Scenarios for the Future of the Digital Payment Industry in Europe: Exploration of Strategic Implications for the Payment Gateway Provider Paybyrd

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Abstract: This work addresses changes in the European digital payment industry over the 10 years, with a focus on the potential implications of a Digital Euro for the Portuguese-Dutch payment gateway provider Paybyrd. Utilizing the Intuitive Logics School approach of scenario planning, four future scenarios were developed. Using the Ansoff Matrix, strategic options for Paybyrd were proposed, tailored to each scenario. The study emphasizes the need for Paybyrd's vigilance towards evolving trends and the importance of strategic adaptation to maintain competitiveness in a rapidly transforming industry. The work's results were crafted through extensive research and expert consultations via interviews and workshops.

Keywords: *Foresight, Scenarios, Scenario Planning, Strategic Implications, Intuitive Logics School, Europe, Payment Gateway, Digital Payment Industry, Digital Euro*

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Table of Content

Table of Figures

Glossary

AI: Artificial Intelligence

API: Application Programming Interface

BaaS: Banking-as-a-Service

BNPL: Buy Now/Pay Later

CBDC: Central Bank Digital Currency

CIA: Cross-Impact Analysis

DeFi: Decentralized Finance

DPTV: Digital Payment Transaction Value

ECB: European Central Bank

EU: European Union

GDP: Gross Domestic Product

Gen-Z: Generation Z

GII: Global Innovation Index

ICT: Internet and Communications Technology

IMF: International Monetary Fund

INATBA: International Association for Trusted Blockchain Applications

ISO: Independent Sales Organization

KYC: Know-your-customer

ML: Machine Learning

P2P: Peer-to-peer

PAN: Primary Account Number

PayFac: Payment Facilitator

PMT: Probabilistic Modified Trends

POS terminals: Point-of-sale terminals

PoW: Proof-of-work

R&D: Research and Development

SMEs: Small and medium-sized enterprises

TIA: Trend Impact Analysis

U.S.: United States

UPI: Unified Payments Interface

1. Introduction

In recent years, Europe's digital payments industry has experienced impressive growth. Smartphone penetration, growing trust in digital services, and the covid pandemic led to an increase in digital transactions. Innovative technologies, regulatory adjustments, and consumer behaviour are shaping a dynamic, competitive market environment in which traditional banks, Fintechs, and global technology groups must meet the new needs of businesses and consumers. In the future, the European digital payments industry will continue to change rapidly, driven by data security issues, integration of new technologies, and increased regulation. Furthermore, the European Central Bank's plans to introduce a Digital Euro as a Central Bank Digital Currency could significantly change the payment process and the role of the players involved. Although there is no official confirmation yet, based on concurring expert opinions, this report assumes the future introduction of a Digital Euro.

Likewise, for the Portuguese-Dutch payment gateway provider Paybyrd, these developments mean uncertainty about the future of the payments industry and its positioning. Therefore, the aim of this Work Project is to analyse the upcoming changes in the European digital payment industry using a scenario planning approach. The work aims to provide Paybyrd with possible narratives for developments over the next 10 years, up to 2033, and to lay out the necessary foundations to maintain and expand its competitiveness under changing conditions, thus achieving maximum awareness and preparation for the foreseeable future.

As a framework for this work, the Intuitive Logics School is applied. After a brief introduction to the literature, the methodology followed in this work, and to the digital payment process, the five steps of the applied framework, (*I) Framing & Scoping, (II) Explore, (III) Synthesize, (IV) Act, and (V) Monitor*, are addressed sequentially, with a conclusion rounding out the work. This work project was fundamentally supported by Paybyrd. In order to maximize the strategic value

of the report, important company information, industry insights, and expert opinions were gathered through interviews and workshops throughout the process.

2. Literature Review

2.1 Scenario Planning: Conceptualization and Categorization

Scenarios describe future situations and the sequence of events from today to these future situations (Godet, 2000). By combining trends and policies, scenarios of alternative futures are developed (Fontela & Hingel, 1993). Scenarios thereby provide an overall picture of the environment and highlight the interactions among several trends and events in the future (Martino, 2003). In the process of creating several possible futures, a wide range of options has to be captured in order to successfully challenge predominant ways of thinking and the status quo (Schoemaker, 2003). Consideration of multiple possible future alternatives helps to conduct future planning in a holistic manner (Burt & van der Heijden, 2003). Furthermore, this improves the ability to deal with uncertainties in a more targeted manner and to significantly increase the effectiveness of the entire decision-making process (Varum & Meloa, 2010).

Companies from all around the world have started to employ scenario development as a tool for strategic decision-making more frequently. Executives use scenarios to shape their mental models of the future to improve the firm's decision-making process (Martelli, 2001). Companies and their managers are faced with the challenge of determining how to respond to external and uncontrollable events with the aid of internally accessible resources by using scenario planning (Simpson, 1992). Applying the scenario technique enables managers to make better and more resilient strategic decisions (Wilson, 2000). Scenarios are viewed as a useful tool to aid companies in preparing for potential contingencies and responding to changes with enhanced adaptability and creative capability (Hiltunen, 2009).

The term has been refined by a number of experts in the field of scenario planning in an effort to provide a precise definition. Scenarios, in the words of Herman Kahn, are a set of hypothetical events set in the future constructed to clarify a possible chain of causal events as well as their decision points (Kahn & Wiener, 1967). According to De Geus, scenarios are tools for foresight-discussions whose purpose is not a prediction or a plan, but a change in the mindset of the people who use them (de Geus, 1997). Fahrey and Randall describe scenarios as descriptive narratives of plausible alternative projections of a specific part of the future (Fahrey & Randall, 1998). For Kloss, scenarios are stories about the future that are believable and based on examination of how various environmental variables interact (Kloss, 1999).

2.2 Scenario Planning as a Strategic Tool

Scenario planning is a vital strategic tool for organizations, as it enables them to develop robust strategies, foster innovation, facilitate learning, and evaluate their current approaches (Derbyshire & Wright, 2017). By connecting scenarios to strategy, organizations can identify and rehearse strategic options for various possible futures, ultimately translating the implications of the scenarios into strategic action (Schwartz, 1991; Sridharan, 2022).

Lindgren and Bandhold identified four specific purposes of scenario planning: strategy, innovation, learning, and evaluation (Lindgren and Bandhold, 2004). Scenarios serve as a strategy development activity, while also acting as a filter to verify new ideas, granting flexibility and openness in strategic thinking. In innovation management, scenario planning can inspire the generation of novel concepts. Additionally, scenario planning can drive change and challenge existing paradigms and assumptions. Scenarios facilitate the careful evaluation of an organization's current strategy, identifying elements potentially at risk in the future and enabling modifications (Wilson, 2000). This process results in a more resilient and robust overall business strategy.

The value added by employing scenarios as a strategic tool is substantial, as companies using scenario planning expand their thinking and improve individual and collective perception (Bood & Postma, 1997). The planning for multiple options challenges existing assumptions and mindsets of managers (van der Heijden et al., 2002). Scenarios provide a structure for dealing with uncertainties, uncovering unavoidable or nearly unavoidable futures (Cornish, 1977), enhancing understanding of causal processes, relationships, and logical sequences, and supporting strategy development and decision-making (Wright et al., 2012). In the end, scenario planning aids in identifying potential challenges, highlighting possibilities, and creating a communication basis for further actions (World Economic Forum, 2014).

2.3 Main Approaches of Scenario Planning

Existing literature identifies three main approaches to scenario planning: the Intuitive Logics School, the Probabilistic Modified Trends (PMT) School, and La Prospective (Amer et al., 2012).

Intuitive Logics School, the most widely used approach, was introduced by Herman Kahn and the RAND Corporation in the 1960s, later also applied by Royal Dutch Shell (Bradfield et al., 2005; Wack, 1985b). This process-oriented approach uses qualitative tools, focusing on the complex interdependencies of economic, political, technological, social, resource, and environmental factors (Huss & Honton, 1987a). Various methods within this school range from five to over fifteen sequential steps (Bradfield et al., 2005).

The PMT School, also originating from the RAND Corporation, consists of quantitative methods like Trend Impact Analysis (TIA) and Cross-Impact Analysis (CIA) (Bradfield et al., 2005). TIA combines historical approaches, such as time series analysis, with qualitative factors to account for unprecedented events (Huss & Honton, 1987b). CIA focuses on capturing the

interrelationship between key influencing factors, as forecasting an event in isolation is unrealistic (Gordon, 1994).

La Prospective is centred on the idea that the future can be consciously created and modelled (Bradfield et al., 2005). This approach aims to better understand today's world and its hidden opportunities and threats (Durand, 1972). Normative future scenarios and idealistic images of the future are developed to guide policymakers and form a basis for future action (van Vught, 1987).

These techniques differ in their fundamental characteristics. The Intuitive Logics School is process-oriented and qualitative, while PMT is outcome-oriented and quantitative, using computer-based simulations. La Prospective is a mix of both, being outcome-oriented and employing qualitative and quantitative tools. In the Intuitive Logics School, usually two to four different scenarios are developed, all of which have the same probability of occurrence. In the PMT technique, which usually includes three to six scenarios, and La Prospective, which considers a multitude of scenarios, the scenarios have different probabilities of occurrence (Amer et al., 2012).

3. Methodology

3.1 Work Design

The theoretical foundation of scenario planning employed in this project is rooted in the Intuitive Logics School, an approach that has gained significant attention within the scenario planning literature (Bradfield et al., 2005). This approach *"analyses the relationships between:*

- *the critical uncertainties (as they resolve themselves);*
- *important predetermined trends (such as demographics); and*
- *the behaviour of actors who have a stake in the particular future (who tend to act to preserve and enhance their own interests)."* (Wright et al., 2012)

This approach enables organizations to identify key driving forces that may impact their future outlooks, such as the viability of the focal organization or its market offerings. Furthermore, it allows organizations to explore possible and plausible outcomes resulting from these driving forces and to understand the complex interactions among them (Wright et al., 2012). The Intuitive Logics School, utilizing a qualitative approach, proves to be a suitable methodology for addressing the dynamic and uncertain nature of the digital payment industry. This approach offers a comprehensive source of information, enabling the identification of crucial trends and uncertainties, scenario validation and refinement, and the development of strategies to adapt to future changes (Amer et al., 2012). The digital payment industry is characterized by constant innovation and shifts in technology, regulations, consumer preferences, and global market forces, all of which encompass numerous uncertainties. Consequently, businesses operating within the industry face both opportunities and challenges, necessitating a flexible and adaptive approach to thrive (McKinsey, 2022A).

This work follows a deductive approach of scenario building. This method uses a top-down approach in which the researcher first attempts to create a comprehensive framework and then incorporates the data obtained through analysis (Bradfield et al., 2005). By creating descriptive scenarios through a deductive approach, researchers can effectively identify and examine the assumptions surrounding the chosen focal issue, ensuring the coherence and consistency of each scenario while addressing the complexities of the digital payment industry. One of the most frequently cited and highly regarded approaches within the existing literature is Schwartz's method, as detailed in his seminal work, "The Art of the Long View" (1991). Experts consider Schwartz's approach as a primary reference for the Intuitive Logics School and an excellent guide for the comprehensive process of scenario planning (Ringland, 1998; Phadnis et al., 2014). Schwartz's methodology encompasses five distinct stages: *(1) Framing and Scoping, (2) Exploring, (3) Synthesizing, (4) Acting, and (5) Monitoring*.

In the first phase, *(1) Framing and Scoping*, the focal issue and the time horizon were selected. The focal issue was backed with relevant supporting questions. In order to build a strong foundation for the subsequent scenario building process, it was crucial to understand the challenges, assumptions, and ideas within the organization. Therefore, two meetings with Paybyrd were held during this step. In the first meeting, the company and current challenges in the digital payment industry were discussed. Based on the outcomes of this meeting, the focal issue, supporting questions, and time horizon were chosen. The determined conditions were confirmed and finalized in a second meeting with Paybyrd.

In the *(2) Explore* phase, the understanding of the context of the topic was deepened. During this process, predetermined elements, megatrends, trends, and uncertainties were identified. To ensure that all key external factors were included in the explore phase, the various categories of the PESTLE analysis were used as a starting point for the environmental scanning in this stage. Applying the PESTLE framework is particularly well-suited for the environmental scanning phase (Akbalik & Çitilci, 2019).

During the third phase, *(3) Synthesize*, scenarios were constructed by focusing on two critical key uncertainties that serve as scenario dimensions. With the deductive approach, the scenarios were created around the extreme developments of these selected key uncertainties and describe four plausible futures within the previously defined time horizon. The two selected key uncertainties were positioned as axes of a 2x2 scenario matrix in which the final scenarios were presented in four quadrants, each representing a specific future (Wulf et al., 2010). To establish the foundation of the scenario matrix, the two key uncertainties need to fulfil three criteria: significant impact, high uncertainty, and sufficient independence. This implies that the uncertainties must exert a considerable influence on the focal issue, exhibit a high level of uncertainty regarding the likelihood of their occurrence, and be capable of feasibly coexisting in any potential combination within the same future scenario (Cairns & Wright, 2011). The

synthesize phase was accompanied by a workshop in which all identified uncertainties were presented to Paybyrd, and subsequently assessed concerning their level of uncertainty and level of impact. The result of this workshop was the identification of the two key uncertainties, which define the foundation for scenario development. During the development of the scenario narratives, Porter's Five Forces was applied which presents a suitable framework to gain a comprehensive understanding of the situation for different stakeholders in each scenario (Hafezi et al., 2020). By meticulously analyzing the evolution of each component of Porter's Five Forces across different scenarios, researchers can gain valuable insights into the changing dynamics of a company's competitive landscape. This information can form the bedrock for strategic planning, enabling companies to be well-prepared for an array of potential scenarios. Ultimately, such preparation augments a company's chances of securing and maintaining a competitive edge over the long term (van der Heijden, 2005).

During the *(4) Act* phase, strategic implications were formulated for each of the scenarios developed in the previous stage. Therefore, the Ansoff matrix was utilized to pinpoint and evaluate potential strategies for Paybyrd. A shared aspect of the Ansoff matrix and scenario planning is that both methodologies were developed to recognize market opportunities and support the decision-making process, particularly when making strategic choices (Kippenberger, 1998). While scenario planning offers a structure for assessing market dynamics, the Ansoff matrix presents a framework for identifying growth opportunities and refining product-market approaches accordingly (Martinet, 2010). With the approach pursued in this study, scenarios were employed to scan the environment and identify market dynamics. Subsequently, the Ansoff matrix was utilized to develop various product-market alternatives and assess their suitability (Curry et al., 2006). With the help of a workshop, in collaboration with the experts from Paybyrd, the Ansoff matrix and the resulting implications were refined and verified.

In the *(5) Monitor* phase, early indicators were identified with the aim of detecting emerging developments through continuous monitoring.

3.2 Data Collection

To develop a comprehensive response to the focal issue through this work, both primary and secondary data were used throughout the entire scenario development process.

In order to create a paper that meets the requirements of Paybyrd and the focal issue, it was crucial to involve individuals with extensive knowledge of Paybyrd's company and the complexity of the payment industry. Throughout the process, several interviews and workshops were conducted with Miguel de Azevedo Moura, Managing Director of Paybyrd, and Pedro Coelho, Head of Finance at Paybyrd. For the *(1) Framing and Scoping* phase, an unstructured interview was first conducted to gather detailed information about the tasks of a payment gateway provider, the payment process, and market dynamics. Based on the insights from this meeting, the focal issue, supporting questions, and time horizon were established. In a second meeting, the proposals were discussed and validated with Paybyrd. During the *(3) Synthesize* phase, the developed uncertainties were evaluated together with Paybyrd's representatives based on their level of uncertainty and level of impact in a workshop, forming the basis for the subsequent scenario building. Based on the developed scenario narratives, another workshop with Paybyrd was held at the beginning of the *(4) Act* phase to identify the strategic implications that could be derived from the scenarios. The results of all the meetings were considered in the various stages of the project and ultimately led to the derivation of strategic implications for Paybyrd. In addition to the acquisition of primary data through direct contact with experts from Paybyrd, further approaches were used to obtain secondary data. Sources included governmental institutions, globally active strategy consultancies and banks, research papers and books by industry experts, newspaper and press articles, and industry and market reports. To

ensure exhaustive secondary data collection, additional business concepts and frameworks were integrated into the various steps of scenario development process.

4. Payment Process and Company Introduction

4.1 Payment Process Overview

The payment process can be characterized as a sequence of interrelated steps that occur when an individual initiates a digital payment transaction - the transfer of money using digital devices or channels (Adobe, 2022).

The different parties involved in payment processing include (Adobe, 2022): the customer, issuing bank, merchant/business, payment processor, payment gateway, independent sales organization (ISO), payment facilitator (PayFac), acquiring bank, merchant bank, and card schemes. The payment process consists of the following steps (Benaissa, 2021; Fernando, 2021; Radage, 2022). After consultation with Paybyrd (*Appendix 1*) and further research, a total of 11 steps in the process have been identified:

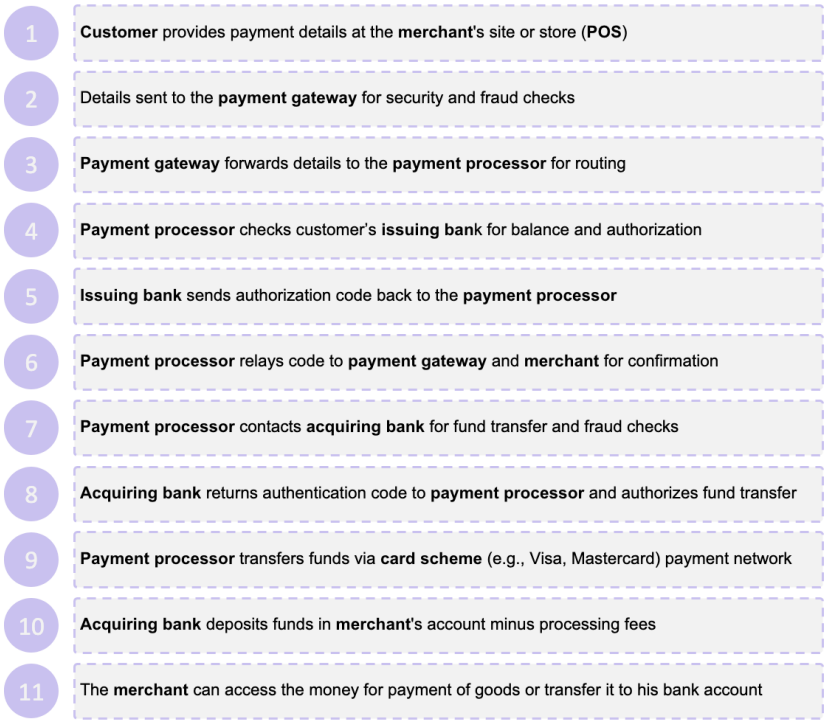

Figure 1: Step by step Payment Process; Sources: Appendix 1, Benaissa, 2021; Fernando, 2021; Radage, 2022; Own Creation

In this context, card schemes (such as Visa or Mastercard) contribute to the establishment of rules and regulations for payment processing and ensure interoperability between payment processors, acquiring banks, and merchants (PSR, 2022).

4.2 Paybyrd – a Payment Gateway and Independent Sales Organization

Paybyrd is a payment gateway provider and ISO in Portugal that specializes in providing POS terminals alongside a secure, unified, omnichannel dashboard. This platform enables merchants to manage various payment options, including social payments, e-commerce payments, in-person payments, and business payments. To cater to the dynamic needs and preferences of customers, Paybyrd offers an assortment of payment methodologies, such as Pay by Link with Pre-Authorization, Payment via SMS, WhatsApp, and Email, as well as the Buy Now, Pay Later option. Paybyrd targets a diverse range of businesses, including in-store, e-commerce, multi-site, and multi-merchant establishments. Through its comprehensive omnichannel dashboard, users can monitor transactional data, access the automatic payments ecosystem, and accept global live payments.

Payment gateways serve as intermediaries between merchants and customers, streamlining the transaction process by securely transmitting payment information and funds between the two parties. As an ISO, Paybyrd collaborates with payment processors to deliver merchant services such as processing payments, managing chargebacks, and providing customer support. ISOs, also called as Merchant Service Providers, provides autonomous credit card processing services for merchants and function as intermediary entities connecting merchants with payment processors (Fernando, 2021).

