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	Anastasios Zannis	20161376
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BLOCKCHAIN TECHNOLOGY AND ITS IMPACT ON BUSINESS MODELS IN THE BANKING INDUSTRY

ABSTRACT

Blockchain is a technology that both incumbent and start-up firms, have shown interest, started exploring, and begun commercializing during the last 10 years. Banks, especially, have to consider the implications of crypto-currencies and DLT (Distributed Ledger Technology), a.k.a. Blockchain, in general. In this paper, we explore the ways that Blockchain technology may affect the banking sector from the perspective of business models. Additionally, we examine the broad characterization of Blockchain, by scholars and others, as a disruptive technology, from the perspective of Disruptive Innovation theory. Using business models as a conceptualization framework, we map the business models of 10 major European banks in order to create an archetype from banks' business models. With the use of secondary sources, such as online articles, we note the most notable changes that pundits expect Blockchain to bring about and project them in contrast to the archetype. We conclude by listing the major components of a Business Model we think Blockchain is likely to affect, and the potential implications of our assessment of Blockchain as technically not disruptive. Finally, we reflect on the process of authoring this research; how it has helped us develop both as students and as people.

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1. INTRODUCTION

Blockchain sits at the top of a broader issue. Technologies with applications in the financial sector are transforming the infrastructure of financial systems worldwide. Blockchain emphasizes this by also promising a radical redistribution of power through decentralization. Finally, it promises trustworthiness and transparency, which one could say are not prominent attributes of banks. Blockchain is an interesting subject not only because of its practical implications to the financial sector, but also because it encourages us to reflect on the ethical aspects of societies' incumbent financial systems.

There existed a technological foundation for Blockchain, but "Nakamoto", who developed it into a platform for the controversial Bitcoin, aimed at providing people with the option to operate without banks. Thus, the relationship between Blockchain and banks is in the epicenter of the phenomenon, and the logical conclusion is that there will be changes in the banking industry. Our approach is to verify whether these changes may take place, and what their nature will be. The perspective we will assume to analyze this phenomenon is practical.

We use the Business Model framework as a tool to conceptualize the changes in the industry. A business model is the sum of answers to questions that a firm has to ask itself in order to realize the best way to create, deliver, and capture value. Its theoretical iterations vary, but the fundamental concept is the same. To have an appropriate theoretical framework to analyze the problem, we went through notable academic and other literature on blockchain, and observed that blockchain has been widely termed a disruptive technology. Thus, we decided to view blockchain through the lens of disruptive innovation theory. Disruptive innovation theory, however, is relativistic in nature. Therefore, a market has to act as a constant, in order to assess disruptiveness of a given technology. Finally, disruptive innovation theory distinguishes between incumbents adopting/exploring potential disruptions and disregarding/ignoring potential disruptors. With these in mind, we will try to answer the following questions in our research.

How will business models in the banking industry change with the rise of Blockchain?

How are banks reacting to the potential disruption by Blockchain?

Is blockchain a disruptive technology? If so, what are the predicted implications?

Chapter Aims

Chapter 2: Theoretical Framework. We begin by presenting relevant academic literature on business models and disruptive innovation, starting with the most accepted definitions and paradigms on the two theories. Having established a theoretical ground zero, we branch into literature exploring the interactions between disruptive innovations and business models, blockchain and business models, and blockchain and banks.

Chapter 3: Research Design. We detail our research design, part of which is on the research blueprint in figure 1.

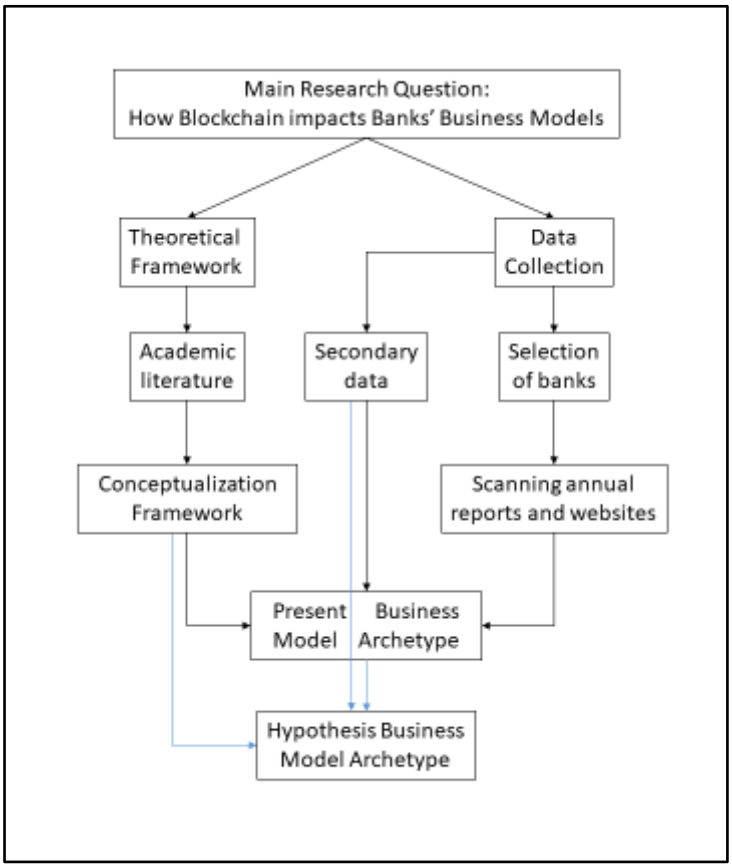


Figure 1: Research blueprint. Authors' creation.

Chapter 4: Findings and Discussion. We consolidate the data and information we have into a business model archetype, and examine how it answers the fundamental questions of business models. Then we compare the archetype to a hypothetical archetype that we have conjured from secondary data and shows the main changes that Blockchain will bring. Finally, we discuss our results.

Chapter 5: Implications and Future Research. We interpret our results to propose implications for banks (for their products/services, specifically) and relevant academic fields. We also propose suggestions for future research.

Chapter 6: Limitations and Conclusion. We list and discuss the limitations of our methodological approach, and conclude our arguments.

Chapter 7: Philosophical Reflections. We reflect on the process of authoring this paper.

2. THEORETICAL FRAMEWORK

In this chapter, our goal is to set the foundations for the research to follow. We begin by explaining blockchain, its history, and current developments. In both academic literature and secondary sources, many authors refer to blockchain as a disruptive technology. We go on to list the main aspects of disruptive innovation theory, and assess whether blockchain technology is disruptive or not, according to the theory. Then we assess the main business model paradigms from which we choose the most appropriate as a conceptualization framework for our main research question. Finally, we analyze the impact of disruptive technologies on business models based on the academic literature, and of blockchain specifically, based on both academic literature and secondary sources.

2.1 Blockchain

The basics of blockchains

In Satoshi Nakamoto's (pseudonym) 2008 white paper titled "Bitcoin: A peer-to-peer electronic system", Nakamoto describes Bitcoin as "a purely peer-to-peer version of electronic cash" that would allow individuals to perform transactions without the need for intermediary financial institutions, such as banks. In order to avoid the problem of double spending (accidentally using twice the same amount, due to errors in records), unique to the intricacies of digitalized currency, Nakamoto suggested a peer-to-peer network that would, in addition to placing digital signatures, timestamp transactions into a hash-based record. A hash is a string of information cryptographically encoded. These strings, added sequentially, would form a chain, similar in function to a ledger. A sequence of strings would form a block, the sequence of all blocks forms a blockchain, and after each block has been completed, it cannot be changed anymore.

In simpler terms, blockchains act as public ledgers. A copy of the blockchain is distributed to each participant (node) in the network. All network nodes have to reconcile each new transaction with their own copy of the ledger. Conceptually, each new hash has to comply with all previous hashes, going back to the very first block, the alpha. The verification process takes place in an outward asymmetrical web pattern from each node. If a node is unable to reconcile a new hash, the chain rejects the hash. The transaction initiator's copy of the ledger is then restored to the reconciled version. This setup provides extraordinary security against typical hacking methods that rely on computational power magnitude, such as DDoS (Distributed Denial of Service).

The so-called miners are nodes that provide computational power for the network-wide reconciliation processes. Because of blockchain, the sudden demand for computational power in recent years has caused even hardware price increases on particular components such as graphics cards (http://www.theverge.com/2018/1/30/16949550/bitcoin-graphics-cards-pc-prices-surge).

Blockchain is a technology that can provide great value for customers, but that is not to say blockchains have been without incidents. There have been cases of people exploiting loopholes in the code, but users in major blockchains that also act as testers, ensure that programmers detect and resolve such issues as soon as possible.

Blockchain technology's appeal stems both from the higher degree of transparency, trust, and security it offers, but also from the unique functionality it offers, which we discuss later. In the case of public blockchains, it eliminates the need for trusted third parties that are currently required to authenticate transactions. There is no need for a centralized authority in a public blockchain.

Blockchains at present

Blockchains are able to store information not only of digital currencies, but also of any decodable parameter value: Property/ownership records, land registries, tax records, inventory tracking are but a few. Governments have already began experimenting on blockchains; Sweden has initiated a project to copy its land registry on blockchain. Meanwhile, blockchains' potential applications grow by the day. Blockchain technology has the potential to disrupt, revolutionize, or transform whole industries.

Private initiatives have already begun experimenting with commercial applications of private, or permissioned, blockchains. Private blockchains can take different forms. A permissioned private blockchain would require a centralized authority to permit new nodes in the network, and could restrict the blockchain's functionality or commercialize its components. For the banking industry specifically, blockchain presents both opportunities and threats. Banks can employ blockchains to improve the efficiency of various back-end and front-end processes, or use them within supply chains and partnerships. Additionally, many of the bureaucratic elements of banks, such as reconciliations, can be streamlined (MarCom, at Deloitte Luxembourg, 2017). At the same time, if government institutions and organizations publicly adopt blockchain, it might cause radical changes for banks' traditional business model, especially fee and interest based revenue streams and traditionally core activities. The

archetypal functions of banks, to keep people's money safe, intermediate transactions, and keep records, are all within blockchain's core capabilities, and more.

Among recent innovations, at the technological front, are "smart contracts" (https://www.fastcompany.com/3035723/smart-contracts-could-be-cryptocurrencys-killer-app) in the Ethereum blockchain and "lightning networks" in the Bitcoin blockchain (http://lightning.network). A vending machine, for example, could record the items it has been supplied with and, according to the contract, make the appropriate payment. Bitcoin's lightning network allows for the possibility of unidirectional, instead of omnidirectional, transmissions, similar to the TCP/IP protocols that pioneered the Internet's structure, as we know it, and is regarded as a step towards the realization of global blockchains.

Apart from developments originating in open-source blockchains, there is also substantial research from corporations. R3, a consortium comprised of over 200 banks, financial institutions and regulators, has developed a blockchain platform, Corda, which corporations can pay to use certain applications on, cutting down on costs and increasing efficiency of IT-related activities (www.r3.com). This ongoing technological innovation process on several fronts is slowly transforming, apart from the industries it affects, blockchain itself into a building tool for creating sophisticated platforms in the pursuit of customer value.

2.2 Disruptive Innovation

Theoretical framework

In order to correctly understand and identify disruptive innovations, we attempt to deconstruct the disruption process. Disruptive innovation theory is a framework for comprehending the phenomenon of "good companies hitting hard times" (Christensen, 1997). Why do industry leaders that seemingly do everything right fail? Christensen (1997) claims that they fail despite or more precisely due to doing everything right. To describe and understand the process of disruption, we must first analyze its structure and elements.

For the purpose of this study, we use the generally accepted definitions of innovation as the production of new ideas, methods, processes or products; and technology as the systematic study and application of theoretical knowledge for practical purposes. Therefore, we can describe the production of new methods or processes as a form of technological innovation. Christensen (1997) distinguishes technological innovation as sustaining versus disruptive. This distinction is different from the classical distinction of innovation in incremental versus radical innovation, but not exclusive.

Sustaining technological innovation aims at the performance improvement of established products, along the dimensions of performance that mainstream customers in major markets have historically valued (Christensen, 1997). Disruptive innovation allows for the creation of different value propositions than those previously available, but near-term it often results in worse product performance (Christensen, 1997). On the other hand, changes in strategies, structures, and power distribution distinguish incremental from radical innovations (Romanelli & Tushman, 1994). Incremental innovations go through small changes over long periods, while radical innovations go through discontinuous bursts of rapid changes in short periods that lead to transformations of strategies, organizational structures, and power distribution (Romanelli & Tushman, 1994. Engen & Holen, 2014). The two distinctions are not mutually exclusive by definition because we measure them using different criteria.

The steps of disruption

The first stage of disruption, while hard to pinpoint, commences when incumbent firms disregard potentially disruptive technologies (Christensen, 1997). A technology becomes potentially disruptive when its products can penetrate a market to a disproportionate degree

than the competitors' products in that market can penetrate said technology's market (Adner, 2002). So, if firm A creates product A for market A with technology A, and firm B creates product B for market B with technology B, technology A can be considered potentially disruptive if product A can penetrate market B more easily than product B can penetrate market A. This asymmetry enables the technology's disruptive potential (Adner, 2002). Incumbent firms that focus on sustaining innovation do not have immediate uses for such technologies. Additionally, new value propositions usually require value reconfigurations, and the marginal cost of changing successful strategies is often a dissuading factor. According to mainstream managerial theories, this is the correct course of action (Christensen, 1997). During the first stage, which we characterize by an incumbent firm's lack of alertness, other firms may decide to adopt the technology in its early stages, and develop it for commercial use. At that point, disruptive technologies underperform established products in mainstream markets, but may appeal to a niche audience (Christensen, 1997).

The second stage of disruption happens when the technology matures enough so these under-performing products can compete with established ones. "Products based on disruptive technologies are typically cheaper, simpler, smaller, and frequently, more convenient to use" (Christensen, 1997). At that point, it is too late for incumbent firms to adjust, and new entrants displace them (Christensen, 1997).

Why incumbents disregard disruption

The dilemma, and hence, problem, incumbent firms have to deal with in the face of disruption is this: how to identify a potentially disruptive technology and how to respond. Christensen (1997) proposes four factors to set up a framework for failure: The first is firms' dependence on customers and investors for resources, and the resulting reluctance to allocate limited resources in technologies that are of no interest to current customers and investors. The second is that small emerging markets cannot provide adequate growth opportunities for large firms, and firms dismiss them for lacking potential. The third is that a firm cannot analyze new or not-yet-existing markets the same way it analyzes its mainstream markets and customers, and, acting as if it can, results in using misappropriate approaches. The fourth is the notion that technology supply does not necessarily equal market demand (Christensen, 1997), which Adner (2002) supports.

Charitou and Markides (2003) conducted a survey on managers of incumbent firms in order to identify the specific reasons behind firms seldom adopting disruptive technologies. Reasons included: strong focus on existing core business practices, need to capitalize on current investment, top management refusal to enter new business, incomplete analysis of the situation, not enough time and resources, disbelief in new business viability or profitability, high marginal costs, and insufficient expertise to operate in the new business. These results align with the notion of new entrants being more interested in the commercialization of early stage potentially disruptive technologies and strongly support Christensen's failure framework. Marx et al. (2014) confirm that new entrants more often employ disruptive technologies. Additionally, they point out that, consistent with entrepreneurial strategy in regards to incumbents, new entrants use a dynamic commercialization strategy for disruptive technologies where they begin by competing and later switch to cooperating.

On the question of whether certain technologies are inherently disruptive or disruptiveness is subject to the perspective of disrupted companies, Danneels (2004) proposes the latter. To provide an example, guns fulfill all the above-mentioned criteria for a disruptive innovation if we look at bow and arrow use in warfare. Armies only started using guns in a broad scale when repeater rifle costs undercut the combined costs associated with archer units. Until that point, the consistent performance of traditional weapons was the dominant criterion.

