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Perceived Business Model Impacts of Blockchain and Other Advanced Technologies Adoption

Thesis presented by

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Declaration

"This is to certify that the work I am submitting is my own and has not been submitted for another degree, either at University College Cork or elsewhere. All external references and sources are clearly acknowledged and identified within the contents. I have read and understood the regulations of University College Cork concerning plagiarism and intellectual property."

Abstract

The adoption of advanced technologies by organisations can affect all aspects of an organisation's business model. This is particularly true for disruptive technologies such as blockchain, Internet of Things (IoT), and others. The objective of this study is "To explore the perceived impacts of blockchain and other advanced technologies adoption on an organisation's business model." A web-based survey was derived by adopting the Business Model Canvas (BMC) (Osterwalder & Pigneur, 2010) as a lens, and 19 business model impacts were identified in prior research.

The study employs a mixed-method approach in two phases: an exploratory study with 31 questionnaire responses plus short interviews, and an extended study with 72 survey responses. The exploratory study focuses on blockchain, small and medium enterprises, and Saudi Arabia. The extended study contains several technologies, organisation sizes, and regions.

The findings reveal that the majority of respondents (N=72) perceive all 19 business model impacts stemming from adopting advanced technologies in general, although this correlates with organisational size for some impacts. However, the perceived impacts of blockchain adoption as reported by blockchain adopters (N=41) are mixed. The majority of blockchain adopters surveyed do not perceive the anticipated impacts of blockchain adoption, although again this correlates with organisational size and sector.

The study makes several key contributions that agree with prior research on the perceived impacts of technology adoption in general, challenging prior research on the perceived impacts of blockchain adoption specifically, and extending current knowledge in terms of the relationships between size, sector, and perceived impacts. The study also contributes to practice, offering insight to managers who are motivated to address the challenges of technology adoption, mitigate negative effects, and maximise positive impacts. Such decision makers can benefit from the insights of the study about the importance of use cases, ROI measurement, and other factors.

Keywords: Disruptive Technologies, Technology Adoption, Business Models, Perceived Impacts, Blockchain Technologies, Advanced Technologies

Chapter 1: Introduction

This chapter presents the research study by explaining the motivation (section 1.1), summarizing the research objective and contribution (section 1.2), outlining the research plan (section 1.3), and summarizing the whole document (section 1.4).

1.1 Motivation

Organisations operate in environments with significant challenges, inherent risks, and unpredictable events and uncertainties. To thrive, they must skillfully balance stability and adaptability, enhancing both their effectiveness and long-term sustainability. A well-structured business model is vital, as it allows organisations to unlock, capture, and efficiently redistribute the value they generate, ultimately driving their mission forward (Carayannis et al., 2015).

Chesbrough (2010) further argues that a business model effectively fulfills several important functions that can contribute to an organisation's success:

1. Business model presents a strong value proposition that specifies the benefits users derive from the technology-based offering, highlighting its relevance.
2. Business model pinpoints a particular target market segment and clarifies the revenue generation mechanism, explaining how the technology serves these users and their needs.
3. Business model outlines the value chain structure necessary for producing and distributing the offering while also recognizing the complementary assets that strengthen the firm's position within that chain.
4. Business model thoroughly assesses the revenue mechanisms available for the firm to earn income from its offering.
5. Business model estimates the cost structure and profit potential, factoring in the established value proposition and value chain structure, which aids in making informed decisions.
6. Business model details the firm's role within the larger value network, connecting suppliers and customers and highlighting potential competitors, which can guide strategic collaborations.

7. Finally, the Business model develops an active competitive strategy that empowers the innovative firm to establish and sustain a strong advantage over its competitors, promoting long-term success.

Osterwalder and Pigneur (2010) provides the Business Model Canvas, one of the most commonly cited organisational frameworks in the information systems (IS) research domain. Osterwalder and Pigneur (2013) identified three major areas in which business model perspective can contribute to the field of IS:

1. IS research can effectively model, represent, and visualize concepts, constructs, and models relevant to the design of business models and other strategic ideas.
2. IS research can enhance our understanding of how design techniques and tools can improve the process of addressing strategic business questions.
3. IS research can clarify the reasons and methods by which computer-aided design can support business developers, strategists, and entrepreneurs in crafting solutions to strategic business challenges.

According to Christensen (2014) and Utterback and Acee (2005), the true significance of disruptive technology goes far beyond its potential to replace established products. It is a powerful market expansion and innovation driver, unlocking new functionalities that reshape industries and enhance consumer experiences. Christensen (2014) illustrates that not many technologies or business ideas can be categorized as either sustaining or disruptive by nature. Instead, their disruptive potential must be shaped into a strategy as managers develop the concept into a plan and subsequently implement it. Successful new-growth builders recognize that disruptive strategies significantly enhance the chances of achieving competitive success. For example, consider the disruptive origins of the Ultrasound product. Ultrasound technology has changed the imaging field by capturing soft tissues that traditional X-ray technology cannot. This innovation created a multi-billion-dollar industry led by companies like Hewlett-Packard, Accuson, and ATL. On the other hand, major X-ray manufacturers such as General Electric, Siemens, and Philips focused on developing computed tomography (CT) scanning and magnetic resonance imaging (MRI). Initially, these X-ray companies did not explore the ultrasound market, but they have recently started to buy important ultrasound equipment companies.

Baden-Fuller and Haefliger (2013) state that there is a significant link between technology effectiveness and business model selection. Researchers in technology strategy should explore the interrelationships between business model choices, technology development, and overall success. Scholars can gain valuable insights by viewing business model selection as a moderating factor and considering the dynamic elements influencing these choices. The right business model can enhance the complementarity with technology and create better monetization paths, while a poor choice may lead to reduced profits. Thus, intense empirical research needs to support theoretical development in these areas (Baden-Fuller & Haefliger,2013).

This study adopts the business model canvas (Osterwalder & Pigneur,2010) as a lens to explore the perceived impacts of technology adoption. The business model canvas is relevant to this study because it is crucial for understanding the impact of technology adoption within an organisation. This canvas clearly outlines the process of business model transformation. It effectively highlights the changes when new technologies are implemented, making it an invaluable tool for understanding and managing these transformations. By integrating technology research into their business model framework, organisations can effectively enhance their agility, stay competitive, and ensure alignment with market trends and their internal objectives. This integration is critical to thriving in today's dynamic landscape. Business models, disruptive technologies, common adoption impacts, and the other concepts above are discussed further in Chapter 2.

This research project began in 2019, originating from my personal experiences and a growing interest in the potential of one specific disruptive technology - blockchain - to transform the business models of small and medium-sized enterprises (SMEs), particularly in KSA. My bachelor's graduation project focused on total quality management, which taught me the importance of measuring process adoption impacts within an organisation. In my master's thesis, I conducted a strategic analysis of an Acute Care Hospital, using a balanced scorecard approach that included four perspectives (customer, internal business, innovation and learning, and financial metrics), a SWOT analysis, and an external analysis, using Porter's Five Forces model, which examines the bargaining power of suppliers, rivalry among existing firms, the bargaining power of buyers, the threat of substitutes, and the threat of new entrants (Porter, 2008). This brought my attention to the importance of system/whole organisation thinking, which informs my PhD research and its use of business model canvas framework to research

technology adoption. Through these research projects, I have developed strong research skills that also support my thesis work.

My exploratory study (2019-2020) focused on SME's. There is an ongoing discussion regarding the relationship between the size of an organisation and its ability to adopt technology. Small and Medium Enterprises (SMEs) often encounter challenges when adopting new technologies such as Blockchain. Larger companies more easily embrace this technology due to their greater resources. However, despite these challenges and other obstacles faced by SMEs, there remains potential for them to adopt technology solutions. Notable companies like McKinsey, Accenture, and IBM are already utilizing blockchain technology and believe that the rate of technology adoption is increasing among developing businesses. These larger firms can assist SMEs by providing training courses on this advanced technology (Clohessy et al., 2019). Consequently, familiarizing themselves with the complexities and standards of blockchain technology can inspire organisations to seek innovative solutions. Additionally, the geographic focus was on the Kingdom of Saudi Arabia (KSA). According to Afandi (2017), Small and Medium Enterprises (SMEs) play a crucial role in Saudi Arabia's economy. The growth of many businesses within this sector has made a significant contribution to the country's economic development. One of the primary reasons SMEs are adopting information technology (IT) is the changing consumer trends, as more people are using the Internet for various activities. Consequently, the rate of IT adoption among SMEs in the country is rapidly increasing (Afandi, 2017).

Ezmigna et al. (2024) state that Saudi Arabia is building a digital economy to help small and medium enterprises (SMEs) gain access to financial resources. SMEs often face high costs and complex rules that make it hard for them to thrive. Digital banking technologies can offer good opportunities for these businesses. The government supports this effort with programs like the regulatory sandbox from the Saudi Arabian Monetary Authority (SAMA), which lets SMEs safely test and use fintech solutions. Additionally, working with fintech companies that excel in areas where banks struggle can give SMEs access to affordable digital banking. This approach allows all businesses to benefit from efficiencies that were once only available to larger companies.

This approach established a strong foundation for the thesis research. The initial focus on blockchain emerged from personal interest, and the fact that blockchain was being heavily discussed in academic conferences and journals, particularly within the FinTech and financial

sectors. Thus, I began by exploring the blockchain literature, and conceptualising its characteristics and impacts. Over the course of the literature review and exploratory study, I realized that blockchain technology could significantly impact other industries beyond finance, and beyond SMEs, and the need to compare these perceived impacts with other technologies. This expanded population of the extended study also provided better access to data. During the exploratory study, I encountered challenges in reaching participants who had been affected by COVID-19. The number of responses was low, and was complicated by the narrowness of the study, making it difficult to draw comprehensive conclusions. Thus, design of the extended study to include technologies other than blockchain, organisations of all sizes, sectors, and regions, made the study both theoretically more complete and practically more operationalizable.

