Linnæus University
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Master Thesis

Examining the adoption of blockchain technology in the diamond industry

Benefits and challenges of embracing disruptive innovation in conservative sectors

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Abstract

Industries with conservative mindsets are known for being reluctant toward adoption of new technologies and resistant to change. The diamond business is one of those examples that encounter challenges in implementing disruptive innovations like blockchain technology despite its potential benefits. The purpose of this thesis is to explore the antecedents influencing adoption of disruptive innovations in conservative industries, with a particular emphasis on benefits and challenges of embracing blockchain technology in the diamond industry. Employing a qualitative research approach, this thesis utilizes semi-structured interviews with the four industry experts from different companies. The empirical data is analyzed using the Technology Acceptance Model, the Innovation Diffusion Theory frameworks, and contextual data.

Findings reveal that most of the antecedents are not favorable to the adoption of disruptive innovations in traditional sectors. Competition was found to enhance the adoption process, while resistance to change, industry heritage, uncertainty, and dependency on industry leaders have unfavorable effects. Transparency, customer trust/pressure were found to have both positive and negative impacts. Findings show that benefits of blockchain technology implementation outweigh its challenges for the diamond industry, however, its observability, and complexity, hinder the adoption due to the fact blockchain is a relatively new technology that is still hard to grasp for most industry professionals. This thesis contributes to the body of knowledge by linking findings to the Technology Acceptance Model and Innovation Diffusion Theory frameworks, exploring deeply conservatism within industries, and identifying antecedents as obstacles and opportunities to widespread blockchain acceptance. Additionally, the researchers provide a solution for observability in the form of an in-depth marketing strategy, which aims at creating a differentiation between ‘blockchain diamonds’ and naturally mined diamonds.

Key words

Conservative sector, diamond industry, disruptive innovation, blockchain technology, technology acceptance

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Appendix 1. Interview guide.

List of Abbreviations

KPCS	Kimberley Process Certification Scheme
BT	Blockchain Technology
DLT	Distributed Ledger Technology
IDT	Innovation Diffusion Theory
TAM	Technology Acceptance Model
PoW	Proof of Work
PoS	Proof of Stake
DPoS	Delegated Proof of Stake
PBFT	Practical Byzantine Fault Tolerance
IoT	Internet of Things
AI	Artificial Intelligence
GIA	Gemological Institute of America

1 Introduction

This chapter provides an overview of the research topic, outlining the background and problem discussion. It follows by the establishment of the research purpose and research questions. Furthermore, a thesis outline is provided, summarizing the conducted research and outlining the content of the subsequent chapters.

1.1 Background

The degree of conservatism that exists within an industry is an element that may hinder the spread of innovation (Paljak, 2019). Traditional or conservative industries are often characterized by their lack of incentives to implement innovations. Such sectors often regroup incumbent companies that are risk-averse, non-innovative, reactive, and specialized in highly standardized goods (Jarrar and Smith, 2014). Companies in traditional sectors are typically those that use technology to a modest or limited extent and invest between 2 - 5 percent of their revenue in research & development (Ooi and Husted, 2021). Examples of conservative industries are banking and finance, education, healthcare, legal services, agriculture, diamond industry, etc. For instance, healthcare providers are frequently constrained by stringent laws and skeptical of new treatments and techniques. Education institutions might be slow to adopt new teaching strategies and technologies because they are rooted in tradition. The legal industry has a long history and a strong tradition, and it frequently favors precedent and established methods above creativity and experimentation (Grimsby, 2021; Tian, Vanderstraeten, Matthyssens, and Shen, 2021).

Innovation is viewed as expensive and harmful to production efficiency by conservative organizations and will only innovate when faced with significant competition or due to shifts in demand (Chenhall and Morris, 1995). Large firms are usually more conservative than small firms as they are more prone to get out of their comfort zone and innovate (Yu, Dai, Liu, and Yang, 2022). Similarly, Christensen (1999) depicted that established firms tend to develop sustaining

innovations that already serve a purpose to their customers, while smaller firms tend to be more entrepreneurial and design disruptive innovations. The following considerations suggest that disruptive innovations are thus more likely to be rejected by industries with a conservative mindset. Similarly, the literature suggests that incumbent companies with a strong heritage may disapprove innovations as they fall in a complicated dilemma where failing to adapt may incur severe consequences, but adapting could also harm their image (Larsen, Jong, Bendixen, and Juncker et al., 2018). As a result, heritage is a potential barrier towards innovation in the sense that it can limit the brands' ability to try new solutions (Aydın and Dimitrova, 2019). Put simply, innovation does not rhyme with establishment.

The terms ‘improvement’, ‘innovation’, and, to a lesser extent, ‘invention’ are frequently used interchangeably, despite the differences in what these terms indicate from a theoretical standpoint (Kogabayev and Maziliauskas, 2017). In this study, innovation is investigated from a technological perspective. Schumpeter (1982) presents innovation as the economic impact of technological progress, defined as the utilization of novel combinations of existing productive forces to address business challenges (Kogabayev and Maziliauskas, 2017). Rogers (2003) defines innovation as “an idea, practice, or undertaking that is seen as novel by a person or other unit of adoption.” (Sahin, 2006). Although the definitions provided above seem to portray innovation differently, both suggest that without adoption, innovation does not occur. Adoption and operationalization are distinguishing factors that separate inventions from innovations (Kogabayev and Maziliauskas, 2017). An invention may have been conceived a long time ago, but if people view it as new, it may still be considered an innovation.

According to Terry (2020), the term ‘disruptive innovation’ was first coined by Christensen (1997), who described the process through which a product or service gains a presence in basic applications at the bottom of a market, then aggressively rises, eventually eliminating established competitors. The concept of disruptive innovation can be distinguished by a lower level of performance

when it is first introduced, while still providing new features to the industry (Sandström, 2010). Consequently, disruptive innovations tend to flourish initially in low-end sectors or in new markets, and later invade the industry by introducing further utilities and even sometimes newer technologies (Ibid, 2010).

Disruption occurs for several reasons, including cost, quality, customers, laws, and available resources (Terry, 2020). A key driver for the manifestation of disruptive technology in today's world is data (Ajmal, Suresh and Wang, 2021). Extant literature suggests that Blockchain Technology (BT) will disrupt supply chain management in its entirety, by enhancing business processes related to accuracy of data, helping in the monitoring of product and service quality, bringing transparency and trust between each supply partner (Omotayo, 2021; Wang and Yang, 2022). BT is a Distributed Ledger Technology (DLT) in which data about each transaction is securely stored in ‘blocks’ that form a chain in a system (Holmberg and Quist, 2018). The word became prominent owing to its usage in Bitcoin, a cryptocurrency that uses BT to decentralize the transmission of transactions from one user to another in an open network (Dehghani et al., 2021). It has been urged in recent years to be employed in more sectors, particularly those with complex supply networks (Haskell, 2022). The features of BT provide security, efficiency, immutability and transparency of data for all stakeholders involved in the network (Orenge, 2018). The above characteristics of BT would disrupt industry’s supply chain not only from a B2B level, but also from a B2C and C2C perspective by providing traceability throughout the entire supply chain, optimizing information flow, and significantly decreasing operational costs (Queiroz, Telles and Bonilla, 2019).

Many industries would undoubtedly benefit from the implementation of BT, but its disruptive nature hinders incumbent companies from applying them into their processes, especially those from industries with conservative dynamics (Christensen, 1997). Over the last decades, global financial and economic instability, geopolitics, disruptive innovation, and, of course, shifting consumer views have all posed challenges to the diamond industry (Ivanov, 2019). The diamond industry is characterized as conservative due to the niched nature of the

goods sold and of the processes involved (ibid, 2019). The market on the procurement side is oligopolistic, with only a few incumbent companies that control most shares of the market: De Beers owns 27%, Alrosa - 27%, Rio Tinto owns 3% and 90% of the supply in pink diamonds (Boele, 2016; Statista, 2021). As a result, the industry is likely to be conservative given the fact that smaller firms do not prevail in this market.

In summary, conservative sectors usually have a risk-averse and tradition bound mindset that hinders them from implementing innovations (Paljak, 2019; Jarrar and Smith, 2014). Hence, disruptive technologies like blockchain may encounter greater resistance because of the infrastructural changes that would be required for a successful implementation. Although BT has the potential to transform supply chain management, its disruptive nature may make it difficult for established businesses in conservative industries to adopt it (Queiroz, Telles and Bonilla, 2019). Therefore, for firms to succeed in the contemporary business climate, tradition and innovation must coexist in harmony. When observing the characteristics of the diamond industry, the complex and standardized nature of the raw material, the oligopolistic nature of the market, high exposure to fraud and corruption are all factors that led the industry to be quoted as conservative.

1.2 Problem Discussion

Innovation is essential to keep up with the market's fast pace and fierce competition and a beneficial asset for economic growth (Wang, 2018). With the shifting trends of industry's processes, technology plays a key role in company innovation (Kogabayev and Maziliauskas, 2017). Technology enables organizations to transition from conventional modes of operation and management, such as manual labor, to modern, technology-oriented modes of operation and management (Gherardo Villa, 2018). The transition from conventional to technological methods is referred to as digital transformation or disruption (Gaile Dagan et al., 2021).

Disruptive innovation is a word that has gained significance in today's business world since it creates several chances for the creation of new goods and services (Terry, 2020). Nonetheless, there has been a lot of resistance to the acceptance of disruptive innovation in conservative businesses, which has slowed adoption and made it harder for these sectors to compete in the global market (A. Rarick and Angriawan, 2017). Resistance to change is one of the main obstacles faced in conservative sectors, which hinders the implementation of disruptive innovation. Contrary to more dynamic sectors, conservative industries frequently have long-standing established business procedures and are hesitant to adopt new technologies. Old-fashioned sectors may also tend to avoid risk and stick to traditional methods rather than taking a chance on new concepts (Paljak, 2019).

Most industries will eventually have to adjust their process due to shifting market trends. Rogers (2010) argues that an innovation will be accepted by individuals or society if it provides a more cost-effective and faster alternative compared to existing innovations, known as relative advantage. Therefore, it is expected that if a new technology offers a greater relative advantage, it will increase the likelihood of its adoption. The way adoption occurs is determined by both the players' initial strategy, their aims and the industry's dynamics (Karagozoglu, 1988). The potential for technological advancements to upset the operations of existing organizations can hinder the adoption of new technology (Sandström, 2010).

The difficulty of accepting new technology inside conservative sectors is a significant barrier to disruptive innovation adoption (Paljak, 2019). To ensure that the innovation is implemented evenly, standardization is frequently required, necessitating a collaborative partnership from all industry stakeholders (Karagozoglu, 1988). This can be especially difficult in markets with fierce competition and participants who may not be willing to work together. Overall, careful planning, coordination, and willingness from all players to cooperate towards a common objective are necessary for the successful acceptance of disruptive innovations in conservative industries (Paljak, 2019).

The integration of new technologies in conservative industries can be especially complicated due to a variety of factors. For instance, traditional businesses often have intricate supply chains or production procedures, which can make the integration of new technology a time and money consuming process, due to compatibility constraints (Paljak, 2019). Even when businesses are aware of the benefits and drawbacks of new technology, uncertainty can often be a major barrier to adoption (Sahin, 2006). As a result, even if an innovation contributes to the development of an industry, its adoption rate may not immediately spike, regardless of the value they might bring to the table (Halila, 2007).

With the enormous time and resource commitment necessary to integrate new technology, it is not unusual that adopters are hesitant as they are faced with a complicated and difficult decision-making process (Karagozoglu, 1988). Adopters should not only consider the possible benefits and challenges of accepting new technologies, but they must also determine in what shape and to what degree it should be applied (Gherardo Villa, 2018). It must be determined how the new technology will affect business activities and how it will fit into the broader company plan (Sahin, 2006). Moreover, adopters must consider any potential obstacles or issues that may occur throughout the implementation process, as well as the expenses connected with application of the technology (Halila, 2007).

The impact of BT on the transaction and the measurement of ‘supply’ and ‘demand’ is drastic and disruptive while also broadening the competitive landscape for both new entrants and incumbents, especially in the financial sector. BT is also characterized as disruptive in the way it changes how things are handled in most industries (MIT MSR Strategy Forum, 2022). However, while BT may provide huge benefits to numerous industries, its practical application remains at its infancy, and thus hard to assess the disruptiveness of the technology at this stage, which is also dependent on the ways incumbent organizations view BT (Queiroz et al., 2019; Wang and Yang, 2022; MIT MSR Strategy Forum, 2022). Nonetheless, despite the existing challenges, adopting disruptive innovations can considerably aid conservative sectors. For instance,

new technologies like BT can boost these sectors' competitiveness in the global market through efficiency improvements, cost reductions and by becoming more consumer oriented (Queiroz et al., 2019; Terry, 2020). Disruptive innovation can also assist conservative sectors in addressing societal issues, like lowering their environmental effect or enhancing social responsibility (Paljak, 2019).

Considering the insights presented in this chapter, researchers have identified a gap when it comes to examining the deployment of disruptive innovations in traditionally conservative industries. Furthermore, while there is a growing volume of material on the adoption of BT, there is a lack of in-depth analyses of how it could be efficiently diffused in all areas of an industry (Queiroz et al., 2019). In addition, the literature on BT implementation tends to focus solely on the advantages of the technology but fails to offer a clear roadmap for how it should be introduced based on its challenges (Ibid, 2019). This leaves many organizations with the difficult dilemma of figuring out how to integrate BT into their operations while simultaneously mitigating any possible disruptions the innovative shift may bring.

1.3 Research Purpose

The aim of this research is to explore how disruptive innovations are adopted in the conservative industries and what factors can influence the adoption process. Additionally, this thesis focuses on exploring the obstacles and opportunities of the implementation of BT in the industries with the conservative mindset as well as how BT may be strategically implemented in the diamond industry, considering the unique characteristics and requirements of this sector.

This study contributes to understanding the advantages and obstacles of integrating new technologies in conservative industries. As the concept of innovation disruption has not been extensively examined in such industries, this research focuses on exploring this area, along with investigating methods to accelerate the adoption of new technologies through manipulating the diffusion of innovation. Additionally, this thesis provides actionable recommendations for

managers in the diamond industry and other traditional industries to understand how BT can be integrated.

1.4 Research Questions

1. What antecedents play in favor of a company's acceptance of disruptive innovations in a conservative industry? What factors do not play in favor?

2. What are the benefits and challenges of the implementation of Blockchain Technology within the Diamond Industry?

1.5 Thesis Outline

Chapter 1, Introduction: gives an overall context for the area it seeks to investigate. The research gap is highlighted, along with the gap in the literature that needs more research. The research purpose and research questions are also outlined to emphasize the importance of the study's execution to the reader. Additionally, theoretical and practical contributions of this research are presented.

Chapter 2, Theoretical Background: presents the literature and existing frameworks which are applied for the analysis of the empirical data.

Chapter 3, Methodology: describes the selected method for the data collection as well as research philosophy, strategy, design, research methods, and, finally, ethical considerations. This chapter also gives an overview of the chosen sample for the thesis.

Chapter 4, Contextual Background: provides a thorough overview of the chosen industry, emphasizing its special characteristics and features that are relevant to the thesis. Information provided in this section is also utilized in the data analysis chapter.

Chapter 5, Empirical findings: presents results that have been collected from conducting semi-structured interviews.

Chapter 6, Data Analysis: outlines the empirical findings which are analyzed with the use of theoretical framework and contextual background. In this chapter insightful and unique viewpoints are offered to the reader in order to comprehend the findings in the context of the study.

Chapter 7, Solution: presents the result of the thesis which comes in the form of tangible recommendations and instructions for the companies. This chapter also includes managerial implications.

Chapter 8, Conclusions: provides a discussion and summarizes the analysis of data. This chapter also outlines the theoretical contribution of the thesis, its limitations, delimitations and recommendations for the future research.

2 Theoretical Background

This chapter gives an overview of the existing literature on the key concepts used to create the theoretical foundation for this thesis. The theoretical background starts with explaining the nature of disruptive innovation, how it impacts businesses and what role it plays in the conservative industry such as the diamond sector. Furthermore, Rogers' Theory of Diffusion of Innovations is discussed which emphasizes the perceived attributes of innovation that influence the speed of new technology adoption by the companies. Additionally, The Technology Acceptance Model is also explored. Both models offer a more thorough knowledge of the innovation's characteristics and the antecedents impacting its adoption, which will be used as a theoretical basis for answering the research questions of this thesis. Additionally, this chapter explores the nature of the conservative industries and how innovation is being perceived in such sectors. Finally, to help the reader to understand BT and its implications, a detailed discussion of its characteristics, benefits and challenges are presented.

2.1 Disruptive Innovations

Christensen (1997), Christensen and Raynor (2003), Christensen et al. (2010) define a disruptive innovation as a new product that first performs poorly in the key performance dimension valued by the previous product's target audience. Alternatively, it might show higher performance in a different area, opening a brand-new market or improving usability and affordability. The disruptive innovation eventually performs better in the primary dimension and starts to appeal to the same mainstream clients who initially turned it down. The concept of disruptive innovation, which is widely attributed to Clay Christensen (Bower & Christensen, 1995; Christensen, 1997; Christensen, Raynor & McDonald, 2015), describes how new competitors might leverage cutting-edge technology to disrupt an established market by fulfilling unmet needs or offering better features at a lower price. When both of the following conditions are met, market disruption will occur: first, the new product must outperform the present product in its core attributes; and second, there must be an incentive gap between the

currently successful firm and the potential disruptive business (Yu and Hang, 2010). Disruptive innovation, however, does not necessarily imply that new or emerging businesses will displace established or traditional ones (Yu and Hang, 2010). Schmidt and Druehl (2008) suggest that well-established industries with cutting-edge technologies might still prosper by concentrating on satisfying the needs of their most demanding but less price-sensitive clients. Hence, the authors conclude that a disruptive development could ultimately have a big impact on an existing market without fully replacing it (Schmidt and Druehl, 2008).