Incumbents' options and solutions

The proposed by Christensen (1997) solutions to the four failure factors are the following: Firstly, setting up a separate resource-independent entity to research the technology and the market emerging around it, whose stakeholders should value the new technology (Christensen, 1997) (Pfeffer and Salancik's (1977) resource-dependence theory supports this claim). This allows for more freedom in decision making regarding resource allocation, as well as adequate growth opportunities for the division to grow along with the emerging market. Secondly, assuming orthodox market research (e.g. asking your customers what they want) to wield wrong results and adopting discovery-driven-planning (Christensen, 1997). In discovery-driven-planning, managers do not decide on a course of action based on accurate result predictions, but by identifying current market parameters, acting on them, and re-evaluating based on the results (McGrath & Macmillan, 1995). Discovery-driven-planning adopts this incremental model because it assumes market parameters can change abruptly and unpredictably.

Charitou and Markides (2003) outline five broad options from incumbent firms' perspective to respond to disruptions: to focus on and invest in traditional business; completely ignore the innovation; disrupt the disruption; adopt the innovation, play both games at once; embrace the innovation and scale it up.

Christensen (1997) adds that for incumbents to stay alert to possible disruptions, firms first need to be aware of the criteria that customers value in the firm's mainstream products (Christensen, 1997). The five factors that affect consumers' choices on product selection are performance, functionality, reliability, convenience and price (Christensen, 1997). We define performance as the measure of practical or technological capabilities; functionality as the degree to which a product can fulfill its intended purpose, as well as the range of unintended purposes it can fulfill; reliability as the rate of consistent performance; convenience as the degree of ease of use (and storage), and price as the demanded value.

Christensen (1997) proposes that competitive oriented technological progress outpacing market demand is the primary mechanism driving the phase shifts of products' life cycle. When performance overshoots market demand, customers reevaluate their selection criteria. Therefore, a disruptive technology that allows for simpler, smaller, cheaper, and easier to use products that simultaneously meet the market's minimum demands for performance, functionality and reliability, has a competitive advantage.

Therefore, in order for an incumbent firm to protect itself from potentially disruptive technologies, it needs to do one of two things. Either to investigate disruptiveness opportunities from within each competitively convergent emerging market using discovery-driven-planning and through a resource-independent entity or division; or to reexamine what are customers' most valued selection criteria in the lower end of its own market.

Overview

Christensen et al. (2015) revisit the theory and try to clarify and rectify common misconceptions that have led to the overuse of the term disruption, and misapplications of the theory. Firstly, disruptive innovations originate in low-end markets or new markets (Christensen et al., 2015). That means that for mainstream customers in a given market, products of disruptive innovation initially appear sub-standard. Revolutionary products that have historically dismantled industries are not necessarily disruptive. Secondly, disruption is not an action it is a process. Thirdly, disruptive innovations will interest upmarket customers as the quality standards of

disruptive innovations improve over time (Christensen et al., 2015). Additionally, disruptive innovations often employ different business models than those of incumbents in order to commercialize their different value propositions (Christensen et al., 2015). Even when an innovation is disruptive in nature, that does not necessarily mean it will be a successful one, but failed disruptive innovations can be disruptive just as much as successful ones (Christensen et al., 2015). Lastly, Christensen et al. (2015) remind of the danger of overreacting to disruptions by strictly adhering to the mantra "disrupt or be disrupted" and advise to maintain focus on sustaining innovations while setting up a division to keep track of growth opportunities from potential disruptions.

2.3 Blockchain as a disruptive technology

While there are limitations to disruptive innovation theory, we can use the framework to examine blockchain technology as a potentially disruptive technology and its interrelations with banks and their business model archetype as incumbents in financial markets.

Primarily, disruptiveness is a trait dependent on the relationship between the firm and market under examination. Secondly, disruptiveness will be examined based on present data, but given the rate of transformation and development of blockchains, it is unquestionable that, whether blockchains are currently disruptive or not, they are potentially disruptive due to the competitive convergence of blockchain, as a product, in banks' mainstream markets.

For average customers, the bank's role is to safeguard the customer's money, verify transactions, and keep records. Banks can also provide additional functionality to high-end customers. Blockchains have superior technological capabilities as far as the basic functions of banks. On one hand, that makes them more appealing to banks, motivating them to adopt and adapt blockchain in order to better serve their main customers' needs or improve the efficiency of the activities related to their mainstream business model. On the other hand, blockchains also appeal to high-end customers who can make use of blockchains' unique capabilities. We must note though, that, depending on the desired functionality, using banks and blockchains complementary is possible. According to disruption theory, which would have a product of a disruptive technology seem worse to mainstream customers at first, this relationship raises more questions.

Overall reactions from banks have been very competitive and have prompted a technological race to determine who can best serve high-value customer needs. The fact that R3, the biggest corporate endeavor, only addresses corporations, allows us to make the following distinction: we can consider corporations (or legal entities) and individual customers (or physical entities) to be separate markets, with overlapping products and services, and attempt to examine their relative disruptiveness individually.

Disruptiveness Indicators	Disruptuve Technology	**Physical Entities (A)**	**Legal Entities (B)**
Value Dimensions			
Performance of primary function/s	Lower	Similar/Higher	Higher
Functionality	Varying	Similar/Higher	Higher
Reliability	Varying	Lower for traditional functions	Higher
Convenience	Higher	Steeper learning curve, but higher variance	Higher
Price	Lower	Dependent on hardware. Varying	Potentially cheaper
Point of Entry	**1 or both**		
New market		Yes	Yes
Low-end of market		No	Unknown
Interest of high-end customers over time	Increases	Unknown	Increases
Different value proposition	Yes	No. Enhanced	Yes
Business model differentiation	Likely	Yes	Yes

Table 1: Blockchain's relative disruptiveness potential for each market.

Market A: As far as low-end customers go, since that is the segment that disruptive products initially appeal to, blockchains offer better performance, functionality, prices, and potentially convenience, but less reliability and ease of use. However, customers cannot completely replace bank's primary activities with blockchains due to lack of integration in the system, the risk of reliability, and regulatory issues. Whether blockchains' enhanced functionality will attract increased interest from high-end customers is uncertain. Finally, a blockchain (whether public or private) has many similarities in what the proposed value is, but differentiates on how to deliver and potentially capture it.

Market B: In the corporation market, blockchain can deliver a better service across all value dimensions, and this is shown by the multiple private and corporate initiatives to commercialize blockchains. An example of this is using blockchains in the area of supply chains. There has also been an increased interest from high-end customers over the years. Commercializing blockchains for corporations has resulted in very different value propositions, also surrounded by different components.

The commercialization of blockchains results, in both cases, in equal or potentially superior products. One observation we can make is that banks appear to act according to the disrupt-or-be-disrupted mantra. Whether that was the cause or simply the result of their reaction, banks are ensuring that they are not prone to disruption from the outside, even if they have to restructure their business models.

From this, we can ask a hypothetical question: Are banks trying to get ahead of a disruption that might have never come? Given the circumstances, we will never be sure, but the decision to radically transform their organizations, even if most experiments are conducted from inter-dependent entities, raises one more question. Is there a relationship between radical innovation and disruptive innovation? The definition of each of these does not make them mutually exclusive. Not only that, but even though banks seem to analyze the situation through disruption, the facts indicate that the innovation process taking place within banks is radical and at the same time, sustaining. Our only conclusion from this can only be that more research needs to be conducted on a broader theoretical framework about the characteristics of innovation, combining the two distrinctions.

2.4 Business Models

Business model is a business term not clearly defined. Many scholars have theorized on business models. The ones we include are those most mentioned, relevant to our objective: Osterwalder and Pigneur (2010), Amit and Zott (2001), Teece (2010), Chesbrough and Rosenbloom (2002) and by Oliver Gassmann, Karolin Frankenberger and Michaela Csik (2014). All the definitions we came across have a common ground on how a business creates and captures value. Most authors include common elements such as value proposition, customers, channels, partners etc. Experts, however, separate these elements in different ways. Some put them together under one block and some study each component individually. Which features are more important than others depends on from which viewpoint the scholar is looking at the subject. Experts have not concluded or come to agreement about a final definition of what a business model is (Zott, Amit and Massa, 2011), or which features are most important, or which features can be excluded. According to Masa and Tucci (2014), the reason for this situation is "computational complexity arises because of the large number of logically possible combinations between BM components (Afuah and Tucci, 2001), activities (Zott and Amit, 2010), and/or choices (Casadesus-Masanell and Ricart, 2010)".

Osterwalder and Pigneur

One of the most famous business model is the one by Osterwalder and Pigneur (2010). Their definition is: "A business model describes the rationale of how an organization creates, delivers, and captures value." In order to have a better understanding of how a business model helps the organization to create, deliver and capture value they created the business model canvas. The business model canvas is the framework of the business model and is divided into nine blocks.

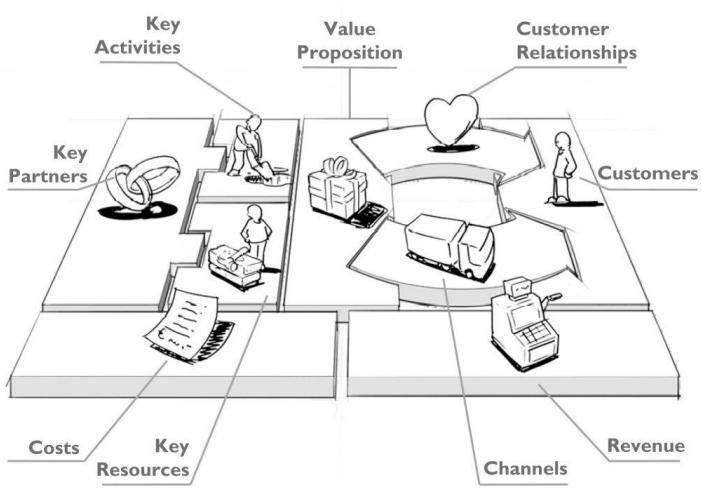


Figure 2: Business Model Canvas. Source: Osterwalder and Pigneur (2010) p. 40

“The nine blocks cover the four main areas of a business: customers, offer, infrastructure and financial viability.” Osterwalder and Pigneur (2010). Below we analyze each block.

1. Customers Segments: This block refers to which customer segments the company is trying to reach. Even if a company has only one product or service, they can target more than one segment. The main types of customer segments that Osterwalder and Pigneur describe are mass, niche, segmented, diversified and multi-sided markets. Mass markets target a huge group of people without differentiating. A classic example is electronic companies whose target customers are everyone. In niche markets, firms target customers with specific needs or financial status, such as Haute Couture high fashion. A segmented market is one where customers are similar, but their needs and problems are different; two customers of a bank can have the same amount of assets but different needs. A diversified market is one where a company targets two completely different customers segments not related to each other, such as Tesla, a firm well known for its expensive sports cars that has now started making trucks. Lastly, the multi-sided markets function as platforms where customers segments are interdependent with each other, such as Facebook.

2. Value Proposition is the solution that the company provides to address a problem or need. The value proposition blocks is the main block of the business canvas because it shows the value that the company creates for its customers. A company can price the value of a product, but the price does not necessarily correspond to customer value. We are living in a consumption society where shopping can even be considered a form of therapy by some. A company, however, that offers products or services without taking into account the value that the product offers becomes one of many companies in a red ocean. The competition is fierce, and the value is the main weapon of differentiation and competitive advantages in the business world. Solving a problem and satisfying a need in the best, safest, fastest and cheapest way creates a strong value for customers and provides the company with a lock-in strategy for its customers.

3. Channels is the block that describes how a company reaches and stays in touch with its customers. The main functions of channels are awareness, evaluation, purchase, delivery and after-sales services. Customers learn about the products and services a company offers through channels. The social media platform Facebook is currently the most widely used channel to create awareness about products and services. E-mail is the main channel for a company to evaluate its value proposition, get feedback and provide support to its customers. Many

companies do not have stores to sell their products or services, but use the World Wide Web (www.) as a channel for customers to find and purchase their products.

4. Customers Relationships is the block that refers to the relations a company establishes with its customers. Osterwalder and Pigneur distinguish six main types. Personal assistance: if not all most of the companies have a personal assistance relationship with their customers, the well-known call center of the companies where customers can get help with any issues that they may face during the purchases or after. Dedicated personal assistance is a type of relationship that is more expensive but in the same time stronger because each customer has its own representative. An example of this relationship is insurance companies or accounting companies. Next, in self-service relationships, the organization has no contact at all with customers, such as gas stations. Automated services is a relationship type where machines can recognize each customer and help them purchase a product or complete a transaction, such as online banking or ATM machines. Communities is another type of a customer relationship, which many companies have used in recent years. Communities are usually online and customers exchange knowledge about the products or services. An example of online community is the PlayStation forum where gamers communicate with each other and invite new members to join. Finally, in co-creation relationships, which function as communities but go beyond that, customers expect to share their knowledge and to submit ideas to the company. Lego is an example where, within the community, when a customer idea reaches 10,000 votes, the company considers implementing it.

5. Revenue Streams is the block that shows how a company is going to generate earnings. There are many types of revenue streams, from which Osterwalder and Pigneur describe seven. Assets sales is when a customer purchases the ownership rights of a product, after the purchase the customer has the right to do anything he wants to with the product, such as resell or even destroy it. Usage fees is a varying revenue that depends on how much the customer has used the product or service. E.g., amusement parks offer tickets with different prices that customers can choose from, depending on the number of attractions or the amount of time spent at the park. Subscription fees is an option where customers pay to become members in order to get unlimited or limited access to the service or the product. A classic example is the business magazine Economics. Lending, renting, or leasing are payment options for customers who only wish to use a product or service for a specific period in exchange for a fixed price. Another form of leasing can be one where a company leases a product but maintains the responsibility

for maintenance. An example is ECOLAB, a company whose products are dishwashing machines leased by restaurants that ECOLAB has to maintain. Licensing is a payment model where a customer can pay to use a company's intellectual properties for a fee for a specific period. Brokerage fees are fees that companies charge to match other companies with customers. For example, when a customer buys a house through a real estate agency, the agent receives a fee for connecting the buyer and the seller. Advertising fees are fees charged by companies to generate awareness for a specific product, service, or company, such as Facebook or Google ads.

6. Key resources are the means that the company has in order to make the business function. Resources can be physical, financial, intellectual, or human. Physical resources are tangible assets that an organization possesses, such as buildings, machines, vehicles etc. Financial resources include cash, funds or stocks that a company owns and can use for hiring or investing. Intellectual resources include brands, patents and copyrights, and customer databases. Examples include music industry copyrights or Apple's brand name. Lastly, human capital includes all the employees and managers in every level of an organization. The resources of a company play a huge role in an organization, allowing its business model to be effective. Furthermore, resources can differentiate a company and in the same time provide competitive advantages, according to resource-based view theory by Wernerfelt, B. (1984).

7. Key activities "are the most important actions a company must take to operate successfully." (Osterwalder and Pigneur, s2010). The three main activities are production, problem solving and platform/network. Production is the most important activity for manufacturing companies such as automobile companies. Problem solving is the activity where organizations provide solution to customers' problems, such as consulting firms, wedding planners etc. Platform/network's key activities relate to platform management, service provisioning, and platform promotion. Alibaba's business model is an example where the company has to continually maintain and develop the platform.

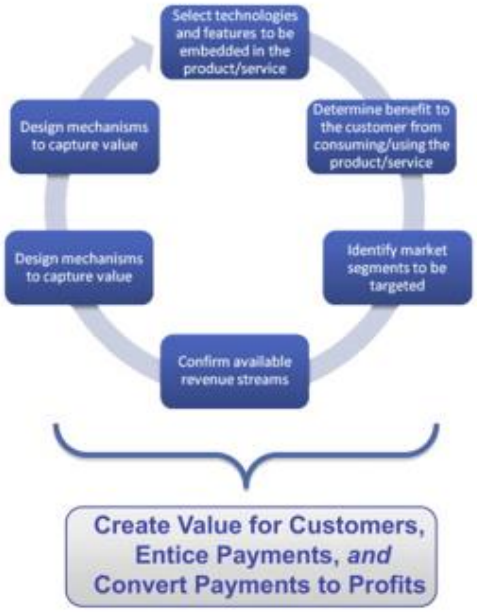
8. Key Partnerships include the outside firms that a company includes in its supply chain when outsourcing one or more of their main activities in order to reduce risk or optimize their business model. The main reasons that a company resorts to a partnership are three, according to Osterwalder and Pigneur: A company can use economies of scale to optimize or reduce their costs. As an example, many companies outsource their accounting department. Another type of partnership aims to reduce risk and uncertainty; companies collaborate in order to have

competitive advantages. Examples of successful strategic alliances include Starbucks or Barnes & Noble. Lastly, companies use acquisitions to acquire particular resources, such as knowledge or customers; successful examples include Gillette and Procter & Gamble.

