Department of Business and Management

Chair of Digital Marketing

A BLOCKCHAIN BUSINESS MODEL: THE SIAE CASE

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INTRODUCTION

In recent years, the world has faced rapid changes in many different contexts. New digital technologies are revolutionizing the way we live, but not only. Inevitably, the digital transformation has introduced new devices that in turn have changed the way customers buy products in the marketplace, influencing their needs. To meet these new trends, the only solution for marketers is to focus on multiple advertising channels, both online and offline, after conducting careful data analysis.

In such a scenario, what can, and should businesses do? As businesses increasingly need to provide instant solutions to their customers' needs, they are called upon to adapt to this reality. However, change is not a simple and immediate process. It requires the renewal of working methods and processes and the strategies on which they are based. This allows companies to become more efficient by being data-driven and to gain profitable advantages such as exploiting more business opportunities.

Nowadays, one of the main problems facing businesses is finding a way to store and analyze data securely. Considering that traditional storage solutions are not able to handle the increasing amount of data, blockchain technologies are the most widely used and appropriate to securely store large data sets.

The aim of the following paper is to present, following interviews and documentation collected in the field and through the voice of the protagonists, how SIAE (Società Italiana Autori ed Editori), a leading company in the cultural and entertainment industry in Italy, has chosen to plan the development and innovation of its business by pushing towards a new "digital frontier": the use of blockchain technology for a more efficient management of its members' copyrights. The aim of this work is therefore to highlight how SIAE is a virtuous example of a company that is making innovation one of its key principles and a model to be followed by companies that would like to undertake a similar path.

The thesis will be structured as follows: in the first chapter an analysis of the existing literature on marketing will be conducted, going into detail on how digital transformation has impacted on Brand Positioning, Product Development, Communication and Advertising, Sales and Channels Strategy and Customer Relationship Management. The second chapter will be initially dedicated to blockchain technology, providing its history, main features, types, pros, and cons, and then moving on to a detailed study of its application to the SIAE case. Finally, in the third chapter, the descriptive part of the project proposed by the same company to the MISE (Ministero dello Sviluppo Economico) and accepted by the latter will be explored.

CHAPTER 1: THE ROLE OF DIGITAL TRANSFORMATION WITHIN THE FIVE MARKETING PILLARS

This chapter describes how digital transformation has revolutionized each of the five levers of digital marketing by introducing new methodologies and technologies. In addition, it analyses the emerging trends resulting from the new digital world and provides both examples of how companies are reacting to them and guidelines on how they should behave in relation to them.

1.1 Segmentation, targeting and brand positioning

1.1.1 From segmentation to customer community

Habitually, marketing begins with segmentation. According to Philip Kotler et al., it is "*A practice of dividing the market into homogeneous groups based on their geographic, demographic, psychographic, and behavioral profiles*"[1]. This process is normally followed by targeting. The same authors define it as "*A practice of selecting one or more segments that a brand is committed to pursue based on their attractiveness and fit with the brand*"[2]. Segmentation and targeting are essential features of a brand's strategy. They enable companies to achieve a more efficient allocation of resources and a more precise positioning in the market. In addition, they support marketers in reaching multiple segments, each with differentiated offers.

Nevertheless, segmentation and targeting also demonstrate the vertical relationship between a brand and its clients, like hunter and prey. These two processes are commonly referred to as "*Unilateral decisions made by marketers without the consent of their customers*"[3]. In fact, marketers themselves decide which variables define each segment. Clients' involvement consists only of their inputs in market research, which usually come first the segmentation and targeting phases. However, customers, being 'targets', often feel encroached upon and annoyed by irrelevant messages addressed to them. In fact, many evaluate one-way messages from brands as spam.

As Philip Kotler continues in his book "*In the digital economy, customers are socially connected with one another in horizontal webs of communities. Today, communities are the new segments*"[4]. The author is keen to point out that, differently from segments, communities are naturally composed of customers within the boundaries they define themselves. Customer communities are resistant to spamming and irrelevant advertising. In fact, they will refuse a company's effort to push its way into these networks of relationships.

[1] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.47
[2] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.47
[3] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.47
[4] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.48

The author explains that "*To effectively engage with a community of customers, brands must ask for permission*"[5]. In fact, Permission Marketing is precisely based on the idea of asking customers for consent before delivering marketing messages. However, when asking for permission, Philip Kotler adds that "*Brands must act as friends with a sincere desire to help, not as hunters with bait*"[6]. This proves the horizontal relationship between brands and customers. Nevertheless, the author believes that companies may continue to use segmentation, targeting and positioning, as long as it is made transparent to customers.

1.1.2 Digital Anthropology as a new way for market research

Recently, marketing literature described customers as the most powerful actors. However, marketers often ignore the human side of customers, which is particularly evident in the digital era. As Philip Kotler explains in his book "*Customers are not perfect, and they feel vulnerable to marketing ploys"*[7]. For this reason, they build communities to strengthen their positions. Marketers should try to adapt to this new reality and create brands that behave like human beings. Brands should also have specific characteristics such as becoming authentic and honest, admitting their faults and stop trying to look perfect.

Guided by core values, human-centric brands should treat customers as friends, becoming an integral part of their lifestyle. Moving to Marketing 4.0, the author expects an increasing importance of human-centricity. In fact, he believes that "*Human-centric marketing is still the key to building brand attraction in the digital age, as brands with a human character are likely to be the most differentiated"*[8].

The process begins by unlocking clients' deepest anxieties and desires. It requires emphatic listening and immersive research into what is known as *'Digital anthropology'*. When the human side of customers has been discovered, it is time for brands to reveal the same. Hence, brands need to prove human attributes that can engage customers and build human-to-human networks**.**

According to the author "*Digital anthropology focuses on the connection between humanity and digital technology. It explores how humans interact with digital interfaces, how they behave in the context of technologies and how technologies are used by humans to interact with each other*"[9]. It can also be used to understand how people perceive brands in their communities and what attracts people to certain brands.

[5] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.48
[6] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.48
[7] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.109
[8] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.110
[9] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.110

In the context of human-centred marketing, digital anthropology provides a powerful way to uncover latent human anxieties and desires that brands should address. In the following paragraphs I will focus on the three most famous methods that are currently used by marketers.

1.1.3 Social listening

According to Philip Kotler et al. "*Social listening is the proactive process of monitoring what is being said about a brand on the Internet, particularly on social media and online communities*"[10]. Social listening can have several applications:

- It can be used in content-marketing evaluation to supervise the conversations taking place around the distributed content.
- It is an excellent tool to understand prospects in social selling.
- Social listening is also normally used in customer relationship management to find conversations that contain complaints or negative feelings and that can potentially lead to brand crisis.

In addition to those mentioned above, perhaps the most useful application of all is linked to market research. In fact, in traditional market research methods, such as telephone surveys or online surveys, customers do not always tell sellers what they really think of the product. They are not always able to express what they really think and do, even if they want to. Furthermore, traditional group-based market research methods, such as focus groups, often fail to decipher the social dynamics among customers that naturally take place in their real communities. This is where social listening stands out. Customers are more relaxed, and they feel free to tell their peers what they think and do. As the author explains *"Natural conversations in customers' own environments help them articulate their deepest anxieties and desires"*[11]. Hence, we can certainly say that social listening is crucial because it truly captures the social dynamics of communities.

1.1.4 Netnography

"*Netnography is a method that adapts the practice of ethnography to understand human behaviour in online communities. It aims to study human beings through immersion in their natural communities in a non-intrusive way"*[12]. Differently from social listening, netnography requires netnographers to become directly involved as active participants in online networks. They immerse themselves in relationships joining communities, engaging in conversations, and transmitting empathy towards community members.

[10] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.110
[11] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.111
[12] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.111

Usually, it is essential that netnographers reveal their goal in doing the research and ask permission from the community members. Whereas social listening mainly utilizes social media monitoring software to mechanically produce data visualisations, netnography still needs researchers to bring together their deeper insights. Hence, it often requires netnographers to think about what they perceive and what they individually believe when they become part of different communities. Therefore, to be a good netnographer, it is not needed only a high level of empathy but also a particular set of capabilities that not all researchers have.

1.1.5 Emphatic research

As Philip Kotler states in his book "*Emphatic research is a method that involves participatory observation and immersion in the context of customer communities with the objective of uncovering latent customer needs*"[13]. Emphatic research, differently from social listening and netnography, is based on in-person observation, dialogue, and collaboration between researchers and community members to reach relevant insights.

To guarantee a multidisciplinary human perspective, the research process usually includes a varied team of psychologists, anthropologists, product designers, engineers, and marketers. Team members aim to join customer communities and monitor their behaviors. The particularity of emphatic research lies in the fact that, coming from different backgrounds, each team member normally achieves different results. Once the results have been collected, the team members must confront each other through a few brainstorming sessions. The insights produced through this method often lead to the development of a new product or a new brand campaign that pleasantly surprises customers.

1.1.6 Human-centric marketing for brand attraction

Once the human side of customers is understood through digital anthropology studies, the second step is to disclose the human side of brands that can engage customers. As Stephen Sampson explains in his book "*Leaders without Titles*"[14], horizontal leaders have six human attributes that attract others even without having authority over them. These six attributes embody a perfect human being, one who normally represents a role model. So much so that, when brands want to affect clients without overwhelming them, they must have these six human attributes:

[13] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.112
[14] Stephen J. Sampson, Leaders Without Titles, HRD Press, 2011

1. **Physicality** → A physically attractive person usually has a strong influence on others. Similarly, brands that wants to have influence on their clients should have physical attractions that make them exclusive. For this reason, they aim for well-designed logos or well-crafted slogans. Google and MTV with their dynamic logo systems are prime examples of brands that possess this attribute. In addition, physical attractions can also come from a convincing product design or a solid customer experience design. Apple is the main example here as it is well known to excel not only in its industrial product design but also in its user interface design.

2. **Intellectuality** → An intellectual person can think, develop ideas and bring about innovation. Similarly, brands with strong intellectuality are able to launch products and services not previously implemented by other players and clients. In this way, brands prove their innovation and their ability to resolve customer difficulties.

   A prime example of an intelligent brand that has been able to innovate is the car company Tesla. It has adopted the name of the famous innovator, Nikola Tesla, and has not disappointed expectations. Indeed, the brand is a leader in the automotive sector due to its major innovations such as electric cars, automotive analytics, and autopilot technologies. Tesla's intellectuality helps to generate a strong brand appeal, even though it does not publicize. Other important innovators such as Uber and Airbnb reveal their intellectuality by offering services that link customers and service providers. They are both seen by customers as smart brands.

3. **Sociability** → A sociable person is self-confident in relations with others and shows great verbal and non-verbal communication abilities. Equally, brands with strong sociability are not scared to converse with their customers. They pay attention to their customers and their conversations and can reply to their requests as well as proactively solve grievances. Brands often attract their customers through several media where they share stimulating content. Zappos is a prime example of a very sociable brand. Customers can talk with the company's call-center agents for hours talking about products or other issues as if they were friends. In effect, the longest customer service call of 10 hours and 43 minutes was recorded by Zappos.

4. **Emotionality** → People who can easily connect emotionally with others are able to guide their actions and influence their choices. Similarly, brands that conjure emotions can guide customers' actions by connecting with them on an emotional level through inspirational messages. However, brands often want to connect with customers by demonstrating their humorous side. An example of the first case is Dove, a brand with strong emotionality. It has over time tackled the topic of self-esteem among women by inspiring them to love themselves and appreciate their true beauty. Thanks to a massive campaign lasting over a decade, Dove has succeeded in connecting emotionally with

women all over the world. A completely different example is the brand Doritos, which launched an advertisement to connect with customers in a humorous way. The SuperBowl 50 'Ultrasound' advertisement depicts a pregnant woman having an ultrasound scan while her husband is eating a bag of Doritos. The advertisement ends with the baby coming out of the womb to take some Doritos. The result was satisfactory but not as good as expected because some people found the advertisement hilarious while others saw it as disgusting. However, a facial tracking technology reveals that the best advertisement is the emotionally engaging one, even if the emotions it provokes are mixed.

5. **Personability** → People with a strong personality are aware of what they are good at and what they still must learn. They demonstrate self-confidence and self-motivation to get better. Similarly, brands with strong personalities know exactly what they stand for and are not afraid to show their flaws.

   Patagonia, for example, is a brand that cares about social sustainability by trying to minimise the environmental impact of its business activities. With its Footprint Chronicles, Patagonia allows customers to see the social and environmental footprint of the product they buy. The brand is so self-confident that it shows that its business processes are not perfect at all. In fact, they still damage the environment, but the company is also motivated to improve over time. Domino's is another example of a brand with a lot of personality. The pizza company even admitted in 2010 that its pizzas were not irresistible. In an advertisement, Domino's publicly shared customer negative reviews on their pizzas. In response, the company reinvented its pizzas and offered them to the more sceptical, making the brand more human.

6. **Morality** → It consists of being ethical and having strong integrity. A moral person possesses the ability to know the difference between right and wrong and above all has the courage to do the right thing. Correspondingly, brands with strong morals are those that ensure that ethics become a fundamental part of all business decisions. Unilever, for example, announced the Unilever Sustainable Living Plan in 2010, which intended to double the size of the business by reducing its environmental impact by 2020. The plan also wanted to progress the well-being of more than 1 billion people and get better the livelihoods of millions in the process. Other initiatives include Knorr's effort to fight malnutrition in Nigeria, Wall's effort to build micro-entrepreneurs in India, and Omo's campaign to save water in Brazil.

1.2 Product development and innovation

1.2.1 Rapid experimentation as a method of innovation

According to David L. Rogers, "*We can define innovation as any change to a business product, service, or process that adds value"*[15]. Change, however, can be of two kinds as it can either be an incremental improvement or the creation of something totally new. If we want to take a company like Google as an example, we could say that an innovation can consist of the launch of a new product like Google Earth or the Chromebook line of laptops. Similarly, however, innovation at Google is also represented by the continuous process of refinement found, for instance, in the evolution of the user interface and experience. The digital transformation has brought with it a new definition of innovation, understood as *'The process by which new ideas are developed, tested and brought to market by companies'*[16].

In the past, the finished product was what innovation was focused on. Testing ideas was difficult and expensive, so decisions were based on the analysis, experience and intuition of the managers involved in the project. Market feedback often came after a long time, sometimes even after public release. For these reasons mentioned above, the biggest concern was to avoid market failure. With the advent of the digital era, the way to innovate has changed. Indeed, companies are forced to innovate in a completely different way than in the past in order to keep up with the times. To innovate they have to rely on rapid experimentation and continuous learning. In this case, instead of focusing primarily on the finished product, they must first identify the right problem and then do as much testing as possible so that they have multiple solutions.

An example of this second approach is the Lean start-ups in Silicon Valley, which develop prototypes to be iterated on repeatedly, before, during and even after launch. Prototypes are then tested at each stage and decisions are made based on customer and market feedback.

Thanks to digital technologies it is now easier and faster to test ideas. In fact, this new approach to innovation brings with it several advantages. Firstly, it allows companies to bring new ideas to market quickly. In addition, they have lower costs, less risk and greater organisational learning.

In the following paragraphs I will look specifically at how rapid experimentation is transforming the way innovation happens. After describing the seven principles of experimentation, I will discuss two complementary methods of experimentation by innovators and compare them. Finally, I will also explore the four paths to scaling an innovation by which companies can learn faster, fail cheaper and shorten the time to successful innovation.

[15] David L. Rogers, The digital transformation playbook, Columbia University Press, 2016, p. 124
[16] David L. Rogers, The digital transformation playbook, Columbia University Press, 2016, p. 124

1.2.2 Seven principles of experimentation

In this section I have chosen to address the key principles for achieving maximum market performance after innovation efforts. These principles have been identified by observing innovative firms in many different sectors and by surveying the main innovation research of the last decade. They can be applied to any business experiment, whether convergent or divergent:

1. **Learn Early** → Start experimenting early in your innovation efforts so that you can learn as early as possible in the process. In fact, in some cases, the same problem that would trigger a heavy financial loss at the end of a product development process may only generate a small financial loss if it is learned early in your project. According to David L. Rogers this is called *'the value of early learning'* or, conversely, *'the cost of late learning'*[17].
   Thanks to the former, the failure rate of the company's product ideas has not decreased, but the cost of failure has fallen dramatically. This is not to be underestimated considering that in any innovation endeavor you are dealing with uncertainty and therefore a significant failure rate among your new ideas. With experimentation, ideas that do not work should fail early in the process. Conversely, waiting too late in the innovation process to show your idea to customers has the reverse effect because it increases the cost of failure and discourages you from testing other options. Many companies measure the costs of running experiments, but very few have realized the importance of measuring their cost savings when they learn from experiments. In fact, such savings can arise from a variety of situations such as the early cancellation of what would have been a costly flop or the course correction that turned a struggling project into a successful one.

2. **Be fast and iterate** → The second key principle of experimentation is that of speed. American Express, for example, is a company that pays particular attention to learning through experimentation. Among the managers' main goals is to get the teams they manage to learn faster through iterative cycles of days rather than weeks or months. This kind of approach can be a real competitive advantage for the company. Increasing the speed of experimentation often requires new infrastructure. In fact, to move to faster experimentation, the Edison Group decided to build its laboratory in West Orange, New Jersey. In this way, the company was able to increase the speed at which it went from any insight to a rapid operational test. Another example is that of the global snack manufacturer Mondelez, which,

[17] David L. Rogers, The digital transformation playbook, Columbia University Press, 2016, p. 135

to speed up innovation, uses a garage that is designed to take any new idea from concept to prototype and into the hands of visiting customers within just two days.

Finally, design company IDEO has strategically chosen to locate its prototyping shops close to its development teams so that physical product ideas can be manufactured in some hours.

3. **Fall in love with the problem, not the solution →** Falling in love with problems and not solutions bring innovators many advantages. Firstly, it allows you to stay focused on the customer and their needs. Secondly, focusing on the problem helps you to have an overview and thus to be able to consider more than one possible solution. In fact, it is often tempting to stop generating new ideas when you focus only on the solution and come across an idea that looks promising. Finally, it is useful to fall in love with the problem because, in most cases, you become emotionally attached to a creative solution and when this happens it is difficult to let go. A case in point is Intuit's Fasal team who had to solve the problem of the poor bargaining position of Indian farmers. Fortunately, they didn't stop with their first solution, and, because of that, they quickly learned that their idea of helping farmers plant more profitable crops wouldn't work.

4. **Get credible feedback →** Once you have developed solutions, you need to collect credible feedback on them. Credibility depends on the people we address, who must be real customers or potential customers. To get credible feedback, we need to show customers something inspiring enough to generate significant results. In a convergent experiment, for example, the feedback is based on the actual product or service you will eventually provide. The case of a divergent experiment is different, where the aim is to use prototypes. They allow you to build an offer that you have not yet designed and, at the same time, provide the customer with the necessary stimulus to respond. Prototypes can be made from both simple and sophisticated materials. In this respect, it is interesting to recall the case of GE, which distributed 3D printers to teams of employees in various functions to help them rapidly prototype new design ideas without having to leave their offices. Prototypes are crucial because they can provide feedback from customers, so try to avoid making a common mistake in innovation. It is asking a focus group of customers to speculate on a product or service that they have never seen or that has never been to market, without a prototype to interface with.

5. **Measure what matters now →** It is important to understand which measurements matter in each experiment. With the advent of digitization, the number of things that can be measured is growing, and it is easy to get distracted by all the indicators you could be

keeping an eye on. But what matters, according to this principle, is to try to identify one metric that is more important than the others and useful to the success of your innovation. Obviously this one metric that matters more than the others is subject to change over time as a company moves from the early stages of customer definition to solution testing and finally to revenue and business scale. A case in point is the American minimarket chain Wawa, which in the past introduced a flat bread sandwich to its menu in several test shops. After measuring that the product was a great popular success, it noticed with subsequent measurements a marked change in the overall profitability of the shops. In fact, customers were spending less on other, more expensive items, so that the company was losing money. Wawa's immediate reaction, rather than distributing the sandwich to more shops, was to take it off the menu completely.

6. **Test your assumptions** → A key principle of experimentation is to test your hypotheses because it allows you to both eliminate risk in any new venture but is equally useful for innovations that take your business into unknown territory. A typical example is the company Rent the Runway founded by Jenn Hyman and Jenny Fleiss that offers a rental service of designer dresses for special occasions. Instead of spending time writing a business plan with detailed projections, the two founders decided to start experimenting to see if their basic idea would work. Their hope was to convince designers to promote the rental service on their websites, so that visitors looking at a dress on the site would see that they could rent it instead of having to go out and buy it. So, they met with twenty designers, but the result was less than satisfactory. Hyman and Fleiss decided to revise their marketing plan and chose to buy a large inventory of dresses, build an e-commerce website and drive traffic themselves. When they looked for investors, Bain Capital was impressed by the speed with which they had tested their new business model and decided to fund the startup. The company began to grow very quickly and in just two years Rent The Runway had provided clothes for 85% of the women who attended the 2013 presidential inauguration.
   For an established company used to operating in its known territory, it's easy to overlook the step of testing your assumptions when planning an innovation. But never forget that, as in the case of the clothes company, it is essential to experiment and test your assumptions

7. **Fail smart** → Failure is an inevitable part of the innovation process. As David L. Rogers states in his book "*If you try to avoid any failure, you will retreat into what seems safest and never innovate. Intelligent failure is actually an essential part of experimentation because it*

allows you to quickly eliminate bad options"[18]. In fact, it consists of a series of tests that show you the gap between where you are and where you need to be.

Now that we have seen the seven general principles of good experimentation, let us look at two planning tools: convergent and divergent experimentation.

1.2.3 Convergent vs Divergent experimentation

As David L. Rogers states in his book *"Convergent experiments are crucial in cases where it is not enough just to know the correlation between two events but to verify which event is causing the other"*[19]. They can be applied in different contexts and can be used with any digital product or service to test and improve elements of the customer experience. Here it is possible to look at some application areas:

- In digital environments such as those of Google, Amazon and Facebook, A/B tests can be performed constantly, where two groups of customers see the same webpage with a difference in design. This is used to measure differences in customer behaviour or response.
- In non-digital environments these kinds of experiments are useful for data-driven strategies to optimise the guest experience and loyalty rewards given to customers of hotels, airlines and resorts.
- Converged experiments are also often used in communication and direct marketing. For example, Barack Obama's presidential campaigns were characterised by continuous and rapid experiments in email subject lines and website page design. All of this helped to significantly increase the effectiveness in signing up new supporters and collecting more donation dollars.

A convergent experiment can be expensive or cheap, but in both cases, it needs to measure causality and follow the key principles of formal scientific experiments:

1. **Causal hypothesis** to have one independent variable (the cause) and one or more dependent variables (the effect).
2. **Test and control groups** to see the difference between those who are exposed to your stimulus and those who are not.
3. **Randomly assigned participants** so that an external factor cannot influence the outcome of your test group.
4. **Statistically valid sample size** so that the differences you measure outweigh the noise of random fluctuations.

[18] David L. Rogers, The digital transformation playbook, Columbia University Press, 2016, p. 142
[19] David L. Rogers, The digital transformation playbook, Columbia University Press, 2016, p. 131

5. **Blind testing** to avoid the Hawthorne effect, where those involved in the experiment unintentionally influence its outcome.

The most common errors in convergent testing are concentrated in the third key principle. In fact, participants are often improperly assigned to test and control groups. For example, a retailer might choose its best customers as the participant group for a new treatment and incorrectly assume that all other customers can serve as an equivalent control group.

Divergent experiments do not revolve around a causal question. They are therefore more informal than convergent experiments, but this does not mean that they necessarily must be ad hoc. Borrowing the author's definition, divergent experimentation *"is structured in a clear process to conceive ideas, create meaningful prototypes, test them to gather real-world feedback on critical hypotheses, and use this information to make decisions about whether to proceed and how to launch a final solution"*[20]. To conclude, the most common mistakes in divergent testing focus mainly on the time factor. In fact, testing too late, such as when 'product testing' of an innovation only takes place after development is almost complete, can lead to a financial loss for the company.

To innovate intelligently, a company needs both convergent and divergent experiments. For example, the launch of a successful new product will require both exploratory learning, which serves to generate and develop new ideas, and confirmatory learning, which serves to verify and refine the ideas. The first type of learning used without the second will never be successful and vice versa. However, there may be a preference for one over the other depending on the area of your business in which you are innovating. Indeed, for innovations that intend to improve your existing core business, it is advisable to rely on convergent experiments.

Conversely, for innovations that intend to develop new products or services, divergent experiments are more useful. Of course, the two types of experimentation can also take place at different stages within the same innovation project. A case in point is a financial services company that wants to offer a new mobile application to its customers.

Initially, it would be desirable to rely on a divergent iterative process to test the general ideas. Then, a convergent process could be used to test and optimize key elements such as price, features or marketing messages for the product launch.

[20] David L. Rogers, The digital transformation playbook, Columbia University Press, 2016, p. 132

Table 1: Summary table of the two types of experiments compared

Two Types of Experiments

Convergent Experiments	Divergent Experiments
Example: A/B feature testing or a pricing test	Example: putting a prototype in the hands of customers
Formal (scientific) experimental design	Informal experimental design
Asks a precise question or finite set of questions	Poses an unknown set of questions
Seeks to provide an answer	May provide an answer or raise more questions
Needs a representative customer sample (test and control groups)	Needs the right customers (who might not be average customers)
Needs a statistically valid sample	Sample size may vary
Focused on direct causality	Focused on gestalt effects and meaning
Goal is to test the thing itself	Goal is to test as rough a prototype as possible for the question ("good enough")
Confirmatory	Exploratory
Useful for optimization	Useful for idea generation
Common in late stages of an innovation	Common in early stages of an innovation
IN COMMON	
Increases knowledge	
Tests assumptions	
Looks outside for answers	
Requires willingness to learn versus decide	

Source: *David L. Rogers, The digital transformation playbook, Columbia University Press, 2016, p. 129*

1.2.4 How to scale an innovation

The digital revolution has changed both the way we innovate and the way we bring an innovation to market. With data and software being added to almost every offering, companies can rapidly continue to experiment and evolve their innovations even after launch. Nowadays there are four general paths to scale up an innovation to a full release. They are basically based on two aspects. The first is whether the company can rapidly iterate its product offering after launch. The second concerns whether the company can limit its rollout in phases.