The diamond industry, which has been in existence for a long time, is vulnerable to disruptive innovation (De Keyser *et al.*, 2022). This is particularly relevant for the millennial market, which places a higher priority on social problems, price, and business's transparency than it does on brand loyalty (A. Rarick and Angriawan, 2017). The established framework of the diamond industry can be seriously threatened by new entrants that provide "good enough" items at lower prices (Ivanov, 2019). Taking into consideration the conservative approach of some businesses, there are several ways to deal with the disruptive developments in the market. According to Larsen et al. (2018), if a change will have a significant influence on the industry or would be disruptive, but the company cannot adopt the change because of its historical values, investing in change is the best course of action. Companies should incorporate the innovation, if the change has a significant impact on the industry and the company's heritage is compatible with the innovation (Larsen et al., 2018; Ivanov, 2019).

2.2 Attributes of Innovation

Rogers (1983) characterizes an innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption". Furthermore, he describes diffusion as "the communication of new ideas over time to the members within a social system" (Rogers, 1983). The Innovation Diffusion Theory (IDT) emphasizes two key parties in the diffusion process: the innovators (individuals or organizations supplying the innovation) and the potential adopters of the innovation. According to Rogers (2003), the speed at which adopters

embrace an innovation is determined by five specific factors: the perceived attributes of the innovation, the type of innovation-decision (voluntary, collective or mandatory), the social system in which adopters function, the communication channels utilized to spread the innovation (e.g. mass media or interpersonal communication), and the change agents whose objective is to guide adopters towards acceptance (Rogers, 2003).

It is crucial to consider a variety of different factors and how they are connected to better understand how innovation spreads. According to Rogers (2003), adoption is a decision of “full use of an innovation as the best course of action available” and rejection means “not to adopt an innovation” (p.177). Rogers (2003) identified five primary perceived attributes of innovation that account for around half of the variation in adoption rates of innovations. As a result, this study will use "innovation attributes" as one dimension in the theoretical framework. The perceived attributes of innovation consist of five elements such as relative advantage, compatibility, complexity, trial ability and observability (Wolverton et al., 2022), which will be described further in order to create a better understanding of the conservatism of the Diamond Industry and how innovation (BT) is being adopted within the sector. The perceived characteristics of the diffusion of innovation theory are shown in Figure 1, which was adapted for this study.

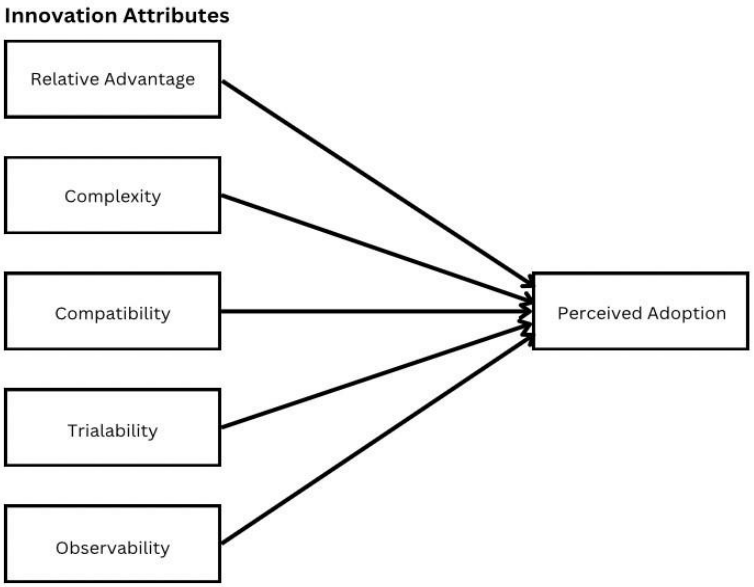

Figure 1. Perceived characteristics of the Innovation Diffusion Theory (Rogers, 2003; Mannan and Nordin, 2014)

Rogers (2003) defined relative advantage as "the degree to which an innovation is perceived as better than the idea it supersedes". Three criteria can be used to assess the relative advantage: convenience, economic aspects, and social prestige. According to Rogers (2003), the sub - dimensions of relative advantage are: economic profitability, low initial cost, a decrease in discomfort, social status, a saving of time and effort, and instant results. An idea might be overused because of a lack of knowledge. In this research, the relative advantage of BT is improving the traceability, security, trustworthiness, and transparency of data shared across a business network while generating new efficiencies that save costs (Drescher, 2017). Therefore, it is playing one of the crucial roles in forming the final degree of perceived adoption within the industry.

An innovation that aligns with the need of potential adopters, known as compatibility, can reduce uncertainties and encourage diffusion (Wolverton et al., 2022). The innovation must be able to meet the needs of the users. According to Rogers (2003), an innovation may not be compatible with a client's needs as well as with certain sociocultural values and beliefs. Adopters may misuse an

invention due to their perception that it is compatible with an earlier concept, which can result in over adoption or misadoption (Tanye, 2017).

According to Zhu and Andersen (2020), an innovation that is simple to understand, explain, use, and implement is more likely to generate interest in its diffusion. That is characterizing the next attribute - complexity. Therefore, for instance, the lack of popularity of BT among investors and fundraisers could potentially hinder its rate of diffusion due to its perceived complexity (Zhu and Andersen, 2020).

Trialability is defined as the degree to which it is possible to try out a new technology. An innovation is more likely to be accepted by the intended consumers if they can try it out extensively before making a final decision to adopt it (Lin, 2011). How frequently it is utilized has a big impact on how quickly innovations spread. Any innovation must be able to be tested to eliminate uncertainty. Innovations are quickly adopted if they are tried and tailored to the needs of the adopters (Tanye, 2017).

Observability refers to the degree to which the results of an innovation are visible and can be explained, which enhances its diffusion. Diffusion would be ensured if the advantages of the idea were clear to others (Tanye, 2017). According to Rogers (2003), there is a diffuser which can be defined as “someone who attracts an adopter of innovation”. Implementing a diffuser incentive program can make an innovation easier to observe. Additionally, according to Rogers (2010), innovations dominated by hardware tend to have faster diffusion than those dominated by software, which can be difficult to explain.

To conclude, the goal of Rogers' five attributes is to identify and clarify the underlying variables that affect how individuals or businesses accept new concepts and technology. These elements go beyond basic product marketing strategies and are necessary to support actual change. They aid in explaining why certain products disperse quickly while others do so slowly or not at all (Mannan and Nordin, 2014). The described above concepts are important for the

exploration of the adoption of BT in the diamond industry. Analyzing BT according to these criteria will help to identify the degree of adoption of such a disruptive technology within the conservative industry.

According to Zhang, Guo and Chen (2008) and Choe and Noh (2018), IDT and Technology Acceptance Model (TAM) share some important characteristics. There have been few studies that investigate the integration of innovation attributes with TAM. According to Hasani et al. (2017), both models emphasize the relevance of perceived usefulness and ease of use in determining user adoption of technology. Combining the IDT and the TAM can provide a more thorough understanding of the variables affecting the adoption and diffusion of new technology (Choe and Noh, 2018). TAM investigates the impact of individual beliefs and perceptions in technology adoption (Davis, 1985), in contrast to the IDT, which focuses on the qualities of the innovation itself and the many stages of adoption. Combining these two ideas can help researchers understand both the attributes of the innovation and the specific factors that affect adoption. This information can be useful for designing and putting into practice effective technology adoption strategies.

2.3 Technology Acceptance Model

TAM aims to forecast user acceptance of technology. Since Davis' initial 1985 proposal, it has undergone extensive research and is frequently used as a reference point (Charness and Boot, 2016). TAM, as defined by Davis (1985), is regarded one of the most prominent models in the subject of technology acceptance, with ‘perceived ease of use’ and ‘perceived usefulness’ being the two key criteria that influence an individual's desire to adopt new technology (Taherdoost, 2018) (see Figure 2).

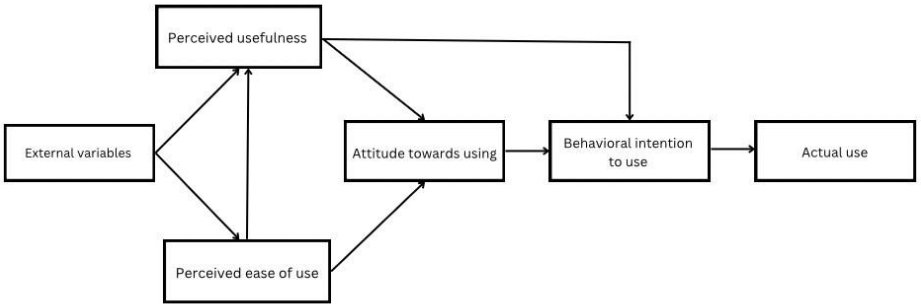

Figure 2. Technology Acceptance Model (Davis, 1985)

As mentioned previously, IDT and TAM share a few key elements. For instance, relative advantage, which in IDT refers to the idea or object being perceived as better than its predecessors, has a concept similar to perceived usefulness in TAM, according to Moore and Benbasat (1991). Furthermore, complexity, which measures how challenging it is to comprehend and apply a particular innovation in comparison to other innovations, is comparable to perceived usability in TAM (Oturakci, 2019).

There have been few studies that investigate the integration of innovation attributes with TAM. For example, Park and Chen (2007) developed a research model by incorporating the innovation attributes of observability, compatibility, and trialability into the original TAM model to investigate smartphone adoption decisions in the healthcare industry. Zhang et al. (2008) combined TAM and IDT to examine individual IT adoption behavior by incorporating relative advantage, trialability, and compatibility factors into a new research model. Additionally, five innovation characteristics were added to the TAM by Lee et al. (2005) to better understand how employees' intentions to use e-learning systems are influenced by various factors. Under their new paradigm, Kapoor et al. (2014) examined how interbank mobile payment service acceptance affected each of the five innovation features. However, Hasani et al. (2017) stated that more investigation is required to discover whether IDT and TAM can be successfully merged into a single model and to investigate the structure and operationalization of such a model.

As it can be observed from the review of literature, in the past years, many studies employed TAM as a research framework in combination with IDT. The above-mentioned works make the implication that there are certain overlaps and similarities between IDT and TAM but do not state whether they can be merged into a single paradigm. For instance, both models emphasize how user acceptance of technology is influenced by perceived usefulness and usability. However, according to Choe and Noh (2018), a more complete picture of the factors influencing the adoption and spread of new technology can be obtained by combining the IDT with the TAM. Researchers can better grasp both the characteristics of the innovation and the elements that influence adoption by combining these two concepts (Zhang, Guo and Chen, 2008).

Therefore, researchers decided to implement and observe both TAM and IDT in this research to make a meaningful theoretical and practical contribution, and to gain insights whether elements from these models affect the adoption of new technologies in the conservative industries.

2.4 Conservative Industries

This section discusses how market structure affects the perception of innovation. In firms with a conservative or traditional mindset, innovation occurs sporadically and are reluctantly adopted due to its disruptive tendency. According to the conservative approach, disruptive innovation only occurs when there are perceived pressures (Miller and Friesen, 1982; Terry, 2020). In contrast, entrepreneurial firms are more prone to implementing disruptive innovations, as they always seek competitive advantage and are ready to take any risks associated with it (Sevil Tülüce and Koç Yurtkur, 2015; Miller and Friesen, 1982). Conservative firms on the other hand, may blatantly resist the adoption of innovation, to the point where they actively exert influence to reject the latter (Hietschold, Reinhardt and Gurtner, 2020). Interestingly, in a hostile environment, entrepreneurial firms are predicted to outperform conservative exporting firms, but conservative exporting firms outperform entrepreneurial firms in non-hostile environments with little technological push (Hosseini,

2013). Conservative firms often do not feel threatened by innovation since they are established and do not need to favor change to outcompete other firms, which particularly the case in oligopolistic market structures (Hosseini, 2013; Terry, 2020). Some circumstances like environmental challenges, competition, effective monitoring and oversight, the availability of resources and qualified technocrats, institutional devices, and decision-making processes suited to innovation initiatives may trigger innovation in a conservative model (Miller and Friesen, 2018).

2.4.1 The Concept of Industry Heritage

Generally, the word *heritage* refers to an inheritance - a legacy given from one generation to the next. Hence, it acts as a channel for prior historical values (Hakala, Lätti and Sandberg, 2011). Urde, Greyser, and Balmer (2007) noted that heritage brand/industry has several characteristics, which include track record, continuity, commitment to core values, historical relevance, and the use of symbolic elements. The existing literature highlights the information about heritage brands and their reaction to the new technology. There is, however, a lack of literature specifically on the industry heritage. To understand how innovation is perceived by companies with historical and enduring values, this chapter applies the learnings to the perspective of brand heritage.

Heritage brands are built on principles that cannot be substantially changed without negatively affecting the heritage and, in turn, the positioning/image of the business. As a result, certain businesses and sectors refrain from implementing innovations (Larsen et al., 2018). The history and tradition of the industry/brand are crucial components in obtaining maximum added value. According to Salzillo (2021) and Aydın and Dimitrova (2019), by raising a brand's perceived worth, the depth, authenticity, and credibility connected with its heritage can increase brand loyalty. Nonetheless, a company’s ability to embrace change and absorb new technology might occasionally be limited by its heritage values (Hakala, Lätti and Sandberg, 2011).

A historical brand or sector typically places a strong emphasis on credibility and trust. A brand runs the danger of losing credibility if it decides to forgo its history, which explains why they have conservative tendencies (Salzillo, 2021; Aydın and Dimitrova, 2019). Thus, for heritage brands and industries, long-term consistency and conserving brand credibility are essential components. Therefore, maintaining trust is a crucial component of managing such businesses (Hakala, Lätti and Sandberg, 2011). Nonetheless, a company's ability to adapt is also essential for preserving its relevance throughout time. In fact, to maintain consistency, a change may be essential occasionally. Innovation and industry adaptation that does not support the perception of the brand's heritage might undermine credibility (Larsen et al., 2018).

2.4.2 Industry Heritage and Innovations

Innovation represents a shift from the long-standing customs of industry's legacy. It frequently results from external factors with the aim of either responding to or influencing the market, such as shifting consumer trends, technical advancements, and other factors (A. Rarick and Angriawan 2017). Brand/industry heritage might be an obstacle to innovation. A brand's capacity to expand may be constrained if its heritage is too closely tied to historical events or core values (Larsen et al., 2018). Adopting new technologies that support the core principles of an industry with a rich history may be challenging. The heritage of the sector may be constrained by a specific set of values and leave little room for change (Larsen et al., 2018).

Certain innovations are resisted by some businesses, both internally and externally on the market. For instance, De Beers has long criticized lab-grown diamonds due to the potential damage they may represent to natural diamonds. Later, the corporation made the decision to add a class of lab-grown diamonds to its line of products (Sipe, 2022). Intentionally blocking innovation can limit market expansion to some degree. According to Larsen et al. (2018), while this approach may be effective in the short term, companies must also realize that if

the market continues to evolve against the brand's/industry's historical values, limiting innovation may not be a sustainable strategy.

2.5 Blockchain Technology

BT allows for the accurate recording of information about how a product or service is used, exchanged, and consumed. By using a distributed ledger, agents record, and store data within the blockchain. Typically, actors utilize distributed ledgers when they require a tool that facilitates synchronous alteration of a shared state while preserving its integrity (Rutland, 2017). The state of the ledger is decided by a consensus protocol that dictates the mechanics used to transact data from network to inputs (Ibid, 2017).

According to Drescher (2017), the ledger is managed cooperatively by all parties interested via a peer-to-peer network. The immutable nature of the data is the prime technological factor of BT that makes it innovative (Forsström, 2018). As data is added to the network, new blocks are created and chained together with a cryptographic hash function, leaving a digital fingerprint of the token's movement (see Figure 3). This addition of information makes BT relevant to supply chain management processes (Forsström, 2018). Thus, the existing literature suggests BT can theoretically prevent operational disruptions, lengthy tracing processes, and collaborative issues that might arise during disruptive supply chain crises (Gaur and Gaiha, 2020).

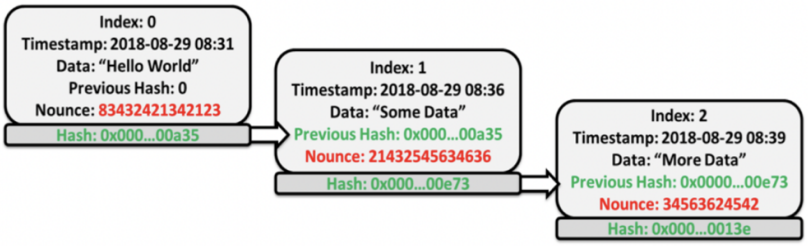

Figure 3. Overview of transactions in a blockchain (Forsström, 2018)

Additionally, rather than relying on a single third-party operator to validate transactions, the blockchain design enables secure validation of time-stamped transactions by other database users. The decentralized nature of BT, therefore,

promotes a transparent, collaborative, and ethically oriented industry by bringing trust amongst the players.

2.5.1 Architecture Distribution

A database may be deployed across several forms depending on its expected purpose. It is important to first understand that a blockchain may be a database, but the latter is not a Blockchain as they differ in the way they store and share data. In other words, BT should be seen as a method that manages data by structuring into blocks (Raj, 2023).

One of the most essential components of BT is the system's architecture or the technique by which all the nodes are organized and interconnected (Drescher, 2017). A blockchain based database may come in a centralized, decentralized and distributed form (Holmberg and Åquist, 2019). In centralized systems, the ledger falls under the monitoring of a central authority. All the nodes interact with only one central player who has the role of validator for all the transactions performed within the blockchain (Drescher, 2017). Only legitimate and reputable validators are permitted to contribute to the ledger.

As the identities of the participants are known, their transactions may be audited and their activities verified (Rutland, 2017). Thus, in contrast to a centralized system, security is the greatest obstacle for any decentralized system (WisdomTree, 2021). A decentralized system spreads tasks across multiple databases as opposed to the reliance of only one centralized server. All member nodes agree on the ledger's content via a consensus protocol (Holmberg and Åquist, 2019). A distributed system is characterized by several data copies held by multiple network nodes (Ibid, 2019). While a decentralized and distributed system sound similar, the difference between them is distinct. A distributed ledger just permits the sharing of data to all nodes, including those that do not monitor the server. A decentralized system on the other hand gives nodes more control over the server (Rutland, 2017). For instance, the system may come under a hybrid form, with both a centralized and a distributed architecture for the

transmission of necessary data to the central server while still enabling the division of tasks (Drescher, 2017).

