web interface is necessary in order to:

- Block account in case of theft.
- See transaction history and reports.
- Cash-out and Cash-in operation management.

4.2.2.2.1.2 Corporate prepaid services: Dine_corporate

Corporate clients will be served through a Web interface where they will make the following operations:

- Business managers will be able to register and buy corporate prepaid services via bank transfer.

³⁰ It refers to the bank account (one or more) at traditional financial institution Dine (as a business) will maintain in order to manage client funds. As will be described later, Dine serves as a gateway to the space of cryptocurrencies, therefore it maintains presence on traditional and novel financial networks.

- Manage employee accounts: open/close, load/unload balance and generate invoices when buying prepaid corporate services.
- See transaction history and employee usage of their corporate prepaid services.

Employees will access the system through a Smartphone app that must allow them to:

- Make peer-to-Business payments at restaurants and other alimentation related retails.
- Check transaction history.
- KYC compliance.

4.2.2.2.1.3 Retail/Merchants/Service providers: Dine_commerce

Whether it is receiving payments through Dine_account or Dine_corporate, the selling end of the transaction must have the proper tools to manage their account. Namely, a web client that allows them to:

- Create an account and register as a merchant.
- KYC compliance and internal revenue service automatic check.
- Make Cash-out operations in one of two possible ways:
 - Electronic transfer to another bank account.
 - Cash out at Dine's master bank branches.
- Transaction monitoring functions in order to verify received payments.
- Generate invoice for every transaction received (IRS compliant).
- QR code generator to facilitate payment spots.

A mobile app will also be developed in order to:

- Monitor transactions and manage cash-out operations to bank accounts.
- On-screen QR code generator to receive payments.

4.2.2.2.2 Product benefits

In this section the hypothesis customer's perceived benefits when using the product are presented.

4.2.2.2.2.1 Smartphone based mobile account: Dine_account

- Dine_account is a payment system based on a mobile electronic wallet that allows people to make transactions free of charge.

- It's based on cryptocurrency protocols that allow secure and fast transactions with no counterparty risk.
- Dine_account will provide a great user experience and gateway access to cryptocurrency payment network, removing all the hassles of dealing with new concepts and technologies, leveraging the distributed protocols to serve the Latin American community.
- Users will need to transfer money to their Dine_account to start making money transfers, pay in retail stores, e-commerce sites and even micropayments wherever an internet connection is available, absolutely free of charge.

4.2.2.2.2 Corporate prepaid services: Dine_corporate

- Dine_corporate is a mobile account for corporate prepaid services based on a Smartphone/Web App.
- With Dine_corporate business can buy corporate prepaid services easily and charge them as expenses to reduce their tax payments.
- For users it's the easiest and safest way to pay for their meals and taxi services during work hours without the hassle of carrying vouchers or cards.
- Thanks to cryptographic currency protocols, Dine_corporate can provide the service at a very low cost, with the highest security standards.

4.2.2.2.3 Retail/Merchants/Service providers: Dine_commerce

- For merchants it will be the least expensive electronic payment system with on demand reimbursements to their bank account. , without POS machines, thus verifying payments is possible only with a smartphone or desktop based internet connection.
- It only requires a desktop or Smartphone based internet connection to verify payments. No dedicated equipment or POS machines, thus merchant can receive payments anywhere at the lowest fees.
- Merchants won't have to worry about collecting, verifying and redeeming vouchers when it comes to corporate prepaid services.
- Taxi services will only need to register and print their QR address in order to receive payments on their account. It only requires a mobile internet connection to verify the transaction (no special equipment), gives total control of their account and on demand reimbursements at the lowest fees.
- Suitable for all services, from food carts to big retailers and web sites.
- It will automatically create sales reports with all required information for tax compliance.

4.2.2.2.3 Intellectual property

The technologies employed in this project are mainly open source. In house development will be centered on algorithms and interfaces; therefore there are no major intellectual property concerns. In a second stage defining and registering trademarks will be mandatory.

4.2.2.2.4 Dependency analysis

Dependency analysis consists on declaring what should happen for the startup to be successful, when it needs to happen and what it means if it doesn't happens. As in previous sections, all three product hypothesis share one common dependency:

- Smartphone and mobile internet penetration in Chile, Peru and Latin America in general should surpass 45% by 2017. If it doesn't happen the market stagnates.
- Obtain authorization from the government entities that regulate prepaid financial services on the target markets:
 - Chile: Superintendencia de Bancos e Instituciones Financieras, Servicios de Impuestos Internos.
 - Perú: Superintendencia de Bancos y Seguros, Ministerio del Trabajo (for the prepaid corporate services / employee benefits segment).
- In order to make Dine_account possible Chilean regulation on prepaid financial services should be approved by the end of 2014/mid-2015. Otherwise legal restraints will difficult operation. Nevertheless, getting buy-in from established banks could be a solution and therefore the service will be provided through a banking institution.

However, the initial legal scheme under which Dine will operate is the trading of cryptocurrencies, in particular the Ripple cryptocurrency XRP. Since this trade is not regulated in Chile and in most of Latin American countries, the business will start on a "no-man's" land. Having a transparent information delivery system to government regulators will be a key aspect of the service in order to gain regulators trust.

4.2.2.3 Channel and pricing hypothesis

4.2.2.3.1 Channel

Since Dine products are a Web/App based service it will be delivered through the internet. For reaching retailers and merchants to participate in the network a direct sale

will be made through unions and merchants associations in order to present them the payment system.

Also, a monetary reward will be paid to users that integrate merchants to the network and who reach a rate of use greater than a determined monthly threshold, based on the DARPA Network Challenge winning strategy [2] [30]. This is an aspect to be designed in a second stage.

4.2.2.3.2 Pricing

4.2.2.3.2.1 Dine Account

As usual in payment networks, the buyer side of the network is subsidized. Dine will be free of charge to buyers and individual users in order to drive adoption of the system. When they make withdrawals from their Dine Account to their bank account or at a cashier, the first withdrawal of the month will be free of charge. Subsequent reimbursements in the month will be charged with a 0,5% fee.

4.2.2.3.2.2 Dine Corporate

For corporate buyers of prepaid services a flat fee of 0.5% of the total issue volume is proposed.

4.2.2.3.2.3 Dine Retailers

For merchants that subscribed to Dine’s payment network there are two charges: a monthly fixed charge and tiered fee structure depending on their transaction volume:

Monthly Transactions	Fee	Monthly charge USD\$ / 500 Tx
[0;1000)	0%	1
[1000;5000)	0.5%	0.5
[5000;++)	0.5%	0.3

**Table 20: proposed fee structure for retailers.
Source: Prepared by the author.**

The fee will be applied if more than one withdrawal per month is made from their Dine account. The first withdrawal will be free of charge. That is, if a merchant makes only one reimbursement per month he will pay only the monthly charge.

4.2.2.4 Demand creation hypothesis

4.2.2.4.1 Creating customer demand

A key aspect to create customer demand is seeking partnerships with companies that provide complementary services to a large customer base: Mobile Network Operators (MNO), banks and government agencies. In particular, an alliance with a MNO will be sought since the adoption of Dine's proposed services is based on access to mobile internet and Smartphones. Simultaneously, Internet advertising campaigns will be the main channel for presenting the value proposition to customers. Lastly, presentations to merchants associations and/or unions will be made to present the service to that segment.

4.2.2.5 Market type hypothesis

Prepaid Mobile Financial Services market is still not fully developed. As stated previously, there are similar services but none of them has the features of Dine's proposed services. In this sense, the company is entering a new market space in the realm of payment networks, where there aren't any dominant players yet, although financial institutions, large retailers or mobile network operators have a considerable advantage due to their large customer base.

Potential customers will come from cash based payment networks, and those who already use electronic means of payment but are unsatisfied by their service. The main features that will compel users to use Dine's services are low cost, safety, mobility and ease of use.

The potential size of the market is over USD\$ 8 billion/year on issue volume in Chile only (see Chapter 4.2.2.1.1.3). The corporate prepaid services issue volume is USD\$ 22 billion in Latin America. Estimating that Chile represents a 4% of the market (Since Mexico and Brasil are the 80% [8]) implies that in Chile only the issue volume is in the order of USD\$ 880 million per year.

Once the market is developed, the key to secure it and prevent well-heeled competitors from taking it is to focus the service on network creation and customer satisfaction rather than maximizing the company's revenue. The value of the company resides in the network and information exchanges made through it.

4.2.2.6 Competitive hypothesis

Dine’s proposed services are creating a new niche in the payment networks market. The proposed reasons why customers will use Dine are:

- Dine allows users to make/receive payments anywhere an internet connection is available.
- It’s the safest, fastest and least expensive electronic payment network.
- It allows making micropayments, a feature that no other electronic payment network provides.
- In order to subscribe to the network only an internet connection is required. There are no necessary sales visits or dedicated equipment installation.
- Suitable for banked and un-banked users.

In a competitive diagram against existing payment networks, Dine could reach a leading position on the cost/benefits dimensions, considering among the key benefits mobility, security and versatility (P2P, P2B, M2M, Micropayments, web payments).

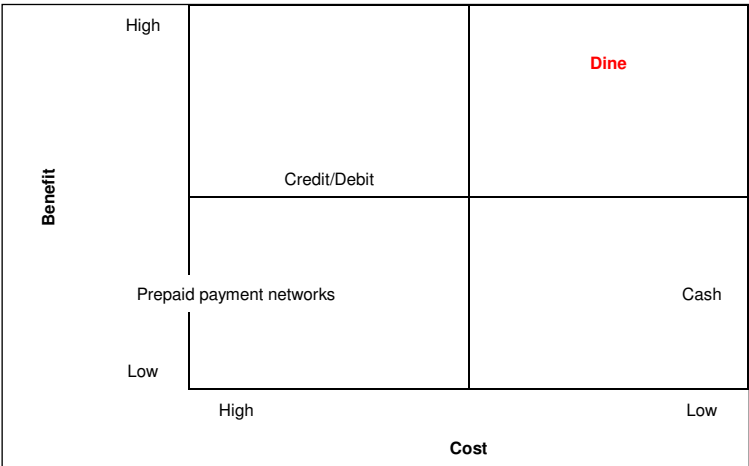


Figure 15: Competitive diagram of Dine against existing payment networks.
Source: Prepared by the author.

