POLITECNICO DI TORINO

ENGINEERING AND MANAGEMENT - INNOVATION

Master's Degree Thesis

Integration of blockchain technology into the corporate organization

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Academic Year 2021/2022

Abstract

This thesis investigates the peculiarities of a technological innovation that represents the future, not only in the field of finance and companies, but also in the social field: the blockchain.

It is increasingly evident how this technology opens the door to new opportunities that can meet the increasingly overwhelming needs.

In particular, it emphasizes the value that it can have inside of the companies, the difficulties that it can go to resolve and the modalities in which it can make it. The integration of the blockchain inside the corporate structures represents an important paradigm shift and a substantial monetary investment for the company.

Innovation, however, is fundamental for every company to acquire and sustain competitive advantages over competitors. The blockchain represents a tool capable of giving these advantages, not only in the present, but much more for what the future will be.

Alongside the blockchain, in fact, many complementary technologies are being developed that will further expand the possibilities and will give even more value to the technology under investigation.

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CHAPTER 1 - Introduction to Blockchain

Overview

We are part of a world in which all the finance, transactions, contracts individuals take part of, are regulated by single institutions, the purpose of which is regulate and validate to ensure the security of these actions. Despite the great innovations that centralized entities have had over time, the increase in demand and the speed needed to accomplish these tasks, have made them obsolete and more and more anachronistic. Of course, nowadays, they are still the foundation of finance around us, but it is clear the needing of strive to find innovative solutions. The transition to new technologies it is going to be very complex, not only because of the sophisticated field under consideration, but because centralized finance (CeFi) is rooted in society for centuries and therefore has a regulation whose completeness can only be achieved in the long term.

The most promising solution that is developing in the last decade is that of decentralize finance through blockchain technology. This innovation abandons the set standards of CeFi to move into a perspective in which individuals can enter transactions or, more generally, have an interaction, without the need to interface with a central control authority. This change brings with it the more general concept of decentralized systems. Those are based on the idea that every user within the network has equal importance and governance is distributed among them. There is therefore no longer a central management power or a hierarchy. The goal, in fact, is to create relationships of trust between people who do not know each other, but who want to be engaged. The blockchain can be defined as a particular form of Distributed Ledger Technology – DLT (Figure 1) in which each transaction is

recorded in a ledger. The blockchain is therefore a growing chain of blocks, containing data, connected to each other within which users are linked together in a peer-to-peer (P2P) network.

Figure 1 – Blockchain as a particular form of DLT

Infrastructure

The blockchain infrastructure is very simple and can be investigated starting from a more general view of the network and entering each component more and more specific.

Ledger: Is the public register, which therefore ensures the transparency of the data, in which all the operations that take place between the nodes of the network are transcribed.

Network: Blockchain is an interconnected network of nodes that exchange digital information

Nodes: They are points of connection where it is possible to carry out operations of interaction between them which: receive, send and exchange data or information.

Blocks: They are the atomic basis of the blockchain. All transactions are transcribed within them. Each block contains a pointer to the previous one so that it is connected to each other and the last block of the chain contain all the information about the transactions.

Wallet: Is a personal software or hardware dedicated to store all transaction data.

Properties

Understanding the characteristics of the blockchain is a fundamental point to understand the importance and the use that can be made of it in the world around us. The most important of these are listed below and shown in Figure 2.

Decentralization: Information recorded within the blockchain is distributed between multiple nodes in the network, without the need for intermediaries.

Immutability: Once a transaction is registered in a block of the network it can no longer be deleted or modified by a single or a group of users.

Transparency: Anyone who is part of the chain is in possession of all the information that composes it and can view all the interactions that take place.

Trackability: For each element present within the network it is possible to trace in all of its life with, therefore, the possibility to trace its origin.

Privacy: Although recording all transactions in a public register, privacy is ensured through a cryptographic model based on an asymmetric public key system. In it each user is in possession of a public and a private key. The first

serves to encrypt the document, the second, which is known only by the individual user serves to decrypt it.

Security: All the properties mentioned above guarantee, together with the consent protocols, the security of the interactions that take place within the network.

Anonymity: The personal possession of the private key by the user guarantees anonymity in its transactions.

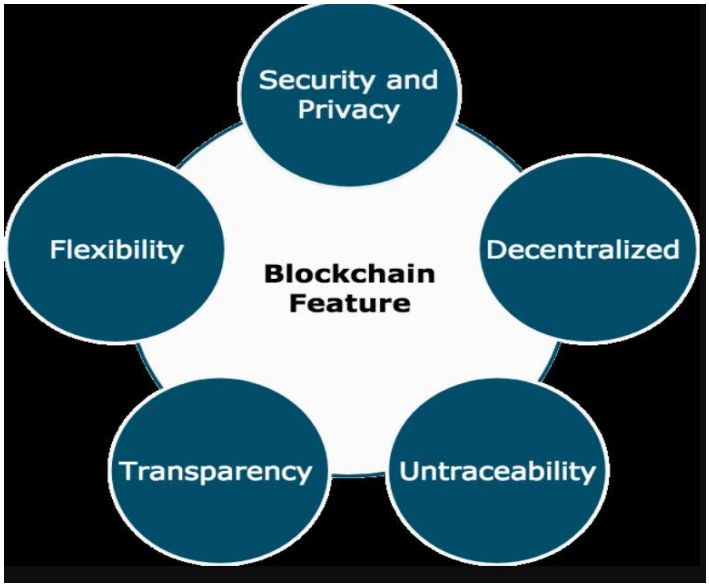

Figure 2 - Characteristic of a blockchain

Consensus protocols

The security of the blockchain is mainly given by its decentralization. Each node contains a copy of all transactions. This means that, to hack the network completely, an attacker should assault it in all its parts. This is obviously impossible to the contrary of how, instead, it can happen in a centralized system in which all the data converge only in one point. The

validity of this principle applies, however, only when the connection between nodes does not vary. When a new chain block is entered, because of this variation, the chain is vulnerable. The change, in fact, is initially represented by the only the ingoing.

For this reason, it was necessary to create a secure system for validating new entries. It was inducted into the "consensus protocol".

A consent protocol is an algorithm shared by the network to agree on what is the new block and who has the right to propose it to the chain. Its benefit is given by the fact that allow to evaluate whether a user is trustworthy, giving them the ability to validate a block. This ensures that the choice is made correctly, despite the possible existence of a possible number of attackers. Each blockchain must contain a consent algorithm to ensure the security of its transactions.

So basically, a consent algorithm has the utility of preventing users from behaving incorrectly and compensating for those who have good intentions. The goal is to have an automatic system to coordinate the network to insert the same new block shared by most of the network.

The most used and, to date, the most reliable are the Proof of Work (Pow) and the Proof of Stake (PoS) of which the main differences are reported in figure 3.

Proof of Work - PoW: It is the first algorithm designed for this purpose. According to it, to be considered reliable, the user, called miner, must demonstrate that he has already done actions within the chain thus attesting to his commitment. The miner, in fact, to have the possibility to validate the block must be the first solve an algorithm that is presented by the network.

Proof of Stake - PoS: It is a more equitable and less energetically expensive consent protocol. In those, to be able to validate a block, the user must place at least a part of their cryptocurrencies in a specific wallet, in which they are blocked. The higher the amount the user enter the greater the chance to be the validator of the transaction and to receive a reward, which will be proportional to the total invested.

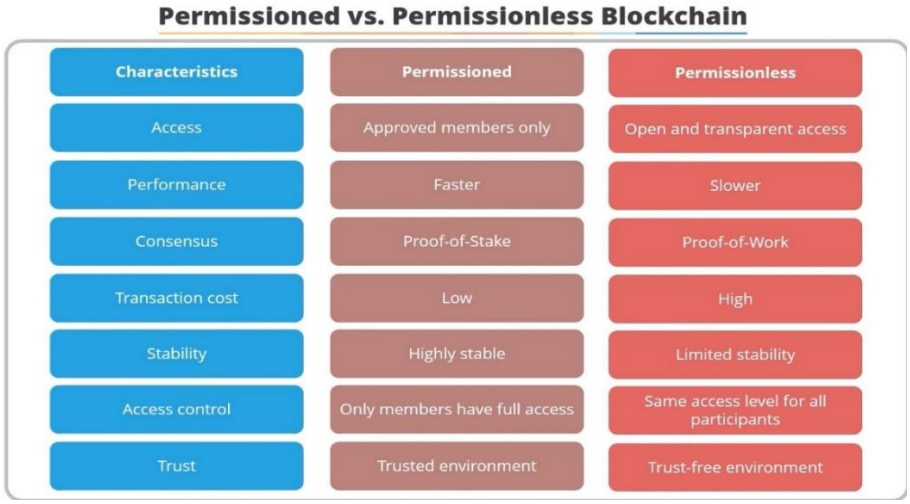

Figure 3 - Permissionless vs Permissioned blockchain

Smart contract

Smart contracts are agreements between parties in digital form, based on the use of algorithms that ensure the security and reliability of transactions in which the two or more nodes decide to participate. They are crucial in the decentralized functioning of the blockchain since there is no need for an intermediary to ensure the validity of the information contained. Moreover, it is this type of contract that guarantees the immutability and transparency of the network giving the possibility to find agreements even in the absence

of trust between the parties. This eliminates much of the negotiation phase and, consequently, improves the efficiency of the network.

However, the immutability of these algorithms is on the one hand a guarantee of safety, but is often too binding for contractors. For this reason, new functions are developing, for example the “c.d. kill”, of Ethereum. It can be activated only by the node that created the constraint, and it is able to present its self-destruction under certain conditions.

Limits

Since its inception, blockchain has encountered many problems ranging from social limits to limits inherent in innovation. Many of them have already been resolved, and others are being studied in an attempt to eliminate them or to limit them to a satisfactory level.

Double spending: The problem is that a malicious node could start a transaction and then, before its validation, spend the promised money. It is only appealing as blockchain developers have already found solutions to it.

Hacker attacks: This mainly occurs in "bridge". Bridges are links for conversion between one cryptocurrency and another. The defense against blockchain attacks is mainly given by its decentralization, but in these points converge large sums of value, making them attractive to attacks.

Scalability and congestion: Scalability is the ability of a blockchain to adapt to the number of nodes and transactions within it. The great growth that this new technology is facing in recent years puts a strain on developers. The congestion present in the nodes of the net drastically lowers the scalability, consequently, increases the slowness of the net.

Gas fee: They are quotas that are added at the time of the transaction for which a user will have to pay an amount greater than the value of what he had attributed to the purchase. They are poured into the net and allow the continuation of operation. The problem is that blockchains are getting larger and therefore expensive. For this reason, the gas fees are constantly increasing.

Energy consumption: The consumption of energy by blockchain networks is one of the most debated problems in the discussion on the social value that it can represent.