5. Phase I: Framing & Scoping

During the first phase of scenario development, the project's focal issue and time horizon are selected. The focal issue defines the project's scope, and the time horizon should represent a suitable long-term planning period in relation to the identified focal issue, allowing for disruptions, implying that there is ample time for changes in trends and historical context (Cairns & Wright, 2011). A deep understanding of company and industry challenges is key (Scearce & Fulton, 2004). Consequently, a meeting with the Paybyrd representatives was held to devise a relevant focal issue for the future of the payment industry. Ensuring this process aligns with the expertise of Paybyrd's professionals is essential for a valuable strategic contribution.

5.1 Focal Issue

In recent years, further stimulated by the COVID-19 pandemic, a persistent change in payment behaviour has been observed. As the European Central Bank's "SPACE" study from 2022 reveals, the use of cash at physical POS terminals has been steadily declining (from a 79% share in 2016 to 59% in 2022), while payment with bank cards (19% in 2016 to 34% in 2022) has gained significant popularity within the Eurozone. In this context, contactless card payments at the POS increased considerably within the last three years, from 41% of all card payments in 2019 to 62% in 2022. Additionally, the growing relevance of e-commerce has led to an exponential increase in online transactions (ECB, 2022B). This changing consumer behaviour in payment transactions is accompanied by various opportunities and risks in areas such as technological advancements, security considerations, and sustainability issues (Capgemini, 2023). Furthermore, since 2021, the European Central Bank has been actively exploring the possibility of introducing a Digital Euro (ECB, 2021A). If implemented, this central bank

digital currency (CBDC), which is a digital form of money implemented by a central bank, has the potential to fundamentally transform the payment industry across Europe.

Peter Bishop stated that the focal issue should be a question that captures the essence of the problem or opportunity to be explored (Bishop et al., 2007). Taking into account the dynamics of the payment industry and stakeholders' expectations, the following focal issue was proposed: *"What will the European digital payment landscape look like in 2033?"* Paybyrd's objective with the following report is to create awareness of the dynamics that will characterize the future of the digital payments industry in order to understand what strategic initiatives will need to be taken. The main question leads to several supporting questions to further explain the defined focal issue: (1) "*How can the introduction of a Digital Euro affect the digital payment industry?"* (2) *"What are discords and synergies within the payment industry?"* (3) *"What are the drivers for customer preferences in choosing digital payments?"* (4) *"How will the acceptance for alternative payment methods, such as cryptocurrencies and digital wallets develop in Europe?"* (5) *"How will legislative institutions and governments influence the digital payment industry?"*

5.2 Time Horizon

To ensure effective long-term planning for a company, Cairns and Wright suggest that the time horizon should strike a balance between being too distant to require speculative thinking and too near to be predictable. According to the authors, the best time horizon is one that encompasses periods of significant change and transformation (Cairns & Wright, 2011).

The introduction of the Digital Euro, which is now going through an investigation phase which is anticipated to be finished by the end of 2023, might be one of the disruptive events in the landscape of digital payments. The EU Commission, Parliament, and other regulators will decide in October 2023 whether the digital currency will be introduced. If so, European laws

must first be adapted before the ECB can finally roll out the project. The subsequent development phase is then expected to take at least three more years (Balz, 2021; ECB, 2021B). It will likely take several more years for the digital currency to gain broader access to daily life. Burkhard Balz, a member of the executive board of the Central Bank of the Federal Republic of Germany, expects CBDCs to be introduced as a new transaction method in at least some countries by 2030 (Balz, 2022).

Social acceptance of a new payment method, in addition to the potential introduction of a digital currency, is a key factor in determining the time horizon. Based on analyses conducted by Research & Markets, a frequently cited analysis firm in economic circles, the European digital payment industry is expected to grow at an average annual rate of 13.2% between 2021 and 2028 (Research and Markets, 2022). These forecasts indicate that by the end of the decade, digital payments will represent a significant portion of transactions in Europe. To introduce revolutionary changes in the landscape of digital payments in Europe and to allow for broad acceptance, the time horizon of the focal issue should be set at 10 years, to the end of 2033.

Group Part

6. Phase II: Explore

Phase II: Explore involves acquiring information about external factors impacting Paybyrd's business and the digital payments industry. This stage identifies and examines various major and minor trends, along with predefined elements that could influence the project's focal issue. This phase concludes by identifying critical uncertainties - unpredictable factors that could significantly impact the project's focal issue.

6.1 Megatrends and Trends

In the world of business and economics, the terms "megatrends" and "trends" are often used to describe shifts in the global landscape that have significant impact on various industries and

markets. Megatrends are long-term, overarching patterns with a broad scope and a dramatic impact that will shape the characteristics of future markets. Trends are shorter-term phenomena that emerge as a result of megatrends. They are usually a gradual and long-term change in the drivers that shape the future of an organisation, region, nation, sector, or society. Megatrends and trends form the foundations and framework for addressing the focal issue question. To assess the future of the European digital payments industry, three megatrends and eight sub-trends are outlined.

Megatrend I: Accelerating technological change, digitalisation, and hyperconnectivity	
Trend I:	Innovation outpaces new regulation
Trend II:	APIs to drive Banking-as-a-Service growth
Trend III:	More reliance on digital wallets
Trend IV:	Gen Z - The tech-savvy generation
Megatrend II: Increasing risks for digital payments associated with cybersecurity and fraud	
Trend V:	Top-rated security powered by artificial intelligence and machine learning
Trend VI:	Tokenisation
Megatrend III: Growing consumption	
Trend VII:	Customer centricity
Trend VIII:	Sustainable payment solutions on the rise

Figure 2: Megatrends and Trends; Source: Own Creatio

Individual Part – Edoardo La Motta

6.1.1 Megatrend I: Accelerating Technological Change, Digitalisation, and Hyperconnectivity

The way technological development is changing the nature of things can be defined as transversal: it ranges from involving the transformation of production systems, to governance, to changing the way we learn, work, and socialize (European Commission, 2023A).

The Covid-19 pandemic has played a crucial role in pushing companies towards the development and adoption of new digital technologies, accelerating the interaction digitation between customers and companies' supply chain. Technological development in multiple

sectors has also led to the reshaping of many industries, such as digital payments, not only in terms of consumer behaviours, but also the players who are involved. For instance, mobile payments have become widespread, and big tech companies such as Google, Amazon, or Facebook have decided to enter this market providing a fast and convenient way for people to pay for goods and services using their smartphones (PwC, 2020). The reasons of this decision mainly revolve around improved data collection that can be leveraged to better design their customer experience and understand their customer needs, but also to explore new revenue streams by diversifying into a fast-growing market, that offers the opportunity to rapidly steal market share from competitors (Harris, 2020).

Overall, it is possible to state that customers' interests and preferences have vastly shifted to online channels and contactless experiences (McKinsey, 2020A). The way people live has been reshaped completely. The secular process of digitalization, accelerated by the pandemic crisis, has thus led to the creation of new interactions between humans, between humans and technology, and between machines and machines, and new purchasing habits as well. The extension of these types of interactions has largely contributed to the creation of the concept of hyperconnectivity (Forbes, 2013). Hyperconnectivity allowed to access information and carry out activities in an immediate way through electronic devices. The immediacy of what people do is even more emphasized by people's smartphone ownership. According to Strategic Analytics, the number of people expected to use a smartphone is increasing, reporting five billion people owning a smartphone by 2030 (Business Wire, 2021), which is affecting the world of payments to the extent that, at today, 52.7% of the global population use a mobile wallet (ACI Worldwide, 2023) and, thus, the number of digital transactions, which is raising. The higher the number of digital transactions, the higher the profits in the industry, because of the higher encouragement from the electronic payment to lead people spend more.

Moreover, the customer tendency to transact digitally will be positively influenced by the enhanced regulation of digital payments, which will also have a positive impact on the shadow economy and the increasing tax take. Hence, providing a solid regulation system will play a crucial role not only in industry profits, but also data security, which at today represents one of the most relevant issues faced by digital payments. Cards details stolen online represents an increasing trend among people reported being victim of fraud in the last 4 years, accounting for 20% of the surveyed people (ACI Worldwide, 2023). Those involved in illegal activities such as consumer scams and money laundering are more and more moving their illicit acts towards digital payments channels, which has placed a priority issue on the agenda of governmental and nongovernmental entities, such as the Financial Action Task Force. For this reason, companies are implementing several controls in their systems, as for example transaction monitoring, and KYC (know-your-customer) requirements, which consist in the user identity verification. In general, together with the implementation of customer-monitoring, transaction-monitoring, and screening programs, more complex and detailed regulation by governmental and nongovernmental bodies will be necessary so as not only to make these illegal activities more complex for those who do them, but also to discourage their intentions, and to let the digitization of payments and innovation go further (McKinsey, 2022A).

6.1.1.1 Trend I: Innovation outpaces new Regulation

The technological innovation boost that the pandemic period provided has played a crucial role in creating regulatory systemic flaws when it comes to new products in the fintech arena, and particularly in the digital payments field. While some products have not been subject to regulation at all, others have been subject to outdated regulations that no longer reflect current conditions (American Banker, 2021). An example in this regard is Buy Now/Pay Later services, which represents a relevant innovation in the digital payments industry. These need more clarity

from a regulatory policy perspective, especially if considered that these schemes contribute to increasing private debt spiral, which might lead the consumer to over-indebtedness and higher spending.

Buy Now/Pay Later (BNPL) can be defined as a short-term loan, which allows consumers to make a purchase (online or physical) and defer payment in the future, without being subject to interest payments, usually. This payment option represents a highly growing trend among consumers to date. From 2019 to 2021, in fact, loans originated by Buy Now/Pay Later payment grew from 16.8 million to 180 million in the US (Consumer Financial Protection Bureau, 2022). However, there are several risks related to BNPL, belonging to three main areas: the difficulty of dispute management and autopay option for loan payments, potential consumer data that are collected by technology platforms and could be subject to attack, and, finally, the over-extension of consumer debt that would lead to a stagnant situation where the individual cannot meet his or her obligations (Deloitte, 2022A). This would lead to an increasing private debt, and, potentially, to higher public debt, creating a risky and uncertain situation, knowing that excessive private debt causes a higher public debt. The reason behind, is that higher private debt is a natural consequence of a consumer overspending, which, however, will subsequently reduce its spending, leading to a slowdown in national economic activity, if considered that other individuals will do likewise. Hence, government might use monetary manoeuvres that would stimulate private spending, by drawing on debt. However, it should also be mentioned that private debt turning into public debt will also depend on the overall national growth slowdown during the considered period (IMF, 2018).

It can be clearly understood how legislative regulation of these new technologies, especially in the digital payments arena given its instantaneous and transnational nature, has failed to keep pace with innovation. A more detailed regulation is therefore necessary to increase safety and inclusivity throughout the growing trend of digital transactions. It is fundamental to adapt

policies and standards to new players, for which the existing regulatory environment is usually not tailored to them or just covers part of their activities (Duff & Phelps, 2022).

6.1.1.2 Trend II: APIs to drive Banking-as-a-Service growth

The expansion of the Banking-as-a-Service (BaaS) model continues to be one of the fastest-growing models among the digital payments rising trends, since the early 2010s.

The BaaS model consists of BaaS companies providing a certain banking product or service under a white label, which can then be purchased by any player that needs it, putting its own label on the product (Deloitte, 2021). The rise and growth of these companies has made it possible to avoid many issues related to the high cost of software to develop these products, or communicating and reaching an agreement with banking institutions, owning licenses, dealing with payment process partners and card issuers. BaaS institutions offer not only an all-inclusive product based on the needs of the company requiring it, but also extremely flexible, low-cost and scalable by virtue of the presence of Application Programming Interface (API) and cloud services (Treezor, 2022).

For the purpose of this study, APIs and their role in facilitating the rise and expansion of BaaS solutions will analysed. APIs can also be defined as software applications, which, through a set of protocols and codes, allow there to be an interface between financial institutions and third parties. Thus, it can be simply stated that bank's services are made available to other entities through APIs. These third parties get the desired APIs from the provider and deploy them based on their needs and on which kind of services they specifically want to offer. On the other hand, these tools offer customers the opportunity to have better control over their data, improve the ease of access and to crease a cohesive and collaborative ecosystem between involved players (Forbes, 2022A).

It is possible to list several types of APIs: Open (or Public) allow any entity to have access to APIs, with no constraints. Partner APIs are available just to entities owning specific rights or a licenses. Internal (or Private APIs) are usually intended for internal use, aiming at improving processes involved in the production of the company's products and services (RapidAPI, 2021). Finally, Composite APIs consist of a design approach that sequentially tunes requests from different APIs into a single API call (Irfan, 2021).

Once the information request is received and validated from the financial institution, the APIs transmit it to the third-party financial services application, facilitating the sharing of consumer data between the financial institution itself and the other entity involved. Thus, APIs function consists not only in the intermediary nature of these tools, but also in directly helping customers in quickly sharing their data with banks applications and products, allowing for a customised experience that will better meet their specific needs. It is widely known how at the foundation of business growth lies the concept of meeting customer needs (Info Entrepreneurs, 2022).

6.1.1.3 Trend III: More Reliance on Digital Wallets

It is possible to state that the increasing reliance on digital wallets is reshaping the customer payments behaviours.

Digital wallets (also known as e-wallet) can be defined as online payment tools that allow the customers to have digital versions of debit and credit cards that store all its payment information, thereby reducing the need carrying the physical version of cards. Among the most widely used digital wallets to date, can be found Apple Pay, Google Pay, and Paypal One Touch (N26, 2022A). Users can add their credit or debit card to their digital wallet, which can be accessed usually from smartphone applications or browsers. They can be employed in many different cases: to make payments in-store by holding the phone up on the POS terminal, online, in-app, and to withdraw or make deposits at bank ATM counters (Bank of America, 2022).

It is possible, moreover, to classify three types of digital wallets: Closed Wallet is a tool developed and offered by a specific company for its customers, on which money is withdrawn and loaded from cancellations or refunds, which will then be available to the consumer should they purchase from the company's site, as in case of Amazon Pay (Corporate Finance Institute, 2022). Making payments with Semi-closed Wallets is only possible in certain areas or with merchants who have an agreement with the issuer of the digital wallet. Meaning that it is not open to all consumers, but only to those who have a digital wallet with the same issuer (Paytm, 2023). Finally, Open Wallets allow customers to use their digital cards for any type of transaction and merchant.

Indeed, digital wallets not only provide convenience and speed of transactions and access to a user's information, but also a level of safety that conventional payment methods are incapable of matching. In fact, trivially, the user does not need to carry any physical card, with the eventual risk of losing it, blocking it, and requiring a new one (ID Strong, 2022). Through cutting-edge features such as biometric authentication and tokenization, which will apply a random token to the customer's purchase instead of providing its financial information, digital wallets can shield the users' financial information from fraud and theft (Josef, 2022). The wall of security built by payment through cards present on digital wallets is even more reinforced by the presence of encrypted information, that is, information available only at the moment when the user authorizes for access and use of the wallet (Techtarget, 2022).

According to a recent study, the total number of digital wallet users world-wide will exceed 5.2 billion by 2026. This forecast supports the digital wallet market's relevance in the near future. Certainly, the boost given by Covid-19 pandemic, the rising of e-commerce and the convenience of digital wallets, which allow users to store multiple payment options and avoid carrying cash or cards, are among the main reasons for this growth (Mouat, 2022).

To conclude, Digital wallets are expected to play an increasing important role in virtue of their ability to meet customers' and businesses' needs.

6.1.1.4 Trend IV: Gen Z - The tech-savvy Generation

Generation Z or Gen Z includes people born between 1996 and 2010. This generation can be considered shaped by the digital age, since they have always been in the presence of the internet, owning a personal computer or a smartphone (McKinsey, 2023). This generation was raised in a world where the pillars of the digital ecosystem were already visible, and as a result, Gen-Z is becoming a driving force in shaping the future of the digital world (Selig, 2022), which is extremely relevant to the extent that Gen Z, together with Millennials, will constitute 72% of the world's workforce by 2029, according to Marsh McLennan (Marsh McLennan, 2020). Thus, understanding their purchasing behaviours, the tools most used in making transactions, and the services they are mostly interested in is going to be a crucial part in meeting their needs. In this regard, contactless payments adoption, which consists in payments that do not require the physical exchange of money or the physical card (N26, 2022B), have seen a dramatic increase, especially among Generation Z. This is related not only to the boost that the pandemic gave in response to general concerns regarding contaminated surfaces and new regulations promoting contactless experiences (Forbes, 2021), but also to their purchasing behaviour. According to a report by Accenture, 70% of Gen Z prefers to use digital payment methods over traditional payment methods (Accenture, 2021). This is because they value speed and convenience in their payment experiences, and digital payments offer just that. Additionally, Gen Z has grown up in a world where online shopping and delivery services are commonplace, and this has further reinforced their preference for digital payments.

Another factor contributing to Gen Z's adoption of digital payments is their familiarity with mobile devices. As per a survey by Business Insider, 89% of Gen Z owns a smartphone, used for several activities, including social media, streaming content, and online shopping (Insider

Intelligence, 2020). This high level of engagement with mobile devices has made Gen Z receptive to digital payment methods, such as mobile wallets and contactless payments. As Gen Z continues to enter the workforce and become financially independent, it is expected that their preference for digital payments will only continue to grow. Thus, Gen Z represents one of the future innovation and growth drivers in the digital payments industry.

Group Part

6.1.2 Megatrend II: Increasing Risks for Digital Payments associated with Cybersecurity and Fraud

The COVID-19 pandemic has exerted a profound influence on global consumer habits, extending well beyond digital payment practices. Many individuals have altered their behaviour, opting to avoid cash transactions and limit interpersonal contact wherever feasible. This behavioural shift has driven a significant surge in the adoption of various forms of digital payments. Indeed, within the first ten weeks of the first quarter of 2020, the pace of digital payment uptake surpassed that of the previous five years (Abrahams, 2022). By the end of 2020, 78% of Americans had employed some form of digital payment (Nadeau et al., 2020). By the end of 2022, this figure had increased to 89% (Nadeau et al., 2022).

Although cash continues to be the preferred payment method in the Eurozone, accounting for 59% of point-of-sale transactions in 2022, trend towards electronic payments has accelerated dramatically during the pandemic, with many consumers now shifting to electronic payment methods. For point-of-sale purchases, card payments have increased by 9 percentage points to 34% in 2022, with contactless payments representing most of these transactions. Cards are viewed as faster and more convenient, reducing the need to carry significant amounts of cash (ECB, 2022A).

The rapid speed of change represents one of the most significant challenges for both retailers and financial at today. Adapting to changing payment processes, acquiring appropriate

technology, and implementing new procedures swiftly has been critical for meeting customer demands and ensuring the availability of online transactions. Security has been an essential consideration in this process. Strong customer authentication with two or more factors is mandatory for online payments throughout the EU and is increasingly being implemented worldwide. However, some specific security risks are associated with digital payments (Abrahams, 2022). In particular, the faceless, relatively anonymous nature of online transactions can make it challenging for merchants to verify the identity of the consumer, potentially rendering some standard security mechanisms useless and increasing the likelihood of fraud and theft (Comerica Bank, 2021).

As a result, cybersecurity and fraud concerns have emerged as a significant risk to global payments (JPMorgan, 2021). Cybercriminals have taken advantage of the pandemic-induced dynamic, resulting in a 600% surge in cybercrime activity (JPMorgan, 2021). It is currently estimated that $6 trillion, or about 1 percent of the world's GDP, is lost to cybercrime each year. These costs are expected to reach $10.5 trillion by 2025 (PurpleSec, 2023).

6.1.2.1 Trend V: Top-rated Security powered by AI and Machine Learning

The online shopping proliferation has birthed the rise of scammers seeking to exploit the flourishing e-commerce industry. The staggering estimate that fraud will cost the card industry more than $408.5 billion in the next decade underscores the imperative of robust cybersecurity measures in the payment industry (Robertson, 2021). Ensuring that electronic payments are secure, convenient and universally accessible is necessary, especially given the shift in customer preferences toward digital payments. Particularly in the realm of online payments, security is of paramount concern, given the heightened risk of unauthorized access to sensitive data such as card numbers and bank account details (Kropelnytsky, 2022).