4.2.2.7 Operational cost and revenue hypothesis

4.2.2.7.1 Costs

The cost of creating an account in the Ripple network is approximately USD\$ 0.1 per user. The Servers will run on Google App engine with an estimated minimum cost of

USD\$1000 per month considering two running instances in the development stage. In function of the number of users, more instances, developers, personnel and other expenses can be hired accordingly.

Sales and advertising expenses are not considered since the initial strategy is to get buy-in from merchant associations, mobile network operators or other providers with a large customer base.

4.2.2.7.2 Revenues

As mentioned, in Chile amount withdrawn from ATMs amounts to USD\$ 40 billion by 2011. Considering that Chilean GNP grew 5.6% in 2012 and 4.6% in 2013, we can estimate that by 2014 annual withdrawals from ATMs can reach USD\$ 44 billion by 2014.

If in the short term Dine can serve as an electronic means of payment for the 10% of the transactions currently made in cash, capture 5% of the prepaid corporate services and considering an average income of 0,5% over the total issue volume, annual revenues could reach up to USD\$ 22 million.

4.2.2.8 Business Model Canvas

As a way to sum up the product and services hypothesis described in previous sections the Business Model Canvas is presented for each service.

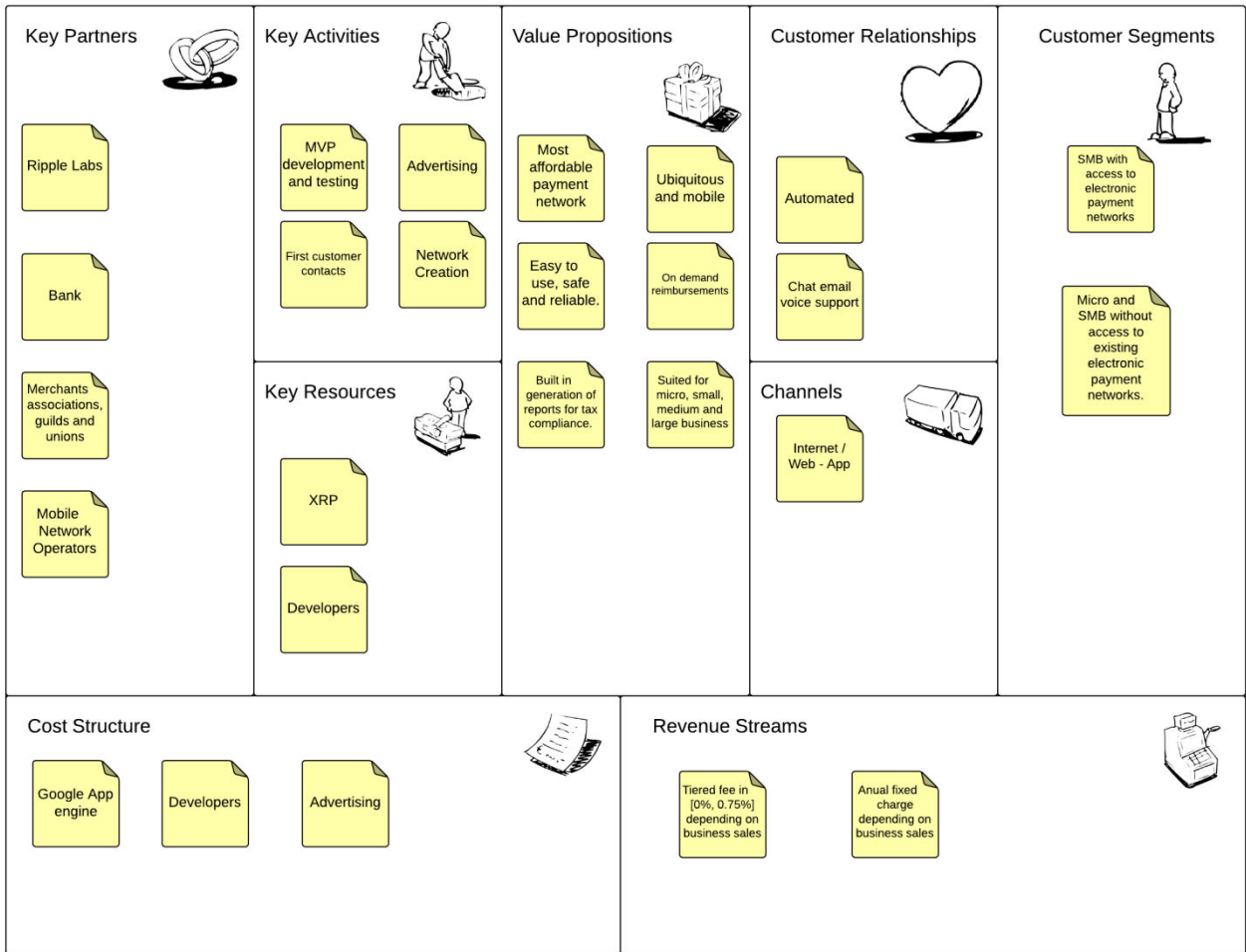


Figure 16: Business Model Canvas Dine Commerce.
Source: Prepared by the author.

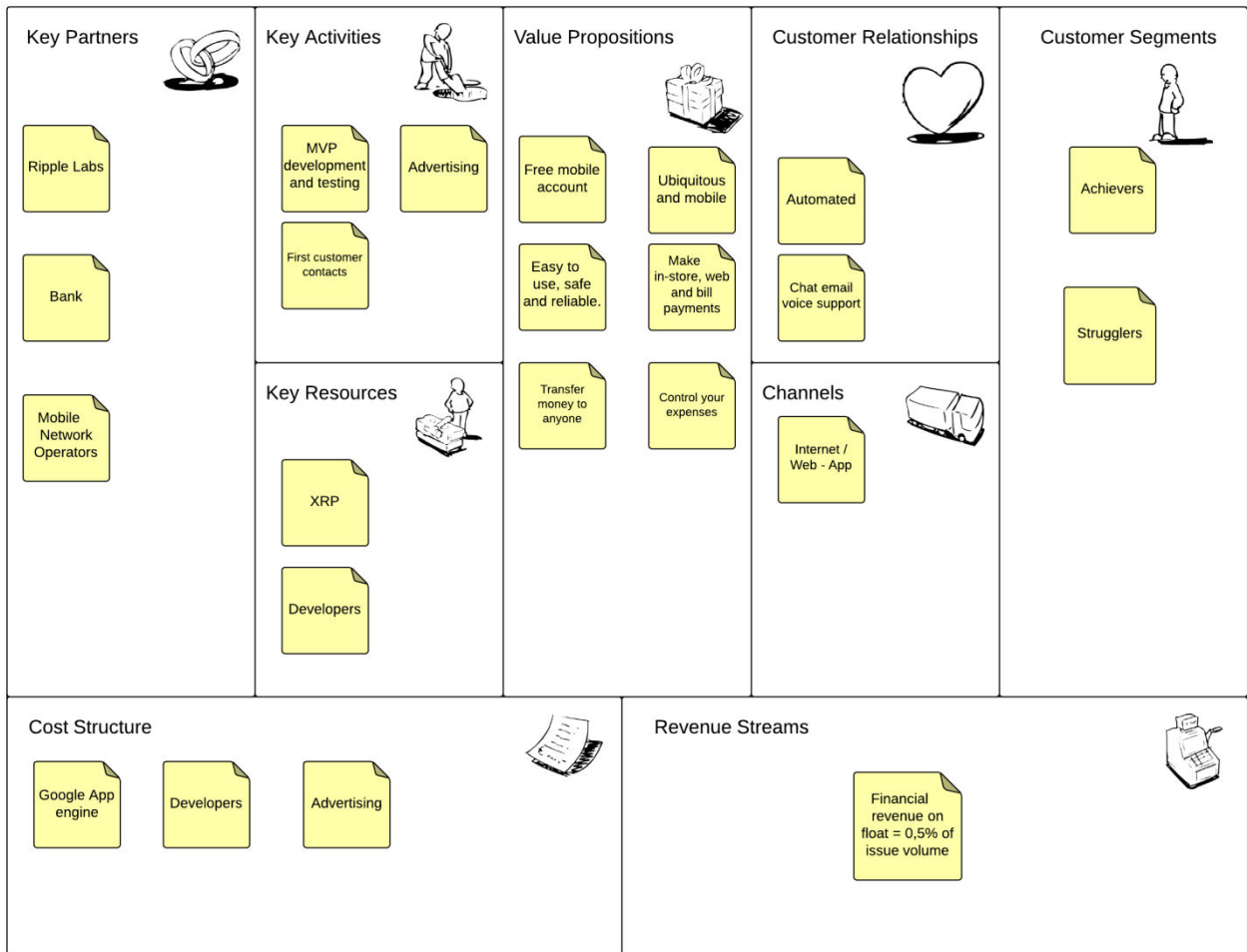


Figure 17: Business Model Canvas Dine Account.
Source: Prepared by the author.

