Identification of the determinants of Blockchain-based business model using hybrid method: Content analysis & System Dynamics

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Abstract: The new information technologies have a great impact on the evolution of organizations' business models. One of the emergent technologies in recent years is Blockchain. The difficulty of Blockchain implementation is not limited to technical concepts, the focus should also be on the re-engineering of the related processes. We attempt to analyze the business model changes related to the readiness of organizations for coping with Blockchain in the future. Organizations should be prepared for a business model modification in the sense of passing from centralized and isolated business models to decentralized and cooperation-based models that could assist them in using Blockchain efficiently. In this study Qualitative method as Content analysis is employed in order to codify the scientific authors' opinion in two fields of business model and Blockchain industrialization. The analyses revealed that the determinants of the Blockchain-based business model comprise 9 canvas blocks and also new category is identified in this study that is called „cooperation". Given the nature of Blockchain's information sharing, the cooperation approach consists in the fact that all stakeholders in the value chain share their values and generate new value-added products or services that none of them could access individually. So business model planning will be a community-based activity. In the new business model, some of the traditional canvas blocks have overlapped due to the nature of Blockchain namely Key Partners, Key Resources and Customer Segment. Then we model the Blockchain, determinants based on System Dynamics approach. This shows us that changing factors like registration fee or transaction tax in the network, could improve cooperation in sharing resources and increase total value.

Keywords: Blockchain, Cooperation-Based Business Model, System Dynamics, Value Chain.

1. Introduction

Trust is one of the most important factors of business, which, as a social capital, leads to the undertaking of efforts and cooperation. Decision-making can be facilitated in a situation where there is trust. Also many issues will be removed due to the existence of trust and consequently the complexity of those issues will be reduced. In the business environment, trust can also lead to ongoing communication and stable transactions. Businesses and services based on the information technology are also not excluded from this rule and trust is exercised in the form of the use and exploitation of technology in transactions and actions of individuals and groups (Corritore, 2003). According to different reasearch works, various variables such as type, level, and generalization can be used to classify IT trust, but with regard to the goal of the study, two concepts, namely that of centralized trust and that of peer-to-peer trust are chosen. In peer-to-peer networks, in contrast to the centralized networks, each node can provide or receive services simultaneously, and there is no central control as regard the management and hierarchy of node performance (Tang, 2004). So far, the structure of trust in the business world has been based on a centralized model that could justify the existence of intermediary entities for verifying and adapting transactions performed in the business. Nowadays, Blockchain has led to the creation of a distributed peer-to-peer network whose members can exchange information and establish communication and auditability without the need for a central entity (Christidis, 2016). Blockchain brings trust to peer-to-peer networks. The use of cryptography and transparent consensus methodology in Blockchain will lead to this level of trust. Each node's transaction is trackable so that nodes can trust validity of transaction without the need to trust each other or the central entity (Xu, 2016). Trust, consensus and immutability within business use cases could be handled by Blockchain (Zīle&Strazdiņa, 2018).

Blockchain provides more sustainable solutions than the traditional information sharing strategies, which leads to the creation of democratic, open, and expandable systems. The potential of Blockchain-based systems includes reliability of transactions, transparency, traceability and decentralized data storage (Christidis, 2016). Blockchain can provide high-level exchanges in various industries, leading to the creation of new business models and solutions for the exchange of distributed information (Pak Nian, 2015). Organizational strategists need to review value generation in order to adapt Blockchain to their services. According to Deloitte, Blockchain technology is one of three top technologies with potential for major changes in industrial infrastructure and organizations should be trained and prepared on the basis of their risk-taking power (Deloitte, 2016). Also, Gartner Market Research reports that Blockchain technology has been among the development technologies in recent years. Preparing the organizations to make the traditional business model compatible with Blockchain will result in organizational development and greater advantages. Considering the growth of large corporate investments and the provision of Blockchain-based services, this technology is expected to influence the business model of various industries in coming years (Wang, 2016).

As it is common at an early stage of the adoption of new technologies, there are a lot of unrealistic proposals and expectations that sometimes cause trick the investors (Zīle & Strazdiņa, 2018). Usage of the Blockchain advantages, however, requires appropriate interpretations within the framework of business processes (Filipova, 2018). Findings have shown that most of the Blockchain essays focus on How it works and on its potential, and also on why questions considered the motivations of Blockchain usage (Li, Y. et al. 2018). So, as could be seen, customization of Blockchain technology to use its positive impacts for business purposes operationally is neglected. In order to bridge the gap in the existing literature, this study attempts to answer the following main question:

What are the determinants of a Blockchain-based business model from scientific authors' point of view?

The remaining of this paper is structured as follows; in section 2 relevant literature about business model based on Blockchain technology is reviewed. In section 3 the research methodology is explained. Further on, the results of data analysis are presented in section 4. Finally section 5 consists of the conclusion of this paper.

2. Literature Review

In 1994, the concept of "smart contract" was introduced by Nick Szabo as a computer transaction that can be implemented as a stand-alone automated contract (Christidis, 2016). The first version of Blockchain for financial transactions with limited capabilities to support programmable transactions was introduced by Satoshi Nakamoto in 2008. Cryptocurrency was introduced as digital currency that transfer money in a peer-to-peer network. Implementation of this solution lacked central management for the transfer of virtual money. Second version of Blockchain launched in 2016 was related to a programmable public infrastructure that would store the computational results. Smart contracts which run as the autonomous programs on the Blockchain network, included the ability to diagnose business logic and conditions, and can execute the complex programming operations under different conditions (Xu, 2016).