Marketing literature has defined the four paths as follows:

1) **MVP Rollout →** This is an easy route to introducing an innovation because it relies on launching a minimum viable prototype and then iterating quickly to move directly into actual product development as more feedback is obtained from customers. The relative ease of being able to implement this route makes it useful for start-ups as you can iterate and learn with real customers without needing large financial resources. An example of a locally limited MVP launch was the launch of Zipcar. This was one of the first services to allow members to rent a car by the hour, picking up cars at identified street locations online rather than having to visit a car rental office. Initially, the service was launched as MVP only in Boston and was then extended to a second location after a year. This strategic choice allowed the company, after raising only $75,000 in funding, to test the business model and iterate its service with feedback from paying customers at many more locations thereafter.

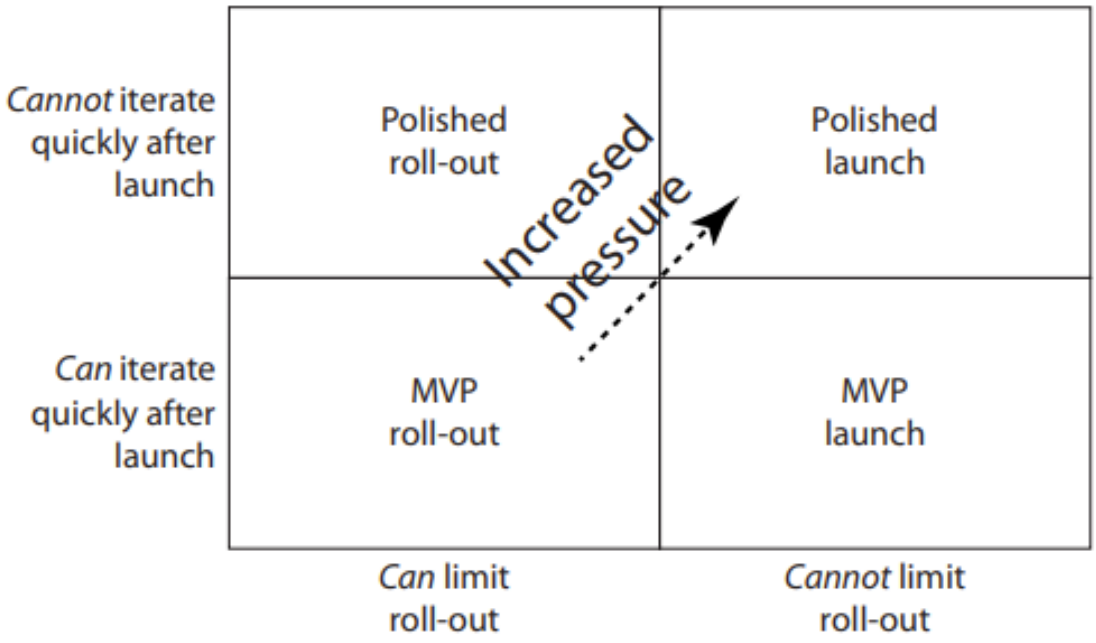
2) **MVP Launch →** In this quadrant, the company is forced to iterate very quickly after the launch of the innovation because it is not able to effectively limit the scope of the launch. This may also be due to the high visibility of your brand or the expectation that the initiative will attract wide attention. A prime example of this is American Express, which launched its 'Small Business Saturday' initiative with the idea of putting America's local small businesses in the spotlight for a day. The project was launched in six weeks and was so successful that a wave of enthusiasm came from social media, consumers, entrepreneurs and even an act of Congress. The company was able to quickly evolve the programme and its objectives due to the speed at which the project was implemented.

3) **Polished Rollout →** In this case, the company can launch its innovation in limited places or for limited customers but cannot rapidly iterate on it once it is public. This means that the product, once released, must already be sufficiently refined. To make this happen, one could use phased innovation launches. It consists of validating the initial results and testing how the innovation is received by different customers or in different markets. Starbucks used exactly the strategy mentioned above. In fact, it first tested wireless charging pads for phones in shops in Boston and then, after verifying their effectiveness, distributed them nationwide. Furthermore, it experimented with a coffee delivery service by offering it exclusively to customers working in the Empire State Building in New York.

4) **Polished Launch** → The fourth path to scale an innovation is the one that creates the most pressure for your company as it is the most difficult of all. In this case you will have to offer your innovation to all customers at once and without the possibility to iterate quickly. An example that falls into this path is Google Glass. The wearable, eye-framed computing device when it was released publicly still had problems in operation and so the company was unable to replicate it in a meaningful way within a year. Google was probably not used to releasing a product of that kind and learned through this initially unsuccessful experience that not all new innovations can be released in the same way.

As we have seen so far, knowing in which of these four quadrants your innovation fits, polished or MVP, rollout, or launch, will help you to take it forward and grow it successfully. In fact, as David L. Rogers explains in his book *"Every new innovation should continue to iterate and improve after launch and knowing how best to do that is essential"*[21].

Figure 1: Four Paths for scaling up



Source: *David L. Rogers, The digital transformation playbook, Columbia University Press, 2016, p. 155*

[21] David L. Rogers, The digital transformation playbook, Columbia University Press, 2016, p. 158

1.3 Communication and Advertising

1.3.1 New media to interact

Content creation is important for almost every company. Once the content has been created, you must try to distribute it to your target customers, and this is not easy. What is needed to avoid losing all the work done is a solid distribution plan. As a rule, Simon Kingsnorth explains in his book, *"You should allocate 30-50 per cent of your budget to distribution"*[22]. This way, regardless of how good or bad the content is, you will be able to create excitement in a crowded market. Thus, success in content distribution is typically achieved by using a mix of three channels:

- **Owned Media →** They represent the properties of the company and are characterized by being very easy to identify. We are referring to owned media when we talk about a company's app, its social media or its website. Amazon, for example, has several owned media through which it provides information to customers, makes sales, and collects data.

- **Earned Media →** are those types of media that the company gets from its consumers. It has the potential to be the most effective because a customer who speaks well of you is worth much more than any advertising, and it's even free! Earned media allows the company to understand how it is seen by its customers. There are many ways to do this: from the ratings you get on TrustPilot or reviews in blogs, to customer likes and shares in social media.

- **Paid Media →** They are services that a company pays to use. Around the world of paid media, we can find multiple ways of advertising: influencers, advertising on Instagram, Google and Youtube. All these methods are characterised to meet different needs of the company at different times. The right combination of various Paid media, with efficient data collection can greatly increase the turnover of the company using them. Think of Netflix, which through its advertisements on various channels, collaborations with famous actors who sponsor the page and the entertaining content they sponsor, has managed to become one of the most used platforms in recent years.

[22] Simon Kingsnorth, Digital Marketing Strategy, Kogan Page, 2016, p.251

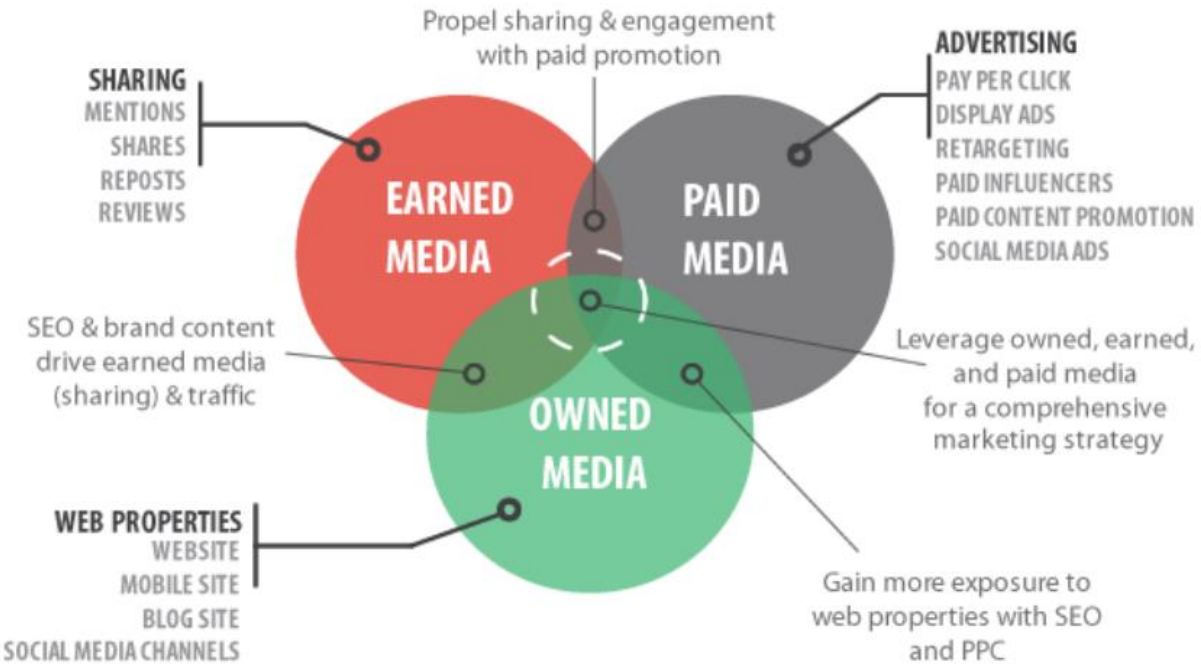
There are 3 key main advantages of using these new channels:

1) Speed of execution → In the digital world it is very different how to launch a campaign and it is a continuous dialogue and communication between brands and customers.

2) Measurability → We need to consider many KPIs such as Brand Awareness, CPM, CPV, CPC. These indicators help us to understand what mistakes we are making, what we need to improve and what we need to continue doing. They are of fundamental help because they can translate into interpretable data information that is not initially interpretable.

3) Personalization of messages → After the segmentation phase, marketers must send customized messages to their audience, dividing them according to gender, rather than the interests they have or the geographical area in which they are located.

Figure 2: Three channels: earned, paid, and owned



Source: *http://blog.admaiora.com/2014/07/le-differenze-tra-paid-owned-e-earned-media/*

1.3.2 New communication and advertising tools

Nowadays, when talking about communication and advertising, it is also necessary to refer to the following new digital tools:

- **SEM → "***It stands for Search Engine Marketing and is the process of gaining qualified traffic to a website through search engines"*[23]. It consists of the SEA (search engine advertising) and the SEO (search engine optimization). SEM is essential for business because operates within a context which is determined by the user's interests in that very precise moment. Interests are expressed through a query and users feel comfortable on search-engine website. Obviously, the higher the users look for a brand on a search engine, the more the website becomes attractive. As we said before, the first element that makes up SEM is the SEA. It can be defined as *"The process of bidding for potential clicks on an advertisement that is displayed within the search engine results".* SEA has many advantages. First, you can better control your budget setting a daily/monthly budget and choose how much to spend for a single click. Second, it allows you to have editorial control deciding what url to display, what title and copy must be shown in your ad. Third, it helps you to easily target your audience at local level. In addition, once your ad is online you immediately start receiving traffic and you can even decide to show your ad to appear on a search engine, on its affiliate sites, or certain sites.

  The second element of SEM is SEO. It can be defined as *"The discipline aimed at improving organic positioning of a website in search engines, when users are looking for certain keywords"*[24]. The starting point for good SEO is a thorough understanding of your customers. The best way to do this is to create audience personas. The author's advice is to consider all the types of audiences we have and try to create no more than five distinct personas. Once the personas have been created the next job is to start building the list of target keywords. This might seem daunting, especially as some companies have target keyword lists running into the thousands. However, if you break the process down into the following four steps it is much easier: 1) create logical segments 2) mine your data 3) mine secondary data sources 4) sense check. A good mix of SEO and PPC (pay per click) could drive traffic to website and its content. The goal is to optimize keyword, promote your brand, engage customers, and measure your results. Finally, we can say that the SEM discipline allows brands to develop an outstanding presence on the web and it is clear that all these activities are part of a general and bigger marketing strategy.

[23] Simon Kingsnorth, Digital Marketing Strategy, Kogan Page, 2016
[24] Simon Kingsnorth, Digital Marketing Strategy, Kogan Page, 2016

- **SOCIAL MEDIA MARKETING →** It can be defined *"As the process of promoting a brand and engage with customers via social medias"*[25]. This new tool allows brands to better manage Institutional Communication, promote your products/ brand via social media channels and generate conversations with customers based on an editorial plan of content. It is important to remember that sponsoring an organic content is different than creating ADV on a social media. The second one has more personalization opportunities and will not remain on a brand page.

- **DISPLAY AND VIDEO ADVERTISING →** They can be defined as the *"Utilization of paid digital spaces to promote a brand"*[26]. Display adv consists of static images (e.g., banners, buttons, etc.) displayed in a dedicated spaces of a website or app. While video adv allows brand to display videos in dedicated spaces of a website, app (e.g., on YouTube). As Simon Kingsnorth explains in his book, there are different types and format of display and video advertising. The most important are the following: 1) In-page banner adverts that consists of simple banners with an image 2) In-page rich media which are more functionality than a standard banner: video, expandable adverts, data capture or live information 3) In-stream which are represented by pre-roll, mid-roll, post-roll, and skippable videos.

- **DIRECT EMAIL/SMS MARKETING →** They are important tools with two main functions. First, they remember customers a content, an incentive, a clear call to action or a good landing page. Second, they help brands to remain in contact with their clients engaging them with different types of alerts.

Finally, we can conclude this part by recalling what are the main objectives of a good digital adv campaign:

1. **Awareness →** interactive experiences to make customers aware of your brand.
2. **Direct response prospecting →** target the right customers at the right time to trigger an action.
3. **Retargeting →** remind your customers the product they were looking for.

[25] Simon Kingsnorth, Digital Marketing Strategy, Kogan Page, 2016
[26] Simon Kingsnorth, Digital Marketing Strategy, Kogan Page, 2016

1.3.3 The relevance of content marketing

According to the Content Marketing Institute, **"***"Content marketing is a strategic marketing approach focused on creating and distributing valuable, relevant, and consistent content to attract and retain a clearly identified audience, and ultimately to drive profitable customer action".* As Simon Kingsnorth explains in his book, great content must have the following seven characteristics:

- **Credible →** Content must be credible, which means that the claims made must be sufficiently substantiated. One method to make your content credible may be to establish the author's profile as an expert, including facts and references from known sources or ensuring that your content is authentic by only talking about topics that are relevant to your expertise.

- **Shareable →** A content becomes great only if many people share it. To make this happen it is a good practice to make it easy for consumers to share your content via quick links to the most relevant platforms for sharing (e.g., Facebook, LinkedIn, Google+).

- **Useful or fun →** Great content must be useful or entertaining. The Michelin Guide, for example, was a unique and useful publication. However, fun is highly dependent on your target audience. The 'how-to' guides above are a good example of usefulness, but what about fun? Can you create an engaging game or fun tool that helps users achieve something? This route can help customers find a result they are looking for while enjoying the process, making it both useful and fun.

- **Interesting →** Defining whether a piece of content is interesting or not is very subjective. Something that is interesting to you is not necessarily interesting to your audience. To create great content, you must consider it from the consumer's point of view.

- **Relevant →** Relevance is probably one of the most important pillars of content. You cannot start creating content without first understanding your audience. You need to know what makes them tick and make sure that all the content you produce is relevant to them.

- **Different →** Great content must be different from what has been done so far and unique to break through to the target audience. You may even decide to take a good idea and make it your own. For example, there are hundreds of guides to the best bars in Barcelona, but that doesn't mean you can't create your own and make sure you stand out from the rest.

- **On brand →** Never forget your brand when creating content. Content consumers always expect to see a connection between the content and the brand.

Having defined the characteristics of great content, let us look at other aspects together. Firstly, content marketing has 3 different key advantages:

1) Increased lead generation and sales
2) Cost savings on acquisitions and retention
3) Loyal customers becoming advocates.

Furthermore, it is possible to distinguish different types of content:

- **Hero content** such as big storytelling moments (e.g., Superbowl ads)
- **Hub content** that are regular content, produced with a publisher approach, that people want to receive (e.g., go pro)
- **Help content** that are based on subjects' people are searching for (e.g., tutorials). Moreover, the key steps of content marketing are:

Content marketing involves both the production and distribution of content. However, the most common pitfall of a content-marketing strategy is to jump straight into content production and distribution without proper pre-production and post-distribution activities. Below we list the eight key steps of content marketing that marketers should follow:

1) **Goal Setting** → Delineating their goals helps marketers to better build a content-marketing strategy. Without proper objectives in place, marketers might become lost when they jump into content creation and distribution. Their goals should be associated with their overall business objectives and converted into key metrics, against which the content marketing will be valued.

2) **Audience Mapping** → Once the objectives have been defined, marketers should define the audiences they want to concentrate on. It will facilitate marketers create sharper and deeper content, which in turn contributes to the brand's effective storytelling. The audience perimeters can be geographic, demographic, psychographic, and behavioral. After marketers have decided their audience boundaries, they need to profile the audiences and describe their personas, which will help them imagine what the audience looks like in real life. Finally, they need to discover their anxieties and desires and provide content that helps them to relieve their fears and achieve their desires.

3) **Content Ideation and Planning** → Marketers have then to decide what content to create and to perform proper planning. To do so they should consider 2 things: 1) Great content has clear relevance to customers' lives 2) Effective content has stories that reflect the brand's characters and codes. Content can be presented in written formats (articles, newsletters, white papers) or can also have a more visual form (comics, games, videos).

4) **Content Creation** → This is the most important step which is the content creation itself. The creation requires enormous commitment in terms of time and budget. Moreover, marketers need to be sure that they have the inhouse capabilities to deliver content over the long term. If they are not so capable, they should consider acquiring the content from external sources.

5) **Content Distribution** → Marketers need to ensure that their content can be discovered by audiences through proper content distribution. To do so they can use the 3 major categories of media channels: owned, paid, and earned media.

6) **Content Amplification** → Marketers should identify the key influencers in the intended audience group to spread the content and make it viral.

7) **Content Marketing Evaluation** → Marketers should evaluate whether the content-marketing strategy achieves the sales-related and the brand-related goals set in Step 1. To do so they must: 1) Check if the goals are aligned with the overall business objectives because evaluation is straightforward and can be integrated with the brand's overall performance measurement. 2) Track how well their content is being shared, which is a proxy for advocacy

8) **Content Marketing Improvement** → Marketers should define their evaluation and improvement horizons and determine when it is time to change the content-marketing approach. They also have to remember that content marketing often needs time to have its effect and therefore requires a certain degree of persistence as well as consistency in the execution.

Figure 3: Step-by-step Content Marketing

Source: *Philip Kotler et al., Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.125*

1.4 Sales and Channel Strategy

1.4.1 Omnichannel marketing as a reaction to new trends

Customer behavior and purchasing patterns are changing radically over time. Just think of a situation where a customer learns about a product from a TV advertisement. Then the customer visits the nearest shop to try the product and buys it online at a better price. This first scenario is called "*Showrooming*".

A customer can now also learn about a product from online banner ads. Soon after, a social media post might lead the customer to compare different websites and eventually buy the product at the nearest shop. This second scenario is called *"Webrooming"*". Both are common shopping scenarios in the digital age.

Customers now constantly move from one channel to another, from online to offline and vice versa. Unfortunately, as Philip Kotler et al. suggest in their book "*Traditional marketing channels are not always organized to allow a smooth transition between channels*"[27]. This generates a massive, lost opportunity. The way marketers consider sales and channels strategy should change and adapt over time to this new reality.

Nowadays, marketers need to deliver content across channels (physical and online) and be available when customers decide to make a purchase. Therefore, it has become a practice to adopt omnichannel marketing. It can be defined as *"The practice of integrating multiple channels to create a seamless and consistent customer experience that requires organizations to unify their goals and strategies"*[28].

This strategic choice is driven by focusing on multiple channels (both online and offline) and pushing customers to buy more. In fact, omnichannel marketing has been demonstrated to provide results. For example, Macy's found that its omnichannel customers were eight times more precious than its single-channel shoppers. Customers' needs are changing over time, and they must be enabled to buy at the exact moment they want to. For these reasons, leading companies are implementing omnichannel marketing to grow even more and satisfy more customers.

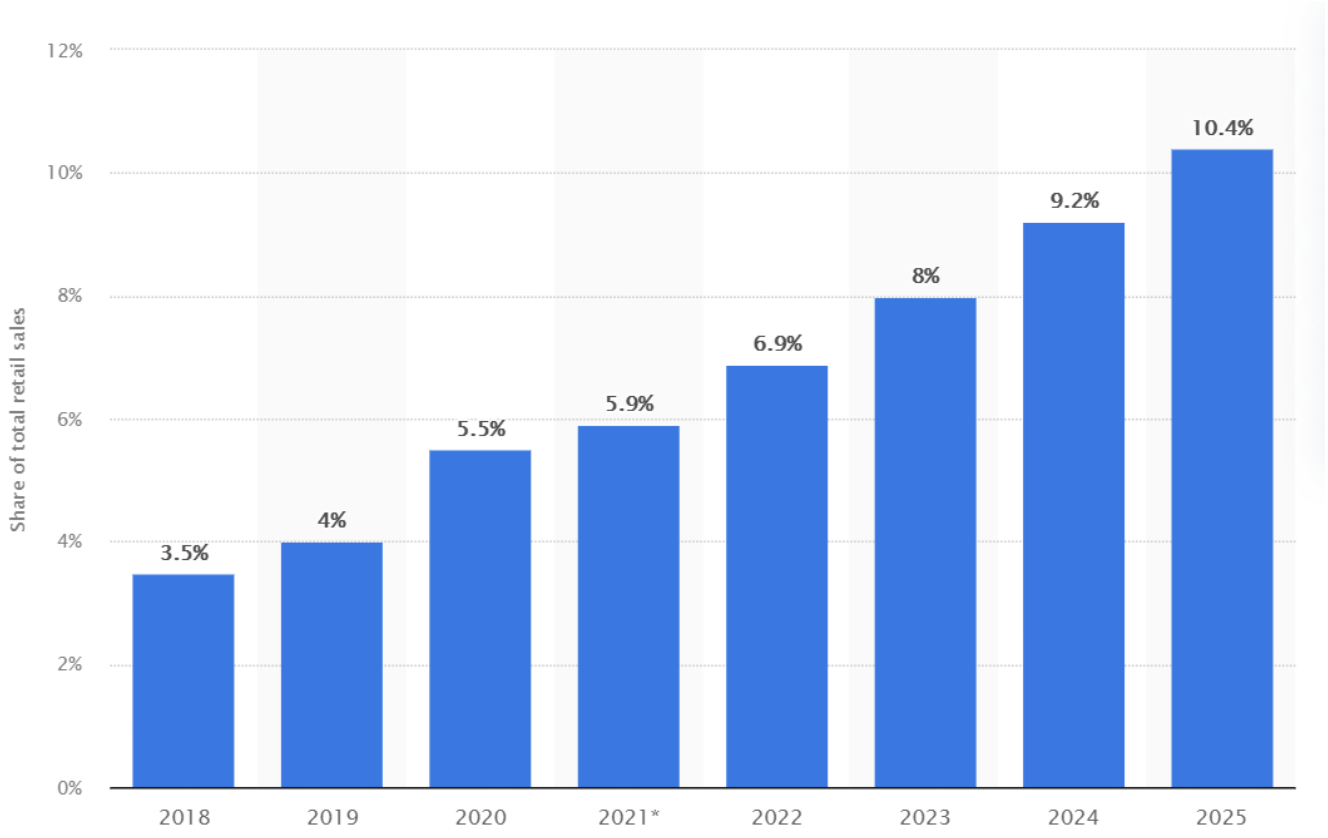
As we have said so far, companies increasingly need to provide instant solutions to their customers' needs. Therefore, what really counts is the speed of delivery, which is often almost as good as the service or product itself. With the advent of the digital age, computers, but especially mobile phones, have revolutionized the way customers shop. In fact, no other channel is as personal and convenient as phones.

This is a growing trend as more and more customers make purchases from mobile phones. Indeed, to highlight some figures, as reported by the statistics portal 'Statista', mobile commerce sales as a percentage of total retail sales in the US since 2018 have increased significantly and are expected to

[27] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.139
[28] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.140

increase further until 2025. These numbers show that it has become essential for retailers to put mobile devices at the heart of their omnichannel strategy. One example is BMW UK, which has allowed its customers to buy cars with their mobile phones for some years now.

Figure 4: Mobile commerce sales as percentage of total retail sales in the USA from 2018 to 2025



Source: *https://www.statista.com/statistics/249863/us-mobile-commerce-as-percentage-of-total-retail-sales/*

Another aspect to consider is that mobile devices are also effective data capture tools. This activity is extremely useful because it allows marketers to:

- Understand which promotion works for each individual customer and thus tailor their messages and avoid sending irrelevant spam.

- Know exactly where customers are at any given time and engage them with real-time offers.

- Use the data collected for predictive analysis. Tracking historical transaction patterns helps merchants predict what customers will buy next. In this way, merchants are able to anticipate future customer demands and manage their inventory.