2.5.2 Consensus Protocol

A consensus mechanism takes the form of an algorithm that authorizes the input of data onto a decentralized ledger while rejecting any false or fraudulent entries (WisdomTree, 2021). Traditionally, conventional system architectures do not have to bother with consensus due to the existence of a central server that interacts with all the nodes. Contrariwise, in a distributed network like blockchain, each node is both a host and a server who must follow a protocol to exchange data with other nodes in order to attain consensus. A reliable consensus protocol can ensure the fault tolerance and safety of a blockchain by minimizing the impact of inactive or malicious nodes. The consensus protocols now utilized in the majority of blockchain systems fall into two broad categories: probabilistic-finality protocols and absolute-finality protocols (Zhang and Lee, 2019).

Finality here refers to the immutability of BT, as once a block is created and validated, this block can never be reverted. Probabilistic finality protocols consider the likelihood of the block is not reverted. This finality is chain-based, as the likelihood for the block to be added increases based on the depth of its chain. The longer the chain, the more nodes will follow that block. As a result, the data input may not necessarily be finalized immediately. In contrast, the absolute-finality protocol finalizes the transaction almost as soon as it is added in a block. (Oba, 2022)

There are a myriad of consensus protocols (Lashkari and Musilek, 2021). The following sections will present the ones that are the most explored by the existing research include Proof of Work (PoW), Proof of Stake (PoS), Delegated Proof of Stake (DPoS) and Practical Byzantine Fault Tolerance. PoW is a probabilistic-finality form of consensus protocol utilized by networks such as Bitcoin. The finality achieved through PoW is an energy-intensive procedure that is achieved through “mining” (Holmberg and Åquist, 2019). In order to produce

a new block, participating nodes compete to solve a cryptographic puzzle. The first node to solve the problem is given the right to construct a new block (Zhang and Lee, 2019). In the PoS system, the node is not chosen based on its computational power, but rather based on its stakes, meaning the likelihood of being the only validator to generate and validate a block is proportional to the number of stakes it possesses (Holmberg and Åquist, 2019). A wallet's stake is its size relative to the value of the network. In a DPoS, the nodes hold voting stakes to elect block creators (Zhang and Lee, 2019). Finally, the PBFT in contrast to the previous mechanisms is an absolute-finite consensus protocol (Ibid, 2019). It solves the Byzantine faults of DLT's by operating securely despite the presence of inactive or malicious nodes (Holmberg and Åquist, 2019; Lashkari and Musilek, 2021).

2.5.3 Smart Contracts

A smart contract can be described as a software with a set of rules that automatically engages a particular function when a predetermined event occurs, removing the need for both parties to trust each other (Holmberg and Åquist, 2019). Their flexibility makes them useful to enhance the management of real-world arrangements, including recurring rent payments, borrowing money and paying it back, arranging and settling complicated bets, and providing insurance (Drescher, 2017). By requiring less human intervention to administer a contract, smart contracts can increase confidence and viability between trading partners while decreasing cost (Holmberg and Åquist, 2019).

2.5.4 Accessibility

One of the conflicting concepts regarding BT is its conflicting approach between transparency and privacy (Drescher, 2017). While its utility is to provide a distributed ledger for all nodes to consult, the blockchain may grant different levels of accessibility (Holmberg and Åquist, 2019). Assessing the type of Blockchain is necessary to implement a coherent consensus protocol that corresponds to the application scenario (Zhang and Lee, 2019). A private blockchain rather has a centralized distribution and only grants access to a few

selected nodes (Ibid, 2019). This type of blockchain provides numerous advantages regarding security, privacy and finality (Buterin, 2015). On the other hand, a public blockchain is rather decentralized, and allows access to all nodes including inactive and malicious ones (Drescher, 2017). Finally, consortium models are a hybrid of both public and private (Holmberg and Åquist, 2019). Thus, this type of blockchain can be considered as partially decentralized (Buterin, 2015).

2.6 Benefits and Challenges of BT

The implementation of BT within industries' supply chains has been considered as highly promising in reducing product development times and increase traceability through real time data visibility of products and raw materials, which could help in reducing cost of productions (Omotayo, 2021; Holmberg and Åquist, 2019; Gaur and Gaiha, 2020). This is thanks to the fact that BT assigns to all assets such as units of inventory, orders, loans, and invoices unique IDs and keeps a record of it in the ledger. To sign the blocks, they add to the blockchain, participants are also given distinctive IDs which serve as a digital print of the node's activities (Gaur and Gaiha, 2020). By doing so, BT registers a detailed record of each step of the transaction as the token is transferred from one supply partner to the other.

Furthermore, the transparency and immutability of the data inserted also enables stakeholders to trust the information shared by the other users, preventing the dissimulation of forged documents and goods, fraud, counterfeit, and other forms of illegal manipulations that may affect the integrity of a supply chain (Holmberg and Åquist, 2019; Queiroz, Telles and Bonilla, 2019). Moreover, the application of smart contracts ensures that the information flows smoothly along the supply chain without the intervention of a third-party operator, providing an additional layer of trust to a network, as they can be programmed to evaluate a transaction's state and execute predetermined actions including releasing payments, recording ledger entries, and eventually highlight interactions that require manual intervention (Gaur and Gaiha, 2020; Drescher, 2017). Thus, BT

can to a certain extent provide automation, but would require the integration of Internet of Things (IoT) and Artificial Intelligence (AI) to extend this benefit to its fullest potential (Omotayo, 2021). As a result, another benefit of BT is its ability to improve electronic data interchange, allowing supply chain partners to work more collaboratively to enhance customer satisfaction and manage disruptions more efficiently (Omotayo, 2021).

On the other hand, the existing literature suggests that BT is still in its infancy and immature due to its scalability weaknesses in terms of security, latency, and capacity (Holmberg and Åquist, 2019; Forsström, 2018; Wang and Yang, 2022). Also coined the scalability trilemma, the framework suggests that each gain in one of the three factors (scalability, security, or decentralization) has a detrimental impact on at least one of the other two factors (Monte, Pennino and Dept, 2020). In addition, BT requires a specific IT backbone in the supply chain, such as internet connectivity, which may be problematic for some remote suppliers of raw materials (Holmberg and Åquist, 2019). This hinders adoption due to a lack of compatibility throughout the supply chain (Wang and Yang, 2022).

As a result, adoption, integration and consensus are the challenges of BT. All parties must agree for the blockchain to function properly, which can be challenging to manage. Not only must supply chain participants agree on a single solution, but sometimes many supplier partners are situated in developing nations with fewer resources (Holmberg and Åquist, 2019). Thus, this suggests that companies need to play the role of digital leadership, but this is a challenging step to take given the disruptive nature of the technology (Wang and Yang, 2022). Additionally, even if the network entails only a few nodes in a decentralized system, the network gets vulnerable to hackers who can target members through Sybil Attacks (Holmberg and Åquist, 2019; Monte *et al.*, 2020). Another challenge of decentralized networks is energy consumption, which is dependent on the consensus protocol that is utilized. For instance, PoW with its mining process requires much more power in comparison to PoS or PBFT (Holmberg and Åquist, 2019; Zhang and Lee, 2019). On the other hand,

this is also the mechanism that allows the highest fault tolerance, meaning that it is more secure against attackers since it requires huge computational power (Zhang and Lee, 2019). Another obstacle to the wide implementation of the technology within industry is the absence of standards for the use of BT (Omotayo, 2021). Stakeholders are also not convinced of the technology's benefits and unwilling to disclose confidential information with potential rivals, showing that most industries are still not fully inclined to opt for fully integrated supply chains (Omotayo, 2021; Jansson and Petersen, 2017).

2.7 Theoretical Synthesis

To address the research questions, the thesis relies on several theories. The theory of Disruptive Innovation is applied to comprehend how cutting-edge technologies, like BT, can upend the conventional ways of doing business in a conservative sector like the diamond industry. The Attributes of Innovation model, as part of the IDT model, is used to examine the adoption of BT in the diamond industry. The five innovation attributes such as relative advantage, compatibility, complexity, trialability, and observability will be evaluated to determine the extent of possible BT adoption within the conservative industry as well as to identify challenges and benefits of BT implementation.

Next, the TAM model is applied to investigate the participants' beliefs and perceptions around the adoption of innovation. TAM assists in making it easier to comprehend the variables that affect people's choices to use or reject disruptive technologies in the diamond industry.

The concept of conservative industries is used to understand the dynamics of the diamond industry and the difficulties the sector encounters in implementing new technologies. This helps researchers to see why the market has been slow to integrate disruptive technologies like Blockchain.

The theoretical background of BT is used to determine the advantages and difficulties of this technology from a holistic aspect. This made it easier to grasp both the potential benefits that BT might have for industries, such as increased

transparency and efficiency, as well as the obstacles that need to be addressed, such as regulatory concerns, the requirement for new business models, etc.

In conclusion, the analysis of the thesis will combine several theoretical frameworks to answer the two research questions. With the aid of the theories, it will be possible to investigate the antecedents influencing the innovation adoption in conservative industries, the advantages and drawbacks of BT, and the elements that have favorable and unfavorable effects on the adoption of disruptive innovations in the diamond industry.

3 Methodology

The following chapter will present the method that was applied to analyze the data gathered for this research. To do so, the authors will discuss the different research designs available in the existing literature and describe the philosophy, the approach, the research method as well as the research strategy. In summary, this study has opted for an interpretivist philosophy, an abductive approach along with a qualitative method of data collection by using semi-structured interviews. Additionally, this chapter will also argue for why the following research design was applied for this study. The researchers inspired themselves with the Saunders research onion (Saunders *et al.,* 2012) due to its exhaustive and highly descriptive approach, providing the ability for researchers to present their research design in an organized manner (Melnikovas, 2018).

3.1 Research Philosophy and Assumptions

A research philosophy is an all-encompassing phrase that refers to the development and characteristics of the knowledge that is gathered (Saunders *et al.,* 2012). As the study proceeds, authors will recurrently make assumptions out of the knowledge gathered and shape one's understanding of how the research question was problematized, ultimately also affecting the way data is interpreted (Ibid, 2012). It is however important to assert that the focal purpose of this discussion is not solely centered around the degree to which the research is philosophically up to date but should also holistically acknowledge how each philosophical view may change the researcher's interpretation of the findings (Aresi, 2017). Throughout the process, researchers will base their assumptions from an ontological (assumptions based on the nature of reality), epistemological (assumptions based on knowledge) and axiological assumptions (assumptions based on values and ethics). The following assumptions will be described further in the following sections.

Ontological assumption

Ontology studies the nature of reality and calls the researchers to question their assumptions about how the world works, and their adherence to a particular point of view (Saunders *et al.,* 2012). An ontological assumption can be described from two aspects; objectivism which posits that there is an objective reality that is independent of individual opinions or cultural norms (Melnikovas, 2018). The second part, subjectivism, asserts that social phenomena are generated by the ethical values and actions of impacted social actors (Saunders *et al.,* 2012). Since it is assumed that there are a multitude of realities and understanding of technologies which are dependent on experiences and interactions within the industry, this research rather opted for a subjectivist research theory (Creswell, 2013). This study explores the acceptance of technologies in the industry and takes a closer glimpse into the adoption of BT in the industry. It is important to outline that the researchers as well as the interviewers have perspectives and opinions that are in constant state of revision (Saunders *et al.,* 2012). This research assumes that meanings and perceptions are diverse. As a result, the researchers are rather looking for complex views rather than funneling meanings into specific categories and ideas (Creswell, 2013).

Epistemological assumption

This assumption focuses on what is acceptable knowledge (Saunders *et al.,* 2012). When performing such research, epistemology questions the relationship between the topic and the researcher's understanding of the topic. Furthermore, since this study is qualitative, it is considered crucial to gain knowledge from participants who actively work in the field simply because knowledge is gained based on subjective experience and compiled based on individual perspectives (Creswell, 2013). The stance of the researcher’s perception of epistemology can take several philosophical forms which include positivism, realism, interpretivism. The following research adopts an interpretivist philosophy, since the researchers are putting an emphasis on the way experience may shape their perception of the technology (Saunders et al., 2019). Understanding people and how they interpret their environment is a focus of interpretivism (Saunders *et al.,* 2012). When using this philosophy, an effort is made to "get inside the heads of

the subjects being studied", so to speak, to comprehend and interpret what the respondent is experiencing or the meaning the subject is assigning to the situation (Kivunja and Kuyini, 2017).

Axiological assumption

Axiology delves into questions related to values, beliefs and research ethics and the roles they play at each step of the research (Melnikovas, 2018). The researchers display axiological skills by "positioning themselves" and concisely present their values and biases when it comes to decision making, and how the research is to be conducted (Saunders et al., 2019; Creswell, 2013). It is important to recognize that some influence is however inescapable when engaging with participants and questioning them about their experiences. It is thus important to maintain a detached, objective, and impartial posture during the entire study. (Saunders et al., 2019). Thus, to showcase consideration towards the concept of axiology, the researcher will freely explain the values that form the subject matter and offer their personal perspective alongside participant opinions (Creswell, 2013).

3.2 Research Approach

A research approach is often used to explain how the theories were applied and tested. Traditionally, researchers either opt for an inductive or a deductive approach. Deductive reasoning is often applied when the research strategy is designed around a specific theory (Creswell, 2013). Contrariwise, an inductive approach starts off by collecting data and interpreting it to build a new theory based on the findings. Finally, an abductive technique can also be utilized, which means that data is collected to investigate a phenomenon, find themes, and explain patterns to produce a new or change an existing theory, which is in return tested through more data gathering (Saunders *et al.,* 2012).

The purpose of this research is two folded. While the authors investigate technology acceptance in the diamond industry through TAM, the study also explores the benefits and challenges of BT through IDT. The research was constructed based on already-existing theories that have been previously used by

several researchers to assess the conservativeness of industries (Paljak, 2019). The researchers seek to evaluate the adoption of BT from a technical perspective along with the behavioral attitude of the diamond industry towards new technologies. This configuration also makes it an interesting case that allows to conduct research that seeks to refine the existing theories and develop new constructs or attributes. As a result, the approach adopted by the researchers in that case is abductive.

3.3 Research Method

The following research aims at collecting insights from industry professionals about their perception of technology acceptance as well as the benefits and challenges of implementing BT in the diamond industry. Since it relies on subjective experience, the paper intends to opt for a qualitative method of research. Qualitative research was also chosen because the topic that is studied requires a complex and an in-depth comprehension of the diamond industry's dynamics (Creswell, 2013). Such details can only be gathered by letting industry players tell their own story to discover additional findings that may not be found in the existing literature. This study could have applied a mix of qualitative and quantitative methods. However, since the paper focuses extensively on technology acceptance based on subjective experience, the researchers feared that a quantitative approach could have added complexity to the study, while not necessarily capturing the problem that is examined (Creswell, 2013). Furthermore, the subject of technology adoption is broad and changes depending on the context of the study (Paljak, 2019). Hence, this necessitates a qualitative technique to obtain an advanced degree of understanding (Ibid, 2019). Furthermore, if the theories exist for certain populations and samples, or that they may potentially not fully represent the complexity of the subject that is investigated, qualitative methods are also preferred (Creswell, 2013). Within each session, the topics revolved around conservatism in the diamond industry, the benefits, and challenges of BT as well as how it should be implemented to accelerate diffusion. This study employed both existing theoretical frameworks

for analysis but also seeks to contribute with additional empirical data to refine existing hypotheses or potentially create new ones.

3.3.1 Semi-Structured Interviews

Semi-structured interviews are particularly suitable for examining individuals' opinions and attitudes on complex and delicate themes, as they enable in-depth questioning and the development of responses (Jamshed, 2014). Hence, semi-structured interviews, compared to structured interviews, which are limited to a predetermined set of questions and have a more formal structure, offer greater adaptability in the way the questions are asked, allowing for a more in-depth examination of the participants' responses (Barriball and While, 1994). Moreover, to establish a deeper understanding of their perception of technology acceptance along with the benefits and challenges of BT, a narrative inquiry was built around each of the interviewees, as this method usually allows to shed light on the identities of individuals and how they perceive themselves (Creswell, 2013). This section is particularly useful to subjectively assess the respondents' acceptance of technology. Finally, the interviews were undertaken cross-sectionally since the study explored the acceptance and the adoption of technologies at a particular moment in time (Saunders, Lewis and Thornhill, 2012).

3.4 Data Collection

This section guides the data collection process and provides the information about the interview guide which was specifically designed for this thesis and the sampling strategy that the researchers utilized to employ the participants.

3.4.1 Interview Guide

The interview guide utilized for the interviews consisted of 35 questions and each session lasted from 50 to 60 minutes (see Appendix 1). Each interview first introduced the entrepreneurs' professional histories, current positions, their career trajectories, and their current perception of technology adoption within the industry. This allowed the researchers to better understand the stakeholders'

background within the diamond industry and to prepare a more detailed narrative behind each participant. In the second section of the interview, the researchers applied the constructs present in the TAM, such as perceived ease of use, perceived usefulness, attitude towards using, behavioral intention to use and actual use. This was particularly beneficial in determining the conservativeness of the industry. The third section delves deeper into BT and applies the five attributes of innovation to discuss its implementation in the diamond industry, as well as observes the benefits and challenges of BT in the industry. Those questions aimed at understanding how the technology could enhance the sector, and what challenges its implementation entails. Since the semi-structured interview finds a balance between rigidity and openness, it enabled the researchers to introduce new questions and allowed them to freely deviate from the topic when the participants pertained to a specific theme (Jamshed, 2014). The fact that the conversations were not constricted to a particular plan also helped the researchers receive an exhaustive range of insights.

3.4.2 Sampling

The diamond industry is characterized by it being a closed and exclusive circle, with a limited number of players controlling most of the market (A. Rarick and Angriawan, 2017; Boele, 2016). Additionally, most of the people involved in the diamond business are not easily willing to take part in the interview and talk about the challenges within the industry. Because of these reasons, it is complicated to get inside this circle. Nonetheless, as soon as the authors managed to get in touch with one participant, the following respondent was effective in spreading the word which allowed the researchers to gather more participants. Thus, the researchers utilized a snowball sampling technique to assemble a group of entrepreneurs who were willing to take part in the study (Creswell, 2013). Moreover, since the participants were all located in different geographical areas, all interviews were undertaken via online video call.