The sustainability of this technology depends heavily on the consent protocol used. Consumption is very high if it is based on PoW while, if you use PoS, consumption drops drastically.

In addition, it is important, in order to understand the impact of blockchain on the environment, to compare its data with those of the systems it would replace. As shown in the figure, for instance, both the cost and energy consumption of Bitcoin are much lower than the current banking system.

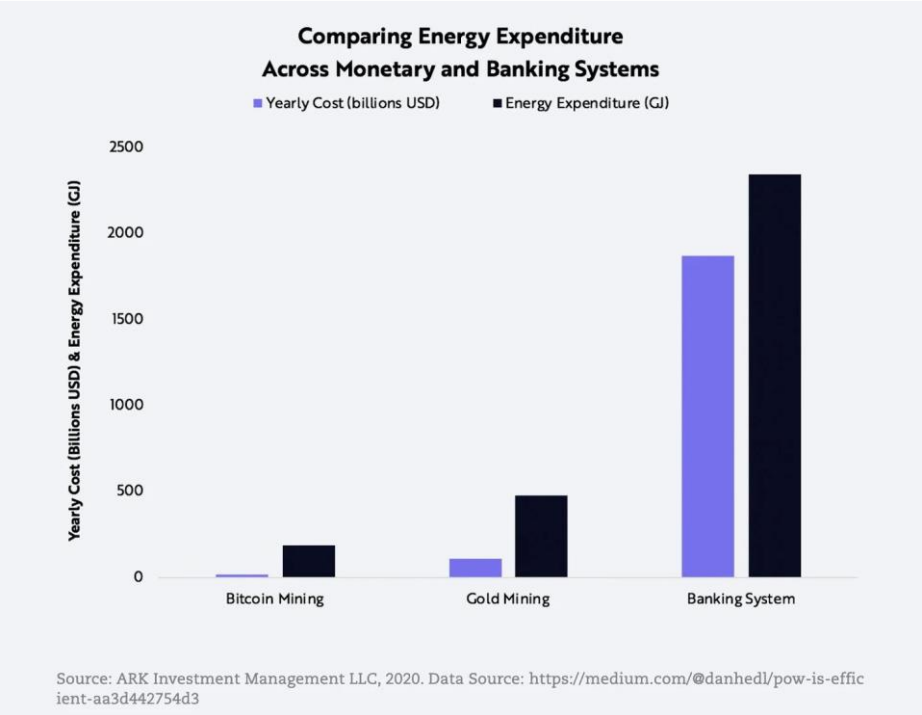

Figure 4 - Comparison of Bitcoin consumption with the current banking system

Categories

A feature that defines a blockchain is the simplicity with which a node can become part of the network. For this reason, the concepts of permissionless and permissioned are born. With the first is meant that any node is allowed, without any identity verification, to join the network. With the second are described the network that restrict access to certain nodes with the ability to reduce rights. This allows them to be more efficient but makes them easier to corrupt.

- *Public*: This type is characterized by being completely decentralized and permissionless. In them, in fact, each node has equal rights and the verification of transactions and validation of blocks is done through the PoW or the PoS.

- *Private*: Unlike the former, they are permissioned and validation management is centralized. In private blockchains, each node can have different rights. These features mean that transaction validation is faster, but at the same time, they make the network more vulnerable. They lend themselves well to exchanges within companies or with their partners.
- *Hybrid*: The goal of these blockchains is to exploit the advantages of the former. They can be both permissionless and permissioned. The data can be public and/or private and participation is determined by the members. These properties make it highly customizable.
- *Consortium*: These blockchains were created with the aim of being used by several partner companies. For this reason, they are permissioned and governance is distributed, but only between some nodes of the network, which makes it only partially decentralized. They are safer than the public and are more decentralized than private networks.

Use cases

IoT

The blockchain and the Internet of Things are subject of many projects that are developing in recent years. In coordination they can create important synergies that many companies have identified and they are trying to exploit.

With the term Internet of Things (IoT) is meant the online interconnection of data between multiple objects through the use of internet. This information can be interesting, as reliable inputs to a blockchain. On the other hand, this

data needs to be exchanged and analyzed securely within the objects network and this can be done with the help of a blockchain.

One of the big problems that is happening in the blockchain is that of data congestion in nodes. The Internet of Things allows to manage and share data between multiple nodes, even locally, helping to reduce the need for use of the global network. This will not only reduce congestion-causing information flows, but also reduce costs and transaction times. The ability to exchange data between devices interconnected by the IoT, is also going to prevent the fact that the block of a node of the blockchain network does not completely freeze the network, but the flow of data can continue locally. Within the IoT network, in addition to the exchange of information, monetary transactions can also take place. They are often for quick use and of small amounts and therefore require a network that can guarantee these services and that has small payments fees.

The importance of coordinating these two technologies is not limited to the synergies they can create. They lend themselves as a base of cutting-edge uses in various fields such as manufacturing and supply chain.

Supply chain

The supply chain is a complex system composed of more actors and infrastructures that are connected. It includes every step of the process and production of a good or service. This structure lends itself well to the use of the blockchain with the possibility to exploit it ranging from the supplier to the buyer as reported in figure 5.

The main uses are connected and traceability the factoring, identity and history of the product and enforceability of contracts.

As regards the former, since transactions are immutable, the blockchain gives, at each moment, the possibility of having the security of the billing value of the product concerned.

The second, probably the most useful, is also based on the immutability characteristics of the blockchain. This is complemented by the fact that each transaction must be reported in the network ledger. This makes it possible to keep track of the development of the life of the good, certifying its characteristics, originality and actual value. This also has a more general importance for companies. It allows an overall evaluation of the goods that are being produced and of the services that are being given, becoming a fundamental factor in logistics for, as an example, the values to keep in stock or the possibility of reuse of certain products.

As for the last one, instead, the concept of smart contract becomes of fundamental importance. For each transaction, before it takes place, an algorithm must be stipulated with inscribed obligations of the parties. If this is not accepted, the transaction will not take place. Obviously, all this will be immutably transcribed in the ledger, so that the billing of the good or the service will be visible to every user of the net and automatically verified and enforceable by the network.

Product traceability and certification thanks to the registration of transactions in a chronological register, enable an anti-counterfeiting systems, useful especially in the field of fashion, the exchange of information and the possibility of reconciliation between the different actors and the reduction of paper contracts and the consequent reduction of the times are just some of the benefits that the coordination between supply chain and blockchain carry and that can be applied for each participant of the chain, from the supplier, to the manufacturer to the final customer. They, instead of

creating a consortium, can be part, as simple nodes, of a chain that connects them to each other.

This coordination, however, still has serious problems. First of all is data privacy, which can be seen by the company as a competitive advantage over others and therefore is not willing to share within the network. There is a cultural problem, as this innovative technology has not yet achieved mass adoption and is, to most, unconscionable. Blockchain radically changes the structure of a company and for this reason it is difficult to integrate both in terms of the process, as it would be necessary to eradicate the inertia inherent in companies and dismantle current routines present, and for a cost problem of the platform that, mainly small and medium-sized enterprises have difficulties to deal with. Finally, there is an obstacle due to the embryonic regulation of the new technology which make it subject to interpretations and, therefore, not completely objective, making possible buyers careful in considering a possible investment and thus very reluctant.

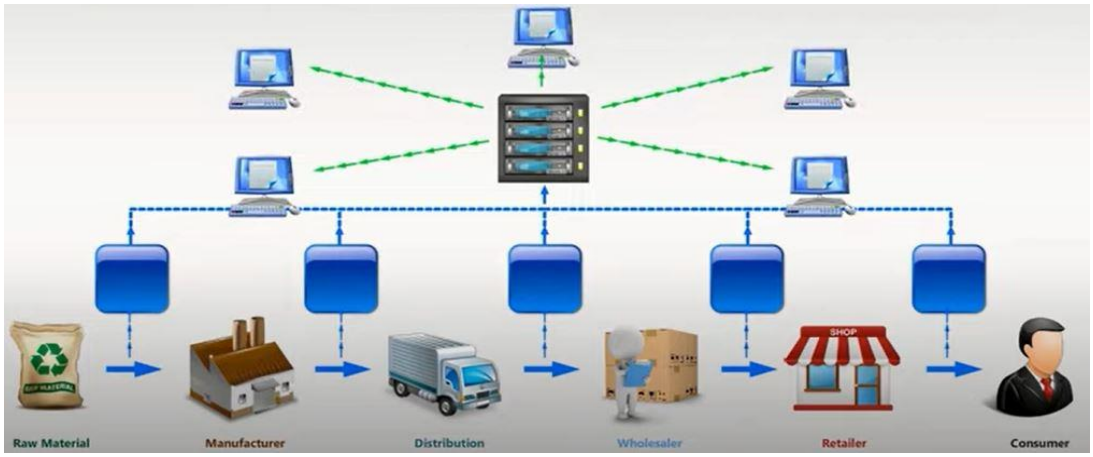

Figure 5 - Coordination between blockchain and supply chain

Cold chain

The cold chain refers to the process of freezing products that starts when the product is frozen at the time it is consumed. It includes every step: production, storage, transport and sale. During the whole process, the product must never, without interruption, rise above the temperature of -18 ºC, to ensure its preservation and edibility.

Again, blockchain can be a fundamental tool as a form of validity. The traceability of the life of the product is of fundamental importance for the guarantee of the edibility. It can be carried out thanks to a network in which each step of the process can be seen as a node where the condition of the food is reported.

MedicalChain

MedicalChain is a healthcare project. As is written in its white paper their goal "is to improve care for people by placing the patient at the center of the digital transformation of healthcare" as can be seen in figure 6, and to do this base their network on a double blockchain platform, using on the one hand Hyperledger fabric to validate permission and Ethereum for the registration of transactions and smart contracts.

MedicalChain is a medical company. The patient's reports will be the data entered into the network in the form of transactions. Consequently, a smart contract will be activated linked to the patient that will give limited access to his information. They can be viewed by other doctors for diagnosis or for new tests, but also by pharmacists for the sale of prescribed medicines. This allows the doctor to carry out thorough checks on the health life of the user even remotely. In addition, the patient also has the possibility to give access

to his medical records to the insurance institutions, which, in the case of improved health, could guarantee premiums.

Finally, patients will be given back rewards if they decide to distribute their personal data to health research bodies.