In conclusion, we can say that these trends involving mobile commerce, 'webrooming', 'showrooming' and data analytics are key factors for marketers to deliver a unique omnichannel experience to their customers.

1.4.2 Key steps for omnichannel marketing

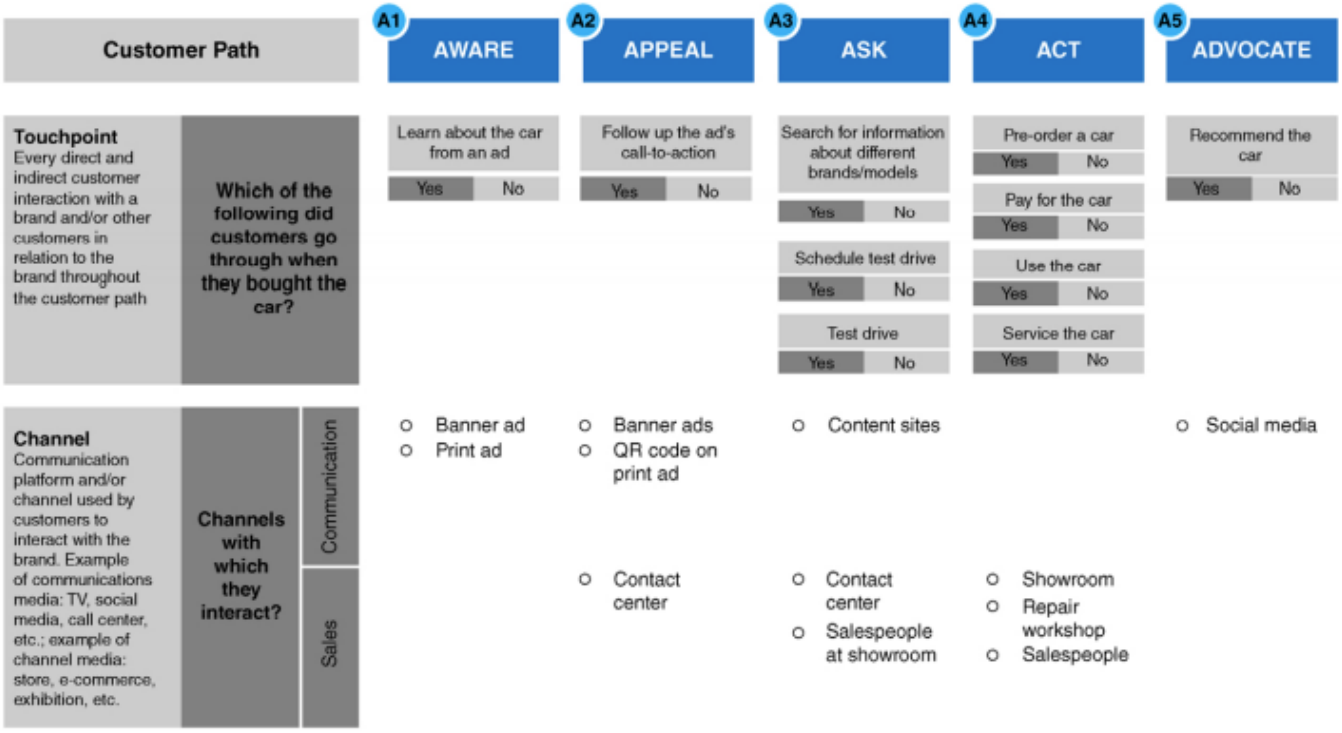
To develop a good omnichannel marketing strategy, marketers need to map all possible touchpoints, identify the most popular ones and finally, they should focus on integrating these most popular channels. In particular, we can analyze this path in more detail as follows:

- **Step 1: Map all possible Touchpoints and Channels across the Customer Path →** The first step in the development of an omnichannel marketing strategy is to map all possible touchpoints and channels through the five A's. As Philip Kotler explains in his book *"A touchpoint is defined as every direct and indirect interaction of the customer, online and offline, with a brand and/or other brand-related customers along the customer journey"*[29]. There are two types of channels: communication channels and sales channels. The former are all *"Channels that facilitate the transmission of information and content*"[30]such as television, print media, social media, content websites and contact centres. The latter include all *"Channels that facilitate transactions, such as retail outlets, the sales force, e-commerce websites, telesales agents and sales fairs"*[31]. Both of those channels need to be managed in the best possible way because they are often closely linked. In conclusion, what is important for marketers is to find the right balance between market coverage and simplicity in planning their omnichannel marketing strategy.

- **Step 2: Identify the most critical Touchpoints and Channels →** Each individual customer might choose to experience a different combination of touchpoints on several channels in a certain sequence, which is called a "Customer journey scenario". An example of a possible scenario is described in the second figure below. There are so many combinations of touchpoints that the focus should be on the most popular ones. In fact, company resources should be spent more on creating a seamless and consistent experience across the touchpoints and channels that matter most.

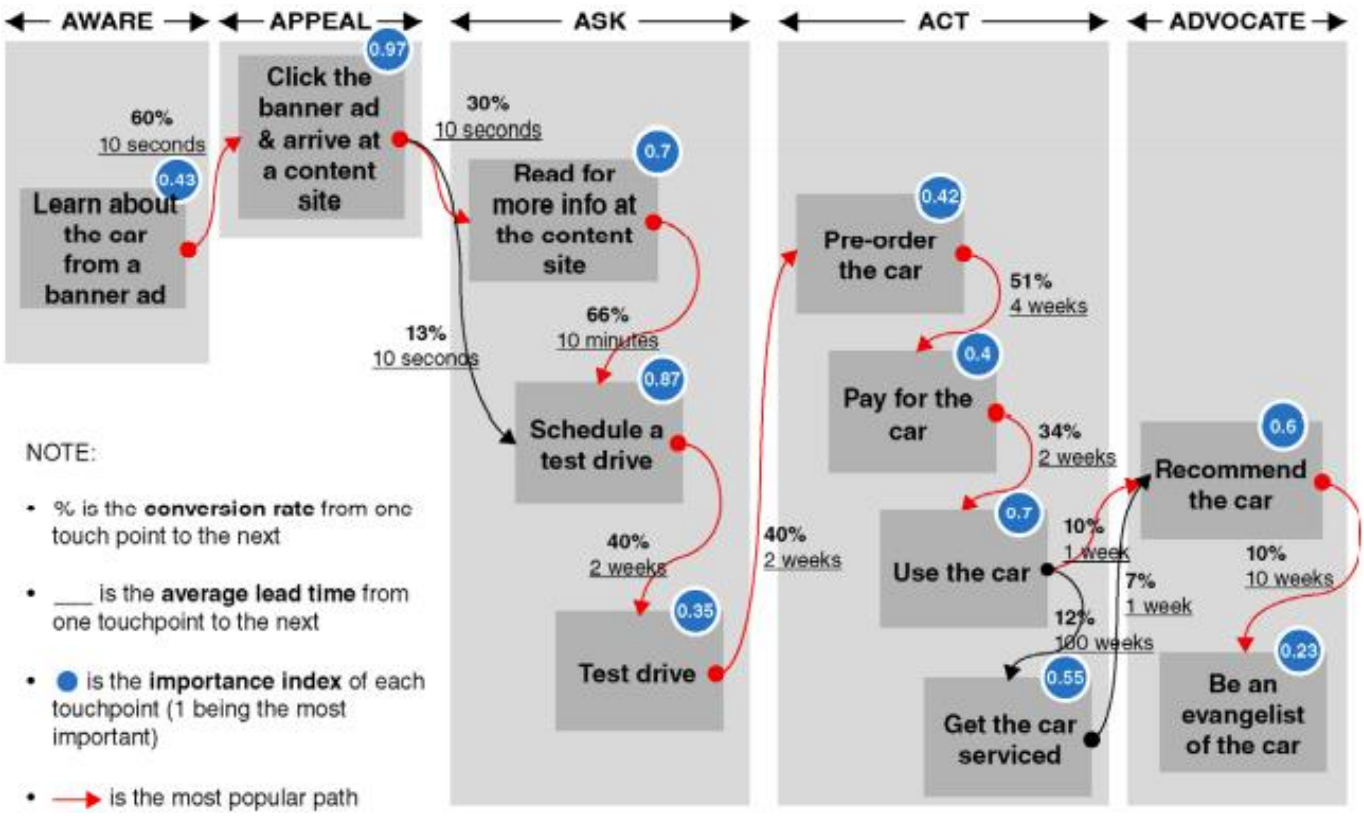
[29] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.147
[30] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.147
[31] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.147

Figure 5: Mapping Touchpoints and Channels across the Customer Path



Source: *Philip Kotler et al., Moving from Traditional to Digital, Wiley, 2017, p.146*

Figure 6: A Snapshot of the Customer Path Scenario

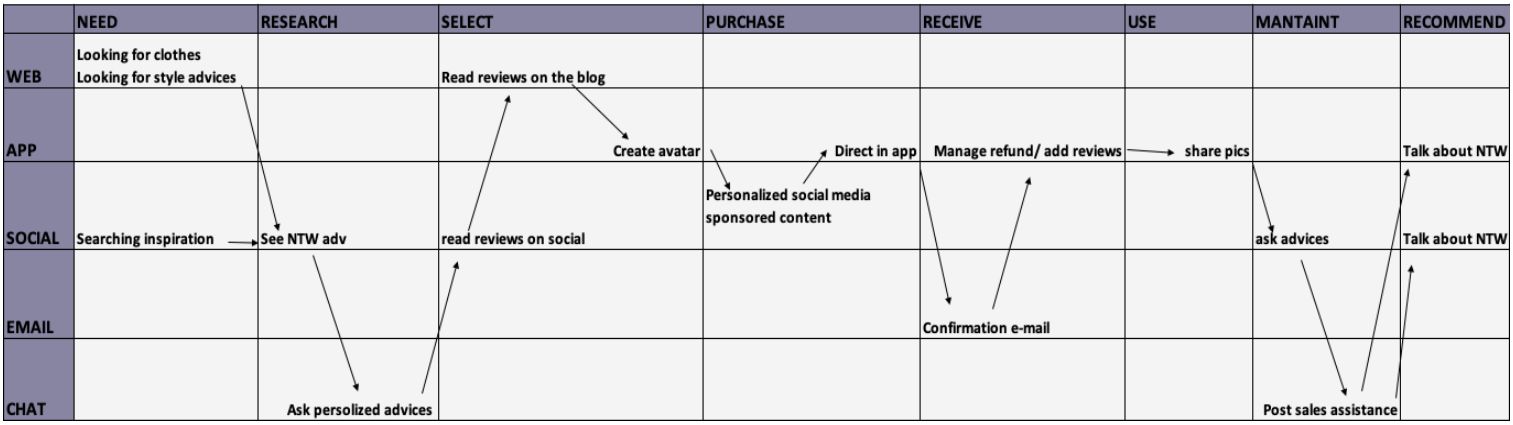


Source: *Philip Kotler et al., Moving from Traditional to Digital, Wiley, 2017, p.148*

- **Step 3: Improve and integrate the most critical Touchpoints and Channels →** The final step is to improve and integrate the most important channels and critical touchpoints. Companies should connect internal teams responsible for different channels so that they can collaborate with each other and deliver amazing solutions to get the most out of omnichannel marketing sales. Moreover, collaboration is even more powerful when companies merge different channel teams, along with their goals and budgets. When they are merged, marketers of each channel can work together to figure out the best way to allocate budgets and achieve company goals.

At the end of this path is the creation by marketers of an Omnichannel Interaction Map similar to the one in figure 6 but more detailed. Below in figure 7 you can see an example.

Figure 7: An example of Omnichannel Interaction Map



1.5 Customer Relationship Management

1.5.1 Defining CRM and retention

As everyone knows, keeping a customer is cheaper than acquiring one. This is precisely where CRM and retention strategies come in handy. "*CRM is an approach to ultimately improve customers' lifetime value and create advocacy by managing customer service/ support and communication*"[32]. While *"Retention is about changing the mindset of customers who want to leave"*[33]. So, CRM is a proactive strategy in that we are working to control a positive situation and thus prevent it from becoming negative while retention is a reactive strategy in that we are reacting to the negative situation that has been created.

As can be seen from its initial definition, CRM has three main advantages:

1) **Improving Lifetime** → It ensures customers happiness with the products and services they are using and keeps customers loyal to the brand.
2) **Improving Value** → It helps driving growth sales by selling more.
3) **Create Advocacy** → It makes your customers your promoter.

1.5.2 Cross-selling and up-selling

Cross-selling and up-selling are two methods to maximize revenues from your customers and continue to play a key role in many business strategies. *"Cross-selling is when you encourage your customers to buy another of your products"*[34]. If, for example, you are a retailer and a customer has recently bought a winter hat, perhaps you could encourage them to buy some gloves or a matching scarf. While *"Up-selling is the method of encouraging a customer to upgrade their product to the next level"*[35]. For example, a customer has recently bought 'Bronze Level' cover from your insurance policy and the following year you take them to buy 'Silver Level' cover. Cross-selling and up-selling depend on what is known as collaborative filtering, which is a very powerful predictive analytics method when combined properly with CRM and retention strategies. This method uses data on the behavior of many people to effectively segment them and then get tailored recommendations from the results. It is used by many companies in a wide range of industries, such as Netflix's movie recommendations based on social connectivity.

[32] Simon Kingsnorth, Digital Marketing Strategy, Kogan Page, 2016, p.184
[33] Simon Kingsnorth, Digital Marketing Strategy, Kogan Page, 2016, p.184
[34] Simon Kingsnorth, Digital Marketing Strategy, Kogan Page, 2016, p.194
[35] Simon Kingsnorth, Digital Marketing Strategy, Kogan Page, 2016, p.194

1.5.3 Social CRM and loyalty

A new area of CRM strategy is social CRM. *"This is the use of social media services and techniques to engage with your customers in a similar way to traditional CRM"*[36]. There are two areas of social media that are most impacted, and these are:

1) **Social customer service** → Social media is not a one-way form of communication. Customers are increasingly contacting organizations directly through their social media channels to ask questions and complain. Making sure there are plans in place to manage these communications is vital. For example, you could develop chatbots or self-care tools as well as build communities and forums.
2) **Sentiment analysis** → *"This is the method of measuring sentiment about our brand by monitoring conversations that take place across social networks"*[37]. Hence, it allows brands to anticipate customers' behavior and thus improve customer loyalty and satisfaction. The limitation of SCRM is that it can be very easy to make mistakes using it and damage your brand if not managed well.

Finally in this paragraph we focus on loyalty. It is a specific area of CRM that needs to be looked at independently. There is a model known as the 'loyalty ladder' which explains the five stages a consumer goes through to become loyal to a brand:

- **Suspect**: no relationship with the brand
- **Prospect**: shown some little interests such as visit or free subscription
- **Customer**: has purchased from you and so has a basic relationship with your business
- **Client**: has developed a greater relationship with you through repeat purchases
- **Advocate**: is showing signs of recommendation you and is highly unlikely to stop shopping with you unless something drastic happens

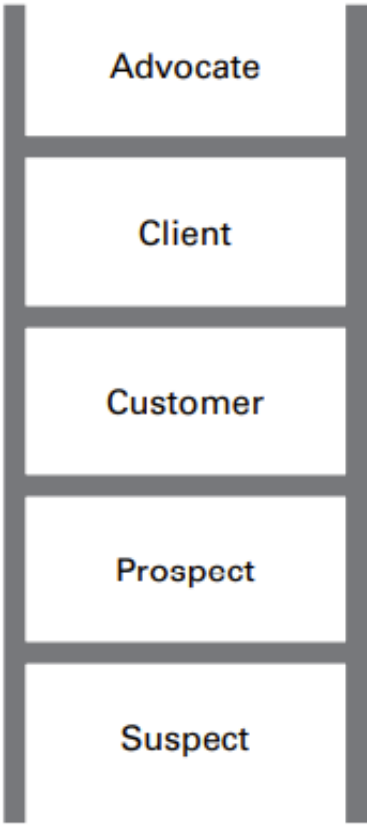
In addition to the loyalty ladder method, there are also loyalty programmes. Their key advantage is that the consumer does not waste time looking for information on other channels but goes directly to the website. Loyalty cards, rewards, clubs, discounts, or points are all examples of loyalty programmes. They all aim to increase customer satisfaction and the value with which customers perceive the brand. At the same time, these programmes are useful for increasing sales and average revenue per customer. As Simon Kingsnorth explains in his book, there are two types of loyalty programmes:

[36] Simon Kingsnorth, Digital Marketing Strategy, Kogan Page, 2016, p.197
[37] Simon Kingsnorth, Digital Marketing Strategy, Kogan Page, 2016, p.197

1) **High Value Loyalty** → These are programmes that involve offering items, services or discounts to customers that are of high value. The advantage of these types of programmes is that there could be a significant increase in average sales per customer and retention rates. The limitation of this method is that it can be expensive to offer high value rewards and most importantly many of your customers would have bought these products in your shop anyway.

2) **High Perceived Value Loyalty** → In this case, the aim is to make the customer believe that the items are valuable, when in fact they cost the company very little. In this way the programme is run with low costs, but the customers will show higher purchasing behavior. However, this solution is highly criticized because it is believed that companies do not offer enough value to the customer. An example of this is when companies buy a product in bulk and add it to their product for free or with a small price increase. The key to success is to ensure that the customer is offered real value without diminishing the company's financial rewards.

Figure 8: The ladder of loyalty



Source: *Simon Kingsnorth, Digital Marketing Strategy, Kogan Page, 2016, p.198*

1.5.4 Final objective: advocacy

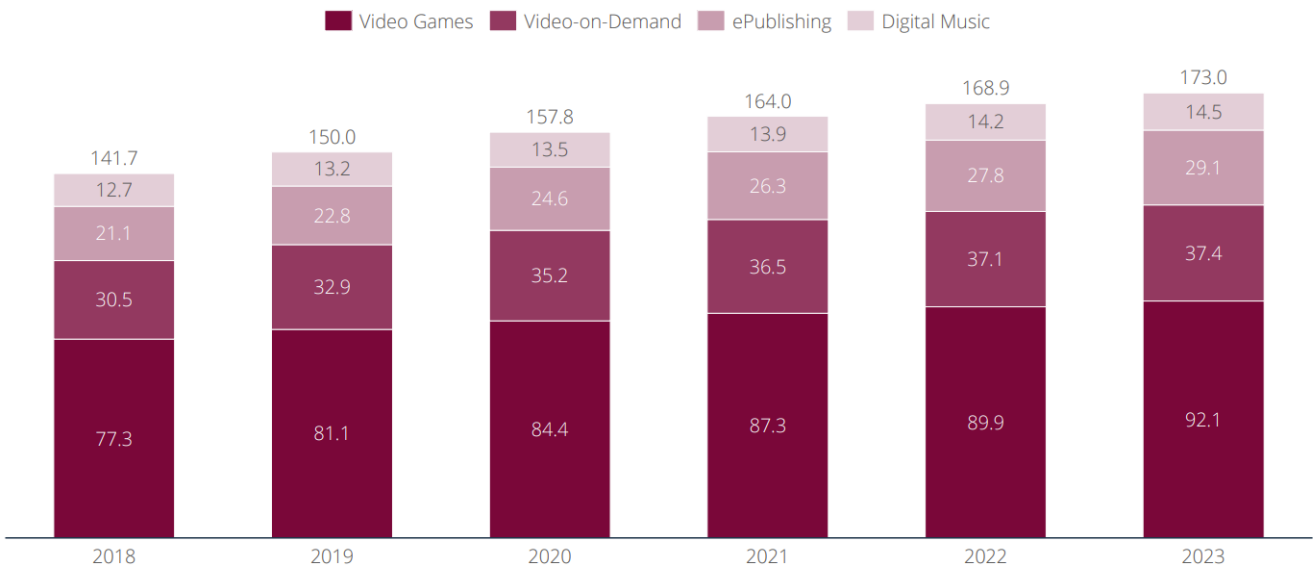
As we have said from the beginning, the last main benefit of CRM is to create advocacy, i.e., to make your customers your first advocates. The goal is to build strong relationships throughout the company so that your messages are widely spread. Taking advantage of other people's trusted networks, there will be a combined effect of the support of several trusted colleagues that is incredibly powerful. However, advocacy becomes essential when you have prepared the proposal, but other people will present it for you. In fact, the challenge is to make sure that these people not only know everything you know about the details of the product, but also that they have and can demonstrate the same passion as you. When you're responsible for taking someone else's proposal forward, it's easy to find points you don't agree with or don't fully understand. In these cases, you need to develop a strong and trusting relationship with your promoters to bring them on your side. Being inspired by your vision they can take responsibility for ensuring that no element of your proposal can be misunderstood or compromised**.**

1.6 The digital media market

With the advent of the digital revolution, there has been a profound change in the entire business concept of the music industry. Indeed, the introduction of MP3 players and online file sharing services such as Napster has also changed the way music is sold, distributed, and consumed today. We can analyze the digital media market in Statista's Digital Market Outlook. It is segmented into Video Games, Video-on-Demand, ePublishing and Digital Music. The video games market has benefited strongly from the shift from desktop computers to mobile devices. In fact, it represents a 55% share of the entire Digital Media market. Video-on-Demand is the second largest digital market and is set to grow due to the continued popularity of subscription-based services. The next smallest segment is ePublishing, which is also expected to grow due to emerging markets where eBook prices are lower. Finally, digital music was the smallest segment in 2018 as it is a market that is totally dependent on music streaming. It is in a severe contraction due to the continued distribution and illegal downloading of digital content. This practice has caused a decline in sales and so companies, faced with changing customer behavior, have had to find new ways to monetize their content. Nowadays, customers want to have easy access to a wide range of multimedia content anytime, anywhere and at a good price. For this reason, companies are increasingly investing in the production of their own exclusive content to increase their competitive advantage and to decrease their dependence on production firms[38].

[38] Digital Economy Compass, Statista, 2019

Figure 9: Global Digital Media revenue forecast in billion US$



Source: *Statista Digital Market Outlook*

1.7 New technologies to manage data explosion

Today's world is based on data. Users and companies are increasingly interlinked. Every time we surf the Internet, we leave traces of our searches on websites without even realizing it. These small actions that we perform every day, along with many others, have led to the creation of an incredible amount of data that is growing every year. In fact, many companies are already looking to use their customer data collected on various platforms or data extracted from production processes.

The problem is that the implications of using Big Data cannot yet be fully assessed. However, what we are certain of, is that companies that can exploit their data will have more business opportunities and improve their production and distribution models.

In this new world, those who can track, monitor, listen, watch, and observe data better than others will be more successful. Indeed, if used correctly, big data can also improve decision-making, help with innovation, and lead to customization in sectors such as entertainment, healthcare, or financial services.

We have talked so far about how the amount of data collected is increasing over time. Nowadays, the problem is to find a way of storing and analyzing it. Since traditional storage solutions cannot handle the incoming flow of data, new solutions such as cloud storage and Blockchain technologies are the most widely used and appropriate.

Moreover, with the increasing amount of data, the need for security measures and secure data storage also increases. Fortunately, Blockchain technologies are by design storage solutions to securely manage large data sets.

As many investors have started to realize their potential, the amount of investment for Blockchain start-ups has increased by almost 300% from 2017 to 2018[39]. The growing importance of data and the public discussion about data security and fraud are making these new technologies so important that now the biggest companies can't help but implement them.

[39] Digital Economy Compass, Statista, 2019

CHAPTER 2: AN EXAMPLE OF BLOCKCHAIN APPLICATION: THE SIAE CASE

We are now going to explore the new blockchain technology introduced at the end of the previous chapter. We will first talk about its history, characteristics, types and the advantages and disadvantages. Afterwards, I will analyze the heart of the thesis: a concrete case of application of this technology by the SIAE for a more efficient management of authors' rights.

2.1 History of blockchain

In the 1990s, the world was preparing to enter the age of digitalization. The Digital Revolution (also called the Third Industrial Revolution) refers to the advancement of technology from analog electronic and mechanical devices to the digital technology available today[40].

When computers and technologies became available, the world started to be populated by programmers and hackers to support this new revolutionary market. The latter began to see how digital systems and services could undermine what is called "computer privacy". Privacy in the digital world was not guaranteed from the very beginning. For this reason, groups of rebellious programmers and hackers emerged who were interested in creating absolute privacy in the digital world. Among them were the "Cypherpunks", who specialized in cryptography and the creation of cypher mailing lists, in informal groups, with the intention of obtaining privacy and computer security for personal accounts, which were almost impossible to penetrate[41]. One of the group founders was Eric Hughes, an American mathematician and computer programmer who through the Cypherpunk Manifesto states:

"Privacy is necessary for an open society in the electronic age. We cannot expect governments, corporations, or other large, faceless organizations to grant us privacy out of their beneficence. It is to their advantage to speak of us, and we should expect that they will speak. We must defend our own privacy if we expect to have any. Cypherpunks write code. We know that someone has to write software to defend privacy, and since we can't get privacy unless we all do, we're going to write it[42]".

Shortly before, in 1989, David Chaum, an American computer scientist and cryptographer created DigiCash and published an academic paper on the subject. Digicash is both the name of the currency David Chaum developed and the company that administered it. He developed a number of cryptographic protocols that governed DigiCash transactions and set his currency apart from its competitors.

[40] https://www.techopedia.com/definition/23371/digital-revolution
[41] https://www.blockchain4innovation.it/mercati/industria4-0/chi-e-satoshi-nakamoto-luomo-che-ha-inventato-il-bitcoin/
[42] https://bitcoin-translate.it/docs/a-cypherpunk-manifesto.pdf

These protocols made DigiCash an important predecessor of modern digital currencies. The company was in business for less than a decade, and during that time it was unable to convince banks to adopt its technology[43].