Given the limited number of potential participants, it was deemed important to select stakeholders within the same branch to guarantee that the data gathered

would be relevant and comparable. Moreover, due to this limitation, the chosen sample was restricted to people who are involved in the trading of polished diamonds because this is the most common type of diamond traded in the industry. Furthermore, another specificity was that all the participants had to be CEOs of their diamond trading company. This restriction was required to make sure that the participants had a thorough understanding of the diamond industry and could give accurate and detailed information on its dynamics. It was also deemed important that they had an executive role due to the small sample size. Six people were contacted in total, of which two preferred not to participate in the study, resulting in four conducted interviews.

To get a clearer understanding of the samples' background for the reader, the researchers included data such as position within the company, company size and main activity, the geographical location, and the respondents' working experience (see Table 1). Additionally, a fictional name was given to each respondent in order to make the sample 'livelier', while still respecting their request on remaining anonymous. An overview of the participants and their background is presented below in Table 1.

Table 1: Overview Participants

Fictional Name	**Company number**	**Position in the company**	**Working experience (years)**	**Company Size (people)**	**Geographical location**	**Company's main activity**
Mikhael	A	CEO	30	1-25	Monaco	Jewellery wholesale and diamond trading
Chris	B	CEO	More than 15	1-25	Antwerp and Torino	Jewellery and diamond trading
John	C	CEO	10	1-25	Geneva and Monaco	Diamond trading

Dave	D	CEO	More than 15	50-75	Geneva	Diamond manufacturing, trading, and jewellery making.

This presented table aimed at helping the reader to get a more complete understanding of the respondents' experience in the diamond industry.

3.5 Data Analysis Method

This section will explore fundamental concepts and approaches used in data analysis to uncover patterns, relationships and trends within the data. The researchers will also delve deeper into the tools that were used to enhance the data analysis process effectively.

3.5.1 Data Preparation

The researchers believe it is important to conduct the interviews in a language the participants are comfortable to speak in. The linguistic differences between each participant required the researchers to translate some of the transcripts to English. The translation was performed by using an AI chatbot ChatGPT. The conversations were both transcribed during and after the sessions by the researchers with the help of ChatGPT. Additionally, to avoid potential misunderstandings of the concepts discussed during the interviews, the transcripts were sent to the respondents to ensure that all the relevant concepts are well transcribed. This process also allows the researchers to elaborate on the findings even after the interviews were conducted.

3.5.2 Thematic Analysis

A thematic analysis was chosen which entails the process of looking at an entire text as a potential unit of study and from which codes and themes are extracted (Braun et al., 2019). Thematic analysis is a highly adaptable technique that can be tailored to the unique requirements of a research, while providing a detailed yet complex explanation of a dataset. This approach is particularly helpful for

exploring the views of research participants, detecting parallels or contrasts, and revealing unexpected insights, according to Braun & Clarke (2006) and King (2004). Moreover, thematic analysis can assist in providing a concise and well-organized final report by summarizing important aspects of a vast data collection (King, 2004). In contrast to other qualitative research techniques like grounded theory, ethnography, and phenomenology, this strategy has drawbacks as well. For instance, the lack of comprehensive thematic analysis literature may make it difficult for inexperienced researchers to conduct a thorough analysis. Also, because thematic analysis is flexible, this may result in inconsistent and disconnected theme development (Nowell et al., 2017).

According to Saunders et al. (2019), there are four steps that need to be followed when utilizing thematic analysis, these are: familiarizing yourself with the data, coding the data, searching for themes and recognizing relationships, refining themes and testing propositions. These steps were followed by the research and are described further.

Familiarizing yourself with the data

In the first stage of becoming familiar with the data it is crucial to ensure the correctness of later data analysis and interpretations. Researchers may already be familiar with the data and have initial analytic interests or ideas when data is gathered through interactive methods. Researchers can begin data analysis by noting their early analysis thoughts, interpretations, and queries by jotting them down while collecting the data (Nowell et al., 2017). During this stage, researchers should approach the analysis as an unbiased observer, noting and monitoring their own biases, prejudices, and theoretical assumptions, according to Starks and Trinidad (2007). Lincoln and Guba (1985) advise researchers to make a record of their developing ideas, values, and insights about the research issue while interacting with the data (Nowell et al., 2017). The immersion approach was essential to identify certain themes and patterns.

The researchers became familiar with the data by conducting the literature review, thus, creating a thorough understanding of the topics discussed in this

study. This provides to the authors a certain level of confidence and expertise when conducting interviews with the people from the field.

Coding the data

Researchers assign codes to the information gleaned from the interviews during the second phase. This is done by recording noteworthy information from the data as a code, which is a concise description of the subject matter being discussed in the interview (Braun and Clarke, 2006). A code aids in grouping the data into meaningful categories and is nothing more than a description, not an interpretation (Nowell et al., 2017). Thus, it is essential to match the code with the interview section it corresponds to (Lincoln and Guba, 1985).

Open coding was used to find first order codes from direct responses in the interviews, and axial coding was used to arrange these codes into themes. In grounded theory, axial coding, which involves dividing the data into separate parts, comes after open coding. Axial coding implies to establish relationships between codes produced during open coding and organize them during this procedure (Belotto, 2018).

After every interview, the authors looked over the pertinent notes and main points and tried to relate them to the new data. During the thematic analysis, specific themes were highlighted based on the data that pertains to them. For example, this research was interested in finding the following: adoption of BT based on its relative advantage (how BT supersedes the current solutions utilized by the diamond industry), compatibility (how BT aligns with the current needs expressed by the interviewed stakeholders), complexity (how comprehensive is BT in terms of its utility and how easy is it to implement), trialability (how frequently has BT been used by the interviewees before and how could it be used more frequently in the future) and observability (how the results of BT's implementation can be visualized and explained). Additionally, from the received data certain themes related to the TAM such as perceived usefulness, perceived ease of use, attitude, behavioral intention and actual use towards innovation adoption could be identified. Some of the codes were theory-driven,

whereas others - data-driven. This strategy is in line with earlier findings (Fereday and Muir-Cochrane, 2006).

Searching for themes and recognizing relationships

After all the data was coded and organized into a list of relevant themes, the third stage of thematic analysis began. All the data extracts that may be useful were gathered and organized at this step after being coded into themes (Braun and Clarke, 2006). The choice of a topic was made based less on quantifiable metrics and more on whether it conveys an important aspect of the overall research subject (Nowell et al., 2017). Then, themes were viewed as important ideas that connect sizable chunks of the material.

When all the interviews were conducted, the researchers were eventually able to combine the codes into logical themes, which helped in identifying key ideas, achieving significance, establishing relationships, and creating a hierarchy. Firstly, three significant themes were addressed during every interview: *Technology Acceptance, Conservativeness,* and *Innovation Attributes of BT.* These themes are more related to the interviewees' experiences in the industry and their expertise with the technologies as well as with BT implementation. These were particularly relevant to the study to answer two of the research questions. The *Technology Acceptance* theme was identified as an umbrella topic, within which *Conservativeness* of the industry was emerging as one of the major elements influencing innovation adoption. Participants explained how the nature of the diamond business can help or hinder the technology acceptance. Next, several themes emerged during this part of conversation and were particularly interesting for analyzing by the researchers: *transparency and ethical sourcing, trust* in general*, customer trust/pressure, competition, difficult implementation, uncertainty, industry heritage and history, dependency on major players*.

The next major theme that emerged during the conversation about BT, its current state, barriers and opportunities was *Innovation attributes of BT.* The conversation was inspired by the elements of the IDT model and led to identifying the several sub-themes. Concepts like *traceability of diamond*

pricing, traceability of diamond origin, intangibility, resistance to change, technical compatibility, diamond price volatility were mentioned by the participants the most regarding opportunities and challenges of the BT adoption within the diamond industry. Themes of *mass marketing and education, current application* and *scalability* emerged from the discussion of what can be improved by the industry players to make the BT adoption process more effective.

Refining themes and testing propositions

Researchers examined the coded data extracts for each theme in this stage to determine whether they seemed to form a common pattern. To determine if certain themes accurately reflect the meanings present in the data set as a whole, the validity of each theme was assessed (Braun and Clarke, 2006). Up until a collection of distinct and consistent topics was obtained, this process has been repeated. The full data collection was then once again analyzed, and researchers evaluated if the themes adequately captured the key ideas in the interview (Lincoln and Guba, 1985; Nowell et al., 2017). Also, researchers assessed whether any uncoded data must be coded since it fits with the themes.

3.6 Quality Criteria

According to Paljak (2019) it is important to consider reliability, validity, and generalizability to properly evaluate the quality of the data produced for interpretation. However, there are ongoing discussions about whether concepts like validity, reliability, and generalizability are suitable in qualitative research. After examining works of numerous authors, including Guba and Lincoln (1985), Saunders et al. (2019) proposed a new set of standards in his work. In this study, a more extensive set of criteria was utilized, which was suggested in works of Morse et al. (2002), Noble and Smith (2015), and Bell et al. (2019), and closely reflects Saunders et al. (2019). These standards for establishing rigor in qualitative research include truth value (credibility), consistency (dependability), neutrality (confirmability), and applicability (transferability) (Bell et al., 2019; Noble and Smith, 2015; Morse et al., 2002). Some authors claim that since

concepts naturally reflect the research topic, validation is not required in qualitative studies (Aung, Razak and Nazry, 2021). Hence, according to Dikko (2016), the expectations of the researchers throughout the interview process determine the validity and trustworthiness of the qualitative data. The researchers play a crucial role in making sure that the interviewees understand the questions and that the information gathered is consistent with the research questions (Dikko, 2016). The standards that were used in this study are described further.

Credibility

In qualitative research, the idea of truth value refers to the depth of the data and how it reflects the participants' expertise (Moon et al., 2016; Bell et al., 2019). Being physically present and actively involved in the research process helped in observing and grasping the context and its environment. Furthermore, the researchers also build more reliable relationships with the participants by better understanding their viewpoints. This also helps the researchers in providing a more reliable representation of their experiences. As a result, the researchers will be able to better thematize the data by better depicting any nuances in the interviewees discourses.

Transferability

The ability to use research findings in similar circumstances with comparable individuals is referred to as transferability (Moon et al., 2016; Sikolia et al., 2013). The participants' demographics were clearly described so that other researchers can make use of the data. Together with a thorough explanation of the findings, direct quotes from the participants were included to support it.

Dependability

This criterion is linked to the trustworthiness of research methodologies, which depends on the researcher recording an understandable "decision-trail." This guarantees that equal or comparable results can be reached by an independent researcher (Noble and Smith, 2015). To make sure this was the case, researchers utilized a similar research method that was applied by Paljak (2019), who also applied the TAM and IDT to investigate the acceptance of innovation in

conservative industries. Furthermore, the TAM and IDT are two frameworks that have been utilized to discuss the acceptance of technologies and innovations and are often applied together (Charness and Boot, 2016; Paljak, 2019).

Confirmability

Eliminating any potential biases held by the researcher was vital to achieve neutrality in study. The confirmability strategy, which entails building a chain of evidence throughout the research process, was used to accomplish this purpose (Noble and Smith, 2015). To ensure confirmability, several steps have been taken, including: documenting the research design, sampling strategy, data collection instruments, and data analysis techniques used in the study; preserving thorough documentation of the study procedure, including field notes, transcripts, and other pertinent materials; using techniques to reduce bias and improve objectivity in the collecting and analysis of data (working with multiple researchers to gather and analyze data, following defined methods for gathering and analyzing data); reflectivity, which entails thinking back on the researcher's presumptions, values, and prejudices that might have an impact on the study procedure and outcomes (debriefing with colleagues and seeking feedback from study participants).

3.7 Ethical Considerations

Qualitative investigations may often involve the collection of data through several interviews and other techniques that involve interacting with people and using their experience to gather data. Consequently, ethical factors must be considered, especially in the diamond industry, where confidentiality is of utmost importance. Thus, as previously discussed, all their identities were anonymized. To ensure this requirement for the participants, their identity will remain anonymous, and the interviews will comply with the Swedish Research Council's ethical criteria. In addition, all the subjects have provided their approval to be included in the thesis and to be referenced in this study.

4 Contextual Background

To provide a foundation of existing knowledge and research in the field that this thesis aimed to study and support the findings, this chapter introduces the context of the diamond industry and the topics relevant for answering the research questions. By conducting an in-depth evaluation of the contextual background, we could ensure that the study is relevant and built on a solid foundation of existing information. This has improved the research findings' authenticity, trustworthiness and expanded the body of knowledge in the area.

4.1 Diamond Industry and its Characteristics

As noted by Berger and Herstein (2012), the diamond industry has always relied on social connections because of the difficulty in enforcing contracts globally. Due to this, the industry has changed into one business where official contracts have replaced informal agreements, and the growth of trust and cultural conformity is highly dependent on family ties (Boele, 2016). With the Jewish community dispersed across several nations, the social framework has made it easier for Jewish merchants to sell polished diamonds, which has reduced the costs involved with enforcement and product assessment (Berger et al., 2016). Similarly on the manufacturing side, over 90 percent of the players are Indian family-owned businesses (Jell-Ojobor and Reddy Wudaru, 2021).

The diamond supply chain can be divided into several layers, including mining, manufacturing, and retailing. The mined diamond is sold to the manufacturer who polishes the gem before selling it to the retailer who then sells it to retailers or investors (Jell-Ojobor and Reddy Wudaru, 2021). The usage of diamonds can be divided into three segments; the biggest chunk of its utility is for jewelry manufacturing. The second largest segment is for investment, and this involves the trading of larger diamonds. The last segment represents industrial utilities, natural and synthetic diamonds that are used in a wide range of manufacturing processes for their physical properties (Chang et al., 2002). Depending on those factors, the diamonds may for instance not go through any polishing if its utility

is for industrial purposes. Thus, diamond manufacturing is more focused on investment or jewelry manufacturing (Ibid, 2002).

The opacity of the diamond supply chain especially on the mining side is a recurring problem in the industry from an ethical and human rights perspective, since a large portion of the diamonds extracted come from developing countries in Africa (Jell-Ojobor and Reddy Wudaru, 2021). This issue was initially mitigated through the introduction of the Kimberley Process Certification Scheme (KPCS). The Kimberley Process (2001) is an international agreement to tackle the difficulties related to the smuggling of conflict diamonds. All member countries agreed to meet certain standards that allowed them to ensure that the rough diamonds were 'conflict free' (Chang et al., 2002). The KPCS is a global governance innovation that blended an industry-led voluntary certification system with cross-state import/export control frameworks (Haufler, 2009). Although the KPCS first appeared promising and its members were willing to participate in routine monitoring, it has encountered various difficulties and perceived loopholes (Elshult, 2015). For instance, when rough diamonds are transported between different parties, such as middlemen, distributors, polishers, and merchants, there are insufficient controls. In addition, certain people in the government and industry have falsified certification documents. Many states are likewise hesitant to enact import and export limitations (Haufler, 2009; Rarick and Angriawan 2017).

Moreover, the KPCS has to a certain extent prevented the dealing of conflict diamonds inside its distribution channels, but it does not oversee illicit diamond trafficking occurring outside of KP certified trading nations, hence facilitating the smuggling of uncontrolled diamonds into Licensed Trading Centers (Global Witness, 2006). In addition, most illicit diamonds are trafficked in their polished condition since they are not subject to KPCS supervision (Lecomte, 2014). Moreover, the KPCS solely focuses on the trafficking of rough diamonds, making it simpler for conflict diamonds to migrate up the distribution chain due to the difficulty to authenticate the gemstone's provenance once it has been polished (FATF, 2013).

4.2 Conservativeness of the Diamond Industry

Simakova (2022) stated that the industry tends to be conservative due to the limited selection of items that are ultimately offered to consumers which reduces the possibility for innovations to be implemented. Since the components used in diamond craftsmanship have mostly not changed over the years, startups may find it difficult to get finance and incorporate new solutions into the industry's supply chain and retail structure. Thus, the standardized nature of the goods and of the processes involved makes the diamond industry conservative by nature (Jarrar and Smith, 2014; Simakova, 2022). Additionally, few accelerators were available that offered the required experience because of the diamond industry's specific business focus (Rarick and Angriawan, 2017). It is also important to underline that conservatism within the industry is particularly prevalent at the mining stage, with only a handful of well-established firms that supply the entire industry (Chang et al., 2002).

4.2.1 Diamond Origins and Perceived Value

Carbon undergoes extreme pressure during the formation of natural diamonds in the earth's mantle. Diamonds are primarily collected by mining kimberlite pipelines, although some are brought to the surface by volcanic eruptions (Ivanov, 2019). Therefore, the introduction of lab-grown diamonds and other developments within the business have significantly disrupted the traditionally conservative diamond industry (Eaton-Magaa, Ardon, and Breeding, 2021).

According to Sipe (2022), diamonds are associated with love, beauty, purity, and social prestige, and this relationship has been maintained by monopolies and marketing that maintain their scarcity. This association has led to a strong demand and desire for diamonds. The prevalence of diamond engagement rings is the clearest example of this fetishisation of diamonds. The idiom "a diamond is forever" was coined by Oppenheimer with the help of the advertising firm N.W. Ayer & Sons. Oppenheimer also played a crucial part in connecting

diamonds with the idea of love, which greatly increased their enduring appeal (Villinger, 2011).

4.2.2 The 4C's

Diamond pricing is complex firstly because there is a difference between the ways rough and polished diamonds are valued. As a result, the price volatility of both commodities differs, with rough diamonds having an average yearly volatility of 20 percent and polished diamonds at 9 percent (Bain & Company, 2011). Polished diamonds are graded based on a scheme called the 4 C's, which was setup by the Gemological Institute of America (GIA) in 1940. The four C's characterize a diamond's value based on color, clarity, cut and carat weight (Gemological Institute of America, 2016). Each of the four characteristics have a wide range of gradations, and by the time the diamonds reach the final step, they have been classified into 12,000 to 16,000 separate groups. Even though appraisers utilize a specific set of parameters to grade the stones, some subjectivity is unavoidable which makes diamond pricing complicated with a 30 percent variation (Bain & Company, 2011).

4.3 Disruptive Innovations and The Diamond Industry

Contrariwise to natural diamonds that take the earth billions of years to make, lab-grown diamonds can now be produced fast and sold at a lower cost (Eaton-Magaña, Ardon and Breeding, 2021). The introduction of new technologies like BT and mass-produced diamonds have the potential to completely upend a conservative diamond market (A. Rarick and Angriawan, 2017). As a result of various challenges, De Beers' business strategy has undergone a substantial transformation. The emphasis has been placed more on a demand-oriented strategy rather than supply management and pricing control. The business highlighted its status as a supplier of high-quality diamonds as it began to sell off its stockpile of diamonds (Haufler, 2009).