1.2 Summary of Objective and Contribution

The research objective of this research study is:

> *To explore the perceived impacts of blockchain and other advanced technologies adoption on an organisation's business model.*

This objective is implemented through four research questions informed by the business model canvas lens:

> RQ1: What Are the Perceived Impacts of Blockchain and Advanced Technology Adoption on an Organisation's Customer Segments (CS), Channels (CH) and Relationships (CR)?
>
> RQ2: What Are the Perceived Impacts of Blockchain and Advanced Technology Adoption on an Organisation's Key Partnerships (KP), Key Resources (KR) and Key Activities (KA)?
>
> RQ3: What Are the Perceived Impacts of Blockchain and Advanced Technology Adoption on an Organisation's Cost Structure (CS) And Revenue Streams (RS)?
>
> RQ4: What Are the Perceived Impacts of Blockchain and Advanced Technology Adoption on an Organisation's Value Propositions (VP)?

These questions were addressed using a two-phase study design including an exploratory study with limited scope and an extended study using a broader scope. The study's key findings

indicate that the majority of the 72 respondents perceived all 19 impacts identified in prior research in terms of general technology adoption (See Chapter 2). However, the majority of the 41 blockchain adopters did not perceive the 19 impacts in relation to blockchain adoption. Furthermore, the data highlighted correlations between perceived impacts and factors such as company size and industry.

The thesis makes several contributions to the IS research field. First, the study supports previous research anticipating the perceived impacts of advanced technologies on business models. Second, the study shows that perceived impacts did vary by organisational size. Third, the study challenges prior research by revealing that the majority of blockchain adopters do not recognize improvements across 19 potential impacts, unlike with general advanced technology adoption. These perceptions again correlated with organisational size and sector. Fourth, the study highlights the significance of factors such as use case, the scale of adoption, levels of integration and training, as well as considerations of return on investment (ROI) in maximizing the benefits of adopted technologies, particularly blockchain. For practitioners, the study suggests that organisations may benefit from exploring new technologies incrementally through projects while managing the number of technologies adopted in relation to their capacity to manage them. Firms should also consider both integration and training requirements. Finally, measuring the return on investment (ROI) is crucial for those adopting new technologies.

1.3 The Research Plan

This research study consists of two phases. The first phase is an exploratory study that focuses on one specific technology. The population sample includes only small and medium-sized enterprises (SMEs) in Saudi Arabia. The sampling strategy utilized various primary data sources, and the data collection methods involved an online questionnaire and interviews. Additionally, progress on the research was presented at several research events, which facilitated valuable engagement with the audience.

The second phase is an extended study containing a broader range of technologies and a diverse sample population, covering organisations of all sizes, ages, and industries. In this phase, the sampling strategy involves conducting a survey, with data primarily gathered through an online survey, showcasing the breadth of the study.

Timeline of the Research

From 2018 to 2019, I completed 90 credits across various modules and defended my proposal document. Between 2020 and 2022, I refined my proposal and began the first literature review. In 2022, I launched an online questionnaire for the exploratory study. In 2023, I redesigned the study and extended the literature review. In 2024, I launched an online survey for the extended study. Additionally, in that same year, I started analysing the data and writing up my findings, a process that continued until early 2025 (See Figure 1.1).

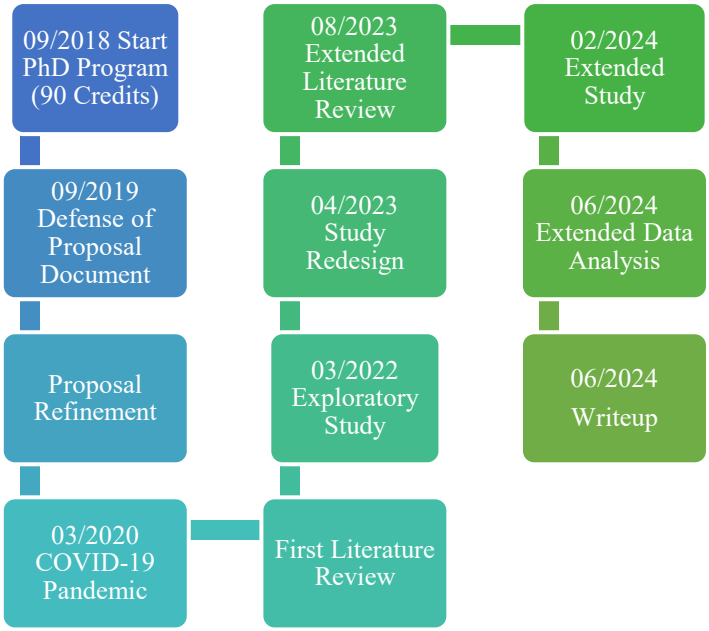


Figure 1.1: Research Timeline

Publications/Presentations During the Research

Over the course of the doctoral thesis project, work in progress was presented through a number of events and publications. These include:

CUBS Postgraduate Research Blog

- Breaking Down Blockchain Technology, Cork University Business School, University College Cork, 8 Jan 2020.

CUBS Postgraduate Research Symposium

- Explore blockchain technology to reframe SMEs business model Saudi Arabia Cases. 30 July 2020. Presented online.

ECIS Doctoral Consortium

- Exploring The Impact of Blockchain Technology on SMEs Business Models, 11 June 2021, ECIS 2021. Online doctoral consortium.

AIS Chapter Event

- Exploring The Impact of Blockchain Technology on SMEs Business Models, Saudi Chapter of AIS Research Seminar, 1st February 2022. Presented online.

5th MENA Conference on Information Systems (MENACIS):

- Alshabeeb, Z., Daly, M., Feller, J., (2022). The Potential Impact of Blockchain Technology in SMEs Business Model. Presented to the 5th MENA Conference on Information Systems (MENACIS), Dhahran, November 2022, Kingdom of Saudi Arabia. *(Proceedings still in press due to publication delays.)*

5th MENA Conference on Information Systems (MENACIS) Doctoral Consortium:

- The Potential Impact of Blockchain Technology in SMEs Business Model, 16 November 2022, the 5th MENA Conference on Information Systems (MENACIS), Dhahran, November 2022, Kingdom of Saudi Arabia.

CBA Lightning Talk Session

- Blockchain Technology in SMEs, College of Business Administration (CBA), Kuwait University, 17 April 2025, Kuwait.

1.4 Summary of the Document

In addition to this chapter, the document comprises five additional chapters, each focusing on separate topics that contribute to a comprehensive understanding of the technology adoption and business model.

Chapter Two: Literature Review

This chapter begins by conceptualizing business models using the Business Model Canvas (BMC). The BMC is divided into nine key building blocks describing a business's fundamental aspects: Customer Segments, Value Propositions, Channels, Customer Relationships, Key Resources, Key Activities, Key Partnerships, Cost Structure, and Revenue Streams. The Business Model Canvas is an essential tool for information system researchers, as this field integrates technology and transforms data into valuable information. Next, the chapter provides a discussion of disruptive technology concepts and examples of technologies. Due to the rapid

development of various technologies, understanding their implications is crucial. Following, the chapter highlights the perceived impacts of adopting disruptive technology on business models, emphasizing that such adoption can significantly influence how businesses operate. Lastly, the chapter presents the research gap and the objective of the study. The gap indicates what existing literature lacks, while the objective is to explore this topic in depth through research. In summary, the BMC offers a structured framework for understanding a business, and disruptive technologies challenge existing models, convincing businesses to innovate to maintain competitiveness.

Chapter Three: Methodology

This chapter begins by introducing the four research questions. These questions are theorized using the Business Model Canvas (BMC) as a lens and organizing the nine components of the BMC into four groups. Each group focuses on a specific theme: managing customer relationships, core operations, value creation, and financial aspects. Following, the structure of the study, which is organized into two phases. The first phase of the study is the exploratory study. The exploratory study focused on blockchain's impact on small and medium enterprises in Saudi Arabia. It involved 25 questions, two interviews with Saudi SMEs, and participants in several research events. The questionnaire result was 31 responses. The exploratory findings indicated the need for a broader range of organisations and technologies to be included in the survey. This refinement improved both the clarity and measurement of the survey, ultimately enhancing the approach to the four research questions in the extended study.

The second phase of the study is the extended survey. The survey consisted of 19 questions and collected 72 responses. After completing the exploratory study, the researcher identified several major modifications needed for the survey in the extended study. These modifications included broadening the topical scope to contain a wider range of technologies, expanding the target population to include all organisations, and improving the structure and format of the questions.

Chapter Four: Exploratory Study

The exploratory study investigated the adoption of blockchain technology within small and medium enterprises (SMEs) in Saudi Arabia. It featured a structured questionnaire exploring: details about the organisation, the adoption of blockchain technology (emphasizing its role, applications, purposes, use cases, and solution services), three key components of managing

customer relationships, two critical components of core operations, three financial components, and lastly, value propositions.

The study also presented findings from interviews conducted with two Saudi SMEs, which included seven interview questions. Additionally, it provided an example of a Business Model Canvas (BMC) used by one of the companies, highlighting its own use case for adopting blockchain technology, specifically the implementation of non-fungible tokens (NFTs) within Saudi Arabia.

In conclusion, this exploratory study provided insights on the potential benefits of adopting blockchain technology within Saudi SMEs. More importantly, it provided insights leading to the expansion of the study as described previously.

Chapter Five: Extended Study

The full study survey results are presented in six sections:

1. Details about the organisation.
2. Details about the adoption of blockchain (if relevant) and about the adoption of other advanced technologies.
3. Customer segments, channels, and relationships (Details and Perceived Impacts).
4. Key partners, key resources, and key activities (Details and Perceived Impacts).
5. Cost structure and revenue streams (Details and Perceived Impacts).
6. Value propositions (Perceived Impacts).

The survey data was analysed using descriptive statistics, frequency statistics, comparative means, and correlations.

Chapter Six: Discussion and Conclusion

This chapter provides two detailed discussions, one about the findings on the perceived impacts and correlation analysis of advanced technology adoption, and the other about the findings on the perceived impact and correlation analysis of blockchain technology adoption.