In the coming years, companies will increasingly leverage machine learning (ML) and artificial intelligence (AI) in the perspective of tackling payment fraud. Through the analysis of prior data and the development of a mathematical model to determine typical user behaviour, machine learning aids financial institutions in monitoring customers' spending patterns and detecting anomalous activity without necessitating additional verification steps for the customer (Kropelnytsky, 2022). In pursuit of artificial intelligence, machine learning tools constitute the initial stage. By gradually supplying their software with novel and diverse transactions, institutions can train their systems to detect fraud in real time. The more transaction data that is accessible to the software, the greater the efficacy and reliability of fraud detection (Digipay, 2022). Furthermore, artificial intelligence encompasses natural language processing tools and image recognition technologies, employed in conjunction to secure payment transactions. By leveraging diverse AI tools in the stages of account opening, authentication, and authorization, companies endeavour to safeguard transactions at every phase of the digital payment process (Jabbara & Katsaggelos, 2019).

6.1.2.2 Trend VI: Tokenisation

Tokenisation is a process that involves the replacement of sensitive information with a placeholder, commonly known as a token (Gartner, 2023). In the context of digital payments, tokenisation replaces the credit card number with an alternative number, which can be utilized for in-app purchases, point-of-sale transactions, and online transactions (Mastercard, 2022A). Tokenisation aims at restricting the amount of sensitive data a company can store to process credit card and e-commerce transactions, with a view to reducing the cost and complexity of compliance with government regulations and industry standards. (Lutkevich, 2023). Tokenisation represents a technological trend that aims to enhance the security of digital

payment options and mitigate the anticipated $408.5 billion global loss to credit card fraud by 2030 (Robertson, 2021).

The concrete application of tokenisation in the payment process comprises five steps. First, the credit card is presented or entered on an e-commerce site or POS terminal. The POS terminal or e-commerce site then transmits the primary account number (PAN) to the credit card tokenisation system. The system subsequently generates a string of random characters or retrieves the corresponding token (if it has previously been created) and stores the correlation in the data vault. In the fourth step, the tokenisation system transmits the token to the POS terminal or e-commerce site, where it represents the customer's credit card in the system. The token, which is not a PAN, cannot be used beyond the context of a one-time transaction with a specific merchant. If alternatively, a third-party tokenisation solution is utilized, the token is sent to the third-party provider, which de-tokenises it and forwards it to the payment processor for credit card processing (Riesen, 2022; Lutkevich, 2023). Paybyrd, with its incorporation of tokenisation capability in its offerings, is aligned with this trend (Paybyrd, 2022).

Individual Part – Selima Mrad

6.1.3 Megatrend III: Growing Consumption

The society we are currently living in heavily promotes purchasing and consuming goods in order to ensure economic growth, resulting in a consumerist culture. The increasing population, purchasing power, and growing urbanization are all expected to fuel growth in consumer demand, further entrenching the consumerist culture (Fengler & Heinze, 2021). The Covid-19 pandemic facilitated the development and adoption of digital payment solutions, altering the way people buy and use goods and services (European Commission, 2023A). For example, Apple and Google have grasped the opportunity to implement Tap-to-Pay technology to respond to consumer shifting behaviour, and thanks to their respective mobile payment

platforms, Apple Pay and Google Pay have become increasingly prominent on a global scale, accounting for 44.28% of e-commerce transactions worldwide (WP Full Pay, 2022).

Moreover, consumers are growing more concerned of the environmental and social consequences of their consumption habits, making it paramount for companies to align their support to ethical and sustainable practices but also environmental. The use of blockchain technology in supply chain management for example permit greater transparency and accountability, allowing consumers to make informed purchasing decisions (Deloitte, 2022B).

6.1.3.1 Trend VII: Customer Centricity

Data analysis methodologies and user experience reveal that consumers increasingly value their shopping experience beyond product quality and features. Consumers seek a comprehensive experience that connects them to the brand, covering all stages of the purchasing process (European Commission, 2021). Successfully meeting these needs can result in significant payoffs for companies, including increased market penetration and an expanded customer base. Corporate strategies should incorporate performance metrics and KPIs that measure and target emotional motivators - patterns influencing consumer decision-making (Macias, 2020).

Effectively tapping into emotional motivators, such as fostering a sense of belonging to an elite community or promoting feelings of well-being and freedom, can create a psychological connection with customers, boosting loyalty, spending, and purchase frequency (Macias, 2020). This requires industry-specific market understanding and in-depth consumer data analysis. The process involves analysing target customer segments and competitive dynamics to identify key emotional drivers. Aligning with these insights can drive growth by meeting and anticipating customer needs (Rossi, 2020).

Connecting customers to a brand community benefits both the company (through increased revenue and profits) and consumers, who may enjoy discounts, special offers, and other advantages that strengthen network effects.

6.1.3.2 Trend VIII: Sustainable Payment Solutions on the Rise

In the context of increasing consumption, customers make purchasing decisions less and less exclusively according to their wishes and needs. Instead, the idea of sustainable consumption is gaining access to the decision-making process. The decision for a brand, a product or a service is increasingly seen as an opportunity to react to global problems and challenges such as climate change or inequalities. Consumers can actively participate in combating problems and transforming society and the economy through their purchasing decisions. This trend is especially true for consumers from developed countries, such as European countries, as sustainable products and services are often more expensive. Making conscious sustainable purchasing decisions thus exerts strong pressure on the corporate side, as the same behaviour is increasingly expected from producers, who are forced to take this into account in order to meet the market demands (European Commission, 2023A).

This trend does not stop at the financial industry. Forecasts show that the number of bank cards in circulation worldwide will rise to over 31 billion in 2025 (Nilson Report, 2020A). In addition, six billion plastic cards made from non-biodegradable synthetic materials are discarded annually (Nilson Report, 2020B). Additionally, the issuance of 2.3 billion cheques annually is equivalent to cutting down 455,000 trees, according to BNY Mellon analysis (Finextra, 2022). Issuing bills in the US alone is comparable to using 9 billion gallons of water and cutting down 3 million trees, emitting as much as 450,000 cars (Porter & Temsamani, 2019). As a result, large banks such as Citi, BBVA, and HSBC are prioritising the elimination of single-use bank cards and the use of recyclable plastic to reduce their carbon emissions on their way to achieving

net-zero emissions (Citi, 2022; BBVA, 2021; IDEMIA, 2021). Furthermore, the growing sustainability mindset in society is accelerating the transition to cashless economies. The growing popularity of digital payment options instead of physical bank cards or the use of cash is therefore also in line with the growing trend of sustainability in the financial industry (Capgemini, 2023).

Group Part

6.2 Predetermined Element: The Introduction of the Digital Euro

Unlike critical uncertainties, predetermined elements can be described as those components that have not yet taken place but are mutually acknowledged to occur (Robbins, 1995; Wright et al., 2012).

This study assumes that within the time horizon considered in this work, a CBDC will be introduced in Europe. Technological progress has produced a large number of digital payment options in recent years. This has increased global pressure on the public sector to define the role of public institutions in providing digital payment options (Carapella & Flemming, 2020). Central banks in 114 countries, accounting for over 95% of global GDP, are therefore currently exploring the issuance of CBDCs for retail customers - a widely accessible digital form of fiat money that could be legal tender (Atlantic Council, 2023). Meanwhile, the ECB is currently in the process of investigating what advantages a Digital Euro would bring and how it should be designed. The investigation phase was launched in mid-2021, the first results are expected towards the end of 2023 and the decision on whether a Digital Euro will be introduced will be made by the ECB's Governing Council only after the investigation phase has been completed. This could then be followed by a phase of realisation and market introduction (ECB, 2021B). Digital Euro implementation is a key step, although neither the European Central Bank nor the European Commission has yet officially confirmed this. Both banks and industry experts expect its introduction in the coming decade. Following discussions with representatives from

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Paybyrd, who share the views of banks and experts, the introduction and existence of the Digital Euro is considered to be given in each of the developed scenarios.

According to the political scientist Andreas Bielig, the Digital Euro should be designed to supplement, not to replace cash and other forms of payment, and it should include strong security measures to protect against cyberattacks and fraud (Bielig, 2023). The introduction of a Digital Euro could curb the growing number of privately held currencies and the resulting threat to the stability of financial systems, act in line with the trend of declining cash use, support the digitalisation of the European economy and make the instruments of monetary and fiscal policy much more precise and targeted. A number of new business models would be feasible on the basis of a Digital Euro. In particular, the development of products and services in the IoT area shows great potential. Depending on the specific design of the Digital Euro, private providers could develop so-called smart contracts, i.e., the fully automated execution of payments, provided that previously defined conditions are met (ECB, 2022). Moreover, the ECB decision to issue a digital version of the Euro could revolutionize how people make payments and conduct financial transactions. The future of payments and financial transactions in the European Union and beyond would be significantly impacted if the Digital Euro is deployed.

vor und nachteile vgl uncertainties dazu

6.3 Uncertainties

The final category of change drivers to be examined within the scope of this study encompasses uncertainties. Critical uncertainties can be characterized as volatile and unpredictable elements, the implications and consequences of which exert significant influence on the focal issue (Phadnis et al., 2014). The intricate procedure of scenario building necessitates the identification and scrutiny of critical uncertainties that bear substantial relevance to the focal issue. Each uncertainty was then tracked by considering two different dimensions: the level of

impact, which was scored on a scale of 0 to 10, and the level of uncertainty, which ranged from "certain to be expected" to "completely unpredictable" (also rated on a scale from 0 to 10). The analysis and classification of each uncertainty underwent meticulous evaluation, grounded in scientific research and consultation with the client.

In this segment, the team opted to utilize PESTLE analysis, a method that facilitates the examination of macro-environmental factors with the potential to influence the company or industry under scrutiny (Wright et al., 2012). Applying the PESTLE framework is particularly well-suited for the environmental scanning phase (Akbalik & Çitilci, 2019). The identified critical uncertainties have been mapped to the six areas of the PESTLE framework, which aids in addressing the prospective drivers of change within the industry.

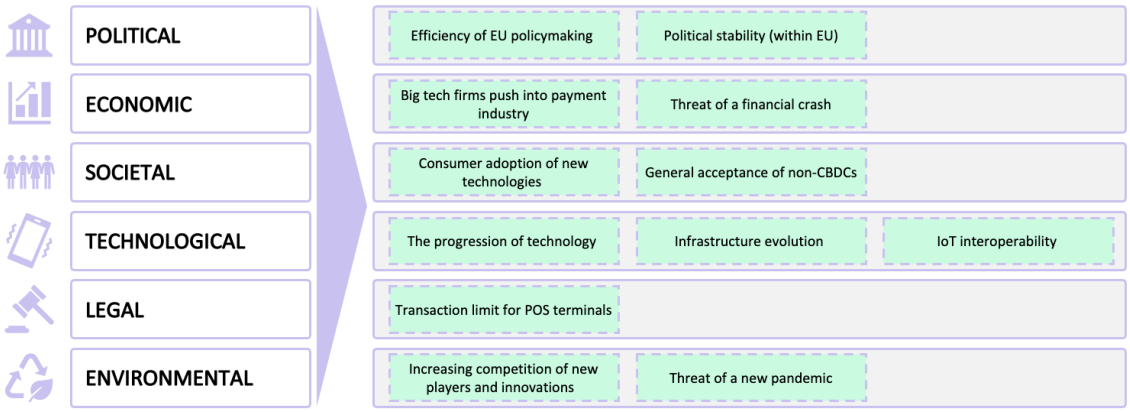

Figure 3: PESTLE and Uncertainties; Source: Own Creation

Through the employment of PESTLE analysis, 12 critical uncertainties were discerned. Subsequently, these uncertainties were assessed in an interview with the Paybyrd experts. In the ensuing section, the six uncertainties deemed to possess the highest combination of uncertainty and impact will be explicated. The remaining uncertainties, along with their respective ratings, can be found in the *Appendix 2* of this work. This led the team to map the following uncertainties: *(1) The progression of blockchain technology and the resulting possibilities, (2) Big tech firms overtaking conventional payment methods, (3) Acceptance of*

non-CBDC cryptocurrencies, (4) Infrastructure evolution, (5) Customer's acceptance and adoption of new technologies, (6) Efficiency of policymaking in favour of new technologies.

6.3.1 The Progression of Blockchain Technology and the resulting Possibilities

Overview: The blockchain can be defined as a ledger that is decentralized, distributed, and immutable. It is composed of a series of records that are cryptographically linked, referred to as blocks, and contain transactions or events. All members in the blockchain network share the decentralized ledger. Transactions are added to the ledger only after verification and agreement processes between the parties in the blockchain have been completed. Blockchain's decentralization delegates authority among its network contributors, distinguishing it from centralized systems that rely on trusted third parties. This characteristic ensures redundancy of third parties (such as payment networks or banks) and increases service availability while reducing the risk of failure. Ultimately, the decentralization of blockchain improves trust in the service. Smart contracts are programs that are self-enforcing and self-executing, implementing the terms and conditions of an agreement or contract using computational infrastructure and software codes. These contracts operate as decentralized programs on the blockchain network, and their immutability is cryptographically verified, ensuring trust in the program. Smart contracts have key features, such as the ability to execute in peer-to-peer mode without the intervention of a centralized third party and service availability without any centralized dependency (Hewa et al., 2021).

There are various smart contract platforms available in the market. Each type of smart contract has unique features, suitable for specific applications. These distinguishing features have made smart contracts applicable in many areas, including retail payments, insurance, banking, stock and asset trading, and supply chains (Hewa et al., 2021). However, the transaction verification times of major blockchain platforms such as Ethereum and Bitcoin have limited their broad

applicability in retail payments, as transactions can take several minutes to complete, which is not ideal for quick merchant transactions. By comparison, payment networks like Visa can handle 7000 transactions per second. Nevertheless, ongoing research is focused on developing techniques that can enhance the performance features of blockchain and smart contracts (Hewa et al., 2021). Another factor impeding the broader integration of such solutions is the absence of a centralized technology. However, the introduction of a Digital Euro by the European Central Bank could potentially address this issue and foster the creation of a unified medium to further drive the application of smart contracts in payment processes (Balz, 2021).

In the event that the involved parties successfully address current challenges, especially the transaction speed compared to VISA and Mastercard, high operational expenses associated with the underlying blockchain technology, as well as still present data privacy problems, this technology has the potential to generate disruptive transformations for digital payments and the payment process in Europe. By eliminating the need for centralized third parties, this could result in fundamental alterations to the current paradigm (Hewa et al., 2021).

Ranking: This uncertainty is rated 8 out of 10 with regards to its level of uncertainty, while the level of impact is rated 9 out of 10. The advent of technological advancements in blockchain and smart contracts within the payment industry offers disruptive potential for current structures and is therefore highly relevant to the focal issue. However, whether the problems that are still present today and hinder broader applicability can be resolved in the coming years is difficult to predict.

Individual Part – Selima Mrad

6.3.2 Big Tech Firms overtaking conventional Payment Methods

Overview: In recent years there has been a rapid push by big tech companies such as Apple, Microsoft, Google, Meta, Alibaba and Tencent into the digital financial industry (Cornelli et al., 2023). In 2022, worldwide 4.76 billion people were using social media (Chaffey, 2023).

With access to such a large and continuously growing amount of user data, big techs can drive the development of personalised financial products and services. These companies might potentially undermine traditional financial institutions by stealing market share from them, thanks to their ability to provide consumers with a variety of financial services. This can result in a change in the financial sector's power dynamics (PwC, 2020).

Especially in China, this process is already well advanced. Big tech companies like Alibaba and Tencent, with their financial subsidiaries AliPay and WeChat Pay, have managed to become increasingly preferred over bank cards as a means of payment in shops and online. Alipay and WeChat Pay have become indispensable payment platforms, with over 1 billion monthly users respectively (Klein, 2020).

For the European digital payment market and its players, such a development can lead to a number of changes. On the one hand, the entry of big tech companies is increasing competition. This can also increase the pressure to innovate in order to remain competitive. On the other hand, several opportunities can arise for players in the financial sector such as entering into new collaborations and partnerships.

Ranking: This uncertainty is rated at 3 out of 10 in terms of uncertainty, while on a level of impact, it is rated at 5 out of 10. Big Tech companies have been striving to establish a foothold in the financial industry for several years. It is foreseeable that they will succeed in doing so, which is why uncertainty is rated rather low. Moreover, an increased entry of big techs into the payment industry is perceived to not lead to radical changes in terms of the focal issue.

6.3.3 Acceptance of non-CBDC Cryptocurrencies

Overview: Cryptocurrencies have grown in popularity over time. In the financial world, Bitcoin has become the most widely known and used cryptocurrency. According to Lilya Tessler, who is a leader of Sidley’s Fintech and Blockchain group, the widespread adoption of digital

currencies is unavoidable and that the form it would take would be erratic. One possibility is that Central Bank Digital Currency (CBDCs) will emerge as the dominant form of digital currency and would take over the mainstream decentralized cryptocurrencies (Forbes, 2022B). Nonetheless, despite cryptocurrencies' growing popularity and adoption, their potential of becoming a medium of exchange has been widely debated vis-a-vis the opportunities and threats rendered by this emerging asset. Particularly, non-CBDC cryptocurrency as it harbours critics pointing out several drawbacks such as price volatility, lack of intrinsic value, limited acceptance among merchants, and susceptibility to criminal activities such as money laundering and tax evasion (Siripurapu & Berman, 2023). Digital currencies offer myriads advantages, including efficiency, speed, and security. Blockchain technology represents the foundation of cryptocurrencies. This technology allows financial transactions to be transparent, decentralized and secure without needing intermediaries such as banks or governments. The degree of acceptance of non-CBDC cryptocurrencies remains uncertain, dependent on a host of determinants including, but not limited to, regulatory frameworks, technological advancements, and societal perceptions regarding digital currencies, indeed, these components can be game changers, as they have the potential to disrupt the digital payment ecosystem by means of presenting both opportunities and threats, making it imperative for companies such as Paybyrd to monitor and leverage them to their advantage.

Ranking: This uncertainty is rated 5 out of 10 with regards to its uncertainty, while the level of impact is rated 4 out of 10. There are few doubts that non-CBDCs will be allowed for widespread use. However, whether there will be widespread adoption by merchants and consumers remains to be seen due to the high price volatility of many non-CBDCs. Moreover, the level of impact on the future European digital payment market should be limited.

6.3.4 Infrastructure Evolution

Overview: The increase and wide deployment of digital payments transactions is strictly related to allowing people to have access to these new options. This means providing not only a detailed regulatory environment, but also proper infrastructures, the lack of which, at today, represents one of the biggest challenges for digital transactions expansion.

In support of this, it has been demonstrated how different kind of initiatives mostly related to financial inclusion and adoption of tools in the context of digital payment acceptance (such as POS terminals offered by merchants), were positively correlated to a sharp increase digital payment (The World Bank, 2022). Moreover, Internet and Communications technology (ICT) development plays a crucial role in increasing financial inclusion and fostering electronic payments. ICT is, in fact, defined as a wide range set of technological devices and resources involved in transmitting, creating, and storing information between parties (UNESCO, 2009). Related to mobile phone and internet among the others, ICT development is surely playing an important role in helping people have more access and encouraging to transact digitally. However, still multiple challenges need to be addressed, and among them economic differences that do not allow equal access to digital tools; the underground economy that continues to grow given quite a weak trend to conduct monetary transactions with cash; and finally, the difference in access to Internet networks not only between developed and developing countries, but also within the same region (Chenming, 2020).

Ranking: This uncertainty is rated 4 out of 10 with regards to its uncertainty, while the level of impact is rated 8 out of 10. Given technology evolution and government's policy making that are promoting digital payments more and more as a general trend, infrastructure evolution will likely happen continuously, such that it will have a high impact. This high impact is also a linked to the necessary nature of the digital tools that are required to enable expanded adoption of digital payments (e.g., ICT and POS terminals).

6.3.5 Customer's Acceptance and Adoption of new Technologies

Overview: Human adaptation to technological development in some markets, such as digital payments, is becoming more difficult since it is configuring itself as a continuous process, that does not let humans stay at the pace of these innovations. The adaptation and integration of new technologies requires redesigning how the individual carries out its daily activities and trust in the new tools that are being discovered. In fact, this represents the biggest issue to address. However, it has been reported that about 50 percent of U.S. consumers in 2020 have not heard of contactless payments or are not really keen on adopting them, despite growing trends in the use of digital payments. The main reasons revolve around a lack of perceived trust, security and value of contactless payments (McKinsey, 2020). By analysing this major issue, it is possible trace the root of the problem. One of the major barriers to a wider adoption of new technologies in this context is constituted by lack of digital literacy, which negatively affects the level of awareness and the limited knowledge of new technologies advantages. In support of this, it has been studied how a positive correlation exists between innovations adoption and level of education reached (Sharma & Selvakumar, 2017). These challenges consequently affect customer's adoption, especially when considering perceived loss of control and data privacy, and lack of a properly structured-regulatory environment. This will finally lead to a higher perceived risk of using digital devices.