To manipulate the value of diamonds, which heavily depended on the perception of scarcity, De Beers maintained a dominant position in the supply and distribution of rough diamonds through a close-knit network of contractual relationships (Boele, 2016). Major suppliers worked together to maintain this value. Its monopoly began to wane in the 1990s before the initial negotiations that led to the establishment of the KPCS which disrupted the industry on the mining level (Elshult, 2015). It is however important to remember that the KPCS talks, and implementation happened while De Beers' monopoly was broken up and American antitrust actions came to an end. According to Haufler (2009), De Beers may have unwittingly been saved by the KPCS, which imposed additional legal precautions.

4.4 Overview of the Participants

This section will discuss the company owners with whom the researchers have been involved with. Their experience, background, opinions on technology acceptance and BT are provided. The prime purpose of this section is to also help the reader understand each interviewee's stance on the adoption of BT and of other technologies, based on how they would affect each companies' activity.

4.4.1 Company A (Mikhael)

Mikhael is the CEO of company A which is based in Monaco. The interviewee has been working in the diamond and the jewelry industry for more than 30 years. In addition to his entrepreneurial activities within the industry, Mikhael has also achieved an expertise from his position as president of the Monaco Diamond Exchange, a non-profit organization that promotes the ethical sourcing of diamonds in Monaco (Monaco Diamond Exchange, n.d.). Company A's central activity is to supply jewelry items for other businesses and for private customers. Additionally, the company also focuses on the trading of larger diamonds in terms of carats for private customers that seek to buy the commodity for investment purposes. Mikhael primarily supplies his diamonds from Antwerp, which is known for being one of the world's oldest diamond trading hubs (De Keyser *et al.,* 2022).

4.4.2 Company B (Chris)

Chris is the CEO of company B, which specializes in the production of on-demand jewelry products for private customers. Chris has been an active participant in the industry for more than 15 years, which allowed him to witness most of the complex steps of the diamond's supply chain, from the time it is sourced in its rough form, to the time it is manufactured and sold to the consumers. His expertise initially comes from Antwerp, where he worked as a diamond trader for more than a decade. His specialization in jewelry making is recent, after having opened his store in Torino, Italy. His manufacturing methods are handled primarily utilizing additive manufacturing as well as through a labor force specialized in the setting of gemstones to achieve his creations. Chris primarily sources his diamonds from Antwerp, since he has close ties with the stakeholders he previously worked with. Thus, his expertise as a diamond trader is still relevant for this paper, despite his current specialization in jewelry making.

4.4.3 Company C (John)

John is the CEO of company C, which specializes in the trading of diamonds. Company C fulfills the requirements of private customers who approach John to find the diamond they are looking for. His sourcing base is in several countries, including the USA, Belgium, Singapore, the UAE, Switzerland and Israel. In addition to his expertise related to his activities with company C, John has also previously worked at the Richemont group, a Switzerland-based luxury goods holding company that manages brands like Cartier, Van Cleef & Arpels, Mont Blanc and Piaget, amongst others. Additionally, John is also a professor in Finance at the University of Monaco, vice president of the Monaco Diamond Exchange and a member of the Geneva Diamond Exchange. Finally, his expertise in the diamond industry and finance has allowed him to work with several stakeholders on potential solutions for the implementation of BT in the

diamond industry. His expertise is particularly valuable since he possesses a strong understanding of the themes explored by the researchers.

4.4.4 Company D (Dave)

Dave is the CEO of company D, which specializes in the procurement, the manufacturing and the trading of diamonds in Geneva. As a result, most of his sourcing for company D primarily comes under the form of rough diamonds as Dave possesses the machinery and the workforce to manufacture them into their polished form. Moreover, Dave also has another company that focuses on the making and customization of high-end jewelry products for private customers. Additionally, Dave is also a member of the Geneva Diamond Exchange which is a branch of the Monaco Diamond Exchange that promotes the ethical sourcing of diamonds in Switzerland (Geneva Diamond Exchange, n.d.). Company D has pushed the implementation of technologies in his process to enhance the production of diamonds through automation.

5 Empirical Findings

To provide context for the conversations and gain insight into the respondents' perspective on the present state of the diamond industry, three major themes emerged: Technology Acceptance, Conservativeness and Innovation Attributes of BT. After exploring the interviewees' experiences, several themes were unfolded, which were then used to build a framework for the data analysis. These themes are presented in the subsequent sections. The chapter ends with a summary of the Benefits and Challenges related to BT, as well as the perceived future of BT based on the respondents' observations.

Each of these themes is presented in its own specific chapter and contains quotes from the participants that have been correctly transcribed and translated to convey their original meaning.

5.1 Technology Acceptance

This chapter presents the findings collected from the discussions about technology acceptance within the diamond industry, as well as respondents' experiences with innovations that have been already implemented or declined.

5.1.1 Conservativeness

The conversations began with questions related to the nature of the diamond industry. Mikhael expressed his view that the industry has shown "*a growing trend regarding the intention to use innovations"*. However, he also noted that the pace of technology adoption is likely to be slow since the business is firmly anchored in old ways of doing things, which makes change difficult and *'scary'*:

"It is a business with traditional practices, so anything new tends to be scary. However, we are making great strides in changes (...) However, this growth will remain slow due to the traditional and conservative nature of the market." (Mikhael)

Similarly, Chris stated that the industry has always been focused on craftsmanship and tradition. However, the respondent also added that it "*has*

never been driven by technology in the first place" and has not seriously considered implementing new technologies, which raises concerns about the industry's ability to evolve and adapt to new market conditions.

"The industry has remained extremely conservative and traditional in its operations, so the question of implementing new technologies was never considered because we have been sticking to the same methods all along." (Chris)

In continuation, Mikhael highlighted the potential for technology to alter the diamond industry and the growing need to modernize the sector. Mikhael's optimism shows that the sector is heading in a positive path toward increased modernization and innovation, even though there may be difficulties and obstacles in integrating new technologies.

"Traditionally, the diamond is analyzed and cut by humans using tools such as loupes and stroboscopes (...) If we switch to the machines [for laser cutting], the situation can change completely. This is the market of tomorrow" (Mikhael)

Similarly, Dave noted that the diamond business has changed significantly from being a conservative sector that mainly relied on conventional methods to one that is increasingly profit-driven and focused on automation.

"There was a time when the diamond industry was more conservative and preferred to stick to its methods. But today, this is no longer the case. We are looking for profitability and maximum automation." (Dave)

Dave's statement illustrates how the diamond industry is evolving, where profitability and efficiency are increasingly significant forces driving innovation and change.

5.1.2 Perceived Usefulness

This section aims at finding out what technologies have been already implemented in the diamond industry and discusses usefulness to assess their success regarding adoption. Innovations that were mentioned are: exchange portals for B2B commerce, ERP system for administrative work, lab-grown diamonds (synthetic diamonds), laser cutting machines, traceability technology such as barcodes and RFID chips, AI, additive manufacturing for jewelry, BT,

etc. According to Mikhael, there are various aspects that influence how beneficial technology is perceived in the industry. He mentioned that some of these aspects are design, benefits, training, and industry support:

"The success of these technologies is due to their user-friendly design, their benefits for businesses, the availability of training and support for users, as well as collaboration and support of the industry for their implementation and adoption." (Mikhael)

However, for example, Mikhael's company has not seen the need for adoption of these new technologies since they were comfortable with their current practices.

"The diamond market has always been profitable for me without necessarily needing to use new technologies." (Mikhael)

As an example of beneficial for the industry technology, John commented on synthetic diamonds. According to John, lab-grown diamonds have a positive effect on business and it can aid in market expansion by being a more affordable, accessible, and sustainable option.

"Synthetic diamonds are a wonderful thing for the business and aid in the process of extending the market. " (John)

Dave also added that perceived usefulness can be directly related to the potential of technology to increase market profitability and production efficiency. He claimed that technology may help businesses raise profits and strengthen their bottom line by making production processes more efficient and lowering costs.

"All the technologies that I mentioned earlier have helped the diamond industry move forward in the right direction because they made the market more profitable and more efficient in terms of production. And once again, there is this aspect of automation that is becoming increasingly important in the industry." (Dave)

Dave also emphasized the significance of automation in the diamond sector, which by removing the need for manual labor in some operations, may increase efficiency and save costs.

5.1.3 Perceived Ease of Use and Implementation

Although adopting technology can significantly enhance organization and production processes in the diamond business, there are a number of reasons why it may not always be simple to do so. According to Dave, there are two main reasons for the challenges of implementing new technology: cost and the need for specialized labor.

"I use all the technologies in my daily work, which has allowed me to have a more structured organization and a more sophisticated production and supply method. However, they are not always easy to implement because they require money to amortize their usefulness in the long term and often require specialized labor to operate these machines." (Dave)

Additionally, Chris and Mikhael mentioned *'resistance to change'*, *'incompatibility'*, and *'a need of specific documentation'* in order to start operating as aspects that can affect the ease of implementation of certain technologies.

Trust

According to Mikhael, trust among customers can be one of the barriers when it comes to the ease of implementation of new technologies. Customers are often asking for more detailed information when making a purchase, including the origin of the diamond, greater transparency and sustainability:

"The first obstacle (...) is to reassure the customer, so I would say that one of the main obstacles that can affect the success of technologies is the lack of trust or even credibility regarding the adoption of the technology." (Mikhael)

John claimed that reassuring a customer is an important part of a business deal. He noted that nowadays it is still done through personal meetings, which makes it more complicated to implement new technologies on this step.

"I would say [technology implementation] is not easy at all. When people buy a diamond, because of its price, they are often uncertain because there is so much to know when buying a diamond (...) People rely on the credibility of the jeweler and buy the diamond in person (...) Everything is based on the idea of reassuring the customer when selling a diamond, and it is true that this is still done through physical interactions." (John)

All of the respondents have mentioned that trust is a big aspect in the diamond industry. It was mentioned by Chris that there may be a lack of trust between industry players in the diamond sector, which can make it difficult to introduce new ideas or innovations:

"The diamond industry is not an easy area to be involved in (...) what really sets this industry apart is the lack of trust (...) this makes it incredibly difficult to introduce new ideas or innovations, as people are reluctant to take risks or trust anything that hasn't been tried and tested over time." (Chris)

During the conversations with Chris and John, it was apparent that the concept of trust also extends to inside players in the industry.

5.1.4 Attitude Towards Using Technologies

During this part of the conversation, the researchers aimed to find out the interviewee's actual attitude, thoughts and opinions towards the use/adoption of new technologies in the diamond industry.

Dependency on major players

It was noted by John that the acceptance of certain technologies by the diamond industry can be influenced by various factors, some of them include market trends and the decisions of Diamond Trading Companies (DTCs).

"Some technologies have easily been accepted by the industry while other technologies have strongly been neglected, and that is because the diamantaires follow the DTCs and the market trends." (John)

John continues the conversation by mentioning that some of the businesses within the sector are dependent on major players (such as DeBeers). He also noted that these bigger organizations' deeds and decisions have a big impact on how quickly they adopt new technologies. Smaller enterprises may adopt new technology more slowly because of their reliance on major players. John said that even though some businesses might not invest directly in particular technology, they might use the services provided by specialist businesses as subcontractors.

"I am a strong supporter of new technologies and think that ultimately diamantaires will have to step forward (…) The attitude can only change once the big companies and the DTCs say what to do and what to think." (John)

Mikhael has also confirmed that he would be more willing to adopt innovations if the others in the industry were to try it first:

"If I see that it is something that has been implemented by others and that it works, I will be more interested." (Mikhael)

While there are supporters of new technologies like John, who think that the industry must embrace innovation to stay competitive, there are also elements that could hinder the adoption of these technologies, like the power of influential players. On the other hand, Mikhael's statement suggests that technology adoption should be approached cautiously.

Uncertainty

During the conversation, Mikhael and Dave mentioned that there can be some uncertainty over the adoption of new technology in the diamond business. According to Dave, this uncertainty is related to a number of factors, including concerns about the '*expense of introducing new technologies*', and the '*complexity of integrating them into current processes*'. It was noted by Mikhael that his company lacked the finances or the desire to pursue new technologies, especially because their current methods were already profitable.

"I have attempted to implement new technologies in the industry several times, but they often had to be aborted due to uncertainties, lack of interest or resources." (Mikhael)

During the interviews it was apparent that there is a new trend in the adoption of innovations. John considered it as a positive development since it will benefit the industry *"to become more efficient, transparent and secure"*. In contrast, Mikhael has mentioned that there are still businesses that consider technology as an '*enemy'* and are often hesitant about their implementation. The reason for it is that innovation may disrupt the old-fashioned structure of the diamond industry and the perceived value of the diamond itself. Mikhael also emphasized his

hesitancy, especially with regard to lab-grown diamonds and the potential loss of the magical aspect associated with real diamonds:

"I have always been hesitant about the implementation of new technologies. When I say this, I think a lot about synthetic diamonds because we are now creating something that was supposed to be eternal, and by using synthetic diamonds, we remove all of that magical aspect." (Mikhael)

These contrasting viewpoints highlight the ongoing discussion regarding the role of technology in the diamond business and the uncertain attitudes towards it among industry players. This also suggests that some technologies are neglected because they do not enhance the image of natural diamonds.

5.1.5 Behavioral Intention to Use

Customer trust/ pressure

During the conversations with John and Chris, it was apparent that customers' trust has a significant impact on the company's behavioral intention to use innovations. John noted, due to the society being more technologically advanced, consumers have changed their values for which they are looking in the company. He highlighted that the company is more likely to adopt innovations in their activity when customers trust a company and believe that its products or services are of high quality, as well as willing to explore the latest technologies:

"Generations become more and more tech savvy, and as consumers are more curious of the origins of the goods they purchase, innovation will definitely prevail and companies will ineluctably take that step." (John)

According to John, consumer needs and desires are important for the diamond business. He noted that a company's profit depends on customer's satisfaction. Therefore, meeting their expectations and improving business activities according to customer demands is one of the crucial aspects of a company's success, according to John.

"If consumers are demanding greater transparency and sustainability in the diamond supply chain, I need to be able to meet those expectations." (John)

Similarly, Chris noted that customer trust can push the company towards adopting new technologies:

"I am especially pressured by my customers to ensure that the jewelry I make has ethically sourced stones." (Chris)

According to Chris, as customers become more aware of the ethical issues surrounding the diamond trade, they are putting increased pressure on companies to guarantee that the products they sell are ethically sourced. As a result, businesses like Chris's are utilizing new technologies to assist them trace the origins of their diamonds and give their clients more transparency.

Competition

Mikhael mentioned that businesses have to consistently enhance the customer experience and match their needs and expectations in order to stay ahead of the competition in a competitive market.

"Improving the customer experience and meeting their demands and expectations is a key factor for me. This also means that competitive advantage is important." (Mikhael)

According to Mikhael, businesses should incorporate new technologies in order to improve their goods or services and stay ahead of the competition. By doing so, companies can gain a competitive advantage and differentiate themselves in the sector. Similarly, John commented that it is essential for industry players to keep up with the latest technological advancements to remain competitive:

"I believe that competition and changing consumer preferences are two key drivers because if my competitors are adopting new technologies and gaining a competitive advantage, I need to stay ahead of the curve (...) Overall, I believe that innovation and technology are critical to the future success of the diamond industry, and I am committed to exploring new opportunities in this space." (John)

According to John, as technology develops and consumer preferences change, businesses that do not adapt risk slipping behind their competitors. Companies like John's may increase their productivity, cut costs, and open new growth prospects by adopting new technologies.

Transparency and ethical sourcing

Chris suggested that transparency and ethical sourcing are becoming increasingly important considerations for companies that are looking to adopt innovation.

"There is a stronger intention towards their [innovations] implementation due to the expansion of the market and of its segments. Diamond dealers are being pressured into making sure that their diamonds are ethically sourced to their customers." (Chris)

Chris mentioned that customers frequently want to know that the stones were mined sustainably and with ethical practices when purchasing diamonds. Therefore, synthetic diamonds and BT are becoming more interesting and relevant in the industry. Mikhael confirmed that by implementing new technologies, transparency and ethical sourcing can be achieved effectively and improve customer trust:

"Today, there is also the ecological and ethical factor to take into account, which is why synthetic diamonds, for example, are also interesting, and why we want to look into blockchain to highlight diamond traceability." (Mikhael)

According to Mikhael, by embracing new technologies like BT and synthetic diamonds, companies can increase their transparency and ethical sourcing methods, which in turn can assist to foster consumer trust. And, as Chris pointed out previously, the diamond industry places a growing emphasis on customer trust as customers look for products that are made with sustainable and ethically sourced materials.

5.1.6 Actual Use

In this part of conversation, the researchers aimed to find out how the respondents perceive the term "blockchain technology" and if they have already implemented it in their businesses. All of the participants know about the technology, but none of them have applied it in their businesses yet.

Difficult implementation

Chris mentioned that BT is currently used by the major players in the industry, such as DeBeers. He also noted that DeBeers' Tracr is now utilized for big carat

stones, which suggests that there might be limitations to the technology's application.

"No, I have not had a chance to do so [implement blockchain] yet. I have heard that DeBeers is working in Tracr which is their blockchain solution for the diamond industry on the rough side and the large carat stones. I know that GIA [Gemological Institute of America] at some point also had integrated blockchain to make the data of the diamond grading immutable and accessible by anyone." (Chris)

John and Chris also have pointed out the difficulties related with the implementation of BT as a reason interfering with the adoption of this technology. John emphasized the challenge of using diamonds as an asset-backed currency, which can make integration challenging:

"Well it's moving one step forward and two steps back most of the time because the integration is extremely difficult to create an asset backed currency especially with diamonds." (John)

According to John and Chris, even though BT has the potential to provide transparency and traceability, there are barriers that can make it more difficult for the diamond sector to use it.

5.2 Benefits and Challenges of BT

This section presents the empirical findings that were gathered for the discussion around the benefits and challenges of BT's implementation in the diamond industry. The findings are presented based on the five attributes of IDT.