This chapter also discusses the academic and practical contributions of the study. For the IS research field, study supports earlier research regarding the 19 perceived impacts of advanced technologies on business models and highlights that these perceived impacts differ depending on the size of the organisation. In contrast, the study challenges prior research by revealing that the majority of blockchain adopters do not recognize the impacts of blockchain across 19

perceived impacts, unlike with general advanced technology adoption. These perceptions vary by organisational size and sector. Moreover, the study emphasizes the importance of several factors in maximizing the benefits of adopted technologies, especially blockchain. These factors include the focus of the use case, the scale of adoption, the levels of integration and training, and considerations of return on investment (ROI). Additionally, for practitioners, organisations can gain significant benefits by strategically exploring new technologies through well-planned projects. By carefully managing the adoption of technologies in line with their operational capacity, companies set themselves up for success. Focusing on integration and comprehensive training programs is crucial to fully realizing the potential of these innovations. Most importantly, measuring the return on investment (ROI) is not just recommended—it is essential for any company looking to use new technologies to drive growth and strengthen its competitive advantage.

This chapter concludes by outlining the limitations of the study and offering suggestions for future research. Critical limitations include the breadth of technology coverage, the sample size, and the research methodology employed. Recommendations for future investigations involve examining variations related to organisation size, particularly among very large organisations, exploring differences across industry sectors such as financial services, IT, and consultancy, and employing case-level comparative analysis, for example, in the context of automation.

Chapter 2: Literature Review

This chapter reviews prior research on technology adoption and its perceived impacts on business models. It has four sections.

First, the chapter defines the concepts of the business model (section 2.1) and disruptive technology (section 2.2). Then, it summarises perceived impacts of disruptive technology adoption on the business model (section 2.3). Finally, it presents the research gap and objective of this study (section 2.4).

Note that this chapter was revised after the exploratory study presented in Chapter 4. Thus, it covers the full range of technologies, organisations, and concepts used in the extended study (Chapter 5).

2.1: Conceptualising Business Models

2.1.1 Business Model Canvas (BMC)

The Business Model Canvas (BMC) is an important tool for researchers and practitioners. Fritscher and Pigneur (2014) emphasize the significance of studying BMC due to its widespread use, which presents significant challenges requiring careful consideration and practical solutions. The visually appealing and user-friendly structure of BMC aligns with design thinking and management principles. Experienced users can do more than add components to the model's building blocks; they can also consider interactions between elements and multiple models. However, for more advanced users, it is essential to create a strategy for managing changes to a business model (Fritscher & Pigneur, 2014). For this study, the researcher will focus on BMC because it will help to understand how the organisation will implement new technology, the transformation of its business model, and the impact of implementation.

In 2004 and 2010, Osterwalder and Pigneur define a business model as essentially a description of the value that a company provides to one or more groups of customers, along with the structure of the organisation and its network of partners that enable the creation, marketing, and delivery of this value and the development of solid relationships. The ultimate goal of this system is to generate revenue streams that are both profitable and sustainable (Osterwalder and

Pigneur (2004), Osterwalder and Pigneur (2010, pg. 14)). As described by Osterwalder and Pigneur (2010), the business model canvas uses nine blocks: customer segments, value propositions, channels, customer relationships, revenue stream, key resources, key activities, key partnerships, and cost structure (Osterwalder & Pigneur, 2010, pg. 16&17) (See Figure 2.1).

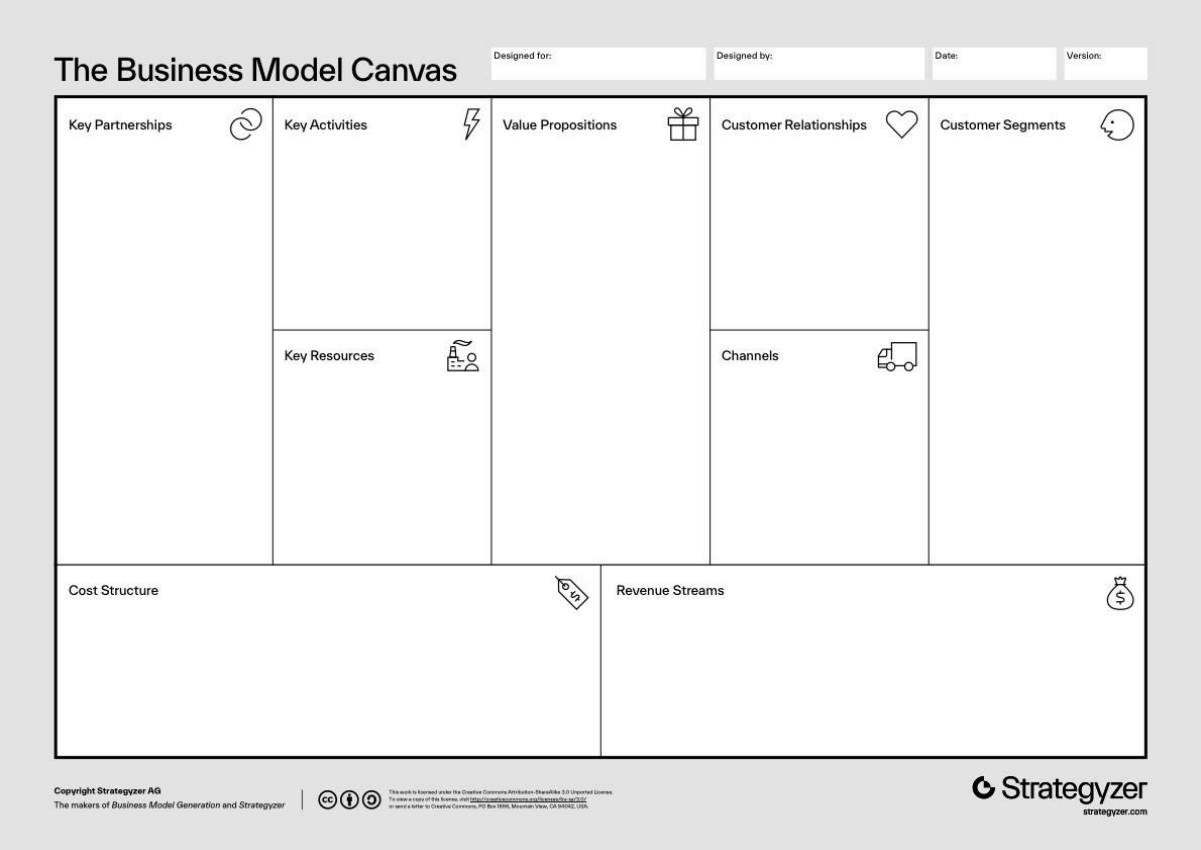


Figure 2.1: The Business Model Canvas (Business Model Canvas- Download the official template, 2024)

2.1.2 Nine Blocks in Detail

Customer Segments (CS)

A Customer Segment is a subset of a firm's market comprising a group of customers who share everyday needs, expected behaviours, or other attributes (Osterwalder and Pigneur, 2010). The number of customer segments, dominant segment(s), segment location, and other aspects of the CS impact the overall business model.

Osterwalder and Pigneur (2010) demonstrate that there are different types of customer segments, for example, diversification is one type of customer segment. Diversification for an

organisation means having two unrelated customer segments with different needs and problems. An example is Amazon.com, which in 2006 made a significant move by introducing cloud computing services to target diverse customer segments in the web industry. This strategic expansion was enabled by Amazon's strong IT infrastructure, allowing it to support both its retail operations and the new cloud computing service unit (Osterwalder & Pigneur, 2010, p. 21).

Additionally, a case study of customer segments by Cooil et al. (2008) illustrates that Migros is the largest supermarket chain in Turkey. The supermarket uses four approaches to segmenting its customer base: value, behavioural, lifestyle, and activity level-based segmentation. The segmentation analyses only included customers who had used a Migros Club card three months before the analysis. First, value-based segmentation categorizes the customer base into nine profitability segments based on the household as the primary unit of analysis. It further divides the customer base into nine groups based on the frequency of visits and utilizes these criteria to create a "productivity index." This index and a loyalty measure are then used to define six segments based on the customers' purchasing behaviour of essential food categories in the past six months. In this segment, Migros focuses on regaining customers from its top clients. Previous customers who were previously in one of the most valuable segments are sent an offer via Short Messaging Service (SMS) each month. Second, behavioural-based segmentation analyses individuals as the unit of analysis and identifies groups of customers with similar behavioural patterns using cluster analysis techniques. Quarterly iterations consistently reveal cluster solutions based on purchase amount, location and store format of purchases, food versus non-food purchases, seasonal trends, level of communication, and products purchased. Third, lifestyle-based segmentation categorizes individuals based on their lifestyles and anticipated product preferences. Migros has established 14 distinct lifestyle groups, using "gourmets" as an example. Gourmets are expected to favour high-margin products like cheese, fine wine, and ethnic foods. Lastly, Activity Level-Based Segmentation categorizes customers as "active," "normal," or "passive" based on their purchase amount and frequency using a 15-month longitudinal data period. This segmentation is particularly valuable for migration analysis and extending special offers to increase customer engagement (Cooil et al, 2008).

Channels (CH)

Osterwalder and Pigneur (2010) explain how a company interacts and connects with its Customer Segments to deliver a Value Proposition. They suggest that organisations choose between different channels to reach their customers: their own channel, partner channel, or a combination of both. For more detailed information about these channel types (See Table 2.1).