Some major companies like IBM, Ethereum community, Microsoft, Intel and Corda have developed platforms to provide services to the other industries such as HSBC, Bank of America and SWIFT (Cachin, 2017). Mobile operators such as Verizon, Orange, and AT&T have worked on designing Blockchain's ability to provide value-added services such as DRM and register their patents (Jones, 2017). Some of the most important research works over the past years in the Blockchain domain are given in *Table 1*.

Table 1. Some of the most important research works in the field of Blockchain

Row	Title of research	subject	Author	year	Name of journal
1	Business Innovation Through Blockchain	It studies the different examples of using Blockchain technology, the management framework, the security of systems based on this tech-nology, the value chain and how it is governed.	V. Morabito	2017	Springer International Publishing
2	Bitcoin: A Peer-to-Peer electronic cash system	double-spend problem has been investigated using a peer-to-peer network and the introduction of Bitcoin	Satoshi Nakamoto	2008	http://www.bitcoin.org
3	Towards Scalable and Private Industrial Blockchain	It studies the architecture development for implementation of industrial standards in Blockchain.	Wenting Li et al	2017	BCC '17 Proceedings of the ACM Workshop on Blockchain, Cryptocurrencies and Contracts
4	Block-by-Block: Leveraging the Power of Blockchain Technology to Build Trust and Promote Cyber Peace	This research studies the potential of Blockchain in security industries such as DARPA.	Scott J. Shackelford JD, Steve Myers	2017	Yale Journal of Law & Technology
5	Digital Supply Chain Transformation toward Blockchain Integration	Using Blockchainin effectively access to customer information and monitoring product or service in the supply chain is described in order to provide transparency.	Kari Korpela et all	2017	Proceedings of the 50th Hawaii International Conference on System Sciences
6	The Blockchain as a Software Connector	Blockchain can be used in data-sharing infrastructure in software generating compared to the legacy systems.	Xiwei Xu et al	2016	13the Working IEEE/ IFIP Conference on Software Architecture
7	Blockchain and Smart Contracts for the Internet of Things	A review of smart contracts and its automated processes for use in the	Konstantinos CHristidis, Michael Devetsikiotis	2016	IEEE Access

		implementation of the IoT infrastructure.			
8	Handbook of Digital Currency	Studying the Next Generation of Money and Digital Payments, Bitcoin, and its risks.	Lam Pak Nian, David LEE KuoChuen	2015	Elsevier
9	A maturity model for Blockchain adoption	The adaptive analysis method has been used to examine the dimensions of Blockchain's technology maturity model.	Huaiqing Wang, Kun Chen, Dongming Xu	2016	Springer Open access
10	Disrupting Industries With Blockchain: The Industry, Venture Capital Funding, and Regional Distribution of Blockchain Ventures	Studying the variety of datasets have been conducted in the area of the user companies or the implementation of Blockchain technology.	Maximilian Friedlmaier, AndranikTumasjan, and Isabell Welpe	2016	Proceedings of the 51st Annual Hawaii International Conference on System Sciences

Changes in technologies used by organizations such as Blockchain technology have led to changes in the business model of organizations (Ju et al., 2016). The business model establishes an interfaces layer between the organization's strategies, processes, and IT systems. Development of IT creativity alone does not guarantee the success of the organization; a business model should properly assess the organizations' internal and external conditions and create competitive advantages, as well as a balance between technical creativity and production of financial value. Creative technologies have the potential to alter the balance among the organizations in the industry. Failure to adapt the business model of organization, could lead to devastating results. Thus, it is important to examine and evaluate the implications and effects of a new technology on the business model.

The history of the business model dates back to 1990. In fact, the concept of the business model was developed because of the need to explain the value of ICT-based creativity for organizations. A business model is a framework that transforms technology features and potential benefits as inputs into economic output through customers and markets of a certain organization. To put it simply, business model is a concept of how to propose, create, distribute and return value to an organization (Ghezzi, 2014). Drucker argues that the competition among enterprises is not about their products, but about their business model. Traditional cost-based models have undergone a change of approach over the last few years. Exchange of financial expenses is effective in business transactions, but it is not the main point of the business model and acting rather as a supporting agent (Jingn&Xiong-Jian, 2011). Organizations must adapt to the technological changes on the market and to existing opportunities or threats in the value chain, with the purpose of acting appropriately in their value chain (Bouras et al., 2007). Organizations need to cooperate in the ecosystem to achieve their goals with other stakeholders. With the emergence of new technologies, the more ecosystems are created, the greater the value that will be generated for the stakeholders involved in the network. In an ecosystem, the goal is not to sell a product or service, but to focus on developing a shared platform for all stakeholders (Holotiuk et al, 2017).

The lack of a shared vision and cooperation among organizations lead to the lack of access to business goals and economic development. If organizations want a better place in a competitive environment, they should focus on developing an IT-based information sharing infrastructure that

will lead to the development of a new business model to be applied within them. In developing a new business model that aims to integrate and develop cooperation and partnerships, all stakeholders play an important part in accessing and disseminating information. Convergence of technology with all stakeholders in the value chain can be considered one of the most important development tools (Kaul et al., 2008). *Table2* presents the most important research papers related to the variables affecting the design of business models based on new technologies.