9. Cost structure is the block that refers to the costs associated with the business. Osterwalder and Pigneur separate the business model cost structure into two categories: cost driven, where the companies pay special attention on how to reduce cost in any possible way, and value driven, where the companies do not pay as much attention to costs as they do to the value that they want to create for customers.

We analyze in depth what each element talks about, as are the ones that most authors use in order to create a business model framework. Business Model Canvas is a great tool for showing the main components that a company needs to focus when it wants to come up with a new product or implement a new technology. As Osterwalder suggests it is great for entrepreneurial start-up companies, but not exclusively. The two main questions that rise from the observation of business model canvas are: where the competitors are and what strategy to use to make all the components interact to get desired results. Even though, those questions are not answered by Gassmann too. On the other hand Gassmann shows in a simple way when we have a business model innovation. This detail is that made us chose Gassmann business model framework instead of Osterwalder. We need to mention that we have taken the business model framework that each author gives in order to show it as a business tool. Our choice takes into account only the business model framework as can be seen in a picture and not the whole work of authors around their business model.

a) Teece, and b) Chesbrough and Rosenbloom



- Articulate the value proposition, that is, the value created for users by the offering based on the technology.
- Identify a market segment, that is, the users to whom the technology is useful and for what purpose.
- Define the structure of the value chain within the firm required to create and distribute the offering.
- Estimate the cost structure and profit potential of producing the offering, given the value proposition and value chain structure chosen.
- Describe the position of the firm within the value network linking suppliers and customers, including identification of potential cooperators and competitors.
- Formulate the competitive strategy by which the innovating firm will gain and hold advantage over rivals.

Figure 3: left: Teece's functions to react to new technologies. Source: Teece (2010), p.173 right: Chesbrough and Rosenbloom's functions. Source Chesbrough and Rosenbloom (2002), p. 7

The section below describes the definitions of business model by Teece (2010) from his work "Business Models, Business Strategy and Innovation" and by Chesbrough and Rosenbloom's (2002) work "The Role of the Business Model in Capturing Value from Innovation: Evidence from Xerox Corporation's Technology Spinoff Companies". The decision to put the two together stems from how both are looking at the business model from a technological perspective. According to Chesbrough and Rosenbloom, there are two ways for a company to capture value from a new technology: it can embed new technology in already existing products or it can start a new project/venture that utilizes the technology in a new business area. Teece's work revolves around the first approach and Chesbrough and Rosenbloom explore the latter.

Figure 3 is a comparison between the models' differences in reacting to new technologies in the industry. Both models include steps such as determining the value proposition, identifying the customer segment, and estimating revenue streams. Teece does not explicitly state if the steps shown in the figure are in order or not, but implies that the elements need to be in order to design a business model. We need to mention that the framework he used may not be correct, as he has included the "design mechanisms to capture value" step twice. Moreover, identifying the customer segment comes after the company has determined the benefits the customer has by using the product. Unless Teece refers to the value that comes with using the product, in which case, it makes sense to prioritize it before the customer segment. It does not make sense,

however, for the value proposition to be part of the first block, before even identifying whom this value addresses. Without a customer segment and a value proposition, though, the first step of choosing a technology to embed to products is problematic if the company has not determined the values that the technology will offer. We propose the first and second block should be reversed. Even though there is common ground with Chesbrough and Rosenbloom, we suggest that Teece's framework as seen in figure 3 is not appropriate for the purpose of this research. On the other hand, Chesbrough et al. does not give us a picture but shows as the functions of a business model figure 3. The last two function that suggest to be included in the business model 'competitors' and 'strategy', we believe that makes the business model too complicated, and need to be study separately. So, we exclude the Chesbrough et al. too.

Amit and Zott (2001)

As we mention in the beginning of 2.4, scholars have not come to one unified definition of "business model", because it depends on the focus area of each scholar. Below we try to understand the definition of business models by Amit and Zott (2001), which is related to virtual markets and transactions. It is important to look at this definition as our research revolves around blockchain and banks. The below definition is based on different economic theories which the authors explain in their work. These are the value chain framework (Porter, 1985), Schumpeter's (1942) theory of creative destruction, the resource-based view of the firm (Amit and Schoemaker, 1993), the strategic network theory (Gulati, 1998), and transaction cost economics (Williamson, 1975).

"A business model depicts the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities." Amit and Zott (2001).

Transaction content refers to the products and knowledge while also referring to the resources and activities needed in order to exchange these products. Transaction structure refers to the partners, suppliers, and channels, which enable the exchange. Lastly, transaction governance refers to the legal aspect of the organization. How value is created through transactions is one of the questions that Amit and Zott attempt to answer in their work. It is the sum of values that all business model participants (suppliers, stakeholders, customers etc.) create, that enable the transactions. A good example of this case is the online store Alibaba, where when the customer orders a product, the sum of all transactions (between the customer and Alibaba, Alibaba and the suppliers, the suppliers and the delivery channels, the banks and Alibaba, etc.) that the

business model enables is what creates value for the company. If Alibaba's suppliers are good and the products match their descriptions, this adds value to the company. We can say the same for when Alibaba's associated banks complete transactions fast and without errors, or when the delivery channels the company uses deliver the products safely and on time. If all transactions take place in a similarly efficient and effective manner, while the customer is not included in many of the transactions, the company manages to increase the value they create for customers.

In conclusion, Zott business model could have been ideal for analyzing the banking industry as it deals in context of transaction. Especially, if we are interested in creating a value proposition model (customers) or a revenue model (shareholders) for banks as its main purpose is to create value. Their works does not totally ignore the capture and delivery of value but they are explain in their framework in a very complicated way.

Gassmann, Frankenberger and Csik

The last business model that we describe is one by Gassmann, Frankenberger and Csik. The definition they give is "*In sum, a business model defines who your customers are, what you are selling, how you produce your offering, and why your business is profitable. Who-what-how-why describes a business model of which the first two (who and what) address its external aspects and the second two (how and why) address its internal dimensions."*

Figure 4: Gassmann et al.'s business model.
Source: Gassmann et al. (2014)

The "what" block includes the value proposition. The "who" block includes customers, stakeholders, and channels. The "how" block includes resources, activities and competencies, and partners. The "why" block includes cost drivers and revenue streams. We will not analyze each one as we observed the components are the same as those mentioned by Osterwalder and Pigneur, except in a more condensed framework. According to Gassmann et al. (2014), when two out of the four components change, that qualifies as business model innovation. The authors mention that most business models focus on creating value for the customers and do not spend as much effort on capturing the value, which is as important for a firm. "What is interesting is that while most business model innovators are quite good at creating value for their customers, many fail to capture it for themselves." Gassmann el al. (2014).

In conclusion

All the above business models are impressive works done by the authors within years on the field and are all related to our research, however we chose to use Gassmann et al.'s, as a tool to explore the change that blockchain will bring to the banking industry. This tool emphasizes the importance of business model innovation. Banks are companies that have existed for a long time and their value propositions have changed very few times because of an innovation, but when it does happen the whole business model, organization structure etc. changes, e.g., with the internet. By using the framework from figure 4 given by Gassmann et al., we can use it as a tool for business model (in our case to create the archetype of banks' business model) and in the same time as a business model innovation tool which will help us to create the future hypothetical banks' BM. We separate the BM with BM innovation according to Gassmann et al. (2014). BM innovation occurs when two out of four questions change. In our opinion it is simple and clear, that blockchain will bring changes to three of the four questions (what, how, why.) What to offer to the customers? The same products but faster, more secure, cheaper and simpler. How to create value? By combining the new technology, with new resources and new partners. Why does the business model generate profit? We believe investors in the banking industry, already experimenting with blockchain, answers this question. At the same time, our research mentions some of the costs that will be reduced from the implementation of blockchain. We believe the question "who" is not going to change radically. In the beginning of the implementation, the core business model will not change, as blockchain cannot replace all activities of banks. For that reason, we propose a two-sided business model, which can be viewed separately during the creation process, and for the sake of analysis, but integrated for drawing conclusions.

2.5 Disruptive technologies' impact on business models

When a company embraces/adopts disruptive innovation, which business model components does this choice affect? In this section, we discuss the findings of case studies we have gathered in order to answer the above question.

Both the terms "disruptive innovation" and "business model" do not have clear definitions. From this point, we will be referring to the disruptive innovation definition given by Osterwalder et al. (2005): "A disruptive innovation is a technology, product or process that creeps up from below an existing business and threatens to replace it." As for the business model definition, we will use the framework of what-why-who-how by Gassmann et al. (2014).

The component that a disruptive technology mainly affects is the value proposition, which is on the block "what" of Gassmann et al.'s business model. Our reasoning is that disruptive innovation usually results in simpler, cheaper, smaller, and more convenient products. These four factors have direct impact on the value proposition, regardless of who the customer is. When firms embrace a disruptive innovation it is usually in order to increase market share and include new customer segments, which turns the focus of the firms (which is usually directly increasing profits) to customers who may have previously been ignored. As the value proposition is the main component related to the customers "to that end, to improve a disruptive technology's appeal to mainstream customers, firms can reconfigure the value proposition, a business model's main component to engage with customers." Bohnsack and Pinkse (2017).

Firms in many different industries are reconfiguring their value proposition when they embrace or study a disruptive innovation. In the mobile network operators industry in Italy "the most significant impact of the main change factors (increase in data traffic and decrease in voice revenues) lies in the value proposition dimension." Ghezzi et al. (2014). E-business microcredit firms in China have taken market shares from traditional bank. "*Most importantly, we can see that e-business microcredit's performance has been ahead of the offerings of traditional microcredit throughout. It provides small customers with efficient, safe, convenient, low-cost, and simple value propositions they have been looking for, and it continues to expand market share by offering the flexible service of easy-lend, easy-repay. E-business microcredit's rapid ascent threatens to blunt TB's lead in microcredit market and forces the latter to fight back*." Zhang, W., Daim, T. and Zhang, Q. (2017)

Shomali and Pinkse (2015) discuss the electricity industry, which faces a choice between embracing and ignoring a disruptive innovation: “Hence, a country's regulatory framework for green electricity could significantly influence the impact of smart grids on electricity firms' value proposition in terms of whether they perceive cross-fertilization between smart grids and renewable energy integration”. Another reason that the value proposition of electricity firms is going to change is, besides the country’s regulatory framework, the customers’ behavior, as the customers’ concern about environmental issues has been a priority over the last decades. Not only outside sources influence the value proposition, vice versa; increasing the quality of suppliers is going to change “an integral part of their value proposition.” (Shomali and Pinkse, 2015).

In the article “Value Propositions for Disruptive Technologies: Reconfiguration Tactics in the Case of Electric Vehicles” by René Bohnsack and Jonatan Pinkse (2017), the importance of value proposition reconfiguration is as important as the new technology that the firm is going to implement. As the value proposition is the main element that helps the customers decide which company to choose. Moreover, it helps the company overcome difficulties they face by embracing disruptive innovation. One difficulty is reaching mainstream customers. “Technological improvement would solve this problem, but value proposition reconfiguration could achieve this more rapidly.” Bohnsack and Pinkse (2017).

In the end, reconfiguration of the value proposition does not only help reach customers, but at the same time helps the firm take full advantage of disruptive innovations. As the components of the business model are interdependent, the change of the value proposition has a direct impact on the ‘how’ block which is the one that represents resources, activities and competencies, and partners. After the firm figures out the value it offers to the customers, by embracing a new disruptive technology, it needs to know if it has the resources, partners, and competencies, in order to conduct the activities needed to create and deliver that value. “If value proposition changes, the firm may then not have the resources and capabilities appropriate for value delivery (Azadeh and Jonatan, 2016)” Zhang, W., Daim, T. and Zhang, Q. (2017)

A disruptive innovation, by itself, cannot lead the company to success. Having strong partnerships and resources is crucial for the firm’s success. DaSilva et al. (2013) work on cloud computing companies provide the examples Salesforce.com, Amazon.com and Siebel. Salesforce and Amazon understood the need to focus on the resources and took action. Salesforce created a new position. “Salesforce.com attention to customers led it to create the

‘lead qualifiers’ position (non-existing position until then in the industry).” (DaSilva et al., 2013). Amazon leveraged its existing resources. “Amazon.com leveraged its own resources and experience in low-margin types of businesses to become one of the leading cloud computing service providers.” (DaSilva et al., 2013). Siebel, on the other hand, embraced disruptive innovation without making changes to their business model. “While Siebel is progressively switching its offering to the cloud with Siebel CRM on Demand, it is still chained to an old business model and an outdated framework of resources, processes, and priorities” (DaSilva et al., 2013). These three examples show the importance of how changing the business model and taking action towards acquiring the necessary resources is vital for the company’s success, as shown by Salesforce and Amazon’s success and Siebel’s failure.

Not all companies, however, have the capability or the financial power to leverage or acquire new resources. That does not mean a company necessarily needs to give up on exploiting disruptive technologies. The step that many firms take is creating a strong partnership. In the case of Aramex, Aramex collaborated with the Australian Post to gain access to the postal network. “‘If you don't have resources, you need strategic alliances, it is the only way you can succeed’ (Fadi Ghandour, INSEAD Interview)” (Alberti-Alhtaybata et al., 2017). Another great example of partnership is the electric vehicle, as the owners can recharge their vehicles by using solar panels. Five firms in the United States have created strategic alliances with solar panel providers, such as Ford and Sunpower. This alliance was created to reduce the total cost of ownership, not because the firms did not have the financial resources. Sometimes it is cheaper to create a partnership or outsource instead of acquiring or leveraging the required resources.

Partnership can also be a viable alternative when a firm does not want to change its business model or embrace disruptive innovation. At the same time, if it cannot ignore it, it can prove to be dangerous for the firm in the end. “If a disruptive technology threatens their business, a larger organization with less flexibility should consider either acquiring or establishing strong partnerships with players that already leverage such technologies.” DaSilva et al. (2013).

“A disruptive technology brings a different value proposition to the market and may respond to needs of new customer segments.” L.-M. Sainio, K. Puumalainen (2007). Thus, a firm’s goal when embracing a disruptive technology is to increase market share, reach new segments, or increase consumption of their products. Inadvertently, this has direct impact on the “who” block, which refers to the customer segments, stakeholders and distribution channels. Moreover, disruptive technology results in cheaper, easier to use, and often, simpler, products,

which supports the idea that more customers will be able to use the product or service, as it will be more widely available. Aramex is an example where the firm managed to reduce prices for their traditional delivery by not maintaining a large fleet. Another disruptive technology that Aramex is using is big data analytics (BDA), which has helped Aramex create demographics of customers that they could not reach previously, resulting in new markets and new customer segments. We did not find case studies that refer separately to the changes that the channels and stakeholders components undergo when a company embraces disruptive innovation. One main stakeholder of a company is its employees. In the example of Siebel, we see how not having skilled employees affected their ability to take advantage of the new technology, and in the example of Salesforce, how creating new positions allowed them to manage better. From these examples, we see the importance of employees as part of a business, both as a resource, and as stakeholders.

In conclusion, disruptive technology may bring changes to all four main blocks of a business model, as we describe above. In our research, the main blocks that will be affected are “how”, “why”, and “what”. As for “who”, we did not find data or supportive evidence, as no bank has put it in use for its clients, and no research has addressed the potential changes and dynamics between the banks and customers segments. Even though we have to mention that from the secondary data that we collected leads us to conclude that the trials that are being run have focus the improvement of products that are mostly being used by “corporate, SME’s MNE’s” customer segment. As one of the goals of the company which embraces new technology is the creation of new customer segments, increased market shares, or increased consumption of products/services, which are mostly related to “who” block. If the segment is going to change or a new segment is going to surface, it is still to be seen, for certain it is not going to remain the same.