Channel Types		
Own		**Partner**
Direct	**Indirect**	**Indirect**
▪ Sale forces ▪ Web sales	▪ Own stores	▪ Own stores ▪ Partner stores ▪ Wholesaler

Table 2.1: Adapted from Osterwalder and Pigneur (2010, page 27)

Based on the literature, Kraemer and Dedrick (2001) present an example of a Dell company that focuses on direct sales and customized manufacturing to sell PCs. During the late 1980s, Dell started growing its corporate market presence, shifting its initial focus from individual PC users and hobbyists. Dell's direct strategy was attractive to big companies' Management Information Systems (MIS) departments, as they frequently did not require the range of services provided by corporate resellers. Dell aimed to simplify MIS departments' work by decreasing the overall cost of owning PCs. Over time, Dell created its own sales team to interact directly with CIOs and other senior executives, enabling the company to access corporate accounts typically controlled by well-known IT vendors such as IBM and HP. With a commitment to competitive pricing, comprehensive support, and a focus on PC sales, Dell avoided the distractions of providing a full line of hardware and services (Kraemer & Dedrick, 2001). Culnan et al. (2010) illustrate three case studies on implementing social media in an organisation. These organisations are three prominent American companies: Walmart, a business-to-customer retailer; Hewlett-Packard (HP), a business-to-customer and business-to-business IT company; and Coca-Cola, a consumer goods manufacturer. All these companies utilize social media to connect with their customer base. Walmart uses Twitter (14 sites plus 2 Sam's Club) and Facebook (3 pages plus 2 Sam's Club) applications and two blogs, primarily for branding and sales support. In addition to its general merchandise, Walmart has specialized websites for beauty (Walmart Beauty) and music (Walmart SoundCheck). The management of Walmart's social media portfolio seems to be centralized, as its applications are connected from the retail website (www.walmart.com) and the corporate website (www.walmartstores.com). In addition, the company's social media applications are readily available through a dedicated

Twitter gateway page connected to the corporate website (Culnan et al., 2010, pg. 250-253*)*. HP has an extensive social media presence, including 5 Twitter accounts and 6 Facebook pages, over 50 blogs, and over 80 hosted forums. These platforms engage with business and consumer customers, primarily for service and support, branding, and marketing related to their products. HP Organizes its social media sites based on the type of customer and product (Culnan et al., 2010, pg. 253-254*)*. Coca-Cola has eight Facebook pages, seven Twitter accounts, and one blog managed by Coca-Cola's historian/archivist. These channels are split between those linked to individual Coke soft drink brands and those representing the Coca-Cola Company as a corporate entity. These three companies effectively use social media to engage with customers (Culnan et al., 2010, pg. 254-256).

Customer Relationships (CR)

Osterwalder and Pigneur (2010) define customer relationships as the many types of relationships a company has with different customer segments. They illustrate self-service and personal assistance as examples of customer relationships, which can co-exist within a company's engagement with specific customer segments. Self-service involves the company providing customers with resources to resolve issues independently without direct interaction. Personal assistance relies on human interaction, allowing customers to contact live agents for support during or after the sales process via email, call centres, or in-person at the point of sale (page 29).

In addition to Osterwalder and Pigneur's (2010) example of the self-service and personal assistance category of customer relationships, Nambisan and Nambisan (2009) conducted a study on the online community's example. Nambisan and Nambisan (2009) indicate that the launch of GlaxoSmithKline (GSK)'s latest weight loss treatment, Alli, provides a compelling case study on customer relationships in the healthcare sector. Alli, Food and Drug Administration (FDA)-approved over-the-counter medication, combines a proven product with an individualized treatment plan. GSK initiated the release of this new drug by inviting 400 overweight individuals to try it and share their experiences within an online community. These interactions allowed consumers to exchange their experiences not only with the company but also with their peers. GSK leveraged this feedback to refine sales and marketing strategies, such as developing educational materials and optimizing distribution channels. Given the importance of individualized treatment plans for the drug's success, the online community played a crucial role in sharing knowledge and helping new consumers navigate their usage of

the medication. GSK's support of this online community shows its ability to increase consumer satisfaction, develop excellent perceptions of the product's quality, facilitate word-of-mouth referrals, and accelerate the adoption of the new product (Nambisan & Nambisan, 2009).

Value Propositions (VP)

Osterwalder and Pigneur (2010) describe value propositions as the products or services a company offers to its customers. They also provide an example of a value proposition as a convenience/usability element. This element can contribute to customer value creation and is explained as "making things more convenient or easier to use can create substantial value. With the iPod and iTunes, Apple offered customers unprecedented convenience in searching, buying, downloading, and listening to digital music. It now dominates the market (Osterwalder & Pigneur,2010, p. 25)."

After defining the term value propositions, additional examples will be provided by other scholars. These examples are from Payne et al. (2017), who offered numerous illustrations of value propositions. The first example is PwC, or PricewaterhouseCoopers, the most successful assurance, consultancy, and tax service firm. PwC developed value propositions by details for each level. At the firm level, the value proposition is a mission statement that describes the firm's "noble purpose." The purpose is to solve significant issues and increase societal trust. PwC acknowledges that prioritizing customer-centric services is crucial for successful competition. At the customer segment level, PwC has detailed value propositions for each major segment, such as the Private Company Services customer segment. PwC works closely with clients to identify their problems and develop value propositions outlining how the firm can assist. Therefore, a company can better implement effective solutions by understanding the value propositions from both levels (Payne et al., 2017). The second example is Google, a multinational technology company that provides the world's largest search engine and develops internet-based services. It is a significant part of Alphabet Inc. The company's mission is to organize the world's information and make it accessible and useful globally. Google's business model is based on providing customer value propositions that connect it to different markets, including search engine users and online marketers. These product markets are divided into segments. For example, regarding search engine products, some customer segments may prioritize speed and efficiency, while others may prioritize discovering new information. In online advertising, some segments are price-conscious, while others may be more quality-conscious. Thus, Google offers a wide range of products that effectively serve organisations'

values while meeting customers' unique preferences (Payne et al., 2017). The last example is Uber Technologies Inc., a fast-growing global firm in the United States that uses technology to connect drivers and riders. Uber aims to provide transportation as dependable as running water, everywhere and for everyone, with a future vision of more intelligent mobility, fewer cars, and greater accessibility. There are two value propositions for Uber to succeed: one to the rider and one to the driver. For the rider, Uber promises to make it convenient for the rider to be everyone's private driver with one tap and anywhere. Customers can use an app they have downloaded to request rides on their phones. In the app, customers pay automatically with a pre-registered credit card and select the level of luxury they need, from an affordable Uber X (a small, compact car) to an expensive Uberlux (a luxury fleet with a driver in a uniform). For the driver, Uber provides a flexible earning opportunity for drivers, allowing them to drive only when and for how long they want. The driver launches an app that accesses trip requests to find a customer. The Uber platform recognizes the riders and directs them to their location and destination. After completing one journey, Uber locates the driver and another rider in the same neighbourhood. Following each journey, the rider and the driver rate their experience, which is then utilized to match parties in their future Uber engagement. Uber prioritizes personal safety, running a 24-hour incident response center to assist drivers and riders. The success of Uber's value propositions has resulted in significant changes in people's travel habits, places of residence, and travel times (Payne et al., 2017). Consequently, Uber is developing new services in the transportation industry and offering new transport services to customers (Payne et al., 2017). Indeed, these three examples, PWC, Google, and Uber, illustrate multiple applications and different approaches to Value Propositions from organisations to customers.

Besides these examples, value proposition design has become an important approach to support companies in developing value propositions, according to Osterwalder et al. (2015), this approach includes three consecutive steps: mapping the customer profile, mapping the value, and checking the fit between the customer profile and the value map (Osterwalder et al., 2015). Neuhüttler and Ganz (2018) use these steps in their study and explained them in detail. The first step is mapping the customer profile. Two steps are involved in profiling a customer. The first step involves the analysis of customer jobs. The fundamental idea, known as the "Jobs-to-be-done" concept, is based on the idea that customers hire goods and services to complete various tasks during their free time or at work. Customers' jobs have social and emotional aspects in addition to their functional ones, which helps to explain why they may favour specific solutions over others (for example, because they improve their appearance or meet

basic needs like improved security). Additionally, it is critical to consider the context (such as a person's personal or professional position) in which a task is carried out. The second step involves analysing and deriving the key pains (issues, barriers, and unfavourable consequences) and gains (desired outcomes, needs, and preferred elements) associated with job management. The second step in mapping the value requires two points to be considered. Firstly, a company must provide all technological, physically delivered services and digital apps that it intends to give its customers to assist them in performing their functional, emotional, or social jobs. Secondly, the company should identify pain relievers and gain creators because it will help to indicate how the listed solutions handle the customers' pains and gains, for example, by removing responsibility or a particular unpleasant activity from the customer's job. The last step is checking the fit between the customer profile and the value map: A good value proposition addresses customers' main pains and gains better than alternatives, excluding components that do not provide value. As a result, during the value proposition design process, it is critical to prioritize duties, pains, and gains and to add or remove redundant items from the value map. Following these three essential steps, a company can effectively determine the necessary utilities and develop innovative products and services for its customers and organisation (Neuhüttler & Ganz,2018).

In addition, according to a study conducted by Camlek in 2010, a comprehensive value proposition should cover all five stages of the value concept from the perspectives of both businesses and consumers. These stages include basic product or utility, product features, basic customer needs, customer benefits, and customer value. The basic product or utility phase that has value for a business is offering basic business skills and achieving the business requirements. The product features value for a business is performing a business requirement and adding various simple and complicated capabilities. The phase of customer basic needs value is when a business has to provide a fundamental component of some business function and achieve the purpose of the work. The phase of customer benefits value is when a business has a product offering a tangible reward and capacity of a product that competitors do not have. The phase of customer value for a business is creating competitive advantage value that quantifies return on the customer investment. An example of the value chain of an online database starts with the online accessibility of information and a feature to know the number of records. Customers' basic need and benefit is to access numerous content sources as one step. The value of an online database for customers is to increase customer satisfaction by measuring savings for multiple resources. These five phases help to demonstrate how value

grows throughout the value chain as it moves from a simple function (utility) to a true customer value from both the business and consumer perspective (Camlek,2010).

Key Partners (KP)

The key partners were defined by Osterwalder and Pigneur (2010) as networking between suppliers and partners and recognized that there are four different types of partnerships:

1. "The establishment of strategic alliances between non-competitors.
2. Cooperative relationships are strategic alliances formed between rivals.
3. Joint venture relationships are used to build new businesses between partners.
4. Buyers and supplier relationships are used to ensure reliable supplies" (Pg 38).