Table 2. Some of the most important research papers in the field of business model design

row	Title of research	subject	Author	year	Name of journal
1	Prototyping Business Models for IoT Service	Research in the field of developing a business model framework through two access items to data analysis and open ecosystems can lead to a new value. (Introducing the 9-item model, canvas).	JaehyeonJu, Mi-Seon Kim, Jae-HyeonAhn	2016	Information Technology and Quantitative Management
2	Challenges of Smart Business Process Management: An Introduction to the Special Issue	Introducing a frame-work for managing smart business process with three levels of business management process, multi-process management, process model management and sample process mana-gement.	Jan Mendling et al	2017	Decision Support Systems
3	The IoT electric business model: Using Blockchain technology for the internet of things	Redesigning the busi-ness model using the peer-to-peer infrastruc-ture in the IoT (intro-duction of a model based on person, pro-duct, operational state, transaction state).	Yu Zhang, Jiangtao Wen	2016	Springer Science+Business Media
4	Collaborative, co-operative and collective business models in the 'new' music industries: a literature review	Cooperation Based business models could affect ownership and value chain of products and people trust due to technology used.	Marcus O'Dair,	2015	NEMODE
5	Strategy and business model design in dynamic telecommunications industries: A study on Italian mobile network operators	Investigating the Impact of Environmental Modi-fications and Providing the Frame-work of Stra-tegy Developing in this Environment (Introdu-cing Value-Based Busi-ness Model).	Antonio Ghezzi, Marcelo Nogueira Cortimiglia, Alejandro Germán Frank	2014	Elsevier
6	Ecosystem Business Model design	Ecosystem Business models need coope-ration of actors and	Nasim Bahari, Rémi Maniak, Valérie	2015	Conférence Internationale de Management

			current BM could not handle its complexity. Each node could be customer and owner in same time.	Fernandez,		Stratégique
7	Designing Business Models in the Era of Internet of Things	Presentation of the business model in the IoT field (the intro-duction of a value-based business frame-work).		Stefanie Turber et al	2014	Springer International Publishing
8	Co-operative enterprise: a unique business model?	Ownership of coope-ration based business model is related to transaction of actors in community and all nodes have equal authority.		Tim Mazzarol, Sophie Reboud, Elena Alexandra Mamouni Limnios,	2011	Future of Work and Organisations, 25th Annual ANZAM Con-ference
9	Internet of Things Business Models	Providing business model based on co-operation, network, method, input, service, profit, strategy, content		H.C. Chan	2015	Journal of Service Science and Mana-gement
10	Business models for the Internet of Things	Examining Canvas in the IoT industry		R. Dijkman et al	2015	International Journal of Information Mana-gement

Various researches show the main change in different industries was triggered by the evolution of peer-to-peer information sharing. All the results show changes in value chain and participants' access models. The new business model should focus on cooperation instead of centralization. The cooperation_based model refers to people who gather voluntarily, make democratic and shared ownership relation and have shared needs in social, cultural, financial aspects. These people don't know each other but trust each other based on technology (Marcus O'Dair, 2015).

Ownership in these business models is defined by the cooperation and transactions among the actors involved. All nodes have equal authority. Value creation, revenue generation, applying transactions and main resources could be important in new business model (Tim Mazzarol et al., 2011).

The most important features of cooperation_based business models are generating new value and attracting more customers. These factors impact on revenue stream and cost structure due to shared risk management. Due to using the Business Canvas model as a cooperation-based model, many canvas blocks have interfere or overlapped. Customers, stakeholders, key resources are the same concepts and we should consider giving a new meaning to investment and distributing ownership. Blockchain could industrialize the concept of cooperation_based business models (Marcus O'Dair, 2015). Traditional business models have an individual approach to organizations which does not allow them to work in a cooperation-based environment. Participants should cooperate from planning phase to be able to create new valuable products with shared resources. Actually, a business ecosystem needs cooperation among its actorsand value creation is not a linear process and could not be achieved by each of the nodes independently (Nasim Bahari et al., 2015).

Blockchain can adapt effectively to changes in current or new services and changes in the service structure, outdates the old business models, and impedes the entry of new actors into the market. The benefit of Blockchain is the cooperation of the different industries involved in the network. The challenge of implementing Blockchain in the industry lies in its technical feasibility and in the necessity to reengineer the cooperation at the level of business processes among the

organizations and industries involved. In fact, all market stakeholders from the buyer, seller, and legislator should be involved in this change (Mainelli & Milne, 2016). In cooperation-based business models, member control and membership are the main characteristics of the model, members are controlled through a democratic method and each member has to pay a membership fee. In this model, members must be involved in the decision making process, and they must be informed of all changes and transactions (Hooks et al., 2017). Blockchain can lead to changes in the business model of organizations by changing the way in which business identity is confirmed, creating a commitment facility, and increasing the operational efficiency of organizations (Nowinski & Kozma, 2017).

Based on the aforementioned review of the relevant literature, it can be noticed that the technology can provide an infrastructure for businesses that require identity-based transactions. The challenge of implementing this technology, in addition to technical issues, is related to the old business model based on a central entity. Different industries should start the process of matching Blockchain's benefits with their organizational processes and gain an understanding of its proper configuration.

3. Research Methodology

The choice of a research method depends on several factors, including the research question, the literature review, and the target audience. According to a survey conducted between 1983-1988, 97% of the research papers on information systems were based on the prevailing view of positivism and quantitative research methods. However this process did not last for a long time, and it introduced qualitative methods (Mousakhani et al, 2010).