2.6 Blockchains' impact on Business Models

"Great technological achievements commonly fail commercially because little attention has been given to designing a business model to take them to market properly. This can and should be remedied." Teece (2010). With this in mind, we attempt to explain the relationship between business models and blockchain. As Teece said, a great innovation/technology does not do much for a company if it is not embedded properly into the business model of a company. Sometimes, embedding a technology into a product without reconfiguring the rest of the business model, or creating a new one, is not enough.

Business models are, to our understanding, tools that help firms to have a better picture of how their products/services can create value for each of their customer segments, how to capture that value and how to deliver it to their customers. Design of the business model is one of the most important and difficult tasks a company has. Determining what problem a product solves for the customers, which customers it solves the problems for, how to persuade customers the product is better than the competitors'; whether the necessary resources, partners, suppliers etc. exist, in order to deliver what you promise as a company; determining the costs and revenues to take into consideration. These are all questions a business model should answer, in order to be able to create value.

Blockchain is a technology whose potential has attracted investments from many firms, but there has not been sufficient research to explain how this will affect the business model of firms in industries that will embrace the technology. When a company adopts blockchain technology, the business model of the company should change to accommodate the new value that it can potentially create, as the first component to change is the value proposition. Blockchain's main value lies in speed, simplicity and affordability. We need to understand how the firm's customer segments will perceive this new, or improved, value proposition. IT has become an important resource for each industry, and one way to ensure a transition goes smoothly, would be to ensure firms have sufficient expertise in their IT departments to administrate blockchains. It will be a test for firms to offset blockchain's costs and attract their customers to use this new technology called blockchain. A benefit that blockchain brings is that there is no need for intermediaries, which has to do with the partners each company has. Firms will need to reconsider their partnerships, not only to decide which to keep or end, but who are the customers of their partners that may play a role to the use of their blockchain. A great example is the financial trade, if banking industry decides to adopt blockchain the import and export industry needs to follow,

as banks still will be the intermediaries for this sector, as digital currency is not completely regulated and integrated by governments. If digital cryptocurrencies become recognized then the banking industry needs to find a way (as they are already trying) to lock in the import/export industry to their blockchain platform.

To conclude, there is no doubt that blockchain will change many industries. CBI Insights mentions “36 industries that blockchain could transform” (cbinsights.com, Feb.2018). The main questions, however, are: how will it change them? Can incumbents prevail? These issues can be overcome with the creation of the appropriate business model.

3. RESEARCH DESIGN

Our research started by looking into Aalborg University library databases ABI/INFORM collection and Academic Research Premier (Ebsco) for empirical studies related to banks and blockchain. Unfortunately, no empirical or case studies where found. We did find many peer review journals related to three key words, blockchain, banks, business model. After we verify that indeed the banks are making moves towards blockchain and how blockchain improves the value propositions of banks by improving their products/services through blockchain technology, we moved to the second step.

Next was the selection of banks, from the desk research we try to figure out which Europeans banks are investing on blockchain, this was our first criteria on the selection process of which banks we need to study. The banks that we choose are: Lloyds, HSBC, Barclays, Bank of Scotland, Danske, Deutsche, UniCredit, KBC, Credit Suisse, and Nordea. The next criteria was they need to be on the top thirty of market share because that way they represent more customers, the information came from https://www.statista.com/statistics/382818/leading-banks-in-europe-by-market-capitalization/. The next was, banks need to be on top thirty based on their assets because that will show that are the banks that have resources to invest on blockchain. The information came from https://thebanks.eu/top-banks-by-assets. Lastly which of these have already in the process of investigating the benefits of blockchain by partnering or being members of big companies such as R3, IBM, Deloitte, Ripple or trying to create their own blockchain.

The third step was the collection of secondary data by going back to AAU library to search in more in depth related articles to banks's business model and blockchain in the same time search on websites, blogs and online org.

After, verifying we had enough material to make a proper analysis we went to the websites of each banks and scan the annual reports from 2016 and 2017 to create each ones their current business model. See Appendix A.

We will then proceed to come to a unified business model that represents the total of these banks' business model components. Afterwards we plan to note the main changes to each of the components by using secondary sources, and discuss them. We will present the results in the same framework. In this process, we will also examine the compatibility of the phenomenon

with the tenets of disruptive innovation theory, and assess blockchain as a disruptive technology.

4. FINDINGS AND DISCUSSION

Blockchain technology or Distributed ledger technology (DLT) is the future of dealing with contacts, transactions, and records of them in a way where deletion, tampering and revision cannot exist. At least that is the goal of banks and institutions, which are investing millions of dollars in blockchain technology. So, what are the actions that big banks are taking? Blockchain has become a buzzword in the banking industry the last few years. As an example, Bank of America has already secured 20 patents since 2014, and has started to experiment with blockchain to strengthen its share in all the sectors that blockchain might be useful, such as payments, risk detection etc. Not all banks have the same financial capital or are willing to take part in every project related to blockchain technology. Many banks are pioneering by investing resources and optimizing blockchain towards specific sectors. China Construction Bank is creating a blockchain platform for bank assurance. Ciol; Bengaluru (Oct 10, 2017)

On the other hand, Barclay focuses on foreign exchange. That is because they need to deal with exchange rate and conversion of digital currency to fiat currency. This is still a headache for banks that want to embrace blockchain. The main activities of banks related to exchange are: cross border payments, transferring money from one country to another country with different monetary units, trade finance, securities and many more. There is no doubt that blockchain is faster, costs saving for the bank but for the customer is still costly and time consuming. "*Barclays joins foreign-change focused blockchain consortium: Barclays, last heard, has also joined a foreign exchange-focused blockchain consortium where JP Morgan Chase, Goldman Sachs and Bank of China are already active and looking at areas of increasing efficiency and security in the forex settlements industry.*" Ciol; Bengaluru (Oct 10, 2017).

Blockchain of banks will have as target market the corporate clients as are the one that use the banks for many activities compare to individual who mainly use banks for saving or loans. As corporate clients lose a lot of money on interest and fees when they use the bank, brings unsatisfied customers. With that in mind and to not lose the clients, banks are incorporated with different multinational companies that are offering the best solution to the problem. Deloitte has launched three blockchain labs already in Dublin, New York and Hong Kong for corporate clients, the last one is in collaboration with the Hong Kong Monetary Authority and five leading banks in Hong Kong for creating a platform for trade finance. Deloitte Press Release (2017). Except Deloitte, IBM is a strong player when it comes to blockchain and banks for better solution for corporate clients in the trade finance sector. "*IBM (NYSE: IBM) today announced*

that it has been selected by a consortium of seven of Europe's largest banks to build and host a new trade finance platform based on IBM Blockchain powered by Hyperledger Fabric." IBM News Releases (26 June 2017)

As we mention in the beginning not all the banks have the knowledge, money or time to invest on blockchain. All the banks, however, have the desire to use the blockchain technology and not lose their customers. If we see blockchain as a disruptive technology, we may say that the small player R3 a distributed database technology company is the one that would have disrupted the banking industry with its optimization of blockchain technology. That would have been the case if the banks had ignored blockchain, so instead of ignoring the small player the banks partner or become member of the R3. "*R3 is an enterprise software firm working with an ecosystem of over 200 banks, financial institutions, regulators, trade associations, professional services firms and technology companies to develop Corda, the only open source and enterprise blockchain platform designed specifically for businesses."* (www.r3.com)

To conclude, blockchain technology is being embraced by the banking sector. Banks all around the world are experimenting in many different project, with target the optimization of the existing products. Banking in partnerships with big corporation, government, institutions and multinational companies are spending millions of dollars to the technology, but no money in business model innovation. So, we hope our research will help the banking industry of the importance on investing money towards business model innovation of the industry. The next work will discuss how the banks' business model looks right now and how it may look after the implementation of blockchain. Because our hypothetical business model may lack because of insufficient data, one of the aim as we said to show how useful tool business models are.

4.1 Banks' Present Business Model Archetype

Among the data we collected to create the business models in Appendix A, these are the common denominators. We use the same framework, compiled of 4 major components and 9 minor components within the major components. Next, we answer the questions related to the 4 major components, and examine the terms we have used in the table, and provide additional comments for the minor components.

WHO	Customer Segments	Individuals, High net value individuals, SME's & MNE's Government and corporate institutions
	Stakeholders	Shareholders, Customers, Employees, Governments and regulators, suppliers Community, Partners
	Channels	Branches, Digital banking, Call centers, Website, Events Radio, print/film/social media advertising, Mobile apps Postal service, Specialists
WHAT	Value Proposition	Security, Dependability, Integrity, Customer Focus, Digital access, Availability, Low Rates, Sustainability, Technological Innovation
HOW	Resources	Capital, Human capital, IP's, Specialist teams Physical assets, Talent, IT infrastructure, Managed assets
	Activities	HR, Communication and branding Internal Auditing, Wealth and Asset management, Advisory, Risk management, R&D, Social and environment responsibility activities, Legal, Loans Activities
WHY	Partners	Governments, Communities, Credit card manufacturers, Insurance agencies Other banks, FinTech firms, Real Estate firms, Cyber security firms Sustainable solutions firms
	Cost Drivers	Operational and administrative expenses, Taxes, Legal fees Risk-related losses, Loan losses, Credit losses, Amortization Funding, Restructuring costs, Auditing expenses, Regulatory compliance expenses
	Revenue Streams	Interests, Fees, Commisions Bonds, securities and other financial instruments Participations, Private equity

Table 2: Bank Business Model Archetype. Source: Own creation based on the data in Appendix A.

4.1.1 Who are our target customers?

A bank's targeted customers are all legal entities that can entrust the bank with money, use the bank as an intermediary to transact with others, or seek services in the form of management, advice, or financial byproducts that the bank can provide by using the accumulated savings of its customers. This includes individuals and organizations, which can be broken down according to their need for each product. Individuals can be divided into low net-worth and high net-worth individuals. Organizations can be divided into SME's, MNE's, institutions, and governments. Finally, banks need to be aware of who the stakeholders are, and what their goals are. As an example, the shareholders, regulators, government, and community, all have

different interests and goals. With the possible exception of regulators or government, where the bank is obliged to comply, it is usually within the bank's own interest to comply with stakeholder wishes.

Customer Segments

While statistically the biggest customer segment for most banks is individuals, corporations are equally valued customers. The smallest customer segment is high net-worth individuals. Despite that, most banks offer a wide array of financial products and services exclusive to this segment. Corporations also have a wide array available.

Stakeholders

Aside from the stakes of shareholders, customers, and employees, it is also in the interest of governments and regulators that banks are healthy organizations, in the sense that any country's economy is supported by the well-managing of banks. This also extends to the communities. Associated firms are also considered stakeholders, since any associate enters a partnership with certain gains in mind, which requires both partners to fulfill their agreed obligations.

Channels

Banks employ a multitude of media to advertise their products and services, along with events and sponsorships to increase brand awareness. Call centers, branches, websites, and online help ensure efficiently and effectively dealing with customer queries, feedback, and service. Major banks are still using postal services for advertising and customer updates, but more and more selectively as digital banking (browser and mobile) is preferred as a platform by most customers. Regarding the more exquisite or volatile services that banks offer, such as asset management or risk-related services, most banks have specialist teams that are dedicated to their respective areas of expertise.

4.1.2 What do we offer customers?

To describe the value that banks create, it is necessary to associate it the bank's products to their corresponding value, as well as the jobs that they fulfill. The basic product of every bank is the savings account. The job it fulfills is to safeguard savings. Part of the value of this product is the reduction of personal risk. Another part of the value is the ability to access savings anytime and in many places, as well as to monitor them at will. Even though this basic product

has innately high value for each customer, banks provide it freely. Additionally, they provide an incentive, in the form of interest. That is because, through the bank's unique business model, the bank is able to create new value for the sum of its customers if many customers use the basic product. Banks are able to create products such as loans or insurances, for example, through the pre-agreed exploitation of a sum of each customer's savings. In this product development process, banks acquire expertise on managing tangible and intangible assets. In turn, banks commercialize the value of the expertise in services such as advising and wealth management.

Value Proposition

Security: Being able to protect the assets entrusted to the bank. Dependability: Banks need to be able to offer solutions. Often that requires a certain degree of flexibility to their products and services. Integrity: Banks have the responsibility to correctly manage the assets entrusted to them without unnecessary risk. Customer focus: Listening to the customer's needs. Digital Access: Compared to the past, an increasing portion of transactions is handled online, and banks now need to have digital channels more than ever. Availability: Being available to customers 24/7, utilizing call centers, digital access and online customer service. Low rates: Low rates in any bank's financial products are more attractive to their intended customers. Sustainability: Many of the banks we examined have a prominent focus on sustainability. Either through investing in renewable energy sources, more efficient planning, small environmental footprint, or a combination of these, among others. Technological Innovation: The rapid innovations and continuous disruptions have forced major banks to become faster and better at innovation, with a strong focus on financial and information technology.

4.1.3 How do we produce our offerings?

To produce and deliver the offerings to customers, banks need to exploit resources, conduct activities, and create partnerships. The need for resources depends on the activities. The need for partnerships depends on the lack of resources, inability to conduct certain activities, or the inefficiency of the bank in conducting certain activities compared to others who specialize in each specific activity.

The main activities then, for a bank, are as follows. Keeping records of all products and services that customers use. Keeping records of each customer's account status. Intermediating, verifying, and recording transactions. Advising and managing. Finally, an equally important

activity for every firm, is innovating, of which the product development process, which we described above, is a good example.

The basic resources a bank needs to perform these activities are employees, offices, IT infrastructure, financial capital, and intellectual capital. These resources in turn create the need for activities such as internal auditing, and resources such as specialized personnel.

To expand their pool of resources or to conduct some of the necessary activities, banks need to create partnerships to complete the process of value delivery. Thus, advertising firms, financial/security/information technology firms, other banks, manufacturing firms, real-estate/insurance agencies, or sustainable solutions firms are potential partners. Banks use these partners to outsource or complement activities, or to conduct secondary activities that are necessary to facilitate primary activities.

Resources

Among banks' resources is capital, physical assets, - in the form of branches, offices, and other tangible assets - human personnel and talent comprising their basic workforce, specialist teams, and management. Additionally, there are tangible and intangible assets they manage on behalf of customers, and intellectual properties such as IT, FinTech, and corresponding infrastructure needed to operate and maintain them.

Activities

The most basic activities of every banking financial institution are the services of lending and safekeeping, along with the associated deposits and withdrawals. Additionally, banks act as third-party trusted intermediaries in order to facilitate payments and other financial transactions, and act to process and record these transactions as well. Most major banks also offer insurance and/or pension schemes. Investments are also a fundamental activity as banks can utilize their customers' assets. For high-value customers, this is also provided in the form of premium services such as wealth and asset management, advisory and risk management. Major banks are required by law to have internal audit teams that act to ensure regulatory compliance. Finally, all major banks we studied have activities dedicated to sustainability, social responsibility and the dedicated R&D departments or projects to exploit the fast-paced innovations that originate from the IT and Fintech industries.

Partners

A way to increase customer reach is for banks to make their services available to customers through other banks, thus driving the need to create partnerships with other banks. Credit card manufacturers are also necessary partners for banks, as outsourcing this procurement activity is financially more sustainable and efficient than for banks to each create their own cards. Government and regulators have to work together with banks to ensure optimal regulatory planning and regulatory compliance. We also consider communities to be partners, contractual agreements notwithstanding since they can affect the banks' reputation and brand recognition. Cyber security firms are also a partner for most banks, as it would be inefficient for banks to insource this activity but is of paramount importance to the basic activity of every bank; safekeeping. Real estate firms/agencies act to help manage the banks' entrusted assets, mortgage collaterals or provide information. Fintech firms are a new type of partnership seen in the latest years since the rate of technological development increased and banks need to heavily invest in R&D through partnering with financial technology firms. Lastly, we see partnerships with various subtypes of sustainable solutions firms, either for the purpose of banks pursuing own sustainability policies and targets, or for the purpose of social responsibility activities and projects. We can breakdown these partners to firms dealing with energy solutions, environmentalism, structural efficiency, and others.