Consider the following perspectives from other scholars regarding the importance of key partners in a business. A previous study by Morkunas et al. (2019) explained various types of partnerships, such as strategic alliances, joint ventures, or buyer-supplier relationships. These partnerships aim to ensure a reliable supply of resources (Morkunas et al., 2019). This explanation is similar to the one found in Osterwalder and Pigneur's (2010) book, which discusses four partnership types. According to Osterwalder and Pigneur (2010), optimization and economies of scale partnerships are typically developed to minimize costs and often involve outsourcing or sharing infrastructure (p. 39). In addition, Osterwalder (2004) uses the term key partners to refer to the partner network that specifies how the elements of the activity configuration are allocated across a firm's partners to reduce transaction costs that make reorganizing and separating vertically in partner networks easier. For instance, CatGen is an open-source e-commerce platform offering software that facilitates local craftspeople to easily capture and transfer digital photographs over the Internet, even in low-connectivity and low-training environments. The solution is possible because of the availability of public access sites like cyber cafés and telecentres (Osterwalder, 2004).

Moreover, Indris and Primiana (2015) discuss the reasons behind strategic partnerships between public and private organisations. These partnerships aim to provide access to the market, reduce risks caused by environmental changes, complement each other's capabilities, and gain resources not within a company's capacity to produce. In today's complex global

economy, partnerships have become essential due to companies' limited competencies and resources (Indris & Primiana, 2015). Consequently, Saenz (2023) identifies three types of partnership practices: no association, two-sector association, and three-sector association. No association type is an extractive company that considers social investment as a part of its corporate social responsibility. For instance, every business's health depends on the well-being of its surrounding community. Chevron has sponsored HIV/AIDS-related initiatives and partners for 35 years to empower individuals and communities, promote a healthy health system, increase health equity and security, and develop growing communities. A prime example is the work being done in Africa and the Pacific Rim by the Global Fund to Fight AIDS, Tuberculosis, and Malaria. More than $60 million has been contributed to the organisation's achievements in preventing HIV transmission from mother to child, reducing new HIV infections, and increasing the quality of life for individuals infected and impacted by the disease since 2008. The second type is a partnership with the private sector or a two-sector association, which means a company achieves more significant results when making social initiatives in their communities. For example, the BHP Foundation supports self-determination and cultural celebration by respecting the rights, culture, and relationship to land, seas, and waterways of first nations and traditional custodians through its partnership with the Global Business for Education. This partnership creates a network of companies investing in education to exchange resources and achieve more efficient educational outcomes. In addition, this partnership will enable companies to leverage the expertise of professionals from the education sector and civic society to enhance the impact of current educational investment. The last type is a partnership with the government sector or a three-sector association, which means a company collaborates with the government on social investment initiatives that involve social trust. For example, in fighting malaria in Ghana with AngloGold Ashanti (AGA), over a third of the workers at Ghanaian mining corporation AngloGold Ashanti were affected by the 7,500 shifts the disease caused to be lost in 2005. AGA and the government worked together to commission an outreach program that, in just three years, reduced the incidence of malaria by 74%. This initiative helped AGA expand its activities beyond the original mining region, and it also provided indoor preventive spraying in the northern regions of Ghana, where malaria incidence is the highest. These partnerships improve the overall health and well-being of the local population (Saenz,2023). As a result, by understanding these different types of partnerships, companies can make informed decisions about engaging with key partners to maximize their social impact.

Key Resources (KR)

Osterwalder and Pigneur (2010) describe that as the key assets required to make a business model succeed. They classify four assets as physical, intellectual, human, and financial. Physical resources, such as those required by retailers like Wal-Mart and Amazon.com, demand significant capital investment. On the other hand, human resources are important for companies like Novartis, which depend on skilled scientists and sales teams to drive their business strategy (Osterwalder & Pigneur, 2010, p. 35). Furthermore, the specific requirements for these key resources can vary depending on the type of business model. For instance, a microchip manufacturer needs capital-intensive production facilities, while a microchip designer focuses more on human resources (Osterwalder & Pigneur, 2010, p. 34). By understanding and prioritizing these key assets, businesses can build a strong foundation for success.

Next, provide additional scholarly perspectives regarding key resources. Hadi and Supardi (2020) suggest that the success of small and medium-sized tourism businesses relies on two key factors: physics and human factors. The physics factor involves integrating the SME listing networks and providing visitors with essential facilities such as hotels, places of worship, halls, restrooms, and parking lots to ensure their safety and comfort. On the other hand, the human factor focuses on customer service, security officers, and tour guides to enhance the tourists' overall experience (Hadi & Supardi, 2020). In addition, Osterwalder (2007) emphasize that a company must recognize a set of key resources, such as tangible assets, to succeed in its business model. Business models are increasingly being constructed on intangible assets that are difficult to quantify, such as brand value and domain expertise. A specific example of a retail bank's business model is that there are three general core resources: brand, employees, and dependable IT systems (Osterwalder, 2007). Furthermore, Johnson et al. (2008) illustrate multiple examples of significant resources or essential assets such as people, technology, products, buildings, and equipment to fulfil the value proposition to the intended customers. The emphasis here is on the main pieces that provide value for the client and the company and how those elements interact. In addition, every organisation uses generic resources that do not contribute to competitive differentiation (Johnson et al., 2008). Therefore, determining multiple key resources is necessary for organisational operations.

Key Activities (KA)

Osterwalder and Pigneur (2010) emphasize that the key activity is the most crucial element of a successful business model. The authors provide examples of different companies and their primary activities. For instance, software development is one of Microsoft's core business activities; supply chain management is one of the most important tasks for PC manufacturer Dell; and problem-solving is the most essential activity for McKinsey consultancy (Osterwalder & Pigneur, 2010, pg. 36). In addition, Osterwalder and Pigneur (2010) have identified several categories of key activities, including production, problem-solving, platform provision, and network management (Osterwalder & Pigneur, 2010, pg. 37).

Furthermore, Chutiphongdech and Vongsaroj (2022) have also classified similar categories of key activities and provided an example of the airport business having two primary activities supporting airport performance: destination and business development (Chutiphongdech & Vongsaroj, 2022). Another suggestion by Hartmann et al. (2016) is that the Data-Driven Business Model (DDBM) framework's main activities component is the result of integrating many perspectives from the literature throughout the processes of the "virtual value chain": gathering, organizing, selecting, synthesizing, and distributing activities. These activities can provide customers with valuable data and insights when they are visually represented, thus improving their decision-making abilities (Hartmann et al., 2016). As a result, A company needs to identify its important activities to operate effectively.

Cost Structure (CS)

Osterwalder and Pigneur (2010) define cost structure as all costs incurred to operate a business model, including inflows and outflows, that impact an organisation’s financial status (Osterwalder & Pigneur,2010). In addition, Chutiphongdech and Vongsaroj (2022) define the cost structure as a reflection of the significant costs involved in the other eight operational blocks. Once these blocks are defined, all inherent costs can be calculated and minimized (Chutiphongdech & Vongsaroj, 2022). In addition to Osterwalder and Pigneur’s (2010) work, Zarei et al. (2011) explain that cost structure includes operational costs, expenses for necessary equipment and tools to provide value, and expenses for required services to partners, such as payments (Zarei et al., 2011).

According to Osterwalder and Pigneur (2010), business models have two main cost structures: cost- and value-driven. A cost-driven business model, wherever possible, focuses on minimizing costs and achieving this aim by offering low-priced value propositions, maximum automation, and extensive outsourcing. No-frill airlines such as Southwest, easyJet, and Ryanair are examples of cost-driven business models. A value-driven company prioritizes creating value by being concerned with the cost of a particular business model design. Such companies typically offer premium value propositions and personalized services. Luxury hotels are an example of a value-driven business with great facilities and exclusive services (Osterwalder & Pigneur,2010, p. 41).

Additionally, Osterwalder and Pigneur (2010) describe four characteristics of cost structures: fixed costs, variable costs, economies of scale, and economies of scope. Fixed costs are costs that remain the same regardless of the volume of goods or services produced. Examples include salary, rent, and physical manufacturing facilities. Some businesses such as manufacturing companies have a high proportion of fixed costs. Variable costs are costs that fluctuate with the amount of goods or services produced. Some businesses such as music festivals have a high proportion of variable costs. Economies of scale refer to the cost advantages that a business can enjoy as it expands its production. As a company grows, it benefits from lower bulk purchase rates. This decrease in the bulk purchase rate and other factors can cause the average cost per unit to decrease as the output increases. Economies of scope refer to the cost advantages that a business can achieve because of a larger scope of operations. For example, a large enterprise can use the same marketing activities or distribution channels to support multiple products (Osterwalder & Pigneur,2010, p. 41).

Revenue Streams (RS)

Chutiphongdech and Vongsaroj (2022) and Osterwalder and Pigneur (2010) identify revenue streams to represent the money a business earned from each customer segment. Furthermore, they suggest that a business model may include two distinct forms of revenue streams. The first type refers to one-time consumer payments that generate transaction revenues. The second type is continuous payments, which generate recurring revenues to deliver a value proposition to clients or offer customer support after a purchase (Chutiphongdech & Vongsaroj, 2022; Osterwalder & Pigneur, 2010, pg. 30).