The purpose of the qualitative research is to identify a phenomenon by examining the behavior of the people involved in that phenomenon. Qualitative data is implemented through the analysis of the ongoing activity of users and stakeholders, the open interview, opinions and experiences of individuals in their own words and analysis of the documentation on the subject matter. Content analysis, ground theory, hermeneutics, etc., are among the main techniques of this method. The tools in the field of qualitative methods can help sort and code or create relationships among elements that are important in that research (Kaplan & Maxwell, 2005). In this research, content analysis is used to clarify the variables related to a certain phenomenon or important variables in the Blockchain business model. In fact, by using the content analysis methodology, qualitative analysis of the authors' view in their papers and documents related to the changes in the Blockchain business model has been addressed. The documents used for examining the variables affecting the development of the Blockchain business model were devided in two groups of Blockchain Technology related subjects and the development of the business model. After formulating the way the research is done, the review of each paper and document is carried out until theoretical saturation. As the aforementioned documents are concerned, the goal is to identify the authors' views about the effects of Blockchain technology on various industries and the changes which are necessary in the context of business model of organizations. With regard to the articles about business models, the main focus is on examining the opinions of authors about the most important variables when changing the business model of organizations when faced with a new technology. After studying each document, their contents are analyzed, the initial coding steps are carried out and then we categorized the identified codes. We mapped the categories by means of the well-known Business model named Canvas and compared their categories and new category as Cooperation is identified.

Actually we use a hybrid method in the planning phase of research. The discovery of variables related to the business model is studied by means of the qualitative approach. Then for answering the study's question with regard to the identity of the business model identified we use quantitative method. We find variables with a higher importance in blockchain business model through a content analyze and then model the system or business model with those results by system dynamics.

We review Blockchain network parameters regarding to categories founded through content analysis and gather the reference models. Due to complexity of the aforementioned issue and to the use of System Dynamics in specialised literature related to business models, we have chosen to simulate the Blockchain-based business model. The casual loops were designed and then stock and flow diagram developed.

4. Research Findings

In order to investigate the documents and articles in two groups of the Blockchain Technology and Business Model, the qualitative analysis tool MAXQDA is used in accordance with the qualitative research method of content analysis. Through this analysis, 55 scientific papers and documents are processed. According to the authors' comments mentioned in those documents, the variables affecting the development of the new business model are identified with regard to technological changes such as the development of Blockchain technology. from these documents, 63 components are extracted and then the identified components are classified into 10 main categories. In all, in the analyzed documents, 1468 codes are identified, then each of them is classified according to its content and relevant category. In *Figure 1*, the identified components and the number of selected codes in the documents are given. Research sources are divided in 2 main groups, journal papers or scientific books rekated to business models and papers on Blockchain development. We review each paper and summarieze the opinion of each author about the effects of a new technology like Blockchain on business model of organizations. Some of the aforementioned papers are described in the research literature review. According to the research literature review, 9 categories include in the canvas value-based model by Osterwalder and Pigneu (Osterwalder&Pigneur, 2010). Processed papers and documents, emphasized the parameters within the 9 categories of the value-based business model, which is introduced under the concept of "cooperation" in many articles. When multiple stakeholders cooperate in the delivery of services, each one contributes its own resources, and there is an underlying attractive business model for all of the players involved (Braccini, 2012).

Therefore, based on the opinions of the authors, the following categories should be considered and analyzed when developing or modifying the business model of organizations when faced with a new technology such as Blockchain. In *Table 3*, the identified categories are presented.

Table 3. Identified Categories in the Design of the Blockchain Business Model

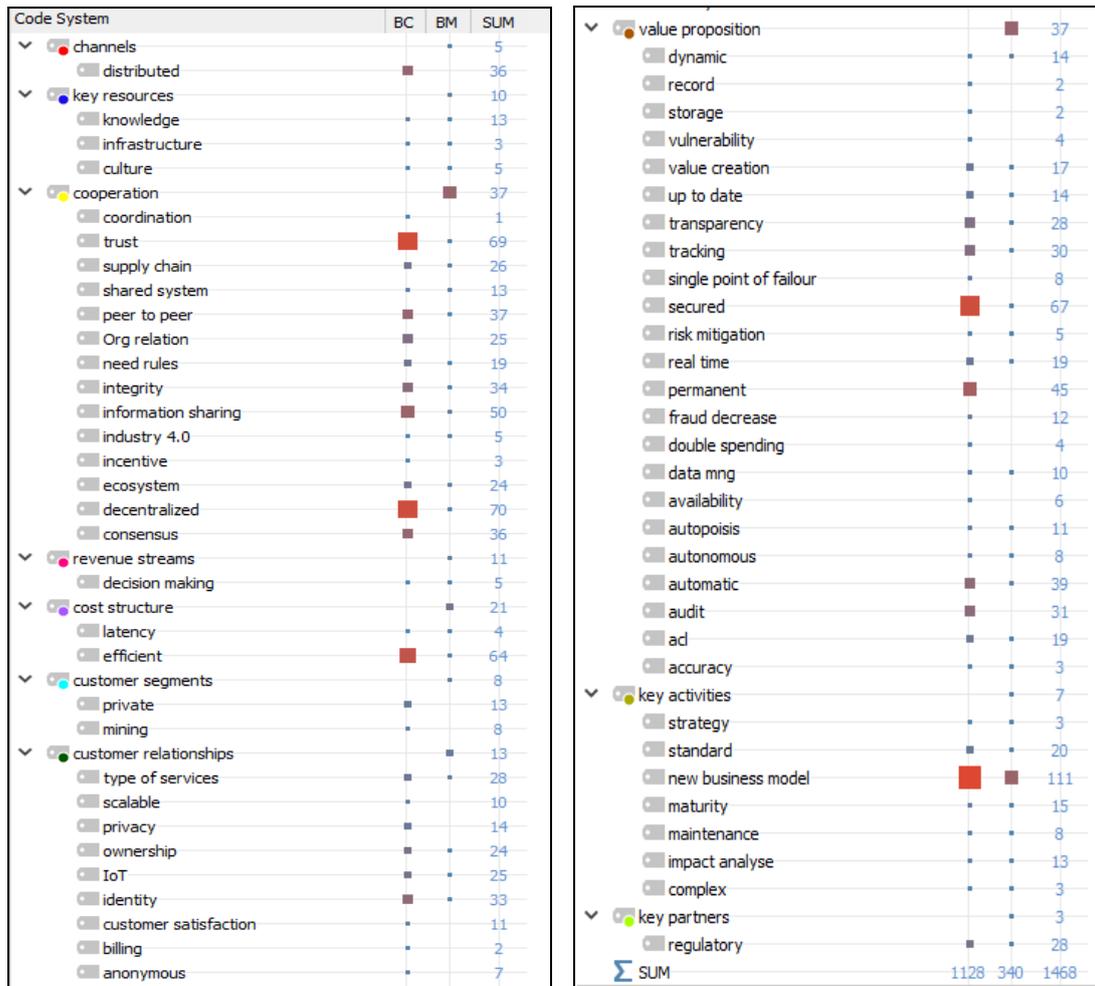| row	Name of the category	Number of codes identified in documents
1.	Revenue stream	16
2.	Customer segment	29
3.	Key resources	31
4.	Key partners	31
5.	Distribution channels	41
6.	Cost structure	89
7.	Customer Relationship	167
8.	Key activities	180
9.	Value proposition	435
10.	Cooperation	449
Total		**1468**