The Cypherpunks pioneered the idea that money could be sent over the net without the use of an intermediary, but they never managed to create a technicality to create a true peer-to-peer experience. It was only after the 2008 stock market crash that the world was ready for a financial digital revolution.

We can say that the blockchain technology was born in October 2008, thanks to the publication of a white paper on The Cryptography Mailing list, entitled "Bitcoin: A Peer-to-Peer Electronic Cash System" signed under the pseudonym of Satoshi Nakamoto[44]. While the world's attention was focused on the financial crisis, created by banks and other financial institutions, Nakamoto proposed a new model to make totally decentralised transactions structured around a consensual mechanism between blocks that would eliminate intermediaries. The aim was to separate currency from the institutions of control and create a network in which payments could be made between individuals without the need for a central unit, eliminating unnecessary management costs and leading to a true financial revolution[45].

Satoshi Nakamoto, a person, or group of people whose identity is still unknown, invented Bitcoin, but more important, the underlying technology. For this reason, he has been nominated for the Nobel Prize even though today no one knows who he really is. Unknowingly, Nakamoto was unaware that the real invention, rather than the minting of a virtual currency, was the blockchain technology on which it was based. In 2008, the above-mentioned paper was released, while it was only on the 3rd of January 2009 that a first version of the client software, i.e., the first version of the software available to the public, was shared, thus making official the birth of the first cryptocurrency: the Bitcoin[46]. Since that day, various other cryptocurrencies have emerged, including Litecoin, Namecoin, SwiftCoin, Bytecoin, Ripple or Ether[47].

The blockchain is basically an accounting system that records all transactions on a public ledger. Instead of the US dollar, or the European euro, the value is exchanged in a digital currency, called Bitcoin or similar. New Bitcoins are created by mining, which is a process that uses the computers capabilities to solve a hard difficult mathematical problem, and once the cipher is solved, the miner is rewarded in Bitcoin.

[43] https://www.investopedia.com/terms/d/digicash.asp
[44] https://bitcoin.org/bitcoin.pdf
[45] https://medium.com/@coinsociety/la-nascita-di-bitcoin-4c0b2e4213ce
[46] https://www.blockchain4innovation.it/mercati/industria4-0/chi-e-satoshi-nakamoto-luomo-che-ha-inventato-il-bitcoin/
[47] https://arxiv.org/ftp/arxiv/papers/1911/1911.02013.pdf

Initially, the community of cryptographers and programmers did not understand the potential of Satoshi Nakamoto's Bitcoin. Only a Californian computer programmer named Hal Finney saw its potential and took Nakamoto seriously. He agreed to work for free on the Bitcoin project and their collaboration led to the previously mentioned launch of the cryptocurrency to the public.

In the years that followed, computer science and cryptography were the 'sciences' most attracted by the fascination of this new technology. They tried to study it in greater depth, until the take-off of Bitcoin trading caught the attention of a wider public. Indeed, in line with Everett Rogers' theory of the adoption curve of innovation (S-curve), the general process of interest and adoption towards a new technology, or rather innovation, is characterised by a few years of slow adoption and then an exponential growth[48]. In the case of Blockchain there was a real boom of massive interest in late 2015 and 2017, linked to the Bitcoin phenomenon. It was the latter that drove the attention towards blockchain and, not surprisingly, many cannot discern one from the other, identifying them as synonymous.

2.2 Features of a blockchain

The blockchain is a decentralised distributed database that uses peer-to-peer technology to validate transactions between two parties in a secure, verifiable, and permanent manner. We can define it as a ledger structured in a chain of blocks, containing transactions, related to each other according to a chronological principle. The integrity of the transactions is ensured by a system of algorithms and cryptographic rules that consists of 3 main elements:

- Mathematical rules.
- Cryptography rules.
- Computer programming rules.

From the fusion of these three sciences and using already available technological discoveries, Satoshi Nakamoto was able to create a self-governing closed economic system that is essentially in nobody's hands[49]. It is difficult to classify blockchain with a single definition, but we can say that its purpose is to provide certainty in terms of traceability and transparency, with the intention of opening new methods of storing data and transactions. It is a basic technology through which information can be tracked, assets tokenized, or funds raised.

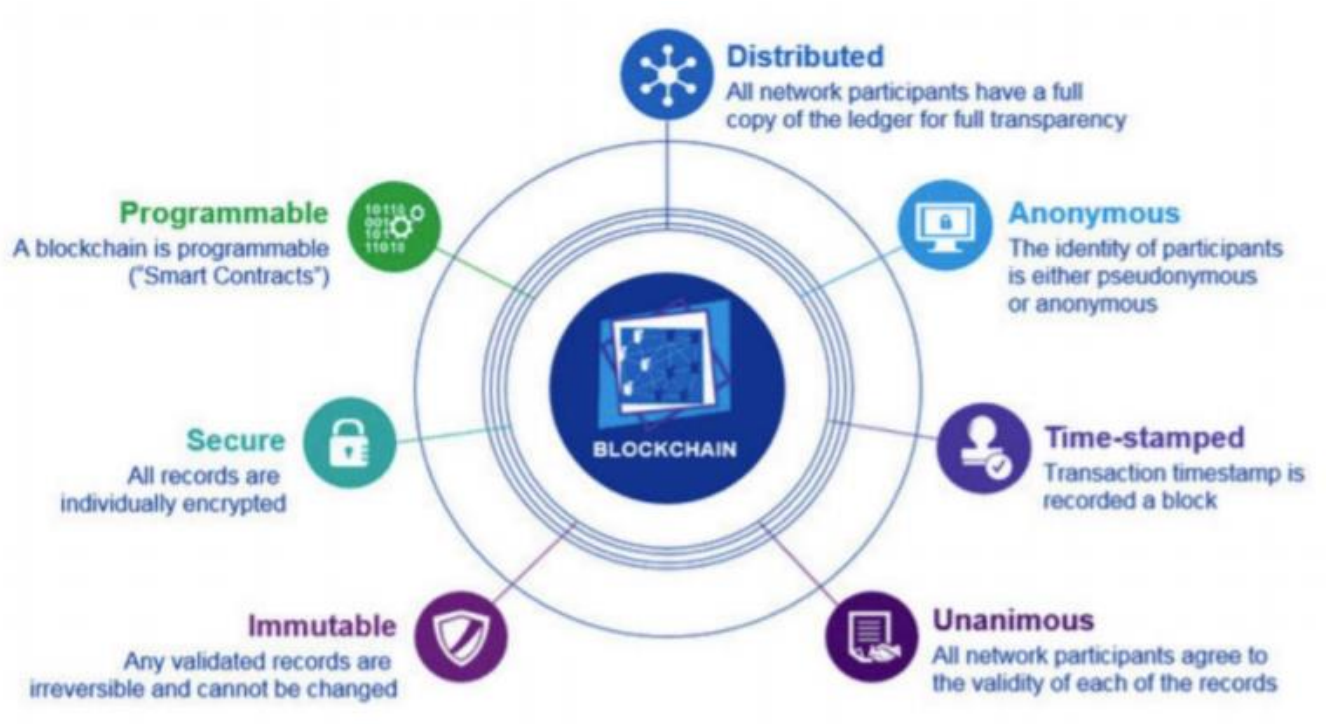
[48] https://www.insidemarketing.it/glossario/definizione/curva-di-rogers/
[49] https://www.fxempire.it/education/article/cosa-e-e-come-funziona-la-blockchain-spiegato-con-parole-semplici-134550

There are several characteristics that distinguish a blockchain[50]:

- Decentralization.
- Immutability.
- Security.
- Programmability.
- Anonymity.
- Unanimity.
- Time-stamped.

Data, once placed within the blocks, cannot be altered retroactively without invalidating all subsequent processes. Each record is stored in such a way that it contains a share of information that relates to previous information. This connection makes alteration virtually impossible without it being immediately visible to the entire network. To become part of the chain, blocks undergo a validation process based on the principle of distributed consensus. This principle makes it unnecessary to have a supervisor to ensure their legitimacy. In fact, it allows data to be managed in terms of verification and authorization without the need for a central authority but guaranteed by the trust distributed among all its users[51].

Figure 10: Blockchain main characteristics



Source: https://webthesis.biblio.polito.it/16546/1/tesi.pdf

[50] https://www.blockchain4innovation.it/esperti/blockchain-perche-e-cosi-importante/
[51] https://www.studiomartelli.it/wp-content/uploads/2014/10/STUDIO-MARTELLI_blockchain.pdf

Next, we are going to analyze the three features that most enable blockchain technology to stand out and be implemented on a large scale in the future.

2.2.1 Decentralization

Differently from the old, centralized ledgers, within a blockchain the various nodes of the network are the holders of the information. If we consider the blockchain as a database, we must think of a network of users connected to each other who have equal access to the data, without the intervention of a third power authorizing them and holding a monopoly on transactions. Of course, this does not mean that any control model is absent from blockchain technologies. In fact, when a good governance model is not present, it is not possible to create a true decentralized architecture. This is because, in the absence of a central authority, it is necessary to establish how decisions are made, how the majority voting process takes place, how data exchanges are handled or how code updates are regulated.

Within the blockchain, each node has an active and passive function, it is both creator and validator. Each user of the chain has its own copy of the entire documentation belonging to the blockchain, there is no official one and no user is more credible than the other. This ensures the transparency of the technology. Each transaction is monitored by a relationship of nodes that guarantee its legitimacy and preservation from its inception. It is a democratic mechanism where information is equally accessible to all and equally verifiable. This is the principle of 'distributed trust'.

The blockchain is a system that does not require a central authority, since the rules governing it are defined during the development phase and cannot subsequently be changed without the consensus of its participants. These laws in the blockchain are identified with the mathematical algorithm whose solution gives access to the chain. It is therefore often associated with the concept of Distributed Ledger, in antithesis to Centralized Ledger, precisely because the blockchain is based on the idea of distributed trust between the various users[52].

2.2.2 Immutability

Alongside decentralization, the immutability of data is another of the distinctive features of this technology. The blockchain is a non-changeable ledger. The records stored within the blocks, thanks to the use of public key cryptography, cannot be altered or deleted by the nodes of the network. There is just a possibility of rolling back the changes, but this is considered almost impossible to do as it will require an unaffordable

[52] https://www.studiomartelli.it/wp-content/uploads/2014/10/STUDIO-MARTELLI_blockchain.pdf

amount of computing resources[53]. In fact, if a malicious user wants to "rig" the blockchain, it is not enough to modify a single block to make the change valid, he/she must work on all the blocks of the chain.
To do so, it is estimated that he/she would require the power of a computer 6000 times more powerful than the 500 fastest supercomputers in the world[54].
This immutability system determines the high value of information, which is increasingly becoming a unique digital asset. For all these reasons, the blockchain is characterized as a value chain that allows for certain transactions such as Bitcoin[55].

2.2.3 Provider of security

Security becomes a big question mark when our personal data are stored in an online repository. Blockchain is inherently secure. It applies powerful cryptography techniques to the individuals who take part in blockchain transactions so they can hold ownership of an address, crypto assets of public and private keys associated with it. The passwords are generated using random combination of letters and numbers called alphanumeric characters. This solves issues such as identity theft because addresses are not associated with the owner's identity directly. Blockchain offers a greater level of security for individuals as it removes the need for weak and easily compromised passwords.

Security in blockchain is needed to protect the data and the transaction information against internal, external, and unintentional threats and peripheral attacks. Typically, this helps to detect, prevent, and provide appropriate responses to the threats based on security policies, rules, tools, and IT services.
In terms of defense in penetration, a single strategy is applied to protect data using infinite countermeasures. The principle of multi-layered data protection is applied in blockchain rather than providing security at a single layer. Vulnerabilities management involves identifying, authenticating, modifying, and repairing them whenever required. In fact, necessary patches are installed to repair the damaged part such as code, operating system operating system, firmware, and applications. Many techniques have been used in the blockchain to achieve security of transaction data or block data regardless of use. Bitcoin applications use cryptographic techniques to provide data security. Combinations of public/private key pairs are used to securely encrypt and decrypt data. The most secure part of the blockchain is the longest one which is considered the authentic one. Fifty-one percent of major attacks and forking problems have been reduced by means of the blockchain. By considering the longest chain as the authentic one in the blockchain, it makes the other attacks null and void[56].

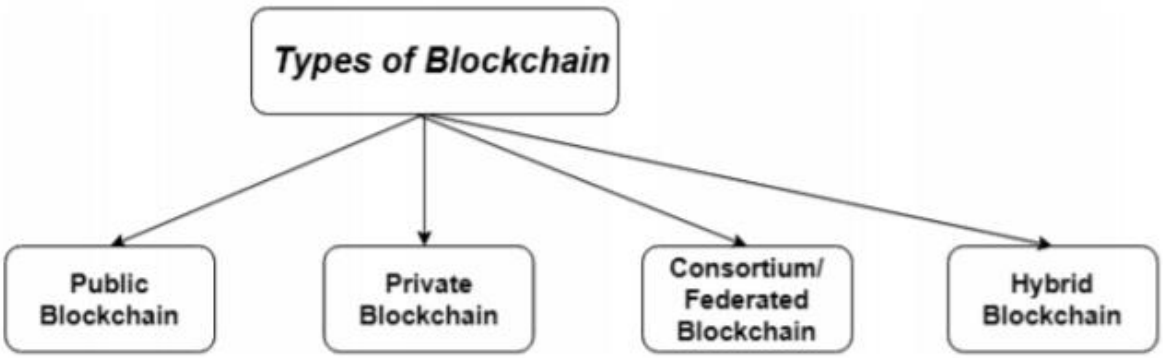
[53] Imran Bashir, Mastering Blockchain, Packt Publishing, 2017, p.22
[54] https://matematica.unibocconi.it/articoli/la-matematica-dei-minatori-della-blockchain
[55] https://www.studiomartelli.it/wp-content/uploads/2014/10/STUDIO-MARTELLI_blockchain.pdf
[56] Pethuru Raj, Kavita Saini and Chellammal Surianarayanan, Blockchain Technology and Applications, CRC Press, 2021, p.125- 127

2.3 Types of blockchain

Based on the way the blockchain has evolved in recent years and according to its different attributes, it can be divided into four different types:

- Public Blockchain
- Private Blockchain
- Consortium/Federated Blockchain
- Hybrid Blockchain

Figure 11: Blockchain Types



Source: Pethuru Raj et al., Blockchain Technology and Applications, CRC Press, 2021, p.120

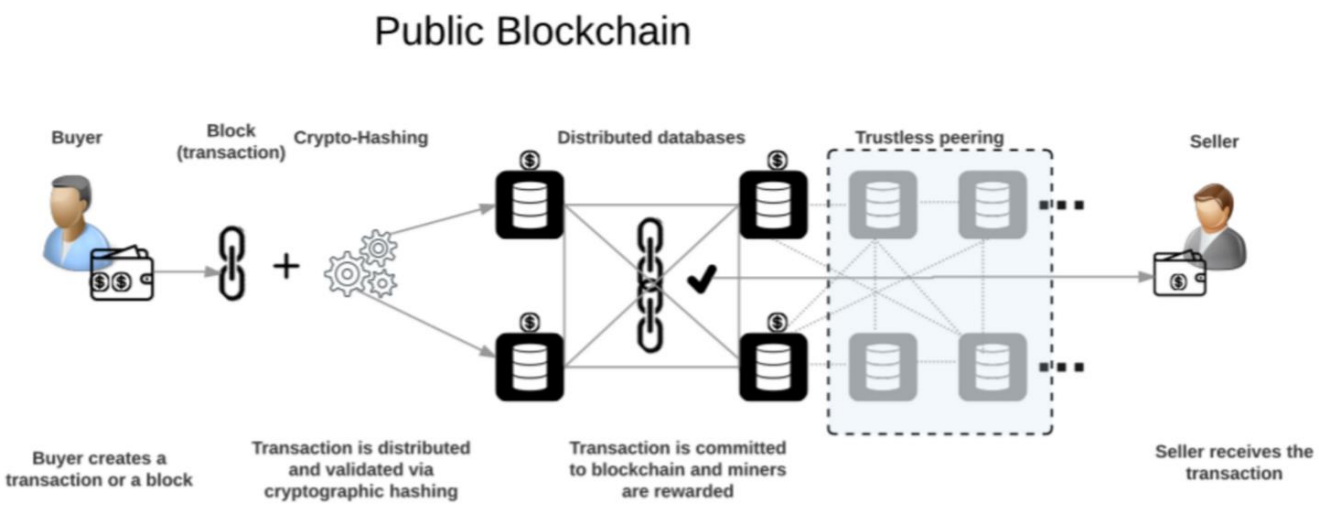
2.3.1 Public Blockchain

This blockchain is 'for the people, by the people and of the people'[57]. Anyone with an Internet connection is allowed to send a transaction (i.e., read/write/hear) and can participate in the consent creation process. There is thus no central registry or trusted third party. The governance of public channels, derived from the open-source movement, is simple: 'code is law'. In this system, the nodes of the network authenticate the choices discussed and started by the developers by deciding whether to incorporate the proposed changes. This operation is based on 'cryptoeconomics', the combination of economic incentives and verification mechanisms using cryptography[58]. Based on a community, or alternative, approach to the economy, this system has proven its power and resilience. Any public blockchain necessarily works with a coin or token. Indeed, the largest known examples of public blockchain are Bitcoin, Litecoin and Ethereum.

[57] Pethuru Raj, Kavita Saini and Chellammal Surianarayanan, Blockchain Technology and Applications, CRC Press, 2021, p.121

[58] Dominique Guegan, Public Blockchain versus Private blockhain, Documents de Travail du Centre d'Economie de la Sorbonne, 2017

Figure 12: How a public blockchain works



Source: *https://www.spindox.it/it/blog/la-classificazione-delle-blockchain/*

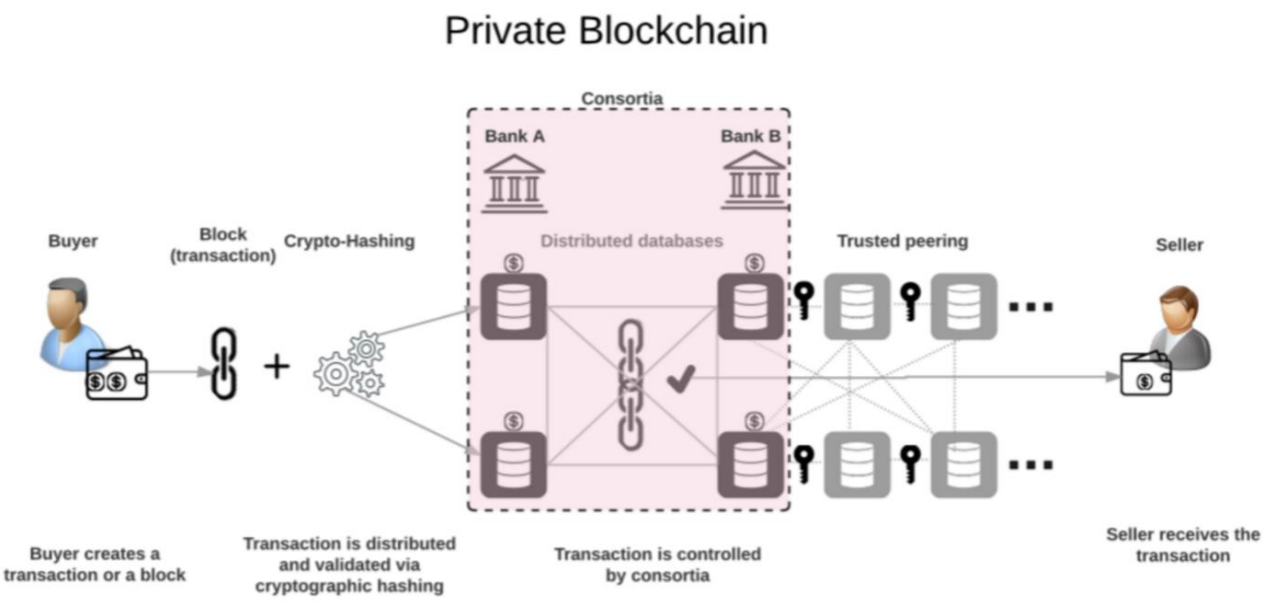
2.3.2 Private Blockchain

If the public blockchain (or permissionless blockchain) is based on the emergence of a new form of distributed digital trust, the philosophy of the private blockchain (or permissioned blockchain) is totally different. Their approach relies on centralized control, which means they do not share the most distinctive feature of blockchains: decentralization. Moreover, there are many other distinctions between the two technologies. In fact, a blockchain system can be defined as private when:

- The consensus process can only be reached by a limited and predefined number of participants.
- Access, in code writing and design, is entrusted to a central organization, which also means that one cannot join in a private blockchain unless invited by the network administrators.
- Read permissions may be open to the public or limited. In this case, the consensus process is controlled by a set of pre-selected nodes.
- The system does not require miners; no proof-of-work or subsequent remuneration. This is what most differentiates the two types of warehouses and transmission technologies.
- There can be different levels of access and information can be encrypted to protect commercial confidentiality. Network participants require permission to read, write or control information within the chain.
- Allow organizations to use distributed ledger technology without making the data public[59];

[59] Dominique Guegan, Public Blockchain versus Private blockhain, Documents de Travail du Centre d'Economie de la Sorbonne, 2017

Figure 13: How a private blockchain works



Source: *https://www.spindox.it/it/blog/la-classificazione-delle-blockchain/*

Hence, this type of blockchain is useful for users who do not want to share their confidential data with a public blockchain. In fact, it is mainly used for accountancy and for keeping data without compromising autonomy. One of the most famous examples of private blockchain is that of Bankchain[60].

2.3.3 The similarities between public and private blockchain

Despite having the differences, we have mentioned above, public and private blockchains also have many similarities that we can list below:

- Both are decentralized peer-to-peer networks, where each member holds a copy of a shared append-only ledger of digitally authorized transactions.
- Both keep the copies in sync through a protocol referred to as consensus.
- Both offer certainties on the immutability of the ledger, even when some contributors are faulty or malicious[61].

[60] Pethuru Raj, Kavita Saini and Chellammal Surianarayanan, Blockchain Technology and Applications, CRC Press, 2021, p.121
[61] https://www.ibm.com/blogs/blockchain/2017/05/the-difference-between-public-and-private-blockchain/

2.3.4 Consortium/Federated blockchain

A consortium blockchain is a type of semi-decentralized blockchain but it is permissioned too[62]. Various companies or many individuals join it to manage the node in a network. These groups are known as a consortium or federation, and their collective nature facilitates in making choices for the advantage of the whole network. Administrators will award the reading request and consensus request to a limited number of reliable nodes who can participate in consensus execution. It is much quicker in solving issues, and there is no single point of collapse. For instance, the world's top 20 financial institutions are clustered into one consortium. No less than 15 companies should vote for or certify the transaction to add one block or to make decisions in this type. R3 and EMF are examples of consortium blockchains.

2.3.5 Hybrid blockchain

As the name indicates it's a mixture of different characteristics of public and private blockchains. With this kind of blockchain we can decide which information is made public and which information is private**.** Normally, participation in the network is private. That is, access to network resources is controlled by one or more entities. However, the ledger is publicly accessible. This means that anyone can explore everything that happens on that blockchain block by block.

For example, these types of blockchain networks are useful for governments or corporate organizations that want to store or share data securely. A perfect use case is occurring in the healthcare industry, where the blockchain is being used to store data from its drug production lines. The stored data can be examined by the relevant authority to check its quality, both at the level of the company itself and the government. The goal of applying this blockchain model is to maintain a high level of transparency and trust.

Finally, to sum up, we can say that among the characteristics of this type of blockchain we can find[63]:

- Access to the network is limited to elements that can only be authorized by the rest of the units
- Access to the transaction book or any other means of information generated by the blockchain is public
- There is no mining or cryptocurrency. The network's consent is given by other means to ensure that the data is correct
- It is partially decentralized, which leads to a better level of security and transparency

[62] Pethuru Raj, Kavita Saini and Chellammal Surianarayanan, Blockchain Technology and Applications, CRC Press, 2021, p.121
[63] https://academy.bit2me.com/it/quanti-tipi-di-blockchain-ci-sono/

2.4 Benefits and limitations of blockchain

So far, we have talked about the history, characteristics, and types of blockchain. In this section, I will analyze the main advantages and disadvantages of this technology, which is becoming increasingly popular.

2.4.1 The advantages of the blockchain

Decentralization is a core concept and the main benefit of this technology. This feature is very important because thanks to it there is no need for a trusted third party or intermediary to validate transactions. A consensus mechanism is used to agree on the validity of trades[64]. The absence of an intermediary means that all participants of the blockchain make the decisions. Each system has a database and it is necessary to safeguard this archive, because when system is working with the third-party organizations, there is a hacking risk of the database or the data may show up in the wrong hands[65].

The procedure of securing the database may take a lot of time and spend a lot of money. If Blockchain technology is used, it can be avoided, because the transactions have their own proof of validity and authorisation to enforce the constraints[66]. This also means that the transactions can be independently verified and processed[67]. In addition, the use of blockchain technology helps to greatly reduce the time for processing and initialisation. It goes from about 3 days to several minutes or even seconds.

Every action is recorded in the blockchain. The data is available to every participant in this system and cannot be altered or deleted. This guarantees the blockchain transparency, immutability, and trust[68]. Blockchain trust is based on the belief of two or more participants who do not know each other. The main idea is the real and worthless transaction between these unknown people. Moreover, trust can be increased further because there can be more processes and shared records[69].