4.1.4 Why does it generate profit?

As mentioned, banks provide their basic product freely, even though it represents certain value for customers. The way banks capture this value is firstly through fees or commissions for intermediation and secondly through interest on loans and other credit-based byproducts. Finally, as with other firms, some banks choose to invest in other firms, from which they get participation earnings. As for the costs, we can categorize them into generic costs and costs related to the bank's business model intricacies. In generic costs, such as operational and administrative expenses, we can also include legal fees and potential fines. In the unique costs that are tied to the business model, we can include risk-related losses from loans and other credit instruments. These costs hold the possibility of turning into revenue for the bank, and vice versa.

Cost Drivers

On a basic level, we include operational expenses such as wages and other fixed costs related to tangible assets (e.g. rent, property taxes, and amortization). Furthermore, there are overhead

costs related to running the bank, such as administrative expenses, legal fees, and auditing expenses. A unique aspect of banks' business model is an expenses group that could be included in overhead costs that revolves around risk; credit losses, loan losses, and risk-related losses. Funding refers to the investment costs for the purpose of future capital or profit increases. Finally, restructuring costs, as well as regulatory compliance costs, are costs the banks are burdened with, to change existing aspects of their structure, either via strategic decision-making or via government regulations.

Revenue Streams

Revenue streams, as well as the previously discussed cost drivers, are the components with the most similarities amongst all the data. The model relies on interest, fees, and commissions on a variety of financial products and services for customers, as well as private equity and various instruments such as bonds and securities. Additionally, banks generate revenue from participations (shares, dividends, or investment capital).

4.2 Future Business Model Archetype Hypothesis

The goal of business model is to show to investors how the company creates, delivers and captures value. Gassmann's business model answers to these question by posing the following four questions. Who are our target customers? By separating our customers into segments, we have a better picture of who the customers are and what product are the looking for from us. In the same time many customers may want the same product by for different purpose. So, by separating them, we get to know them better, serve them better and by satisfying them we keep them from going to competitors. In order to reach to the last part, meaning to "keep them from going to competitors" Gassmann pose the second question "what do we offer customers?" By answering this question, the company understand what value need to create for its customers in order to lock them in. After answering the second question Gassmann goes to the third: "how do we produce our offering?" On this question the company sees if it has the right resources, activities and partners in order to deliver the value that the customers are looking form its product. The last step is the question, "why does it generate profit?" The company tries to answer this question by seeing if the price that the customers have put to its product coincides with the price they have put. And if it does then the company can capture the value for their customers and for their shareholder. For customers is the price they are willing to pay and for shareholder is the price that the revenues cover the cost and generates profit. If the price does not coincide and it is higher than the one customers give it is very luckily to lose their customers to their competitors. If it lower, then it cannot generate profit. Let's take a lot of how banks will deal with these four questions after the embracement of blockchain.

WHO	**Customer Segments**	SME's & MNE's Individuals, Families, High net value individuals, Government and corporate institutions
	Stakeholders	DAO's Shareholders, Customers, Employees, Governments and regulators Community, Partners,
	Channels	Events, Branches, Digital banking, Call centers, Website, Radio, print/film/social media advertising, Mobile apps Postal service, Specialists
WHAT	**Value Proposition**	Cryptographic security, Transparency, Real-time transactions, Immutability, Smart contracts, Dependability, Integrity, Customer focus, Digital access, Availability, Low rates, Sustainability, Technological innovation
HOW	**Resources**	Blockchain specialists, Human Capital Cash Capital, IP's, Physical assets, Talent, IT infrastructure, Managed assets
	Activities	Identity management, Internal Auditing, Legal Wealth and Asset management, Advisory, Risk management Social and environment responsibility activities, Regulatory compliance, Communication and branding, R&D, Investments, Loans activities
	Partners	Fintech firms (IBM, R3, Ripple, Deloitte,EnVision) Cyber security firms, Miners/server farms Governments, Communities, Credit card manufacturers Other banks, Real Estate firms, Sustainable solutions firms,
WHY	**Cost Drivers**	Operational and administrative expenses, Restructuring costs, Taxes, Legal fees, Risk-related losses, Loan losses, Credit losses, Amortization Funding, Regulatory compliance expenses
	Revenue Streams	Interests, Fees, Commisions, Bonds, securities and other financial instruments Participations, Private equity

Table 3: Bank Business Model Hypothesis after Blockchain. Own creation based on Table 2 and secondary sources.

4.2.1 Who are our target customers?

Customer Segments

The customers that the bank has as a target is everyone, but for starter we assume that it is going to be the customer segment "corporate clients, SME'S and MNE's" because the products/activities that blockchain improves are the ones that most this customer segment uses. The most simply and the most important businesses are using banks is for making payments to their suppliers, employees, partners, investors ect. "Each year, businesses send about $150 million to $300 trillion for payments across borders. Fees for those transactions average around 10%, and the money transfer takes about two to five business days." John Mason (2017) From this sentence we understand why would businesses would look for a cheaper and faster way to make their payments.

In the beginning of the embracement to do believe that is going to be the SME's and MNE's as we said above. Later on, the customer segment it will be as it is, however there may be a need to separate the customers in two big segments the ones that are using blockchain and the ones who are not.

Stakeholders

The stakeholders will remain the same with the exception that we added DAOs (decentralized autonomous organization) because as most of the banks do not have the right to issue their money or digital cryptocurrency partnership or future shareholder of banks can be DAOs. As the need of blockchain increases the need for digital currency may increase. Though the legal status of these organization has not been stated, and as cryptocurrencies are not legal tender and not back by central banks. (www.ecb.europa.eu). In the same time the focus of DAOs to help companies decentralize their business model. (https://daostack.io). It is still to be seen the relationship between DAOs and banks how it will evolve. The employees will be affected, too, refer to resources human capital.

Channels

The channels that reach the individuals will not change. Banks are in risk to lose customers such as SME's or MNE's if they do not reach them fast. The company or bank that offers the best and strongest software blockchain platform will gain the most customers. Social media such as Youtube has been used by big companies such as IBM, Ripple Deloitte in order to show the benefits of blockchain and in the same time the elimination indirectly of banks. The big banks have already been in contact with these companies and are using each other to reach SME's and MNE's by emphasizing in their webpages or social media their partnership. A lot of seminars and events are taking place around the world by inviting banks and companies to show the benefits of blockchain. So, we believe that the channels such as events and social media are being used strongly now to make sure to not lose customers, because after the customers have started using the blockchain that the bank is offering they will be locked in.

4.2.2 What do we offer customers?

Main products/services that blockchain is going to upgrade are: payments, syndicated loans, trade finance, clearing and settlement. By improving them we answer the second question "what do we offer customers?" The values that blockchain creates for banks' customer in relation to

these products/services simply put makes them cheaper: because no so many fees, faster: time 1 to 14 days goes to second to a day, safer: no room for forge, simpler: no need for many intermediaries. We describe them on our business model below as cryptographic security, transparency, real time transactions, immutability and smart contracts.

Value Proposition

Cryptographic security: It is the main value proposition that it will be added to the value proposition of banks. As blockchain offers the possibility to customers to store to blocks their data that they want to in a crypto graphic way which is difficult to be changed or hacked. In the same time provides them with public and private keys encrypted with industry standards. The customers that are going to be using blockchain of the bank for a specific reason, they will have the option of a closed ledger which can be shared between only trustee parties.

Transparency: Until now the banks and all the other financial institution could use our funds in any possible way they needed sometimes without even our knowledge. With the use of blockchain any transaction that is related to the funds of customers is open and the customer has the access to see any changes that may happen, in the same time banks can not make any changes with the approval from the customers.

Real Time Transactions: simple transaction between two single banks or PayPal accounts happen in real time, however if someone needs to send money from one bank to a different one, or for bank of Denmark to a bank in U.S.A the transaction takes days and fees are being charged. With the implementation of blockchain these transactions happen in real time without any extra charge.

Immutability: Even though immutability is one of the values that banks offer even though right now, however as a lot of data is still controlled manually, there is not guarantee of immutability. As soon the blockchain uses the immutability option for the data that they have stored, a change is impossible. This feature is extra important when it comes to auditing of the bank.

Smart contract: even for the simplest products or services that the banks offer there is a need of a contact, still most contact are physical which means are easily forged or destroyed. With blockchain technology as soon a smart contract has been issued and stored it is impossible to lose or forged. We need to mention as computers do not have the ability to negotiate or to interpret the law language, smart contracts are still in trial.

These are the many value propositions that will be added to the banks' business model by the implementation of blockchain. In the same time the existing value propositions do not disappear as the blockchain technology is not possible to be used by all the customers or for all the services or products that a bank offers.

4.2.3 How do we produce our offerings?

The banks need to have specific resources related to blockchain, such as miners farmers in order to cover the electricity and the speed that may require for the blockchain technology to run. Specialists that have to know how in relation to the activities the blockchain creates. IT in order to maintain the software. The correct partners that will provide with the best blockchain software. In more details below to the description of each component.

Resources

The resources in the beginning of the implementation will remain the same. However, as the time goes by and the blockchain is mostly used there will be no need for so many branches or employees. Employees that deal with payments, clearing and settlement, trade finance, identity management may lose the jobs and jobs in the IT infrastructure and specialists team may be a need for more employees.

Activities

Financial institutions currently spend between $ 60 million and $500 million just to keep with KYC regulation." John Mason (2017). The identity management is one of the main activities that blockchain improves so we go in depth.

An important activity related to banks, is the identification of customers. Without making sure that the blockchain can provide better solution of the identity verification all the rest functions/sectors of the bank will not be able to work. Martin Arnold (2017) in order someone to use the bank services the first step is to open an account, in order for the bank to identify that the person is who he/she says it is the bank usually requires an identity such passport driving license etc. After the copy of the documents they verify with the authorities if the information is correct and proceed with issuing the right to the customer to open an account. However, as the banks are trying to make the process easier and faster, have started to give the option of opening an account online. The online procedure is based on the collaboration of the bank with

different other partners and agencies which the customers give access to all their data related to them. The banks require all these data face to face or online in order to comply with money laundering regulations and in the same time to keep our money safe by making sure no one uses our accounts without our knowledge. The identity theft is a huge problem in the whole world only in North America costs $2.5 billions a year. “The Canadian Council of Better Business Bureaus estimates ID theft costs more than $2.5 billion a year to consumers, banks, credit card firms, stores and other businesses.” (mbc.app.bbb.org) Blockchain as a distributed ledger technology is public, however the data that we store such as your personal information id number, social security number etc. is verified and secured using advance cryptography which resist to unauthorized changes and hacks, as all the nodes work together so it is almost impossible to break the chain. The benefits that the blockchain brings to identity management is show by the large amount of investments done by governments, banks and other institutions, in the work of Ori Jacobovitz Blockchain for Idenity Management (2016) which shows 30 projects were in trial by December 2016.

Internal Auditing is another activity that blockchain says that it will improve or eliminate the need of so many internal auditors. As blockchain promises, security and no forging, internal auditors question the human nature. Cases such as losing the encrypted key, hacking through mobile app and email is still on. So, the internal auditing activity will be in need for a long time, especially for banking industry, however auditors need to able to understand the technology. “internal audit must develop strategies for maintaining a sufficient level of transparency and verifying that the blockchain and related applications are performing as intended.” Pelletier J. (2018)

Legal department is a front runner for huge banks such as the ones mentioned (Barclays, Lloyds, HSBC, RBS etc) mainly because any transaction that occurs between the banks and its customers needs a contact. The creation of contracts is the main job/activity of the legal team. So far, the contracts are being created manually, when blockchain is going to be implemented there will be a need for programmers to translate the legal terms into coding, in order to create smart contracts. How, this activity and the whole legal department is going to be transform is still to be seen.

Partners

The partners section will change, but there will be no need for some existing partners to use so much the banks such as real estate firms as they may try to use blockchain for their own use by eliminating banks, not totally. In the same time the blockchain software requires a lot of power to run so there will be a need of obtaining a server/miner farm or partnering with a company which will offer the bank the server farm to run blockchain. The main partner that may be added to banking industry are companies such as IBM, Ripple, Deloitte, R3. By this partnership the banking industry may move towards fintech industry. As they need this partnership in order to have the blockchain platform because not all the banks have the resources cash, human and intellectual to run the platform or establish it.

4.2.4 Why does it generate profit?

The trials that have been running by big companies such as Accenture in relation to blockchain has shown that blockchain it will cut a lot of administrative and operative costs of the bank industry. In the same time a lot of interest and fees that lead to dissatisfaction of customers will be decrease. Even though, the banks generate revenues mainly from fees and interest, the trials have shown that blockchain will bring more profit than costs by its implementation to the banking industry. As everything, especially the numbers may change drastically after the implementation

Costs

Already blockchain is costing the banks million on the investment process. By 2017, BofA, HSBC and other invested, $107 million on blockchain technology of R3. Anna Irrera (2017) The consumption power needed to run blockchain is tremendous “Just a few years into the cryptocurrency revolution, bitcoin mining is already eating up an estimated 20,000 giga watt hours of electricity per year. That’s roughly .1% of global generation, on par with the power demand of Ireland.” Helman (2018). A study, however, by Accenture and McLagan conducted an analysis and come with these conclusions that blockchain will save “70% potential costs savings on central finance reporting, 30-50% on compliances, 50% on centralized operations,50% on business operations.” Restructuring costs also need to be consider and calculated when the final decision is made. Costs towards investments and trial period are also important and can lead to losses if the customers are not willing to use blockchain, so careful approach is recommended.

Revenues

The revenues stream from commission fees, interest, securities may decrease as these mostly come by using the banks as intermediary. Banks will not totally lose their role as intermediaries, they are trying to show the customers the improvement of their services by blockchain and the money that their customer may save before the customer has the option to change. They still will charge them fees and interest just lower. In the same time operation and administrative costs will be reduced and the money will be added to the revenue stream.

5. IMPLICATIONS AND FUTURE RESEARCH

The importance of creating the right business model when a disruptive innovation enters the market, has been proven based on many empirical studies that we mention few on section 2.2. However, one academically accepted definition of what is business model and when an innovation is consider disruptive is still under research. With this in mind in our paper try to see business model as a tool that helps a firm to have a better understanding of how to create value, deliver and capture by understanding each block of the business model and what should be included on. By creating the present business model of banks the elements were extracted from the annual reports of banks, so from our point of view, it is quite accurate. On the other hand, the hypothetical business model of banks after the adoption of blockchain is still lacking in many ways. First, even though many articles and papers that we used in order to see the blockchain as disruptive were peer-reviewed, none of them was base on cases or was an empirical study. So, we did use blockchain as a disruptive technology even though it may not fill all the criteria that Christensen the father of the definition disruptive innovation requires but because many scholars and experts refer to it as disruptive. We note, blockchain is a disruptive technology but not so strong as to lead out of the market the banking industry but strong enough to make internal radical changes of how the banking industry operates in specific areas. Secondly, the correlation between business model and blockchain, and how blockchain will change banks' business model is again based on website, journal, articles and blogs. The future business model of banks after the embracement of blockchain is far way of how it may really look as the main players (partners, suppliers and resources) are still to be determined, how the costs and revenues will change, what percentage of customer will switch. As we do not have access on this information and blockchain is still in experimental trial. Our impression is that our business model of banks did grasp the main changes that banks need to take into consideration before they decide to embedder blockchain into their business.

5.1 Implications on products/services of banks

Nowadays, most of the banks are going through trials to see how they can utilize blockchain. In this section we will describe the implications that blockchain is going to bring at the banking products/services when it is going to be implemented. The four main areas are: payments, syndicated loans, clearing and settlement, trade finance and identity.