5.3.1 Relative Advantage

The following construct evaluated the relative advantage and disadvantage of BT in comparison to current methods for data traceability. All respondents agreed that BT would be more efficient and help the industry in being more efficient by "automating" the supply chain. All respondents asserted that trust is a driving factor of the industry's conservativeness and reluctance towards the entrance of new methods.

"Yes, because the market is limited by this concept of trust. The diamond market is a fairly closed and restricted market, and simply operates on trust criteria. This limited circle could be expanded. For example, my diamond suppliers are willing to send me diamond stock because we have been in partnership for over 30 years and have been able to establish trust between us. If tomorrow I become an industry player but am unknown to these sources, they will put up obstacles everywhere, I will have to block guarantees. All of this requires a lot of money and slows down market development in terms of the introduction of new players. Blockchain could reassure these circuits and expand the number of available players." (Mikhael)

As the discussion began to revolve around the benefits of BT on the development of the industry, Mikhael argued that this concept of trust affects the diamond market by making it so that only well-known companies can trade gems. Because it is hard to get into the market, there is less competition there. He later explains that Blockchain could help build trust and bring more people into the market by giving a proof of claim and a detailed description of the diamonds provenance

Traceability of Diamond Origin

The traceability provided by BT could provide a visible and tamper-proof record of a diamond's trip through the supply chain, which exemplifies how BT can provide trust between trading partners.

"We can use blockchain to make things more transparent and traceable. Whenever someone buys or sells a diamond, it gets recorded on the blockchain. This means we can easily see where each diamond comes from and who's had it before which would make it helpful for detecting conflict diamonds that are sold to fund bad stuff like wars. Plus, we can use blockchain to check if a diamond is natural or synthetic, which is important for stopping other types of frauds we've previously seen in the industry." (Chris).

Chris argues that this openness allows all parties involved to check the legitimacy of the diamonds to guarantee that they have not been used to fuel conflicts and could help in determining if a diamond is genuine or synthetic, which suggests that BT could provide trust to the market.

Transparency and Ethical sourcing

In the sections related to the relative advantage of BT in comparison to current methods, Chris and Mikhael pointed out the utility of the KP within the rough

sector, which has certainly helped in making the diamond industry more ethically considerate in the rough market, but the process still has certain limitations. However, according to Chris, the KP only looks at the ethical sourcing of rough diamonds and has been perceived as flawed since blood and conflict diamonds can be dissimulated into the market by their polished form.

"We initially had the Kimberley Process that was used to certify that diamonds were conflict free, but those can be faked, and only look at the ethical sourcing of rough diamonds, which facilitates the entrance of blood diamonds through its polished form and relies on cooperation and governments." (Chris)

Mikhael suggested that BT could contribute to the KP's flaws by making sure that the standards put in place are respected.

"That being said, the KP has been able to establish trust in the market, but I think that Blockchain can contribute to adding proof criteria. I say this because the KP can be falsified. The advantage of Blockchain is to frame the standardizations such as ISO or any other regulations related to our activity." (Mikhael)

Thus, BT has been characterized by Chris and Mikhael as an enabler of "ethical" sourcing or aspect to the industry and would bring more transparency.

"Blockchain would establish more trust and regulations, bringing a more ethical aspect to the market and more openness." (Mikhael)

"Ethical sourcing also comes to my mind here, and I think it will help a lot in reassuring the customers on the provenance of diamonds." (Chris)

In summary, BT would bring more trust, transparency in the diamond industry by allowing stakeholders to more easily impose regulations and requirements. In other words, BT could reassure the industry players and open the market up.

Traceability of Diamond Pricing

Regarding the relative advantage of diamond, John, Chris and Dave all discussed the inconvenience of the current pricing benchmarks that are followed by the industry. According to them, they base themselves off of the Rappaport price, a non-official baseline index used to determine the worth of stones during negotiations. However, the vast majority make a percentage decrease when

compared to the Rappaport price. Blockchain technology has the potential to help standardize this and provide new norms for businesses. Furthermore, the value of a diamond might fluctuate depending on where it is acquired, and Blockchain can help consumers comprehend this better, especially if the diamond has a set price.

"There is the 'Rappaport' which is a baseline index but is not official like a stock exchange. It is just a company that releases weekly figures used by professionals to estimate the valuation of stones during negotiations. But most people make percentage reductions, such as -10% to -40% compared to the Rappaport price. The Blockchain could help standardize this or become new benchmarks for companies." (Dave)

Chris and John also assume that this might affect jewelry brands, which tend to sell diamonds at a different price compared to diamond traders for instance and often without any certifications. John suggested that this could impact their activities due to the enormous price difference between the diamonds provided in the industry and those provided by the jewelry sector. This could affect the way consumers perceive the value of diamonds and potentially push them to opt for other points of sales.

"The bigger brands like Cartier or Tiffany sell it to you at 20% to 30%, and without a diamond certificate." (Chris)

"Blockchain will also help in making people understand that the value of diamond changes when you buy it at Cartier or when you buy it at a diamantaire in Antwerp, especially if there is a fixed price for the diamond." (John).

In summary, John and Chris both discuss how BT may affect the current methods of selling diamonds in the jewelry industry. They both suggest that the transparency of diamonds in terms of pricing could disrupt some industry players, while benefiting others.

5.3.2 Compatibility

The following construct was observed based on the technical compatibility of BT with the current infrastructures and method used to channel information from the mine to the fields. In addition to that, the construct also investigates the

compatibility of BT based on the mindset of diamond traders, and questions whether the relative advantages are appreciated by the interviewers.

Resistance to Change

Chris argues that companies may be reluctant to implement BT as most diamond traders are private and secretive about their activities. Similarly, while John acknowledged the compatibility of BT from a technical perspective, he however highlighted that its technological attributes could lead to some sort of resistance towards its adoption. Both respondents convey this aspect of data security and secrecy as factors that may affect the industry's perception of BT.

"I think that technology can be compatible with anything, so yes, although we are mostly paper, we do it for a reason, and that is because they are offline. Why do we use Excel? Because it is an offline tool so no government can access my Excel." (John)

"The other problem is data security and privacy, and I think the big question is who should have access to that information? Some companies will definitely be reluctant to share information of this sort." (Chris)

Mikhael suggests that willingness and readiness are essential for the successful implementation of BT. Thus, just like Chris and John, Mikhael also questions whether BT is compatible with the mindset of diamond traders in general.

"Another factor is once again the willingness to implement this system and a willingness to overcome the same challenges." (Mikhael)

Technical Compatibility

The opinions related to the technical compatibility of BT were quite diverse depending on its application. Mikhael and Chris pose the dilemma related to standardization and the differences in the way diamonds are dealt within the rough and polished markets. According to them, this incompatibility would affect the flow of information for the mines up to the retailers and reduce the interoperability of BT in terms of implementation.

"One of the key challenges is the lack of standardization and interoperability among different systems in the diamond industry. This can make it difficult to exchange information between different stakeholders in the supply chain from the miners to the retailers." (Chris)

"It can be adapted, but it depends on the fact that the diamond market is divided between rough and polished diamonds. The rough market is very rudimentary, and there is still a lot to be done because diamonds are extracted in regions where there may not necessarily be technological infrastructure to implement blockchain. In the polished diamond industry, everything is more organized, and protocols are followed, while in the rough market, it's a bit of a jungle." (Mikhael)

Chris also asserted that the traditional methods of tracing diamonds do not facilitate the implementation of BT either, in the sense that some areas of the supply chain may not have the infrastructure to effectively implement the technology.

"From a technical perspective of course, it is possible to implement but since most of the documentation is private, this makes it surely problematic to put in place the Blockchain in some areas of the supply chain in the industry that may lack the infrastructure to implement blockchain in an effective way." (Chris)

In summary, the technical compatibility of BT was mostly discussed by the respondents, which could affect its implementation at a bigger scale.

5.3.3 Complexity

In this chapter the questions aimed at exploring how complex BT was from the respondent's perspective and how some of those drawbacks could be addressed. Mikhael and John perceived BT as complicated to 'implement' and to 'understand' in its extension to potentially more utilities than those currently presented. Mikhael depicts reasons that are related to the costs of infrastructure and of hiring a new working force to build a system that is tailored to the diamond industry's needs.

"There is a lack of comprehensive understanding of the usefulness of blockchain in the diamond industry. Additionally, there is also a need to create infrastructure to deploy blockchain, which requires money, so there are high development costs." (Mikhael)

John argues that its complexity also lies in its disruptive nature, in the sense that stakeholders have yet to grasp the utilities of BT in the diamond industry.

"Because a lot of us do not understand how flexible and disruptive this technology can be (...) a lot of us do not know how many different applications this technology has in the industry." (John)

John and Mikhael's discourse suggest that BT is a project that may hinder its implementation due to high costs and because of a lack of understanding on how it could be implemented to benefit them.

Diamond Price Volatility

This section discusses the complexity of putting in place an asset backed digital currency that would be used as a price index of diamond. Dave exemplified the complexity of its implementation by comparing it to the way gold is sold. He also explained that the main challenge is the volatility of the diamond price which hinders the entrance of investors.

"It is a guarantee of counter value that is the obstacle in this case. If we work with gold, it is managed by a specific exchange that is used to value the currencies of central banks, it is a real fact. Many have tried to do the same but it is very complicated, to bring investors to invest in diamonds, but on what basis? Then the price of the diamond is too unstable, and the diamond market is very volatile." (Dave)

This price volatility is a result of the differences in the diamond's clarity, cut, color and carat once they get polished. As previously discussed by John, Chris and Dave, "*most people make percentage reductions, such as -10% to -40% compared to the Rappaport price."* which means that two investors might sell the same diamond but come with two different prices. John also explained that *"this is also why we do not give any quotations in the industry", which* shows the repercussions of the diamond's price volatility in the way traders negotiate.

Mass Marketing and Education

To address the challenges of complexity, all the respondents suggested that mass communication within the industry around BT should be deployed to educate the stakeholders on the potential benefits it could bring to their activities. Chris and Dave assumed that the lack of understanding around the technology's utility is a barrier that affects the adoption of BT within the industry, and that this resistance to change can potentially be tackled by simply being more informative around the purpose of DLT's in general.

"Education is key here but this can only be achieved through mass marketing." (Chris)

"A huge marketing effort will be necessary to educate professionals and make them understand the usefulness of Blockchain within the industry." (Dave)

Mikhael, Chris and John all assume that this complexity can be solved through *'collaboration*' and through the entrance of a workforce specialized in a multitude of disciplines. All agreed that there needs to be people who fully understand BT from a technical perspective.

"This needs people who really know about the technology to make it work." (Mikhael)

Chris and John had however a different perception of the specialization that was required to achieve this. John for instance points out that this workforce needs to be specialized both in diamonds and BT while Chris suggests that a financial background is also necessary.

"(...) they have to open up to a new workforce specialized in finance and programming." (Chris)

"The issue here is also that Blockchain and diamonds are two specializations in a sense, so you need people from both worlds (...) people who understand both aspects." (John)

John's statement also conveys that there needs to be an enormous amount of collaboration within the industry, and huge effort on informing how BT works and can be used.

5.3.4 Trialability

This construct aimed at discussing how BT could be tested in the sector or gradually scaled before fully implementing it. Additionally, the interviews extended the questioning around the benefits and challenges of trialing BT. Everyone asserted that trialing is a great option to test the compatibility of BT, but that it could only be enabled by the industry leaders. Mikhael for justifies this from the fact that only a handful of companies hold a wide share of the market.

"This starts once again with the participation of major market players, as they hold 80% of the market share." (Mikhael)

Current Application

All the interviews pointed out that DeBeers has already been working on a Blockchain based solution called Tracr, that is used to track the larger diamonds. The example was also used by the respondents as an answer to how BT could be tested within the industry. According to Chris and Mikhael, DeBeers has gradually opened their platform to major diamond graders like GIA.

"This is what DeBeers is currently doing with Tracr, they are collecting more and more companies into their project for testing which also helps them see how efficient the system is and where it needs changes. I see on the news that Tracr has managed to get more and more people on board overtime with the more recent one being GIA." (Chris)

They suggested that businesses could try implementing BT by using the diamonds that are already available in that circuit. This also allows the company to test the technology and refine it, but also helps in raising awareness in the industry on how the technology works.

"Providing education and training to stakeholders can improve their understanding and knowledge of the technology. The implementation of pilot projects can also help overcome technical and implementation challenges, as well as demonstrate the benefits of blockchain technology." (Mikhael)

Trialability was recurrently connected to the idea of educating and teaching the diamond trader about the purpose of BT for Mikhael.

Scalability

As discussed in the previous constructs related to the complexity and the compatibility of implementing an asset backed digital currency for the diamond value, Dave and Chris explained how complicated such a project might be to achieve. They suggested trying the solution on a smaller scale, by focusing on a specific type of diamond for instance. This approach was suggested based on how DeBeers is currently handling their blockchain solution, Tracr.

"To create an index for a particular type of diamond, one can start with colored diamonds that already have specificities, and a smaller quantity of these diamonds to test the blockchain form on a smaller scale." (Dave)

"The good thing is they can test the scalability, and adjust it over time, so trialing is a great method to see the difference between what blockchain should do on paper, and what it does in reality." (Chris)

Trialability here serves the purpose of testing the scalability of BT and feasibility, since Dave and Chris suggested how this could be achieved.

5.3.5 Observability

This construct considers the questions related to the visibility of BT's benefits in the diamond industry. Mikhael considers that the complete implementation of the technology will bring automation of verification and validation processes for transactions. He argues that those factors would be felt through *"greater transparency, increased traceability, security, and cost savings"*.

"There needs to be marketing out there that educates and informs the industry players, but also to push collaboration." (John)

On the other hand, John saw some challenges in relation to observability which were the lack of collaboration and if education may limit the perceived benefits of BT due to its complexity. He suggests that this is a necessary step to solve that problem.

Intangibility reduces Observability

Chris and Mikhael also outlined the importance of providing education to improve their understanding of the technology. The implementation of pilot projects, collaboration and coordination among the major diamond industry players are central to address these obstacles, according to the respondents. Furthermore, they also believed that the advantages of utilizing BT may not be immediately apparent, particularly if the industry is not incentivized to learn about it.

"Well Blockchain is intangible, it's a lot about data, you could probably use it and not even realize that you have utilized a decentralized database. So I honestly don't think that it will be immediately visible, especially if there are no incentives on teaching the industry on what it is and how it is used." (Chris)

Finally, John also explained further that the participation and coordination of industry executives and the integration of BT with existing systems and procedures are crucial to its success in the diamond industry.

"By making standards and protocols for sharing data, working together to build a unified blockchain network by integrating with current systems and processes." (John)

This assumption is also primarily since only a handful of industry players handle 80 percent of the market share, noted Mikhael. This suggests that Mikhael, similarly to John, believes that the incentives must be initiated by the major industry players.

"Collaboration and coordination among different players in the diamond industry can improve its implementation. This starts once again with the participation of major market players, as they hold 80% of the market. Without their approval, it is very difficult to see how this service could function." (Mikhael)

In summary the intangibility of BT makes it harder for industry players to understand its utility as stated by Chris. This affects its observability and shows that there is a strong need for collaboration and consensus between all industry players. Additionally, the support of industry incumbents is once again perceived as necessary to observe any changes through the usage of BT.

6 Data Analysis

The emerging themes from the empirical findings were revised and clustered by the researchers, which was then developed into the visualization (see figure 4). The established themes were then incorporated into the analysis using two theoretical frameworks - TAM and IDT. By doing so, researchers intend to shed light on the antecedents that affect an organization's choice to adopt new technologies as well as the advantages and difficulties of implementing BT in the diamond sector.

In the analysis, the diamond industry was examined based on the TAM as a basis for understanding how innovations are adopted in a conservative industry. Additionally, researchers used the IDT framework to investigate the antecedents that influence the adoption of BT in the diamond industry through five attributes of innovation – relative advantage, trialability, observability, compatibility and complexity.

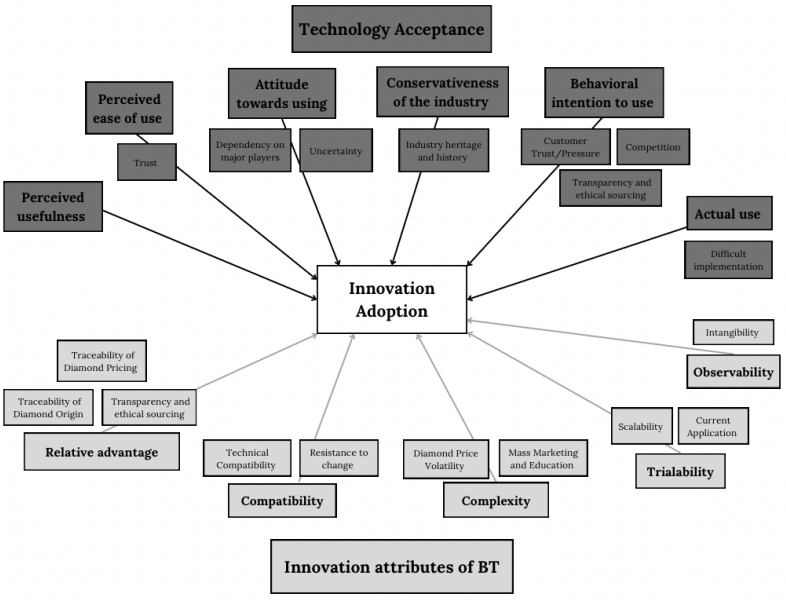

Figure 4. Conceptual framework resulting from this study

Through this analysis, researchers hope to shed light on the dynamics of innovation in conservative industries and deliver insights that help guide future strategies for technology adoption in the diamond industry.

6.1 Antecedents affecting Innovation Adoption

According to the findings, companies within the diamond industry already have profitable businesses and are comfortable with their current strategies. The industry has a long history of operating in a particular way, therefore, there was less of an urgency or need to accept new technologies that might upend the established methods (Berger and Herstein, 2012). This *resistance to change* led to slow progress of technological innovation in the sector. Therefore, the researchers identified that one of the antecedents affecting the adoption of new technologies is the *industry history and tradition of doing business*. Industry players are reluctant to introduce new technologies that can necessitate a sizable commitment of time and resources because the long-established techniques worked well and have given them a good profit (Larsen al., 2018). The interview participants often had a common concern: "How will the market react to this new technology?". Researchers believe this is because most of the new technologies can be disruptive for traditional or conservative industries. To successfully introduce and adopt an innovation within such a sector, it requires to disregard 'the value of convenience' and the longstanding tradition of doing business (Hakal, Lätti and Sandberg, 2011). According to Mikhael, most people in the diamond business tend to think that if the system is not broken – do not fix it. The researchers assume that this is one of the reasons for why the industry is characterized as conservative. Therefore, it was assumed that such factors as *resistance to change* and *industry history and heritage* do not play in favor of the innovation adoption in the diamond industry.