Immutability is achieved when transactions are agreed upon and shared on the blockchain. When the transaction is connected to the blockchain, it will not be possible to change or delete it. It also depends on the type of system. If the system is centralised, it can be changed or deleted, because the decision is made by one person. But if the system is decentralised, each transaction which is joined to the Blockchain, is copied to every computer in the network. This advantage makes the blockchain technology unchangeable and indestructible. Moreover, blockchain users have the power to control all information[70].

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[64] Imran Bashir, Mastering Blockchain, Packt Publishing, 2017, p.31

[65] Arshdeep Bahga, Vijay Madisetti, “Blockchain Platform for Industrial Internet of Things”, Journal of Software Engineering and Applications, No. 9, 2016, pp. [36]533-546,

[66]https://blockchaintechnologycom.wordpress.com/2016/11/21/advantages-disadvantages/

[67]https://medium.com/nudjed/blockchain-advantage-and-disadvantages-e76dfde3bbc0

[68] Julija Golosova, Andrejs Romanovs, The Advantages and Disadvantages of the Blockchain Technology, 2018

[69] Ankit Songara, Lokesh Chouhan, “Blockchain: A Decentralized Technique for Securing Internet of Things”. Conference paper, October 2017

[70] https://blockchaintechnologycom.wordpress.com/2016/11/21/advantages-disadvantages/

Changing or deleting information in a blockchain system is only possible when the intruder has the fantastic computing power to be able to overwrite or delete information on all the computers included in the blockchain before the next block registered on it. For this reason, if the Blockchain consists of a small number of computers, the technology is more exposed to being attacked, whereas if there are many computers in the blockchain then the system becomes more secure and transparent.

Another important advantage of this technology is transparency. It is achieved in the process of copying transactions. In fact, each transaction is copied to one of the computers in the blockchain network. In this way, every participant can immediately see all the actions that are carried out within the system. Nobody can do anything insensitively without the other participants seeing it or being aware of it.

The blockchain is designed in such a way that it can show any problems and correct them if necessary. This advantage makes Blockchain technology traceable and secure. The security of a blockchain technology is mainly due to individual entry into the network. Each person who enters the blockchain has a unique identity that is linked to their account. Furthermore, the security of the blockchain is also based on the reliable cryptographic hash chain. In general, the hash consists of the type, the ID number of the block, the value of the previous hash, the time when the block was created, the ID number of the user, the miner level and the root where the information about previous transactions is stored. This hash is automatically generated by the node key. As can be deduced from what mentioned earlier, it is impossible to change any information in the hash value[71]

Thus, the ten main advantages leading towards the distribution of this technology are:

- Decentralization
- Durability, reliability, and longevity
- Cost and time saving
- Trust
- Immutability
- Empowered users
- Transparency
- Traceability
- Security
- High quality data

[71] https://data-flair.training/blogs/advantages-and-disadvantages-of-blockchain/

2.4.2 The blockchain challenges and disadvantages

Unfortunately, this technology also has its downsides and challenges. The main problem of blockchain is its high energy consumption. Energy consumption is necessary to maintain a real-time ledger. Every time a new node is created it communicates with every other node. This creates transparency. Network miners attempt to solve many solutions per second to validate transactions. They are using significant quantities of computer superpower. Each node is providing extreme amounts of fault tolerance, guaranteeing zero downtime, and making the data stored on the blockchain forever immutable and resistant to censorship.

Unluckily, all this is wasteful, as each node repeats a task to reach consensus, burning electricity and time along the way[72]. Signature verification is one of the challenges of the blockchain because every transaction must be signed with a cryptographic scheme. In this way they can propagate between nodes in a peer-to-peer manner and their source cannot be proven otherwise[73].

The high costs are another big disadvantage of the blockchain. The average cost of the transaction is between 75 and 160 dollars and most of it covers by the energy consumption[74]. Moreover, modern currencies have always been created and regulated by national governments while blockchain faces a hurdle in widespread adoption by pre-existing financial institutions because its status as a government regulator remains uncertain[75].

We have various types of blockchain but in each of them there are cybersecurity issues that need to be addressed before the public entrusts their personal data to a blockchain solution. The last two aspects I wanted to mention are the problems of integration and the cultural adoption of technology. Regarding the first disadvantage, it must be remembered that blockchain applications offer solutions that require significant changes or the complete replacement of existing systems. To make the switch, companies need to strategise the transition. Finally, cultural adoption could prove to be an obstacle for blockchain as the latter represents a complete transition to a decentralised network that requires buy-in from its users and operators[76].

[72] https://medium.com/nudjed/blockchain-advantage-and-disadvantages-e76dfde3bbc0
[73] https://blockchaintechnologycom.wordpress.com/2016/11/21/advantages-disadvantages/
[74] https://dataflair.training/blogs/advantages-and-disadvantages-of-blockchain/
[75] https://blog.deloitte.com.ng/blockchain-technology-benefits-challenges/
[76] https://blog.deloitte.com.ng/blockchain-technology-benefits-challenges/

To sum up, the main disadvantages leading towards the distribution of this technology are:

- Large energy consumption
- High costs
- Uncertain regulatory status
- Control, security, and privacy
- Integration concerns
- Cultural Adoption

The following part is the heart of the chapter and concerns the description of the technical part of the SIAE project entitled “Global Creator Network”.

2.5 Decentralised Global Creator Network on Algorand

The Interested Party Information (IPI) system uniquely identifies rights holders worldwide, making it possible to know for each party and at any time which rights are protected, by whom and for which territories[77]. Nowadays, this service is provided centrally, outside the EU. The project aims to make this system fully decentralised to provide more guarantees to both right holders and end users.

Moreover, the new decentralised solution, called Global Creator Network (GloC-Net), will overcome the limitations associated with centralisation, such as:

- Reliance on a single uncontrolled entity, i.e., a "single point of failure"
- Synchronisation between copies of the central system
- Conflicts due to asynchronous updates over time

The main purpose of this chapter is precisely to illustrate the blockchain architecture proposed for the implementation of the Global Creator Decentralised Network on the Algorand platform.

Collective management is the most common option in the copyright system. It allows right holders to administer their rights through a collective management organisation (CMO)[78]. Managing copyright individually can be difficult and very time consuming. Indeed, it is not easy and straightforward for an author, performer, or producer to contact every single radio station to negotiate licenses and remuneration for the use of their songs.

[77] https://www.ipisystem.org/
[78] https://www.wipo.int/copyright/en/management/

Conversely, it is also true that it is not practical for a radio station to seek specific permission from each rights holder for the use of each song. The main objective of CMOs is precisely to facilitate the management of the rights in the interest of both parties and the financial reward for the right holders[79].

For this reason, by authorising or appointing professional CMOs to take care of their rights, right holders can only benefit. The main functions to be performed by a CMO can be summarised as follows:

1) Controls when, where and what works are used
2) Negotiates tariffs and other conditions with users
3) It grants licences for the use of protected works on behalf of its members and other right holders it represents
4) Collects tariffs from users and distributes them to rights holders

SIAE[80] is the Italian CMO, a Public Body with economic interests based on membership. It is a non-profit company and completely independent in its own business activity[81]. The only purpose of the Society is the protection of the rights of its members.

Recently, SIAE started an investigation into the use of the most effective technologies to support its mission. As a non-profit organization, one of SIAE's main objectives is to provide the highest quality of service to its members while minimizing the need for their financial support. Consequently, dreaming a future in which transactions to remunerate rights holders will be fully automated is absolutely aligned with the purpose of SIAE's mission.

This vision is possible, at least in principle, thanks to the deployment of new technologies that enable secure and reliable transactions, e.g., blockchain, in real-time communication environments such as 5G mobile networks. We can now envisage a future where while listening to a song on your favorite player, wherever that may be, a transaction is automatically triggered on the blockchain platform to remunerate rights holders in a suitable cryptocurrency. This not only will likely significantly improve the efficiency of the whole process, but it will also naturally lead to decentralized governance, where rights holders will be able to manage their interests themselves.

The project consists in developing a public and fully decentralized solution capable of providing this service in a transparent manner for all stakeholders, thus contributing to a potential solution to the so-called value gap problem[82]. Similarly, this transparent approach will also help to address the information gap problem. Today, the centralized governance of over-the-top operators allows them to have exclusive availability of

[79] Cosimo Bassi, Fabrizio Brasca, Federico Demicheli, Matteo Fedeli, Raffaella Guido, Francesco Mogavero, Luca Monti, Francesca Papisca, Cristina Salonico, Fabiano Taliani, Federico Tenga, Andrea Vitaletti, Marco Zecchini, Decentralised Global Creator Network on Algorand, 2021
[80] In English: Italian Society of Authors and Publishers; in Italian: Società Italiana degli Autori ed Editori
[81] https://www.siae.it/en/about-us/siae/siae-and-its-history
[82] https://policyreview.info/articles/news/tale-two-industries-value-gap-dilemma-music-distribution/

valuable information that generates significant revenues. A public and open environment will obviously reduce the power of these operators, thus contributing to the creation of a more dynamic and fairer environment providing new opportunities for all stakeholders[83].

The vision we have been talking about so far will be based on a high-quality pervasive communication infrastructure. In fact, SIAE's main partner in the project is WINDTRE, one of the largest mobile operators in Italy and one of the major alternative players in fixed network connectivity. Thanks to its brand new 5G technologies, WINDTRE can provide fast, ultra-reliable and low-latency communications, which are key ingredients for future deployment in a real-world environment.

Even when the project is completed and the vision realized, we cannot imagine an immediate buy-in of all stakeholders in the process and, consequently, the role of CMOs will still be relevant for a number of years. Probably, their role will be more in the perspective of managing services related to the blockchain platform. For example, they will be responsible for providing an easier interface to the complex digital world for those who are unwilling or unable to operate independently.

However, the project points in the direction of an incrementally realizable decentralized future. As such, the purpose of the next few paragraphs is to investigate how to decentralize one of the first technical ingredients needed to implement our vision: the IPI system we mentioned above.

We conclude this paragraph by talking about the market potential of the project solution. We can say that it is largely represented by all the CMOs that manage copyright globally. In fact, SIAE aims to convince them to join this new decentralised solution[84].

2.5.1 The interested party information system

The Interested Parties Information System (IPI) is the international information system managed by the Swiss copyright society SUISA and adopted by the International Confederation of Societies of Authors and Composers (CISAC) and the BIEM societies (international organization representing mechanical rights).

It includes data on all rights holders of protected works that are registered by user organizations in the IPI system and on all public domain works. The objective of the IPI system is the clear global identification of a natural or legal person active in various creation classes, roles, and rights. The information that has been registered according to the Common Information System (CIS) regulations of CISAC and BIEM serves the

[83] Cosimo Bassi, Fabrizio Brasca, Federico Demicheli, Matteo Fedeli, Raffaella Guido, Francesco Mogavero, Luca Monti, Francesca Papisca, Cristina Salonico, Fabiano Taliani, Federico Tenga, Andrea Vitaletti, Marco Zecchini, Decentralised Global Creator Network on Algorand, 2021

[84] Cosimo Bassi, Fabrizio Brasca, Federico Demicheli, Matteo Fedeli, Raffaella Guido, Francesco Mogavero, Luca Monti, Francesca Papisca, Cristina Salonico, Fabiano Taliani, Federico Tenga, Andrea Vitaletti, Marco Zecchini, Decentralised Global Creator Network on Algorand, 2021

companies that use the IPI in their documentation, distribution, and accounting effort. This is extremely important not only for the exchange of data within CISAC societies, but especially for the worldwide exchange of information with third parties and user organisations such as radio and TV stations.

To give an idea of the most relevant information in an IPI record, I have decided to show the following table.

Table 2: Summary table of IPI main fields

Heading	Short description	#	Example	Private
BASE_NO	Interested Party (IP) base number, unique identifier of a right holder		E.g. I-001068130-6 identifying the rights holder	YES
NAME_NO	IP name number, additional identifier of a rights holder		E.g. 00334284961 identifying a pseudonym of the rights holder	NO
NAME	IP name		E.g. Rossi Mario	NO
SOC	Collecting Society	~200	SIAE, SUISA E.g. SIAE	NO
CC	Creation class	16	Musical Work, Dramatic work ... E.g. Musical Work	NO
RO	Role	34	Musical creator, Book publisher ... E.g. Musical creator	NO
RI	Right	26	Performing right, ..., Re-transmission right, E.g. performing right	NO
ValidFrom	The date from which the right management is given to the collecting society		E.g. 01.01.2017	NO
ValidTo	The date until which the right management is given to the collecting society		E.g 31.12.2017	NO
SHARE	The percentage of right the CMO is in charged to collect		E.g. 100%, 75%, ...	NO
TERRITORY	The territory in which the CMO is in charge of the right management	220	E.g. Italy, France, Europe, North America, World	NO

Source: *Cosimo Bassi et al., Decentralised Global Creator Network on Algorand, 2021*

Other attributes that are reported and that we can identify as secondary are the following: Name Type, IP type, Current Status, First Name, Sex, Birthday/Month/Year (natural person) or Foundation Month/Year (legal entity), Decease Day/Month/Year (natural person) or Dissolved Month/Year (legal entity), Nationality (natural person) or Foundation place/state/country (legal entity), Birthplace/State/Country (natural person), Amendment.

2.5.2 Artistic right, agreement and interested party record definition

In the current centralized IPI system, the tuple (CC, RO, RI) identifies an artistic right of the right holder. Specifically, the tuple (CC, RO, RI) identifies a right (RI) related to a category of artistic work (CC), in which the right holder has collaborated with a role (RO).

On the other hand, the tuple (NAME NO, SOC, CC, RO, RI, SHARE, TERRITORY, ValidFrom, ValidTo) represents an agreement between the rights holder (NAME NO) and a collecting society (SOC or CMO) valid in the time interval [ValidFrom, ValidTo], and for the territory TERRITORY. Essentially, these fields mean that, in the ValidFrom-ValidTo time interval and for the TERRITORY territory, the NO NAME has assigned to the collecting society SOC a percentage share of the management of its artistic right[85] (CC, RO, RI).

An important feature to remember about this system is that a rights holder can only be associated with one IP base number and one or more IP name numbers. Furthermore, the proposed solution is made in such a way that most of the attributes shown in Table 2 are public and accessible by all network members. However, further personal information about the rights holders (such as day and city of birth, gender, name etc..) and the IP base number should remain confidential, and their access should be under the control of the rights holder. Table 2 also shows those fields in an IPI record that are categorical (such as CC, RO, RI, SOC, TERRITORY).

The IPI system mainly implements C.R.U.D. (Create, Read, Update, Delete) primitives for the agreement tuple. Among them, we can consider the Right transfer primitive as a special case of an agreement update that has relevance in our scenario. A right transfer updates the SOC, ValidFrom and ValidTo fields of one or more agreement tuples. Similarly, in the IPI system it is also possible to work on the personal information of the rights holder. This is useful information to check whether a right holder has already been registered in the database and possibly identify duplicates.

[85] Cosimo Bassi, Fabrizio Brasca, Federico Demicheli, Matteo Fedeli, Raffaella Guido, Francesco Mogavero, Luca Monti, Francesca Papisca, Cristina Salonico, Fabiano Taliani, Federico Tenga, Andrea Vitaletti, Marco Zecchini, Decentralised Global Creator Network on Algorand, 2021

2.5.3 Architecture of the blockchain-based IPI system

To achieve our goal, the project aims to implement a blockchain that provides a minimum set of features, briefly introduced below, and that guarantees maximum scalability in view of the future management of many records. The blockchain in question will therefore have to support the management of non-fungible tokens (NFT) that will have the task of representing an artistic right for a specific territory (i.e., the tuple CC, RO, RI, TERRITORY).

Furthermore, since all creation, update and deletion operations must be agreed upon by multiple parties, we require that the adopted technology supports multi-signature accounts, i.e., accounts that need the cryptographic signature of multiple autonomous accounts to publish new transactions on the blockchain.

The platform that was chosen for the project is Algorand. It is currently regarded as one of the best in terms of scalability, and it provides all the necessary features to implement our solution. In addition to this, there were two main reasons why Global Creator Network was developed on Algorand:

- Its interlocking time is very short: about 5 seconds.
- Its consensus algorithm can confirm up to 1000 transactions per second.

To go into detail, digital tokens in Algorand are called Algorand Standard Assets (ASA). They are made up of immutable fields (such as Creator, AssetName, UnitName, Total, Decimals, DefaultFrozen, URL, MetaDataHash) and mutable fields[86] (such as Manager Address, Reserve Address, Freeze Address and Clawback Address) but we will look at the structure later in the dedicated chapter.

2.5.4 The reference solution functioning

Artistic rights for each specific territory are configured in the form of Algorand Standard Assets (ASA). The project is designed in such a way that for the first period the creation of the asset is (at least partially) centralized while its management is decentralized. As time goes by, the aim is to make the first phase fully decentralized, but above all the aim is to have the rights managed directly by the owners in the (hopefully not distant) future. Information about the artistic right and the territory is stored in the parameters of the asset. The token is created by an issuer and a rights holder (RH) 2-of-2 multisignature account, which is the initial asset owner. The necessary condition for the whole system to work in the best possible way is that the issuer is trusted to create valid ASAs that are not duplicates of already available assets.

[86] Cosimo Bassi, Fabrizio Brasca, Federico Demicheli, Matteo Fedeli, Raffaella Guido, Francesco Mogavero, Luca Monti, Francesca Papisca, Cristina Salonico, Fabiano Taliani, Federico Tenga, Andrea Vitaletti, Marco Zecchini, Decentralised Global Creator Network on Algorand, 2021

The peculiarity of the system is that, depending on the governance requirements, we can have two different types of issuers:

1) It could be a single entity (e.g., a single CMO), a multi-signature account, etc.

2) We can also have multiple issuers working independently (but consistently) of each other (i.e., multi-issue). The Clawback address of the ASA corresponds to the Algorand address of the RH. In this way, at any time the rights holder can "take back control" of the ASA and assign it to any other account.

This solution uses non-fungible assets to store the attributes of an artistic right. In this solution, each asset is an artistic right of a right holder to be assigned to a CMO. The assignment of the artistic right is represented by the transfer of the asset to the destination CMO, thus implicitly implementing the conclusion of an agreement. As we said in the previous paragraphs, an artistic right is the tuple (CC, RO, RI, TERRITORY), whereas an agreement is the tuple (CC, RO, RI, TERRITORY, validFrom, validTo, SHARE).

The values (CC, RO, RI, TERRITORY) are stored in the immutable fields of ASA, while the values validFrom and validTo can be implicitly determined from the timestamp of ASA asset transfer transactions. The percentage of the SHARE is determined by the total supply (equal to 100) and the decimals (equal to 2). The total supply and the decimals, used together, allow the rights holder to be free to assign any portion of the 100.00% SHARE to CMO1, another portion to another company CMO2, etc., while at the same time avoiding the double expense of the share. This approach, illustrated in the figure below, involves three distinct categories of users:

- Trusted issuer(s) of the goods
- Rights holders (authors, e.g., Morricone)
- CMO (e.g., SIAE)

The proposed solution works as follows:

1. When the rights holder needs to assign the management of one of his/her rights, he/she first asks the broadcaster to generate the new and unique corresponding ASA with data (CC, RO, RI, TERRITORY)

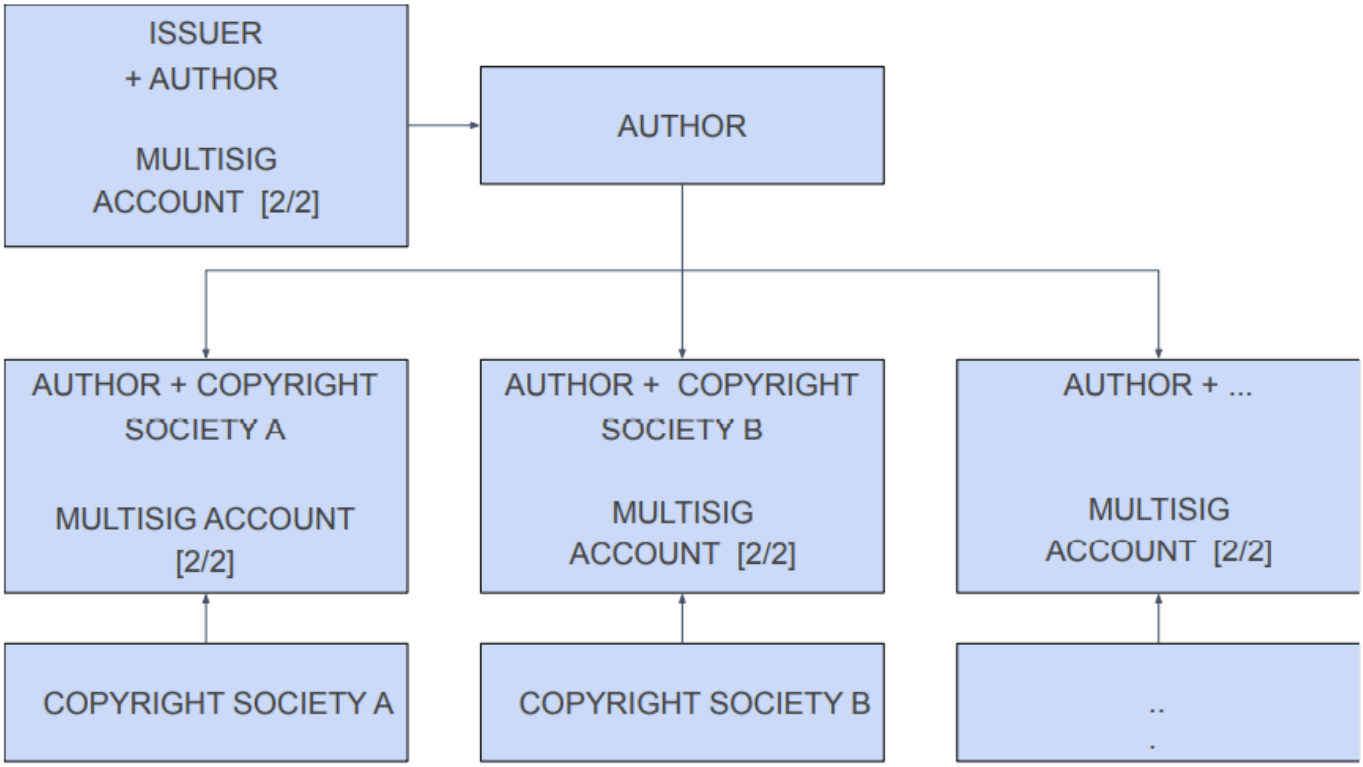
2. The issuer + RH multisignature creates the ASA.

3. The rights holder recovers ownership of the ASA and transfers it to a CMO1+RH multisignature account that has already opted in. This corresponds to ceding management of the artistic rights associated with the ASA to CMO1, entering into an agreement valid from the timestamp of the clawback transaction[87].

[87] Cosimo Bassi, Fabrizio Brasca, Federico Demicheli, Matteo Fedeli, Raffaella Guido, Francesco Mogavero, Luca Monti, Francesca Papisca, Cristina Salonico, Fabiano Taliani, Federico Tenga, Andrea Vitaletti, Marco Zecchini, Decentralised Global Creator Network on Algorand, 2021

When the rights holder decides to reallocate the management of the artistic right to another company (CMO2), (s)he takes back ownership of the SAA and transfers it to a CMO2+RH multi-signature account. The values of the validTo field of the previous agreement and of the validFrom field of the new agreement are equal to the timestamp of the clawback transaction.

Figure 14: Roles and Architecture of Non-fungible assets solution



Source: *Cosimo Bassi et al., Decentralised Global Creator Network on Algorand, 2021*

2.5.5 The role of the issuer

To avoid double spending on artistic rights it is important not to have two ASAs in the system relating to the same artistic right. Therefore, before issuing a new ASA to an artistic right holder, the broadcaster must check whether an active ASA relating to the new artistic right to be added already exists in the system[88].

[88] Cosimo Bassi, Fabrizio Brasca, Federico Demicheli, Matteo Fedeli, Raffaella Guido, Francesco Mogavero, Luca Monti, Francesca Papisca, Cristina Salonico, Fabiano Taliani, Federico Tenga, Andrea Vitaletti, Marco Zecchini, Decentralised Global Creator Network on Algorand, 2021

The issuer's account may be managed in different ways depending on governance requirements. In fact, there are four different options:

- A single account managed by the owner of the application, (e.g., SIAE).
- A multi-signature account managed jointly by several CMO accounts. This option allows greater decentralization in the issuing of tokens.
- A stateless smart contract governed by its own code
- A different account for each CMO (multi-issue)

2.5.6 A particular security design

In Algorand, each individual issuing account can create or receive up to a maximum of 1000 ASAs. However, this number is particularly low if the application is governed by a single issuer. In fact, to overcome this limit, ASAs are not only issued by the issuer account alone, but rather by a multi-signature issuer + rights holder account. In this way, the issuer participates in many multisignature accounts that manage up to 1000 ASAs per distinct rights holder.

From a specular point of view, each CMO account can receive up to 1000 ASAs in total. This problem is solved in the same way as above: when an IP wants to assign the management of its artistic right to a CMO, (s)he sends the corresponding ASA to a multi-signature rights holder + CMO account. For security reasons and by application design, multisignature accounts are 2 of 2 rather than 1 of 2.