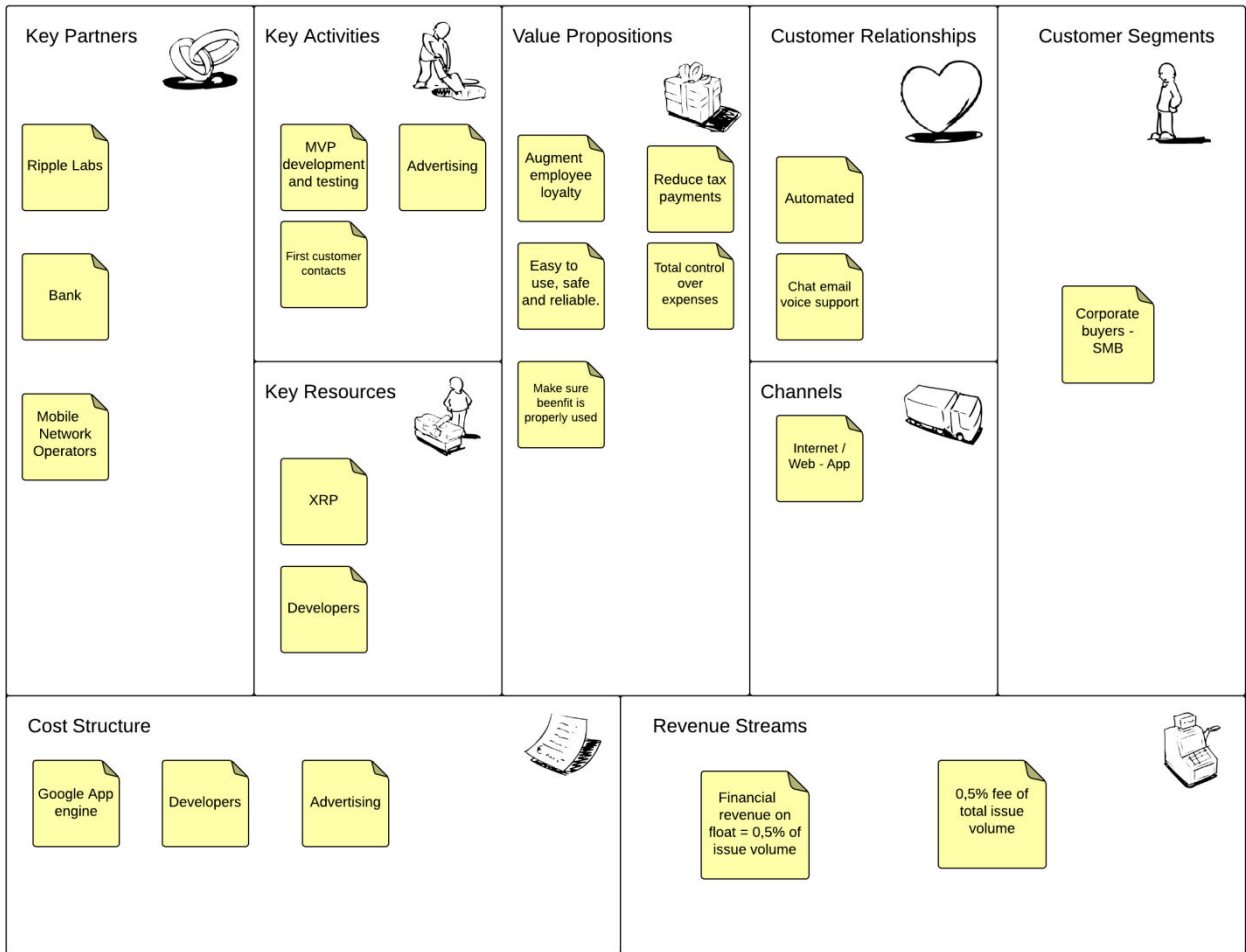


Figure 18: Business Model Canvas Dine Corporate.
Source: Prepared by the author.

4.3 FINANCING

As every Startup, Dine requires an initial capital in order to build the prototype, reach the identified customers segments and validate the declared hypothesis. In this direction an application to the Startup Chile program was submitted on April 2014. The committee's decision was:

"We'd like to thank you for applying Dine to Start-Up Chile. The application process has finally finished. Judging was not an easy task, but we've selected the best startups for this round. Unfortunately, CORFO's Committee of Entrepreneurship didn't choose Dine for the following reason: To have different backgrounds represented among the project's executors is key to solve problems from different perspectives. This team could improve by integrating multiple disciplines and more varieties of work experiences."

This made an important point when it comes to selecting team members, an aspect that has not been solved yet. The other initial team member was another civil engineer, but he left the project to work on Telefonica.

Despite this setback, the project has been submitted to two other Startup funds:

Google Startup Pack: On May 15th the project was awarded the Google Startup pack credit, which consists of USD \$20000 to be spent on Google cloud platform during one year. This has been an important contribution to the development of the project and has helped define the technological infrastructure that will support it.

Cross Coin Ventures: this fund is centered on supporting startups that use the Ripple protocol. The fund consists of USD\$ 50 000, XRP credits and includes a 4 month internship at Ripple Labs to work with Ripple engineers in the development of the software. This would be a great opportunity and could be a gate to get more funds directly from US venture capitalists. The results have not been published yet.

During the following weeks more applications will be sent in order to assure financing for the project.

5 MINIMUM VIABLE PRODUCT DESIGN AND PROTOTYPE

5.1.1 THE LEAN STARTUP CYCLE

The Lean Startup methodology proposes a development cycle centered on ideas, building and testing the ideas against the market in order to pivot or persevere. As seen on figure 14 the cycle for Dine can be presented as:

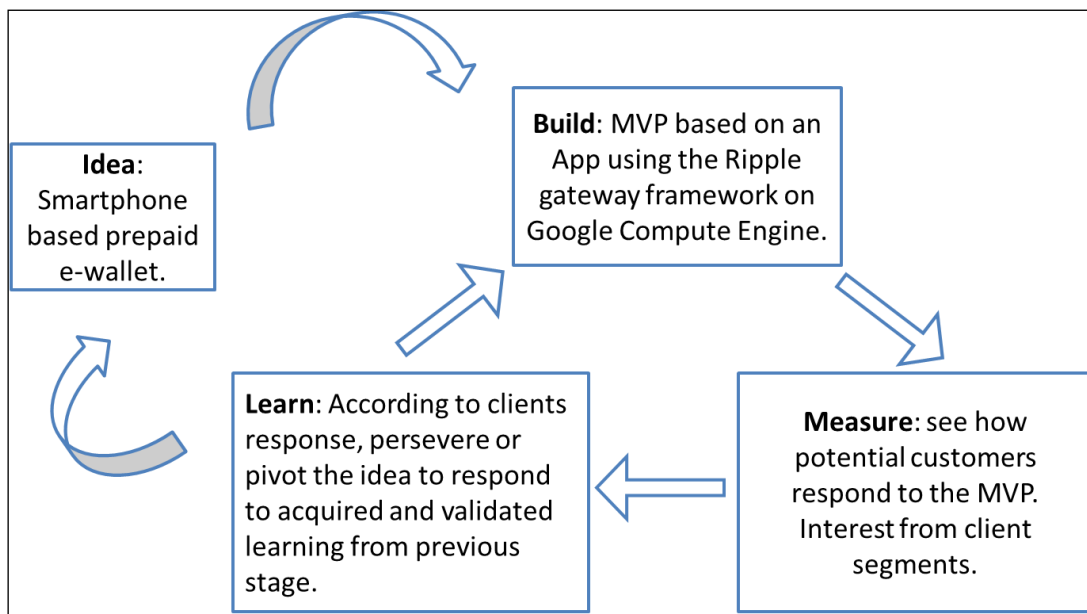


Figure 19: Lean Startup Cycle for Dine.
Source: Prepared by the author.

The scope of the present work is limited to the formulation of the Idea, as done in previous chapters, and start building the prototype in order to measure and learn customer needs in a second stage.

5.1.2 TECHNOLOGICAL SUPPORT

As shown on product hypothesis, every development is based upon the Ripple protocol and therefore there is a common basic service to be developed which is gateway access to the network. Please refer to Annex 2: “Gateway integration guide”. The server and client applications will be coded in Javascript, using Node.js on the server side. The communication between both parties will be made through an http RESTful API already implemented on the Ripple protocol and gateway applications.

Since Google supports the project with the credit to Cloud Engine, their infrastructure will be used. All major cloud computing providers have similar operation costs and provide similar services. The instances running the gateway application use an open source Linux Debian distribution on a virtual machine with 2 virtual CPUs and 15 GB in memory. The main advantage of cloud platforms is that the resources can be accessed on-demand, therefore in case the service gets more users, the expansion process is straightforward. A great advantage that Google’s Startup pack provides is that it sets a time limit for this proposal (until June 1st 2015) to execute the Lean Startup plan, Learn and Pivot in order to reach a sustainable business model.

5.1.3 MINIMUM VIABLE PRODUCT

The MVP to be developed is designed in order to be presented to identified customer segments and therefore validate the hypothesis behind the project. To do so, a mobile app will be programmed that will allow users to do basic operations such as registering, sending payments, receiving payments and monitor transactions. These are the basic requirements common to all devised products and therefore constitute the core of the service. Depending on users response more features will be developed accordingly.

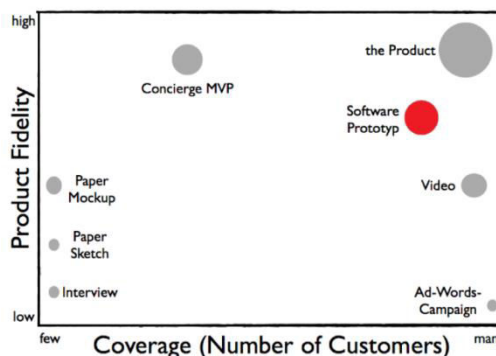


Figure 20: Dine’s MVP positioning.
Source: Adapted from [35].

As shown on figure 20 the designed MVP will be a software prototype, that does not have all the desired characteristics of the final product (which are also unknown since they will be defined after the customer validation stage) but still will provide the basic functionalities and will be able to scale in order to reach a large number of customers. To do so the integration with the Ripple Gateway framework is essential and it is identified as the first step to develop the mobile application.

The first basic MVP will not be centered on metrics, rather than doing customer presentations in order to gain a minimum user base for one of the use cases described in previous chapters. If one of the segments does buy-in the product, the launching phase will begin where actionable metrics will be obtained from users.

An introductory website has already been developed which can be visited at www.dine.cl. In the site there are also the mockups for the web interface and for the Smartphone App <http://www.dine.cl/#!/mvp/c1ziv>.

Access to the Ripple gateway is still being developed. It is expected to have the prototype App and the web site by the middle of August 2014. For now the contributions to the Ripple Gateway code can be seen on Github (<https://github.com/ripple/ripplegatewayd>) where some minor bugs have been detected. For now the development is based on Ripple Labs work and our implementation of their code. No developers will be hired until the results from Cross Coin Ventures fund are published.