Additionally, Chutiphongdech and Vongsaroj (2022) agree with Osterwalder and Pigneur (2010) that there are seven ways to generate Revenue Streams. These are asset sales, usage fees, subscription fees, lending or renting, licensing, brokerage fees, and advertising (Chutiphongdech & Vongsaroj, 2022; Osterwalder & Pigneur, 2010, pg.31). Osterwalder and Pigneur (2010) illustrate that using the subscription fee method, businesses can create a revenue stream by offering continuous access to a service for a fee. For instance, a gym may offer its members monthly or yearly subscriptions to access its training facilities. Similarly, World of Warcraft Online, a web-based computer game, allows users to play an online game for a monthly subscription fee. Another example is Nokia's Comes with Music service, which provides users access to a music library for subscription fees. The Lending or renting method for generating revenue involves temporarily granting someone the exclusive right to use a particular asset for a fixed period for a fee. The lender benefits from recurring revenues, while renters enjoy the advantage of incurring expenses for only a limited time instead of bearing the total costs of ownership. An example of such a service is provided by Zipcar.com, which enables customers to rent cars in North American cities hourly. This service has led to numerous people preferring renting over purchasing automobiles. Advertising generates revenue by promoting a product, service, or brand. In the past, the media industry and event organizers depended mainly on the income generated by advertising. However, in recent years, other sectors such as software and services have begun to depend more on advertising revenue (Osterwalder & Pigneur,2010, pg.31&32).

Subsequently, Mahadevan (2000) discuss a different revenue-generating approach, including free offerings. The underlying principle of free services is to offer current earnings to guarantee future earnings. The example of Adobe Systems successfully executed this idea by offering an Acrobat Reader for free. As users increasingly utilize Acrobat Readers to view documents, they are likely to develop an interest in creating documents with Acrobat and eventually purchase the full software version. Similarly, organisations such as Hotmail and Netscape have discovered revenue streams by offering free products and services. Hotmail built a large online community of users by providing free email services, which could then be directed towards other websites offering products and services. This large community attracted the attention of potential advertisers who were willing to pay for advertising. If the organisation creates a community of suppliers, it can charge membership and variable transaction fees. Sometimes, offering a free product or service can result in free customer feedback and product improvement initiatives, which have been attributed to the success of the Netscape browser and Linux

operating system (Mahadevan, 2000). These are examples of how a company can generate revenue from customer segments.

2.1.3 Business Model Canvas in IS Research

The Business Model Canvas (BMC) is a powerful tool that empowers organisations to understand and shape their business practically and scientifically. Specifically, this research argues that the BMC is an example of a Type 1 Theory (Theory of Analysis) as defined by Gregor (2006). Type 1, the Theory of Analysis, concerns "what is" rather than attempting to explain causality or make predictive generalizations (Gregor, 2006).

In particular, the thesis research uses the BMC as a lens for understanding, recognizing, and illustrating changes (whether actual and perceived) in an organisation's business and to better understand:

1. **The Role of Value**: Analysing business models helps companies create innovative and valuable products. For example, in the fashion industry, consumers seek better quality and style (Hvass, 2015).
2. **The Role of Strategy**: Business models form part of a strategy. Seddon et al. (2004) clarify that a business model is an abstraction of strategy and showed how they are related but different. While the business model focuses on a firm internally and how a company can develop its value, the strategy concentrates externally on a firm's competitive position (Seddon et al., 2004).
3. **The Role of Innovation**: Disruptive technologies can impact a company's structure and activities. For example, Blockchain is an emerging technology with the potential to revolutionize our traditional business model. It allows for trustless transactions without intermediaries, reducing costs and saving time (Chowdhury, 2019).

Many previous studies have used the BMC to understand the impact of changing technologies like IoT (Dijkman et al.,2015; Varaniute et al.,2018) and Blockchain (Chowdhury, 2019). In 2015, Dijkman et al. use the business model canvas to identify nine building blocks for IoT applications. They found that value propositions are the most crucial building block, which can have multiple types: convenience, performance, price, newness, and brand or status. However, there is an argument that reducing costs alone in IoT business models is insufficient. Companies should also explore revenue models, such as generating additional revenues from

the data collected. Therefore, while cost reduction is an essential value proposition type, it is not the only one. Moreover, a business model canvas can help determine the types of each component of the nine blocks and identify the impact of adopting IoT on organisational transformation (Dijkman et al.,2015).

In 2018, Varaniūtė et al. find that IoT causes significant changes in the business models of small and medium enterprises (SMEs) in four main areas: value propositions, key resources, key partners, and cost structure. Although changes occur in the other five areas of the business model, they are less frequently mentioned in the literature. The first change is that the value proposition of products improves with IoT by allowing for highly customized and better-quality products. Second, key resources change through reorganizing production lines, improving workers' qualifications, and replacing staff due to changing skill sets. Third, IoT strengthens partnerships for key partners by increasing trust, improving productivity, and enhancing collaboration between SMEs in distributed production networks. Lastly, the cost structure improves cost reduction due to improved production efficiency and decreased errors (Varaniute et al.,2018).

Similarly, Chowdhury (2019) uses all nine blocks of the BMC to establish a sustainable business culture by creating, delivering, and capturing value through the use of blockchain technology. Blockchain has a major impact on a company's business model canvas. For example, blockchain eliminates the need for intermediaries in business processes by using smart contracts to facilitate transactions between parties (channels). Additionally, blockchain technology can significantly reduce transaction, search, negotiation, and intermediary costs, leading to a more efficient cost structure. Another significant benefit of blockchain is the ability to generate revenue through initial coin offerings (ICO), where firms can raise funds using cryptocurrencies and a blockchain-based trading system (revenue). These three blocks demonstrate how blockchain technology affects businesses (Chowdhury, 2019).

2.2: Disruptive Technology

2.2.1 What Is Disruptive Technology?

Christensen et al., (2015) observe that there are four points to define the term disruption innovation. First, disruption is a process focused on a particular product or service at a specific time rather than considering its development over time. For instance, the first minicomputers

were disruptive, not only because they were low-end upstarts when they first appeared but also because they were eventually recognized as superior to mainframes in many markets. However, their journey from the edge to the mainstream made them genuinely disruptive (Christensen et al.,2015, pg. 8). Second, disruptive businesses create unique and different business models from established companies. Apple's iPhone is a well-known example of how an innovative business model can disrupt an existing market. In 2007, Apple launched its first iPhone, a sustaining innovation in the smartphone industry. Their target customer is the same as other established companies, and the product's success over others in the market is because of their superiority. The company is introducing a new business model that helps it improve its products and make achievements. Also, Apple changed the game in the laptop market by creating a network connecting application developers with phone users. With the introduction of the iPhone, a new market for internet access emerged, disrupting the dominance of laptops as the primary device for web browsing (Christensen et al.,2015, pg. 10). Third, disruptive innovations are either successful or unsuccessful. It is a common mistake to assume company success is based on disruption because success is not necessarily a part of the definition of disruption. Sometimes, a disruptive approach does not lead to success; sometimes, an achieving newcomer does not need to follow a disruptive path. Uber is a successful example of a platform-based model. Uber's digital platform connects riders with drivers and has worked to expand its network and functionality to improve traditional taxi services, making it a sustaining innovation (Christensen et al.,2015, pg11). Lastly, the misguided idea of disrupting or being disrupted. The newcomer companies leading their industries should not disperse their still-profitable business in response to disruption. However, they must respond to the disruption by investing in sustaining innovations and strengthening their relationships with core customers. Additionally, they can establish a new division dedicated to exploring and capitalizing on growth opportunities that arise from the disruption. Therefore, newcomer companies must keep their operations separate from the core business and manage two different operations for success (Christensen et al.,2015, pg. 12). This definition of disruption innovation provides several benefits, such as guiding strategic choices when new technology arises, allowing innovative disrupters to improve their products, and driving upmarket (Christensen et al., 2015).

According to existing literature disruptive technology is defined by its effect on performance, growth, and cost or quality. In terms of performance, Danneels (2004) explains that disruptive technology transforms how businesses compete by changing their performance metrics.

Customers need to drive their search for specific product benefits, which form the basis of their choices among competing products. These benefits determine which product attributes they value, and different customer segments may value different attributes. Products with physical goods and services offer various performance levels based on their embedded technology. These performance levels are often called performance dimensions, such as speed, capacity, and efficiency. Because of these differences, customers must identify which aspects of performance value they value most to differentiate between competing products and make informed choices. A particular technology may have limitations restricting the current product's features at a specific time. However, disruptive technologies introduce new products with attributes different from those of existing products. Introducing new products may lower performance on dimensions important for the mainstream market segment but have higher performance on dimensions important for remote or emerging market segments. In contrast, with time, the performance levels that technology enables increase, and eventually, the performance levels offered by disruptive technology meet or exceed the minimum levels demanded by the mainstream market. Disruptive technologies introduce new performance dimensions that change the basis of competition. A good example is disk drives; once drive capacity exceeded the requirement of a particular market segment, the size of the drive became a basis of competition. This example showed how disruptive technology may change the operating system of disk drives (Danneels,2004). Similarly, Carayannopoulos (2009) state that disruptive technology's primary function is market performance rather than cost reduction.

Regarding growth, Kostoff et al. (2004) state that disruptive technologies in various industries can create new growth opportunities by providing different skill sets for people and organisations that offer significant value to existing industries or create new ones. Disruptive technologies often utilize various technologies to achieve multiple performance objectives based on consumer needs. Kostoff et al. (2004) provide seven examples as follows:

1. Developing micro- or nanotechnologies may be necessary to create smaller products.

2. Technology advancements might be necessary to produce lighter products.

3. Advancements in component technologies and their corresponding manufacturing processes may necessitate lower-priced products.

4. Advancements in human factors research, ergonomics, and artificial intelligence may enable more flexible and convenient products.

5. Advancements in design, manufacturing, quality control processes, probability, and statistics may create more reliable products.

6. Advancements in chemistry, physics, materials, heat transfer, design, and micro- and nanotechnology manufacturing may require higher unit-performance products.

7. Advances in artificial intelligence, robotics, and design may require simple operating products. These seven examples show how disruptive technologies can fundamentally reshape our processes and operations (Kostoff et al., 2004).

Nagy et al. (2016) emphasize disruptive technology as an innovation that offers "good enough" functionality at a low cost. This definition suggests that lower-quality and lower-priced innovations gradually improve until they compete with market-leading products and disrupt the market status quo. Also, this definition is unsuitable for categorizing technology types based on price and quality because three factors influence price changes: organisational processes, materials, and marketplace conditions. In addition, this definition compares two or more innovations that perform the same task. Price and perceived quality are not inherent qualities of innovation but reflect business strategy decisions. This definition is important because innovation can change customer expectations and create new markets rather than just being a pricing or entry strategy (Nagy et al., 2016). Finally, Walsh et al. (2002) have provided a specific definition of disruptive technology as a feature of the evolution of technology. The evolution of technology is to use disruptive technology-based products that using continuous development and innovation.