Figure 1. Identified components in designing a Blockchain-based business model

Customer Segment

The category related to the customer segment, refers to the organizations or individuals that the organization intends to provide services to. In order to increase customer satissfaction, the organization may categorize them into different groups based on their requirements, behaviors or similar characteristics. The organization must finalize its decision to concentrate its efforts on providing services to some customer groups or ignoring them.

Value Proposition

The category of value proposition refers to the services and products that make value or profit. That is why customers choose an organization. Some value propositions may include new products or services, and some may be similar to other services on the market and only some variables altered.

Distribution Channels

The distribution channel is based on a method through which the organization communicates with a customer segment with regard to its proposed value. Distribution channels refer to communications, distribution and sales, and the organization's encounters with the customer, and have a major impact on the customer experience.

Relationship with the Customer

The types of communication between the organization and the customer segments are explained in this category. These can range from personal communication to automated system-based communication.

Revenue Stream

The amount of revenue that an organization generates from each customer segment is interpreted in terms of revenue stream. The organization must know why and for what value, the customer will pay money to the organization. By answering this question, the organization will be able to create one or more revenue streams for each customer segment.

Key Resources

The key assets needed to create a business model are included in key resources. These resources allow the organization to value a part of customers and establish its relationships with the customers in order to earn revenue.

Key Activities

The key activities category refers to the core activities that the organization should implement to create its business model. Key activities are different in each business model and the organization can provide its values to a part of customers so that it can communicate with them and make money.

Key Partners

A network of suppliers and business partners that lead to the performance of the business model is described in this category. Business partnerships are one of the key factors in developing a business model. Organizations work together to improve their business model, reduce risk, and make more resources available to the other organizations in a variety of ways.

Cost Structure

The cost structure refers to all costs associated with the business model of the organization. The most important costs for creating and deliver value, maintaining customer relationships and generating the revenue for the organization should be considered in this section. After identifying key activities, key partners and key resources, you can see a decent view of the organization's key costs in the business model.

Cooperation

Ecosystem of a business involves the direct and indirect relationships of the organization such as those with suppliers and distributors, competitors and customers, and institutions whose activity impacts the business sector, such as regulators and media centers. Many decision problems involve multiple decision makers with multiple goals. Cooperative decision making requires free communication among decision makers. Blockchain could offer business approach that could help reach a consensus in a cooperative way (Fiala, 1997).

The concept of cooperation creates a new perspective for communication and improves the level of product analysis at a system level. In cooperation-based business models, organizations are considered business partners whose purpose is to create and enhance the terms of their members for the provision of services that they cannot provide on their own. From among concepts that have been described with regard to the business model design, the development of the isolated business model of the organization is studied. In fact, as technology-related changes are concerned, an organization alone cannot develop a business model for itself and needs a common effort in its ecosystem to create an optimal business model.

As outlined in *Figure 2*, the results of the analysis of the contents of the authors` documents also confirm the importance of business cooperation. Blockchain technology can create this potential for organizations in an ecosystem. By sharing the required information, members gain trust in their ecosystem and it leads to transparency, tracking, and ultimately increase the profitability. This figure shows that variables with a higher importance in the development and design of the business model. Value proposition and the increasing rate of cooperation among industries and organizations are most important in categorizing Blockchain technology documents. From the point of view of the authors in these two fields, mentioned important variables can be covered by Blockchain technology.

Figure 2. Identified categories in business model and Blockchain groups' papers

According to variables found in the 1st phase of research, we analyze the Blockchain network parameters. As described and codified based on the qualitative approach, all 9 variables of canvas model and one extra variable are important in Blockchain business development. With cooperation based view on the canvas blocks, some of the canvas blocks have overlapped in the cooperative business or Blockchain network.

Key resources, customers and partners have same meaning in Blockchain and each customer could be considered as a business partner or a resource for developing business. Revenue stream and cost structure will be the same as in traditional Canvas model in Blockchain network. Key activities could be referred to as transactions which each node implemented in the network for value generation.