6 CONCLUSIONS AND FUTURE WORK

The present work described the main aspects behind Dine, a prepaid mobile account Startup for Smartphone users. During the development of the project many challenges have been faced, from establishing the basic building blocks of the service, stating a value proposition, applying to different funds and establishing the technological building blocks for the service. This project started as an inquiry on the Bitcoin protocol and the possible uses of cryptocurrencies in order to provide more accessible and distributed financial services. The Ripple protocol was finally selected due to the unique characteristics of the framework that make it suitable for various business models and use cases. Furthermore, there is an active and organized development team which has supported the work and contributes constantly to the project.

Perhaps the most difficult aspect of the project has been forming a developing team, some members have participated temporarily, but it hasn't been possible yet to establish a permanent work team. This is an aspect to improve since the project needs more participants in order to succeed. Accordingly to the answer of the Cross Coin Venture fund a recruitment process will begin sooner or later.

The execution of this first stage will stop at the development of the prototypes in order to validate customer hypothesis. This will allow us to learn if the designed service has customer acceptance and answer to a latent market need. We firmly believe it does so, informal presentations to taxi drivers, retailers and users all validate the need for a low cost Smartphone based payment method that does not require dedicated POS or special equipment. The challenge will be to find the right business model, value proposition and alliances in order to gain a wide customer base while complying with financial regulators. The opportunity might not be in the Chilean market, but on the Peruvian or Colombian financial services. Once the prototype is developed these questions will be answered and guide future development.

The realization of this project has been a great learning experience and mostly a huge challenge in order to understand the mobile financial services market, cryptocurrencies, regulation and the building of a startup. It is a very complex and uncertain process, but following the customer validation and Lean Startup methodologies we hope to build a useful service for the whole society, or at least contribute to it.

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8 ANNEXES

8.1 ANNEX 1: “RIPPLE: A PRIMER”



Ripple: A Primer

Contents

Ripple: Executive Summary

What is Ripple.....	2
Examples of Internet Protocols.....	2
Who owns Internet Protocols?.....	2
What are the advantages of using ripple for financial transactions?.....	2

Ripple: a Primer

Payment Technology is Decades behind Communications.....	3
Ripple: Distributed Clearing and Settlement.....	5

Ripple: How it Works

A Universal Translator: the World's First Distributed Exchange.....	7
Digital Money, Counterparty Risk, and Ripple Gateways.....	8
Math Based Currencies.....	9
XRP: Protecting the Network from Abuse.....	10
XRP: A Bridge Currency.....	10

About Ripple Labs Inc.

Partner with Ripple.....	12
For More Information.....	12



Ripple: Executive Summary

What is Ripple?

Ripple is an Internet protocol for making financial transactions. You can use Ripple to send money anywhere in the world, in any currency, instantly and for free.

What is an Internet protocol?

An Internet protocol is a set of rules followed by the computers on the Internet to help them communicate with each other.

Examples of Internet Protocols

The protocol **HTTP** (Hypertext Transfer Protocol) is a set of rules for building and sharing websites. The invention of HTTP led to the World Wide Web.

The protocol **SMTP** (Simple Mail Transfer Protocol) is a set of rules for sending messages on the Internet. The invention of SMTP made it possible to send emails.

The protocol **RTXP** (Ripple Transaction Protocol) is a set of rules for making transactions on the Internet. The invention of RTXP makes it possible to transfer value across a distributed network. Like email for money.

Who owns Internet protocols?

No one owns a protocol. It is invented to be a useful standard. Anyone can choose to use a protocol in his software or business. Ripple is free and open source. Just like email, no one owns it, and there is no central operator.

What are the advantages of using Ripple for financial transactions?

An open, shared Internet protocol for financial transactions offers many advantages.

Payments are cheaper. Because Ripple is not owned by anyone, the cost of making payments decreases. Merchants that receive payments via Ripple can save billions of dollars in fees.

Payments are faster. Because Ripple transactions are automatic, payments can be fully settled within seconds. By making money available sooner, Ripple can accelerate economic activity.

Currency exchange is easy. Ripple makes it possible to exchange currencies at no extra charge. This makes international commerce easier and more profitable.

Finance is accessible. Because Ripple only requires an Internet connection, it can provide financial services to billions of people in under-banked areas of the world.

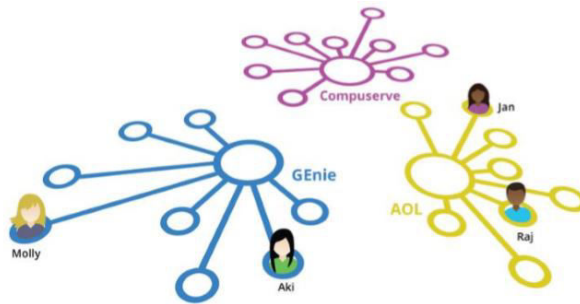
Finance is interconnected. By creating a shared protocol for money, Ripple makes transactions between independent businesses easy. This reduces friction and inefficiency in the financial system.



Ripple: A Primer

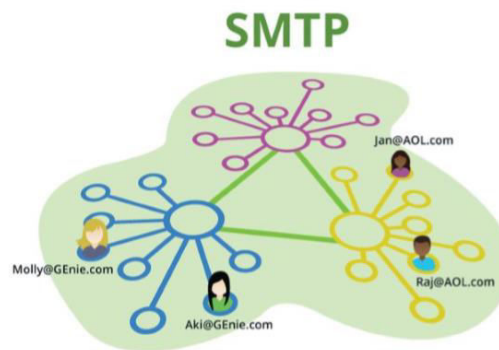
Payments Technology is Decades behind Communications

In the early days of the Internet, people could only send messages within a limited, closed network. If you were a CompuServe user prior to 1989, you could only send email to other CompuServe users. If you were a GEnie user, you could only send messages to other GEnie users. Email had not been created yet; there was no standard protocol to connect the messaging systems operated by each internet service provider.



Early email providers operated as walled gardens

When SMTP (Simple Mail Transfer Protocol) was created, commonly known as email, it allowed the many disparate message systems to align into a single, interconnected system. The genius of SMTP was to connect independent systems — exactly what the Internet was designed to do. The advantages of an interconnected email system were so obvious and powerful that SMTP quickly became the standard for email. Today the idea of email without federation seems absurd.

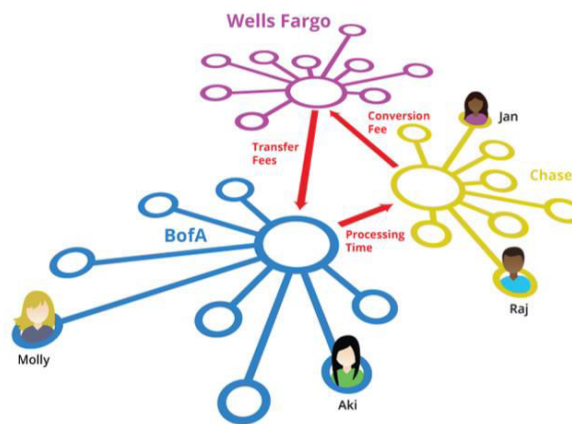


SMTP allows Molly@GEnie.com to message Jane@AOL.com

Today's payment systems look a lot like email did in the 1980s – closed and disconnected.

If you are a Wells Fargo customer, you can only make easy, free transfers to other Wells Fargo customers. If you have an American Express you can only buy things from businesses that accept American Express.

In order to link the disconnected payment systems, we add even more clearing houses. How do you send money from the Wells Fargo network to the Chase or Paypal network? You might use SWIFT (i.e. send a wire transfer), which adds another third party and another layer of fees to the transaction.



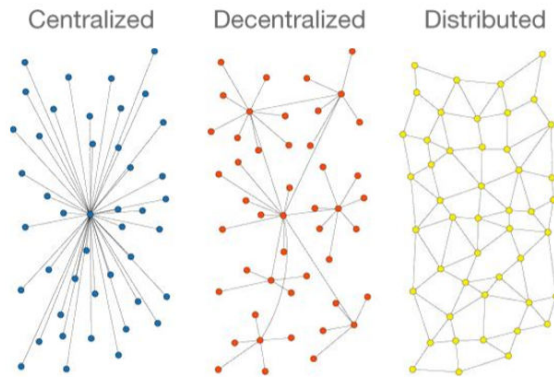
Finance today is like early email

When most information transfer has become free, there is still tremendous friction around value transfer. It still costs \$15 to send a wire transfer. Remittance fees average around 7%. Credit cards charge ~2% on every transaction that occurs on the internet. Amazon.com is spending billions a year in payment processing fees.

Forty years into the internet, a big gap has formed between communications and finance. Communications have been flattened out by peer-to-peer, distributed networks. Yet the centralized nature of clearing and settling transactions has kept finance running on infrastructure that was mostly designed in the 1950s – 1970s, before the internet.

Money, in the digital era, is really just another type of information. It is information about credits and debits stored on digital ledgers. Why is there such a big disconnect between how computers transmit money versus how they transmit other information?





Source: p2pfoundation.net

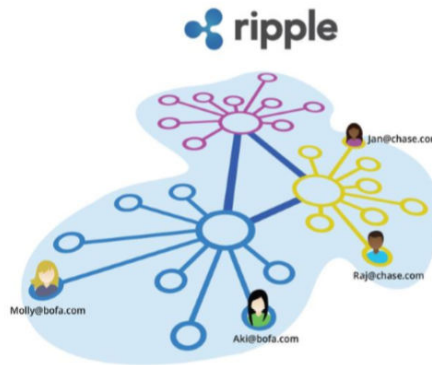
*Information exchange occurs on distributed networks;
Payments remain predominantly on centralized networks.*

Sending money is slow, expensive, and complicated because there are so many independent networks and payment systems running on centralized and proprietary software. Centralized networks are expensive – they require fees to pay for staff and servers and to turn a profit.