Another barrier, parallel and related to the one mentioned above, is represented by the factor of inclusion, being aware that the availability of an Internet connection is not the same everywhere. This will certainly be one of the major issues to think about, not only in contexts such as developing countries. The fact that the Internet is available in varying proportions could be a major obstacle to achieving a critical mass of customers, slowing the adoption process of new payment methods (Rana et al., 2018).

Ranking: This uncertainty is rated 5 out of 10 with regards to its uncertainty, while the level of impact is rated 8 out of 10. The acceptance of new technologies by the wider society can be rated with a relatively low level of uncertainty. Especially with the technology affinity of Gen-Z, it can be assumed that new, fast, and easy payment processes or options will be quickly established in society. On the other hand, widespread adoption is central to the success of a technology, which is why this uncertainty was rated with a high level of impact.

6.3.6 Effectiveness of Policymaking in Favour of new Technologies

Overview: Public policy refers to the choices taken by political actors and governmental bodies to handle or change a problem or issue that has been recognized by decision-makers or the general public as having political significance. This uncertainty relates to governmental regulations and policies, specifically targeting new technologies within the digital payment industry. In general, policies are crucial for several reasons, such as achieving a stated goal, regulating, and incentivizing economic behaviour, or facilitating innovation and technological improvements (Hassel, 2015).

The implementation of smart contracts and blockchain in regard to contract law, liability law, data protection law, and regulatory law is still fraught with uncertainty in many EU nations, leading to potential effective or ineffective outcomes (Rübe, 2019). The European Commission is dedicated to implementing a constructive approach to benefit from the advantages of smart contracts. The aim is to synergize law and technology to foster the positive development of smart contracts without hindering their progress, while preserving their inherent advantages (European Union, 2021). Conversely, in late March 2023, the European Commission introduced a draft legislation that proposes the incorporation of a "kill switch" mechanism for smart contracts. This proposed law mandates that smart contracts possess the ability to pause or terminate their operations for enhanced consumer protection. However, experts have

expressed concerns regarding the feasibility of most smart contracts adhering to these regulations as set forth by the parliament (Schickler, 2023).

The conflicting approaches highlight the prevailing uncertainties in policymaking. This example in the context of smart contracts shows how policymaking could lead to either effective or ineffective outcomes, which could significantly impact the continued evolution of the technology.

Ranking: This uncertainty is rated 7 out of 10 with regards to its uncertainty, while the level of impact is rated 9 out of 10. Efficient policymaking is crucial for the successful establishment of new technologies, which is why the level of impact for the focal issue is rated as very high. The effectiveness of policies is difficult to predict, leading to a high level of uncertainty. The main reason is related to the slow decision-making process within the EU and the high importance of issues such as data protection.

7. Phase III: Synthesize

7.1 Scenario Development Process

In the previous section, the narrowing process of uncertainties led to the considerations of 6 uncertainties of greater significance. The concept of relevance was mainly related to two factors: first, the level of impact on the focal issue (ranked from 1 to 10), and second, the level of uncertainty of this potential driver of change (ranked from 1 to 10). Rating the identified uncertainties has been a process that was the subject not only of our analysis based on scientific and academic research but also on the joint evaluation carried out with Miguel Moura and Pedro Coelho from Paybyrd. In *Phase III: Synthesize*, the decision was made to initially map these uncertainties within a matrix, and subsequently, to focus on only the two most relevant uncertainties out of the six identified in the previous section: *The progression of blockchain technology* and *the effectiveness of policymaking.*

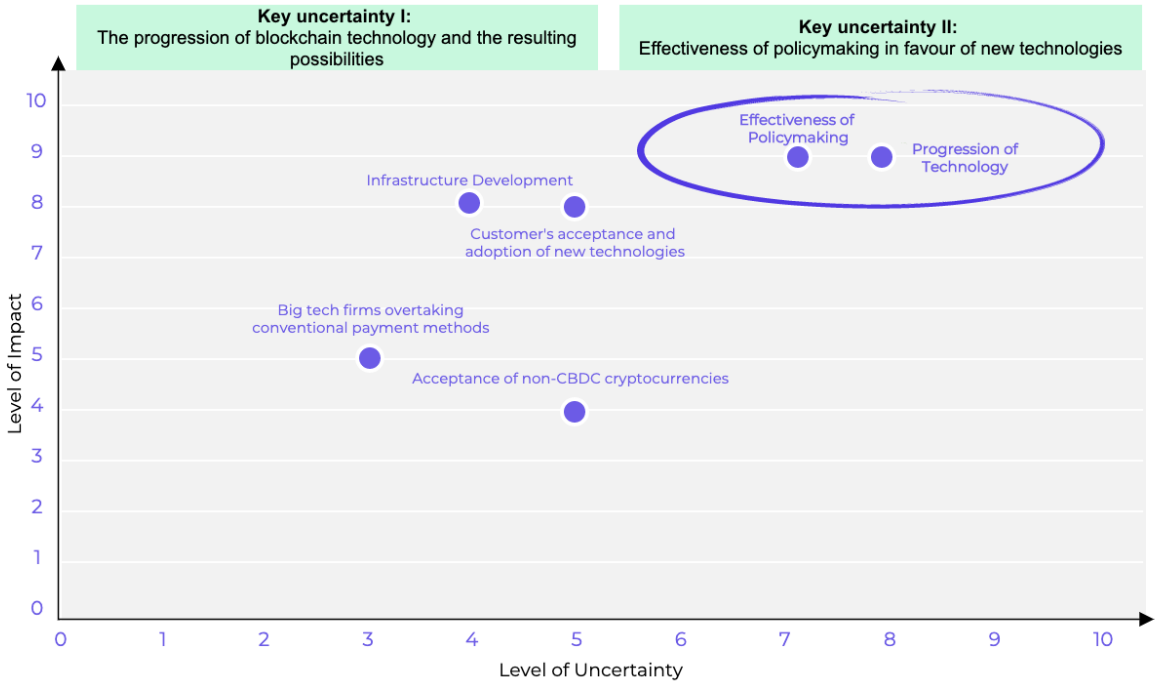

Figure 4: Uncertainties Mapping; Source: Own Creation

Set up of scenarios and selection of sufficiently independent uncertainties

Setting up the scenarios started with ensuring the two critical uncertainties' independence, which means, making sure that each uncertainty can co-exist, without influencing each other, within the range of possible narratives that can be built along the two axes. This represents a fundamental feature when it comes to building plausible and mutually independent scenarios (Wright and Cairns, 2011; Rhydderch, 2017). Moreover, both the two chosen uncertainties constitute potential sources of change affecting the focal issue. By utilizing the two axes and considering the respective characteristics of the uncertainties, four scenarios were created: *The Digital Renaissance*, *The Patient Innovator*, *The Hindered Revolution*, and *The Stagnant Landscape*.

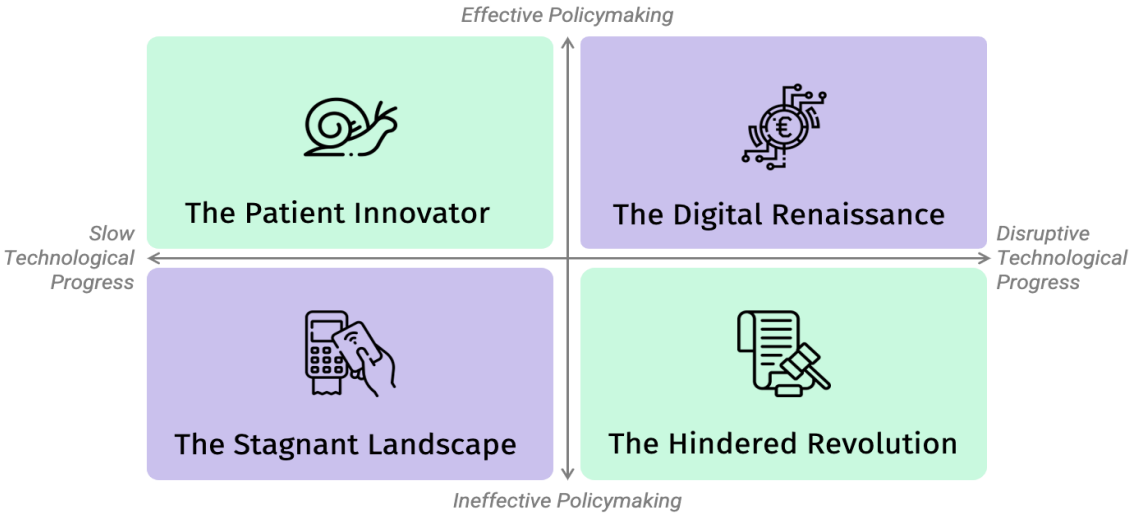

Figure 5: Scenario Matrix; Source: Own Creation

The four scenarios that result from including the two critical uncertainties considered in the matrix, illustrate how future developments directed by the drivers of change affect the future of the digital payment landscape in Europe. In order to better understand the outlined competitive landscape in each narrative, the Porter's Five Forces framework was used, which presents a suitable framework to gain a comprehensive understanding of the situation for different stakeholders in each scenario and is an often-applied framework within the scenario planning literature (Hafezi et al., 2020). To ensure a simplified overview of the various scenarios, summaries of the respective dynamics and outcomes can be found in *Appendix 4*, providing a comprehensive overview of the key elements.

Underlying premise: Introduction of the Digital Euro

Each of the scenarios developed below is based on the premise that the Digital Euro will be introduced. The so-called Digital Euro research phase began at the end of 2021, and the insights gained from this phase are expected to be available by the end of 2023 (ECB, 2021A). This will be followed by a development phase that will last at least three years (Balz, 2021). The future introduction of Digital Euro is considered as a step which the European Union will go through. However, this prediction is still not confirmed by the European Central Bank or the European

Commission. Both banks and industry experts expect its introduction in the coming decade. Following discussions with representatives from Paybyrd, who share the views of banks and experts, the introduction and existence of the Digital Euro is considered to be given in each of the developed scenarios.

Individual Part – Maximilian Zimmer

7.2 Scenario Narratives

7.2.1 Scenario 1 - The Digital Renaissance

In the Digital Renaissance scenario, the European digital payment landscape undergoes a significant transformation, fuelled by disruptive technological progression and effective policymaking. The Digital Euro coexists with traditional fiat currency (ECB, 2021B), and blockchain technology, smart contracts, and secure digital identities are widely adopted (Tapscott & Tapscott, 2016). The Digital Euro's integration makes the European digital payment landscape more interconnected and seamless, fostering collaboration and competition among financial institutions and fintech companies (Gomber et al., 2018). This advanced technological landscape results in a revolutionized in-store and online retail payment process, thus enabling it to be faster, safer, and more efficient for both consumers and merchants.

In this scenario, the European Central Bank and European Commission have implemented policies that encourage technological innovation in the digital payment landscape while maintaining financial stability, consumer protection, and preventing illicit activities (ECB, 2021B). The General Data Protection Regulation, which is viewed as the toughest privacy and security law in the world, represents a key initiative that contributes to a harmonized regulatory landscape (Wolford, 2020). Collaboration between lawyers, programmers and government intermediaries has led to the development of policies that ensure the equivalence of blockchain based smart contracts with written signatures, facilitating the spread of smart contracts on the blockchain (de Graaf, 2019). By setting up a propitious regulatory environment, policymakers

have encouraged businesses and individuals to further participate in the digital economy. These policies have also facilitated rapid technological improvements through subsidies and support programs, ensuring that Europe remains at the forefront of fintech innovation. The proactive approach of EU regulators has enabled the digital payment landscape to flourish, attracting new fintech start-ups and leading to a highly competitive market.

In the Digital Renaissance, blockchain technology has progressed significantly, enabling fast, secure, scalable, and cost-efficient digital payment solutions. The widespread implementation of blockchain technology in the European digital payment landscape is made possible due to advances in smart contracts and secure digital identities. One crucial innovation in this context pertains to the swift development of smart contracts. They have become highly sophisticated, allowing for efficient transactions across various industries. They have the potential to transform the digital payment landscape by automating payments, reducing the need for intermediaries, enhancing transparency, and trust between parties (Rudolph-Göttmann, 2023). The Digital Euro's integration with smart contracts results in a seamless and secure digital payment environment (Balz, 2021). In the context of e-commerce, smart contracts can facilitate the entire purchasing process, from ordering to receiving the product. Payments in Digital Euros can be automatically executed upon meeting predefined conditions, such as product delivery, ensuring trust and transparency between buyers and sellers (Mougayar & Buterin, 2017). This automation reduces the risk of fraud and chargebacks, increasing e-commerce security and reliability. Furthermore, smart contracts can be integrated with other emerging technologies, such as the Internet of Things and Artificial Intelligence, to create innovative payment solutions (Christidis & Devetsikiotis, 2016; Balz, 2021). IoT devices can communicate with smart contracts to automate payments in Digital Euros for services such as utility bills or subscription fees. AI-driven smart contracts can analyse customer behaviour and preferences to provide

personalized recommendations and incentives, further enhancing the digital payment experience.

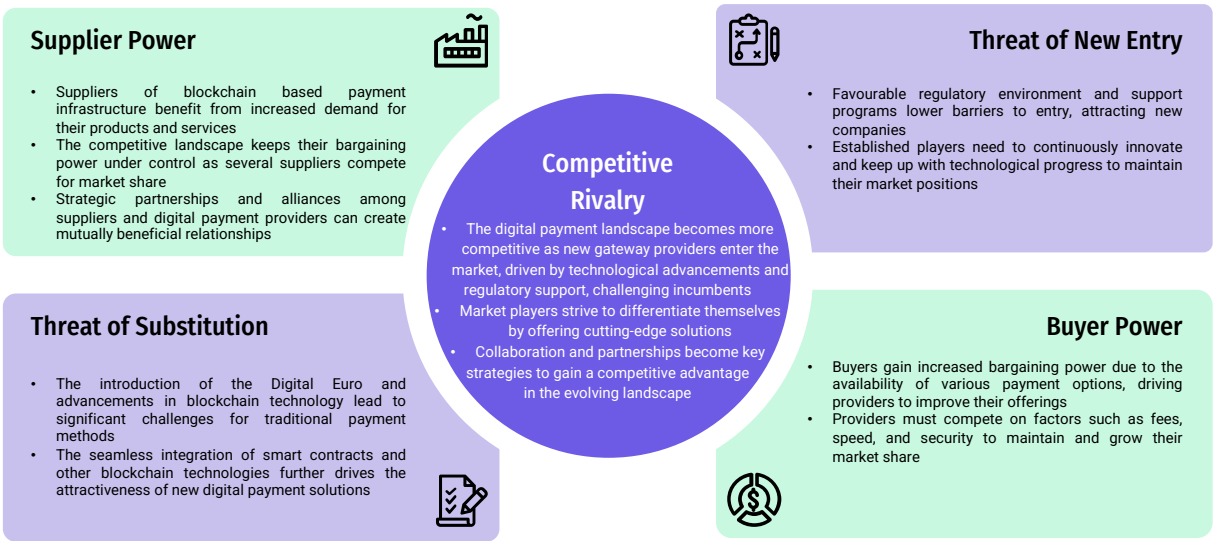

Figure 6: Porter's Five Forces in "The Digital Renaissance"; Source: Own Creation

Considering Porters Five Forces, traditional payment methods not based on digital currencies may face significant challenges in this scenario. Although the introduction of the Digital Euro originally aimed for the digital currency to act as a complement rather than a replacement for the physical Euro (ECB, 2021B), technological breakthroughs in the area of smart contracts and a supportive policymaking ensure that the benefits of the new payment option continue to outweigh the drawbacks. As a result, customers can make payments seamlessly using digital wallets, either through a smartphone or a dedicated payment device (ECB, 2021B). The transaction process is faster compared to traditional card payments or cash, reducing waiting times for customers, and improving the overall shopping experience (Mancini-Griffoli et al., 2018). Strong encryption mechanisms help protect against fraud and cyber-attacks. This increased security benefits both consumers and merchants by reducing the risk of data breaches or unauthorized transactions (ECB, n.d.). Smart contracts enable various value-added services to be integrated into the payment process. Examples are loyalty programs, instant discounts, and targeted promotions (McKinsey, 2019). These services can be automated and executed at the point of sale, providing real-time benefits to customers, and driving sales for merchants.

Moreover, merchants can use the data generated by these transactions to better understand customer preferences and personalize their offerings. Furthermore, the effective policy making enables new businesses to enter the European market, further fuelling innovation and technological progress. Merchants and consumers hold an enhanced power position, as they can exert targeted pressure on payment providers by choosing from a range of available payment options. Due to the convenience of highly developed smart contracts and blockchain technology and its cost efficiency, most merchants and customers prefer payment with the Digital Euro. The competitive landscape becomes more fragmented due to the entry of new businesses and payment methods, and established companies involved in the payment process are forced to offer cutting-edge payment solutions to avoid losing market share to innovative new entrants. Partnerships and collaborations are central factors for success in this scenario, as they allow for the pooling of resources and knowledge to gain competitive advantages through faster progress. Cooperation may arise between banks, blockchain experts, and payment processing providers. Since the widely accepted and used Digital Euro is a CBDC, collaborations with government institutions in this scenario may also prove to be successful.

The technological advancements result in alterations to the payment process, encompassing both e-commerce and brick-and-mortar storefronts. A potential outline can be the following:

1. Customers load their digital wallets with the Digital Euro, either by converting fiat currency or receiving digital payments from other sources (ECB, 2021B).
2. At the point of sale, customers select the items they wish to purchase and proceed to checkout.
3. Smart contracts represent the bridge between blockchain and the real world. Therefore, smart contracts must be linked to technologies that generate the required data (Subramanian et al., 2020). The customer therefore initiates the payment by scanning a

QR code or tapping their smartphone or payment device on a compatible point-of-sale terminal (ECB, 2022C).

4. A smart contract is automatically generated, outlining the transaction details, such as the purchase amount and any applicable discounts or loyalty rewards. The smart contract is sent to the costumer's digital wallet, where he or she can review the terms and either accept or reject the transaction.
5. Once the customer approves the transaction, the smart contract is executed, and the payment is instantly transferred to the merchant's digital wallet. In an online transaction, the smart contract automatically verifies the payment and confirms the transaction, thereby activating the merchant to deliver the product to the consumer. Alternatively, the smart contract could automatically release payment to the merchant only after the product has been delivered to the customer.
6. The transaction is recorded on the blockchain, ensuring its security and immutability.

By incorporating Digital Euro and smart contracts, intermediaries such as banks and payment networks can be excluded from the process, simplifying processes, and reducing fees. Currently, merchants in e-commerce or stationary retail pay fees of about 0.8 to 3 percent of their turnover for processing card payments. With the Digital Euro and smart contracts, these could drop drastically to a few cents, and in addition, the payment is made in real time (Rudolph-Göttmann, 2023). This leads to a very high attractiveness of this payment method among merchants. By integrating smart contracts and blockchain technology into their whole supply chains, merchants can ensure transparency and traceability (Zhang, 2020). This enables them to verify the authenticity of products and share relevant information with consumers, enhancing trust and brand reputation. In case of disputes or payment discrepancies, smart contracts can serve as unbiased arbitrators. By referencing the terms encoded in the contract, disputes can be resolved quickly and transparently, reducing the need for time-consuming and

costly mediation. This scenario leads to a very high adoption of the Digital Euro, while conventional payment methods loose relevance.

Individual Part – Selima Mrad

7.2.2 Scenario 2 - The Patient Innovator

The Patient Innovator scenario belongs to the upper left quadrant of the scenario matrix, and the main uncertainties are configured as follows, forming the basis for this scenario: effective policy making, and unimpactful technological progression.

In this situation, advancements in smart contract technology failed to achieve optimal efficiency, primarily due to the prohibitive costs associated with implementation and development. These costs arose from the need for new infrastructure and energy consumption, as well as issues with scalability and immutability (Khan et al., 2021). The viability of smart contracts is also tied to energy usage, which is substantial due to the resource-intensive consensus algorithm, commonly known as proof-of-work (PoW) or mining (Frankenfield, 2023). This consensus method ensures decentralization by necessitating network participants to expend effort in solving a cryptic hexadecimal number. Although blockchain technology allows secure P2P (peer-to-peer) transactions without a trusted intermediary, it has also been linked to high energy consumption - a major concern in an era where adherence to climate change regulations is crucial (Saingre, 2022).