In the *Figure 3*, we demonstrate the reference model of Blockchain network parameters. These are shared with respect to Bitcoin, Ethereum and Hyperledger network nodes' behavior and we filter parameters that could be important for industrial usage of this technology. These variables for reviewing reference model are Transaction, Nodes or accounts in the network that could be the same as wallets and also we check cost and revenue generation in developing a Blockchain network for business purposes.
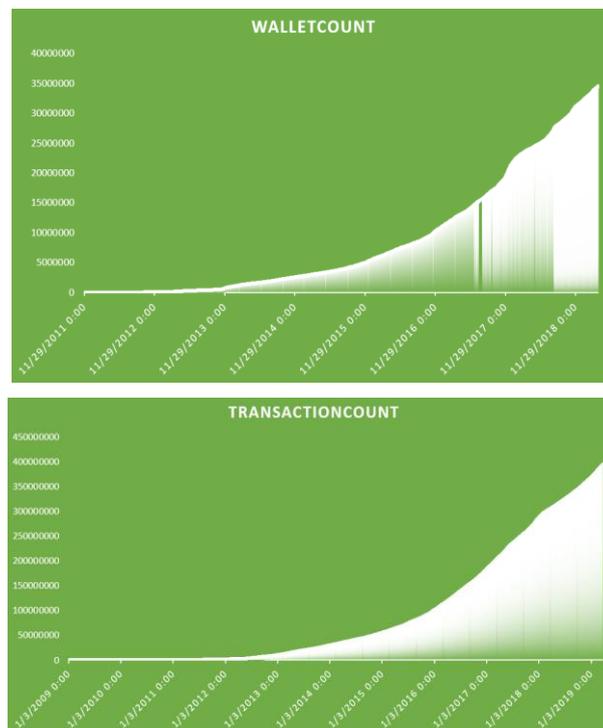
Figure 3. Reference Model of Blockchain network parameters

Transaction counts graphs and Node graphs (Wallet count) refer to exponential growth. It starts with a low quantity. Also, revenue models in *Figure 4* show that transaction revenue and membership revenue refer to exponential growth. Total revenue of Blockchain shows expo-nential growth, it could be stataed that exponential growth could illustrated through S-shaped graphs as well.
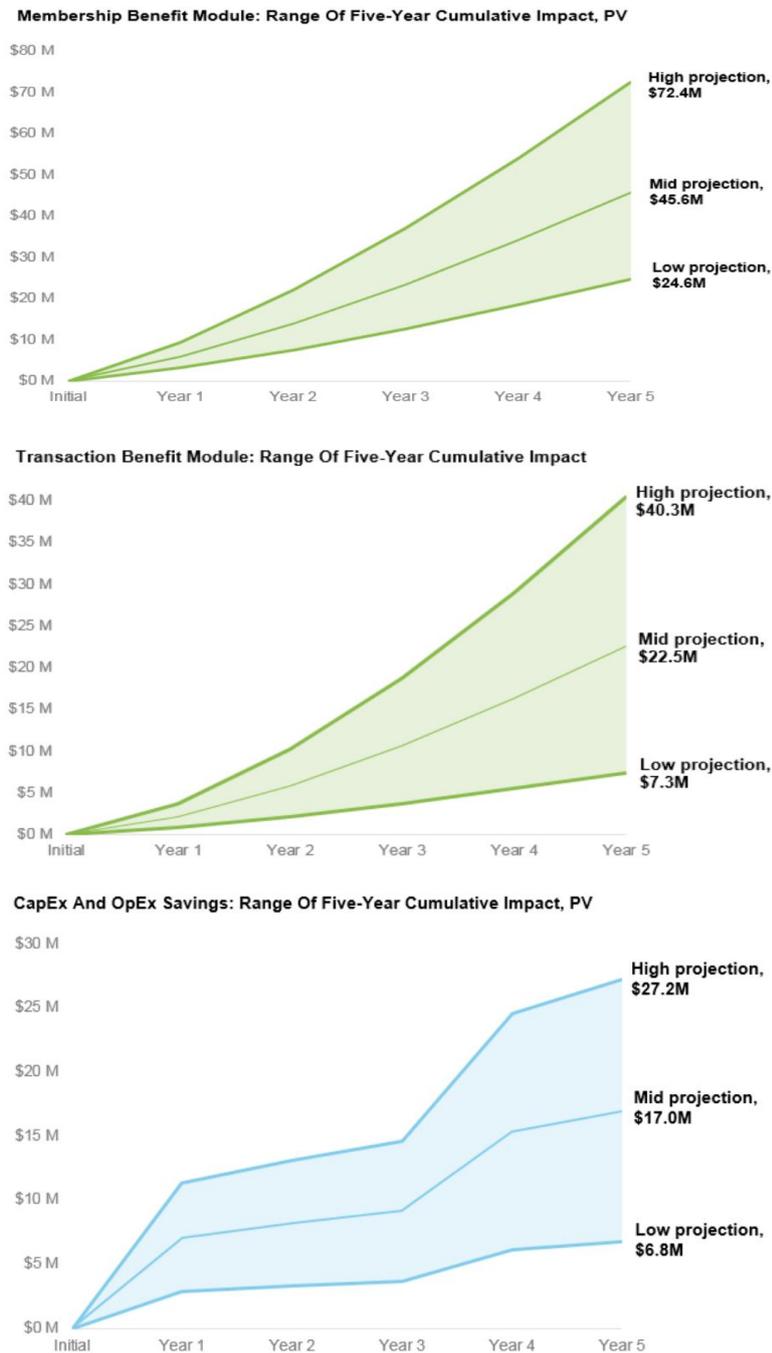
**Figure 4.** Reference Model of Blockchain network parameters

Further on the reference models are analyzed with regard to their type of behavior and casual loops are generated. The Blockchain Business Model includes 3 main loops, transactions, network nodes and revenue aspect as illustrated *Figure 5*. These loops are developed based on 9 business model canvas blocks with cooperative impacts. These blocks and cooperation are described in the previous section. Based on the registration of each node in the Blockchain network, we could consider that it shares its resources with other nodes to conduct transactions and cooperation, so as to be provided services from other nodes and also bring new value to the network. Actually each node of a Blockchain_based network is customer and partner of that network simultaneously that

shares its resources with others. After participating in the network, nodes could have transactions with other nodes for receiving the resources of those nodes or for providing their resources to the latter. Registration fees and transactions taxes could generate new value for all network participants as revenue stream. The implementation of this infrastructure for each of node causes technical and human resource costs. Actually each stakeholder in value chain should have one node for processing purposes that could cooperate with others as a result. We model the cooperation logic of the Blockchain-based business model in relation to nodes and transactions in the network that affect value generation. In other words, when the activity of node loops increases, more customers become our partner and share their resources with others. In other loops or transactions, more revenue will be generated, if participants request to have more cooperation based transactions. Transactions will impact on total value of network and will attract more participants and sharing resources. We described each loop in the paragraphs below.