Products	Products
Loans	Loans
Clearing and Settlement	Clearing and Settlement
Cash accounts and deposits	Cash accounts and deposits
Advisory	Advisory
Investment services	Investment services
Brokerage	Brokerage
Trade Finance	Trade Finance
Insurance and Pensions	Insurance and Pensions
Wealth and asset management	Wealth and asset management
Payments	Payments
Funds and trusts management	Funds and trusts management
Financial products and services	Financial products and services
Syndicated loans	Syndicated loans

Table 4: Main products and services offered by banks.
Own creation based on Appendix B and secondary sources.

Payments

"Payment: in a strict sense, a payment is a transfer of funds which discharges an obligation on the part of a payer vis-à-vis a payee. However, in a technical or statistical sense, it is often used as a synonym for transfer order." www.ecb.europa.eu

In order to understand how it will work let's take an example: a Danish company wants to pay for the products that order from China. The firm wants to make an international transfer of money for the products it received. So, the accountant of the company goes to their online bank system and issues the order to the bank to transfer the amount to the China company. This transaction usually takes days. Why? Because the first bank needs to see if the company has the money, after they verify, they need to wait until the specific time of the day in order to see the exchange rate and convert the amount of Danish krone to Chinese yuan. This usually takes at least a day. The third step is to send the money to the corresponding bank that the Danish bank works with, or which is usually the central bank of the country, however that does not mean

that is the bank that the Chinese company is using. After the corresponding banks accept the order, then it sends the money to the bank of the company and finally the Chinese company gets verification of receiving the money and sends a thank you note to the Danish company. According to banks these kinds of payments usually take 1 to 14 days. And of course, in the process a lot of fees are involved. Without even mentioning in case there is a simple small mistake from the accounted, such as he writes the address with one less letter. Which has happened multiple times and money come back almost half (because of fees) and the circle repeats itself.

With this current centralized system, the only company who has the real authority are the banks. Simply, because banks are the ones who have control over our money. Banks record, help us and also charge us for each move we need to make. Of course, we have access to our money by going to online to our bank ledger and check everything. But in order for us to go and check just one online ledger (ours) and give our ok, it takes the banks a lot of money, people and in our example at least three ledger and no human mistake.

However, if a company decides use blockchain as the ledger which will record their transaction, how does that work? Blockchain is a decentralized ledger or a one big distributed ledger where all the computers that have that specific blockchain software have access. The second a transaction takes place all the computers that have the blockchain software will try to compete in order to update the ledger. The first computer which solve an algorithmic puzzle is the one in charge to create the new block which will be added to the blockchain system. However, before that all the other computers need to give the ok that the puzzle was solved correctly, need to check if the transaction was valid. After these two steps and if more than 50% of the computers agree the block is created and is ready to join the rest of the blocks and create the blockchain.

Let's go back to our example, for the Danish company to make that payment to the Chinese company it takes at least three bank ledgers. If the banks share one ledger in our case blockchain, then in our example the corresponding bank goes out of the picture there is no need, because the sending bank connects directly to the receiving bank. This process does not take more than ten minutes. This will lead, to less fee charges, less human interaction, less human mistakes and lots of costs cuts for the banks which means more money.

Syndicated loans

Syndicated loan is when a company, organization, institution, or government need to borrow money for a big project. Because the project is big and the amount of money huge banks with other banks or firms decide to share the amount of money in order to reduce risk. So, in the end the borrower does not own to one single lender but to two or more. However, the lender usually deals with the lead bank (the agent, the underwriter) which is in charge for all the details and arrangements and in most cases is the one that gives the biggest portion of funds needed. An example: "Tencent Holdings Ltd., Asia's biggest internet company and the owner of popular messaging services WeChat and QQ, signed a syndicated loan deal on March 24, 2017, to raise $4.65 billion. The loan deal included commitments from a dozen banks with Citigroup Inc. acting as the coordinator, mandated lead arranger and book runner." (www.investopedia.com). Even thought it may sound easy, it is a process that takes days to months, and, in the end, may not even be finalized. Big firms as banks and investing companies the target in a collaboration this big is to see who will make the biggest profit. Takes a lot of paper work, form the legal team, the accounting, the financial analysis team and lots of money during the negotiation and signing period.

In order to cut down costs and reduce time many companies offer a platform (which is based on blockchain technology) where companies/banks/institutions can come to an agreement in our case an agreement about syndicated loan and create a smart contract. The platform is based on the logic the blockchain as a distributor ledger technology. The block in the case of a syndicated loan will act as a central repository contact which it will retain the terms of the actual contact instead a ledger in the case of payment. All the parties involved in the contact will have access to the block, and no individual changes can be made as it is synchronized across the entire network by a protected consensus algorithm. Moreover, the role of the lead bank or agent is going to be reduced almost to minimum. "*Recently, 19 multi-national banks (including Credit Suisse, Barclays, Danske Bank, U.S Bank and Wells Fargo) participated in a proof-of-concept demonstration of a new blockchain-based syndicated loan servicing program, called Synaps Loans. The program will work by including every party to a particular loan trade on shared smart contacts that interact automatically and permit users, for example to verify ownership of a loan without having formally ask an agent at a bank."* Craig A. de Ridder et al. (2017)

The main concerns that are involved with the case of smart contacts is how to translate the law language to a code and the second how to "develop a software that has the capability to deviate from its course to adapt to negotiation." John Crabb (2017)

Clearing and settlement

When a transaction or payment occurs between a sender and a receiver, we have a settlement bank which the most important role is the "clearing and settlement" where the bank reconciles the two parties, validates, records and ensures efficient settlement of transactions. Basically, everything that happens after the moment the sender gives the instruction to start the order. Clearing and settlement plays the main role at the trade of securities. Buying and selling securities may happen in seconds, however the clearing and settlement of those trades may take days. One wants to buy a bond or security the clearing and settlement process takes few days and extra costs for a security to go from hand to another; as to requires several steps, verifying the first ownership, checking the funds if they exist at the accounts, checking with the legal team about the terms of the contact, register the security to the new owner etc.

With the blockchain technology all the information and history of an assets or a security will be store at a chain of blocks where the buyer will be able to identify the asset or the security which wants to purchase. A solution which is under investigation on how to use the blockchain technology regarding clearing and settlement sector of the banks is the creation of a digital coin that is going to be used only for that purpose by a specific software platform which is based on blockchain.

"Banks are also joining up to design a brand new blockchain-based digital currency that they are intending to launch in 2018. Six of the world's premier lenders—Barclays, Credit Suisse, Canadian Imperial Bank of Commerce, HSBC, MUFG (Mitsubishi UFJ Financial Group) and State Street—have recently joined a project led by Swiss banking giant UBS—in addition to existing members Deutsche Bank, Banco Santander, Bank of New York Mellon and NEX—with the goal of creating the utility settlement coin, a digital currency that will primarily be used to quickly clear and settle financial transactions using blockchain." John Manning (2017). The goal of the project is to save time and money in order for the clearing and settlement services of banks. By creating a digital currency which can be converted to fiat at the central banks, and it can be used mainly for clearing and settlement of transactions helps the financial work more efficiently and faster compare to the way the service has been handled so far. The digital coins

after they been converted to fiat can be saved at the blocks of the platform and can be changed to securities anytime and be ready for trade.

Trade Finance

An export company wants to send the goods to an import company, the exporter wants the importer to pay upfront in order to reduce risk however the importer does not want because of fear if the goods will be on time, the proper amount, the way as they are described and the biggest fear of never been shipped. The trade finance deals with many parties: exporters, importers, banks, insurance, export credit agencies. The main role is again of banks, in order to make the system work and increase the trust between the companies and reduce risk to the importer' bank "to provide a letter of credit to the exporter's bank that provides for payment once the exporter presents documents that prove the shipment occurred, like a bill of lading." www.investopedia.com. The importance of trade finance in the bank sector can be seen by the revenues that were generated globally. Only in the first half of 2017, even though the revenues have decreased, we are talking about billions of dollars: "Total trade finance revenues for the ten largest global transaction banks (Bank of America Merrill Lynch, Barclays, BNP Paribas, CITI, Deutsche Bank, HSBC, JP Morgan, Société Générale, Standard Chartered and Wells Fargo) fell to US$2.8bn." Lønsetteig A. B. (2017)

The main issues in the trade finance sector are: the contracts are manual, the exporter uses invoices from different banks, banks are manually dealing with anti-money laundering checks, and the bill of lading that banks issue as "warranty" need to be issued multiple times because of the process of verification. In order for the bank to make the payment, it needs verification of the delivered goods by multiple parties. All the steps that we are referring have to do with the banks because in trade finance there are multiple players are we mentioned. All these steps require time and costs form the banks in the same time has to deal with the risk of money laundering. However, as soon the agreement is created on a block where all the players are using the software blockchain platform, as soon it is released at the block and the parties have access the banks in real time will be able to view the agreement and decides to take the right for the payment to the exporter's bank. As soon the importer' bank issues the draft of the obligation, the exporter' bank will view the content and it will create a smart contact where it will lock in the importer' bank. That will be the main role of banks in the trade finance if the blockchain is embraced. www2.deloitte.com

5.2 Implications on Academic literature

We cannot say that our research brought many implications on the academic literature on disruptive innovation and business model. We do have one main implication. Our observation led us to conclude that the scholars need to either come up with an alternative theory for disruptive innovation or they should not name blockchain as disruptive. The table 1. *Blockchain's relative disruptiveness potential for each market* was created based on previous literature work on what is disruptive technology. The new market (legal entities) that blockchain will create have been based on secondary data. As we combine the two, we notice that the elements performance, functionality, reliability, price and convenience do not coincide exactly as the literature say that should function when a disruptive innovation is entering an industry. With this in mind we conclude that the blockchain technology should be name radical disruptive innovation. As it may not be the first or the last innovation that disrupt an industry inside without creating major changes to the external environment. We believe that further study needs to be made by experts regarding the implication on how a technology such as blockchain where does it belong to academic literature of disruptive innovation. So, our contribution on the literature is the table and the small step towards of what a technology such as blockchain should be named.

5.3 Future Research

This section will include the main future suggestions that we come up with during our research. The first thing that we notice in the most secondary data that we collected is that the term disruptive is being used as the literal definition given to the word and not as the business term of what disruptive innovation represent. So, the first suggestion is that scholars need to give a simpler definition of the term disruptive innovation. Even though Christensen and other have a clear picture of that makes a innovation disruptive each author uses the term from their perspective. There is a need for more work done on the definition of disruptive innovation so an unified one can be used by all. Secondly, for investors time is money and a clear simple business model gives a clear picture of how a company creates, delivers and captures the value propositions for their customers and stakeholders. So, if banks that mention business model section (or want to have a business model section) in their annual reports need to give more information for all the sections of the business model. Third, as we already mention in the limitation section too much information about blockchain and its trials. We would like to suggest that as much work is done from the companies that are in the process of embracing

blockchain so much work in in need to be done by the same companies on their business models. As the history has proven that a technology by itself cannot be successful if the appropriate business model is not created in regards to it.

6. LIMITATIONS AND CONCLUSION

6.1 Limitations

In this section we will try to explain the main three limitation that we faced while doing our research. First, too much information related to blockchain. Sometimes too much around a field is good as far it is peer review or academically approve. In the case of blockchain innovation which was first introduced 2008 has not been to much work from scholars until 2014 where the word blockchain become a buzzword in the business world. Even though we could find some work done by researchers of the field of how blockchain works and how it may affect banks. There was no work done as a case or empirical study as blockchain is still on the trial stage, that can lead only to assumptions and no to concrete data. We try to overcome this limitation by choosing mainly from the databases of the University library, well known journals such Harvard review, and websites that are working with blockchain R3, Deloitte, IBM.

Secondly, blockchain is a technology as much we try to understand any technology if we do not try it, there will be limitations. We gather a lot of secondary data that many companies are trying blockchain and we try to understand the results that come from these trials. All, the companies that are trying to embrace blockchain come up with positive results. The negative results are mainly from academic papers and no experiments. As we did not have the chance to try by ourselves how blockchain really works even in a simple transaction, makes our paper to be limited. Unfortunately, we could not overcome these limitations.

The third main limitation was the annual reports of banks. Without any doubt business model is an important tool, where many investors have required banks to include it into their annual reports. However, by reading the annual reports of banks on the section business model the main elements were: values (no value proposition), stakeholders and products. So, there was not a very clear picture of their business model. But for the whole annual report we could figure out the value propositions, resources and channels (no very clear though), costs, revenues and activities (very clear) and unfortunately the partners section is the one that lacks more as we could not figure out all their partners even by reading the websites of banks. We try to overcome these limitation by change our banks frequently in order to reach to the final 10 that would help us to create the archetype. In general, we are under the impression we have created a representative business model of banks, even with these limitations.

6.2 Conclusion

Blockchain is on its way to revolutionize industries. From its inception, the technology was designed so banks would be rendered redundant. As we discussed, disruptive innovations usually go unnoticed until it is too late. In the case of Blockchain, however, banks have reacted. At first, observing, and following with research of their own on how to utilize blockchain for their own benefit. The results of this R&D resulted emphasizing the distinction between the banks' two major customer segments: individuals and corporations. It is not clear to us whether that will be of consequence in the future.

From the business model perspective, we see that the main component, which will be affected by the implementation of blockchain, is the value proposition. With the development of new products and services, corporations will be able to utilize banks for purposes previously unavailable. The other business model components will also be affected, some more than others. Gassmann et al. (2014) note that if more than two of the major aspects (Who, What, How, Why) of a business model change, the firm (banks, in our case) will need to invest in business model innovation if they are to succeed in capturing the value of blockchain.

From the perspective of disruptive innovation, although we can technically say that Blockchain is not disruptive, the theory cannot help us interpret the situation of banks. Banks seem to have adopted an approach suitable to facing disruptions, experimenting through mostly separate entities, and their results seem very promising.

7. PHILOSOPHICAL REFLECTIONS

Reflection on theories

Disruption theory according to Christensen:

‘’’Disruption” describes a process whereby a smaller company with fewer resources is able to successfully challenge established incumbent businesses. Specifically, as incumbents focus on improving their products and services for their most demanding (and usually most profitable) customers, they exceed the needs of some segments and ignore the needs of others. Entrants that prove disruptive begin by successfully targeting those overlooked segments, gaining a foothold by delivering more-suitable functionality—frequently at a lower price. Incumbents, chasing higher profitability in more-demanding segments, tend not to respond vigorously. Entrants then move upmarket, delivering the performance that incumbents’ mainstream customers require, while preserving the advantages that drove their early success. When mainstream customers start adopting the entrants’ offerings in volume, disruption has occurred. Christensen, Raynor and McDonald (2015)

As we read again on how this may apply to blockchain, we concluded that it does not fit the theory. To take each step separately: firstly, smaller company challenge the incumbent company, in our case R3 challenges the banking industry, which is bank-subsidized entity. Because the theory says that incumbent focuses on improving the products that their most profitable customer segment uses and ignore the smaller segments. R3 has as customer target the same one as the banks SMEs and MNEs. So, it does not focus at least in the beginning to smaller segments such as individuals. Moreover, the incumbents tend not to respond vigorously. One more statement not true, as banks are spending millions of dollars to explore and optimize the benefits of blockchain. The last step is that the mainstream embraces the use blockchain technology in our case that the entrant suggest in volume. This is something to be seen, as the blockchain solutions that are on trials by banks do not have interest on mainstream, if another company persuades them and “steals” the banks customers then maybe we will have distribution, until now this is not the case. We conclude that blockchain is closer to radical innovation theory characteristic than to the disruption theory. A radical innovation brings extreme changes to the business model/organization of an industry and creates new market. Engen and Holen (2014). The last step of the disruption theory has not been verified, we decided to use the term radical disruptive innovation for blockchain. Because of all the above this lead

us to have a lot of negative reflection on the articles that refer to blockchain as disruptive and many times put us to dilemmas what and who is right.

As for the theories and definitions around business model we have only positive reflections as it is a great tool that helped us to put in nice structure our paper and the picture that we wanted to draw for the existing banks system and the changes that blockchain may bring to it.

Reflection on ourselves and the process of learning

There are several reasons that we chose to study this topic. One of them is the dynamism of the relationship between a new revolutionary technology and a sector that has remained largely static throughout the years. Another reason is the ethical implications of a reality where banks would be redundant. Having a common interest in philosophy and discussion of ideas, we had previously talked about the subject, and were curious to view it from a different perspective.