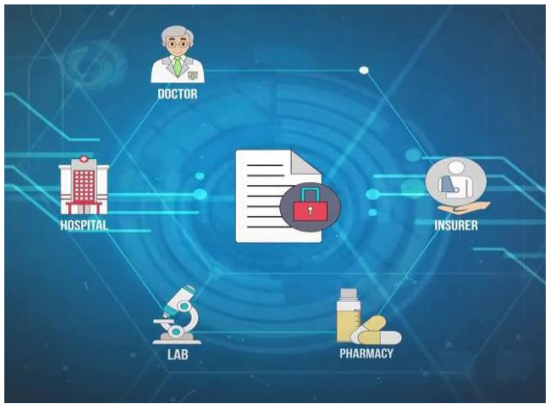

Figure 6 – MedicalChain

E-Vote

The institutional vote is a very high cost for a state both for the cost of the material and for the human cost of the actors involved: tellers, polling stations and security forces. In addition, it is not possible for every person to go physically to vote in their municipality of residence, for example of off-site students or people employed on business trips.

The blockchain allows people to vote electronically, solving or, at least, limiting all these problems. In fact, it is safe, anonymous and verifiable, thus guaranteeing those fundamental peculiarities for a fair election. In addition, having found a solution to the problem of the so-called "double spending" would be impossible for a malicious to vote twice.

Blockchain would have lower operating costs because manual control is not required. Even more, it would allow the entitled to vote remotely from any device connected to an internet network.

The basic idea is to make a validated transaction, through a smart contract, coincide with a vote. It is going to enjoy every characteristic of any exchange between the blocks: immutability, non-eras ability, security and anonymity. Essentially, the transaction involves a cryptocurrency of the voter that is transferred to the preferred deputy's wallet. The one, at the end of the election, that will have more cryptocurrency, will have consequently, received more votes from the users.

In the United States, the United Kingdom and Estonia, electronic voting has already been tested with satisfactory results.

CHAPTER 2 - Blockchain integration in corporate structures

Firm's structure

There are different points of view to define the internal structure of a company. A more static vision, in which, it is seen as an organized association of complementary resources and one, more innovative and more useful to fully understand the intrinsic value of a company, called "dynamic view", in which it is described as a set of organizational routines that involve and exploit resources, both material and human, moving in the same direction.

Based on these two visions comes what is called "Evolutionary Theory of the Firm", shown in figure 7, where the arrows represent the routines, and the men represent the resources. They cooperate to create the processes thought which an enterprise operates. The latter can be exploited in different way. Moreover, it is clearly visible that not all the ability of the resources are useful for the company. This gives a good overview of how each of them can be more suitable for one business rather than another. Even more, the potential that they present do not have general validity, because it depends on the routine in which they are involved and on the context in which they are immersed.

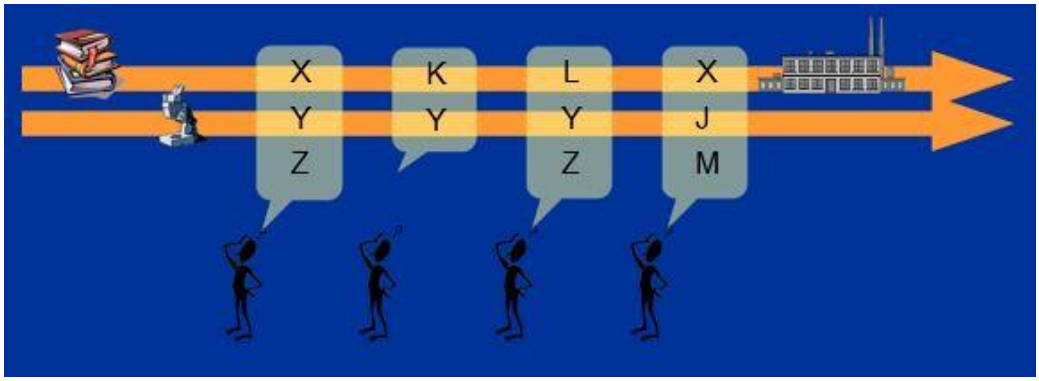

Figure 7 - Routines involve and activate resources

Routines are defined as those patterns of behaviors that are replicate constantly over time and that are placed in a consequential way activating the necessary resources, creating a business process. They define the way in which a company is going to pursue a given objective and they bring great advantage to it since the constant replication of them leads to an increase of efficiency in the process. This is the so called “learning by doing”. An example of increasing efficiency may be related to the fact that human resources understand how to operate better a function giving improved performance and becoming faster and faster. The routines, however, also bring critical issues. They, in fact, are the main responsible for the inertia, both cognitive and actional, that permeates the companies: once learned the best way to maximize its value, a process becomes more difficult to change, although in favor of a more valuable and, in the same way, once incorporate a notion it is difficult to change perspective.

The resources, instead, are the actors, material or human, to disposition of the companies. These, initially, are an investment that must be addressed. The return they give is different depending on the typology. Human capital, in fact, has the value inherent in its being, plus a value of knowledge that its hiring can give. Material resources, on the other hand, can be exploited to

the fullest of their value and life, but they can also be seen as fixed capital in case they continue to have a commercial validity even during their use.

The strength of these two concepts gives birth to what are the organizational competencies of a company. They define the performance that the company is able to complete, they represent its value and, moreover, they make the knowledge hard to imitate by competitors. Based on a process of decision-making are investigating those competencies that are defined as "core" which are particularly distinguished. They are the ones that are the main focus, for which is fundamental to ensure a constant growth, and the continuous implementation of the underlying resources. They represent the real added value and characterize the market segment in which the companies can exploit their potentiality giving them the maximum profitability.

From the core competencies derive the competitive advantages, that represent the way in which a company is more attractive than others.

From the evolutionary theory of the firm came the perspective of the Resources Based View - RBV, which system is represented in figure 8, the company is investigated in its internal structure. It is precisely the resources and routines and the way in which they operate together that give a competitive advantage over others. According to this vision, in fact, it is essential to invest in these ideas because they also give the sustainability of the advantage. A self-evolve company during life according to the concept of "learning by doing" creating a path dependency making its competencies not replicable and inimitable, also because immersed in a context where not everyone is surrounded by.

In the RBV the sustainability of the competitive advantage is well described by the VRIO analysis. This process has been developed to investigate which are the resources that have the base characteristics that can give to the company the opportunity to be more profitable over the competitors. To provide this strength to the enterprise a resource has to be valuable, so it has to bring something valuable to the process. It is necessary to be rare and difficult to imitate. Those two concepts are correlate. On one hand is important that the resource is not in commonplace with the others and at the same time it has to be costly for them to copy. The last property is linked with the internal structure. The investment, in fact, must fit well with the structure and the processes already existing. They need to support the development and the exploitation of the new resource giving even more importance to the concept of the environment in which it acts.

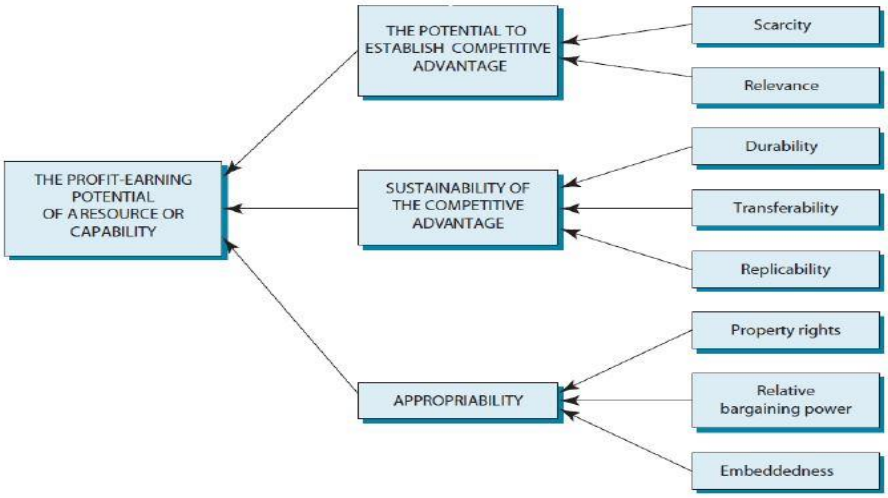

Figure 8 - Resources Base View - RBV

In this view, it becomes central to accurately assess the value of a resource. It is not the same for each company but varies according to its structure and

skills. In general, a resource is a capital investment and the fundamental idea is that it has to generates a return that is equal to or greater than what is spent to be a justified expenditure.

Value post integration > Acquisition price + Integration costs

Where the value post integration reflects the revenues that the resource is able to generate, the acquisition price is the initial investment and the integration costs represent how much has to be spent to be able to integrate a new resource into the company routines.

Integration costs are a major obstacle to business innovation. They are difficult to assess accurately and are often seen as avoidable costs and they are difficult to legitimate by a top manager to the shareholders. This, combined with the tendency of companies to inertia makes growth and change difficult. Moreover, in most cases it is impossible for a manager to also justify a changeover that leads to the abandonment of a profitable project for one with a higher future gain that is affected by greater uncertainty.

Innovation

To develop and grow an entity needs constantly progress, changing and adapting to its environment and market needs. These procedures are based on the concept of innovation. It can be defined as the economic exploitation of an invention. The last, in fact, is only an idea, while the second constitutes an entire process that starts from the basic concept going to reach the diffusion of it.

*Innovation = Invention * Commercialization*

Innovation drives a business. It creates value, that could be commercial or social, from one or more ideas.

As shown in Figure 9, the first step of the innovation process, in which there is the discovery, is fully carried out by research institutions such as, for example, universities. At this stage there is large investment by the government and is characterized by strong uncertainty. During the second phase, called "Applied research", companies begin to participate, even if in a very isolated way, starting to invest in the invention. The third stage, where is began to develop the product is divided into two parts. In the pre-competitive there are still investments by the state, while in the second, the post-competitive, all the risk is borne by the companies that start to fully compete among them, creating the emerging paradigms. In this phase, the first prototypes are born and they are tested through the Minimum Valuable Product - MVP, up to the creation of the final product. The last step is the diffusion of it, with its mass adoption by customers and settle the standard. Only after reaching this stage the initial discovery can be finally called innovation.