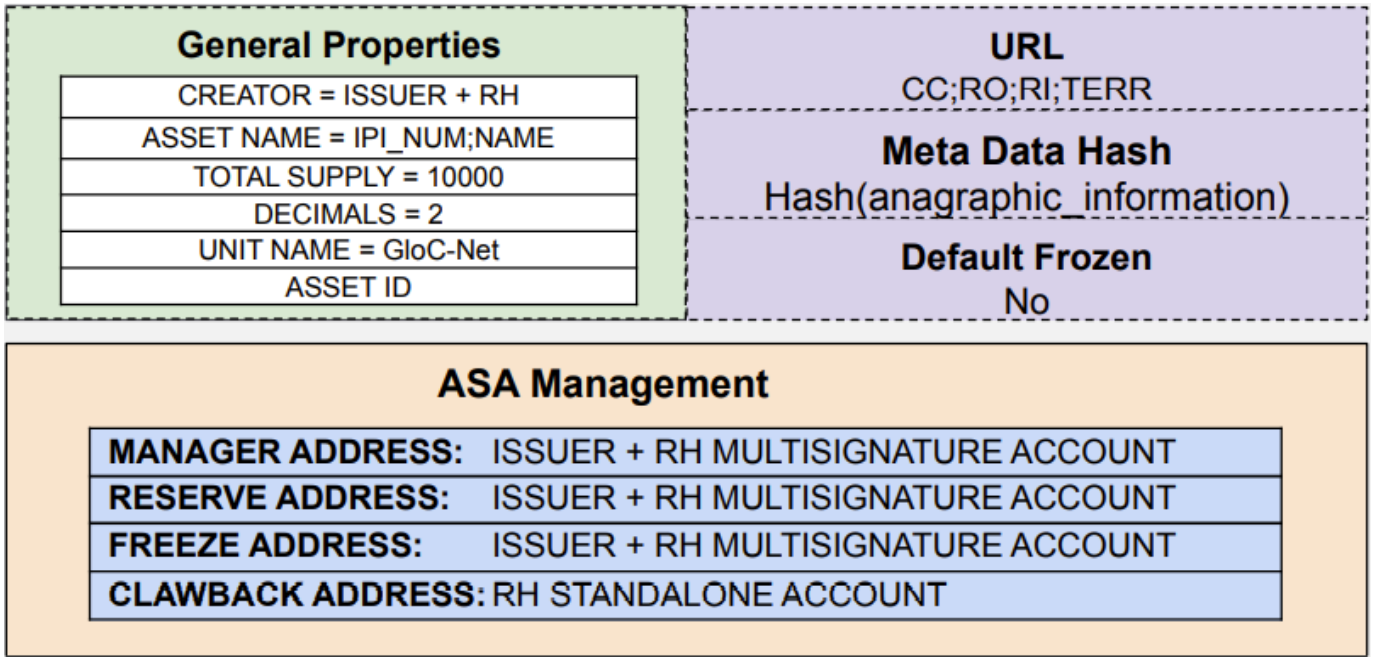
This means that every transaction issued by the account (and thus, every on-chain activity) must be signed and agreed upon by both parties. This prevents a single malicious party from poisoning the application with false or duplicate data in new ASAs and prevents CMOs from opting in to ASAs they don't want to receive. In fact, any attack requires the collusion of both parties[89].

[89] Cosimo Bassi, Fabrizio Brasca, Federico Demicheli, Matteo Fedeli, Raffaella Guido, Francesco Mogavero, Luca Monti, Francesca Papisca, Cristina Salonico, Fabiano Taliani, Federico Tenga, Andrea Vitaletti, Marco Zecchini, Decentralised Global Creator Network on Algorand, 2021

2.5.7 Token structure

The structure of an ASA issued by an issuer + multi-signature rights holder is shown in the figure below. The artistic right identified by the ASA is written in the AssetName and URL fields. In this solution we use the Metadata Hash field of each ASA to store the hash value of the IP of the private master data, to verify the integrity of this data later.

Figure 15: Structure of non-fungible Algorand Standard asset (ASA) used in this solution.



Source: *Cosimo Bassi et al., Decentralised Global Creator Network on Algorand, 2021*

CHAPTER 3: THE SIAE PROJECT: COPYRIGHT MANAGEMENT ON 5G NETWORKS THROUGH BLOCKCHAIN TECHNOLOGY

It must first be noted that what is described in Chapter 2 represents the evolution, developed over the period between 2019 and 2021, on a methodological and practical level of the original project proposed by SIAE to MISE. This will be illustrated in detail below in order to provide the reader with a clearer vision of the objectives aimed at making the management of copyright more efficient and therefore the results of the company's primary activity.

3.1 A support programme for emerging 5g technologies

On 26 March 2019, the MISE (Ministero dello Sviluppo Economico) approved the 5G Emerging Technologies Support programme. The objective of the programme is to implement projects of experimentation, applied research and technology transfer, based on the use of emerging technologies, such as Blockchain, Artificial Intelligence (AI), Internet of Things (IoT), linked to the development of next-generation networks.

Therefore, public administrations and bodies, agencies and universities may apply for the implementation of these specific projects, which must be carried out through the aggregation of several entities. Among the latter, the leader of the aggregation must be identified, with the mandatory participation of at least one public research body or university, and in collaboration with the operators holding of frequencies that can be used for 5G. The Plan is financed by resources from the 2014-2020 Development and Cohesion Fund as set out in the Investment Plan for the deployment of ultra-wideband[90].

At that time, SIAE was carrying out some studies on the applicability of Blockchain technology to copyright in collaboration with Blockchain Core and the University of Rome "La Sapienza". As soon as the call for participation in the programme came out, the company took the opportunity to work on its project proposal applying as project leader. As you can imagine, for the reasons mentioned above, the choice and search for partners was very easy and quick. WindTre was immediately added to the two initial partners, as it was a mandatory requirement of the call for proposals. Finally, on the 4th of November 2019, SIAE sent its project proposal. Algorand was added as a technical partner at a later stage.

In the following paragraphs I have reported on the various sections of the project proposal: description of the project, analysis of the objectives, methods of implementation, improvements in services thanks to new technologies, driving forces for the growth of entrepreneurship in Italy, sustainability and replicability of results, roles and participants in the project, costs, and timescales of the project.

[90] https://www.mise.gov.it/index.php/it/comunicazioni/servizi-alle-imprese/tecnologia-5g/tecnologie-emergenti-5g#asse-II

3.2 Project description

The 5G network promises to make existing multimedia content available at a higher quality level. In addition, the high bandwidth availability and low latency enable us to imagine the use of completely new content. A key issue in realizing these ambitions, both technically and economically, is the ability to exploit and protect creative, audiovisual and entertainment content, which will represent most of the traffic on the 5G network.

The blockchain is a technology that allows us to imagine a future in which the valorization of content and the distribution of remuneration to rights holders is completely different than it is today. A large part of current processes will be automated and managed by smart contracts (i.e., programmes that run autonomously on the blockchain and regulate relationships between parties, effectively implementing traditional contracts in a decentralized context).

In the project long-term vision, smart contracts will not only be able to verify the lawfulness of a user's enjoyment of a content in each context but will also be able to automatically distribute rewards to the entitled parties. One of the project's challenges is to overcome the intrinsic limits of the current system for remunerating rights holders who live off copyright income. These limits are represented by the existing difficulties in defeating endemic phenomena of unauthorized use of content, but also, and above all, by the ability of rights holders - or of those who, like SIAE, represent them - to finally have an objective audit on the activities of the large platforms that make their content available.

Today, it is impossible for a right holder or his representative to challenge any Digital Service Provider (DSP) (e.g., a large music streaming platform) for the play count based on which the use of a certain content is remunerated. In fact, there are no tools to verify that the volume of playback declared by the DSP is correct. The implementation of this model would represent a real paradigm shift. Traditionally, the network infrastructure has been limited to transporting content, but with the help of a blockchain-based infrastructure, the 5G network will for the first time also be able to offer the tools to properly exploit it.

The project aims to propose a generalizable solution using an approach that complies with 5G network architectures. In this perspective, although the attribution ledger is primarily conceived for the protection and valorization of content falling within the sphere of creativity, audiovisuals, and entertainment, it may also represent an excellent test bed for future implementations of blockchain solutions[91] (e.g., for the protection and valorization of Made in Italy brands, but also in other sectors in which the smart contract concept can be applied, such as the energy industry).

[91] SIAE, Proposta del progetto “Gestione dei diritti d’autore su reti 5G con Blockchain”, 2019

Even if the steps to achieve the full effectiveness of our vision are multiple and gradual, the implementation of an attribution ledger like the one proposed is fundamental to achieve one of the most important project goals. The ambitious result is to zero the value gap that creators around the world currently challenge to the largest global digital platforms.

The blockchain-based infrastructure that has been planned will allow, once completed, to guarantee for the first time a 360° protection by design of content and its full exploitation.

To eliminate the value gap, as we said before, the project will be based on an action plan with the following steps[92]:

1) Development of an attribution ledger with standard unique identifiers for rights holders

2) Creation of a distributed database with standard unique identifiers for all intellectual property

3) Management of economic flows directly on-chain

4) Certification of information on the use of content

5) Smart content and dedicated hardware to fight piracy crime

[92] SIAE, Proposta del progetto "Gestione dei diritti d'autore su reti 5G con Blockchain", 2019

3.3 Analysis of project goals

5G networks will allow content to be delivered at unprecedented speed and latency. A central issue in exploiting their potential is the enhancement of content through appropriate copyright protection by using blockchain technologies. Within the project, this vision is reflected in the following objectives:

1) Implementation of an attribution ledger (i.e., decentralized register of entitled persons) based on permissioned blockchain technology. It allows to identify unequivocally and worldwide the owners of copyrights on intellectual works. The development of such an information system is a prerequisite to implement appropriate mechanisms for the protection of copyright on the 5G network including automatic and direct management of financial flows between users and rightsholders using transactions regulated solely by smart contracts (i.e., computer protocols that guarantee the enforcement of the terms of an agreement between several parties). Considering that most of the content delivered on the 5G network is in creativity, audiovisual content, and entertainment in general, the realization of such mechanisms could represent a driving force to enhance and protect this content also and above all outside the national borders, guaranteeing a fair remuneration for all intangible products that can be traced back to the 'made in Italy' brand. The proposed solution is designed to be cross-border and aims to become the global platform for copyright protection on the 5G network. In this perspective, the 5G network will be the first one to offer the tools to regulate the access and enjoyment of content provided on it.

2) Investigation on the possibility of implementing the attribution ledger described in the previous point on permissionless blockchain. This will be useful to fully exploit the decentralization capabilities of the blockchain and provide stakeholders with a solution to anticipate an eventual, but likely future in which many components of copyright management will potentially be managed in a decentralized manner directly by an infrastructure based on blockchain technologies.

3) Testing on the WIND network of the proof-of-concept of an IoT device capable of exploit the 5G for low-latency transmission of songs played in an entertainment context (e.g., a disk jockey console) to a back-end that can recognize them with appropriate AI techniques. The device must also be able to interact with the attribution ledger using the 5G network. This will allow it to simulate the automatic distribution of remuneration deriving from the use of intellectual works detected by the IoT device itself through an infrastructure based on blockchain technology[93].

[93] SIAE, Proposta del progetto “Gestione dei diritti d’autore su reti 5G con Blockchain”, 2019

Table 3: Summary table of result outputs for each objective and the related key performance indicators

Objective number	**Target**	**KPI**
Ob 1	T1. In-lab implementation attribution ledger	All functionalities of the attribution ledger works as expected with latency compared to the centralized solution. Scalability tests demonstrate the applicability of the solution
Ob 1	T2. First deployment of attribution ledger on 5G network	Availability of 5 nodes on the permissioned network and testing of scalability and performance passed
Ob 1	T3. Final deployment	Package solution with easy installation and documentation.
Ob 2	T4. Comparison of blockchain permissionless solutions and selection of the most promising one	Solution analysis through the study of scientific literature and laboratory testing of prototype solutions.
Ob 2	T5. Development of a PoC of attribution ledger on permissionless technology	Test of scalability and acceptable performance
Ob 3	T6. Development of the expected PoC device	The device is able to recognize at least 70% of the tracks and the test is correctly performed by exploiting the information contained in the attribution ledger.

Source: *SIAE, Proposta del progetto "Gestione dei diritti d'autore su reti 5G con Blockchain", 2019*

3.4 Methods of implementation

SIAE has the experience and authority, consolidated over 137 years in the copyright market, to realize the long-term vision, providing the project with the necessary know-how and the ability to involve all relevant stakeholders. The roadmap includes a series of steps that gradually lead to the realization of the long-term vision described in the previous paragraphs. The first of these is the implementation of the attribution ledger, which is a decentralized information system based on blockchain technologies that uniquely identifies copyright holders worldwide.

This system enables us to know, for each subject and at any time, for which rights he/she is protected, by whom and for which territories. Now, this service is provided centrally, and the aim of the project is to make it completely decentralized in order to provide greater guarantees to rights holders and users, overcoming the limitations associated with centralization.

Talking about blockchain technologies, it is necessary to distinguish between permissionless and permissioned blockchains. Permissionless blockchains are defined so because they do not require any authorization to access the network, perform transactions or participate in the verification and creation of a new block[94]. Conversely, permissioned blockchains are subject to an authority that determines who can access them. In addition to defining who is authorized to be part of the network, this authority also defines the roles that each user can play into it and the rules on the visibility of recorded data[95].

Although permissionless blockchain technologies have the potential to become a real paradigm shift, for the roadmap to be credible, there needs to be a process of stakeholder's adaption that allows them to seize all opportunities without feeling threatened by the blockchain itself. It is easy to imagine a permissionless blockchain that could radically change the market, but its realization in the short term presents significant obstacles. It requires a real revolution, which is not yet completely possible in many aspects such as the technological ones of scalability and bandwidth.

Hence, the first implementation of the attribution ledger is designed on permissioned technologies (Ob1). However, at the same time, the possibility of transporting the solution to permissionless technologies will be studied to fully exploit the decentralization capacities of the blockchain. Moreover, this would provide stakeholders with a solution to anticipate a potential completely disintermediated future for copyright management, giving them the opportunity to understand and take a leading role in the new environment (Ob2)[96].

[94] https://www.spindox.it/it/blog/la-classificazione-delle-blockchain/

[95] https://www.spindox.it/it/blog/la-classificazione-delle-blockchain/

[96] SIAE, Proposta del progetto "Gestione dei diritti d'autore su reti 5G con Blockchain", 2019

Once the implementation of the attribution ledger for the management of rights holders is complete, it will be possible to proceed with the final phase of the project. The latter involves the development of a proof of concept for an IoT device able to exploit the 5G network to transmit at low latency the songs enjoyed in an entertainment context to a back-end able to recognize them with appropriate AI techniques (classification).

The device will also be able to interact with the attribution ledger through the 5G network to simulate the automatic distribution of rewards using information managed with blockchain technology (Ob3). Finally, the PoC will be tested on Wind Tre's commercial 5G network.

3.5 Services improvements due to new technologies

Currently, the attribution ledger has functionalities that are performed by a centralized system. However, there are limitations associated with centralization, including:

a) trust in the service provider with little possibility of control

b) the annual cost to be paid to the service provider

c) conflicts due to asynchronous changes over time.

d) a single point of failure (i.e., the existence of a single entity that, if compromised or cyber-violated, could cause system manipulation)

e) synchronization between copies of the central system

The development of the attribution ledger on a private blockchain would allow all the stakeholders of the current system (i.e., all Collective Management Organizations such as SIAE (IT), SACEM (FR), PRS (UK)) to:

a) share the infrastructure with consequent cost optimization

b) have complete auditing capabilities

c) have full guarantees on data integrity and time stamping

d) mitigate risks due to the delegation of management to third parties

All these benefits will help overcome piracy crimes that afflict the current remuneration model. For the first time, rightholders will have direct access to an infrastructure that can fully exploit the content they create.

The aim is to exploit an intrinsic property of blockchain technology: to transfer value and not just information in a peer-to-peer mode[97].

The permissionless solution study will allow Collective Management Organizations (CMOs) to evolve their business model and prepare for a future world in which a large part of the current copyright management processes could be decentralized.

This will offer new guarantees of transparency and reliability to rights holders and content users. Moreover, the implementation of a permissionless solution could lead to the complete disintermediation of financial flows, managed by smart contracts, in order to distribute royalties to rights holders quickly and efficiently.

3.6 Driving forces for entrepreneurial growth in Italy

The project is part of a wider context of protection and enhancement of the Italian creative and cultural industry. The latter is not only the universally recognized beauty of Italy, but also the vital soul of our country's economy. According to the Italia Creativa study[98], the Culture and Creativity Industry in Italy is today the third most important production sector on the employment side. It is a leading sector for our economy as it employs more than 1 million people and has a turnover of 48 billion euros (2015).

An estimate[99] made in the context of this study shows that the potential value of the culture and creativity industry in Italy could reach 72 billion euros, creating more than 500,000 new jobs from 1.03 million to 1.6 million. This would represent a growth rate of more than half of the current jobs in Italy. Today, the untapped potential we are talking about must deal with the threats posed by piracy. It consists of the illegal reproduction, distribution and use of intellectual works.

This phenomenon, which is not fully estimated (it is assumed to be worth between 4.6 and 8.1 billion euros, according to the Italia Creativa 2015 study[100]), unfortunately represents an endemic problem in our and other countries. The figure below represents the ten creative sectors identified in the study. It is evident that many of them will distribute their products through the 5G network. For the 5G network itself, it is likely that these same sectors will account for a large share of the total traffic handled[101]. In fact, according to some studies[102], Netflix alone now accounts for 15% of global internet traffic.

[97] SIAE, Proposta del progetto "Gestione dei diritti d'autore su reti 5G con Blockchain", 2019
[98] http://www.italiacreativa.eu/

[99] https://www.ilsole24ore.com/art/in-italia-l-industriacreativa-e-culturale-vale-48-miliardi-24percento-e-cresce-piu-pil-AE2ybD

[100] http://www.italiacreativa.eu/wp-content/uploads/2017/01/ItaliaCreativa_SecondaEdizione.pdf

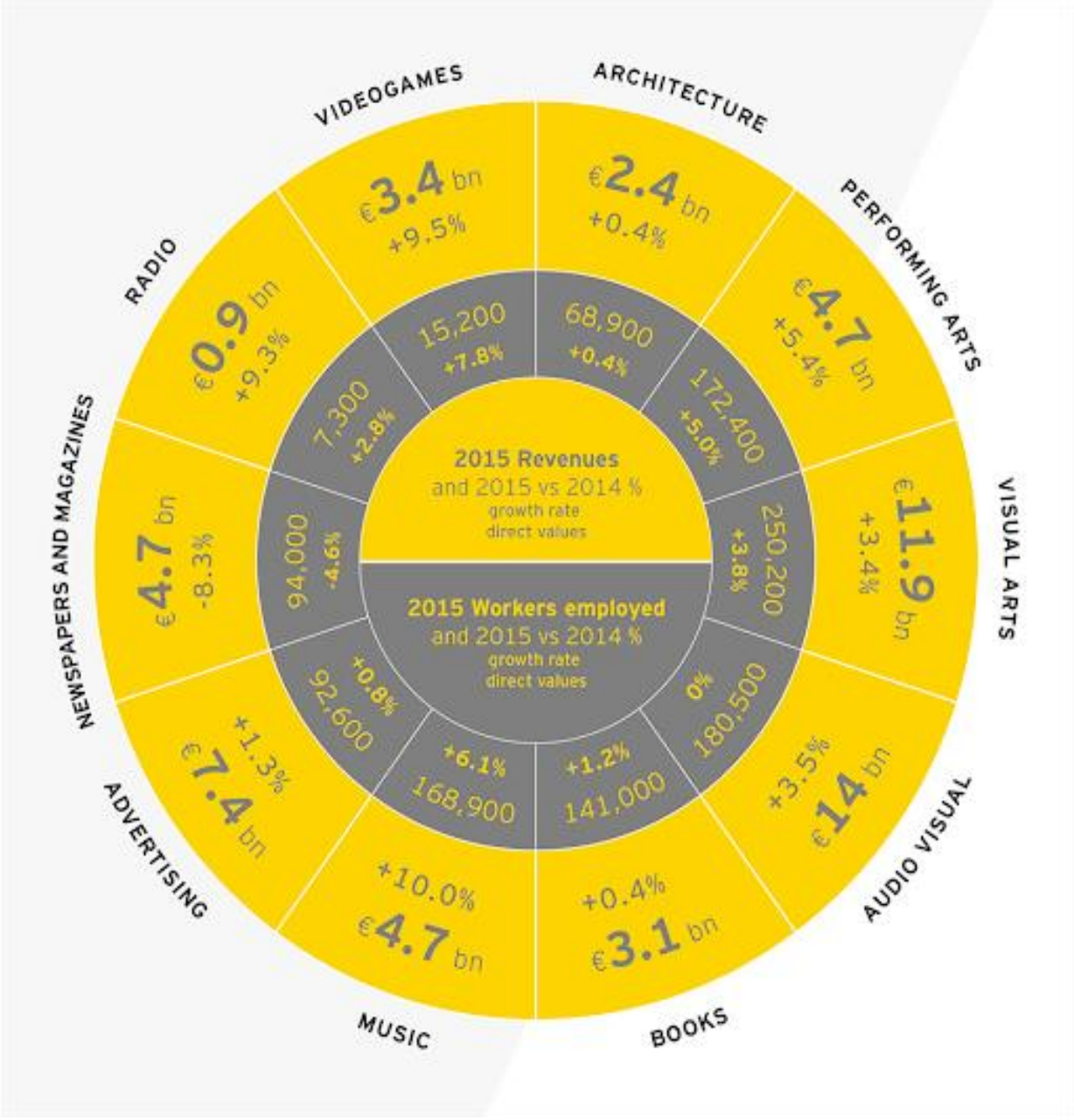
[101] SIAE, Proposta del progetto "Gestione dei diritti d'autore su reti 5G con Blockchain", 2019

[102] https://www.sandvine.com/hubfs/downloads/phenomena/2018-phenomena-report.pdf

The expected effects of this project are, in short, a more efficient and transparent management of the copyright chain and, ultimately, a greater and fairer valorization of creative content in general. These effects would have a strong impact on the creative industry, which by nature is decentralized and strongly rooted throughout the Italian territory.

In today's world, it is increasingly difficult to imagine a working future built on your own passions and talents. The project will work precisely in this direction by making easier and more effective for small artists and creators to monetize their creativity. Lastly, it will facilitate the start of a professional career in the field of creativity for many young people.

Figure 16: Italia Creativa's Ten Sectors (2015 values)



Source: *http://www.italiacreativa.eu/*

3.7 Sustainability and replicability of results

Decentralized solutions, such as those based on blockchain, are replicable by design. Indeed, to work, the same infrastructure must be distributed (i.e., replicated) across a number of entities that jointly administer and manage it. In other words, the key concept in blockchain of decentralization is the antithesis of the concept of centralization where a single entity administers the system.

However, decentralization is not limited to machines and/or infrastructure, but it necessarily extends to processes which, thanks to the adoption of blockchain, are naturally harmonized. The sharing of infrastructure makes it possible to share investments, thus promoting the sustainability of the initiative itself. As copyright management is a global issue that also involves significant financial flows (the music industry alone generates annual cash flows of approximately €9 billion[103]), any effective solution must be replicable internationally.

This is mainly because the stakeholders involved (e.g., CMOs) manage the rights in their own territorial context. Finally, it should be borne in mind that most of the traffic on the 5G network is related to creative, audiovisual and entertainment content. Such content must somehow generate value in terms of rights for authors. In this sense, even a small percentage on the rights for the exploitation of the content would lead to the sustainability of the results. In fact, the envisaged infrastructure will basically be supported by 'network charges', just like in the energy market[104].

3.8 Project roles and participants

In this section I will describe the actors involved in the project and their respective roles:

- **SIAE** is a company for the collective management of copyright, i.e., an entity made up of members (authors and publishers are its "membership base"), which deals with the intermediation of copyrights[105]. It will assume the role of project leader, coordinating the partners in the realisation of the different objectives and managing the relations with the Ministry of Economic Development. In addition, SIAE will indicate the necessary requirements for the realisation of the objectives, thanks to its knowledge of the current management of copyright protection.

[103] https://www.siae.it/sites/default/files/RENDICONTO%20DI%20GESTIONE%202019.pdf

[104] SIAE, Proposta del progetto “Gestione dei diritti d’autore su reti 5G con Blockchain”, 2019

[105] https://www.siae.it/it/chi-siamo/la-siae/siae-e-la-sua-storia

- **Wind Tre** is the number one mobile operator in Italy and one of the main alternative operators in the fixed line sector. The company is a key player in fixed-mobile integration and in the development of new generation fiber networks[106]. It will support its partners in the realisation of the various project objectives and participate in the creation of a new ecosystem.
  The latter will be based on the results of the tests (in the PoC phase) obtained on the real infrastructure made available "in kind" in the Rome area.

- **The University of Rome "La Sapienza"** coordinates the activities related to objective 2 and will support the project partners in the design of solutions to achieve the other project objectives. All project members are part of the Department of Excellence in Cybersecurity (DIAG)[107] and participate in the Cyber Intelligence and Information Security Centre (CIS)[108].

- **Blockchain Core SRL** is a company that offers highly qualified and specialized global consultancy for assessing the applicability and impact of blockchain technology to the activities and operational strategies of institutions and enterprises[109]. Its role in the project will be to develop the software for the realisation of the project objectives.

As mentioned earlier, a new technical partner was added at a later stage of the project but it does not appear within the project proposal.