2.2.2 Examples of Disruptive Technology

These different definitions of disruptive technology by Christensen et al. (2015), Danneels (2004), Carayannopoulos (2009), Kostoff et al. (2004), Nagy et al. (2016), and Walsh et al. (2002) provide a clear understanding of the concept of disruptive technologies. Thus, in this study, Disruptive Technologies are understood to be emerging technologies that challenge incumbent assumptions, enhance performance, drive growth and innovation, and create new markets and new customer expectations.

Since 2000, there have been many technologies with these characteristics. Below, I present several examples.

Disruptive Platforms: Internet of Things (IoT) and Cloud-based Systems and Mobile Apps

The Internet of Things (IoT) refers to a system of physical items, including devices, vehicles, and appliances, that are integrated with sensors, software, and internet connectivity, allowing them to gather and exchange data. IoT can help businesses lower costs and increase profits by automating tasks and tracking energy use, leading to reduced energy expenses and improved sustainability (IBM, 2023).

Cloud computing provides on-demand access to a variety of computing resources over the internet. This includes physical servers, virtual servers, data storage, networking capabilities, application development tools, software applications, and AI-driven analytics. With cloud computing, organisations can pay only for what they use, making it easier to manage IT costs efficiently (Susnjara & Smalley, 2025).

Mobile application development is the process of making software for smartphones, tablets, and digital assistants. Most apps are designed for the Android and iOS operating systems. Integration of advanced cloud services can enhance an application. The advantages of the cloud go beyond improved performance. By connecting the organisation's mobile app to powerful cloud services, the organisation can implement new functionalities and improve the user experience (IBM, 2025).

Disruptive Data Management: Enterprise Resource Planning (ERP) / Manufacturing Resource Planning (MRP) and Customer Relationship Management (CRM)

Enterprise Resource Planning (ERP) is software that helps organisations manage their daily business activities. This includes accounting, purchasing, project management, risk management, compliance, and supply chain operations. Organisations switch to ERP cloud solutions to utilize new technologies. This usually occurs when they find cloud applications that enhance their current ERP modules. This integration allows for quick access to technological advancements and improved user experiences, providing immediate business value without major operational changes (Oracle, 2025).

Manufacturing Resource Planning (MRP) is software that helps organisations in determining the necessary materials to meet production targets and customer demand. Vendors of MRP software are employing Machine Learning (ML) within their planning systems to continuously monitor conditions and improve the precision of their understanding of cause and effect (SAP, 2025).

Customer relationship management (CRM) is a technique that helps organisations manage their relationships and interactions with current and potential customers. This approach utilizes integrated technology to document and track these interactions. The combination of CRM with new technologies, such as AI-powered customer relationship management software, enhances traditional CRM tools and significantly improves customer interactions and overall experience. CRM offers multiple advantages for organisations, including increased revenue and reduced direct and indirect costs (Kavlakoglu et al., 2024).

Disruptive Manufacturing: Robotics, Automated Control, Monitoring Systems and 3D Printing/Additive Manufacturing

The robotics field aims to create intelligent machines that help humans. A key application of robotics is artificial intelligence (AI), used for object recognition, natural language processing, predictive maintenance, and process automation (Yasar & Hanna, 2025).

Automated Control and Monitoring Systems adds controls to everyday business processes. Companies can standardize rules and reports to facilitate internal and external audits. It also helps implement changes to policies and procedures more quickly (OCEG, 2025).

3D printing makes solid three-dimensional objects using a 3D printer. 3D printer is part of Additive Manufacturing (AM), which builds items layer by layer (Forge Labs, 2025). According to Berman (2020) 3D printing disrupts supply chains by enhancing customer value through immediate delivery and personalized customization. According to Hannibal and Knight (2018) Additive Manufacturing impacts the industry by accelerating prototyping and enhancing customization options, as well as increasing production speed and reducing costs. This technology can efficiently print various types of parts and components.

Disruptive Analytics: Artificial Intelligence (AI)

Artificial intelligence (AI) is a technology that enables computers and machines to replicate human capabilities, including learning, comprehension, problem-solving, decision-making,

creativity, and autonomy (Stryker & Kavlakoglu, 2024). This technology holds extensive potential for a range of applications across various sectors and functions, in particular for business data analytics.

Kibria et al. (2018) emphasize that machine learning (ML) and artificial intelligence (AI) are essential tools for analytics, as they can extract valuable insights from raw data and provide useful recommendations and predictions. Similarly, Varsha et al. (2021) define machine learning as a branch of artificial intelligence that enables computers to learn from data and make predictions without explicit programming. It focuses on developing programs that can access information and learn independently.

Looking ahead, it is clear that ML and AI will continue to play a crucial role in advancing and refining analytics, even as we recognize that the field involves broader elements beyond just these technologies.

Disruptive Infrastructure: Cybersecurity

Cybersecurity is the discipline focused on the protection of systems, networks, and applications against digital threats and attacks. A successful cybersecurity strategy requires an organisation to have a unified threat management gateway system that integrates security products and improves key functions such as detection, investigation, and remediation (Cisco, 2025).

2.2.3 Unpacking One Technology in Detail: Blockchain

As described in Chapter 3, the research involved an exploratory study focused on one technology in particular: blockchain and distributed ledgers. To support that study a deeper review of this technology was required.

Blockchain technology is defined as: a publicly distributed and decentralized ledger technology used to manage transactions. It can be secured by cryptography and governed by a variety of consensus mechanisms. This technology is characterized by a peer-to-peer network in which individuals can record transaction data between two parties and is capable of integrity and immutability (cf. Alcarria et al., 2018; Andoni et al., 2019; Beck & Müller-Bloch, 2017; Lindman et al., 2017; Minoli & Occhiogrosso, 2018; Mohsin et al., 2019; Feng et al., 2019; Viriyasitavat & Hoonsopon, 2019; Yli-Huumo et al., 2016).

Mohsin et al. (2019) describe fifteen key technology platforms of blockchain technology; they are Bitcoin, Ethereum, Hyperledger Fabric, Cardano, Monero, NEO, Ripple, NEM, Intel

Sawtooth, ZCash, Straits, Waves, ICON, EQS, and Steem (Mohsin et al., 2019). Bitcoin is the best-known cryptocurrency application. It was described as a new system of exchanging money online in late 2008 and early 2009 in a white paper by Satoshi Nakamoto (Nakamoto, 2022). Ethereum was launched by the founder Vitalik Buterin in 2015 (Buterin, 2014). Hyperledger Fabric is a project by the Linux Foundation in 2015 for the Hyperledger foundation ("Hyperledger-fabricdocs," 2021). The other twelve technology platforms have been released in different years, and specific ideas for multiple fields under blockchain technology.

According to Tapscott and Tapscott (2016), this technology applies to Smart Contract to decrease contracting costs in all fields, such as policy contracts and the payment process. Establishing a digital contract program is helpful due to the three factors: (1) agreement of contract between individuals and organisations, (2) secure enforcement, and (3) settlement. Furthermore, with a Smart Contract, the coordination cost will require less of an outside resource, and the cost of establishing trust in an organisation is almost zero (Tapscott & Tapscott, 2016).

There are fundamental characteristics of blockchain technology as a disruptive technology.

1. **Decentralized/Distributed Ledger Technology (DLT):** A distributed ledger is a digital ledger that stores information on a network of devices, reflects real-time updates, and authenticates it using a cryptographic signature (Deshpande et al., 2017). Yli-Huumo et al. (2016) defined a decentralized system as one in which no intermediaries or third parties are needed to transfer and transact data. For instance, Bitcoin uses a decentralized environment for cryptocurrency by digitizing the money to buy and exchange goods between the participants.

2. **Trust**: A blockchain-based authorization system for a trustworthy and protected monitoring solution comprises three fundamental components: a community gateway, a smart gateway, and a Resource Monitoring Smart Contract (RMSC). The proposed solution ensures that all transactions and tracking information are kept confidential and reliable (Alcarria et al.,2018).

3. **Transparency/Immutability:** With Blockchain, every transaction is visible to anyone with access to the system. The visibility is determined by each user or node, which has a unique character for identification. There is a choice to be anonymous or appear as

proof of identity to other users (Iansiti and Lakhani, 2017). Viriyasitavat and Hoonsopon (2019) stated that this technology has tamper-proof resistance for storing data.

4. **Smart Contracts:** According to Tapscott and Tapscott (2016), Smart Contracts are innovative digital mechanisms designed to ensure the security and execution of recorded agreements between individuals and organisations (pg.101). Additionally, Smart Contracts have three main objectives: (1) increasing satisfaction with contract conditions, (2) reducing malicious behaviours and accidents, and (3) lowering the need for trust intermediaries (Tapscott & Tapscott, 2016, Pages 101 & 102).

Use Cases of Blockchain Adoption in Different Industries

There are various use cases for blockchain technology across different industries, including:

Everledger

Morabito (2017) discusses one example: the Everledger insurance company, which has 70 employees. The company needed to change its method of transferring data and to find a way to collect protected and safe data. One of the company's operations is to make diamond certifications and check the certification process. The main issue for this company is the possibility of theft or cheating in the certification of a diamond. A practical solution for this issue is to apply blockchain technology, which uses a ledger. A ledger can organize and sort the data for every diamond transaction. Also, blockchain technology can give each piece of data an identification number for every transaction (Morabito, 2017). Therefore, blockchain technology appears to be linked to preventing theft in diamond certification.