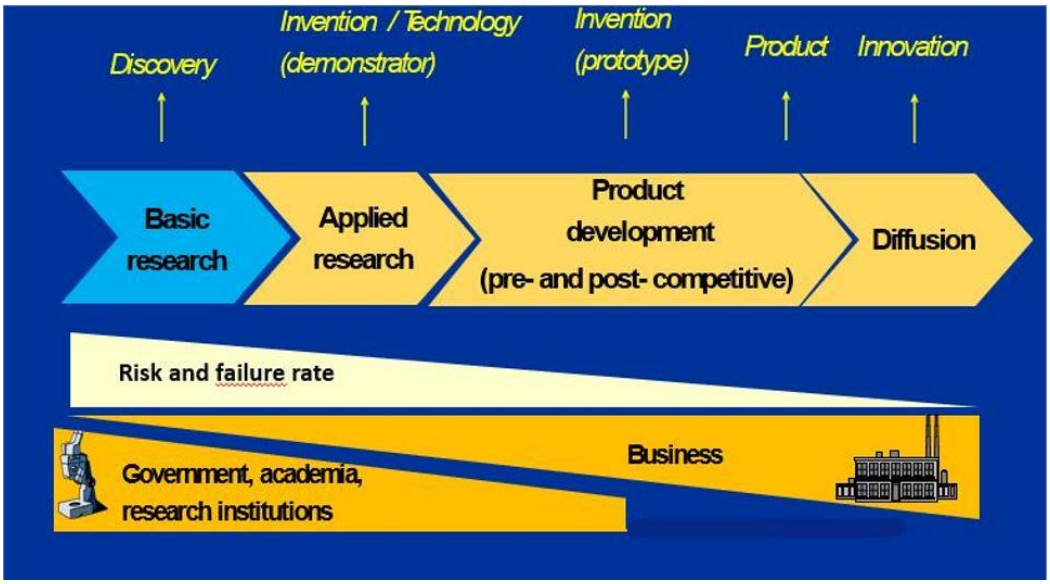

Figure 9 - The process of an innovation

The risk is greater in the first steps, decreasing in later parts but it is precisely in those phases, in which there is great uncertainty, that a possible investment may be more profitable and can give more competitive advantage to a company. This happen also because, adopting it earlier, the incumbent can choose the best way in which they would act against the competition and the new entrants.

Types of innovation

The innovative process can have different pressures. It may be due to a new need that arises within the market from the needs of customers and is called "demand-pull". This is an approach that takes place from an external request and goes to modify the internal features of the development. The second determinant can occur reflecting the birth of the new paradigms. A "Technological paradigm" is the meeting point of the supply side and the demand side, where the market stops, seeing it as a better solution that cross

the needs of both parties, creating e outline the innovation trajectories. Once adopted in the processes, it can open to new opportunities and to the requirement of the complementary needs on which companies decide to focus in order to fully exploit the potential of the paradigm. This process is called "technology-push". The paths based on the determinants can be visualized in figure 10 where they are seen on an example of a technology roadmap.

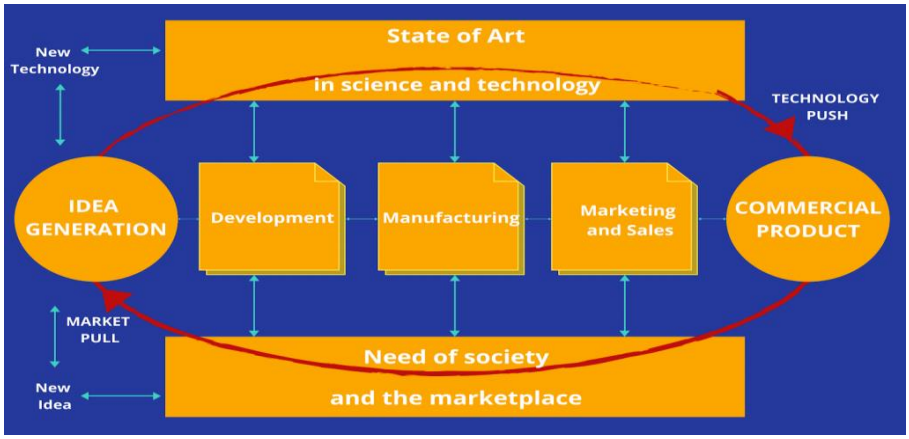

Figure 10 - The process directions based on the determinants

There are different types of innovation, they are classified according to their impact within the company. The classification therefore depends on the innovation itself, but also, to a large extent, on the structure of the enterprise in which it is sought to integrate it.

The taxonomy of the innovation is based on the intrinsic change that it brings with it. If the focus is on the technical features of the product, it can be defined as incremental or radical depending on the modification of the trade-off that define it. The new technology can be seen as competence enhancing or competence destroying depending on the skills required to develop the product. An innovation is considered “core” if it affects the main

functionality, otherwise it can be classified as “peripheral”. Finally, it can be “sustaining” or “disruptive”. The second lead to significant change in the internal structure of the company, but also a significant change in the positioning in the market or, in the most significant cases, to a segment change of it.

Innovation can change what is the relationship between the components of a product and between the actors of a process or it can go to modify what is the technology that is at the base.

Therefore, as shown in figure 11, the types of innovation are:

- *Modular innovation*: It brings with it a change in the reference technology, but it is quite easy to integrate as the relationship between the components remains unchanged.
- *Architectural innovation*: In contrast to the first, the components interface with each other in a different way but refer to the same technology. It is more difficult to fit into the internal structure, but is, in most cases, less expensive.
- *Incremental innovation*: Is the easiest to achieve as it is simply a natural development of the process, without going to change anything in the structure.
- *Radical innovation*: Is the most expensive and risky. There is a total change, both from the point of view of technology, both in that of the relations between the parties. Often companies are reluctant towards this type of innovation and tend to avoid it. To pursue it they prefer to move in small steps through small changes brought about by less risky innovations or integrating them potion by potion in the internal departments.

Relationship between components / Reference technology	Do not change	Change
Do not change	Modular innovation	Radical innovation
Change	Incremental innovation	Architectural innovation

Figure 11 - Types of innovation

Finally, it is also important to underline the concept of disruptive innovation, that is, the kind of change in the needs of the market that lead a company to the failure of the goal if they are not able to adapt to it.

Under certain conditions, innovation can cause serious damage to the businesses of an incumbent. This occurs when they are unable to fit into the emerging paradigm due mainly to the cognitive or action inertia that makes the company stuck in what it already knows. The second explanation is due to the "Christensen effect" that occurs when the incumbent does not take into consideration an emerging market, which then growth rapidly proving to be of fundamental importance to be considered.

There are, however, many reasons why a technology can be harmless. The first is the wrong reading of the life of the old one. It can happen that it becomes difficult to implement it further, giving the idea of being impossible to improve it. With an additional investment in R&D, however, it could still be exploited more of its potential, which, in some cases, can be more profitable than that brought by the new technology. A second reason could be the switching costs. They represent the monetary efforts that a costumer has to face changing from one product to another. Often, the idea of having to bear

this expense makes the buyer reluctant to change. Another reason is the possible lack of the necessary complementary assets. Finally, there is the problem linked to the so-called “appropriability regime”, that is, the extent to which radical innovation can give an economic value and retain it to the proposer. This makes the creator reluctant to share details with suppliers, denying the implementation of the innovations themself.

Blockchain as an innovation

The blockchain prepares itself to be a great technological resource for companies, but it constitutes first of all a social innovation. It must overcome the difficulties that people have in adopting a tool that is not just an advanced substitute for something that already exists. The blockchain completely changes what are the conception, the hierarchies and the way to interweave between people.

Blockchain is, therefore, primarily a social innovation. The education of the masses to this new resource is the basis of its diffusion. Indeed, it poses a change of perspective with respect to the society in which people have always lived and act. There is no longer a concept of centralization, but instead a decentralized vision in which key institutions, such as banks, that have always guaranteed security, working as intermediaries in economic transactions, will no longer be necessary. Of course, this new technology is going to require a new infrastructure, financed by large investments that the mass will be reluctant to accept.

Like any new technology, the blockchain will no longer require certain work figures, for example, lawyers and notaries who will be replaced by automatic smart contracts. This will make the implementation of the platform even

more challenging. However, it must be stressed that, while on the one hand there will no longer be a need for some bodies, new figures are going to born necessarily, for instance, competent persons capable of maintaining the technology.

Moreover, there will be a change of vision also of the trust between the people, not more important as before, since there will be the new platform to guarantee the security of the interaction, probably also modifying those that will be the standard relations of the population. Figure 12 represents this concept well. The new decentralized user arrangement is at the heart of blockchain innovation. In many cases, society and companies still refer to a central control body, which, after the adoption of the new technology will no longer be necessary, thus also changing the links between the actors of the different interaction and processes.

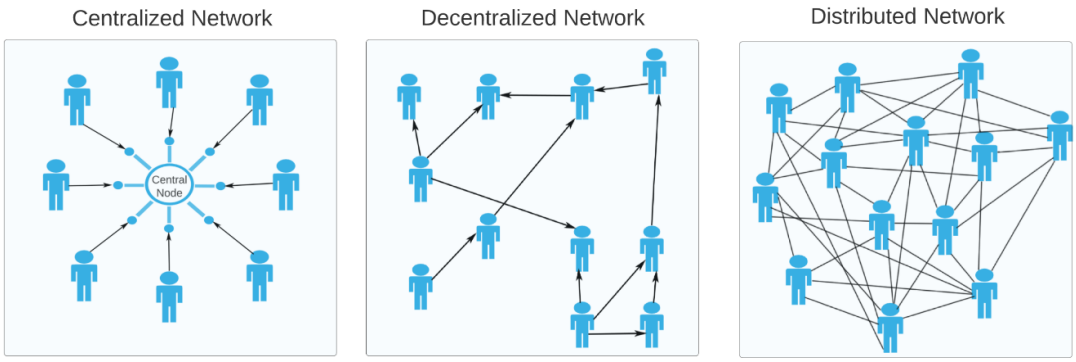

Figure 12 - Change in users' interactions

The education to the blockchain can be promoted in economic way, giving monetary prizes, based on cryptocurrencies, to those who will begin to use and exploit it. This will be a risky investment for platform developers but is necessary because the mass adoption of technology will allow, in addition to

facilitating integration of it, to have savings in terms of sustainability and scalability. It will also be important to highlight the importance of stopping investing in commodities such as gold and silver and to start investing in assets that can give more opportunities in the market and could be more eco-friendly in the future.

For all these reasons, change will happen slowly and gradually, making the institutions at the base of society obsolete. It is, however, equally evident that there is a need for a change of perspective, which abandons past canons and turns to the future in a view in which the individual increasingly has in his hands the possibility of choosing, self-forming herself, without the need to give account to anyone, select the way she considers most appropriate. The blockchain gives the individual more freedom of decision-making, both in the financial sphere and, more generally, in the management of his own person.

Taking into account the business scope, in each company there is a research and development - R&D department to which companies devote specific investments. This is because there is always an eye on the future to anticipate the needs of the market and to differentiate themselves from other competitors in the market. The R&D department serves to try to develop ideas internally. When this does not happen, to keep up with the times a company must take third parties of innovations, investing usually larger capital in it.

Business processes are gradually becoming digitalized, moving towards increasingly cutting-edge technologies that allow the various components to be efficiently interconnected. The IoT or the Cloud system, for example, is now an integral part of every business system. Supplement these new technologies to the existing must be done conscientiously. This means that a safety department must be developed in addition to them. In fact, they

cannot be physically insured like other equipment, but they need a digital guaranteed tool, called cybersecurity.