- **Algorand** is a company founded by Turing Award-winning cryptographer Silvio Micali that builds the technology to power the Future of Finance (FutureFi), the convergence of traditional and decentralized models into a unified system that is inclusive, frictionless, and secure. In essence, it develops a blockchain infrastructure that offers the interoperability and capacity to handle the volume of transactions needed for defi, financial institutions and governments to smoothly transition into FutureFi[110]. This partner was later added by SIAE within the project to collaborate in parallel with University of Rome “La Sapienza” on permissionless blockchain technology solutions related to project objective 2.

[106] https://www.windtregroup.it/IT/company/La-Storia.aspx

[107] http://diag.uniroma1.it/

[108] https://www.cis.uniroma1.it/

[109] https://www.blockchaincore.it/

[110] https://www.algorand.com/resources/news/siae-launches-4-million-nfts-on-algorand-for-creators

3.9 Project costs

As stated in the notice on the website of the Ministry of Economic Development, the eligible expenses and costs in the project proposal are those relating to:

- Personnel employed by the project leader, or in collaboration with a project contract, with a contract of employment, or with a specific research grant, limited to technicians, researchers, and other auxiliary personnel. Excluded are the costs of personnel with administrative, accounting and commercial tasks.
- Depreciation of instruments and equipment, to the extent and for the period used for the research and development project.
- Consultancy and other services used for the project activities, including the acquisition or licensing of research results and know-how.
- Purchase of materials used directly and exclusively for carrying out the activities under the project (e.g., raw materials, components, semi-finished products for the construction of a prototype).
- General expenses at a flat rate of no more than 15% of the costs referred to in point (a).

SIAE was asked to indicate the costs necessary to implement the project, broken down by macro-area of activity and respecting the expenditure items conditions mentioned above. As can be seen from the table below, the company decided to work by objectives. In fact, for each of the three objectives the expenditure items and their relative cost are reported.

The Emerging 5G Technology Support Programme allocated 5.000.000 euros to the six winning applicants. Moreover, the project should have provided for a total budget of at least 500.000 euros and expenses incurred and paid must be reported no later than 6 months after completion of the of the latter[111].

Initially, when SIAE sent the project proposal, they thought they would start working on objectives 1 and 2 simultaneously from the first month and then work on all 3 objectives only from the fifth month. Then, with the introduction of the new partner Algorand, the leading company chose to change its strategy and start working immediately on objective 2 and then concentrate on all objectives concurrently from the fifth month.

Similarly, there was also a small change from the initial forecast regarding the costs of purchasing materials. In fact, in Objective 1, the cost went from €12,500 to €40,000 (underestimation) and in Objective 3 from €30,000 to €2,500 (overestimation).

[111] https://www.mise.gov.it/index.php/it/comunicazioni/servizi-alle-imprese/tecnologia-5g/tecnologie-emergenti-5g#asse-II

The remaining items have kept the same costs over time. This last observation helps to better understand the validity of the SIAE's projections.

Table 4: Summary table of final expenditure items and related costs for each objective

Objectives	Work Months	Expenditure Items	Costs
Ob 1) Implementation of an attribution ledger	M4-M15	A1. employee personnel	20.000 €
		A2. depreciation quotas	3.000 €
		A3. remuneration for professional services	120.000 €
		A4. purchase of materials	40.000 €
		A5. general expenses (15% of A1)	3.000 €
		Subtotal	**186.000 €**
Ob 2) Study on the possibility of implementing the attribution ledger on permissionless blockchain	M1-M15	B1. employee personnel	10.000 €
		B2. depreciation quotas	4.000 €
		B3. remuneration for professional services	160.000 €
		B5. general expenses (15% of B1)	1.500 €
		Subtotal	**175.500 €**
Ob 3) Proof-of-Concept of an IoT device	M5-M15	C1. employee personnel	20.000 €
		C2. depreciation quotas	3.000 €
		C3. remuneration for professional services	110.000 €
		C4. purchase of materials	2.500 €
		C5. general expenses (15% of C1)	3.000 €
		Subtotal	**138.500 €**
		Total	**500.000 €**

Source: *SIAE, Proposta del progetto "Gestione dei diritti d'autore su reti 5G con Blockchain", 2019*

3.10 The opportunity becomes reality

On 7th January 2020, the final list of projects submitted for experimentation and applied research eligible for FSC 2014 - 2020 funding was approved, as indicated in Axis II of the Emerging Technologies Support Programme of the Broadband Investment Plan. On the basis of the overall score achieved by each project proposal approved and admitted to the ranking list and in consideration of the available budget, the first 6 projects of the final ranking list are admitted to funding. As can be seen from the table below, Siae's project proposal was ranked first in the list and obtained the grant[112].

Table 5: List of approved and ranked project proposals with final scores

N.	Capofila Proponente	Punteggio attribuito dalla Commissione tecnica	% di maggiorazione del punteggio in applicazione del criterio di premialità art. 10, comma 2, lett a) dell'Avviso	Punteggio attribuito in applicazione del criterio di premialità art. 10, comma 2, lett. a) dell'Avviso	Punteggio finale
1	SIAE (Società Italiana degli Autori ed Editori)	27			27
2	UNIVERSITA' DEGLI STUDI DI CASSINO	27			27
3	UNIVERSITA' DEGLI STUDI DI CAGLIARI	24,5	10%	2,45	26,95
4	AGID (Agenzia per l'Italia Digitale)	26			26
5	POLITECNICO DI BARI	26			26
6	COMUNE DI CATANZARO	25	1,75%	0,44	25,44
7	SCUOLA SUPERIORE SANT'ANNA	23,5	2,47%	0,58	24,08
8	CNR ROMA	23,5			23,5
9	UNIVERSITA' DEGLI STUDI DI PALERMO	23,5			23,5
10	PARCO ARCHEOLOGICO DI POMPEI	23			23
11	UNIVERSITA' DEGLI STUDI DI ROMA "SAPIENZA"	23			23
12	COMUNE DI PADOVA	23			23
13	CNIT (Consorzio Nazionale Interuniversitario per le Telecomunicazioni)	23			23
14	CNR TORINO	21,5			21,5
15	CCIAA FOGGIA (Camera di Commercio di Foggia)	21			21
16	CREA (Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria) - Centro di Ricerche Politiche e Bio-Economia.	21			21
17	COMUNE DI RIMINI	21			21

Source: https://www.mise.gov.it/images/stories/normativa/Graduatoria-finale-progetti-Asse-II.pdf

[112] https://www.mise.gov.it/index.php/it/comunicazioni/servizi-alle-imprese/tecnologia-5g/tecnologie-emergenti-5g#asse-II

3.11 Chronoprogramme

Once the grant has been awarded, as requested in the project proposal, the Lead Partner must indicate the duration of the project, the timetable and the expected start date of the activity. In addition, the project must have a duration of no less than 12 months and no more than 24 months. It must start no later than 3 months after the date on which the agreement is signed with the Ministry of Economic Development (the 28th of January), failing which the funding will be revoked[113].

Table 6: Summary of tasks and related deadlines for each objective

OBJECTIVES	TASK	LEAD	START	END
Ob 1) Implementation of an attribution ledger	Attribution ledger development in lab	Blockchain Core	31/07/2020	30/04/2021
	Providing 5G network infrastructure	WindTre	22/11/2020	22/06/2021
	Acceptance test	SIAE	01/05/2021	14/05/2021
	First attribution ledger deployment on 5G network	Blockchain Core	15/05/2021	14/06/2021
	Final deployment	Blockchain Core	15/06/2021	30/06/2021
Ob 2) Study on the possibility of implementing the attribution ledger on permissionless blockchain	IPI domain analysis	SIAE; Sapienza; Blockchain Core	22/04/2020	07/05/2020
	Blockchain technologies study	Blockchain Core	22/04/2020	14/05/2020
	Comparison of permissionless solutions and selection of the best one	Sapienza; Blockchain Core	22/04/2020	31/05/2020
	Algorand solution analysis	Sapienza; Blockchain Core	04/05/2020	30/06/2020
	Analysis of attribution ledger realisation on Algorand	Sapienza; Blockchain Core	04/05/2020	30/06/2020
	Analysis of the critical aspects of the solution with Hyperledger Fabric and feasibility study of the migration to public blockchain (Algorand) with an in-depth study on the issue of data confidentiality	Prof. Ivan Visconti Prof. Gennaro Avitabile	15/06/2020	24/07/2020
	Refinement of permissionless solution on Algorand and development support	Sapienza	01/07/2020	22/06/2021
	Study of evolutionary proposals and alternative technologies	Sapienza	01/07/2020	22/06/2021
Ob 3) Proof-of-Concept of an IoT device	Providing device for PoC	WindTre	01/01/2021	15/05/2021
	PoC development	Blockchain Core	31/07/2020	30/04/2021
	Acceptance tests	Blockchain Core; SIAE	01/05/2021	15/05/2021

Source: *SIAE, Proposta del progetto "Gestione dei diritti d'autore su reti 5G con Blockchain", 2019*

[113] https://www.mise.gov.it/images/stories/documenti/AVVISO-5G%20TECNOLOGIE%20EMERGENTI%20Definitivo%205.08.2019.pdf

For the above reasons, SIAE decided to start the project on the 22nd of April 2020. The second decision was to establish a project duration of 15 months and to think again by objectives. In this perspective, as can be seen from the table below, the partners will initially concentrate only on the realization of the second objective and then work simultaneously on all three.

CONCLUSION

The primary objective of this paper is to describe, following interviews and documentation collected in the field and through the voices of the protagonists, how SIAE, a leading company in the cultural and entertainment industry in Italy, has chosen to plan the development and innovation of its business by pushing towards a new "digital frontier": the use of Blockchain technology for a more efficient management of its members' copyrights. The SIAE project, named in fact "COPYRIGHT MANAGEMENT ON 5G NETWORKS THROUGH BLOCKCHAIN TECHNOLOGY", proposed to, and accepted by, MISE, was carried out over the three-year period 2019-2021 in collaboration with Algorand, Blockchain Core, Università La Sapienza di Roma, WindTre aiming to achieve the following three specific objectives:

1) Implementation of an attribution ledger based on permissioned blockchain technology.

2) Investigation on the possibility of implementing the attribution ledger described in the previous point on permissionless blockchain.

3) Testing on the WIND network of the proof-of-concept of an IoT device capable of exploit the 5G for low-latency transmission of songs played in an entertainment context to a back-end that can recognize them with appropriate AI techniques.

To the part concerning the technical development of the project, called "GLOBAL CREATOR NETWORK", essentially referred to the realisation of the above mentioned objective number 2, I have considered to give particular attention treating it preliminarily in chapter 2 (compared to the description of the mentioned general SIAE project analyzed in chapter 3) because it incorporates in itself the focus of my thesis: the study of the architecture of an IPI system based on blockchain and its possible application in a practical case. The analysis of this experience highlighted the following key points:

- The rights of SIAE members for a specific territory are embedded in digital non-fungible tokens (called Algorand Standard Assets – ASA). The token structure was based on the Interested Parties Information System (IPI), which is the international information system managed by the Swiss copyright society SUISA and adopted by the International Confederation of Societies of Authors and Composers (CISAC) and the BIEM societies (international organisation representing mechanical rights).

- Each right must correspond to only one token and each token can incorporate only one right. This key feature may be a merit of the solution but also its limitation for the reasons set out at the end of this discussion of key points.

- Blockchain functioning steps: 1) request for creation of the right by the right holder to the issuer; 2) creation of the right by the issuer and the right holder; 3) recovery of the availability of the right by the rightholders and its assignment to the multisignature account: an account managed by SIAE and the author himself through digital subscription by both (see page 55)

- The security of the entire blockchain is guaranteed by the multisignature account. When an author wants to assign the management of his artistic right to SIAE, he sends the corresponding token to a multisignature account. Every transaction issued by the account must be digitally signed and agreed by both parties. This prevents a single malicious person from poisoning the application with false or duplicate data in the new tokens.

However, at this stage of the project, the protagonists stated that the solution needs adjustments which will be addressed in a subsequent phase:

- As mentioned in the second key point, the project is still based on the reliance that the issuer enforces the condition that each right must correspond to only one token, and each token can embed only one right. At present, any on-chain system has yet been implemented to mark as invalid (or delete) tokens incorporating more than one right. However, the project is moving forward in this direction and aims to implement a PoC of an Algorand Smart Contract through which any entity at level 2 can provide references to identify possible erroneous tokens to the smart contract figure at level 1 who will eventually delete them.

- In the current solution the list of trusted issuers is stored in an off-chain configuration file in the distributed applications (dApps) used by the members of the Global Creator Network. This file must be updated every time a new CMO (Collective Management Organisation) is added to the list, or an existing one, for some reason, is deleted. Asynchronous updates, however, can lead to different dApps having different versions of the configuration file, thus leading to different views of the system and tokens. These system distortions will be addressed in a later phase of the project by exploiting Algorand's smart contract structures to bring the list of trusted issuers directly onto the chain.

- The identification of rights holders, issuers and CMOs (i.e., the link between an Algorand public key and a real-world identity) will also be investigated in a later phase. However, to avoid the issuance of tokens embedding more than one right, right-holders must be uniquely identified in the chain, i.e., a single public key must be associated with only one right-holder.

Even when the blockchain solution will be completed and adopted, SIAE does not envisage an immediate buy-in of all stakeholders in the process and, consequently, its role will still be relevant for several years. Probably, in a not-too-distant future, the company's core business could turn into the management of services related to the blockchain platform. It is understood that, on the one hand, SIAE will still have to act as an intermediary for those who do not want to or cannot operate independently and, on the other hand, it will have to try to provide the complex digital world with an interface that is easy to interpret for those who wish to manage their rights independently.

What makes SIAE's blockchain solution interesting is its huge market potential. We can say that it is represented by all the CMOs that manage the worldwide copyright of their members on a territorial basis, as SIAE does for its members. In fact, the company's vision is to implement the new blockchain solution only after having convinced as many CMOs as possible to join the platform. This would immediately create a worldwide network to radically change the way copyright is managed.

BIBLIOGRAPHY

Ankit Songara, Lokesh Chouhan, “Blockchain: A Decentralized Technique for Securing Internet of Things”. Conference paper, 2017

Arshdeep Bahga, Vijay Madisetti, Blockchain Platform for Industrial Internet of Things, Journal of Software Engineering and Applications, No. 9, 2016

Cosimo Bassi, Fabrizio Brasca, Federico Demicheli, Matteo Fedeli, Raffaella Guido, Francesco Mogavero, Luca Monti, Francesca Papisca, Cristina Salonico, Fabiano Taliani, Federico Tenga, Andrea Vitaletti, Marco Zecchini, Decentralised Global Creator Network on Algorand, 2021

David L. Rogers, The digital transformation playbook, Columbia University Press, 2016

Dominique Guegan, Public Blockchain versus Private blockhain, Documents de Travail du Centre d’Economie de la Sorbonne, 2017

Digital Economy Compass, Statista, 2019

Eric Hughes, A Cypherpunk's Manifesto, 1993

Imran Bashir, Mastering Blockchain, Packt Publishing, 2017

Julija Golosova, Andrejs Romanovs, The Advantages and Disadvantages of the Blockchain Technology, 2018

Pethuru Raj, Kavita Saini and Chellammal Surianarayanan, Blockchain Technology and Applications, CRC Press, 2021

Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017

Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System, 2008

Simon Kingsnorth, Digital Marketing Strategy, Kogan Page, 2016

SIAE, Proposta del progetto “Gestione dei diritti d’autore su reti 5G con Blockchain”, 2019

Stephen J. Sampson, Leaders Without Titles, HRD Press, 2011

Wubing Chen, Zhiying Xu, Shuyu Shi, Yang Zhao, Jun Zhao, A Survey of Blockchain Applications in Different Domains, the project "Secure databases based on SGX" of Alibaba-NTU Singapore Joint Research Institute, 2018.

WEB REFERENCES

https://academy.bit2me.com/it/quanti-tipi-di-blockchain-ci-sono/

https://www.algorand.com/resources/news/siae-launches-4-million-nfts-on-algorand-for-creators

https://arxiv.org/ftp/arxiv/papers/1911/1911.02013.pdf

https://bitcoin.org/bitcoin.pdf

https://bitcoin-translate.it/docs/a-cypherpunk-manifesto.pdf

http://blog.admaiora.com/2014/07/le-differenze-tra-paid-owned-e-earned-media/

https://www.blockchaincore.it/

https://www.blockchain4innovation.it/mercati/industria4-0/chi-e-satoshi-nakamoto-luomo-che-ha-inventato-il-bitcoin/

https://blockchaintechnologycom.wordpress.com/2016/11/21/advantages-disadvantages/

https://www.cis.uniroma1.it/

https://coinmarketcap.com/currencies/algorand/historical-data/

https://data-flair.training/blogs/advantages-and-disadvantages-of-blockchain/

http://diag.uniroma1.it/

https://www.fxempire.it/education/article/cosa-e-e-come-funziona-la-blockchain-spiegato-con-parole-semplici-134550

https://halshs.archives-ouvertes.fr/halshs-01524440/document

https://www.ibm.com/blogs/blockchain/2017/05/the-difference-between-public-and-private-blockchain/

https://www.ilsole24ore.com/art/in-italia-l-industriacreativa-e-culturale-vale-48-miliardi-24percento-e-cresce-piu-pil-AE2ybD

https://www.insidemarketing.it/glossario/definizione/curva-di-rogers/

https://www.investopedia.com/terms/d/digicash.asp

https://www.ipisystem.org/

http://www.italiacreativa.eu/

http://www.italiacreativa.eu/wp-content/uploads/2017/01/ItaliaCreativa_SecondaEdizione.pdf

https://matematica.unibocconi.it/articoli/la-matematica-dei-minatori-della-blockchain

https://medium.com/@coinsociety/la-nascita-di-bitcoin-4c0b2e4213ce

https://medium.com/nudjed/blockchain-advantage-and-disadvantages-e76dfde3bbc0

https://www.mise.gov.it/images/stories/documenti/AVVISO-5G%20TECNOLOGIE%20EMERGENTI%20Definitivo%205.08.2019.pdf

https://www.mise.gov.it/images/stories/normativa/Graduatoria-finale-progetti-Asse-II.pdf

https://www.mise.gov.it/index.php/it/comunicazioni/servizi-alle-imprese/tecnologia-5g/tecnologie-emergenti-5g#asse-II

https://policyreview.info/articles/news/tale-two-industries-value-gap-dilemma-music-distribution/

https://www.sandvine.com/hubfs/downloads/phenomena/2018-phenomena-report.pdf

https://www.siae.it/en/about-us/siae/siae-and-its-history

https://www.siae.it/it/chi-siamo/la-siae/siae-e-la-sua-storia

https://www.siae.it/sites/default/files/RENDICONTO%20DI%20GESTIONE%202019.pdf

https://www.spindox.it/it/blog/la-classificazione-delle-blockchain/

https://www.statista.com/statistics/249863/us-mobile-commerce-as-percentage-of-total-retail-sales/

https://www.studiomartelli.it/wp-content/uploads/2014/10/STUDIO-MARTELLI_blockchain.pdf

https://www.techopedia.com/definition/23371/digital-revolution

https://webthesis.biblio.polito.it/16546/1/tesi.pdf

https://www.windtregroup.it/IT/company/La-Storia.aspx

https://www.wipo.int/copyright/en/management/

Department of Business and Management

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A BLOCKCHAIN BUSINESS MODEL: THE SIAE CASE

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INTRODUCTION

In recent years, the world has faced rapid changes in many different contexts. New digital technologies are revolutionizing the way we live, but not only. Inevitably, the digital transformation has introduced new devices that in turn have changed the way customers buy products in the marketplace, influencing their needs. To meet these new trends, the only solution for marketers is to focus on multiple advertising channels, both online and offline, after conducting careful data analysis.

In such a scenario, what can, and should businesses do? As businesses increasingly need to provide instant solutions to their customers' needs, they are called upon to adapt to this reality. However, change is not a simple and immediate process. It requires the renewal of working methods and processes and the strategies on which they are based. This allows companies to become more efficient by being data-driven and to gain profitable advantages such as exploiting more business opportunities.

Nowadays, one of the main problems facing businesses is finding a way to store and analyze data securely. Considering that traditional storage solutions are not able to handle the increasing amount of data, blockchain technologies are the most widely used and appropriate to securely store large data sets.

The aim of the following paper is to present, following interviews and documentation collected in the field and through the voice of the protagonists, how SIAE (Società Italiana Autori ed Editori), a leading company in the cultural and entertainment industry in Italy, has chosen to plan the development and innovation of its business by pushing towards a new "digital frontier": the use of blockchain technology for a more efficient management of its members' copyrights. The aim of this work is therefore to highlight how SIAE is a virtuous example of a company that is making innovation one of its key principles and a model to be followed by companies that would like to undertake a similar path.

The thesis will be structured as follows: in the first chapter an analysis of the existing literature on marketing will be conducted, going into detail on how digital transformation has impacted on Brand Positioning, Product Development, Communication and Advertising, Sales and Channels Strategy and Customer Relationship Management. The second chapter will be initially dedicated to blockchain technology, providing its history, main features, types, pros, and cons, and then moving on to a detailed study of its application to the SIAE case. Finally, in the third chapter, the descriptive part of the project proposed by the same company to the MISE (Ministero dello Sviluppo Economico) and accepted by the latter will be explored.

CHAPTER 1: THE ROLE OF DIGITAL TRANSFORMATION WITHIN THE FIVE MARKETING PILLARS

Habitually, marketing begins with segmentation and targeting. They are essential features of a brand's strategy to achieve a more efficient allocation of resources and a more precise positioning in the market. In addition, they support marketers in reaching multiple segments, each with differentiated offers. These two processes are commonly referred to as "*Unilateral decisions made by marketers without the consent of their customers*"[1]. In fact, marketers themselves decide which variables define each segment. As Philip Kotler states in his book "*In the digital economy, customers are socially connected with one another in horizontal webs of communities. Today, communities are the new segments*"[2].

The author explains that "*To effectively engage with a community of customers, brands must ask for permission*"[3]. In fact, Permission Marketing is precisely based on the idea of asking customers for consent before delivering marketing messages. However, when asking for permission, Philip Kotler adds that "*Brands must act as friends with a sincere desire to help, not as hunters with bait*"[4]. This proves the horizontal relationship between brands and customers. Finally, the author believes that companies may continue to use segmentation, targeting and positioning, as long as it is made transparent to customers.

The second marketing mainstream is product development and innovation. Previously, the finished product was what innovation was focused on. Testing ideas was difficult and expensive, so decisions were based on the analysis, experience and intuition of the managers involved in the project. Market feedback often came after a long time, sometimes even after public release. For these reasons mentioned above, the biggest concern was to avoid market failure. With the advent of the digital era, the way to innovate has changed. Companies must rely on rapid experimentation and continuous learning. In this case, instead of focusing primarily on the finished product, they must first identify the right problem and then do as much testing as possible so that they have multiple solutions. In fact, this new approach to innovation brings new ideas to market quickly with lower costs for companies, less risk and greater organisational learning.

When we talk about marketing, we cannot help mentioning communication and advertising. Content creation is important for almost every company. Once the content has been created, companies must distribute it to their target customers using a mix of three channels. The Owned Media represent the properties of the company and are characterized by being very easy to identify (i.e., company's app, its social media, or its website). The Earned Media are those types of media that the company gets from its consumers to understand how it is seen by them (i.e., reviews). Finally, Paid Media are services that a

[1] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.47
[2] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.48
[3] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.48
[4] Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017, p.48

company pays to use (i.e., influencers, advertising on Instagram and Youtube). In addition to the three distribution channels mentioned above, nowadays marketers use other new digital tools for online advertising such as SEM **(**Search Engine Marketing), Social media marketing, display and video advertising and direct email marketing. Another important aspect of advertising is Content marketing, which involves both the production and distribution of content, and which will be analyzed specifically in this chapter.

The digital transformation has also influenced customer behavior and purchasing patterns. Customers constantly move from one channel to another, from online to offline and vice versa. Knowing that, marketers need to deliver content across channels (physical and online) and be available when customers decide to make a purchase. Therefore, it has become a practice to adopt omnichannel marketing. This strategic choice is driven by focusing on multiple channels (both online and offline) and pushing customers to buy more. In fact, omnichannel marketing has been demonstrated to provide results. To develop a good omnichannel marketing strategy, marketers need to map all possible touchpoints, identify the most popular ones and finally, focus on integrating these most popular channels.

The fifth marketing pillar is customer relationship management. As everyone knows, keeping a customer is cheaper than acquiring one. This is precisely where CRM and retention strategies come in handy. Thus, the main benefits of CRM are to create loyalty and advocacy, i.e., to make your customers your first advocates. The goal is to build strong relationships throughout the company so that your messages are widely spread. With the advent of the digital age, a new area of CRM has emerged: the social CRM. In fact, customers are increasingly contacting organizations directly through their social media channels to ask questions and complain. Making sure there are plans in place to manage these communications is vital. At the same time, it is also essential for companies to measure sentiment about their brand by monitoring conversations that take place across social networks. Sentiment analysis allows brands to anticipate customers' behavior and thus improve customer loyalty and satisfaction. The limitation of social CRM is that it can be very easy to make mistakes using it and damage your brand if not managed well.

Digital transformation has also led to the creation of an incredible amount of data that is growing every year. In fact, many companies are already looking to use their customer data collected on various platforms or data extracted from production processes. In this new world, those who can track, monitor, listen, watch, and observe data better than others will be more successful. Indeed, if used correctly, big data can also improve decision-making, help with innovation, and lead to customization in sectors such as entertainment, healthcare, or financial services. Nowadays, the problem is to find a way of storing and analyzing it. Since traditional storage solutions cannot handle the incoming flow of data, new solutions such as Blockchain technologies are the most widely used and appropriate. Moreover, with the increasing amount of data, the need for security measures and secure data storage also increases. Fortunately, Blockchain technologies are by design storage solutions to securely manage large data sets.