In addition, the limited number of transactions that blockchain technology can process per second compared to other payment options like Visa can lead to network congestion. This, in turn, can increase costs related to data storage and capacity, which businesses may be unwilling to bear. Additionally, the low throughput and high time required for transaction confirmations can further hinder the adoption and scalability of blockchain-based payment solutions. These factors negatively affect not only businesses' profitability, but also customer experience (Geroni, 2021). On the other hand, the immutability and irreversibility of blockchain

transactions, in a context where mistakes can occur even among experienced developers, can represent one of the biggest challenges for companies with limited resources and expertise. The immutability characteristic of smart contracts is significant, as it prohibits any party from altering the code once it is deployed. Nevertheless, this concept can be problematic in the case of code errors or changing circumstances, such as modifying business parameters or new laws. As a result, rectifying a smart contract becomes complicated, making it essential for experts to review the contract comprehensively before deployment, which can be costly and time-consuming (Rickard, 2022). Additionally, the lack of financial resources for research, development, and implementation of blockchain technology, as well as the shortage of expertise in cryptography and consensus algorithms, has further contributed to the stagnation and limited adoption and trust of blockchain in this scenario (Zavolokina et al., 2020).

In this respect, it is imperative to regulate technological advances, and regulators are well aware of that, therefore collaborating with industry stakeholders to collect the essential expertise and technical insights is indeed crucial for the proper governance of emerging technologies. The EU acknowledges the revolutionary and disruptive potential of these technologies and has, consequently, embraced a proactive approach to harness their inherent benefits. In pursuit of this goal, the EU is dedicated to cultivating an enabling environment that encourages the exploration and deployment of new technologies. This method not only propels the emergence of new technologies but also fosters social and economic development throughout the EU. Additionally, partnerships are highly advocated by regulators to promote the exchange of knowledge among stakeholders, and the sharing of expertise and resources, to encourage companies to engage in initiatives such as blockchain technology. Consequently, effective policies would ipso facto accelerate the development and adoption of emerging technologies, and foster innovation, collaboration, and healthy competition (Foggo et al., 2022).

In light of the challenges posed by the stagnation in technological development, EU regulators are poised to take proactive actions to secure financial stability and growth while focusing on preventing sluggish technological innovation (European Commission, 2022A). Essential to this endeavour are grant programs designed to inspire collaboration between academic institutions, experts, industries, and start-ups, which could shape the development of avant-garde technologies such as artificial intelligence, biometrics, blockchain, and quantum computing. The potential of these innovations lies in their ability to transform payment systems, strengthen fraud prevention strategies, and elevate the customer experience (European Commission, 2022B). With a keen interest in driving progress, European policymakers are deeply invested in driving and fostering the advancement of blockchain technology, with the ultimate goal of creating an optimal environment for the successful launch of a Digital Euro.

It has also been studied how effective policymaking would actually drive customer payment behaviours. If there were substantial technological developments in security, scalability, and costs involved in the use of blockchain through advocacy by policymakers, this would lead to a substantial shift towards a Digital Euro payment option preference. To accomplish this, decision-makers may employ strategies such as targeted marketing campaigns, allocating funds for research and development initiatives, granting financial support, and presenting monetary incentives to businesses working on blockchain-related endeavors (European Commission, 2022B; European Commission, 2022C). As a result, merchants would be more inclined to offer the Digital Euro as a payment alternative, which would, in turn, boost the probability of its extensive uptake throughout the European region (ECB, 2023).

Figure 7: Porter's Five Forces in "The Patient Innovator"; Source: Own Creation

Considering Porter's five forces, effective policy-making and ineffective technological improvement in blockchain will readjust the industry and its players. Indeed, a favorable regulatory environment that actively promotes and supports the development of disruptive technologies, such as blockchain, can create a sense of urgency among incumbent fintech companies. As a result, existing fintech companies will face increased competition as more companies strive to enter the market and secure EU funding to foster the development of blockchain technology. Especially considering the fact that European politicians are willing to let the Digital Euro and the fiat currency coexist.

Due to just a moderate improvement in blockchain technological development, however, companies will face higher costs, still trying to determine how to mitigate them. This might lead to higher fees charged to merchants, in order to cover those increasing costs.

The increased pressure to innovate and remain ahead of the rapidly changing digital payments landscape will drive existing businesses to be more agile and innovative in order to maintain their competitive edge. This pressure does not just revolve around technological advancements, but also focuses on improving the overall customer experience. However, in the short term, due to the limitations and underdevelopment of smart contracts and blockchain technology, traditional digital payment methods are expected to be preferred by most merchants and customers. On the other hand, Fintechs often find themselves compelled to come up with

innovative solutions due to the constant pressure to innovate from regulators and the evolution of customers' preferences.

The European digital payment landscape could potentially undergo a significant evolution, driven by proactive support and pressure to innovate from policymakers. In virtue of policymakers' efforts to incentivize companies to embrace blockchain development through tenders and funding schemes, it is possible to state that the impact of the Digital Euro and smart contracts on the digital payments landscape in the medium and long term is going to be disruptive, with just slight adjustments to the payment process in the short term. Thus, digital payment methods will gain increasing dominance in the market, and financial inclusion and economic growth will progress moderately and steadily.

Individual Part – Edoardo La Motta

7.2.3 Scenario 3 - The Hindered Revolution

The Hindered Revolution scenario belongs to the lower right quadrant of the above-mentioned scenario matrix. The configurated uncertainties, in this case, are: an ineffective policy making, and a disruptive technological progression. The scenario relies on the assumption that Digital Euro and traditional fiat currency will coexist, and that blockchain related technological advancements will increase enormously. Progressions in this area will be crucial for the Digital Euro development and implementation. There are two main blockchain features that will see a vast advancement: scalability and security. Scalability will be reached through Layer 2 scaling solution optimization, for instance, which allows for a greater number of transactions per second within the network for the user, increasing the customer experience. The majority of Layer 2 solutions revolve around a server or a group of servers, which are commonly known as nodes, validators, operators, sequencers, block producers, or other such names. The responsibility of operating these Layer 2 nodes may fall on the individuals, businesses, or entities that use them, or they may be operated by a third-party operator or a sizable group of

individuals, similar to the Layer 1 (principal network nodes). In general, instead of being submitted directly to Layer 1, transactions are submitted to these Layer 2 nodes (Ethereum, 2023). Advancements in Sharding, a database technique that consists in splitting a company's blockchain into smaller shards each independent of the other, will also help achieving blockchain scalability, overcoming the security issues concerning the potential loss of information or data due to the corruption of the shards (Frankenfield, 2021).

On the other hand, enhanced security will likely be achieved through improvements in processes concerning encryption and smart contracts audit, which will contribute to optimize companies' codes avoiding flaws and bugs (Kousalya & Baik, 2023; Hacken, 2023). The improvement area, in this case, will mainly be concerning the implementation of renewable energy use, due to the high energy employment it requires (Hendrickson, 2023).

However, in this context, EU policy makers are unable to keep up with technological innovation, leaving regulatory holes in terms of data privacy and data protection. There are several types of reasons why regulators have difficulty in keeping pace with technological development: the complexity in standardizing a regulation that crosses the code of several states (World Economic Forum, 2020) is surely among the main problems to consider. If, for example, the bodies of the European Union (Commission, Council and European Parliament) decide not to issue a regulation, a legal act that applies automatically and uniformly to all EU countries as soon as it comes into force (European Commission, 2023B), without needing to be transposed into national law, then the legislative process would not only be sluggish (McKinsey, 2022B), but would not lead to the issuance of a legal act that is uniformly applied by EU states. This is because, in the case of other types of acts issued by the European institutions, such as directives and recommendations, it is recommended by the European Union that certain goals must be achieved in specific time frames, but without outlining a common process (European Commission, 2023B). These elements, together with the fact technological innovations and

their regulation involve different stakeholders (industry players, consumers, and policymakers of course) in each national context, can lead to high fragmentation in the normative regulation about technological advancement, which means, unevenness in the results achieved in individual national realities. Moreover, European policymakers struggle to regulate the latest innovations due to the precautionary consumer-protection imperative (McKinsey, 2022B). The precautionary principle is a risk management approach that suggests that if there is a potential for harm to the public or the environment from a particular policy or action and there is no scientific consensus on the issue, the policy or action should be avoided. However, the policy or action may be re-evaluated if additional scientific information becomes available. This principle is outlined in Article 191 of the Treaty on the Functioning of the European Union (TFEU) (Eur-Lex, 2015). Precautionary theory has been the subject of numerous studies and opinions, especially regarding its effectiveness when applied in the context of policymaking. According to Cass Sunstein, law professor at Harvard, the precautionary principle has a strong rhetorical appeal, but it is fundamentally inconsistent. While it is important to take measures to protect against potential risks, there are always risks involved in any decision, including the risk of inaction. Therefore, taking precautions can itself create risks, resulting in the principle both prohibiting and requiring actions. Hence, not thoughtfully assessing costs and benefits of a given technological innovation could result in deliberately not adopting new disruptive tools. In this context, relentless technological improvement in blockchain and ineffective policy making will reshape the industry and its players. In fact, a regulatory environment that is not conducive to the adoption of newly explored technologies naturally places a limit on market growth and discourages new players from entering this market, which will decrease competitive rivalry among the already present fintech companies and might discourage further future research and innovation. Thus, policies that do not support technology development related to blockchain would threaten to slow down the innovation process. However, technology

developments might mostly be related to digital payment options, which are already common and represent a growing consumer trend (Markets & Markets, 2023). In this regard, several studies have been conducted on the application and development of new payment methodologies through biometric authentication in digital payments. It consists of a type of digital transaction that relies on physical features, like facial recognition or fingerprints, needed for customer authentication (Aratek, 2023). The biggest issue of today, as revealed by a Mastercard research published in 2022, is the privacy concerns, when it comes to sharing biometric data (Mastercard, 2022B). Nonetheless, policymakers could play a key role in promoting a new type of payment that is extremely secure and convenient, given the no need to carry cards or remember PINs. Another innovation that would be more easily regulated by policymakers given its wide application nowadays is the use of machine learning in traditional payments. In fact, machine learning algorithms would not only help addressing fraud detection through predictive analysis based on historical transaction data, real-time transactions monitoring and behavioural customer analysis (Makalesi, 2022), but also in the automation of processes such as routing transactions to the most appropriate and cost-effective payment channels or automatically flagging transactions that require further review (Opus Consulting, 2022). This, in perspective of reducing processing times and increasing the accuracy and efficiency of the payment system, as well as meeting different customer segment's needs, having the opportunity to analyse their spending behaviours (Molen & Nadeau, 2016).

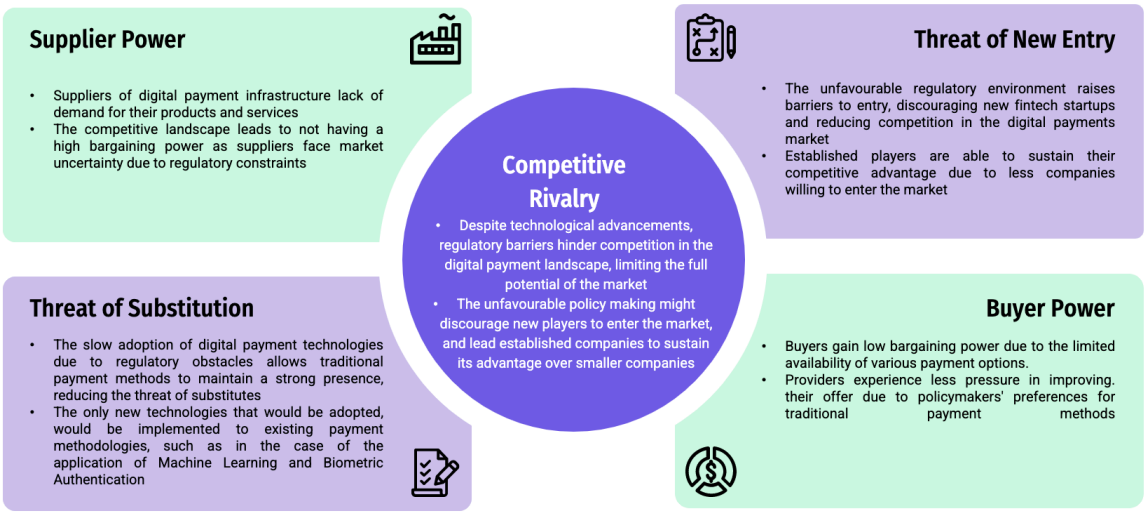

Figure 8: Porter's Five Forces in "The Hindered Revolution"; Source: Own Creation

Given the external limitation set by policymakers, the wide adoption of digital payments through smart contracts will hardly be achieved, in favour of traditional payment types, which make for a low threat of substitute products. The whole industry will be affected by the overall low competition due to the high regulatory barriers to entry, leading to a low bargaining power both for suppliers and buyers, given the reduced amount of digital payment options. The feeling towards this scenario is of a great but missed opportunity. The vast advancements, in fact, would allow companies to bear less costs risen from the use of smart contracts and blockchain technology, which would suggest the possibility the charge lower fees to merchants, in order to cover those costs.

Overall, it is possible to state that, due to the dynamics mentioned above, the payment options landscape will experience just slight changes, both for in-store and e-commerce payment options, although smart contracts technology has experienced great progress enough to be ready for use, giving a great opportunity to the Digital Euro to be used in transactions. The major changes will surely revolve around already existing payment options. The blockchain technology, as well as the Digital Euro, will be probably limited to niche applications because of a restricting regulatory policy, despite technological advances in scalability and improved data privacy and security. Traditional payment methods (through cash and digital transactions

without the use of DeFi) will continue to dominate the market, benefitting from innovations employment of machine learning and biometric authentication, which are already implemented in part in digital payments, hence, already regulated.

7.2.4 Scenario 4 - The Stagnant Landscape

The stagnant landscape suggests that the European digital payment landscape remains as it is. The different configurations in this context are ineffective policymaking and unimpactful technological progression. Although the Digital Euro exists alongside traditional fiat currency, this scenario suggests an archaic payment environment. If this situation were to persist in the future, the consequences could be dire, with one of the most severe outcomes being Europe's potential to fall behind in the global economy due to its inability to compete with regions that have adopted advanced digital payment technologies.

This scenario implies that the potential of blockchain technology and smart contracts in the European digital payment industry might not be fully exploited, due to several factors that include the absence of standardized protocols, the resistance to switching from traditional payment systems, and the limited awareness and trust among stakeholders (European Commission, 2022D). Furthermore, limitations of blockchain technology, such as security concerns related to smart contracts and scalability issues leading to higher costs, transaction fees and delays, may further hinder their widespread adoption and exploitation (Atzei, et al., 2017).

Added to that, the absence of supportive policies would be detrimental as it would discourage merchants and individuals from adopting emerging digital payment technologies, and the lack of innovation would result in an economic, social, and political downfall. Thus, businesses and individuals would prefer sticking to familiar and less risky payment methods such as cash, cards, and conventional digital payment methods. To the same degree, the development and

implementation of developing digital payment technologies like smart contracts and secure digital identities would be limited, negatively impacting overall financial inclusion, economic growth, and competitiveness in the digital payment ecosystem (Makarov & Schoar, 2022).

The introduction of the Digital Euro does not yield substantial changes to the digital payment ecosystem since the promised benefits do not materialize. Meanwhile, traditional digital payment methods are still recognized as the primary means of payment, while blockchain based payment methods would still struggle to be recognized and adopted due to lethargic technological improvements and ineffective policymaking.

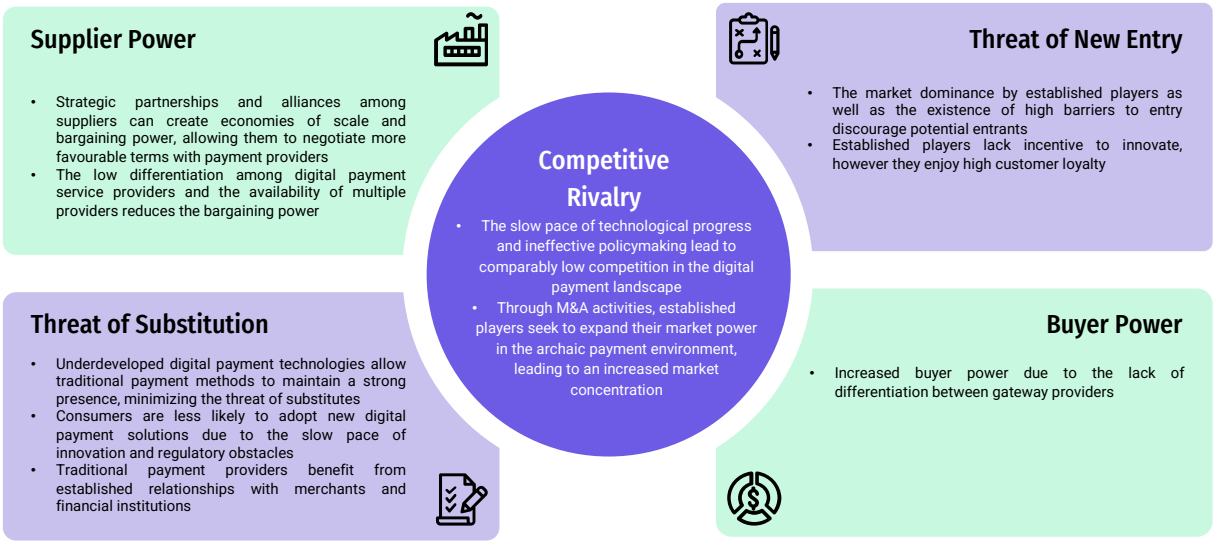

Figure 9: Porter's Five Forces in "The Stagnant Landscape"; Source: Own Creation

This scenario is characterized by only marginally improved digital payment options. Coupled with inefficient policymaking, this results in the lack of widespread acceptance of new blockchain-based digital payment methods by consumers and merchants, and the Digital Euro will not assume a prominent role. The absence of incentives from policymaking to reverse this dynamic leads to a minimal substitution threat from such emerging technologies and an unattractive landscape for new entrants. As a result, established players particularly benefit from their market power, customer loyalty, and well-established partnerships. The limited differentiation among digital payment services results in reduced bargaining power for service providers. M&A-activities, horizontal, or vertical integration are conducted by market leaders

to push bargaining power and economies of scale. This process leads to a further increase of the market concentration in the European digital payment market. Due to the similarity in product offerings, low costs and high reliability are the primary differentiators among the various payment service providers. Owing to pricing as the paramount differentiator, both consumers and merchants possess considerable bargaining power.

Generally, it can be assumed that the evolution of the payment process will be marginal in comparison to its contemporary state. The most notable change will entail the near-total eradication of cash-use, supplanted by cashless payment modalities such as digital wallets. Even in countries with historically conservative attitudes towards cashless payment methods, such as Germany, a substantial majority of consumers will have adopted cashless payment alternatives. Security mechanisms have been further refined through technological advancements in the domains of machine learning and artificial intelligence. Due to the lack of technological progress and policy gaps, the potential of the Digital Euro cannot even begin to be realised in this scenario. As a result, the Digital Euro will not play any decisive role in the future of the European digital payments industry.

Group Part

8. Phase IV: Act

The fourth phase, *Act*, focuses on establishing a strong connection between the narratives created in the *Synthesize* stage and the strategic recommendations aimed at helping Paybyrd to remain and enhance its competitive position. During this stage, the Ansoff matrix was employed to identify and evaluate potential strategies for Paybyrd within each scenario. The Ansoff matrix describes four entry-market strategies:

(1) *market penetration*: focus on existing products and existing markets,

(2) *market development*: focus on existing products and new markets,

(3) *product development*: focus on new products and existing markets,

(4) *diversification*: focus on new products and new markets (Ansoff, 1957).