Ripple: Distributed Clearing and Settlement

Ripple is a universal protocol for money that allows independent payment systems to communicate as easily as email systems do. **Just as SMTP created a shared standard for email, Ripple creates a shared standard for payments.** As with email, no one owns Ripple, and there is no central operator. Ripple is open source software that allows servers all over the world to communicate peer-to-peer financial transactions to one another.

If the Ripple protocol becomes the standard protocol for money, payments will become as fast, cheap, and easy as email. There are no network fees, and payments are instant.



Ripple is a Federated Payment System



Ripple: How It Works

The Ripple network, at its core, is a shared, public database. Within the database is a ledger that tracks accounts and balances. At any time, anyone can view the ledger and see a record of all activity on the Ripple network.



Name	Bank	Balance
Jan@	WELLS FARGO	230.35
Bob@	WELLS FARGO	320.82
Tom@	Bank of America	0.12
Susan@	Bank of America	100.93
Aki@	HSBC	-230.35
Bob@	HSBC	320.82
Molly@	CHASE	0.12
Dalila@	CHASE	+230.35

The Ledger

Computers on the network mutually agree on changes to the ledger through a process called consensus. **The network reaches consensus globally within seconds.** This consensus finding process is the engineering breakthrough that allows for fast, secure, and decentralized transaction settlement on the Ripple network.



Computers on the network reach consensus about changes to the ledger.

Distributed networks offer many efficiencies over centralized networks. Because the network is “self clearing,” it eliminates the need for a centralized network operator (and gets rid of the associated layer of fees). Because there is no single point of failure, distributed networks are more reliable. And because they are open source, they tend to be more secure.

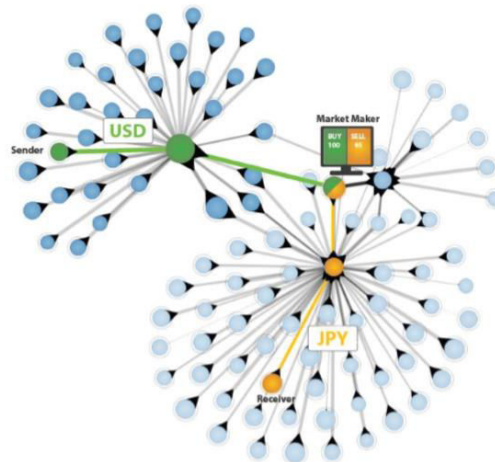


A Universal Translator: the World's First Distributed Exchange

Ripple supports any currency. But it goes farther than that: Ripple gives users complete currency choice. You can hold balances in one currency and send payments in another.

You can hold your balances on Ripple in USD and pay a merchant in JPY, EUR, bitcoin, gold, or any other currency. The Ripple network “translates” currencies by routing orders through market makers who compete to earn bid/ask spread.

In the diagram below, a user who holds USD balances sends payment to a merchant who only accepts payment in JPY. A market maker facilitates the transaction, buying USD and selling JPY.



*A user with USD balances pays a merchant in JPY.
The Market Maker buys USD and sells JPY to facilitate the transaction.*

Ripple’s distributed exchange allows users to trade without the need for a broker or a third party exchange. Anyone can post bids or offers into aggregated global order books, and the Ripple network finds the most efficient path to match trades. There is no network fee, and there is no minimum size.

For decades, economists have debated the merits of creating a global currency. Nobel Laureate Friedrich Hayek once hoped that technology would arise to make a multiple-currency model more efficient: “Electronic calculators, which in seconds would give the equivalent of any price in any currency at the current rate, would soon be used everywhere,” he wrote.

Ripple’s distributed exchange is the “electronic calculator” that Hayek dreamed of, but on a scale he probably never imagined. Ripple is the world’s first universal translator for money.



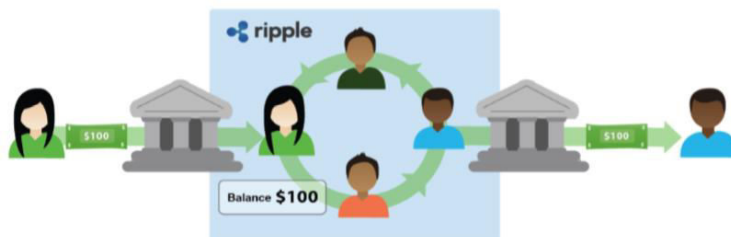
Now every currency has the smooth transactional qualities of a global currency. You can hold balances in gold or bitcoin and easily send payments in dollars or Euros. Ripple gives everyone complete currency choice.

Digital Money, Counterparty Risk, and Ripple Gateways

Traditional fiat currencies – when in digital form – have counterparty risk associated with them. This may not seem obvious at first glance, but in order to get your fiat \$100 bill onto a digital network, you would traditionally hand it over to the network operator: your bank or Paypal, for example. In return you get an IOU showing your account balance.

At that point, you no longer hold fiat money. You traded fiat dollars for a digital USD balance which is effectively just a promise to pay. It is a promise from the bank that you can redeem your money on demand. And as the last few years have demonstrated, USD deposits at Citibank are not necessarily equivalent to USD deposits at Bank of Cyprus or Bank of Iceland. Hence digital fiat currencies have counterparty risk.

This holds true within the Ripple network as well. USD balances traded within the Ripple network are redeemable at a specific “gateway”. A gateway is where fiat money enters and exits the Ripple network.



Fiat money enters and exits the Ripple network at a “gateway”.

In practice, gateways could look very similar to traditional banks; but a gateway can be any business that provides access to the Ripple network. Gateways can be banks, money service businesses, marketplaces, or any financial institution. Businesses that become gateways create advanced financial functionality for their customers and generate new revenue streams.

Just as with any form of digital fiat currency, it is critical that you trust a gateway’s ability to redeem your balances on the Ripple network as well.

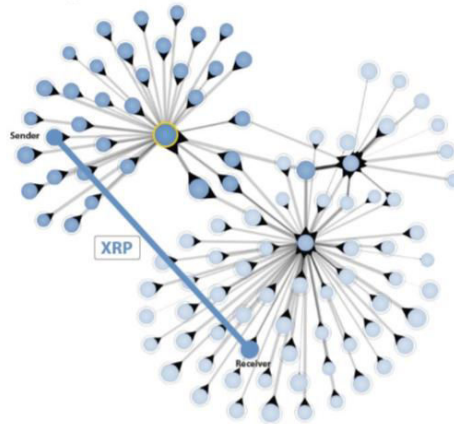
Math Based Currencies

A math based currency, also referred to as a cryptocurrency, is a digital asset with verifiable mathematical properties, similar to how we can reliably verify gold as an atom with 79 protons. Math based currencies exist as digital assets in their own right and can be transferred directly between users (as fiat cash could be) without relying on any centralized network operator.

The supply of a math based currency is governed by the laws of mathematics. There is no human intervention beyond the creation of the protocol rules. This is in contrast to the many “virtual currencies” that can be issued without restriction by companies and people (airline miles, reward points, Facebook credits, etc.)

Bitcoin was the first example of a math based currency. Bitcoin exists natively as a digital asset. It is not a balance that is redeemable somewhere, and it does not have risk to any counterparty like the “digital fiat” currencies described above. You could hand someone a thumb drive with bitcoin on it, and in doing so, you are transferring the asset itself, like handing over cash, as opposed to transferring an IOU or someone’s promise to pay. It does not require trust in any third party.

There is a math based currency called XRP (pronounced “ripples”) that is native to the Ripple network. Just like bitcoin on the Blockchain, XRP exists natively within the Ripple network as a counterparty-free currency. Because XRP is an asset as opposed to a redeemable balance, it does not require that users trust any specific financial institution to trade or exchange it.



Users of the Ripple network are not required to use XRP as a medium of exchange or as a store of value. The Ripple network is currency agnostic. Users can use their favorite currency, whether that’s USD, BTC, XRP, or something entirely different.

XRP exists to fulfill two primary network functions – network security and to act as a currency bridge – which we will discuss below.



XRP: Protecting the Network from Abuse

Since the Ripple network is based around a shared ledger of accounts, a malicious attacker could create large amounts of “ledger spam” (i.e. fake accounts) and transaction spam (i.e. fake transactions) in an attempt to overload the network. This could cause the size of the ledger to become unmanageable and interfere with the network’s ability to quickly settle legitimate transactions.

To protect the network from abusive creation of excess ledger entries, each Ripple account is required to have a small reserve of XRP to create ledger entries. This reserve requirement is currently 50 XRP, which is roughly equivalent to \$0.50 at time of writing. This requirement is intended to be a negligible amount for normal users while preventing a potential attacker from amassing a large number of fraudulent accounts to “spam” the network.

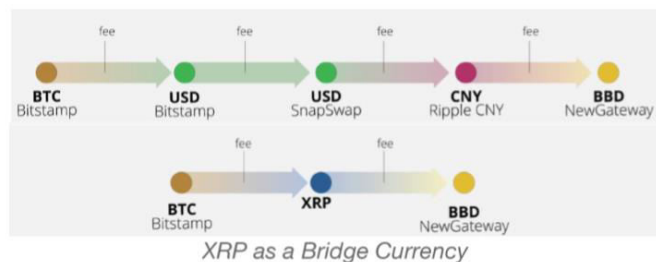
With each transaction that is processed, 0.00001 XRP is destroyed (roughly one one-hundred-thousandth of a penny in USD terms). This is not a fee that is collected by anyone – the XRP is destroyed and ceases to exist. This transaction fee is also designed to be negligible for users. But when the network is under heavy load, such as when it is attacked, this fee rapidly rises.

The goal of this design is to quickly bankrupt attackers and keep the network functioning smoothly. Attacking the Ripple network can get very expensive, very quickly, but for regular users, the cost effectively remains “free”.

XRP: A Bridge Currency

XRP can also be very useful as a bridge currency. If two counterparties cannot find a shared currency/gateway combination, XRP can fill in as a neutral currency with no counterparty risk. For example, Alice prefers USD and Bob prefers EUR. If they cannot find a suitable EUR/USD market maker to resolve their transaction, they may find it advantageous to convert their preferred currency to and from XRP to be able to transact with each other.