The process of writing this project has helped us develop in many ways, even though it proved challenging to a greater degree than we initially thought. While learning and processing all the information that we needed in order to provide a valid perspective, we often had to revise parts of the project. The layers of revisions we did in order to clarify our ideas, their meaning, and to try to minimize other technical mistakes also helped us think about the reader, and the possible interpretations of our writings.

Reflecting on this process has also allowed us to expand the way we think. Having to create a framework helped us to improve our own perceptual framework, to find efficient ways to integrate new knowledge, and to expand our scope when thinking about the potential applications and implications of this new knowledge.

We would do many things differently if another opportunity presented itself. One of the things that hindered us during the beginning of the research phase was the lack of a clear plan. Ideally, we should have identified specific pieces of knowledge that we needed to test our arguments or complement our knowledge base. Along the way, we were aware and tried to control for our own biases, but we are not sure how successful we were in that aspect.

We feel that by having had the experience of writing this project, we have realized a lot of our own limitations and potential. The skills that we had to improve, or develop, to complete this task, may allow us to explore many new possibilities that we previously did not consider. In the

future, we also have to reflect on how we can best utilize these skills, not only as students, but also in the context of our career paths, personalities, and personal circumstances.

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Nordea Bank

https://www.nordea.com/Images/33247331/Annual%20Report%20Nordea%20Bank%20AB%202017.pdf

UniCredit Bank

https://www.unicreditgroup.eu/content/dam/unicreditgroup-eu/documents/en/investors/financial-reports/2017/4Q17/2017-Consolidated-Reports-and-Accounts.pdf

Credit Suisse

https://www.credit-suisse.com/media/assets/corporate/docs/about-us/investor-relations/financial-disclosures/financial-reports/csgag-csag-ar-2017-en.pdf

Deutsche Bank

https://www.db.com/ir/en/annual-reports.htm

COMPANIES AND ORGANIZATIONS WEBSITES

IBM

https://www.ibm.com/blockchain/

Deloitte

https://www2.deloitte.com/global/en/misc/search.html#qr=blockchain

Statista

https://www.statista.com/statistics/383406/leading-europe-banks-by-total-assets/

R3

https://www.r3.com/

Ripple

https://ripple.com/

https://thebanks.eu/top-banks-by-assets.

https://www.cbinsights.com/

mbc.app.bbb.org Better Business Bureau https://www.bbb.org

www.investopedia.com

www.reuters.com

https://lightning.network/

APPENDICES

Appendix A: Bank Business Models

Bank	WHO			WHAT	HOW			WHY	
	Customers Segments	Stakeholders	Channels	Value Proposition	Resources	Activities	Partners	Cost Drivers	Revenue Streams
Lloyds (UK)	Retail 56% Commercial Banking 32% Insurence and Wealth 12%	Shareholders Customers Colleagues Communities Regulators/ Government	Community Digital banking Face to face interaction Branches Website Call-center Consultations Events	Largest digital bank Branch reach Customer Franchise Multi-channel approach Low-risk participation Operational efficiency Strong management & execution	Staff Capital Branches Specialist teams Website International trade portal	PROFESSIONAL Auditing Finance Sourcing Brands and Marketing Group transformation CONTACT CENTER Customer operations Customer services RETAIL Mortgage advice Branch management Customer services SPECIALIST Security and Fraud Risk management UK private banking	Scottish Widows Education bodies Banks LDC Bank of Scotland Blackhorse AMC Halifax Lex Autolease MBNA	Financing Dividends Acquisition of subsidiaries Taxes Distribution on equity Amounts advanced to subsidiaries	Interest income Fees and commisions Trading income Insurance premium income Other operating income Net insurance claims

Bank	WHO			WHAT	HOW			WHY	
	Customers Segments	Stakeholders	Channels	Value Proposition	Resources	Activities	Partners	Cost Drivers	Revenue Streams
HSBC (UK)	Individuals (37mil) SME's, MNE's (1,7mil) Government and corporate institutions (4100) High net-worth individuals/ families	Shareholders Customers Employees Associates	Social Media Mobile Applications Branches Online banking Call center Sponsorships	Dependable Open to ideas and cultures Connected to customers, communities and regulators	Staff Capital Branches Website Specialist teams (e.g. IT, regulatory compliance)	Commercial banking Global assets management Global banking and markets Global functions Global private banking HSBC operations, services and technology Retail banking and wealth management IT and Banking operations	Tradeshift, R3 US Dept. of Justice HSBC Environmental Water Programme Partnership Various fintech firms Public-private partnerships Information sharing initiatives Duke Corporation Education	Operational costs Asset expenses Legal fees R&D Risk-related losses Reclassified fair value gains Fair value losses	Interest income Fee income Trading income Income from financial instruments Loss recovery on investments Dividends Insurance premium income Operating income

Bank	WHO			WHAT	HOW			WHY	
	Customers Segments	Stakeholders	Channels	Value Proposition	Resources	Activities	Partners	Cost Drivers	Revenue Streams
Barclays (UK)	Individuals SME's Corporations Financial institutions and banks Institutions and governments	Customers, Employees, Shareholders and Investors, Suppliers, Industry Associations, Government, Communities, NGOs	Online banking, community, mobile friendly, face to face, call center, branches, website	Respect Integrity Service Excellence Stewardship	Staff, Capital, Securities Branches Specialist teams Website	saving, invest and manage cash,identity management,HR, trading for purchases and growth,management of business and financial risks,financial and business support	ACCA, Growing Business, NFEA, Coinbase, 30 trade unions, barclaycard, uber, R3	fix assets expenses,audit and legal fees, innovation and technology (operating expenses) Taxes, credit losses	net interset income and non interst income, fees and commissions, trading and investments income through wholesale activities

Bank	WHO			WHAT	HOW			WHY	
	Customers Segments	Stakeholders	Channels	Value Proposition	Resources	Activities	Partners	Cost Drivers	Revenue Streams
Danske Bank (DK)	2.7 million personal customers, 231,000 small and medium sized business cutomers, 1,900 coporate and institutional customers	Customers, Employees, Shareholders and Investors, Suppliers, Industry Associations, Government, Communities, NGOs	Cash Credit, Talking ATMs, Easier online banking, information by letter, mobilepay, social media	Nordic Potential Innovation and digitalisation Customer experience People and culture	Staff, Capital, Securities Branches Specialist teams Website	Personal Banking, Business Banking, Corporates and Institutions, Wealth Management, Non-core, Northern Ireland, Group Treasury (internal banking, liquidity management and funding) and Group Supporr functions	Gjensidige Bank Norway, SingularityU, IBM, nHack, Nordic anti-cybercrime, R3	Operating expenses (affected by compliances, new regulation and digitalization), Taxes, loan impairment charges from Northern Ireland	net interest income, net fee income, net trading income, other income (sale of domicile properties), net reversal, bonds

Bank	WHO			WHAT	HOW			WHY	
	Customers Segments	Stakeholders	Channels	Value Proposition	Resources	Activities	Partners	Cost Drivers	Revenue Streams
Royal Bank of Scotland (UK)	Personal Banking, Business Banking, Commercial Banking, Trust total of 18.9 millions customers (Peronal and small Businesses, Commercial Customers, Corporate Customers, Relevant Financial Instituions	Customers, Employees, Shareholders and Investors, Suppliers, Industry Associations, Government, Communities,	TechXpert, Personal Banking, Website, Prince's Trust, Webchat, Online Banking, Branches, Call Center, Closed Loop Feedback, Charity Events, Mobile Banking, Self service Account Opening	Serving Customers, Working together, Doing the right thing, Thinking long term,	Staff, Capital, Securities, Specialist Team, Branches, Website	Finance, Audit, Risk, Change and Strategy, HR, Legal, Technology, Data Analytics, Personal and Business Banking, Commercial and Private Banking	NatWest, Ulster Bank, Coutts, Adam & Company, Child & Co, Drummonds, Holt's Military Banking, Isle of Man Bank, Lombard, Start up loans, Nordisk Renting, (many are subsidiers), gov, R3	operating expenses, litigation and conduct costs, adjusted operating expenses, restructuring costs, Taxes, staff costs,	non-interest income, interest income, property sale, securities. Fees,

Bank	WHO			WHAT	HOW			WHY	
	Customers Segments	Stakeholders	Channels	Value Proposition	Resources	Activities	Partners	Cost Drivers	Revenue Streams
Credit Suisse (Switzerland)	individuals, corporate, institusions,	Employees, shareholders, investors, suppliers, govern	online banking, mobile app, direct link, post, email, events, sponsorships, fundings, our bring your own device, big data	Deliver client value, Enhance client proximity, Increase client time, Focus on targeted client groups, Delivering client tailored solutions, Continue to build our base of profitability	Staff (46840), Specialists, Branches, Research Institue	Finance, operation, technology and services, risk management, compliance and regulatory affairs, general counsel,human resources, communication and barnding	Caran d`Ache, Schweizer Tafel, Baur au Lac Vins, Victorinox, Pack Easy, ING, R3, Apple The Swiss Association for Myopathy, Neuenschwander, CeDe.ch , Helvetas, Calida, SFV, Solis, Swiss Red Cross,	compensation and benefits, general and administrative expenses, commission expenses, goodwill impairment, Restructuring expenses, taxes	net interest income, fees and commissions, trading revenues, other income

Bank	WHO			WHAT	HOW			WHY	
	Customers Segments	Stakeholders	Channels	Value Proposition	Resources	Activities	Partners	Cost Drivers	Revenue Streams
Nordea (Sweden)	Individuals (10mil) Corporations & Institutes (580.000)	Shareholders Customers Employees Funded start-ups	Mobile banking Online meetings Branches Online banking Website	Advisory Digital experience Efficiency Low commissions Collaboration Passion Courage	Staff Capital Branches Web related resources (servers, staff, IP's)	Main Operations Support center Asset & liability management Treasure operations Business Development Risk management Liquidity management Regulatory compliance Sustainability planning Pension funds management Shipping, offshore & oil services Social responsibility activities Internal monitoring and reporting Incident reporting IT General Controls Transaction Controls Entity-Wide Controls	Banks, Apple Pay Tink (FinTech) DNB (Joint bank [Luminor]) Samsung Pay	Operational expenses Taxes Lending to corporates Net loan losses Household mortgage lending Consumer/Corporate/ Household deposits	Interest income Fee income Trading income Income from financial instruments Loss recovery on investments Operating income Fair value Equity method income Solvency RoE (shareholders') Traditional products Market return products Profit risk products

Bank	WHO			WHAT	HOW			WHY	
	Customers Segments	Stakeholders	Channels	Value Proposition	Resources	Activities	Partners	Cost Drivers	Revenue Streams
UniCredit (Italy)	25 million, individual, corporate, private banking	Shareholders, investors, gov, employees, customers,	Multi channel , online banking.online help, website, email, app, post, sponsorship, events and goodwill	optimize and strengthen capital, Improve asset quality, transforming operating model, maximize commercial bank value, adopt a lean but strong steering Group Cor. (Center People, community development, EB leading, excellence, easy to deal with, great place to work), Customers First, People Development, Execution & Discipline, Cooperation & Synergies and Risk Management.	employees (91,952), branches (4,778), financial assets	finance and advisory, invesments, risk management, planning finance and adminstration, human resources, organization and logistics, identity and communication, compliance, group internal audit, legal	UEFA, Apple, banks, IBM, ERGO, PIONEER INVS. Allianz, eni tigaz, DIAK HITEL, Garantiqa, AXA, Generali	payroll costs, administrative expences, recovery of expences, amortization, depreciation and impairment from assets, taxes	net interest, income from equity investment, fees and commissions, net trading income

Bank	WHO			WHAT	HOW			WHY	
	Customers Segments	Stakeholders	Channels	Value Proposition	Resources	Activities	Partners	Cost Drivers	Revenue Streams
Deutsche Bank AG (Germany)	more than 20 million clients Individuals Corporations Governments Institutional investors SME's	Customers, Employees, Shareholders and Investors, Suppliers, Industry Associations, Government, Communities, NGOs	Call center, website, mobile app ads, social media, face to face, events, brand	Simple Efficient Less risky Disciplined execution Well capitalized and run	Employees, Branches, Website, Specialists, Property and Equipment, Intellectual Capital	Global Transaction Banking, Origination and Advisory, Financing, Sales and Trading Fixed Income and Currencies, Sales and Trading Equties, Private and Commercial Clients Gremany, International, Postbank, Wealth Management, Asset Management	BlackRock,Inc., C-QUADRAT Special Situations Dedicated Fund, Paramount Services Holding Ltd., Supreme Universal Holdings Ltd., Apple, United Nations Development Programme	Compensation and benefits, general and adminstrative expenses, policyholder benefits and claims, impairment of goodwill and other intangible assets, restructuring activities, taxes	Net Interest income, provision for credit losses, commission and fee income, net gains of financial assests,net income from equity method investment, other non interest income

Bank	WHO			WHAT	HOW			WHY	
	Customers Segments	Stakeholders	Channels	Value Proposition	Resources	Activities	Partners	Cost Drivers	Revenue Streams
KBC (Belgium)	11 million clients, individuals, copratre, gov, insurance agencies	shareholders, insurance agencies, employees, supplliers, goverments	Modile app, website, social media, events (sponsorship), email, face to face, call center	the acronym 'PEARL', which stands for Performance, Empowerment, Accountability, Responsiveness and Local Embeddedness Our integrated bank-insurance model, strong geographical focus, r focus on local responsiveness, approach to sustainability, shareholder structure	financial capital, human (42,000) and intellectual capital, social and relationship capital, natural capital	lending, investment and advising, risk managemnt and insurance, services in the area of payments, securities, access to the financial markets and derivative products, leasing, real estate activities, etc, legal, sponsorships, IT	Horizon 2050, The shift, Stadslab 2050, Leuven Klimaatneutraal, BRS, CDP (Carbon Disclosure Project) Climate Change Program Dow Jones Sustainability Index (DJSI) Fairfin/ Bankwijzer Ethibel Sustainability Index (ESI) Excellence Europe FTSE4Good Index STOXX ESG Leaders Index Euronext Vigeo index: Benelux 20, UN Global Compact UN Guiding Principles on Business and Human Rights UN Environment Programme Finance Initiative (UNEP FI) Principles of Responsible Investments (PRI) Task Force on Climate-related Financial Disclosures (TCFD) OECD Guidelines for Multinational Enterprises Equator Principles COP 21 Belgian SDG Charter	Impairment Staff expenses General administrative and other expenses Income tax expense	Interest income, Interest expense Fee,commission income, Fee and commission expense Earned premiums, Technical charges (insurance) , Other income items

Appendix B: Bank Products

Bank	Lloyds (UK)	HSBC (UK)	Barclays (UK)	Danske Bank (DK)	Royal Bank of Scotland (UK)	Credit Suisse (Switzerland)	Nordea (Sweden)	UniCredit (Italy)	Deutsche Bank AG (Germany)	KBC (Belgium)
Products/ Services	Lending Deposit taking Commercial Financing Investment Insurance Risk management, Payments	Retail banking Wealth management Asset management Insurance Commercial banking Tailored financial products Working capital Term loans Payment services International trade facilitation Access to financial markets Merger and acquisition expertise Global banking and markets Risk management Capital markets and financial services Advisory Transaction banking Global private banking Investment management Private wealth solutions (Trust and Estate planning) Brokerage services Corporate centre Balance sheet management	Financial advice Primary capital raising and capital markets execution Risk and liquidity management Lending Sales and trading International credit cards Consumer payments Banking Investments Wealth management Credit cards and transactional lending Investment products and services Business banking solutions	Banking services, life insurance and pension, mortgage credit, wealth management, real estate and leasing product and services (Advisory, financing, financial markets, transaction banking)	Cash Accounts and depostis, Payments and Clearing, Trade Finance, Lending, Securities and Money Markets, Securitiezed Product Lending, Spot FX/FX FWD, All other Derivaties, Syndicate Lending	PB: Structured advisory process, Client segment specific value propositions, Comprehensive investment services, Financing and lending , Multi-shore platform , CB: Asset management offerings, Investment banking financial solutions , Global credit products, Securitized products, Macro products,Emerging Markets, Financing and Structured Credit	Personal banking Commercial and Business banking Wholesale Banking Wealth Management Asset management Life & Pension Life, health insurance	commercial banking, corporate investment banking, asset managemnt, asset gathering, governance and corporate function	Assets Mang. Cash Mang, for Corp., Debt Capital Markets, Equity Capital Markets, Global Equities, M&A, Sustainable Products & Investments Strategies, Trade Finance, Debt Trading, Securities Services, Trust and Agency Services,	20% share of the market for traditional bank products, 33% for investment funds, 14% for life insurance and 9% for non-life insurance, (payments, cash management, trade finance, leasing, corporate finance, and money and capital market products, insurance)

Appendix C: Empirical Studies Analysis

Title: Disruptive technologies: a business model perspective on cloud computing

Author: Carlos M. DaSilva, Peter Trkman, Kevin Desouza & Jaka Lindič

Year: 2013

Research question: "how cloud computing disrupted a well-established player and how different business models generated different outcomes."