The change in social perspective reflects the shift in perspective that blockchain gives to interaction. This also applies at company level. It brings with it the need for major structural changes in an enterprise and consequently high integration costs. Its adoption, in fact, need necessarily a technological change and at the level of reference platforms.

Depending on the company structure, it can be seen as a modular or radical innovation. The blockchain does not necessarily change the interactions between users and their coordination, it just changes the modes. If they have the ability to adapt to new technology without the need to add or the need to eliminate components or actors, then it will be easier for an enterprise to insert the new platform.

As already pointed out, the blockchain, is an innovation that goes to modify processes not incrementally. It presents itself as a strong change and for this reason top managers are very reluctant to adopt it. In addition, it needs many complementary systems that constitute an additional cost. Digitalized platforms and competent personnel are just part of what a company requires to fully exploit the potential of this resource.

The path, both in the cultural and corporate sphere, of the blockchain would be to implant themselves in the structure in a gradual to be less disruptive as possible. Too radical a change would be very difficult to sustain for companies and socially not accepted.

Since there is not yet a common standard, this new instrument has a wide field in which to move.

An idea to reduce the initial investment of both, platform and energy cost, can be that of co-development between companies, especially those in the same supply chain of a product.

Blockchain in the Metaverse

The Metaverse is a digital reality that aims to reduce to the point of eliminating the gap between the physical and the virtual world. In it are offered experiences, based on Virtual Reality (VR). These immersive events are experienced through the use of an avatar created to your liking.

The Metaverse is flanked by core technologies such as IoT, Artificial Intelligence (AI) and, more than any other, blockchain.

Within this digital world there are all the commodities that one can have in the daily life to which ownership is associated. These assets are represented by the Non Fungible Tokens - NFT that can, therefore, be referred from clothing for their avatar to rewards for some actions of the users, but also to properties in the Metaverse. Blockchain technology ensuring the certification of ownership of these assets. Secondly, in the Metaverse users can have Peer – to - Peer (P2P) transactions through cryptocurrencies. Again, blockchain is critical to the security and decentralization of these. Moreover, thanks to the latter feature, organization can be taken part with more people in an autonomous way.

Finally, thanks to the technology under examination, it is possible to certify the identity of users within the digital world by eliminating the possibility of illegal actions.

In conclusion, as reported in figure 13, the blockchain represents a fundamental complementary asset for the Metaverse. t is a digital proof of

ownership thanks to authentication, allows the transfer of cryptocurrencies, ensure accessibility and manage user governance and interoperability.

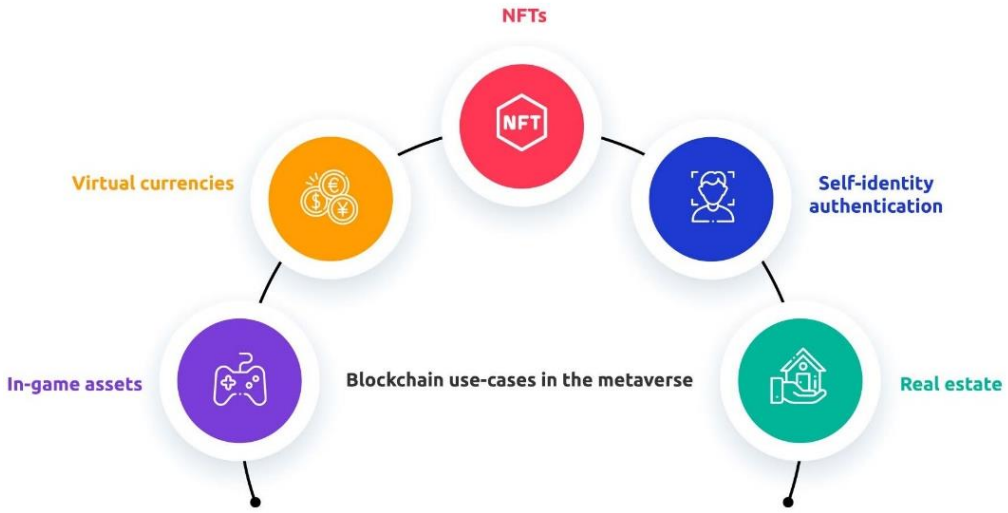

Figure 13 - Application of blockchain in the Metaverse

PROJECT

VarGroup S.p.A.

Vargroup S.p.A. is a consulting company for small, medium and large enterprises. Its focus, in fact, is to support customers in innovation and consolidation of technologies. It is part of the SeSa S.p.A. group and is a leader ICT market on the level of knowledge and competences.

This is done through a process that relies on in-depth knowledge of technologies that can add value to companies. It starts from an analysis of the internal structure of the institutions which require advice on a given technology. From these two factors, the experts present within VarGroup, can carry out a feasibility study on the possible integration of the resource within the customer's routines. In addition, it also provides the ways in which synergies can be best exploited.

VarGroup develops internally in a matrix structure. It is, in fact, divided into departments with vertical specialization on a specific market and on resources that can be of value, for example fashion, and one, horizontally oriented, that puts its focus directly on a technology, capable of adapting within different markets and integrating in different types of companies.

Moreover, it also supports enterprises in interacting and entering new environments, opening new opportunities through the internalization of them.

Figure 14 - Data referred to VarGroup S.p.A.

Hackathon

Hackathon is a topic-specific event in which industry experts challenge each other in an effort to find innovative solutions to present problems.

In particular, the workshop organized by VarGroup, of which Figure 15 is the flyer, focuses on Web3.0, Metaverse and blockchain. It is structured differently from the others. There is not a single equal challenge for all

participants. In this case, each group is affiliated with a problem relating to a business case of a specific company. This group will have thirty-six hours to face and try to solve it, relying on the technologies of interest, in the most optimal way in reference to the internal structure and needs of the linked enterprise.

In the months before it has been focus of the host company to take the recruitment of the companies and the participants.

The challengers are chosen after their voluntary candidature that could be both as a single and as a team composed of five members.

As for the company side, instead, recruitment is a more complex and structured process. In the first phase, companies' spontaneous applications are evaluated or there is direct recruitment by VarGroup for companies with potential for the event.

From here, there are the first contacts to understand if the innovations protagonists of the Hackathon can have a value within their structure. It is on the hand of the VarGroup experts to indicate in which departments they can be useful and what needs they can go to solve.

During a second meeting, it will be the responsibility of the companies, supported by the team of experts of the host enterprise, launch the challenge and then, decide what will be the business case that the team connected to them will have to address.

The last step is to prepare a file for each case study that will be presented to the subject team of the challenge made by a VarGroup team and a clip of presentation of the values and the history of the company made by themselves. These will be given to the competitors so that, they can evaluate with as much data as possible the optimal solutions to the business case.

During the three days of the event, the teams will work in the direction they deem most appropriate, accompanied by a representative for each company. These, will then also be the judges who will evaluate the final winners.

Figure 15 - Flyer Hackathon VarGroup 2022

Objective

The purpose of this project is to find a model of general validity that can be used by companies to understand, according to their needs, problems, sector of belonging and internal structure, whether and how to integrate blockchain technology into their organization.

To do this, ten different companies, immersed in different markets, will be analyzed. Each of them presents difficulties in meeting new needs in their sector. It will be highlighted possible solutions relying on the innovation subject of interest. Some of them have common factors. They may belong to the same market segment or seek solutions to the same needs. This will

make possible the search a model that can have a more general applicability, than can be disconnected from the company itself in order to be linked, instead, to the factor.

The result will give the possibility to a future company, that will research this type of advice, only identifying itself within this system, to understand whether the blockchain can optimize its structure.

1. **Business structures**

   The business model varies from company to company. It is strongly influenced by the environment in which they act and the structure of their competitors. This, however, does not mean that in every market segment companies are structured in the same way. On the contrary, it is often through this feature that the enterprise seeks to create a differentiation and, consequently, a competitive advantage over those who produce its substitute products. An intuitive way to analyze the different business model of an enterprise, as shown in the figure 16, is to use the "Business Model Canvas", in which the elements of value and criticality of the company are reported.

   Moreover, the structure of the business is also strongly dependent on the existing complementary assets. This suggests how, the birth and diffusion of an innovation can lead a company to completely change its vision and composition.

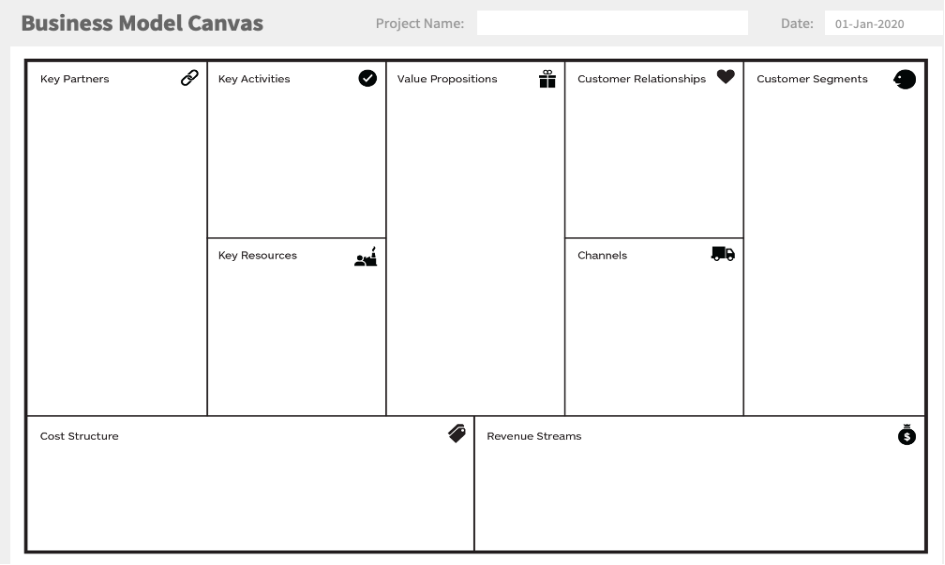

Figure 16 - Business Model Canvas template

There are common points and big differences between the models analyzed in this project. Obviously, every company has a perspective on innovation and technological advancement, witnessed by their willingness to participate in the Hackathon organized by VarGroup. Linked to this, there is an increasingly sustainable vision of their structure, trying to have a low environmental impact and, in many cases, even in the core products of their business.

Many businesses are similar to each other despite referring to completely different markets, while others are completely different despite belonging to competing companies.

Some of them, in fact, base their business model on the sale of high-quality products, starting from high-level and very expensive raw materials. Others relying on selling at discount, therefore, trying to sell their products at the lowest possible price. Even these companies try to have quality in their products as best as possible, but their focus is more on selling based on large retailers.