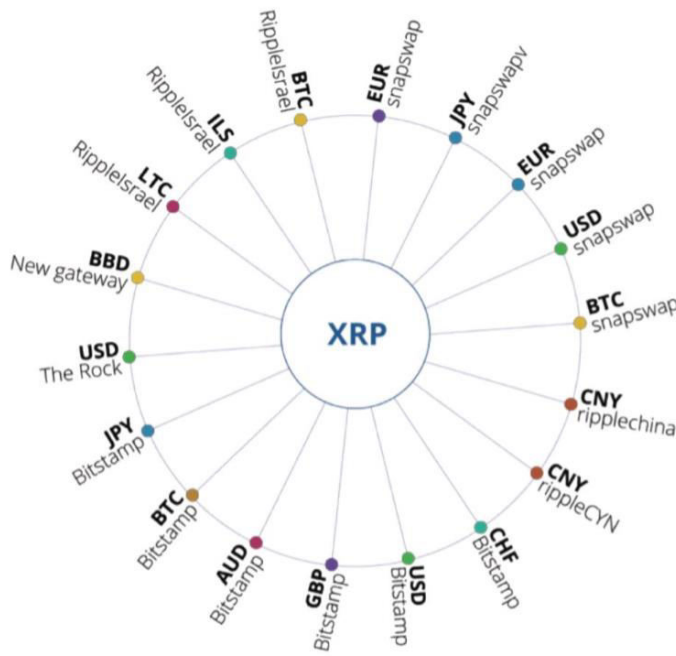
In the diagram below, we show how in some instances, converting to/from XRP could result in less transactional friction. XRP is not a required bridge currency, only a useful one.



Three factors make XRP an ideal bridge currency on the Ripple network:

- XRP has low friction. It can be sent directly to any account with no transfer fees
- XRP has no counter party risk. It is the only currency native to the Ripple network and thus requires no trust relationship with any gateway or third party.
- XRP cannot be debased – a finite amount exists. 100 billion XRP was “minted” with the creation of the protocol, and by definition, no more will ever be created.

There is no requirement that Ripple users hold or exchange XRP, aside from the negligible reserve amount. Ripple is currency agnostic. Merchants do not need to accept XRP to use Ripple. Both buyers and sellers can continue to use their preferred currencies.



About: Ripple Labs Inc.



Ripple Labs is the creator of Ripple. We developed the protocol and its distributed payment network, and we now work to support and promote its growth. Because Ripple is free and open source, we receive no cash flows from the network.

Ripple Labs hopes to make money from XRP if the world finds the Ripple network useful and broadly adopts the protocol.

100 billion XRP was created with the Ripple protocol. Ripple Labs plans to gift 55 billion XRP to charitable organizations, users, and strategic partners in the ecosystem over time. The company will retain a portion with the hope of creating a robust and liquid marketplace in order to monetize its only asset sometime in the future.

If the Ripple network grows into a vibrant, distributed payment network, Ripple Labs will have accomplished its goal, and the Ripple protocol will belong to the community as a free and open source resource.

Partner With Ripple

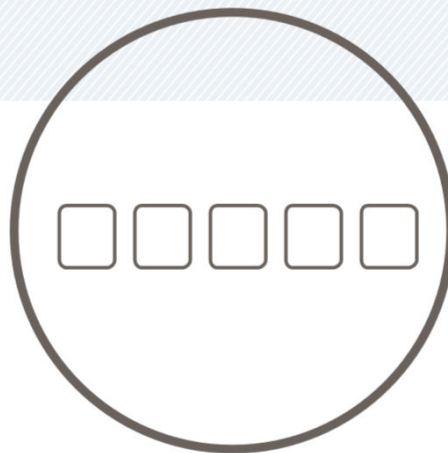
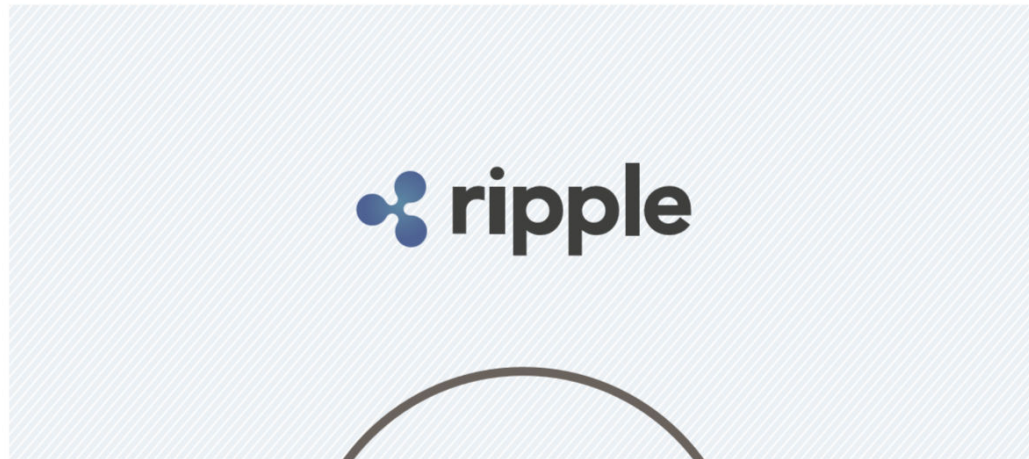
The Ripple protocol is in its infancy. This primer only scratches the surface of its robust potential. At Ripple Labs, we are working on many exciting new applications, and the utility of the Ripple network will only grow.

We believe that distributed financial networks and math based currencies will revolutionize the infrastructure of our financial system in the near future. We invite anyone who shares our view to get in touch so that we can work together.

The Ripple ecosystem needs gateways, market makers, developers, and merchants to fulfill its potential.



8.2 ANNEX 2: "GATEWAY INTEGRATION GUIDE"



Ripple Gateways



Consumers



Market Makers



Gateways



Merchants

Overview

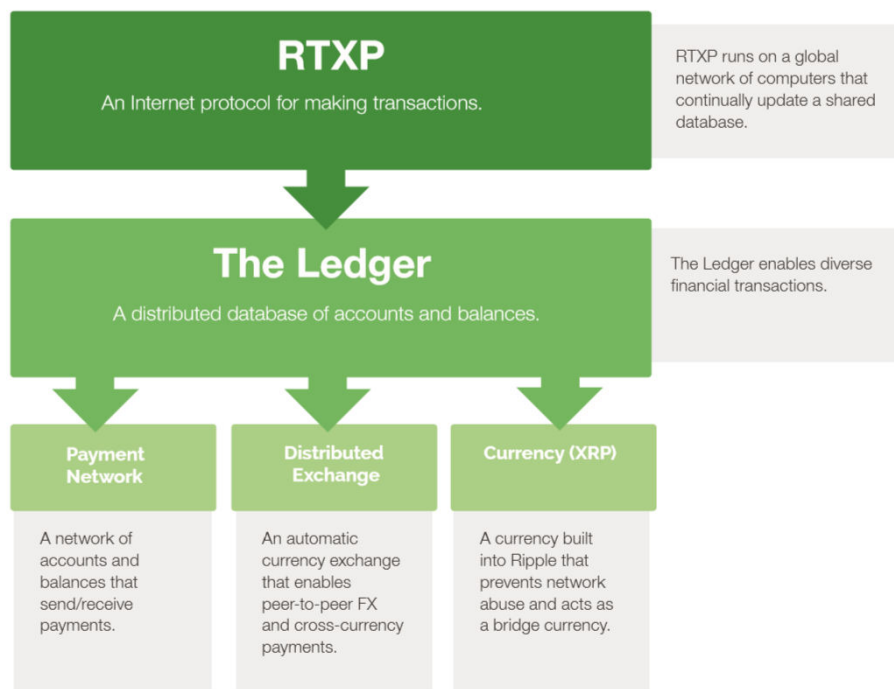
A Ripple gateway is a business that provides onboard and offboard ramps to the Ripple network. Ripple is free open source software and no agreement with Ripple Labs is necessary. However, Ripple Labs would like to be of assistance in integration planning and implementation. This is a primer on considerations related to integration of the gateway service.

Section 1	The Ripple System	3
Section 2	Business Cases	4
Section 3	The Gateway Service	5
Section 4	Types of Accounts	6
Section 5	Account Balances	7
Section 6	Connecting Gateways	8
Section 7	Revenue Models	10
Section 8	Integration Process	11
Section 9	Legal Compliance	13
Section 10	Best Practices	15
Section 11	Resources	16
Section 12	Contact Information	17

The Ripple System

Ripple is a universal protocol for money that allows independent payment systems to communicate as easily as email systems do. Just as SMTP created a shared standard for email, Ripple creates a shared standard for payments. As with email, no one owns Ripple, and there is no central operator. Ripple is open source software that allows servers all over the world to communicate peer-to-peer financial transactions to one another.

If the Ripple protocol becomes the standard protocol for money, payments will become as fast, cheap, and easy as email. There are no network fees, and payments are instant.



Business Cases

Ripple offers unique value propositions to diverse financial services business models.