Type of study: Empirical case study upon Amazon.com, Salesforce.com and Siebel

Findings: "Technology is disruptive but business models determine who wins"

"Managers must be willing to experiment and build side business models that can potentially respond to emerging technological changes."

"Managers need to constantly monitor smaller players and industry trends. If a disruptive technology threatens their business, a larger organization with less flexibility should consider either acquiring or establishing strong partnerships with players that already leverage such technologies.". "Incremental changes to the existing business model are not necessarily the solution". "As innovative technology decreases and eventually eliminates marginal costs (see e.g. Anderson 2009), managers should consider 'freemium' revenue models in order to lure new users and convert them to paying customers."

"Managers commercializing innovative solutions based on disruptive technologies should not underestimate the marketing efforts associated with building a brand as well as educating, acquiring and maintaining customers."

"While innovative technology usually reduces transaction and switching costs, companies must devise creative ways to lock customers into their products through ways that go beyond pure financial commitments."

Theoretical framework: technology innovation and business model

Title: Understanding the disruptive business model innovation of E-business microcredit: a comparative case study in China

Author: Wenyao Zhang, Tugrul Daim & Qingpu Zhang

Year: 2017

Research question: e-business microcredit firm (EMF), via establishing a fundamentally innovative business model, challenges credit service mode of traditional bank (TB). Is such a completely new business model a disruptive innovation (DI)? If so, what DI characteristics does it have? How does EMF accomplish this?

Aim: This study aims to find out how EMF realises DBMI with triggers compared to TB from the holistic view. EMF, by means of rapid IT development, guides a new way of value creation and delivery under the disintermediation effect to capture value.

Type of study: Empirical case study of two firms (EMF) of China

Findings: "E-business microcredit performance is superior to that of TB even at the very beginning, which is not in line with the inferior performance that DI initially provides (Yu and Hang 2011). There is no over- supplied performance on microcredit market, but a large number of under-supplied customers exist indeed."
"TB's cost structure is tailored and adaptive to the competition in the mainstream market with huge-crowd strategy, while EMF's cost structure is relatively flexible and greatly reduced in terms of business and labour."
"Thus, EMF, by focusing on user demand features, uses an internet-based plat- form to construct diversified abilities, and weighs the trade-offs of safety and efficiency by utilising IT technologies to mine out credit of small businesses."

Theoretical framework: disruptive business model innovation

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"Thus, EMF, by focusing on user demand features, uses an internet-based plat- form to construct diversified abilities, and weighs the trade-offs of safety and efficiency by utilising IT technologies to mine out credit of small businesses."

Theoretical framework: disruptive business model innovation

Title: Value Propositions for Disruptive Technologies: Reconfiguration Tactics in the Case of Electric Vehicles

Author: René Bohnsack1 and Jonatan Pinkse

Year: 2017

Research question: "how do firms reconfigure their value proposition as a way to overcome the technological inferiority of disruptive technologies?"

Type of study: conceptual and empirical analyzed 16 EV in U.S and Netherlands

Findings: this study shows that firms can reconfigure their value propositions by combining different tactics and can overcome the perceived inferiority of disruptive technologies in a timelier manner than using technological innovation alone

Theoretical framework: business model, disruptive innovation and value proposition

Title: A knowledge management and sharing business model for dealing with disruption: The case of Aramex

Author: Larissa v. Alberti-Alhtaybata, Khaldoon Al-Htaybatb and Khalid Hutaibat

Year: 2017

Research question: what are the elements of the business model that allow Aramex to successfully address and incorporate disruptive technologies?

Type of study: empirical study upon logistic Middle East company Aramex

Findings: They became a global logistics provider by operating on a minimal fleet approach, primarily focussing on using vehicles for local delivery but utilising airlines and existing shipping/cargo companies for long-distance transportation. Thus, they did not invest in large, fixed assets, contrary to large, global logistics companies, but chose to maintain an 'asset-light' model. Instead of investing in heavy and expensive assets, they sought to build a network of alliances, essentially focussing on 'leveraging strategic alliances'. This model is at the heart of their strategic approach, as Aramex suggests their sustainable competitive advantage lies in the agility and best-price-for-customer approach they offer by utilising existing transportation at the best price possible, rather than maintaining their own large fleet, which would render their services more expensive

Theoretical framework: disruptive technology and business model

Title: Exploring the Multi-Phase Driven Process for Disruptive Business Model Innovation of E-Business Microcredit: a Multiple Case Study from China

Author: Wenyao Zhang & Tugrul Daim & Qingpu Zhang

Year: 2017

Research question: In this sense, it leads researchers to further explore how DBMI is generated. What drivers and mechanisms are implied in its formation process? How do they contribute toward disruption?

Type of study: empirical study upon seven e-business microcredit firms in China

Findings: **"**The primary discovery phase for drivers is a phase where EMFs emphasize scanning
the external environment to collect changes and to conduct a detailed analysis, in order to perceive signals, phenomena, issues, and trends that carry new business model opportunities, and to incorporate them into a corporate strategy and business model."
"The matching phase between drivers and the business model refers to the phase where the internal conditions within a firm need to be well matched with drivers in order to form different types of DBMIs with varied matching degrees. The results from the seven firms indicate that they combine the unique resources and capabilities within their organizations to achieve three different internal and external matching approaches, triggering different types of business model"

Theoretical framework: Disruptive business model innovation

Title: Strategy and business model design in dynamic telecommunications industries: A study on Italian mobile network operators

Author: Antonio Ghezzi, Marcelo Nogueira Cortimiglia and Alejandro Germán Frank

Year: 2014

Research Question: Thus, the main assumption of the proposed framework is that disruptive changes modify the performance of a firm's business model

Aim: The aim of this study is to propose an interpretative framework to support MNO's strategic decision making in a dynamic competitive context characterized by disruptive changes in technology and business dimensions.

Type of study: Empirical study upon four Mobile Network Operators in Italy: Telecom Italia Mobile,

Vodafone, Wind and Tre.

Findings:

"the most significant impact of the main change factors (increase in data traffic and decrease in voice revenues) lies in the value proposition dimension"

"Finally, it seems that change factors do not strongly impact the value creation dimension, as most organizational capabilities remain unaffected."

Disruptive Change Categories	Disruptive Change Factors		Changes in Business Model Dimensions						
			Value Proposition			Value Creation	Value Delivery	Value Appropriation	
			Target Customer	Customer value perception	Value proposition charact.	Internal value creation resources	Value Network Positioning	Value capture mechanisms	Cost structure
Environment-driven	Increase in data traffic	Diffusion of VAS (OTT)	◑	●	●	○	●	◑	◔
		Bandwidth consuming services	◔	◕	◑	◔	◑	◑	◔
		Accessible data traffic plans	◑	●	◑	○	○	●	●
		Social networking services	◔	●	◐	○	◑	◔	◔
		Smartphones	◔	●	◕	◔	◑	◕	◔
		Marketing efforts	◔	●	○	○	●	○	○
	Decrease in voice revenues	Market saturation	◔	◔	◔	◔	○	◔	◕
		Emergence of VoIP	○	◑	◔	○	◑	◔	◑
		Social networking services	◑	◑	◑	○	◑	◔	◔

○ No impact ◑ Medium impact ● Very high impact

Theoretical framework: disruptive innovation and business model

Title: The consequences of smart grids for the business model of electricity firms

Author: Azadeh Shomali and Jonatan Pinkse

Year: 2015

Research Question: A key question is whether electricity firms would either benefit or lose from smart grid deployment, because their established business model might be at risk.

Aim: This paper seeks to explain under which conditions smart grid deployment will have an enabling or a constraining effect on electricity firms' engagement in business model innovation.

Type of study: Conceptual

Findings:

	Impact on Electricity Firms' Business Model Innovation	
	Enabling	Constraining
Value creation	• New value propositions based on renewable energy & energy services • Increased demand for high-quality electricity • Customers' demand response helps balancing the network	• Empowered customers control and reduce electricity usage • Consumers generate their own electricity and become prosumers • Consumer engagement does not materialize
Value delivery	• Improved optimization of the electricity network • Improved marketing based on real-time data on electricity usage • Leverage assets of specialized ICT or energy service providers	• The value of conventional power plants erodes • The risk that new entrants become competitors • Increased complexity of the value network requires new capabilities
Value capture	• New revenue streams based on services and big data • Potential to become central actor in a multi-sided market • Reduced costs from less grid maintenance and load-shift	• Reduced revenues from selling electricity • Increased costs from investments in smart infrastructure • Uncertainty about the potential changes in revenues and costs

Theoretical framework: Disruptive technology and business models

Title: THE RELATIVITY OF DISRUPTION: E-BANKING AS A SUSTAINING INNOVATION IN THE BANKING INDUSTRY

Author: Albrecht Enders, Tawfik Jelassi, Andreas König and Harald Hungenberg

Year: 2006

Research Question: One important question discussed in the context of this theory (DIT)is whether the Internet and also the business models of pure e-banks constitute a disruptive innovation to the retail banking industry

Type of study: the case of Nordea Bank (Scandinavia)

Findings: "Nordea has the integrated business model of a traditional retail bank. This means that customers can chose from a wide range of services (e.g. transactions, brokerage, savings, etc.) provided by one integrated supplier. DIT suggests that if a company is successful with an integrated value chain, then it is located in sustaining circumstances where customers are underserved with respect to the traditionally most-valued performance criteria [Apigian et al. 2005]"

Theoretical framework: Disruptive innovation

Title: BUSINESS MODEL AS AN INDUCER OF DISRUPTIVE INNOVATIONS: THE CASE OF GOL AIRLINES

Author: Sirlei de Almeida Pereira, Fabricio Garcia Imbrizi 3Alessandra Demite Goncalves de Freitas Marcelo Aparecido Alvarenga

Year: 2015

Research Question: What are the characteristics of the internationalization of these firms?

Aim: We aim to 1) characterize the disruptive innovation and its determinants; 2) characterize and interpret the business model adopted by the company due to the characteristics of disruptive innovation; and 3) demonstrate how the business model can support the disruptive innovation processes.

Type of study: This is a qualitative research based on a single case study and the data collection was conducted by documentary analysis in publications on the Gol Airlines case.

Findings: The results of this study reinforce that the appropriate design of the business model of a company can be the basis for sustaining innovation processes.

Theoretical framework: disruptive innovation and business models

Title: The role of business model in capturing value from innovation: evidence from Xerox Corporation's technologies spin off companies.

Author: Henry Chesbrough and Richard S. Rosenbloom

Year: 2002

Research Question/Aim: the role of business model in capturing value from early stage technology

Type of study: Empirical research upon six spin off companies 3Com, Adobe, SynOptics, Metaphor, LiveWorks and Documentum.

Findings: "it seems reasonable to infer that a business model similar to 3Com's would not have evolved had the technology remained within Xerox."

"We do not regard Metaphor's lack of success as a reflections of limitations in its technology; rather, we attribute its fate to its inability to find the model that would unlock the latent value embedded in that technology."

Theoretical framework: Business Model

Title: A firm level analysis on the relative difference between technology-driven and market-driven disruptive business model innovations
Author: Solomon Russom Habtay

Year: 2012

Research Question: Examine the relative disruptiveness potential between technology-driven and market-driven innovations from the entrant's perspective.

Research Aim: 1. Introduce new typology of T-driven versus M-driven disruptive Innovation that can help firms think better on a firm level. 2. Propose a conceptual model to examine the inhibiting/enabling factors to the development of disruptive business model innovation.

Findings: The disruptiveness potential of technology-driven innovation is significantly constrained by technological and market uncertainties, initially inferior value propositions, low-end niche market, economic unfeasibility and resource scarcity.

In contrast, in the short run the initial strategic choice, economic feasibility of the new business models and resources endowments allow market-driven firms to grow relatively quickly and disrupt a significant part of the established mainstream market.

In the long run, these relationships seem to change in the opposite directions. If a potentially disruptive technology crosses uncertainty, emergant strategy, specialization and asymmetric economic incentives are likely to have positive effects on its long term disruptiviness potential. On the other hand, the initial strategic choice of markets and customers, associated specialization and cost factors are likely to moderate long-term disruptiveness potential of market-driven disruptive business model innovation.

TLDR; Contextualization matters in analysizing the disruptiviness potential of new firms.

Paradigm: Firms' disruptiveness potential is determined by the interaction of a distinct type of disruptive innovation and the determining factors for BM development residing within a firm's specific context.

Type of study: Empirical

Theoretical Framework: Business model concept. Technology-push innovation vs. Demand-pull innovation. Disruptive innovation theory.

Title: Corporate entrepreneurship, disruptive business model innovation adoption, and its performance. The case of newspaper industry

Authors: Benjamin Amshoff, Christian Dulme, Julian Echterfeld, Jurgen Gausemeier

Year: 2015

Research Question: Examine how prominent corporate entrepreneurship attributes impact disruptive business model adoption, and how such adoption impacts business model performance.

Findings: Autonomy, risk-taking, and proactiveness have positive associations with the extent of adoption of disruptive business model innovation. Innovativeness does not.

Disruptive business model innovation adoption is non-linearly associated with business model performance.

Theoretical Framework: "Disruptive technology, Business model innovation, Digitization"

Title: Evaluating technology disruptiveness in a strategic corporate context: A case study

Author: Kaisu Puumalainen, Liisa-Miaja Sainio

Year: 2006

Research Question: Examine how firms interpret new, potentially disruptive technologies in their own strategic context

Findings: Percieved disruptiviness in terms of product characteristics does not necessarily translate into strategic importance.

Firms did not see new technologies as a threat in terms of potential competence disruption.

Theoretical Framework: Business model, Disruptive technology

Title: The disruptive nature of digitization: The case of the recorded music industry

Author: Francois Moreau

Year: 2013

Research Question: Analyze the impact of digital technology on the recorded music industry and explain the delay of dominant firms in reacting to technological discontinuity. Analyse the phenomenon through the the theoretical framework of disruption theory.

Findings: Essentially, recording companies could have been leaders or pioneers, but were late to recognize the disruptiviness of mp3 technology, and their orientation towards sustainable innovation (earlier examples: vinyl, tape, cd) prevented them from adapting their business model.

Theoretical Framework: Disruptive innovation

Title: The link among information technology, business models, and strategic breakthroughs: Examples from Amazon, Dell and eBay

Author: Chris Kimble, Isabelle Bourdon

Year: 2013

Research Question: Examine the relationship between 1: IT, and 2: business models and breakthrough strategies, in large organisations.

Findings: All 3 companies used IT (to various extents) to manage the relationship with their customers. Including previous findings that disruptive innovation can occur even using non-disruptive technologies (clarify terminology), it is concluded that disruptive breakthrough strategies are build as much int technology as they are on business models.

Success factors for strategic innovation: Understanding customers' value.

Theoretical Framework: Business model (Osterwalder and Pigneur's), breakthrough strategy (derives from disruptive innovation)