Large differences, however, can be seen in the vision and study of the market. Some companies, in fact, are completely immersed in the market in which they operate, for example in the field of clothing, trying to make the most out of all the opportunities that it grants and moving within it. Others, on the other hand, try to expand into more markets at the same time, using their competences to cope with the needs of different consumers looking for products that are not similar. Within the first type, moreover, there are some characteristics that differentiate the companies that are part of it. Some enterprises try to cover only one market segment, but in a complete way, others instead place their focus only on a specific part of it, satisfying a smaller slice of demand, but very effectively.

Some entities of this investigation place the customer directly at the center of his vision or in a more marginal mode. However, only some of them have direct contact with it. In fact, despite the fact that most of the companies under investigation use as a distributor of the stores owned, some of them exploit, in part or completely, third-party distributors to reach the consumer. Moreover, extreme cases have also been found in this area. Some of them are themselves distribution companies for third-party manufacturers, while others exploit the concept of having the entire supply chain concentrated in a single point.

Another way that some of these enterprises use to get to the customer is digitization. They use, therefore, the internet and, especially, e-commerce to get feedback and to sell their products. However, not all have this vision, bringing some examples to improve in physical contact with market needs.

In most cases there is an attempt to collaborate with companies in the sector and those that are part of its supply chain. This is done to make the most out of the complementary assets that are made available by this cooperation.

The last big difference emphasized by this study is the one concerning the client. Some have a business model for selling to other companies (Business to Business - B2B), others come directly to the final user (Business to Consumer - B2C), other use both, also in consulting perspective on the core business product. In some cases, finally, they try to reach the customer using its client companies as transit in a B2B2C model.

2. Market segments

The market segment in which a company is immersed strongly influences its structure. As already pointed out, the analyzed companies have business models and the visions very different and articulate to one another. The link between an enterprise and a market segment, however, carry other connection, which lead to include in them all the surrounding environment where they are immersed. The products, the competitors and their structures and perspectives are a starting point on which to base themselves both for the incumbents and for the entrants. On the one hand you can try to imitate the successful ones, but on the other, in a more abject perspective, many companies try to create their competitive advantage precisely through the differentiation of their structure and their internal organization.

Within the project, it has been tried to differentiate the market segments as much as possible in order to create a more complete investigation base. At the same time, however, also underline the differences between companies in the same field was evaluated as representative for the creation of a model of general validity.

The market segments are varied among which are listed: clothing both luxury and sports, large distribution, sponsorship, food sales, hedging, betting, lottery and grocery.

3. Challenges

The challenges faced by companies are based on the obstacles they are facing. The consensus is that blockchain can be a fundamental resource in overcoming the difficulties to which their market segment submits them. Obviously, the challenges depend also on the assets that the enterprise already possesses and on those that miss her. This, together with the study of the structure of the company gives life to the attempt to understand how this innovation can guarantee the overcoming of problems.

It was interesting to note that often the challenges launched are common to companies belonging to different fields, while, in most cases, those belonging to common market segments have tried to approach radically different needs.

The attempt is to offer a greater value to its customers, this, however, is sought through the exploitation of different opportunities that the blockchain guarantees.

Increased loyalty and fidelity are the main reasons why companies decided to attend the VarGroup event. In different areas, often without anything obvious in common, it is becoming increasingly difficult to keep the customer within their own program and brand. Related to this problem is that of customer engagement, enlargement, and customer rejuvenation and, in the field of sports, fan base. The research starts from the search of a modality with which the customer is more involved in the company vision.

The blockchain, thanks to its immutable transcription of transactions in the common register, makes product traceability possible. As a result, thanks to this peculiarity of innovation, it is possible to certify the quality of the product that is placed on the market.

The problems addressed are very diverse and, in some cases, very detailed. One of these companies has a clientele that comes from different historical contexts that, presenting themselves together in the stores, for example, mother and teenage daughter or, even more, grandmother and granddaughter, make the purchase of products complex. Their vision of products makes them reluctant to choose each other. The intervention is therefore aimed at bringing the different generations together.

Another concern is the still immature legislation on blockchain. A new business model that exploits this technology must fit within the current regulatory framework still poorly defined and, given the difficult user-side usability of Web3.0, for example the portfolio setup, It is not an easy obstacle to have a clear benefit for the consumer in terms of transparency, guarantees and protection.

Some of the companies that have turned to VarGroup for this project are facing a radical change in Modell business. For this reason, their focus is on using this technology to facilitate the transition. Each change in vision and structure brings with it new skills and abilities, but necessarily also leads to the loss of some values. The study focused on understanding how blockchain could help to avoid losing these capabilities and how it could provide greater synergy in the links between the company's business chains.

Finally, investigating the consumption of their product, some enterprises have found that, thanks to the help of some complementary goods, it was used more frequently. For this reason, attention has not been paid to a direct improvement, but to the improvement of the structures that, used in correlation, go to ensure greater prestige to the focus product of the company itself.

4. Possible solutions

Company A

Market segment: Food.

In addition to ensuring a certified product in line with the sustainability standards of its supply chain and the production procedures of Company A brand products, the enterprise aims to raise the loyalty of its consumers through consumer engagement strategies that attract the Z and Millennials generations.

The project structure is based on gamification logic attached to the technologies provided by Web3.0, Metaverse and blockchain. Starting from the base of those technology platform that guarantees the quality certification of branded products, until you get to the logic of

gamification through the production of branded NFT or the story of the product through the avatar in AR encoded in Metaverse that "instruct" the consumer and at the same time entertain him.

Company B

Market segment: Food.

The challenge launched by Company B was to exploit the Web3.0 to educate the consumer to a change of perspective compared to what is its flagship product: ice cream. The research has developed in a perspective of change from the common vision of the product that, to date, can be consumed only through ice cream shops, trying to see it as a good that can be cooked by anyone and anywhere.

Ice cream must become a homemade meal. Company B is, in fact, changing its business model, from a fixed store to a temporary store or delivery. The company now aims to sell packaging made from quality raw materials. Thanks to them, the consumer can prepare ice cream in his daily life and in the comfort of his home.

It is essential that everyone, once they buy raw materials, knows how to exploit them. To do this, the Metaverse is an economic and effective tool. Thanks to its virtual reality structure, customers can have a direct interaction with Company B staff. The instructor, who in this context can be represented by its founder, thanks to his experience, will make the customer able to prepare ice cream starting from the raw materials marketed by the company itself.

Company C

Market segment: Large Distribution.

The distribution company, from a market analysis, has been able to find that the consumption of drinks is greater if the customer is engaged in a secondary activity in front of a screen. The proposal is therefore to use this result to try to make the consumer passing from drinking any drink to drink "drink C".

To do this it is wanted to, through a collaboration with big online streaming brands such as, for example, Netflix or YouTube, bring the customer to have a better experience ("premium" experience) if the beverage produced by the company C is consumed while using these platforms. This partnership would be based on blockchain with the use of smart contracts.

The user consuming this drink will have access to the "Company C-Verse" in which these collaborating platforms will be present in Web3.0 and where, thanks to the exchange of NFT brand in the community, the user will be enticed, first having access to this world and, secondly, through advertising campaigns through NFTs, to consume the "drink-C".

Company D

Market segment: Sport.

The difficulties facing Holding D, especially after the period of the pandemic, are manifold. In particular, the company aims to expand and rejuvenate its fanbase by increasing its loyalty, to bring people back to the stadium and to exploit the international following of the team.

Thus, it is wanted, therefore, to try to exploit Web3.0 and, in particular, Metaverse to bring young people closer to rugby and

especially to "Team D". The experiences on this platform must create a strong bond and loyalty for international fans and serve as a bridge for young people to become passionate about the sport and lead them to undertake physical experiences, mainly, going to see the "Team D" at the stadium.

Company E

Market segment: Regulated Game.

The difficulty that the company E is facing is that of the responsibility of the user towards the world of betting.

The idea is to expand the range of functions made available to customers compared to those that the Web2.0 could guarantee. In particular, we want to leverage Metaverse and NFT to increase customer engagement and responsibility.

The user is evaluated through an "R-score" relying on, not on the gain, but, through the data available to the company, the analysis is made based on the quality of the game. The rating scale is divided into 25 ranges, divided into three categories. The higher the range in which the R-score will be placed, the wider the Web3.0 experiences the user will have access to. To further stimulate the customer, exclusive physical events will be offered for the five with the highest R-score.

In the Metaverse, moreover, the user can play in virtual structures of the company E in a perspective of "play for fun" in which there is the possibility to accumulate R-coins (always through an evaluation of R-score) that can be used to continue playing in this reality or be converted into Company E-Points.

Company F

Market segment: Publishing.

Books are increasingly being purchased online. Company F's goal is to get customers back into physical stores. The mission is therefore to exploit the Web3.0, that is something online, as a link to bring the user to have a direct physical experience with the product.

The most suitable platform for linking these two visions is the Metaverse. The idea is to give the customer an experience in this universe, making it move in digital stores with themed rooms on this platform. Access, however, is guaranteed by poap that can only be physically withdrawn in the store, thus leading the user to live this part of the experience. The poaps, issued periodically, also give access to a cutting-edge community linked to the company F to which you can offer advantages over customers who buy only online.

Company G

Market segment: Clothing.

The mission of the company G is to bridge the generational gap between customers who present themselves together in stores (for example, mother and teenage daughter) and to make the supply chain more sustainable.

One solution is to let the different generations interact through pop-up experience directly in the stores of the brand. Customers can, in the form of an application, scan a QRcode, which will give access to a virtual world. Then there will be the possibility to create your own avatar with which to move in this universe dressing it with the garments produced by the company G, chosen according to the event

you want to participate in a gamification experience "play to earn". Rewards are represented by experience coupons for both children and parents, and access to exclusive events and clothing lines.

Thus, the blockchain will be used for the traceability of raw materials of products that, in this new model can be certified of their authenticity and quality. Instead, the customer will be equipped with an NFT for certification that will also have the utility of maintaining the distinction between new and used product.

In the new vision, in fact, the products will also be sold secondhand, reducing the environmental impact of the company.

Company H

Market segment: Luxury Clothing.

Company H is looking to leverage the Web3.0 platforms to innovate its brand. The obstacle that immediately the luxury clothing company found was the lack, customer side, the tools to make purchases in this new universe.

The attempt is, therefore, to create a greater involvement of the user in the purchase through platforms Web3.0 regarding the traditional methods of payment. To do this, it is necessary to take advantage of the wider opportunities to which they give access. In particular, with the purchase through their digital wallet the customer will get not only the garment chosen, but also an NFT that will guarantee the authenticity of the product and, in addition, it will give access to an exclusive community of the company H where discounts and limited edition content will be made available.

Company I

Market segment: Sportswear.

Company I is an innovative company in the field of sportswear. The company wants to use new technologies based on Web3.0 to give value to customers. The challenge to face is due to the different types of consumers of Company I and, consequently, to the different market needs that these innovations would have to face in order to satisfy them simultaneously.