Remittance

- Expand geographic footprint at no cost
- Offer new currencies without capital requirements
- Pay wholesale forex spreads
- Earn 100% margin on transaction fees

Banks

- Charge fees for faster clearing
- Free, automated clearing house for money movement
- Create a new revenue channel from balance transfers within Ripple
- Expand geographic footprint without regional/country risk
- Facilitate B2B cross-border transactions without currency risk

Currency Exchanges

- Free, global clearing house and prime broker for market makers
- Create a new revenue channel from balance transfers within Ripple
- Earn 100% margin on spreads and service fees
- Expand currency coverage without new capital requirements
- Expand portfolio of brokered assets

Prepaid

- Expand participating merchant base
- Acquire a turnkey digital prepaid wallet
- Enable peer-to-peer payments
- Allow cross-border payments
- Create a new revenue channel from balance transfers within Ripple

Merchants & Marketplaces

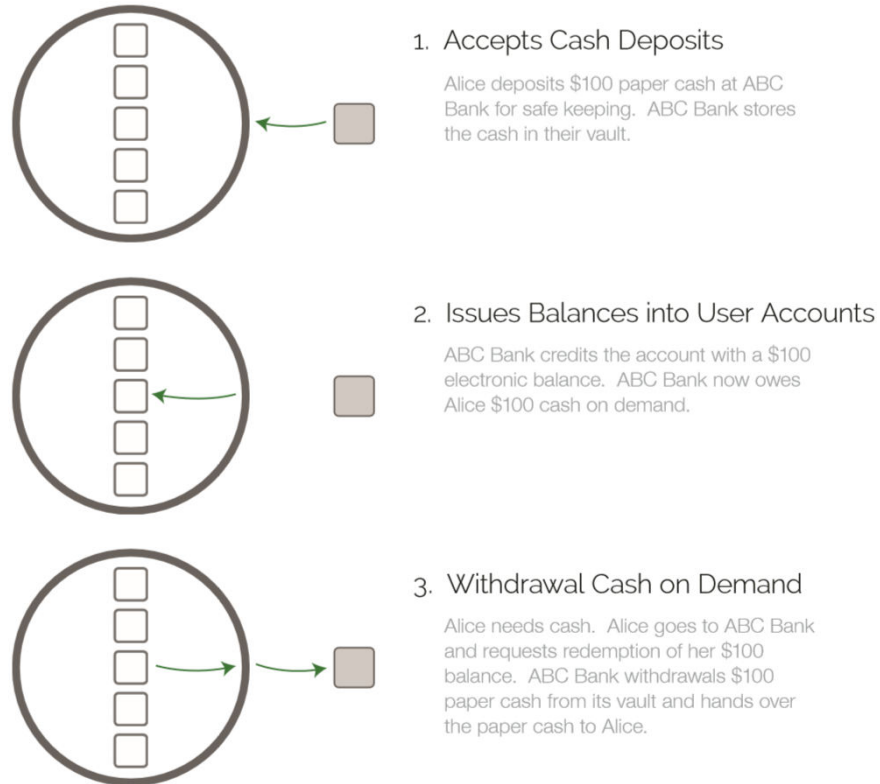
- Own and operate a branded payment rail
- Acquire a turnkey digital wallet
- Eliminate interchange fees and fraud
- Accept international payments without currency risk
- Settle funds instantly

Merchant Acquirers

- Free payment rail
- Earn 100% margin on all processing fees
- Create a new revenue channel from balance transfers across Ripple
- Process cross-border payments at no cost
- Eliminate buyer fraud from chargebacks
- Seamless integration with existing settlement platforms

The Gateway Service

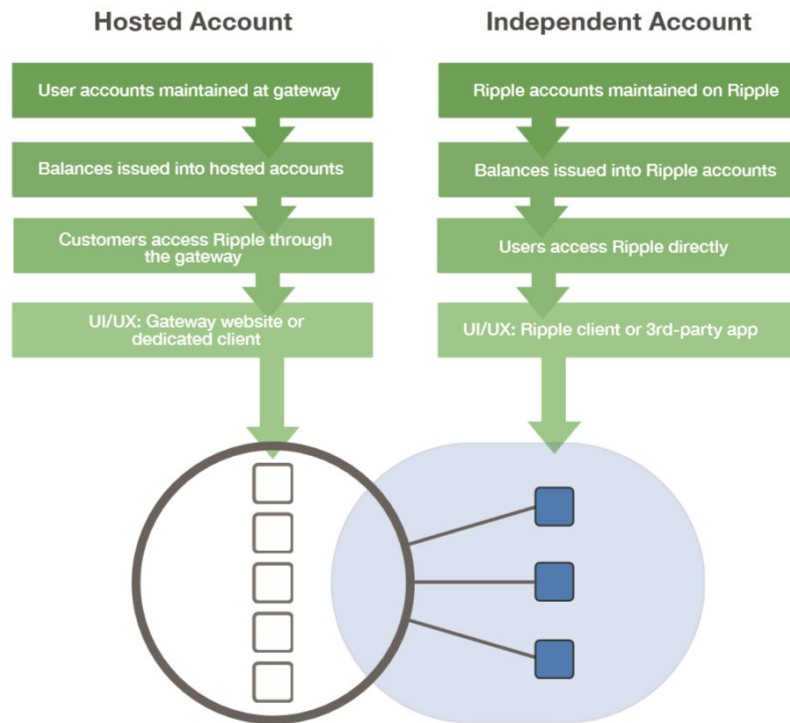
A Ripple gateway is any business that provides access to the Ripple network via the following services:



○ Gateway □ Hosted Account ■ Non-Ripple Account ➤ Value Transfer

Types of Accounts

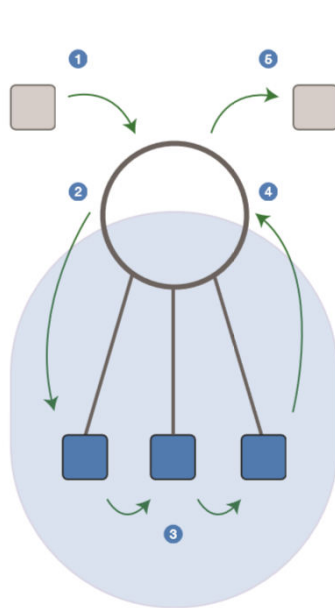
New Ripple gateways can choose to have their customers' accounts be independent or hosted. Independent accounts will have a unique address on the Ripple network connected to the gateway. Hosted accounts have indirect access to the Ripple network through their gateway's Ripple account. Typically, a pre-existing business with its own consumer relationship will elect to integrate as a hosted gateway.



Account Balances

Balances in accounts are demand liabilities for the gateway that issued the balance. Balances move from account to account as payments. The balance must always be withdrawn via the original issuing gateway.

The "life cycle" of a Ripple balance:



1 Deposit / 2 Issuance

A gateway receives a deposit and issues a balance into an account.

Alice deposits \$100 at ABC Bank by handing over cash or electronically with an ACH or wire transfer.

3 Circulation

Balances are transferred between accounts as payments.

Sally and Bob both bank at ABC Bank. Sally owes Bob \$100. Alice transfers her balance to Bob, and now ABC Bank owes \$0 to Sally and \$100 to Bob. The cash never left ABC Bank's vault, but Sally has paid Bob.

4 Redemption / 5 Withdrawal

Balances are withdrawn from the original issuing gateway.**

After receiving payment from Alice, Bob presents the balance to ABC Bank for immediate redemption and withdraws the cash from their vault.

*Gateways can limit circulation to pre-authorized accounts.

**Gateways institute prerequisites (KYC, AML) for withdrawal.

Non-Ripple Account
 Gateway
 Value Transfer
 Ripple Network
 Independent Account

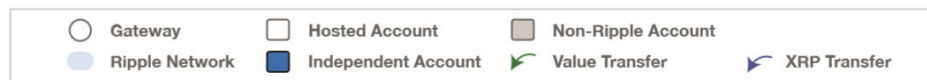
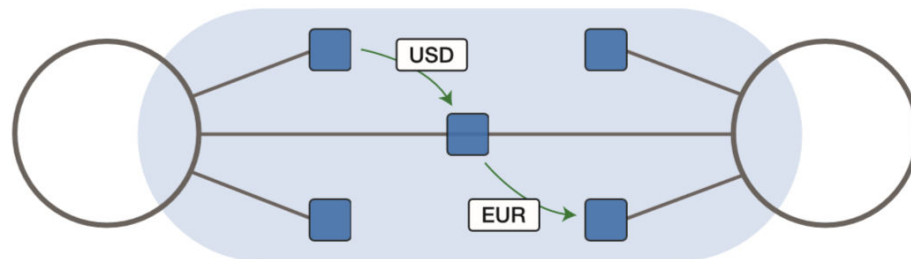
Connecting Gateways

Ripple is designed to wire together financial institutions. Ripple wires together, or 'federates', gateways in 3 ways:

Direct Market Makers

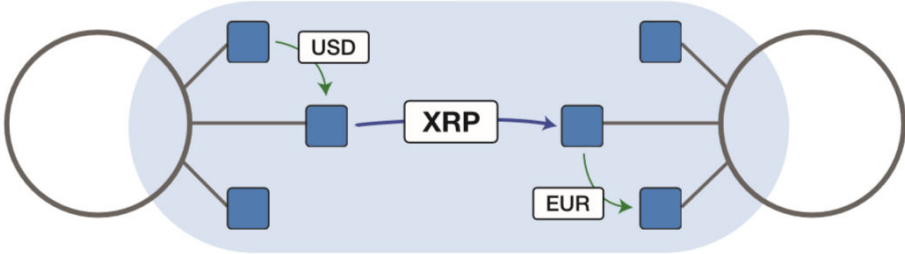
Payments move from one gateway to another gateway through market makers holding accounts at both institutions.

- Alice holds a balance for \$100 dollars in her account at ABC Bank.
- Alice needs to pay Dave, who holds an account at XYZ Bank. XYZ Bank does not accept ABC Bank balances, so neither does Dave.
- Sally has an account at both gateways and has created an offer to buy ABC Bank balances with XYZ Bank balances.
- Ripple routes Alice's payment to Dave through Sally's offer.
- When Sally's offer is fulfilled, Ripple credits her account the +\$100 balance from ABC Bank which she received from Alice; and simultaneously debits her account the -\$100 balance from XYZ Bank which she sends to Dave.
- Sally creates offers because she can earn a profit on spreads



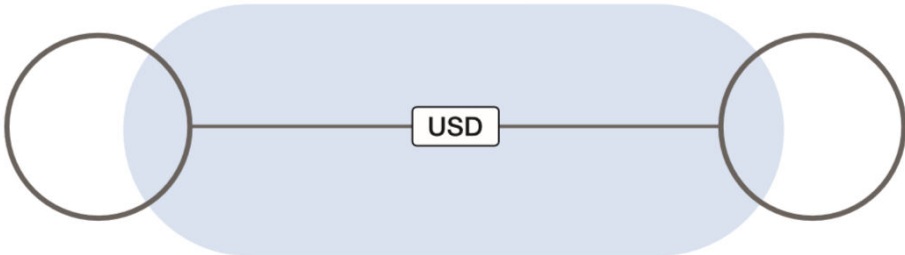
XRP as a Vehicle Currency

XRP in Ripple is like gold in your hand. It is an asset without counterparty and plays the role of a bridge currency between exotic gateways. This is similar to the role of USD in exotic forex markets.