Node loop means the Blockchain network has some nodes that participate and cooperate with each other to develop a certainbusiness. New nodes gain access to a network by registration and pay the registration fee so that they can benefit from information sharing of other nodes. So we compare the revenue from registration fee with our revenue goal, if the difference is meaningful, we should decrease the registration fee to encourage more nodes to have cooperation in the network and increase the node's quantity in the network.

Transaction loop refer to requests of each node for carrying out transactions in the network. The transaction quantity is important for us because it relates to transaction revenue. Which means that if each node has more transaction requests in the network, so the total number of transactions will increase. For each transaction, the node should pay a related fee. So again we compare transaction revenue with the goal. If the difference is meaningful, we decrease the transaction fee to encourage having more transactions.

Cost loop means each parameter for developing Blockchain platform between organizations has a different cost, so each item could increase total cost of platform. When we develop the platform, cost of the developing will be increased and we should use our capital resources which are limited. If capital resource usage increased so the cost of the platform will be increased too which is not desirable and we should plan to decrease the cost of implementing platform. Node revenue, transaction revenue and platform cost formulate the total value of the aforementioned business model as network revenue.
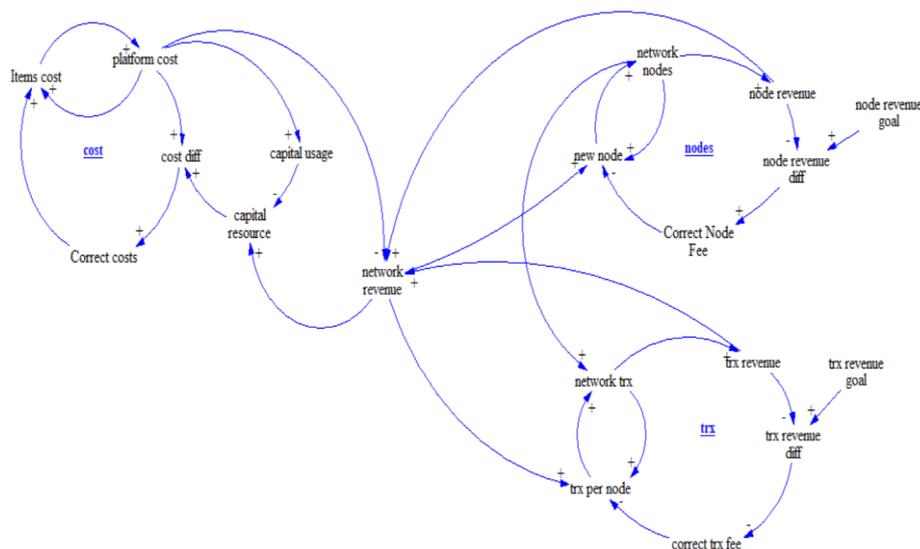

Figure 5. Casual Loop of Blockchain Business Model

In the next step of modeling, we analyze the behavior of Blockchain network and work on stock and flow diagrams. The logic of stock and flow formulation is based on a description that we presented in the casual loops section. We formulate each loop in accordance with the behavior of the network that we describe with regard to casual loops. Stocks are node revenue, network nodes,

network transactions, transaction revenue, total revenue, and available resources, platform cost. We model the cooperation with registration nodes in the network and they request for carring out new transaction. Each transaction will be done with cooperation of other nodes so each node should pay the transaction tax and also registration fee. We tune the cost of the network with rate of network nodes registration and transactions fee, so the model automatically decreases the rate of the respective fee, when cooperation is not at the desired level.