The solution could be to reward customers who actively interact with the sports environment and Company I products. The attempt is to create a hierarchical reward system based on the activities carried out. On the one hand they can be sporty, like going for a run or a walk, on the other they can be represented by the purchase of brand products or by participation in events. All this would be traced by a blockchain technology linked to the user's wallet and rewarded with tocken and NFT. The latter would refer to discounts in stores and/or access to physical.

In addition, with an eye to environmental sustainability, Company I is committed to planting a tree whenever a predefined amount of token is reached by users.

Company J

Market segment: High-quality Clothing.

The problem that Company J is facing is mainly that of customer engagement and traceability of product quality that, to date, is not part of the internal structure of the brand.

The company's mission is to digitize products using Web3.0 technologies to certify the authenticity of its products and increase customer loyalty.

The idea is based on the development of an application that can scan tags inserted on clothing. These, referring to Near Field Communication - NFC that allow access to a wallet. Therefore, the history of the product will be made available to the customer, highlighting the entire supply chain and, consequently, ensuring the quality of the garment.

Through the NFC and a possible implementation of NFT, there will then be the opportunity to increase customer loyalty, linking these digital assets to discounts or other exclusive rewards.

This new vision will also bring benefits in terms of sustainability. Thanks to the new technologies of Web3.0, the company will be able to use reselling in a safe and certified way.

Company K

Market segment: Large-scale Grocery.

Company K does not have a customer loyalty program active in the territory in which it operates. As part of a highly competitive market, for which Web2.0 has already been widely exploited for this purpose, the company sees new technologies as an important tool to make up for this lack.

In this project, loyalty wants to be achieved through customer involvement in a gaming experience. By purchasing certain products, Company K-points are accumulated and converted into NFT. These, give access to discounts in certain products in stores. In the shops

themselves, you can also find QRcodes, which, once scanned, represent another access to shopping points.

Gaming is well conceptualized by the NFT already created and by searching the QRcode stores.

CONCLUSIONS

The aim of this thesis project is to research common aspects that link the factors analyzed previously in this chapter. Companies that, today, want to interface with blockchain technology and in some way, even more generally, to Web3.0, will be able to use this paper for an assessment of the actual advantage of integrating these technologies in their internal structure and, even more, on how they can interface and respond to their difficulties.

The path of the project was to first analyze the link between the internal structure of the company, the market sector and the problem to be addressed. Important common factors have already emerged at this stage. It was also fundamental to analyze in depth the characteristics of the market in which the company is immersed. The solution of the problems was the second part which gave the true conclusive meaning to the project.

The main aspects to highlight are factors related to the type of product you want to market. A high-quality product is conditioned in a very lateral way by the competition, but linked to it, there are great problems related to anti-counterfeiting and certification. This need, to be able to verify the quality of the good that you are buying is solved, company side, in wide way, by the blockchain with its system of traceability, transparency and immutability of transactions. On the customer side, in most cases, NFTs have been

developed, again linked to blockchain technology that can certify the originality of the product.

On the contrary, in market segments characterized by great competition, for example that of large retailers, the main problem to be met is that of loyalty and customer engagement. Again, blockchain is a fundamental tool for solving the problem. In this case, however, not directly, but as a complementary asset. The technologies on which the proposals were based were mainly the NFT, which were linked with rewards for loyal customers, and the Metaverse, which was associated with a part of gaming to bring the customer to the brand to increase customer engagement.

Interesting was, analyzing these first two factors, product quality and market competition, that more companies, immersed in the same environment, have encountered opposing difficulties based on their business model and the type of goods they are marketing.

As already highlighted, the company's vision is important. The same problem can lead to completely opposite needs and, therefore, challenges. This was the case of two companies that are interfaced with a change of business model. On the one hand, the company that wants and is facing this shift has tried to exploit new technologies to move better in the new paradigm. The other company, instead, for which change is already widely in place, wanted to try to use these tools to keep the customer tied to the traditional vision. In the first case, blockchain technology was fundamental for the new type of marketing and was also used the Metaverse to connect the user with the new business model. On the other hand, in the second case, the virtual reality was used, but in this case, to bring the customer closer to the previous vision of sales of the product.

Great difficulty was given by the presence in the market where the company operates of a wide variety of customers, characterized by different needs. In this area, more than in others, it becomes essential to collect as much data as possible. This problem is well solved by the structure of the blockchain, able to keep track of all the data and store them in a safe and unchangeable way. These can then be analyzed and exploited for future implementations of their internal organization.

The generational change and the different needs and visions of customers are a problem that, on the one hand, is linked to the previous one of data collection and on the other the need is to develop a search for a bridge that acts as a link between the different perspectives. Metaverse, able to put customers in direct contact with a new point of view of the product, thanks, mainly, to a use in the gaming field, was the innovation to which several projects of this type have referred.

In conclusion, as already predicted, it was impossible to find a single common resolution point for each problem. This, however, is due to the fact that every business organization is different and, for this reason, even being part of the same market sector, the difficulties will be distinguished. For the same reason, even the solutions will not be the same.

The project, however, has been largely satisfactory. Many common elements have been found that link the different factors examined. This means that, a company that is faced with the same difficulties can use the solutions found and reported in this paper to its advantage, even just as a trace on which to base the new investment.

CHAPTER 3 – “Swimming pool S.p.A.” Case Study

Introduction

For this case study we are placed in a scenario of a company, called by convention "Swimming Pool S.p.A.", born a few years ago. Its objective is to open new digitized structures and clean up obsolete ones. The facilities, made available to customers, will host activities related to the water concept, such as swimming pools and spas.

The purpose of Swimming Pool S.p.A. is to reconcile their structures with others already existing in the general field of health, for example in villages of gyms.

The company’s vision is to give customers a more immersive experience in wellness. Not only that, Swimming Pool, aims to have an environmentally sustainable supply chain.

The challenge to face is to be able to give the final customer a complete knowledge of the concept of water, its possible uses in the field of well-being and to insert it into a comprehensive vision of the wellness.

POSSIBLE SOLUTION

Create a partnership between several companies related to the world of well-being, for example, supermarkets, perhaps linking in particular to some line of products, gyms, spa and so on, through a blockchain type consortium. Any company that wants to be part of it must pay or provide a service to Swimming Pool S.p.A..

Business model

The business model, reported in figure 17, will be divided firstly by an initial investment based on public funding. The project, in fact, has social value as it aims not only at the construction of new structures, but also at the redevelopment of existing ones. In addition, the contribution made in the education of the population to raise awareness of the issue of water will be important.

The revenue stream will be largely covered by the payment of an entrance fee by companies that want to be included in the partnership.

The second revenue factor will be related to the services used by individual customer in Swimming Pool facilities.

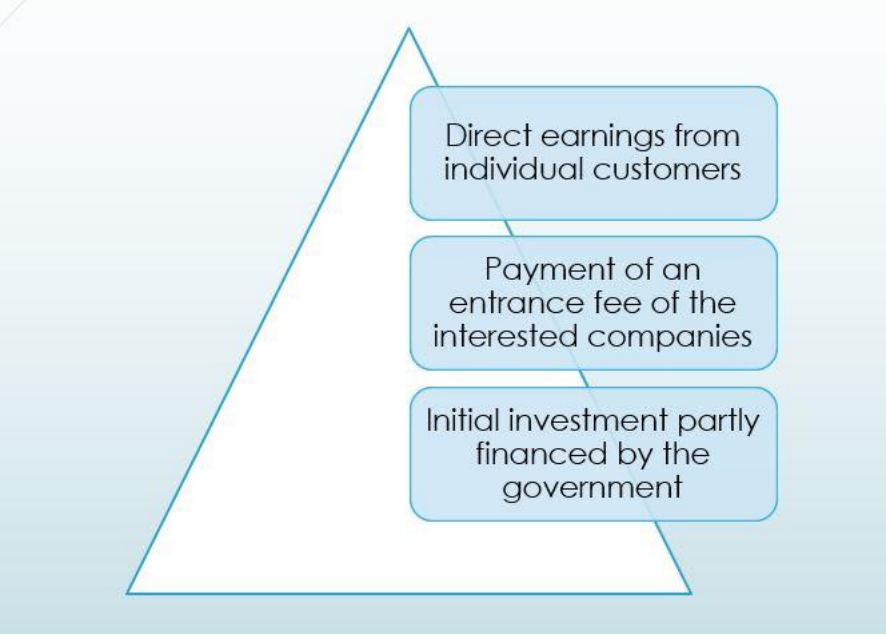

Figure 17 - Business model scheme of Swimming Pool S.p.A.

Structure of the possible solution

- *User*: Each user, already in possession of a personal wallet, is equipped with a digital card in which are enclosed its transactions with the blockchain consortium. Each user can choose the entities that have permission to see the information contained in the card (It can be used the blockchain Hyperledger fabric).

- *Proof of Health – PoH*: The card can be used by the partnership as "Proof of Health - PoH". "Health" evaluated based on the quality of actions, it does not necessarily mean "the more you do the better". It can give the user access to discounts in the facilities affiliated to the partnership. In addition, not only those who behave healthily, but also those who, starting from an unhealthy routine basis, workday by day to improve it, can be rewarded. This will guarantee to Swimming Pool S.p.A and to all the companies of the partnership loyalty and customer engagement. The quality of the behavior can be assessed according to the analysis made by insurance companies to guarantee premiums.

- *Partnership*: As already mentioned, partnership will ensure to bind more companies from different fields, but united by the value of the search for well-being.
  In this structure, as shown in Figure 18, the customer is at the center and acts as a bridge of communication between the partners.