Mutual Trust

If two gateways trust each other on ripple, their balances become interchangeable. Alice can present ABC Bank balances to XYZ Bank, and Dave can present XYZ Bank balances to ABC Bank.



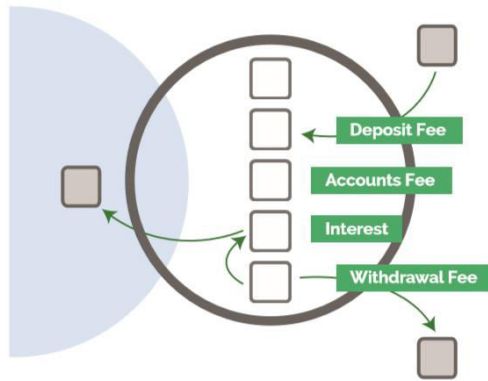
Gateway	Hosted Account	Non-Ripple Account
Ripple Network	Independent Account	Value Transfer
		XRP Transfer

Section 7

Revenue Models

Ripple allows variable fee structures and revenue models.

Traditional Revenues for Financial Institutions:



Deposit / Issuance

Fees for processing deposits into Ripple accounts.

Accounts

Fees for the creation and maintenance of accounts.

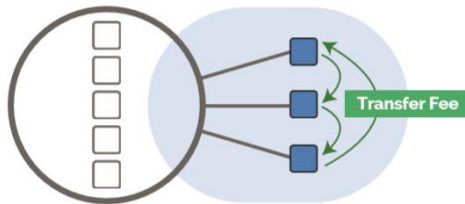
Interest

Interest on deposited funds.

Withdrawal

Fees for withdrawals from the gateway.

Ripple Unique Revenue:

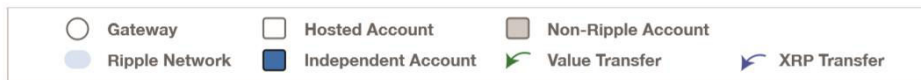


Circulation

Fees collected for the transfer of a gateway's balance.

Advanced

Participate in the decentralized market and earn fees on forex spreads.



Integration Process

Integrating Ripple into your business processes can be done in stages.

Stage 1: Mock Manual Gateway

Setting up a mock gateway can be done in minutes. Doing so provides an excellent way to gain a conceptual understanding of operating a gateway. Instructions are provided on the wiki.

Stage 2: Manual Gateway

A gateway can be professionally operated using only the Ripple client. Customers are given instructions for making deposits and withdrawals on the gateway's web site. As deposits are received, the gateway operation manually sends funds to the user's account. Upon receiving a withdrawal transaction the operator manually disburses the funds.

Stage 3: Automated Gateway

Withdrawals and deposits can be automated by interfacing the gateway's business/web server to a locally deployed Ripple server. Hosting a local Ripple server provides robustness, security, and simplifies implementation. For banks and payment processors with pre-existing funding systems, Ripple integration becomes trivial. Only two Ripple operations need to be implemented: Sending a Ripple balance upon deposit, and monitoring for Ripple withdrawals.

Stage 4: Business Integration

All gateways must implement deposits to and withdrawals from user managed Ripple wallets. These independent accounts are necessary for market makers to providing liquidity to other Ripple gateways. However, this role need not be the primary focus of the business.

Banks, card issuers, payment processors and remittance services may use Ripple's infrastructure behind the scenes without exposing Ripple to their customers. Integrated businesses enable all of their customers to transparently send or receive payments through Ripple by acting as their proxy to the network. All that is necessary is to add a "Send Ripple Payment" option to the user's existing transaction flow. In addition businesses can provide an easy to remember email style Ripple address allowing their users to receive payments.

Stage 5: External Payment Bridges



Beyond their key business, gateways can increase their utility by providing a "Ripple Bridge" to other payment system to which they interact. Ripple's Bitcoin bridge is one example, but bridges to other popular payment systems like Alipay in China or M-Pesa in Kenya are also possible.

Gateways interact with three external parties: their banking system, the Ripple network, and their users for sending payments. This table shows the implementation effort required at each stage.

Summary of Integration Requirements

Less than one week for automated gateway integration.

	Deposit Withdrawal	Sending Transactions	Integration Effort	Time (days)
Manual Deposit and Withdrawal	Mock	Web Client	Web Client	< 1/2
Automated Deposit and Withdrawal	Bank Website	Web Client	Web Client	1
Stand-alone Gateway	Business Server to Bank	Business Server to Local Ripple	Web Client	5
Hosted Users	Completed	Implement Source and Destination Tags	Extend Business Site	5
Extended Features	Re-use Bank Interface	Extend Business Server	Web Client	5

	Custom development involved.
	Pre-existing component. No additional work required.



Legal Compliance

Gateways are responsible for complying with local regulations and reporting to the appropriate agencies. Reporting requirements vary depending on country and state, but may include:

Know Your Customer (KYC)

Know Your Customer (KYC) refers to due diligence activities by financial institutions to determine whether customers may be at risk of using the institution's to conduct criminal activity. Criminal activity in financial terms may include money laundering, terrorist financing, financial fraud, etc. Customers may be individuals, intermediaries, or businesses.

KYC requirements generally address the customer's identity, affiliations, and transaction behavior.

KYC is critical for financial institutions. Having an inadequate or nonexistent KYC program may result in criminal penalties for the gateway or individual employees.

Example: The USA Patriot Act requires strict KYC programs of all financial institutions to avoid terrorist financing. Several of the following topics refer to specific components of KYC due diligence practices.

Anti-Money Laundering (AML)

Money laundering is the process making income generated by illegal activity appear to be from a legitimate source. Anti Money Laundering (AML) refers to the laws and procedures designed to stop money laundering from occurring.

Example: The US Bank Secrecy Act requires financial institutions to comply with a minimum set of due diligence requirements outlined here: http://www.fdic.gov/regulations/examinations/bsa/bsa_13.html.

For more information on AML, visit <http://www.finra.org/Industry/Issues/AML/>.

Source of Funds

To support AML, financial institutions must be able to determine within reason whether the source of a customer's deposits are linked to criminal activity.

Determining the exact source of funds may not be administratively feasible for every customer. As a result, some regulatory authorities may not provide specific regulation or guidance for all accounts. In specific cases, however, authorities may require financial institutions to identify and report the source of funds.

Example: The US Bank Secrecy Act requires financial institutions to identify and report the source and expected use of funds totalling more than \$1,000,000 USD in private bank accounts belonging to non-U.S. persons (deposited either directly, or indirectly via a liason).

Suspicious Activity Reporting

If a financial institution suspects that funds may be related to criminal activity, the institution must file a report (Suspicious Activity Report (SAR) / Currency Transaction Report (CTR)) with the appropriate regulatory authority. Failure to report

suspicious activity may result in penalties for the institution.

Financial institutions may automatically generate and submit an electronic report

Example: The US Bank Secrecy Act requires any cash transactions over \$10,000 USD to be reported to the government identifying the individual and the source of the cash. An example of the form required by the US Internal Revenue Service: <http://www.irs.gov/pub/irs-pdf/f8300.pdf>.

Travel Rule

The Travel Rule is enforced by the US Financial Crimes Enforcement Network (FinCEN; an agency of the US Department of Treasury) refers to the requirement for financial institutions sending a large amount (as of writing, value equalling or exceeding \$3,000 USD) to provide the receiving institution with identifiable information about both the sender and receiver of the transfer. FinCEN may require each institution to provide this information about transactions when asked.

FinCEN outlines the required information: http://www.fincen.gov/news_room/rp/advisory/html/advisu7.html.

Workers Remittance

Workers Remittance refers to the act of workers in a foreign country sending money to their home country. Transfers are generally in cash, relatively low value (e.g. \$500 USD), and channeled through remittance service providers (e.g. Western Union).

Since the systems are informal, originate in cash form, and represent significant aggregate volume (\$500B USD/year) local regulatory authorities are concerned about the risk for money laundering and terrorist financing.

Office of Foreign Assets Control (OFAC)

The Office of Foreign Assets Control (OFAC; an agency of the US Department of Treasury) that administers and enforces economic and trade sanctions based on U.S. foreign policy and national security goals. OFAC helps financial institutions avoid directly or indirectly supporting activity by or with foreign states, organizations, and individuals.

Example: OFAC provides a list of specific individuals and companies that financial institutions are not allowed to support: <http://www.treasury.gov/resource-center/sanctions/SDN-List/Pages/default.aspx>.

A list of OFAC resources: <http://www.treasury.gov/resource-center/sanctions/Pages/default.aspx>.

Threshold

Any other reporting as required by law or internal policies in the country where the gateway operates.

Best Practices

Gateways should be transparent about their terms of use. A suggested end user level agreement may include consideration for:

Fees

Territory Coverage

Payment options

Deposit protection

Protection against unauthorized transaction

Regulation

Customer service

Top payment use cases

Deposit time

Chargeback Policy

Escheat

Escheat is the process of turning over unclaimed or abandoned property to the appropriate local authority. This is relevant to financial institutions whose customers may create an account, deposit funds to create a balance, but never redeem the balance. Escheat laws apply to issuers of balances and how those balances are administered after a certain time period.

Demmorage

Demmorage is the cost associated with owning or holding a currency over a given period of time. The costs can result directly from from maintaining an inventory of a physical currency (e.g. warehouse to store gold), or indirectly from currency inflation (e.g. central bank issues more currency).

Resources

International Ripple Business Association - The International Ripple Business Association (IRBA) provides unified procedures to establish trustworthy and secure services for Ripple customers. (<http://www.xrpga.org/>)

FFIEC Customer Identification Program - (http://www.ffiec.gov/bsa_aml_infobase/pages_manual/OLM_011.htm)

To learn more about Ripple, visit Ripple.com or the [Ripple Wiki](#).

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