However, the findings also suggest that there is a shift towards a profit-driven and automation-focused mindset in the industry, where businesses are starting to see the potential advantages of implementing cutting-edge technologies like AI, laser-cutting equipment, BT and, frequently mentioned, synthetic diamonds.

Industry players realize that the potential benefits from these innovations cannot be ignored. Automation and AI technologies, for example, can improve precision and efficiency in diamond cutting and polishing, leading to higher productivity and cost savings (A.Rarick and Angriawan, 2017). Particularly when compared to traditional diamond cutting processes which are done by a human, laser cutting machines offer greater precision and accuracy, which could lead to more consistently high-quality output. Another example is BT which offers greater traceability opportunities as well as improving customer's trust in the process (Omotayo, 2021; Holmberg and Åquist, 2019; Gaur and Gaiha, 2020), compared to KPCS which, according to the respondents, has multiple flaws. As a result, companies in the sector are becoming more inclined to accept new technologies as they start to understand their competitive advantages. Therefore, it was assumed that another antecedent affecting company's acceptance of innovations is *competition.* It was noted by the respondents that competition is one of the factors that influence industry players to become more familiar with new technologies. Thus, it was assumed that competition plays in favor of the innovation adoption in the conservative industries.

However, at the same time, industry players are not willing to take risks or trust technology that has not been tried yet by others. According to Hosseini (2013) and Terri (2020), conservative companies, particularly those in oligopolistic marketplaces, may not feel the need to embrace innovation to outcompete other firms due to their established status. Some of the participants particularly highlighted that they would rather prefer to follow a demand than "being a pioneer" (Mikhael, John). As a result, researchers believe that the competition in this industry is not necessarily about being the first to adopt new technology and getting a competitive advantage. In fact, according to the findings and the contextual background, the major players in the diamond industry, like DeBeers and DTCs, were usually the first to adopt and try new technologies (Boele, 2016). Smaller businesses were considering implementing innovations once these major players have tested and developed them. This is because major players provide trust and are considered as respected and established leaders in the field due their reputation and expertise (Haufler, 2009). Therefore,

researchers determined that *dependency on major players* does not play in favor of the adoption of the disruptive innovation due to the reason that smaller players may be less willing to take risks on their own without the support or experience of industry leaders. Thus, *competition* alone is not a powerful enough driver to encourage businesses to adopt new technologies in conservative industries. Instead, industry leaders' actions – which might not always be in favor of smaller businesses – have a significant impact on the technology's adoption rates.

Next factor that was identified by the researchers is *uncertainty* in terms of adoption of a certain innovation. According to Mikhael and Chris, uncertainty is driven by a lack of resources, lack of interest and trust in the technology, difficulties with implementation of the technology. According to the existing literature, industry players often perceive the risks to outweigh the potential benefits (Rarick and Angriawan, 2017). Findings confirm, most of the companies within the diamond industry are not willing to invest resources into unproven technologies and trained professionals since they are comfortable with their current profit. For example, our respondents have executive positions in well-known corporations, but neither of them has adopted new technologies due to high implementation costs, even though most of them have noted benefits and opportunities of certain innovations (synthetic diamonds, BT, etc.). *Uncertainty,* according to the findings, can also result from technical implementation obstacles that businesses may have, such as problems with new technology integration into their operations or compatibility with current systems and equipment. Which is in line with the existing research (Eaton-Magaa, Ardon, and Breeding, 2021; A. Rarick and Angriawan, 2017). According to Chris, ten years ago lab-grown and natural diamonds had about the same buy price. Compared to today, synthetic diamonds can be 90 percent cheaper than a natural diamond. The researchers believe, if companies would have overcome uncertainties related to the high implementation costs, they could have made more profit on lab-grown diamonds ten years ago than nowadays. Additionally, it was assumed that lack of interest or confidence in the technology is created from unfamiliarity with the technology or doubts about its usefulness in the sector (Larsen et al., 2018), which directly affects the *uncertainty* about its adoption. To conclude,

uncertainty was determined as a factor that does not play in favor of an adoption of disruptive innovation in the diamond industry.

Furthermore, from the conversations with the respondents, the researchers determined that *customer trust/pressure* is one of the antecedents affecting industry's adoption of innovation. Industry players claimed that if their consumers do not approve of a certain technology or activity, the company would rather not implement this technology to avoid losing their customers. Therefore, it was estimated that customers play one of the crucial roles in the diamond business. According to the respondents, nowadays consumers desire more sustainable and environmentally cautious options and seek businesses that align with these values. Since synthetic diamonds are ethically produced and sourced (A. Rarick and Angriawan, 2017), customers started to encourage companies towards the acceptance of this new technology. Therefore, it can be assumed that a rise in the customer demand for synthetic diamonds prompted the adoption of innovation within the diamond industry. It was apparent that consumer trust has a big impact on each participating company's business. Thus, researchers believe that c*ustomer trust/pressure* can help to advance the adoption of new technologies.

However, researchers determined that it can also work against innovation if the technology is not seen as being in line with customers' values and preferences. Findings show, *customers' trust* can be an obstacle since some consumers are reluctant to buy diamonds that have been processed using new technology, preferring to rely on more conventional techniques that they view as being more trustworthy. Additionally, some customers continue to favor naturally mined diamonds due to the reason that this way the gems possess a certain "magical aspect", which highlights the significance of a diamond origin (Sipe, 2022). Therefore, some companies do not implement lab-grown diamonds because it would disregard their loyal consumers' expectations (Mikhael). Moreover, according to the findings, companies cannot sell mined and lab-grown diamonds under the same business name. This is because customers would assume that the company could "fool" them and sell synthetic diamonds for the price of a mined

one (Chris). Therefore, it is believed that even in the conservative industry, consumers' desires and preferences are key factors affecting a company's decisions. To conclude, it is suggested by the researchers that *customer trust/pressure* is an antecedent that influences the innovation adoption within the conservative industry, in some cases it does play in favor of disruptive innovations and in some – does not.

The diamond sector is at the forefront of the *transparency* debate. The industry has traditionally been cloaked in secrecy, with a small group of dependable participants (Berger and Herstein, 2012; Boele, 2016). Consumers and industry players, however, are now pressuring businesses to be more transparent, upending established business procedures and encouraging the adoption of new technologies. Researchers believe that this is what is spurring the industry's growing interest in BT. Customer trust and industry participants' trust are both assumed to rise with more openness. However, not all industry players may be ready for this level of transparency (Queiroz, Telles and Bonilla, 2019). Technologies that increase supply chain transparency are seen as a threat by certain businesses because they make it impossible to profit from unethical or illegal business operations, according to the findings. As a result, the use of new technology within the diamond industry can be a divisive topic, with some businesses resisting the push for greater openness. Researchers believe that *transparency* is one of the important antecedents affecting the innovation adoption within the traditional sector. However, the same as customer trust/pressure, it does not always play in favor of the disruptive innovation adoption, but in some cases it does.

From the first part of the data analysis where the researchers aimed to answer one of the research questions, it became apparent that there are various antecedents that influence the adoption of innovation in the conservative industry that are interconnected and have a simultaneous impact on the innovation adoption process (as seen in figure 4). While some of these antecedents are positively impacting the innovation adoption (like *competition*), others - have an unfavorable impact (like *resistance to change, industry heritage, uncertainty,*

dependence on major players). Additionally, some antecedents (such as *consumer trust/pressure* and *transparency*) were found to have both favorable and unfavorable effects, depending on the circumstances. However, it is apparent that most of the identified antecedents are unfavorable to the adoption of disruptive innovation in the conservative industry.

6.2 Benefits of BT's Implementation

BT has the potential to revolutionize the way respondents interact within the diamond industry. As observed from the interviews conducted, the technology could introduce new solutions to enhance diamond traceability, which would help in detecting counterfeits and conflict diamonds. As a result, BT would help the diamond industry become more ethically oriented, by ensuring that their sourcing methods are in line with standards related to child labor or human rights abuse that regularly occur on the mining side of the supply channel (Frąckiewicz, 2023). That is a huge benefit for the industry since its current methods of tracing diamonds like the KP is still regarded as flawed by both our respondents and the existing literature (Orenge, 2018; Global Witness, 2007; FATF, 2013). The existing research, along with the respondents both agree on the fact that BT could be adapted to the KP to reinforce some of its weaknesses by making the data immutable and unalterable compared to the paper-based systems currently used by the industry (Chase, 2018). This can be enforced through smart contracts which can ensure that governance standards are respected for instance but also help in re-tracing illicit transactions (Ibid, 2018). Additionally, BT would promote greater trust among industry partners, who are frequently hesitant to collaborate with newcomers, thus boosting market competitiveness (Thakker, Patel, Tanwar, Kumar, and Song, 2020). Using smart contracts can facilitate payment and transaction execution for diamond merchants, resulting in lower trading costs and increased trust thanks to security (Frąckiewicz, 2023). According to Mikhael, he has worked exclusively with the same diamond supplier for more than three decades due to mutual trust regarding payment obligations. Implementing smart contracts would allow for the resolution of this issue and ultimately increase the number of potential suppliers available to

merchants. Through this method, diamonds could be rented, and to a certain extent, this process could also be incorporated for the renting of diamond factories, apparatus, instruments and many other diamond-related equipment that might be too expensive to acquire for new entrants (Thakker *et al.,* 2020). Nowadays, most of the diamond trades are handled by third party intermediaries to make sure that the process occurs smoothly. However, these middlemen are often costly and involve a lot of paperwork. This could ultimately be replaced through the usage of BT thanks to smart contracts and eliminate the need for a third-party operator to monitor the transaction (Frąckiewicz, 2023).

As observed in the findings, BT could also be used to trace its pricing. By recording the characteristics and prior transactions associated with a specific diamond, BT can provide a source of evidence for a diamond's value index. This guarantees that purchasers can rely on such estimations and in stabilizing the price of diamonds (Chase, 2018). John, for example, described on several occasions how BT could help in turning the diamond into an asset backed digital currency. Despite the diamond's high price, the industry has always had difficulties attracting investors in the market because there lacks uniformity in the ways diamonds are valued. BT could turn diamonds into a more attractive option for investors by standardizing its value through a digital currency asset (Ashraf, 2022). As a result, one of BT's benefits based on the five attributes of IDT, is its relative advantage in comparison to the current methods that are used by the industry. Moreover, the versatility of BT regarding the ways it could be implemented also makes it a compatible tool, that can answer to the current needs of the industry and to its dynamics, such as trust, transparency, ethical sourcing, and the dissolution of fraud and of other corruptive practices. Thus, compatibility is also a benefit of BT in that case since it answers well to the issues currently faced by the diamond industry.

In addition to its relative advantage and its compatibility with current systems, another benefit of BT is its trialability. At the time this thesis was written, several industry players had begun the development of their own blockchain solutions. The findings firstly show that DeBeers have been working on Tracr for several

years, and that their project is widely supported by all the industry players. For instance, the GIA, one of the biggest diamond graders of the industry has joined Tracr with the objective of providing to consumers an ability to provide an exact description of a stone's provenance (De Beers, 2023). This factor is a benefit in terms of trialability since this allows consumers and companies to already test the technology and see how it works. This also increases the adoption process and educates the stakeholders on how BT can serve the industry. Another instance of how trialability is benefiting the industry through current implementations is Everledger, which offers a solution for the industry related monitoring and controlling the diamond production life cycle from mine to consumer (Thakker *et al.,* 2020). Their solution gives to diamond traders metadata on the gem's origin and mining source, its attribute regarding carat, clarity, color and cut, the artisans who cut and polished the diamond, as well as a certification. This metadata can then be found and accessed through public or private ledgers (Orenge, 2018).

As a result, the fact that those solutions are already available to users makes BT more observable as well, which is one of the five constructs evaluated through the IDT and a leading factor of technology adoption within companies. In other words, if the benefits of a technology are observable, companies are more likely to implement it (Paljak, 2019). The fact that EverLedger and Tracr are developing their solutions helps industry players with assessing the technology's utility. However, as observed in the findings, most industry players have not had the opportunity to utilize BT in their daily activities thus suggesting that observability is not benefiting the adoption of BT in some areas of the industry at this time.

In summary, the main benefits of BT's implementation in the diamond industry based on the five attributes are relative advantage, compatibility, trialability and to a lesser extent observability. BT's relative advantage is a benefit to its diffusion since it allows for transparency, traceability and immutability of data. Those factors to promote ethical sourcing but also trust among industry players, hence sparking competition using smart contracts. Moreover, BT would help in

reducing the volatility of the diamond price and facilitate most of the activities undertaken by diamond traders through the automation of transactions, the standardization and digitization of all related paperwork. Furthermore, BT can be seen as compatible because it answers to many of the industry's needs, which are related to ethical sourcing, traceability and trust. Moreover, BT is versatile with a myriad of different configurations, and can thus be implemented into the industry's practices, meaning it is also compatible from a technical perspective. Finally, the fact that there are current applications like Tracr and EverLedger shows that there is compatibility. This also promotes trialability, and observability for those who have utilized the systems mentioned.

6.3 Challenges of BT's Implementation

One of the main challenges of BT's implementation is firstly the *conservative nature* of the diamond industry. This can be argued from the fact the production of diamonds and even jewelry are standardized (Jordan, 2022). Thus, new entrants and technological disruptions are perceived as threatening to the traditional diamond trade (Dharani, 2020). The diamond industry is also perceived as complex, difficult to understand, even impenetrable by the existing literature and the respondents (Bain & Company, 2011). As a result, the industry seems to be open to new ways of doing, but is at the same time conservative, by rather opting for a 'watch and see' approach (Jordan, 2022). Ultimately, the diamond industry seems more prone to opting for sustaining innovations rather than disruptive innovations, since the companies would rather accept their implementation if they were undertaken by incumbent companies (Cote, 2022). Blockchain is disruptive in the sense that it is complex to implement, hence meaning that infrastructural costs will also be required, and this could be a challenge for many companies if BT became a standard. Blockchain is a technology that consumes energy and requires a good amount of hardware to enhance the system (Thakker *et al.,* 2020).

As expressed by John, the problem is that diamond traders appreciate paper-based methods for privacy reasons. Another challenge in terms of complexity is data security and privacy. As observed in the literature review, BT can come under many forms in terms of accessibility and architecture. Since BT's purpose is to open data accessibility using a public ledger, it implies that anyone in the network can view the transaction details of any companies. Stakeholders in the diamond industry may however view such practices as a drawback because some of this data is sensitive and could affect their competitiveness (Thakker *et al.,* 2020). Thus, this could make the industry more resistant to BT's implementation into their process. For instance, the findings showed that despite the benefits of BT in dissolving paper-based solutions for administrative work, the respondents like John seemed to reject them for privacy reasons. The complexity of BT from a technical perspective is a challenge in its adoption. As observed from the findings, the versatility of BT in terms of its utilities is difficult to grasp. So far, its capabilities have yet to be unleashed in the diamond industry (Yaniv Chechik, 2018). For most diamond traders, it also seemed like they had difficulties understanding BT due to its intangibility. Some of them even assumed that they had potentially been trading diamonds that were part of the Tracr blockchain without even realizing they were. This underlines the construct of observability as a challenge to BT's implementation in the diamond industry.

Some other issues related to the complexity of BT's implementation in the diamond industry is the scalability of the technology, affecting security and/or decentralization. It is also important to point out that BT is a resource intensive technology, as it constantly duplicates blocks of data. There are numerous transactions occurring in the diamond supply chains, and as they progress toward connecting Internet of Things (IoT) devices and other systems to automate the network further, the burden related to the scalability of BT may affect its efficiency. This saturation would lead to latency issues due to transaction cost overheads. Moreover, the immutable nature of the BT's data will also influence memory requirements (Thakker *et al.,* 2020).

It is also important to acknowledge that the diamond industry is complex by nature, and that BT will thus be challenging to implement for some use cases. For instance, John expressed his enthusiasm of building an asset backed digital currency that would allow creating an indexed fund for diamonds just in the same way it is designed with gold for instance. However, Dave also argued that the volatility of the diamond price is a factor that complexifies the implementation of BT for this purpose. This is because polished diamonds are valued based on a myriad of criteria which include carat, color, cut and clarity. It is also very common to see two exact stones sold at a different price. This shows that the complexity of the diamond industry makes it challenging to implement technologies like BT. Moreover, the industry is not necessarily open to the entry of startups which have access to only a few venture capital firms specialized in the industry. As a result, few of the projects presented managed to get the required funds to implement them successfully (Jordan, 2022). Here again, the problem is that the technology is disruptive in the way it requires a new architecture to emerge, meaning that the industry needs to change certain standards that have prevailed for centuries and shift to new methods of valuation. This could once again lead to reluctance and resistance to change from industry players.

In summary, the main challenges of BT's implementation in the diamond industry relate to its complexity and its observability. Firstly, BT is disruptive in the sense that it requires infrastructural changes to the ways stakeholders interact within the industry. Furthermore, BT is versatile, and can be constructed in a wide range of forms. It is however clear that the industry is wary of data privacy, meaning that a collaborative approach through communication and mass marketing is required to ensure that the network architecture corresponds to the stakeholders needs. Additional problems related to complexity also include scalability, energy consumption, memory capacity, which all are technical weaknesses of BT. The volatility of the polished diamond price may also affect the range of utilities of BT, as it may complicate the implementation of an asset backed digital currency. Even though gold and diamonds are often used together in jewelry, their valuations behave differently in the investment market. In

contrast to other indexed commodities like gold, diamonds are notoriously difficult to value (Bain & Company, 2011). Other challenges revolving around the observability of BT are its intangibility, as people may be less inclined to embrace a technology if they believe it to be difficult to use owing to its intangibility. The lack of understanding on the forms BT would then subsequently affect its perceived ease of use and ultimately its observability. This assumption is in line with Rogers IDT (2010) who explains that innovations based on hardware diffuse faster than those dominated by software.