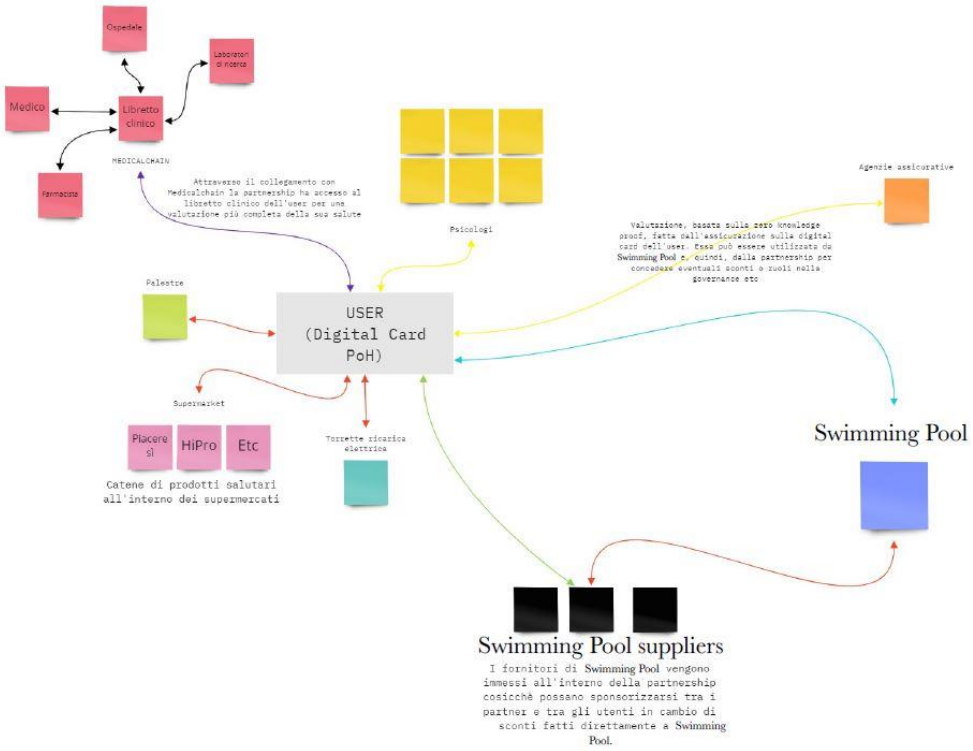

Figure 18 - Partnership: User POV

LEGEND:

Green Arrow: Information

Grey Arrow: Money

Red Arrow: Information + Money

Purple Arrow: Information with zero knowledge proof

Yellow Arrow: Information with zero knowledge proof + Money

Blue Arrow: Information + Money + Job Exchange/Reward

Black Arrow: Relationship not managed by partnership

At the same time, in the view represented by Figure 19, Swimming Pool S.p.A is at the heart of the collaboration since the values of the latter must reflect those of the founding company.

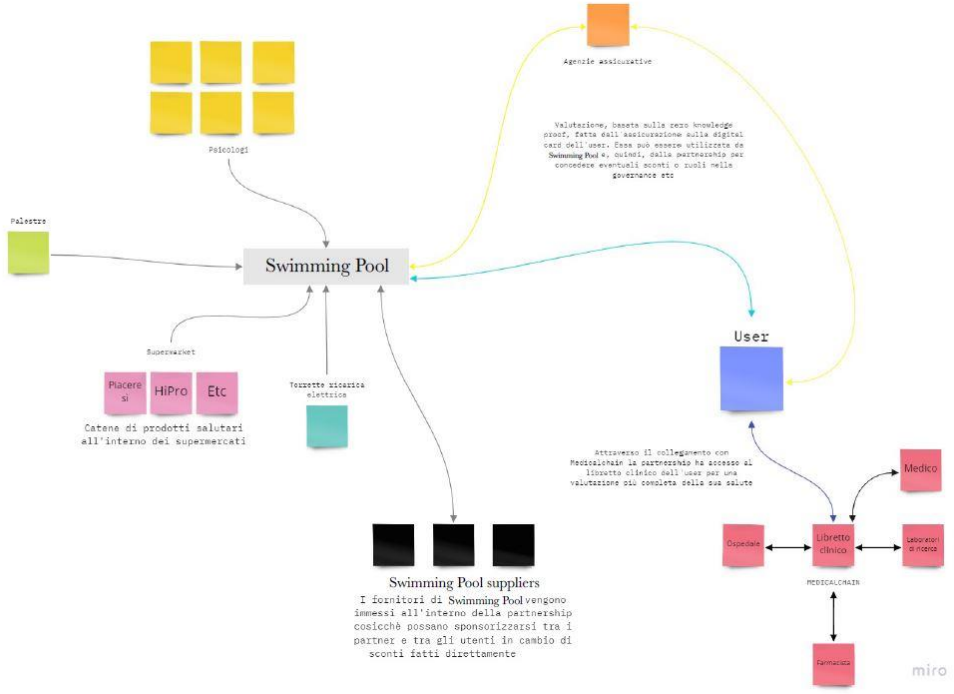

Figure 19 - Partnership: Swimming Pool S.p.A. POV

LEGEND:

Green Arrow: Information

Grey Arrow: Money

Red Arrow: Information + Money

Purple Arrow: Information with zero knowledge proof

Yellow Arrow: Information with zero knowledge proof + Money

Blue Arrow: Information + Money + Job Exchange/Reward

Black Arrow: Relationship not managed by partnership

- *Insurance agencies*: There will be the possibility, on the part of the user, to give access to information to insurance agencies for any insurance premiums based on the healthy behavior of the user relying on the data contained in the card (Figure 20).

Figure 20 - Insurance Agencies Rating on the user's card for any rewards

LEGEND:

Yellow Arrow: Information with zero knowledge proof + Money

Blue Arrow: Information + Money + Job Exchange/Reward

- *Swimming Pool suppliers*: Also, the suppliers could be inserted in the consortium. This would allow providers to advertise themselves among network users and companies, in exchange for discounts made directly to Swimming Pool at the time of the investment (Figure 21).

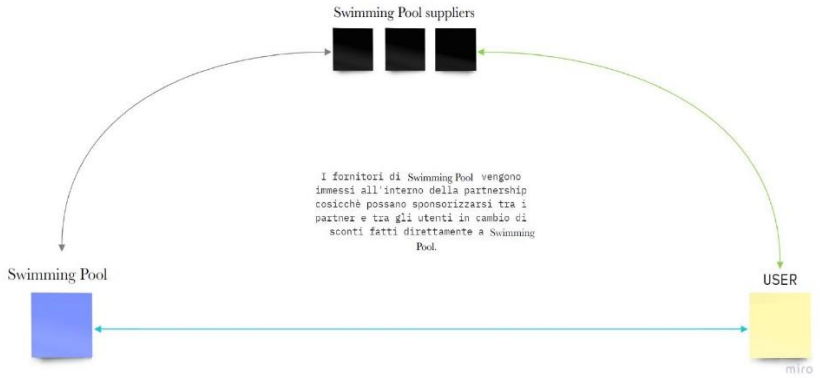

Figure 21 - Supplier ties within the partnership

LEGEND:

Green Arrow: Information

Grey Arrow: Money

Blue Arrow: Information + Money + Job Exchange/Reward

- *Interaction between Swimming Pool and the user*: Users will themselves be an important resource for Swimming Pool S.p.A. as shown in figure 22. In particular, the relationship could be structured as follows: the user pays Swimming Pool for the services that the company provides. It exchanges information with the user's card and, in addition, if the assessment made by the insurance agency on the card is within certain ranges, Swimming Pool can grant discounts, or see the user as a reliable resource so that the company can propose work within the structures themself or, even more, give the customer some role in governance. The more important the user contribution becomes to the company, the greater the reward it will receive.

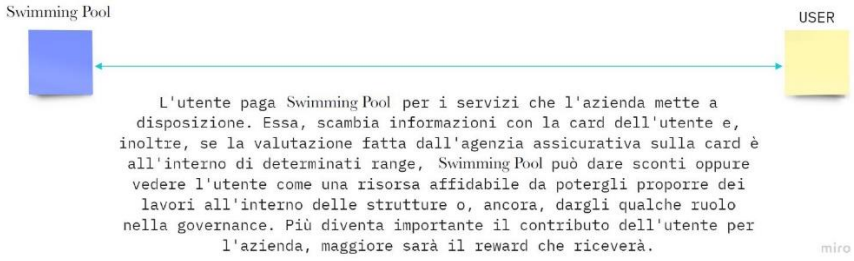

Figure 22 - Interaction between Swimming Pool and the user

LEGEND:

Blue Arrow: Information + Money + Job Exchange/Reward

- *Possible implementation*: In case the user makes use of it, there could be the possibility to tie the card to the medical record and consequently to everything he had already given access using MedicalChain, already discussed in chapter 1.

  All this can then expand from physical well-being to mental well-being through the entrance of psychologists or meditation. In this context, it

may be important to include Trainect in the collaboration. Trainect's mission is to help companies improve and monitor workers' well-being in an engaging and easy-to-use way, increasing team building and productivity. Trainect was born from the founder's passion for sport and outdoor activities, new technologies and innovation. In particular, they are not limited to physical well-being, but also focus on the emotional, social and financial side.

Another possible development could concern the environmental and sustainability field, for example by connecting the partnership with turrets to power electric cars.

- *Role of the blockchain*: As represented by figure 23, the blockchain has a fundamental role for the development and the realization of this solution to the attempt of widening of Swimming Pool S.p.A..

  It is indeed a necessary and fundamental resource in many of the key aspects of this idea.

  In the first place it binds through a consortium the user to every company or participant of the partnership. It also connects enterprises to each other.

  Secondly, it transcribes in a transparent and immutable way, all transactions that take place between the participants so that the data can be safe and recorded in order to be the basis for the prosecution of the collaboration.

  The blockchain will give the user the right to give access to his data to those with whom the customer is interested in interfacing. These can also be filtered by Zero Knowledge Proof, which guarantees the

truthfulness of the information without giving access to unnecessary details.

Finally, thanks to the characteristics of this technology, it will be possible to create binding contracts between members without the presence of a central control authority. This will ensure greater security and simplicity of transactions.

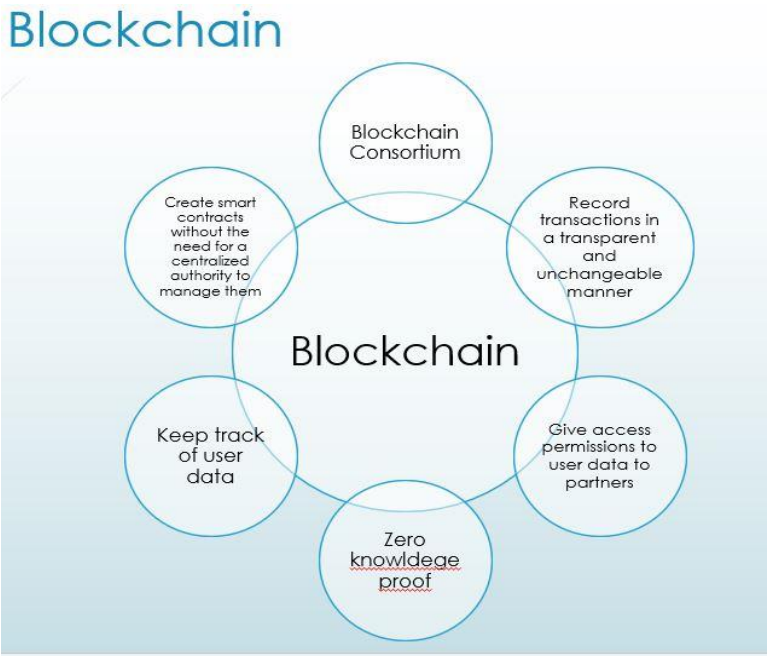

Figure 23 - Role of the blockchain

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