Both the Ansoff matrix and scenario planning share a common goal of uncovering market opportunities and facilitating informed decision-making, especially when it comes to strategic implications (Kippenberger, 1998). While scenario planning provides a structured method for examining market dynamics, the Ansoff matrix offers a systematic approach for discovering growth prospects and fine-tuning product-market strategies (Martinet, 2010). In this research, scenarios were used to analyse the environment and detect market dynamics. Following this, the Ansoff matrix was applied to formulate diverse product-market options and evaluate their appropriateness (Curry et al., 2006). With the help of a workshop, which can be found in *Appendix 5*, the Ansoff matrix and the resulting implications were refined and verified in collaboration with the experts from Paybyrd. During the workshop, arguments for and against each field of the Ansoff matrix were developed, and the strategies were subsequently ranked according to their suitability for Paybyrd in the respective scenario. To maximize the efficiency of the workshop, the key dynamics of each scenario were illustrated in summarizing visualizations, which can be found in *Appendix 4*.[1]

Individual Part – Maximilian Zimmer

8.1 Scenario 1 – The Digital Renaissance

The Digital Renaissance scenario presents preconditions for policymaking and technological progress that are conducive to disruption, and these factors introduce several dynamics that are essential to consider when developing strategic implications for Paybyrd. This scenario involves fundamental changes to the payment process, both online and in-store, and the emergence of new fintech companies that are entering the market due to supportive policy-making and technological advancement. Furthermore, an influx of companies from other

[1] The strategic implications elaborated, as well as the ranking of strategies, are based on the key dynamics of each scenario, the Ansoff matrix associated with the respective scenario and the results of the workshop with Paybyrd (Appendix 5).

regions has occurred, driving competition in the attractive new European payment market. Due to technological advancements and increased transaction volumes, the cost of adopting new payment technologies has decreased, making it an attractive market to enter. However, this has also led to a highly fragmented sector where merchants hold considerable bargaining power, making fee competitiveness a crucial differentiating factor in this environment. In this context, the development of conventional payment methods has been limited, with a greater focus on Digital Euro related technological advancements. Adoption rates for various payment methods have changed, with the Digital Euro experiencing very high uptake, while the use of traditional methods has declined considerably.

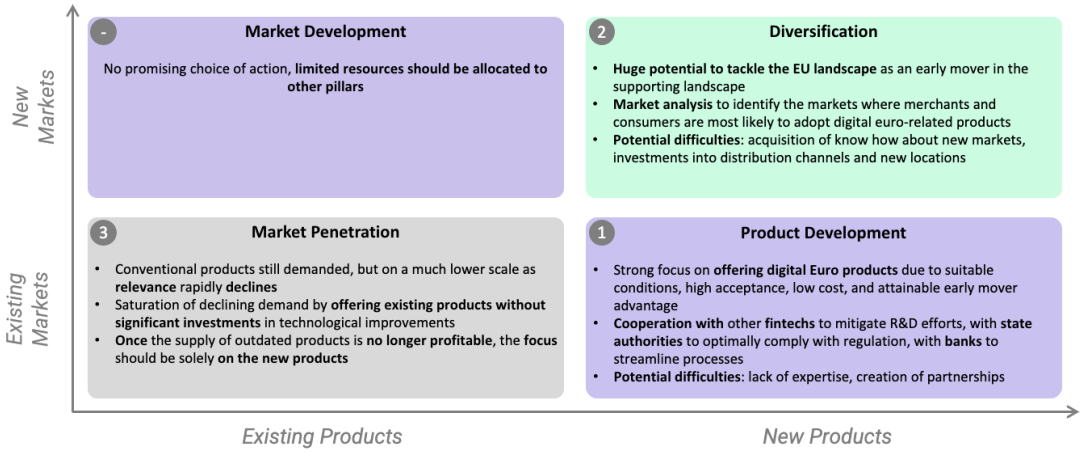

Figure 10: Ansoff Matrix, Scenario 1; Source: Own Creation

In this scenario, the *product development* strategy is best suited for Paybyrd. Due to the widespread adoption of the Digital Euro, the supportive conditions provided by EU policy, and the low development costs, Paybyrd has the opportunity to act as an early mover by developing innovative gateways and POS terminals for the Digital Euro and securing attractive market shares. Potential obstacles lie primarily in the lack of know-how in the areas of blockchain, smart contracts and Digital Euro. To overcome these, investments in R&D activities and human capital are necessary. Paybyrd needs to acquire the missing knowledge by hiring blockchain experts and project managers. Another focus should be on creating partnerships with various

institutions. By partnering with other gateways, it is possible to pool financial and knowledge-related resources during the R&D process to keep development costs as low as possible. Cooperation with government institutions, banks, and other stakeholders of the Digital Euro payment process can ensure efficient interfaces, optimal process flows, and compliance with regulations.

Furthermore, due to the homogeneity of the EU payment industry, this scenario offers great potential for *diversification* and for expanding activities to other EU countries. The focus should be on regions where both merchants and consumers demonstrate a comparatively high adoption rate of the Digital Euro, and the competitive landscape allows for Paybyrd's entry. For this strategy, additional investments in know-how and personnel for new markets, distribution channels, and potentially newly emerging local offices are required.

In this scenario, the adoption of conventional payment methods will decline significantly. However, it is advisable not to completely disinvest in this product line but to try to satisfy the remaining demand without significant investments in new technologies (*market penetration*). Once the supply of outdated products is no longer profitable, disinvestment should be made, and the focus should be placed exclusively on the new products.

Market development is not a suitable strategy in this scenario. Due to the sharply decreasing demand for existing products, limited resources should be invested in more promising strategies with high growth potential.

Individual Part – Selima Mrad

8.2 Scenario 2 – The Patient Innovator

The second quadrant portrays a scenario in which EU regulators create an enabling environment through the implementation of effective policies. Nevertheless, progress in technological development remains insignificant. As such, this scenario highlights that the observed changes in in-store and e-commerce payment processes displays a moderate degree of variation, which

is highly attributed to the high support provided by the state. Furthermore, despite the insignificant progress in technological development, the intensity of competition in the market remains high, largely due to state support, as regulators recognize the importance of setting clear guidelines regarding emerging technologies. Subsequently, the proactive measures taken by regulators to promote emerging technologies, are expected to have a significant impact on the adoption of the Digital Euro in the short and long term. While the diffusion of the Digital Euro is likely to be moderate in the short term, its long-term prospects are promising due to the state support. In the interim, conventional payment methods should remain very relevant and preferred in the short term, and the emphasis from policymakers on blockchain technologies has resulted in a moderate pace of technological development in conventional payment methods. In this scenario, the lack of significant technological development has resulted in higher costs, leading to increased fees and therefore hesitancy from merchants to invest in this emerging technology. In this particular context, conventional means of payment and the Digital Euro are equally favoured and considered extremely relevant, while the use of cash is gradually becoming obsolete.

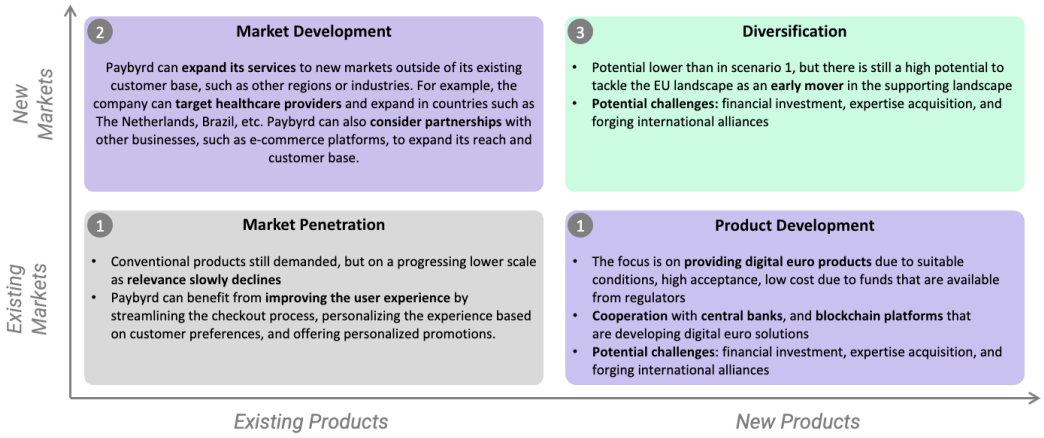

Figure 11: Ansoff Matrix, Scenario 2; Source: Own Creation

Among the strategic initiatives suggested, two were assessed as equally significant and in alignment with Paybyrd's objectives. The first is *market penetration*, which is a more compelling short-term direction given the anticipated slow adoption of the Digital Euro, indeed,

the Digital Euro has not had a market reshaping effect, indicating that the digital payment market is still expanding, which therefore means that Paybyrd's current offering will continue to be highly demanded. As such, Paybyrd's market share can be effectively increased by focusing efforts on improving the user experience by simplifying the payment procedure, ensuring the highest degree of security, and providing a tailored payment experience. Additionally, building customer relationships through incentives and promotions can increase customer loyalty and retention.

Product development is another strategic initiative that received the top spot and is deemed more adequate in the long term, integrating with the Digital Euro and offering smart contract functionality, are viable options for Paybyrd to consider while expanding its product range given the changing environment and the increasing spread of the Digital Euro, these options would involve working with central banks and blockchain experts.

The strategic initiative that received second place is *market development*, which involves expanding Paybyrd's services into new markets beyond its existing customer base, such as different regions or industries. For example, in some countries such as Angola, where there is a lack of POS terminals, as discussed in previous workshops with the client, the government has provided subsidies to international fintech companies to implement their payment solutions in the country. Paybyrd has a lot to gain from this strategy, by extending its services to these new markets, Paybyrd can tap into new customer segments and revenue streams, allowing it to improve its market share and stay ahead of the competition.

The *diversification* strategy is the least favoured among the proposed initiatives for Paybyrd, as it carries a high level of risk and requires substantial investments. While diversification offers Paybyrd the opportunity to gain a first-mover advantage in new markets or sectors, it also comes with a significant degree of criticism.

8.3 Scenario 3 – The Hindered Revolution

The third quadrant illustrates a scenario where there is going to be disruptive technological innovation, but ineffective policymaking by EU regulators. As a result of regulations still in their infancy, the payment process for in-store and e-commerce remains relatively unchanged. In fact, despite the potential for Digital Euro to revolutionize the market, consumers and merchants continues to opt for traditional payment methods, due to a lack of promotional activities by policymakers. The insufficiency of regulation leads to a decrease in competition, as companies feel little incentives to invest in innovation without clear guidelines, or, in case of new entrants, to enter a risky and capital-intensive market. This, in turn, leads to a reduction in development and a slower rate of progress in conventional payment methods. The lower cost of development due to high technological capabilities, however, allows for lower fees, an advantage in a more stable market. Nevertheless, the lack of clear policies and support for blockchain and smart contract tech means that the opportunities for advancement in the industry are limited. Thus, the spread of the Digital Euro is restricted to niche applications, and merchants and consumers continue to rely on the familiar comfort of traditional payment methods.

In this context, conventional digital payments will be the payment options that see the greatest use and development. On the other hand, the Digital Euro will remain extremely confined due to inefficient regulation. Finally, the use of cash will be expected to fall into disuse.

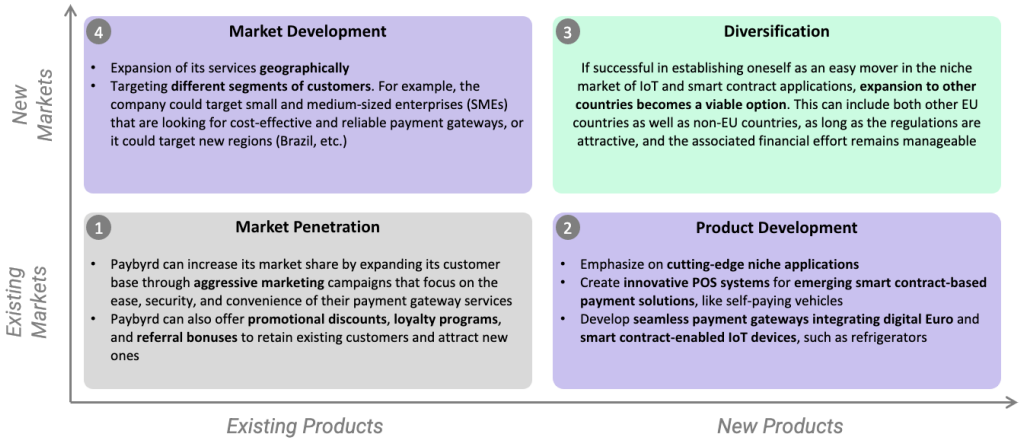

Figure 12: Ansoff Matrix, Scenario 3; Source: Own Creation

Among the proposed strategic initiatives, market penetration was evaluated as most cost-effective for Paybyrd. In fact, given the difficult future development of technology in the direction of blockchain and smart contracts, the adoption of Digital Euro will be very limited. Therefore, expanding the growing segment already targeted by Paybyrd through promotional marketing and leveraging its current products seems to be the most attractive option given the context. To make this happen, offering loyalty programs and referral bonuses could make its customer base more solid, to mitigate future uncertainty, such as tough economic cycles.

The second most attractive option consists in product development. The second most attractive strategy lies in product development. Developing new types of POS terminals for emerging smart contract-based payment solutions, such as in the case of self-paying vehicles, are options that Paybyrd could consider expanding its product mix while maintaining traditional POS terminals. This strategy should be preferred over diversification, too risky and capital intensive, in an extremely uncertain context. Expanding in other EU and/or non-EU countries, along with introducing new products, needs a careful analysis of whether the local regulations will support blockchain and smart contracts technological advancements in the future or not, and whether the new target segment would be profitable for Paybyrd. This strategy represents a good opportunity but encompasses many question marks as well.

Market development is the least attractive to Paybyrd. In fact, as noted during previous workshops held with the client, at today, Paybyrd has no plans to target new segments, such as small and medium-sized enterprises (SMEs). The option that could be evaluated, on the other hand, is expansion into new geographic areas where there is a shortage of POS terminals, or where national governments can support the development of new technologies. Examples in this regard are Brazil and sub-Saharan countries, where there would also be a less restrictive legislative environment regarding the sensitive issue of data protection. This, turns out to be of high relevance, especially given Paybyrd's desire to become a Payment Facilitator, an entity that must comply with the law.

Individual Part – Maximilian Zimmer

8.4 Scenario 4 – The Stagnant Landscape

Due to the ineffective policymaking and the slow technological progression in *The Stagnant Landscape*, the environment leads to minimal to negligible alterations in both brick-and-mortar and e-commerce payment processes. The competitive landscape is diminished due to an absence of incentives, ineffective regulatory measures, and the overall irrelevant nature of the Digital Euro. High costs are associated with the technological implementation of the Digital Euro, stemming from inadequate technological progress, and a lack of governmental support. In order to cover these high costs, high fees are necessary for processing transactions, which has a significant negative impact on its attractiveness for merchants. Propelled by the insufficient backing for blockchain-related payment technologies, the conventional payment process is witnessing remarkable advancements in terms of efficiency and security. In this context, the significance of the Digital Euro remains considerably constrained, suggesting that its introduction has been highly unsuccessful. Simultaneously, conventional payment alternatives continue to hold substantial prominence and enjoy widespread adoption.

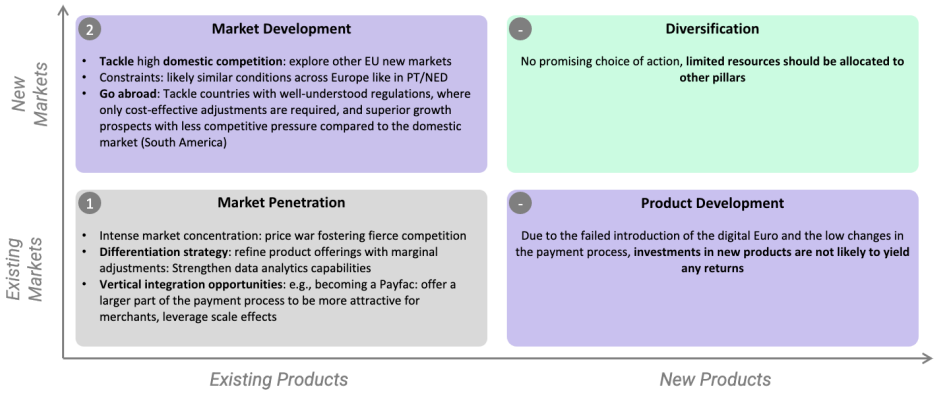

Figure 13: Ansoff Matrix, Scenario 4; Source: Own Creation

Since conventional means of payment will remain predominant in this scenario, Paybyrd's focus should be on marketing existing products. The most suitable strategy is *market penetration*.

The key difficulty in this scenario is the high degree of similarity between the products offered and the strong market concentration of established players who are trying to expand their market position through M&A activities and price wars. Therefore, the main goal of Paybyrd in the context of market penetration must be differentiation. The existing offering must be differentiated from the mass of available products through product enhancements. In addition to improving acceptance rates and transaction speed, improving the data analytics capabilities offers the most attractive lever: through in-depth analytics, Paybyrd can help merchants understand what products are being bought, when, through which channels, in what quantities, etc. The wealth of information collected can be processed by Paybyrd to provide implications for merchants as to which measures, such as discount promotions, targeted marketing, or loyalty programs, can be used to increase their turnover, potentially based on algorithms and in the form of monthly reports. Another option to counteract market concentration is vertical integration along the payment process. By offering a larger number of steps and services along the payment process, higher fees can be generated on the one hand, and on the other, merchants have only one contact for several services, which increases convenience. Possible vertical integrations are the step to a payment facilitator and/or to a payment processor. These moves

require licenses, the application for which can be a time-consuming process, which is why such decisions should be made thoughtfully and in advance.

Market development is the second most suitable strategy. In order to escape the high market concentration of large players, new markets should be developed in which there is attractive growth potential and less competition. Since the conditions in other EU countries are very similar to those in Paybyrd's current markets, Portugal and the Netherlands, the focus should be on new regions. Of particular interest are developing and emerging countries where the digital payment industry is comparatively underdeveloped. Examples include South America and Africa. In some countries with underdeveloped infrastructure, government subsidy programs exist that can make a market entry by Paybyrd even more attractive. Since Paybyrd already has a location with IT specialists in Brazil, South America can be a suitable starting point for further growth.

Strategies related to new products should be completely neglected in this scenario, as investments in new technologies are most likely not profitable due to the failure of the Digital Euro and the unattractive market conditions.

Individual Part – Selima Mrad

9. Phase V: Monitor

The fifth and final phase, *Monitor,* entails connecting the previously developed scenarios and strategic implications with the actual events and developments surrounding the environment. Identifying *Early Indicators* for each scenario is the main objective of this section. The team has laid out quantifiable signals or precursors that are fundamental to monitor, as they might suggest the increasing likelihood of specific uncertainties to turn into real elements (Lindgren & Bandhold, 2006).

Since Early Indicators help outline the direction of the scenario toward which they are heading by acting on a future plan, companies have the opportunity to be flexible and plan their strategic

initiatives in the present so as to maximize the outcome in the future. Hence, by aligning their strategies to the changing environment, Paybyrd can stay ahead of the curve and achieve long-term success (Scearce & Fulton, 2004). More profound information, status quo and sources for each of the scenarios' early indicators can be found in *Appendix 6* of this work.

Scenario	Early Indicator	Status	Expected Trajectories	Alternative Trajectories
Digital Renaissance	Early realization and adoption of Digital Euro and other CBDCs	In progress	Increasing	Hindered Revolution or Stagnant Landscape if trend decreases
	. Cross-industry collaborations in blockchain	Positive	Increasing	Patient Innovator if trend decreases
	Regulatory Adaptability for DeFi Innovations	In progress	Increasing	Hindered Revolution if trend decreases
Patient Innovator	Expansion of government funding for blockchain companies	In progress	Progressing	Hindered Revolution or Stagnant Landscape if trend decreases
	Growth in innovative projects	Positive	Steady growth	Hindered Revolution or Stagnant Landscape if trend decreases
	Growth of the CBDCs Transaction Value	Positive	Scalable adoption	Hindered Revolution if trend decreases
Hindered Revolution	Delayed realization of the Digital Euro	In progress	Hindered progress	Digital Renaissance or Patient Innovator if trend increases
	Rapid development of technologies outpacing regulations	Positive	Uncontrolled Growth	Digital Renaissance or Patient Innovator if trend increases
	Decline in the growth of CBDCs transaction Value	Challenging	Slow Adoption	Digital Renaissance or Patient Innovator if trend increases
Stagnant Landscape	Lack of interest in the Digital Euro	In progress	Slow or no growth	Digital Renaissance or Patient Innovator if trend increases
	Stagnation in blockchain development	In progress	Stagnant	Digital Renaissance or Patient Innovator if trend increases
	Preference for traditional digital payments	Negative	Uncertain future	Digital Renaissance or Patient Innovator if trend increases

Figure 14: Indicator Tracking Table, Source: Own Creation

Early Indicators – The Digital Renaissance

The Digital Renaissance scenario encompasses two uncertainties, and they are described as disruptive technological development and effective policymaking. The researchers of this paper have thoroughly identified several key precursors that could lead to the materialization of the "Digital Renaissance" scenario: (1) **The early realization phase and vast adoption of the Digital Euro**, coupled with an increase in the number of countries seeking to create their own CBDCs, signifies a significant paradigm shift in international banking systems. The successful trial of CBDCs for cross-border transactions underscores this trend and suggests that the world is becoming more accepting and accommodating of digital currencies (Swift, 2023). (2) **Increasing number of cross-industry collaborations and partnerships between the financial industry and central banks in the blockchain space,** is exemplified by the International Association for Trusted Blockchain Applications (INATBA), which is actively working on blockchain technology adoption and innovation of the regulatory framework by facilitating its understanding, use, and development in all sectors. This indicator suggests disruptive technology adoption and a collective push for innovation (INATBA, 2023). (3) **The**

adaptability of regulatory frameworks for DeFi innovations, the willingness of European lawmakers to review and possibly amend the text of the Data Act, which currently prohibits smart contracts underpinning DeFi protocols, signifies an adaptive regulatory environment that can accommodate the disruptive innovations within the blockchain industry, particularly DeFi (Akolkar, 2023).