Cost of developing platform for cooperation, will be decreased when participation improves. It means that when each of the nodes becomes a member of the network it could add resources to the network, which will impact on the total cost of Blockchain developing. Cost modeling is collapse graph. Total revenue and value of the network is calculated based on Nodes' registration fee, Transactions' tax and Cost of developing platform. It improves on the basis of the cooperation relationships between new nodes and requesting more transactions. As it can be seen in *Figure 6*, Behavior of Stock-Flow simulation is in accordance with reference models in Blockchain network.
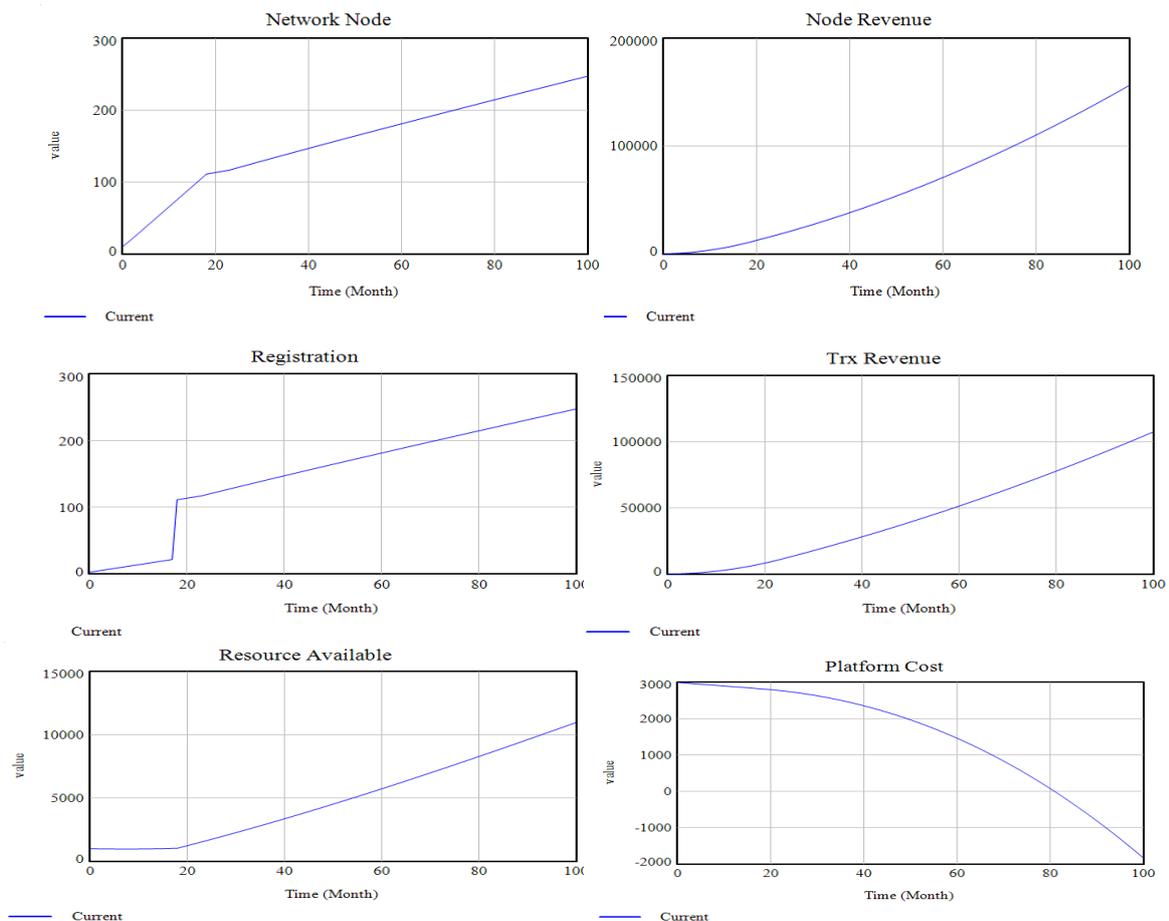
Figure 6. Behavior of Stock-Flow simulation for Blockchain Business Model

5. Conclusion

According to the findings of this study, organizations with the aim of business-oriented survival, have to identify the technology-driven changes, and adapt their business model to those changes. The main purpose of any business is to minimize the costs and maximize the profits. A business model can be a dynamic link between business variables and determine how to generate the revenue and profit. As explained in the literature review, many scholars such as Osterwalder have emphasized the concept of creating, proposing, transferring and retrieving value in their definition of the business model. If organizations want more value, they need to have transparent and up-to-date information. Organizations can cooperate with other organizations to develop an information sharing infrastructure and maximize the benefits of all stakeholders involved in the

value chain. The traditional business model was linear and could not reflect the cooperation. In developing a cooperation-based business model, we seek to maximize the value for all stakeholders in the value chain. Blockchain technology means radical change in the direct relationship between network nodes without intermediaries that agreement between nodes is based on their consensus. Features of new transaction is verified by nodes and all nodes are up-to-date about the information. The challenge of implementing Blockchain technology in the industry is not limited to technical feasibility, but requires a reengineering of the cooperation of business processes among the different organizations and industries. Utilizing this technology makes it easier to meet customer requirements and track the product or service transparently. This goal represents the role of information stream between organizations at the level of organizational processes. Proper integration between different businesses in the value chain requires the integration of their processes and information.

According to the qualitative research carried out in the field of developing the Blockchain Business Model in this paper, coding was performed for the scientific papers and documents. It was noticed that that in addition to 9 variables introduced in the value-based business model, there should be another variable in the development of Blockchain Business Model. The variable under discussion is introduced as "Cooperation". The concept of cooperation means analyzing and identifying business processes and information streams among different industries in the value chain as a cooperation-oriented activity. Organizations cannot independently design their business model for market development and profit. They should jointly review the required changes in the business model, in partnership with other stakeholders in value chain. Other blocks of traditional canvas model have overlapped like customers, partners and resources in the new Blockchain environment. With regard to exploiting the benefits of Blockchain technology, members can take the right decision at the right time and thus lead to an increase of profitability in the cooperation-based business model in the value chain. Due to complexity of business model planning, we conduct a system dynamics modeling based on the parameters observed during the qualitative phase. We design the business model with a view to each organization participating in the network to generate more value for others and itself. The proposed model consists of 3 main loops as Nodes, Transactions and Cost that could be related to customers, activity and revenue and cost generation in canvas blocks. The aforementioned model shows us increasing the cooperation among nodes and attracting more nodes or activity in network generates more value for all participants. The cooperation-based business model that could be implemented with Blockchain, could contribute to market evolution and produce new value stream that could not be achieved in an isolated manner. We recommend to customize the model for different industries and verify it for future studies.

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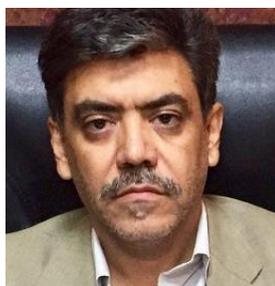
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