7 Solution

According to the data analysis, the diamond industry seems to prefer the implementation of sustaining innovations, which are implemented by trustworthy incumbents. In fact, as observed in the previous section, there are already existing BT solutions that have been implemented in the diamond industry. Therefore, the researchers believe that the solution designed for this study should not focus on the technical challenges of BT such as complexity or compatibility. The analysis has also shown that one of the key challenges of BT's implementation and adoption in the diamond industry is its observability. While BT has been already deployed in the industry, it seems clear that the respondents still misunderstood how they could take advantage of BT. Therefore, *the challenge* that the researchers are attempting to solve is the lack of observability of BT' advantages in the diamond industry, despite its already deployed usage. To help the reader understand how the BT platform works in the diamond industry, researchers created a process flow diagram (see figure 5).

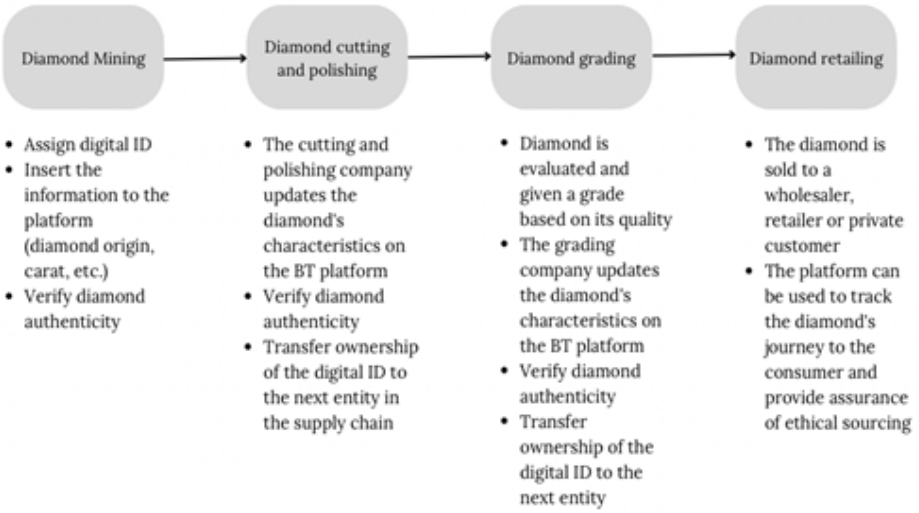

Figure 5. Process flow diagram of BT platform adapted to the study.

As shown in figure 5, BT can be used to monitor diamonds in a safe and transparent manner, guaranteeing that they are sustainably sourced and conflict-free, by leaving a digital ID every time it moves to another node. Thanks to that, diamond makers and sellers can verify the authenticity and provenance of the diamonds they acquire, while customers can be certain that the diamonds they purchase are sourced ethically. As mentioned previously, the paper solely focuses on the polished diamond industry, hence meaning that the solution is more oriented to retailers and diamond traders.

Introducing The Solution

The following approach offers an in-depth marketing strategy for effectively promoting and distinguishing blockchain diamonds from non-blockchain diamonds. The researchers believe the diamond trading organization should harness the benefits of current BT solutions such as Tracr or Everledger to create new interactive utilities that improve user experience to add value to blockchain diamonds. Thus, the primary goal is to allow for distinction in the manner blockchain diamonds are marketed.

Collaboration with Existing Blockchain Solutions

Collaboration with existing blockchain networks, which provide dependable platforms for recording and tracking diamond information, is a vital component of the marketing plan. This collaboration allows diamond merchants to avoid investing time and money on the development of an entirely new blockchain by instead leveraging those firms' reliability, recognition, and wide network of participants. Collaboration with previously established networks not only helps provide credibility to blockchain diamonds, but also ensures that the diamonds are transparent, traceable, and ethically sourced for all clients. This is also a factor that comes in line with the analysis made on how conservative industries behave. Since trust is a key aspect in such industries, it was deemed important by the researchers to recommend going for existing, well-established blockchain solutions like Tracr or EverLedger.

Creating a Digitally Interactive Platform

To widen the gap between blockchain and non-blockchain diamonds, diamond trading organizations must provide a digital platform or application that provides clients with an engaging, immersive, and value-added experience. This platform may use data stored on the blockchain network to give clients with extensive information about the diamond's journey, qualities such as carat, clarity, cut, and color, as well as certificates. Customers may learn about the diamond's origin, mining procedures, and the numerous phases it went through owing to the establishment of a virtual journey that encourages transparency and trust while also providing more knowledge about a diamond's tale than natural diamonds. It should be noted that this should assist promote the relative benefits of BT. More capabilities, such as 3D models and Augmented Reality might be added to the interactive platform, allowing buyers to examine the blockchain diamonds from various perspectives, zoom in to see the complex intricacies, and even compare them to non-blockchain real diamonds. Finally, this approach should aid in providing customers with an immersive experience that not only improves their understanding of the diamond's characteristics, but also fosters an emotional connection and appreciation for the craftsmanship inherent in blockchain diamonds that may not be present in non-blockchain diamonds.

Expert and Educational Resources

The data study also revealed the need of teaching and conveying the benefits of BT to stakeholders. This might be accomplished by creating an interactive platform with educational resources and professional perspectives. Diamond trading businesses may work with specialists to provide instructional information about ethical sourcing, environmental issues, and the role of BT in the diamond industry. This strategy should also enable the diamond trading firm to differentiate itself from its competitors by lobbying for a more ethically sourced sector, which will aid in distinguishing blockchain diamonds from non-blockchain diamonds.

Customer-Driven Personalization

Traders can supply further adaptations to their consumers based on their preferences by improving this interactive utility. Customers would enter their

criteria and desired diamond features including cut, color, clarity, and carat weight onto this interactive portal, and the program would produce individualized suggestions based on the blockchain diamonds available in the market. This customer-centric approach provides value to blockchain diamonds by allowing for greater personalization, adapted to the customer's expectations, as well as making blockchain diamonds easier to list and pick from.

Summary of Solution

The diamond industry has placed a high value on trust, transparency, and ethical sourcing. Through product differentiation, these aspects may be emphasized through a marketing strategy to promote blockchain diamonds. Diamond merchants can sell those under a new type of product that comes with a more reliable certification than diamonds that are not registered in a blockchain. Additionally, they can provide an added value to this product category through interactive digital platforms and additional services that come with the shopping experience of a blockchain diamond. Diamond merchants may successfully promote BT and position themselves as leaders in an ever-changing sector by using this strategic approach. To conclude, by employing the proposed strategies, the challenge of BT's observability will be overcome through the effective marketing and education about the benefits of BT for the industry.

7.1 Managerial Implications

Solution developed by the researchers aims to bring value for the managers who are planning to implement BT in their businesses. The solution will be of use for them since it will solve the challenges related to marketing and effective communication to the consumers on the stage of distributing their products. The proposed solution contributes by providing a marketing strategy that helps diamond traders promote BT through a new type of product - blockchain diamonds. As a result, this should help managers to understand how BT can be advertised and communicated to provide unique differentiating benefits of blockchain diamonds in comparison to diamonds that are not included in a blockchain.

In general, the solution developed by the researchers aims to bridge the gap between the technical facets of BT and the practical aspects that companies should consider when promoting their products. Moreover, it can aid in increasing the use and adoption of BT by the companies and support the long-term development of the sector by offering management useful advice and suggestions. Finally, this is also a solution that could help any diamond trading company to make a shift towards ethical sourcing and environmentally conscious.

8 Conclusions

The results of this thesis offer insights on the antecedents that affect innovation adoption in the industries with a conservative mindset. The researchers concluded that these factors are interrelated and have simultaneous effects on the adoption of new technologies. Certain antecedents, like competition, can play in favor of the innovation adoption process by making companies become more familiar with the new technologies and realize their competitive advantage. However, this factor alone is not powerful enough to positively influence the adoption due to the companies' dependency on major players of the industry. Smaller companies prefer not to take risks before the actions of the industry's leaders. Therefore, dependence on major players was identified as being unfavorable for the innovation adoption. Similarly, other antecedents, like resistance to change, industry heritage, and uncertainty have been found to have unfavorable effects on the adoption process. These factors have been connected by the researchers to the standardized nature and dynamics of the diamond industry, which was also emphasized by the participants throughout the interviews.

Furthermore, customer trust/pressure was found to have both favorable and unfavorable effects, depending on the circumstances. It can be an obstacle for innovation adoption when consumers do not approve of a certain technology or activity, and when it is not aligned with the consumers' values. However, customers also can encourage the companies towards the innovation implementation by showing a desire or demand for it. Similarly, transparency and ethical sourcing was found to have a double sided effect. On one hand, consumer and industry players' pressure for transparency and ethical standards is disrupting business practices and driving the adoption of new technologies. On the other hand, businesses within the industry see that as a threat due to the impossibility of profiting from illegal and unethical activities. Overall, the findings of the first research question established that most of the discovered

antecedents do not favor the adoption of disruptive innovation in conservative industries.

The second research question discussed the benefits and challenges of the BT in the diamond industry. The results suggest that the diamond sector can benefit from the adoption of BT in terms of relative advantage, compatibility, and to a certain extent, trialability, and observability. BT makes it possible for data to be transparent, traceable, and immutable, fostering ethical business practices and industry trust. As well as streamlining transactions and paperwork, it lowers the volatility of diamond prices. However, researchers found several difficulties with complexity and observability. It was concluded that BT needs to make infrastructure modifications and must address data privacy issues. Additionally, researchers emphasized the importance of fixing technical flaws like scalability and energy usage. The adoption of BT can be hampered by its intangibility and a lack of comprehension, which are connected to this aspect of observability. Overall, it is crucial for the companies to carefully weigh the advantages and disadvantages of BT for successful deployment in the diamond sector. Researchers have concluded that by tackling significant issues and fostering positive changes, BT can undoubtedly transform the diamond business. Widespread acceptance, however, faces huge obstacles due to the industry's conservatism and the antecedents identified in the first research question.

By comparing the results to the current literature and theoretical theories, this study helped the researchers get a better idea of how people adopt new ideas. It also looks more closely at what BT means for the diamond industry, which is used as a model for the notion of conservatism. This gives a better understanding of the specific dynamics and factors that affect the acceptance of disruptive innovation in a conservative industry. This also strengthens the validity and relevance of existing theories.

8.1 Theoretical Contributions

This study firstly contributes to the theories by exploring why disruptive innovations are complicated to implement in industries with a conservative

mindset. It provided a deeper understanding of the level of technology acceptance in the diamond industry. While some technologies were accepted, and some were not, it always seemed like the technology in question needed to benefit, or at least not threaten the image of the industry's core product, which in that case are diamonds. This thesis took inspiration from the TAM and complemented the theory by showing why sustaining technologies are more prone to succeed in the diamond industry than disruptive ones. Incumbent companies are perceived as pillars in conservative industries. They dictate what trends should be accepted or not. As a result, technologies are accepted under their sustaining form because only incumbent companies successfully implement innovations in those industries. Another reason for why disruptive technologies tend to fail in conservative industries is also due to the highly standardized nature of all processes. As a result, either the implementation is sustainable, as it easily fits into the current processes of incumbents, or it is disruptive, meaning that an infrastructural change will be required.

Furthermore, there is limited research that focuses on the diamond industry from its conservative stance to analyze the benefits and challenges of implementing disruptive technologies. In this thesis, the benefits and challenges of implementing BT in the diamond industry based on the IDT were explored. The study complements the theory by highlighting the concept of intangibility and education as two major factors that affect perceived ease of use. The study also contributes to the IDT by providing more insights into the concept of innovation diffusion in scope to the TAM. The results may also enlighten the industry further on how BT should be implemented for an efficient diffusion. It could assist stakeholders who are willing to implement BT in their activities. Finally, the combination of both theories has led the researchers to the following conclusion: disruptive innovations do not have to be disruptive in their implementation, they can also take the form of a sustaining implementation. This is particularly relevant to industries with conservative and long-lasting practices. In other words, industry players should focus on implementing BT from a sustaining rather than from a disruptive form.

This study adds to the body of knowledge by creating connections between the results and the TAM framework, which also serves to confirm the framework's applicability and usefulness in explaining innovation adoption behavior in the conservative industries. Research findings are also aligned with the IDT model. The conclusion underlines that, in keeping with the IDT's concept of the social and contextual factors driving innovation distribution, the industry's conservatism and indicated antecedents pose barriers to the widespread acceptance of BT.

8.2 Limitations

Several limitations were identified that may have affected the research. Firstly, there is a limited amount of literature and research available that specifically focuses on the diamond industry and its acceptance of new technologies such as BT. Therefore, the level of analysis and comprehension of the industry-specific challenges may have been impacted by this.

Secondly, due to the specifics of the diamond industry such as its standardized nature, the study was further limited by the access to the data. Therefore, the accuracy of the findings might have been influenced by restricted data availability. Without thorough data, the analysis might have been incomplete or biased. This might have had an impact on the study's conclusions and suggestions.

Thirdly, the sample size of this thesis was limited to four experts, which means that the discussed topics and received insights may not fully reflect the ideas and perspectives of the entire industry, potentially affecting the generalizability of the findings.

Lastly, there are several challenges of BT implementation in the diamond industry that have been identified by the researchers, however, it was mainly focused on solving the observability issue. As a result, other challenges of BT were not addressed.

8.3 Delimitations

When evaluating the results and comprehending the limits of the study's application to other situations or facets of the diamond business, it is crucial to acknowledge the existence of several delimitations. To begin with, this thesis only focuses on the polished diamond industry and other sectors of the industry, such as mining and trade in rough diamonds, are not included in this study. As a result, it is possible that the results and recommendations of this thesis are not applicable to these additional areas.

Next, the population of this study consisted of four people located in France, Belgium, Switzerland and Italy. The generalizability of the results to a wider global context might be constrained by this geographical focus.

Furthermore, due to the lack of competence in the fields like computer science or programming, the thesis mainly explores the behavioral aspects of BT's adoption and acceptance by the industries with the conservative mindset. Therefore, there is not enough discussion of the technical aspects of BT and its implementation. As a result, the proposed solution does not include complex technical details and might not have value for the future researchers aiming to use this thesis in the technical fields.

Finally, researchers adopted a particular conceptual framework and set of theories based on the study's objectives and research questions. By employing different theories and frameworks, the thesis could have resulted in different findings, interpretations and conclusions.

8.4 Future Research Implications

Future researchers can expand on the current result of the thesis solving the BT's observability challenge, as well as further enhance and improve the suggested solution. Additionally, the researchers can investigate other challenges encountered in this thesis. Considerations for this could include scalability, intangibility, data privacy, etc.

Next, future research can employ a larger sample size and increase the diversity of the geographic representation of participants. The study can offer a more thorough knowledge of the adoption and acceptability of BT in the diamond business by incorporating perspectives from various geographic areas.

Finally, future researchers who are proficient in programming can explore the technical elements of BT implementation in the diamond industry or other fields in greater detail. This could entail creating and evaluating software programs or performing in-depth investigations of the BT's protocols and algorithms. Examining the viability and effects of technical implementations might offer insightful information on the applicability and efficiency of BT in different markets.

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Appendices

Appendix 1. Interview guide

№	Question	Category
1	Can you tell us a little bit about your experience in the diamond industry?	Introduction
2	What do you think about the current state of the industry in terms of technology adoption?	
3	What are the factors of technology that you perceive as important to push your business forward?	TAM - Perceived usefulness
4	What technologies have you implemented into your operations that you consider as useful?	
5	Can you provide examples of technologies that have been useful in the diamond industry, and the factors that contributed to their success?	
6	How easy do you perceive it to be to implement new technologies in the diamond industry?	TAM – Perceived ease of use/implementation
7	What are the potential barriers that may affect the success of its implementation?	
8	Can you describe your experience with using new technologies in the diamond industry? How easy or difficult were they to use and implement?	
9	What is your attitude towards implementing innovations in the diamond industry?	

10	What factors influence your attitude towards the implementation of new technologies?	TAM – Attitude towards using
11	In your opinion, how can attitudes towards implementing and using new technologies be positively influenced in the diamond industries?	
12	How likely are you to implement new technologies in the diamond industry?	TAM – Behavioral intention to use
13	Do you think the intention to use innovations in the diamond industry will increase?	
14	What circumstances would push you to implement new technologies?	
15	What factors would motivate you to implement/use a new technology into your process?	TAM – Actual use
16	What do you understand by the term "blockchain technology" and how do you think it can be applied in the diamond industry?	
17	Have you previously used Blockchain technology in the diamond industry?	
18	How do you perceive the relative advantage of using blockchain technology in the diamond industry compared to traditional methods of tracking and verifying diamond transactions?	IDT – Relative advantage
19	In your opinion, what are the key benefits of using blockchain technology in the diamond industry and how do they compare to existing methods?	

20	What are some potential disadvantages or drawbacks of using blockchain technology in the diamond industry compared to traditional methods?	
21	How compatible do you think blockchain technology is with the existing processes and systems in the diamond industry?	IDT - Compatibility
22	What are some potential challenges or obstacles to implementing blockchain technology in the diamond industry that are related to compatibility?	
23	How can these challenges be addressed?	
24	How complex do you perceive blockchain technology to be compared to traditional methods of tracking and verifying diamond transactions?	IDT - Complexity
25	What are some potential challenges or obstacles to implementing blockchain technology in the diamond industry that are related to complexity?	
26	How can these challenges be addressed?	
27	What are some potential ways to trial or pilot blockchain technology in the diamond industry before full-scale implementation?	IDT - Trialability
28	What are the potential benefits of trialing blockchain technology in the diamond industry before full-scale implementation?	
29	What are the potential drawbacks of trialing blockchain technology in the diamond industry before full-scale implementation?	

30	How visible or observable do you think the benefits of using blockchain technology in the diamond industry will be to industry participants and other stakeholders?	IDT - Observability
31	What are some potential challenges or obstacles to observing the benefits of using blockchain technology in the diamond industry?	
32	How can these challenges be addressed?	
33	How do you see the adoption of blockchain technology progressing in the diamond industry?	Future of Blockchain Technology
34	What factors do you think will drive the adoption of blockchain technology in the diamond industry?	
35	In your opinion, what steps should the diamond industry take to ensure successful adoption of blockchain technology?	