Early Indicators – The Patient Innovator

The Patient Innovator scenario entails two uncertainties, and they are described as unimpactful technological development and effective policymaking. The researchers of this paper have identified the precursors underlying the realization of the "Patient Innovator" scenario: (1) **Expansion of government funding and grants offered to companies specialized in blockchain technology,** suggests the supportive action taken by the government to support the growth and evolution of blockchain technology**.** (2) **Growth in the number of projects carried out to explore new technologies**, the **2022 EU Innovation Index** reported a 45.59-point average across 27 nations (on a scale where 100 represents the frontier, defined as the maximum value achieved by any EU country since 2011), Although the EU Innovation Index does not focus exclusively on technologies related to cryptocurrencies or digital payments, a high score could still be relevant for these areas. The Innovation Index displays the innovation capacities across the region and its influence surrounding the development and adoption of emerging payment methods in the future (The Global Economy, 2022). (3) **Significant growth of the CBDCs Transaction Value** signifies the widespread adoption and acceptance of digital currencies. It allows companies to assess the economic influence of their services in the market and align their operations with trends affecting user behavior (Rolfe, 2023).

Early Indicators – The Hindered Revolution

The Hindered Revolution scenario entails two uncertainties, and they are described as disruptive technological development and ineffective policymaking. The following precursors

are indicative to the "hindered revolution" scenario: (1) **Delayed realization phase of the Digital Euro,** hindered by ineffective policymaking, might cause difficulties for the ECB in reaching a consensus on its regulatory framework. Thus, consistent monitoring of the Digital Euro's progress and the related policy discussions within the ECB is crucial (ECB, 2023). (2) **Rapid development in emerging technologies outpacing regulatory framework**, the **Global Innovation Index** (GII) of 2022 reports that some performances exceeded the level of development, making it difficult for policymakers to monitor (Dutta et al., 2023). (3) **No significant growth of CBDCs transaction value,** acceptance of digital currencies, which is largely due to factors such as regulatory hurdles, lack of infrastructure, or lack of public confidence and understanding of these new technologies.

Early Indicators – The Stagnant Landscape

The Stagnant Landscape scenario entails two uncertainties, and they are described as unimpactful technological development and ineffective policymaking. The precursors of the scenario have been thoroughly analyzed and identified and are as follows: (1) **No interest or viable reason to invest in the Digital Euro**, as it is not seen as a viable solution and is deemed to fail (Bofinger, 2022). (2) **Stagnation in blockchain development**, with little to no collaborations or partnerships between stakeholders, suggests a lack of innovation and a preference for maintaining the status quo (Chowdhury, 2023). (3) **Resistance to shift from traditional digital payments** due to the conservative mindset shared among regulators, stakeholders, and industry players, suggests a lack of incentives to progress in the digital payments landscape.

10. Conclusion and Limitations

10.1 Conclusion

This report aims to prepare Paybyrd, a payment gateway provider, for the future of the digital payment industry in Europe. Paybyrd's experts were intensely involved in the process. Key business challenges were identified for Paybyrd and connected to a suitable focal issue and time horizon. With a time horizon of 10 years (up to 2033) and considering current developments such as research on the introduction of a Digital Euro, four scenarios were created using the Intuitive Logics School method. In a workshop, the critical uncertainties of *"technological advancement of blockchain technology"* and *"effectiveness of policymaking"*, as well as the predetermined element of the introduction of a digital currency for Europe, were identified. This led to the formation of four plausible, diverging future scenarios. Subsequently, the Ansoff Matrix was used to develop strategic options for Paybyrd and rank them according to their suitability for each scenario. The monitoring phase emphasized Paybyrd's need for vigilance towards emerging trends and scenario manifestations that could significantly impact the future, highlighting the importance of strategic adaptations.

1. *The Digital Renaissance* (Disruptive technological progress and effective policymaking): Leveraging entrepreneurial conditions by focusing on the development of new products within the context of the Digital Euro, initially regionally and then across Europe. In parallel, conventional products can be sold off as long as they prove to be profitable.
2. *The Patient Innovator* (Incremental technological progress and effective policymaking): A dual-track strategy where conventional payment process products remain relevant, but the Digital Euro gains increasing importance due to regulatory pressure.

3. *The Hindered Revolution* (Disruptive technological progress and ineffective policymaking): Focus on conventional products as a foundation, with the addition of digital currency products for niche applications in the context of smart contracts.
4. *The Stagnant Landscape* (Incremental technological progress and ineffective policymaking): Full focus on conventional products, as the introduction of the Digital Euro failed. To avoid high market concentration in this scenario, differentiation strategies and vertical integration are appropriate. Additionally, focusing on less competitive markets in South America or Sub-Saharan countries presents an option.

10.2 Limitations

This work has limitations, some of which present opportunities for future research. Firstly, the findings are based on expert opinions from a single company. To enhance the study's reliability, future work on the future of Europe's digital payment industry could consider a larger number of experts from various companies and different stages of the payment process. Moreover, upcoming publications from the ECB, outlining the definitive structure of a European digital currency (which is currently undefined), should be taken into account. Secondly, delving deeper into the strategic implications developed in this work and crafting detailed implementation strategies would exceed the scope of this report. Future research should place a greater emphasis on the practical application of the concepts formulated.

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12. Appendix

<u>Appendix 1</u>: First interview conducted with Miguel Moura and Pedro Coelho to gather primary information about the company. The purpose of this interview was to obtain first-hand information from reliable sources and gain insights into various aspects of Paybyrd's operations and business model. The interview was conducted on February 22nd, 2023.

- Team: *What is the primary objective of Paybyrd as a payment gateway provider, and what specific products or services does the company offer to its clients?*
- Miguel Moura "Our objective is to provide a gateway to merchants, Paybyrd wants to move as a payment facilitator, as from a cashflow perspective it is more convenient to manage and settle funds to the client. Moreover, Open-source payment (OSP) is a new product that Paybyrd is launching, which means that merchants can adapt their own payment solutions to their needs without technological limitations. 2 models that Paybyrd implements: Payment Facilitator (PE) / Independent sales organization (ISO)**.** In the PF model: the merchant does not open a payment account in Acquire, Paybyrd onboards all the merchants (receives the funds) and does the settlement. However, Paybyrd currently use the ISO model, since the PF model requires a license, ISO refers to referring merchants to the acquirer (not receiving a referral fee), however, they have access to the back-office of the acquirer (observers but no control)."
- *Team: "How does Paybyrd configurates itself, is it more of a payment gateway, processor, or ISO or a combination of all of them?"*
- Miguel "We are a gateway and currently and ISO, we don't technically process payments. Financial institution (like the acquirer) process payments. This should be taken into consideration in your analysis. However, we are now in the last phase of

acquiring a license within the European Union, which means that we will be no longer an ISO and we will become a PF (Payment Facilitator) and therefore, we'll be under new regulations. In that scenario, we will be no longer just a gateway, but also, we'll hold client funds and do the settlement for them.

- *Team: Could you please elaborate on the revenue streams and pricing model of Paybyrd?*
- Pedro “Paybyrd charge money in 3 cases: **selling or renting terminals**, **setup fees** for implementation in terms of E-commerce (time and effort from their developers to integrate their system in the system of the merchant, which results in charging implementation fees for the merchant), and **Processing fee** (each transaction that passes through Paybyrd systems should be charged). Plus, we have two types of models:
- **IC++** (plus a Paybyrd Fee): means that the merchant should pay a fee for each transaction. This fee comprises 4 components (3 Mandatory, and Paybyrd Fee). IC which stands for interchange and it is the fee that the acquirer should pay to the issuing bank. The first + refers to the fee that acquirer should pay to the card schemes; the second + is the fee that the acquirer will receive from the merchant => this model is more transparent to the client as it knows all components of what they are paying.
- **Blended:** it presents a fixed fee to the merchant. It’s more understandable for non-sophisticated clients. However, this model presents risks for Paybyrd as the amount of the blended model does not cover the IC++. For example, with non-European cards, the merchant would be subject to interchangeable fees, which means that it would pay less than it should. Sometimes, Paybyrd pays the remaining part

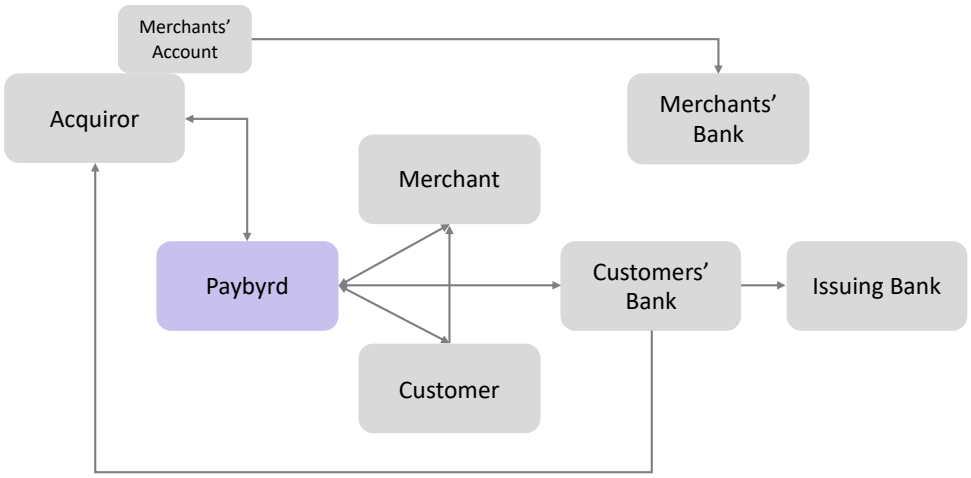
(negative fees), albeit they used to use this model to acquire non-sophisticated type of merchants."

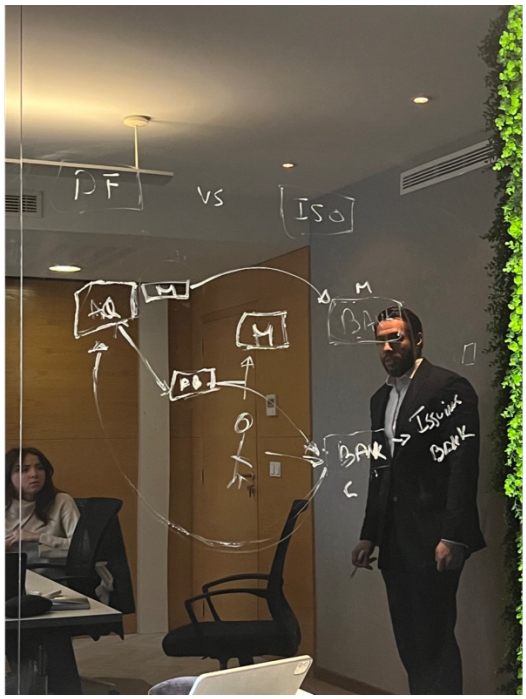
- *Team: you have mentioned banks before; can you explain how banks ensure that merchants utilize their payment system and generate sufficient cash flow to cover their loans?*
- Pedro "Banks can negotiate prices (even blended), by means of crashing down the fees that they apply for the payment solutions that they provide to their clients => Lock down merchants through contracts (oblige them to use SIBS system, and to be the acquirer of the payments and they ensure the CFs generated by the business and it covers the loans)."
- *Team: Could SIBS impact or pose a threat to Paybyrd applying for a license?*
- Miguel "Yes! As a PF, Paybyrd could overcome some restrictions or limitations that SIBS is imposing to non-financial institutions. They consider it would be easier for them to have access to MBway for instance, but they are applying for a license in Lithuania."
- *Team: How will the demand for alternative payment methods, such as cryptocurrencies and digital wallets develop in Europe?*
- Miguel "Paybyrd is waiting for a regulation to be adopted by the European Union. The regulation is the MiCa and it refers to 2 different things, the first is **Virtual assets service providers (**VASPs), which works as an exchange (Coinbase: this type of cryptocurrency needs to be approved and controlled by competition authorities in Europe). Furthermore, there are VASPs in which you can issue tokens in cryptocurrencies (like initial coin offering which is an operation in which a company issues tokens and sell them in an exchange), as this type of providers should be regulated as a normal financial institution, by means of providing capital

requirements. The second part of the regulation is **conceptual**, since it is still unclear if cryptocurrencies could be regarded as payments, but, since there are 3 types of cryptocurrencies, one of them could be somehow regarded as financial instrument, share or asset."

- *Team: How will competition develop and respond in the future?*
- Pedro "Paybyrd views it not as a matter of pricing but a matter of the quality of the product, and strong technology that allows the approval rates to be higher. Plus, in terms of innovation with the introduction of their new product OSP, they can be ahead of their competitors."
- *Team: How can the current product offering help to mitigate cybersecurity issues in digital payments?*
- Miguel "Paybyrd has the certification of PCI compliant LVL1, which means that the transactions that pass through their system are secured (cards are tokenized, no access to the details of customers)."
- *Team: "We would like to ensure that we included all of the players in the payment process. At today, we included namely customers, the issuing bank, the merchant, the payment getaway, the payment processor, PayFac, the merchant account, the acquiring bank, as well as the merchant bank. Did we miss any player?"*
- Miguel: "Yes. You should include card schemes, Visa, MasterCard, Amex."

- Simplified Payment Process Overview provided by Paybyrd, which was used as a foundation of the payment process description in chapter 4:





<u>Appendix 2</u>: Plotting the Scale of Uncertainty with the help of Miguel Moura. The workshop was conducted on March 24th, 2023.
Presentation of the uncertainties with a thorough explanation to Paybyrd.

Uncertainty	Level of Impact	Level of Uncertainty	Paybyrd Comments
Acceptance of non-CBDC (Bitcoin, Ethereum, etc.)	**Score: 4** *Low impact*	**Score: 5** *Neither likely nor unlikely to predict*	*"Non-CBDSs will be accepted as payment in many places in the future but will not influence the future of the digital payment industry."*
Effectiveness of policymaking in favour of new technologies	**Score: 9** *Acute impact*	**Score: 7** *Likely uncertain to predict*	*"Through policymaking, governments have the opportunity to play a significant role in shaping the future. Effective regulatory frameworks are therefore essential for the rapid development of new technologies."*
The progression of technology and the resulting possibilities	**Score: 9** *Acute impact*	**Score: 8** *Extremely uncertain to predict*	*"The advancement of blockchain technology and smart contracts provides a possibility for disruptive transformation of payment procedures and smart contracts have the possibility to dispense the need for centralized third parties."*
Customer's acceptance and adoption of new technologies	**Score: 8** *Very high impact*	**Score: 5** *Neither likely nor unlikely to predict*	*"Customer acceptance is crucial for the success of new technologies. Nevertheless, customer acceptance can be actively influenced. One example of such influence can be effective policymaking."*
Infrastructure development	**Score: 8** *Very high impact*	**Score: 4** *Somewhat likely to predict*	*"Infrastructure development is relatively predictable, Paybyrd can implement strategies with confidence, however, for the introduction of new technologies it is essential to have a well-developed infrastructure."*
Big tech firms overtaking conventional payment methods	**Score: 5** *Moderate Impact*	**Score: 3** *Predictable*	*"Big tech companies have a lot of resources and a huge reach to their customers, so the impact wouldn't be negligible, but moderate. For example, Paybyrd has created value and trust over time, and we're pretty competitive, it is more of an opportunity for us as*

			there is a need for fast payment, improved efficiency and effectiveness, and instant payment."
Increasing com petition of new players and innovations	**Score: 5** *Moderate Impact*	**Score: 3** *Predictable*	*"Established players always prevail on the market; acquire new entrants and competitors."*
Political stability (within European Union, war) affecting technological change	**Score: 7** *High impact*	**Score: 4** *Somewhat likely to predict*	*"Political stability or instability within the European Union or due to conflicts and wars may impact the rate and direction of technological progress"*
New Pandemic	**Score: 3** *No serious impact*	**Score: 8** *Extremely uncertain to predict*	*"Assessing the impact of a new pandemic is complex. However, it can be assumed that the influence on the digital payment market will remain manageable."*
Financial crash	**Score: 7** *High impact*	**Score: 4** *Somewhat likely to predict*	*"A financial crisis can have a massive impact on the payment industry, primarily due to a decline in consumer spending. Companies must carefully evaluate risks to avoid insolvency, which may result in a setback for technological innovations as well."*
Barriers to POS-terminals wide-adoption in EU	**Score: 5** *Moderate Impact*	**Score: 3** *Predictable*	*"POS terminals are expected to encounter minimal barriers to widespread adoption, given the ongoing shift towards digital payments. As a result, their impact is anticipated to be moderate rather than negligible, especially considering that many countries are already implementing government incentives to promote their usage."*

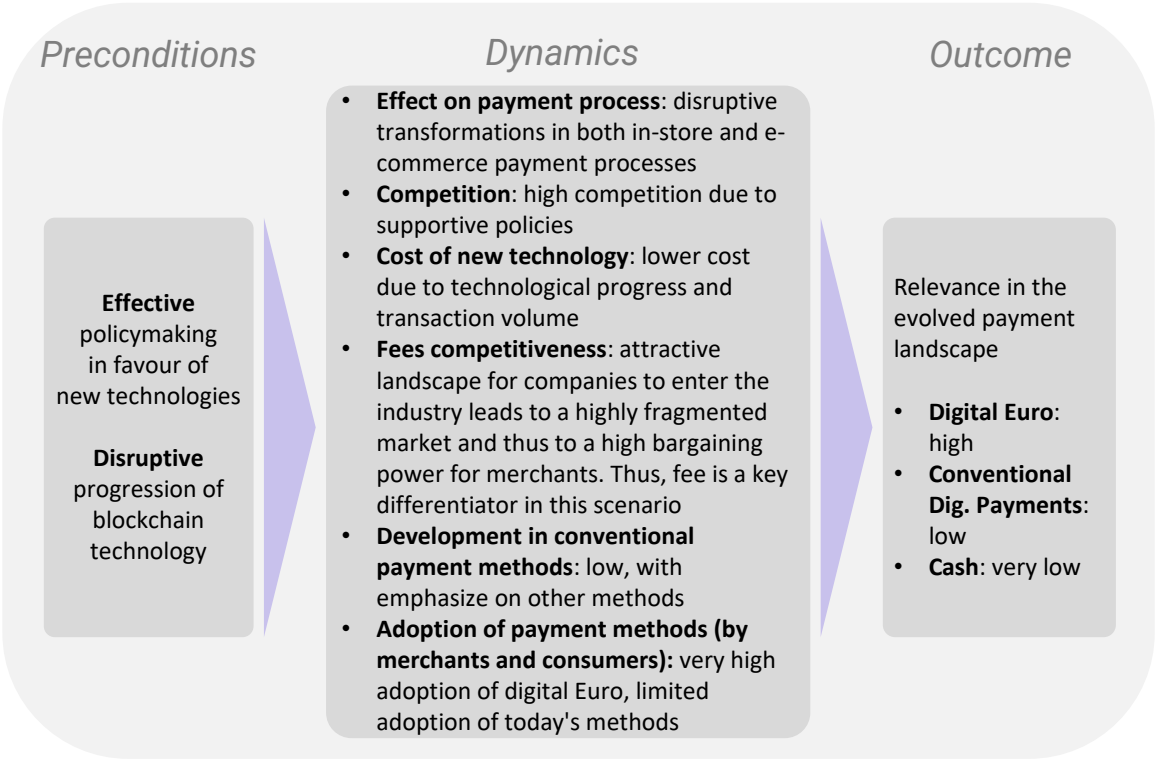
IoT interoperability and standardization	**Score: 6** *Serious Impact*	**Score: 4** *Somewhat likely to predict*	*"IoT interoperability and standardization are very important as they contribute to a seamless integration between different industry systems. However, ensuring a seamless experience is still a big challenge, especially related to some technical complexities related to it. For example, IoT spans various technologies and involves many stakeholders, each with their own standards and protocols to comply to. Also there are some critical concerns related to data security and privacy which threat the correct IoT interoperability and standardization."*