CHAPTER 2: AN EXAMPLE OF BLOCKCHAIN APPLICATION: THE SIAE CASE

The blockchain is a decentralised distributed database that uses peer-to-peer technology to validate transactions between two parties in a secure, verifiable, and permanent manner. We can also define it as a ledger structured in a chain of blocks, containing transactions, related to each other according to a chronological principle. Blockchain technology was born in October 2008, thanks to the publication of a white paper on The Cryptography Mailing list, entitled "Bitcoin: A Peer-to-Peer Electronic Cash System" signed under the pseudonym of Satoshi Nakamoto. While the world's attention was focused on the financial crisis, created by banks and other financial institutions, Nakamoto proposed a new model to make totally decentralised transactions structured around a consensual mechanism between blocks that would eliminate intermediaries. The aim was to separate currency from the institutions of control and create a network in which payments could be made between individuals without the need for a central unit, eliminating unnecessary management costs and leading to a true financial revolution.

After some brief historical background, I decided to focus on the three features that most enable blockchain technology to stand out and be implemented on a large scale in the future. The blockchain is a system that does not require a central authority, since the rules governing it are defined during the development phase and cannot subsequently be changed without the consensus of its participants. These laws in the blockchain are identified with the mathematical algorithm whose solution gives access to the chain. It is therefore often associated with the concept of Distributed Ledger, in antithesis to Centralized Ledger, precisely because the blockchain is based on the idea of distributed trust between the various users. In addition, immutability of data is another of the distinctive features of this technology. The records stored within the blocks, thanks to the use of public key cryptography, cannot be altered or deleted by the nodes of the network. There is just a possibility of rolling back the changes, but this is considered almost impossible to do as it will require an unaffordable amount of computing resources. Last key feature of blockchain is security. Powerful cryptography techniques are applied to the individuals who take part in blockchain transactions so they can hold ownership of an address, crypto assets of public and private keys associated with it. The passwords are generated using random combination of letters and numbers called alphanumeric characters. This solves issues such as identity theft and offers a greater level of security for individuals as it removes the need for weak and easily compromised passwords.

According to the way the blockchain has evolved in recent years and to its different attributes, it can be divided into four different types that will be analyzed in detail in this section. Immediately afterwards, I will highlight the main advantages and disadvantages that derive from the application of this useful technology.

The following part is the heart of the chapter and concerns the description of the technical part of the SIAE project entitled "Global Creator Network". The Interested Party Information (IPI) system uniquely identifies rights holders worldwide, making it possible to know for each party and at any time which rights are protected, by whom and for which territories[5]. Nowadays, this service is provided centrally, outside the EU. The project aims to make this system fully decentralised to provide more guarantees to both right holders and end users. Collective management is the most common option in the copyright system. It allows right holders to administer their rights through a collective management organisation (CMO)[6]. Managing copyright individually can be difficult and very time consuming. The main objective of CMOs is precisely to facilitate the management of the rights in the interest of both parties (right holder and radio station for instance) and the financial reward for the right holders[7]. Recently, SIAE, the Italian CMO, started an investigation into the use of the most effective technologies to support its mission. As a non-profit organization, one of SIAE's main objectives is to provide the highest quality of service to its members while minimizing the need for their financial support. Consequently, dreaming a future in which transactions to remunerate rights holders will be fully automated is absolutely aligned with the purpose of SIAE's mission. This vision is possible, at least in principle, thanks to the deployment of new technologies that enable secure and reliable transactions, e.g., blockchain, in real-time communication environments such as 5G mobile networks. The project consists in developing a public and fully decentralized solution capable of providing this service in a transparent manner for all stakeholders. As such, the purpose of SIAE is to investigate how to decentralize one of the first technical ingredients needed to implement our vision: the IPI system we mentioned above.

In the current centralized IPI system, the tuple (CC, RO, RI) identifies an artistic right of the right holder. Specifically, the tuple (CC, RO, RI) identifies a right (RI) related to the creation class of artistic work (CC), in which the right holder has collaborated with a role (RO). On the other hand, the tuple (NAME NO, SOC, CC, RO, RI, SHARE, TERRITORY, ValidFrom, ValidTo) represents an agreement between the rights holder (NAME NO) and a collecting society (SOC or CMO) valid in the time interval [ValidFrom, ValidTo], and for the territory TERRITORY. Essentially, these fields mean that, in the ValidFrom-ValidTo time interval and for the TERRITORY territory, the NO NAME has assigned to the collecting society SOC a percentage share of the management of its artistic right[8] (CC, RO, RI). An important feature to remember about this system is that a rights holder can only be associated with one IP base number and one or more IP name numbers.

[5] https://www.ipisystem.org/

[6] https://www.wipo.int/copyright/en/management/

[7] Cosimo Bassi, Fabrizio Brasca, Federico Demicheli, Matteo Fedeli, Raffaella Guido, Francesco Mogavero, Luca Monti, Francesca Papisca, Cristina Salonico, Fabiano Taliani, Federico Tenga, Andrea Vitaletti, Marco Zecchini, Decentralised Global Creator Network on Algorand, 2021

[8] Cosimo Bassi, Fabrizio Brasca, Federico Demicheli, Matteo Fedeli, Raffaella Guido, Francesco Mogavero, Luca Monti, Francesca Papisca, Cristina Salonico, Fabiano Taliani, Federico Tenga, Andrea Vitaletti, Marco Zecchini, Decentralised Global Creator Network on Algorand, 2021

The blockchain in question will therefore support the management of non-fungible tokens (NFT) that will have the task of representing an artistic right for a specific territory (i.e., the tuple CC, RO, RI, TERRITORY). Furthermore, since all creation, update and deletion operations must be agreed upon by multiple parties. For security reasons we require that the adopted technology supports multi-signature accounts, i.e., accounts that need the cryptographic signature of multiple autonomous accounts to publish new transactions on the blockchain. This prevents a single malicious party from poisoning the application with false or duplicate data in new tokens and prevents CMOs from opting in to tokens they don't want to receive. The platform that was chosen for the project is Algorand and the digital tokens in it are called Algorand Standard Assets (ASA). Their structure is based on the IPI attributes we mentioned above.

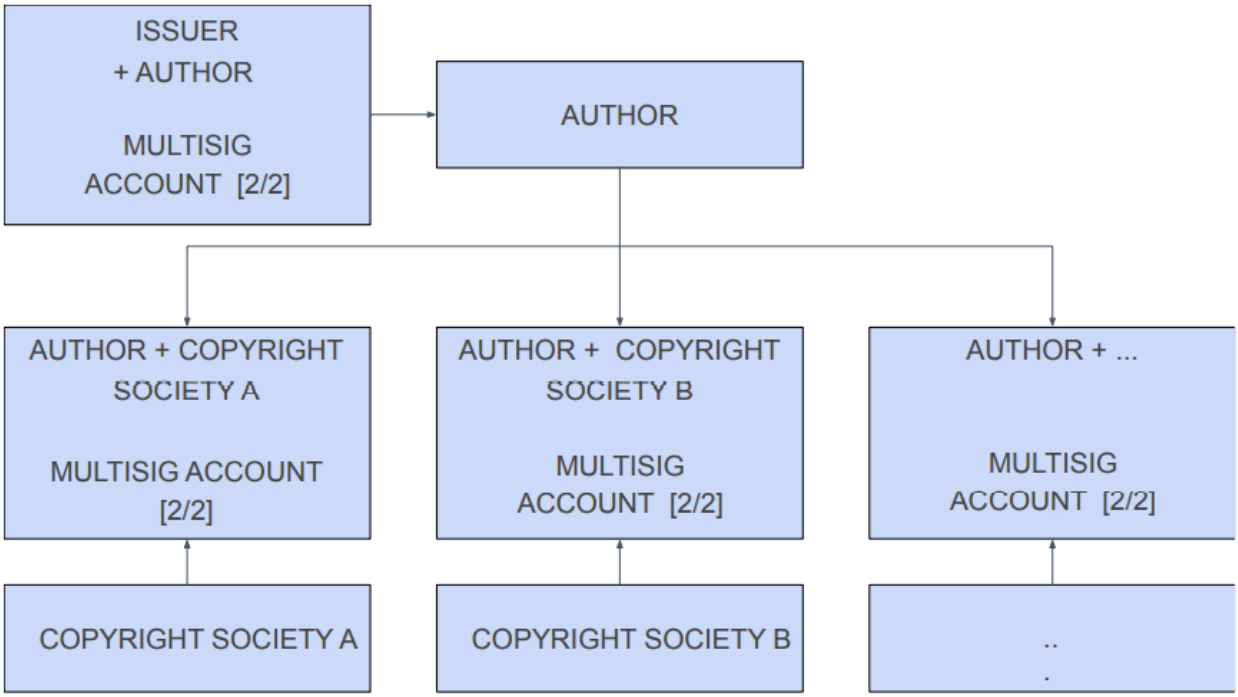
The proposed solution works as follows:

1. When the rights holder needs to assign the management of one of his/her rights, he/she first asks the broadcaster to generate the new and unique corresponding ASA with data (CC, RO, RI, TERRITORY)

2. The issuer + RH multisignature creates the ASA.

3. The rights holder recovers ownership of the ASA and transfers it to a CMO1+RH multisignature account that has already opted in. This corresponds to ceding management of the artistic rights associated with the ASA to CMO1, entering into an agreement valid from the timestamp of the clawback transaction. When the rights holder decides to reallocate the management of the artistic right to another company (CMO2), (s)he takes back ownership of the SAA and transfers it to a CMO2+RH multi-signature account. The values of the validTo field of the previous agreement and of the validFrom field of the new agreement are equal to the timestamp of the clawback transaction.

Figure: Roles and Architecture of Non-fungible assets solution



CHAPTER 3: THE SIAE PROJECT: COPYRIGHT MANAGEMENT ON 5G NETWORKS THROUGH BLOCKCHAIN TECHNOLOGY

It must first be noted that what is described in Chapter 2 represents the evolution, developed over the period between 2019 and 2021, on a methodological and practical level of the original project proposed by SIAE to MISE. The original project will be illustrated in this chapter to provide the reader with a clearer vision of the objectives aimed at making the management of copyright more efficient and therefore the results of the company's primary activity.

On 26 March 2019, the MISE (Ministero dello Sviluppo Economico) approved the 5G Emerging Technologies Support programme. The objective of the programme was to implement projects of experimentation, applied research and technology transfer, based on the use of emerging technologies, such as Blockchain, Artificial Intelligence (AI), Internet of Things (IoT), linked to the development of next-generation networks. At that time, SIAE was carrying out some studies on the applicability of Blockchain technology to copyright in collaboration with Blockchain Core and the University of Rome "La Sapienza". As soon as the call for participation in the programme came out, the company took the opportunity to work on its project proposal applying as project leader. As you can imagine, for the reasons mentioned above, the choice and search for partners was very easy and quick. WindTre was immediately added to the two initial partners, as it was a mandatory requirement of the call for proposals. Algorand was added at a later stage as a technical partner but it does not appear within the project proposal. Finally, on the 4th of November 2019, SIAE sent its project proposal which contains everything I will outline from here to the end of the chapter.

The 5G network promises to make existing multimedia content available at a higher quality level. In addition, the high bandwidth availability and low latency enable us to imagine the use of completely new content. A key issue in realizing these ambitions, both technically and economically, is the ability to exploit and protect creative, audiovisual and entertainment content, which will represent most of the traffic on the 5G network. The blockchain is a technology that allows us to imagine a future in which the valorization of content and the distribution of remuneration to rights holders is completely different than it is today. A large part of current processes will be automated and managed by smart contracts (i.e., programmes that run autonomously on the blockchain and regulate relationships between parties, effectively implementing traditional contracts in a decentralized context). They will not only be able to verify the lawfulness of a user's enjoyment of a content in each context but will also be able to automatically distribute rewards to the entitled parties.

The project vision is reflected in the following objectives:

1) Implementation of an attribution ledger (i.e., decentralized register of entitled persons) based on permissioned blockchain technology. It allows to identify unequivocally and worldwide the owners of copyrights on intellectual works. The proposed solution is designed to be cross-border and aims to become the global platform for copyright protection on the 5G network.
2) Investigation on the possibility of implementing the attribution ledger described in the previous point on permissionless blockchain. This will be useful to fully exploit the decentralization capabilities of the blockchain and provide stakeholders with a solution to anticipate an eventual, but likely future in which many components of copyright management will potentially be managed in a decentralized manner directly by an infrastructure based on blockchain technologies.
3) Testing on the WIND network of the proof-of-concept of an IoT device capable of exploit the 5G for low-latency transmission of songs played in an entertainment context (e.g., a disk jockey console) to a back-end that can recognize them with appropriate AI techniques. The device must also be able to interact with the attribution ledger using the 5G network.

The development of the attribution ledger on a private blockchain would allow all the stakeholders of the current system (i.e., all Collective Management Organizations such as SIAE (IT), SACEM (FR), PRS (UK)) to:

a) share the infrastructure with consequent cost optimization
b) have complete auditing capabilities
c) have full guarantees on data integrity and time stamping
d) mitigate risks due to the delegation of management to third parties

All these benefits will help overcome piracy crimes that afflict the current remuneration model. For the first time, rightholders will have direct access to an infrastructure that can fully exploit the content they create. The permissionless solution study will allow Collective Management Organizations (CMOs) to evolve their business model and prepare for a future world in which a large part of the current copyright management processes could be decentralized. This will offer new guarantees of transparency and reliability to rights holders and content users. Moreover, the implementation of a permissionless solution could lead to the complete disintermediation of financial flows, managed by smart contracts, to distribute royalties to rights holders quickly and efficiently.

The project is part of a wider context of protection and enhancement of the Italian creative and cultural industry.The expected effects of this project are, in short, a more efficient and transparent management of the copyright chain and, ultimately, a greater and fairer valorization of creative content in general. These effects would have a strong impact on the creative industry, which by nature is decentralized and strongly rooted throughout the Italian territory.

In today's world, it is increasingly difficult to imagine a working future built on your own passions and talents. The project will work precisely in this direction by making easier and more effective for small artists and creators to monetize their creativity. Lastly, it will facilitate the start of a professional career in the field of creativity for many young people.

The decentralization feature of the project is not limited to machines and/or infrastructure, but it necessarily extends to processes which, thanks to the adoption of blockchain, are naturally harmonized. The sharing of infrastructure makes it possible to share investments, thus promoting the sustainability of the initiative itself. As copyright management is a global issue that also involves significant financial flows (the music industry alone generates annual cash flows of approximately €9 billion[9]), any effective solution must be replicable internationally. This is mainly because the stakeholders involved (e.g., CMOs) manage the rights in their own territorial context. Finally, it should be borne in mind that most of the traffic on the 5G network is related to creative, audiovisual and entertainment content. Such content must somehow generate value in terms of rights for authors. In this sense, even a small percentage on the rights for the exploitation of the content would lead to the sustainability of the results. In fact, the envisaged infrastructure will basically be supported by 'network charges', just like in the energy market.

SIAE was asked to indicate the costs necessary to implement the project, broken down by macro-area of activity. The company decided to work by objectives. In fact, in this chapter for each of the three objectives mentioned above, the expenditure items and their relative cost are reported. Initially, when SIAE sent the project proposal, they thought they would start working on objectives 1 and 2 simultaneously from the first month and then work on all 3 objectives only from the fifth month. Then, with the introduction of the new partner Algorand, the leading company chose to change its strategy and start working immediately on objective 2 and then concentrate on all objectives concurrently from the fifth month. The Emerging 5G Technology Support Programme allocated 5.000.000 euros to the six winning applicants. Moreover, the project should have provided for a total budget of at least 500.000 euros and expenses incurred and paid must be reported no later than 6 months after completion of the of the latter[10].

On 7th January 2020, the final list of projects submitted for experimentation and applied research eligible for FSC 2014 - 2020 funding was approved, as indicated in Axis II of the Emerging Technologies Support Programme of the Broadband Investment Plan. Based on the overall score achieved by each project proposal approved and admitted to the ranking list and in consideration of the available budget, the first 6 projects of the final ranking list are admitted to funding. SIAE’s project proposal was ranked first in the list and obtained the grant.

[9] https://www.siae.it/sites/default/files/RENDICONTO%20DI%20GESTIONE%202019.pdf

[10] https://www.mise.gov.it/index.php/it/comunicazioni/servizi-alle-imprese/tecnologia-5g/tecnologie-emergenti-5g#asse-II

CONCLUSION

The primary objective of this paper is to describe, how SIAE, a leading company in the cultural and entertainment industry in Italy, has chosen to plan the development and innovation of its business by pushing towards a new "digital frontier": the use of Blockchain technology for a more efficient management of its members' copyrights. The SIAE project, named in fact "COPYRIGHT MANAGEMENT ON 5G NETWORKS THROUGH BLOCKCHAIN TECHNOLOGY", proposed to, and accepted by, MISE, was carried out over the three-year period 2019-2021 in collaboration with Algorand, Blockchain Core, Università La Sapienza di Roma, WindTre.

To the part concerning the technical development of the project, called "GLOBAL CREATOR NETWORK", I decided to give special attention in chapter 2 because it incorporates the focus of my thesis: the study of the architecture of a blockchain system and its possible application in a practical case. The analysis of this experience highlighted the following key points:

- The rights of SIAE members for a specific territory are embedded in digital non-fungible tokens (called Algorand Standard Assets – ASA). The token structure was based on the Interested Parties Information System (IPI), which is the international information system managed by the Swiss copyright society SUISA and adopted by the International Confederation of Societies of Authors and Composers (CISAC).

- Each right must correspond to only one token and each token can incorporate only one right. This key feature may be a merit of the solution but also its limitation for the reasons set out at the end of this discussion of key points.

- Blockchain functioning steps: 1) request for creation of the right by the right holder to the issuer; 2) creation of the right by the issuer and the right holder; 3) recovery of the availability of the right by the rightholders and its assignment to the multisignature account: an account managed by SIAE and the author himself through digital subscription by both (see page 55).

- The security of the entire blockchain is guaranteed by the multisignature account. When an author wants to assign the management of his artistic right to SIAE, he sends the corresponding token to a multisignature account. Every transaction issued by the account must be digitally signed and agreed by both parties.

However, at this stage of the project, the protagonists stated that the solution needs adjustments which will be addressed in a subsequent phase:

- The project is still based on the reliance that the issuer enforces the condition that each right must correspond to only one token, and each token can embed only one right. At present, any on-chain system has yet been implemented to mark as invalid (or delete) tokens incorporating more than one right. However, the project aims to implement a PoC of an Algorand Smart Contract through which any entity at level 2 can provide references to identify possible erroneous tokens to the smart contract figure at level 1 who will eventually delete them.

- In the current solution the list of trusted issuers is stored in an off-chain configuration file in the distributed applications (dApps) used by the members of the Global Creator Network. This file must be updated every time a new CMO (Collective Management Organisation) is added to the list, or an existing one, for some reason, is deleted. However, asynchronous updates can lead to system distortions that will be addressed in a later phase of the project by exploiting Algorand's smart contract structures to bring the list of trusted issuers directly onto the chain.

- The identification of rights holders, issuers and CMOs (i.e., the link between an Algorand public key and a real-world identity) will also be investigated in a later phase. However, to avoid the issuance of tokens embedding more than one right, right-holders must be uniquely identified in the chain, i.e., a single public key must be associated with only one right-holder.

Even when the blockchain solution will be completed and adopted, SIAE does not envisage an immediate buy-in of all stakeholders in the process and, consequently, its role will still be relevant for several years. Probably, in a not-too-distant future, the company's core business could turn into the management of services related to the blockchain platform. It is understood that, on the one hand, SIAE will still have to act as an intermediary for those who do not want to or cannot operate independently and, on the other hand, it will have to try to provide the complex digital world with an interface that is easy to interpret for those who wish to manage their rights independently.

What makes SIAE's blockchain solution interesting is its huge market potential. We can say that it is represented by all the CMOs that manage the worldwide copyright of their members on a territorial basis, as SIAE does for its members. In fact, the company's vision is to implement the new blockchain solution only after having convinced as many CMOs as possible to join the platform. This would immediately create a worldwide network to radically change the way copyright is managed.

BIBLIOGRAPHY

Ankit Songara, Lokesh Chouhan, “Blockchain: A Decentralized Technique for Securing Internet of Things”. Conference paper, 2017

Arshdeep Bahga, Vijay Madisetti, Blockchain Platform for Industrial Internet of Things, Journal of Software Engineering and Applications, No. 9, 2016

Cosimo Bassi, Fabrizio Brasca, Federico Demicheli, Matteo Fedeli, Raffaella Guido, Francesco Mogavero, Luca Monti, Francesca Papisca, Cristina Salonico, Fabiano Taliani, Federico Tenga, Andrea Vitaletti, Marco Zecchini, Decentralised Global Creator Network on Algorand, 2021

David L. Rogers, The digital transformation playbook, Columbia University Press, 2016

Dominique Guegan, Public Blockchain versus Private blockhain, Documents de Travail du Centre d’Economie de la Sorbonne, 2017

Digital Economy Compass, Statista, 2019

Eric Hughes, A Cypherpunk's Manifesto, 1993

Imran Bashir, Mastering Blockchain, Packt Publishing, 2017

Julija Golosova, Andrejs Romanovs, The Advantages and Disadvantages of the Blockchain Technology, 2018

Pethuru Raj, Kavita Saini and Chellammal Surianarayanan, Blockchain Technology and Applications, CRC Press, 2021

Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0, Moving from Traditional to Digital, Wiley, 2017

Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System, 2008

Simon Kingsnorth, Digital Marketing Strategy, Kogan Page, 2016

SIAE, Proposta del progetto “Gestione dei diritti d’autore su reti 5G con Blockchain”, 2019

Stephen J. Sampson, Leaders Without Titles, HRD Press, 2011

Wubing Chen, Zhiying Xu, Shuyu Shi, Yang Zhao, Jun Zhao, A Survey of Blockchain Applications in Different Domains, the project "Secure databases based on SGX" of Alibaba-NTU Singapore Joint Research Institute, 2018.

WEB REFERENCES

https://academy.bit2me.com/it/quanti-tipi-di-blockchain-ci-sono/

https://www.algorand.com/resources/news/siae-launches-4-million-nfts-on-algorand-for-creators

https://arxiv.org/ftp/arxiv/papers/1911/1911.02013.pdf

https://bitcoin.org/bitcoin.pdf

https://bitcoin-translate.it/docs/a-cypherpunk-manifesto.pdf

http://blog.admaiora.com/2014/07/le-differenze-tra-paid-owned-e-earned-media/

https://www.blockchaincore.it/

https://www.blockchain4innovation.it/mercati/industria4-0/chi-e-satoshi-nakamoto-luomo-che-ha-inventato-il-bitcoin/

https://blockchaintechnologycom.wordpress.com/2016/11/21/advantages-disadvantages/

https://www.cis.uniroma1.it/

https://coinmarketcap.com/currencies/algorand/historical-data/

https://data-flair.training/blogs/advantages-and-disadvantages-of-blockchain/

http://diag.uniroma1.it/

https://www.fxempire.it/education/article/cosa-e-e-come-funziona-la-blockchain-spiegato-con-parole-semplici-134550

https://halshs.archives-ouvertes.fr/halshs-01524440/document

https://www.ibm.com/blogs/blockchain/2017/05/the-difference-between-public-and-private-blockchain/

https://www.ilsole24ore.com/art/in-italia-l-industriacreativa-e-culturale-vale-48-miliardi-24percento-e-cresce-piu-pil-AE2ybD

https://www.insidemarketing.it/glossario/definizione/curva-di-rogers/

https://www.investopedia.com/terms/d/digicash.asp

https://www.ipisystem.org/

http://www.italiacreativa.eu/

http://www.italiacreativa.eu/wp-content/uploads/2017/01/ItaliaCreativa_SecondaEdizione.pdf

https://matematica.unibocconi.it/articoli/la-matematica-dei-minatori-della-blockchain

https://medium.com/@coinsociety/la-nascita-di-bitcoin-4c0b2e4213ce

https://medium.com/nudjed/blockchain-advantage-and-disadvantages-e76dfde3bbc0

https://www.mise.gov.it/images/stories/documenti/AVVISO-5G%20TECNOLOGIE%20EMERGENTI%20Definitivo%205.08.2019.pdf

https://www.mise.gov.it/images/stories/normativa/Graduatoria-finale-progetti-Asse-II.pdf

https://www.mise.gov.it/index.php/it/comunicazioni/servizi-alle-imprese/tecnologia-5g/tecnologie-emergenti-5g#asse-II

https://policyreview.info/articles/news/tale-two-industries-value-gap-dilemma-music-distribution/

https://www.sandvine.com/hubfs/downloads/phenomena/2018-phenomena-report.pdf

https://www.siae.it/en/about-us/siae/siae-and-its-history

https://www.siae.it/it/chi-siamo/la-siae/siae-e-la-sua-storia

https://www.siae.it/sites/default/files/RENDICONTO%20DI%20GESTIONE%202019.pdf

https://www.spindox.it/it/blog/la-classificazione-delle-blockchain/

https://www.statista.com/statistics/249863/us-mobile-commerce-as-percentage-of-total-retail-sales/

https://www.studiomartelli.it/wp-content/uploads/2014/10/STUDIO-MARTELLI_blockchain.pdf

https://www.techopedia.com/definition/23371/digital-revolution

https://webthesis.biblio.polito.it/16546/1/tesi.pdf

https://www.windtregroup.it/IT/company/La-Storia.aspx

https://www.wipo.int/copyright/en/management/