<u>Appendix 3</u>: Most critical Uncertainties; Potential outcomes at opposite ends:

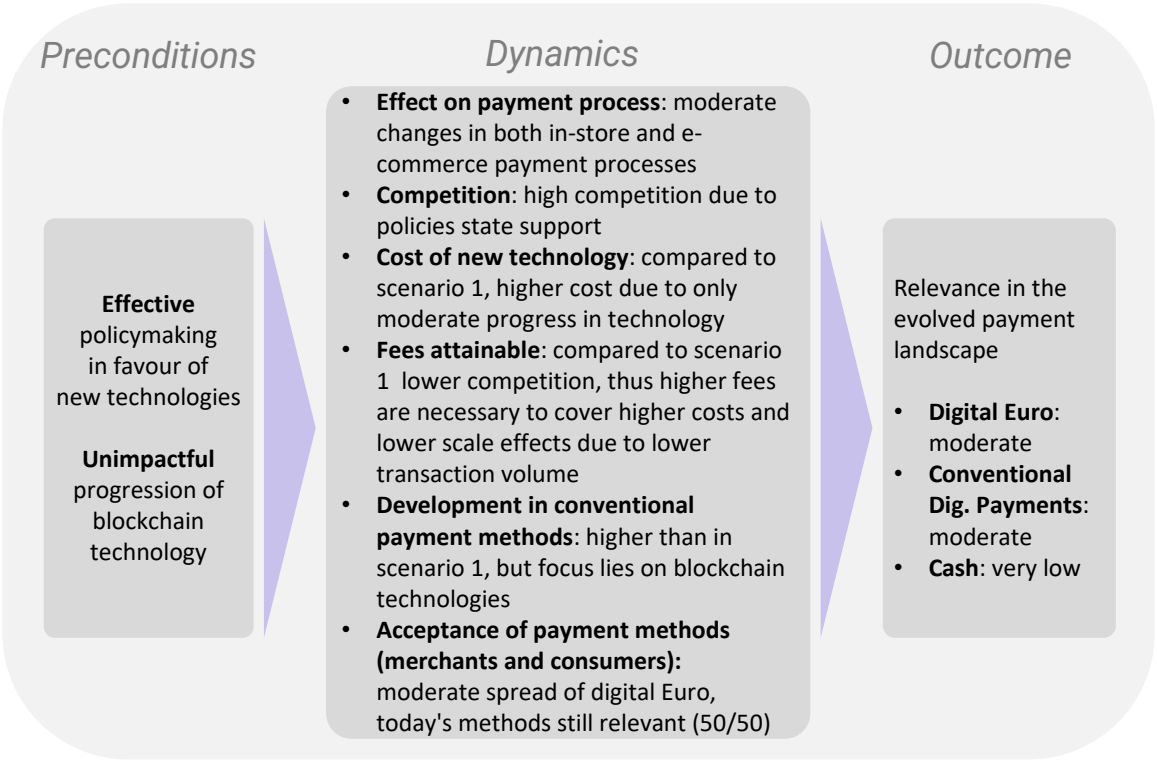
First Extreme	Uncertainty Name	Second Extreme
Non-CBDC are accepted	Acceptance of non-CBDC cryptocurrencies	*Non-CBDC are not accepted*
Effective policymaking	Effectiveness of policymaking in favour of new technologies	*Ineffective policymaking*
Disruptive technological Progress	The progression of technology and the resulting possibilities	*Slow/incremental technological Progress*
Wide adoption of new technologies	Customer's acceptance and adoption of new technologies	*Reluctance to the adoption of new technology*
Infrastructure development to today's customer requirements	Infrastructure development	*The failure of infrastructure development*
Big tech firms will overtake conventional payment methods	Big tech firms overtaking conventional payment methods	*Big tech firms will not overtake conventional payment methods*

<u>Appendix 4</u>: Overview of Key-Dynamics per Scenario. Results from workshop conducted on April 24th, 2023.

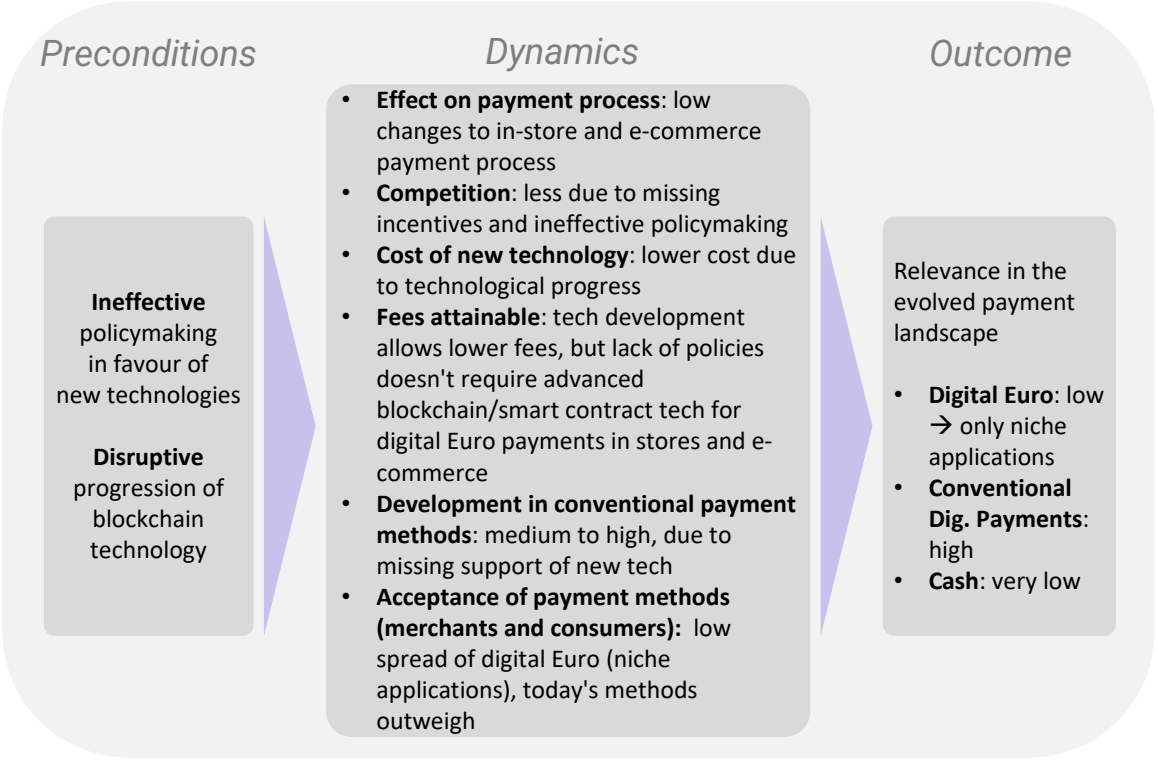
Scenario 1 – The Digital Renaissance



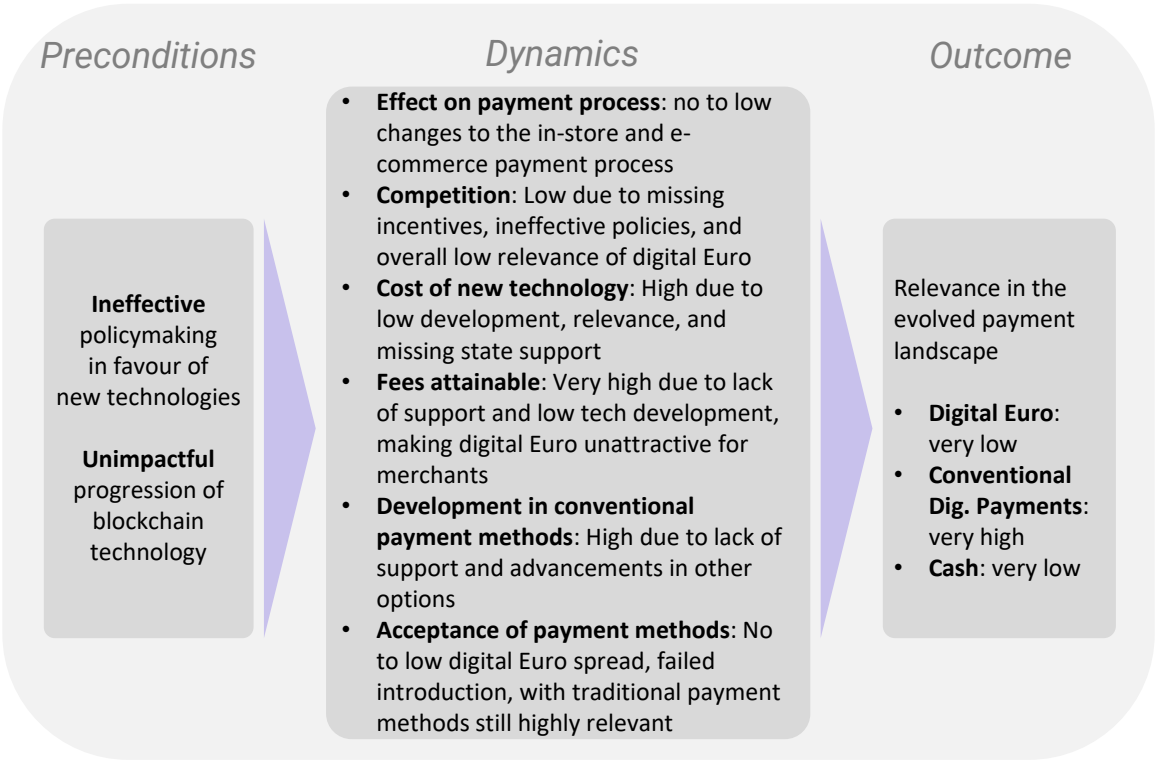
Scenario 2 – The Patient Innovator



Scenario 3 – The Hindered Revolution



Scenario 4 – The Stagnant Landscape



<u>Appendix 5:</u> During the meeting with Miguel Moura, a collaborative approach combining elements of a workshop and a structured interview was adopted. Initially, the key dynamics and a comprehensive Ansoff Matrix were presented for each scenario. This provided a solid foundation for discussion and analysis. In the subsequent phase, Miguel had the opportunity to seek clarification and gain a deeper understanding by asking questions. This interactive dialogue was followed by targeted inquiries regarding the suitability and prioritization of the proposed strategies. By adopting this approach, the meeting facilitated both knowledge sharing and strategic decision-making. The workshop was conducted on April 24th, 2023.

Digital Renaissance Scenario

Presentation of a draft version of the Ansoff Matrix and an overview of the scenario 1 dynamics to Miguel.

- Team*: "From the strategies proposed, which strategy do you consider to be the most appropriate for Paybyrd to adopt or execute?"*
- Miguel: "As far as I understood about the Ansoff matrix and this scenario, I think you came up with logical conclusions, and I think that product development would be the most suitable, simply because if there's a widespread relevance of the digital euro it definitely makes sense to invest in new products or in new technologies. The second option would be diversification because I see a huge potential in tackling the whole European landscape and the last one, I would say market penetration."
- Team: *"How would you describe or envision the industry to be by 2033 at the European level considering this scenario?"*
- Miguel: "Fierce, what's happening right now is that there is a decrease of newcomers, not only due to big companies acquiring these newcomers, but also because now

technology has become more accessible and available to everyone, so 'the bigger you are, the easier you get customers which makes it more difficult to get market share, what would make a difference would be fees in this context."

- Team: *"Referring to strategies such as product development and diversification, what would be the obstacles or opportunities for Paybyrd to offer a new product that is related to the digital Euro, in terms of R&D investment, human capital?"*
- Miguel: "I think with regards to digital Euro in particular, we need to have like blockchain experts, to deal with it, so like a team of at least four people for the construction of any product, it would also be important to hire a project manager to build the project, because usually the developers don't understand the features, the needs, everything about this specific project. Concerning R&D, yes of course we need to invest, however, the investment may either be direct and indirect, because, sometimes you outsource with other companies on some features of this new products, as it makes the process for R&D cheaper."
- Team: *"Referring to the possibility to expand to new markets, in this scenario, what would be the steps or prerequisites for a payment gateway?"*
- Miguel: "So in case of digital euro, I think we should first study the countries or the jurisdictions in which the consumers and the merchant so are keener to accept cryptocurrency and alternative payment methods, and then try to move there, simply because some countries are keener to new technologies and there are other countries that are not."

Patient Innovator Scenario

Presentation of a draft version of the Ansoff Matrix and an overview of the scenario 2 dynamics to Miguel.

- Team*: "From the strategies proposed, which strategy do you consider to be the most appropriate for Paybyrd to adopt or execute?"*
- Miguel "First would be in my opinion and especially considering the short-term would-be market penetration because as you have mentioned conventional products will still be demanded, the digital euro did not have a market-shake up effect, however, the product development one would also be viable but more like towards the medium- and long-term perspective. Then I guess market development to the Sub-Saharan region, or South America, the diversification strategy is also viable however it could entail much risk, if Paybyrd consider expanding its product offering as well as exploring new markets."
- Team: *"How would you describe or envision the industry to be by 2033 at the European level considering this scenario?"*
- Miguel: "Similar to the scenario before but based on the assumption that there's unimpactful technological progression but favorable environment fostered by policymakers, it would say the industry would be more challenging."
- Team: *"Referring to strategies such as product development and market penetration, what would be the obstacles or opportunities for Paybyrd to offer current products in the near future considering the slow adoption of products that are related to the digital Euro?"*
- Miguel: "I would say, we are currently working to expand to Brazil, but also in the future it would be interesting to consider other south American countries, because they urgently need solutions like Paybyrd, and Sub-Saharan African countries because there's a lack of POS terminals there and in particular Angola because the government has issued some grants for international fintech companies to implement their payment

solution in the country, so there's a really interesting opportunity for Paybyrd to enter the African market."

- *Team: "In Mozambique and Angola, they also speak Portuguese, would you say it would be easier for Paybyrd to expand there?"*
- Miguel: *"*Yes, to some extent, we have been in touch with some investors in Angola specifically because they know that we are in Portugal, despite the fact that Paybyrd is not Portuguese, but the fact that in Mozambique and Angola they speak Portuguese makes the commercial relationship easier and will help the entry of Paybyrd within the market."

Hindered Revolution Scenario

Presentation of a draft version of the Ansoff Matrix and an overview of the scenario 3 dynamics to Miguel.

- Team*: "From the strategies proposed, which strategy do you consider to be the most appropriate for Paybyrd to adopt or execute?"*
- Miguel: "I think that market penetration would make more sense, here we can leverage on our resources capabilities to expand our customer base. The second option I think would be product development because what you mentioned about creating innovative POS-terminals for emerging smart contracts-based payment solutions could be interesting and especially since this scenario considers niche applications for digital euro, then it would be interesting also to explore the diversification and last would-be market development."
- Team: *"How would you describe or envision the industry to be by 2033 at the European level considering this scenario?*
- Miguel: "Based on the assumption that there's impactful technological progression and inefficiencies in terms of regulations I think it would the industry would be fragmented."

- Team: *"Referring to strategies such as market penetration and product development, what would be the obstacles or opportunities for Paybyrd to implement machine learning or biometric authentication to their current offerings?"*
- Miguel: "I think that the most important or most relevant obstacles in terms of machine learning and biometric authentication would be concerning data protection rules, and the fact that we are within the scope of the European data protection regulation, which means it we need to comply very hardly to those rules, and these rules are not very clear to understand upfront, the problem is not the technology, per se, the problem is how to use the technology and to be compliant with the regulations."
- Team: *"Referring to the implementation of new technologies within Paybyrds' product portfolio, in this scenario, would it be more appealing to offer these products in your existing market or go to a new market?"*
- Miguel: "As I have mentioned before, data protection rule applies to all European Union markets and it also applies overseas, which means in other jurisdictions that are not European union jurisdictions. But I would say that it'll be easier with that technology specifically to target market like Angola for example in which they don't have these very hard rules on data protection."

Stagnant Landscape Scenario:

Presentation of a draft version of the Ansoff Matrix and an overview of the scenario 4 dynamics to Miguel.

- Team*: "From the strategies proposed, which strategy do you consider to be the most appropriate for Paybyrd to adopt or execute?"*
- Miguel: "I agree with you on only two suitable strategies in this scenario, and in my opinion the first one would be again market penetration, as I fully agree that data

analytics would be one of the biggest differentiators, and then I would say market development."

- Team: *"How would you describe or envision the industry to be by 2033 at the European level considering this scenario?*
- Miguel: "As I have said before, the bigger you are, the easier you get customer and the easier it would be to acquire small companies, so I agree on the point that the industry would be highly concentrated in this scenario and only a few large companies would dominate the market."
- Team: *"Referring to the diversification of Paybyrds' data analytics capabilities, in this scenario, would it be more appealing to offer these products in your existing market or go to a new market?"*
- Miguel: "I think that data analytics capabilities would be one the greatest card we can throw. For example, if you are a hotel, you can take a look at the dashboard and see how many sales you have made, the payment methods that were used, the type of card that people are using. So, you can divide different areas of activity and you can control everything through our dashboard, in short, you control life."
- Team: *"Referring to the possibility of product differentiation, what are the data regulations surrounding the ability to combine or connect a consumer's payment data to analyze their behavior over time?"*
- Miguel: "No it is not possible because the cards are tokenized, which means that we Paybyrd, we don't have access to consumers' data, we just have access to the 4-digits, meaning we cannot track a specific consumer to analyze their behavior."

<u>Appendix 6:</u> Identification of a set of precursors supported by relevant indices and information.

Scenarios	Set of Precursors	Current Status
Digital Renaissance Scenario	Early Realization Phase for the digital euro	There is a significant growth in the number of businesses and services accepting digital currencies as a form of payment (Swift, 2023) Successful trials of CBDCs for cross-border transactions further underscore this development and suggest that the world is becoming more accepting and accommodating of digital currencies (Swift, 2023)
	Increasing number of cross-industry collaborations and partnerships in the blockchain space	The International Association for Trusted Blockchain Applications (INATBA), established in 2019, has grown to over 200 members from various industries working towards blockchain technology adoption and regulatory framework innovation (INATBA, 2023).
Patient Innovator	Expansion of government funding and grants offered to companies specialized in blockchain technology	Franklin Templeton, a leading global investment management organization, launched its money market fund on Polygon, a scalable blockchain platform compatible with Ethereum. This move signifies the growing recognition and adoption of blockchain technology in the financial industry as traditional institutions begin to explore its potential benefits and applications (BusinessWire, 2023).
	Growth in the number of projects carried out to explore new technologies	The 2022 EU Innovation Index reported a 45.59-point average across 27 nations, with Sweden leading with 61.6 points and Romania trailing with 34.1 points (The Global Economy, 2022).
Hindered Revolution	Rapid development in emerging technologies outpacing regulatory framework	In Europe considering the Global Innovation Index 2022 (GII), the top three performing countries were Switzerland, Sweden, and the UK. The GII reports that some performances exceeded the level of development, making it difficult for policymakers to monitor and regulate these developments (Dutta et al., 2023).
	Delayed realization phase of the Digital Euro	The complexities surrounding the realization of the Digital Euro, showcases the challenges stemming from ineffective policymaking. A range of concerns, including technical complexities, policy implications, and a fragmented decision-making process can delay the Digital Euro's launch (ECB, 2023)
Stagnant Landscape	No interest or viable reason to	The digital euro is not seen as a viable solution and is deemed to fail, plus public consultations

	invest in the Digital Euro	might yield low participation rates, reflecting disinterest or skepticism about the digital euro (Bofinger, 2022).
	Stagnation in blockchain development, with little to no cross-industry collaborations or partnerships	The integration of zkSync, a layer-2 Ethereum scaling solution, into the Particle Network exemplifies a collaboration aimed at enhancing capabilities and providing cost-effective solutions for users; however, slowed or inconsistent growth of such partnerships caused by the lack of support from regulators could create a less dynamic ecosystem (Chowdhury, 2023).