Car eWallet

An example of adopting blockchain technology in e-mobility in Germany is the Car eWallet project. Car eWallet has developed a blockchain transaction platform that connects vehicles and infrastructure with various mobility services, including parking, car-sharing, car rental, charging stations, and energy providers. This platform utilizes a shared ledger built on Hyperledger technology, which eliminates the need for a central trusted authority. Depending on the customer's preference, payments can be processed either manually or automatically (Andoni et al., 2019).

Airbnb

A well-known example of blockchain technology implementation is in the hotel sector. bAirbnb is a distributed application (DApp), which is a collection of smart contracts that maintains data on a blockchain for house listings. The bAirbnb app provides an attractive user interface, and owners may post their property information and photos. The platform keeps track of providers' and renters' reputation scores to improve everyone's business decisions. The renter and the owner of bAirbnb might communicate off-chain and complete the transaction entirely off-chain, but the renters have a better chance of completing the transaction on-chain for a few reasons. These reasons include an excellent reputation, identity verification, privacy protection, risk reduction, insurance, payment settlement, and property access using smart locks (IoT devices) (Tapscott & Tapscott, 2016; p. 115–117). As a result of smart technology, there is a probability of enhancing the effectiveness of house listing operations in the hospitality and tourism industries.

2.3: Perceived Impacts of Disruptive Technology Adoption on Business Models

Prior research shows that the adoption of blockchain and other disruptive technologies is perceived to have a number of business model impacts. In the synthesis below, 19 perceived impacts are identified based on prior research.

Impacts on Customer Segments (CS)

Prior research shows that adopting blockchain and other advanced technologies is perceived to grow existing segments and create new ones.

Impact 1: Increasing the Number of Customers within Existing Customer Segments.

Two studies by Hashem et al. (2023) and Rathore (2023) explore the impact of Metaverse technologies on customer segments. Both studies agree that Metaverse Marketing has significantly contributed to reaching various and more diverse customer segments. For instance, one of the dimensions of the Metaverse environment is avatars. Avatars represent individuals within a game or virtual environment as an alternative to the traditional profile image (Hashem et al., 2023; Rathore, 2023). Similarly, Muhtaroğlu et al. (2013) find that big

data applications in the healthcare sector target various customer segments, including consumers, providers, payors, and manufacturers. Consumers include patients and individuals who are interested in taking an active role in managing their health. Providers include doctors and other healthcare practitioners. In the US, most new big data applications in healthcare target consumers and providers. With the increasing availability of big data applications, consumers and providers have formed large online communities. Payors include governmental entities and hospital management units interested in utilizing big data applications to improve the efficiency of their systems by managing and analysing massive amounts of information. Manufacturers include pharmaceutical and medical product companies, and researchers use big data applications as an essential data source for their research and development (R&D) activities. In addition, there are multiple markets or segments for some big data applications, such as platforms requiring a large patient base and pharmaceutical companies to perform R&D activities on available data. The success of such business models depends on the existence of these two markets. Likewise, many big data applications offer free services to their customers and rely on advertisements for their revenues. For these applications to attract advertisers, they must have a large user base (Muhtaroğlu et al., 2013).

Likewise, Treiblmaier and Špan (2022) report that blockchain-based payment tokens or cryptocurrencies have the potential to enable billions of unbanked and under-banked people worldwide to access global commerce. Also, blockchain technology can effectively address customer groups with specific privacy concerns or those wanting to capitalize on using their personal data. Additionally, blockchain technology can create new product and service offerings that appeal to new customer segments (Treiblmaier& Špan,2022). Also, Morkunas et al. (2019) find that organisations can use blockchain technology to serve customer segments in various markets, including niche, diversified, and mass markets (c.f. Dalgic et al., 1994, and Lee et al., 2007).

Impact 2: Creating New Customer Segments.

Macron et al. (2022) have identified the impact of digital technologies on the development of new customer segments, which can be classified into three categories: digital transformation level (Software Integration), patterns of adoption (Industrial IoT), and investment capacity (Additive Manufacturing) (Macron et al., 2022). The authors explain that Industrial IoT relies on IoT sensors to collect data for customized services. Industrial IoT platforms can be transformed into quality assurance and predictive maintenance solutions. Additionally, the

authors demonstrate that Additive Manufacturing is based on 3D technology, constantly exchanging data via cable connections. Thus, customer segments are expected to mature to give rise to a new industrial maturity stage characterized by the intensive use of digital base technologies such as the Internet of Things (IoT), cloud computing, big data, and artificial intelligence, where providers are expected to understand the various customer needs based on their segments (Macron et al., 2022).

In addition, utilizing blockchain allows businesses to access previously unreachable target markets, creating new customer segments. For example, ChromaWay's blockchain technology pilot project in Sweden enables individuals to buy or sell real estate. On the other hand, Everest uses a private and permissioned Ethereum-based protocol to provide a decentralized distributed ledger technology solution that includes a payment system, a multicurrency wallet, and a biometric identity system to facilitate microfinance transactions, land claims, and medical records for customer segments in developing countries. Everest targets a group of 2 billion people who have limited or no access to financial services in Africa, Asia, and South America (Morkunas et al., 2019).

Indeed, Piller's research (2024) indicates that organisations that proactively embrace new technologies typically experience significant enhancements in productivity, efficiency, and innovation, all of which drive overall business growth. Moreover, companies that effectively integrate and implement these technologies into their operations often achieve a competitive advantage within their industries, allowing them to attract more customers and expand their market share.

Impacts on Channels (CH)

Previous studies have examined the impact of adopting advanced technologies and blockchain on communication channels.

Impact 3: Adding New Channels.

According to Metzler and Muntermann (2020), companies may reduce costs by replacing call center operations with chatbots and digitizing communication channels. This digitalization is often linked to increased automation (Metzler & Muntermann, 2020). Muhtaroğlu et al. (2013) find that big data applications are available in mobile applications as illustrated in the Ginger.io example who use smartphone sensors to track patient behaviours.

Additionally, mobile applications such as Apple Store (store.apple.com) and Google Play (play.google.com/store) provide more examples of big data applications. These platforms lower the barriers to entry for innovative new players by providing established sales and marketing channels, making it easier for new players to reach and engage with a wide audience (Muhtaroğlu et al.,2013).

Likewise, blockchain technology allows business transactions to occur without intermediaries between parties, as per Morkunas et al. (2019). This means that smart contracts can facilitate transactions in real estate, eliminating the need for personnel and time to complete a transaction. In addition, Treiblmaier and Špan (2022) find that implementing blockchain technologies can create new communication channels by removing intermediaries. Removing intermediaries can allow companies to connect with their customers directly. Another advantage of this development is that relevant data is stored and analyzed at the transaction endpoints, i.e., by the customers and companies, rather than used by powerful intermediaries to create their own business models. By using application programming interfaces (APIs) and software development kits (SDKs), companies can participate in development projects and collaborate with sophisticated ecosystems, which can further open up new channels for them (Treiblmaier & Špan, 2022).

Impacts on Customer Relationships (CR)

Previous research demonstrated that adopting blockchain and other advanced technologies can enhance a company's customer relationships.

Impact 4: Strengthening Transparency.

Dijkman et al. (2015) find that the Internet of Things (IoT) revolutionizes how businesses interact with customers. In this context, companies like Philips use co-creation as a customer relationship strategy for their IoT product 'Hue.' By offering the ability to design their own lighting requirements, Philips provides a unique customization level to their customers. This customization develops a deeper level of engagement with the brand and allows Philips to collect valuable insights from their customers on their preferences and behaviours. As a result, the co-creation approach is expected to become popular in IoT applications as businesses seek to build stronger, more collaborative relationships with their customers (Dijkman et al., 2015).

Mohamad et al. (2014) reveal that Customer Relationship Management (CRM) has been transformed by advancements in information technology and changes in customer-centric processes. A successful CRM implementation requires a balanced approach integrating technology, processes, and people. To gain a competitive advantage, CRM should be considered a strategic disposition, not just a tool. In addition, efficiency, competitive advantage, customer support, inventory control, and accessibility are the driving forces behind CRM. CRM is a business strategy that uses IT tools to build long-term customer relationships. Also, CRM builds close customer relationships; organisations can possess all the resources needed to stay competitive. Therefore, organisations must deploy CRM resources and build strong CRM capabilities to improve firm performance, optimize revenue, and increase value by understanding and satisfying individual customer needs (Mohamad et al., 2014).

Muhtaroğlu et al. (2013) report that big data applications developed for consumers typically offer a self-service interface, such as a map that users can navigate to learn about traffic conditions or locate specific businesses. Automated services may also recognize individual customer characteristics to offer personalized transaction information. For instance, a retail industry application may suggest products based on a user's previous purchases. In addition, companies co-create value with customer communities in specific applications, including community-generated maps, local business ratings, and healthcare information from patient communities. The communities provide the foundation for these applications, and individual customers benefit from the collective information generated by the community, which is only possible because of its formation (Muhtaroğlu et al., 2013).

In a study by Morkunas et al. (2019), they have identified several types of relationships that businesses can have with their customers. These include personal assistance, dedicated personal assistance, self-service, automated services, creating communities, or co-creating new content. These relationships are often motivated by acquiring new customers, retaining existing ones, or increasing sales. An example of the use of blockchain technology to streamline the real estate transaction process is the Lantmäteriet case study. Lantmäteriet is the Swedish government's land registry authority. They implemented a pilot workflow powered by ChromaWay, a digital ledger that records each step of a real estate transaction and the property title. This application can be accessed securely by bank representatives and real estate agents, providing up-to-date information that is easy to access. Lantmäteriet is involved in the entire

purchase process, creating greater confidence and transparency in its dealings with Swedish citizens (Morkunas et al., 2019).

Impact 5: Improving Data Security.

Treiblmaier and Špan (2022) find that blockchain technology could enhance customer trust, transparency, privacy protection, and digital marketing security. Companies have recognized the benefits of blockchain in building and strengthening customer relationships. Companies that have already implemented blockchain have reported a more positive evaluation. The use of blockchain can increase transparency by allowing customers to share data that is stored on a distributed ledger. However, it is not necessary to make all data accessible, and dedicated roles can be assigned to allow consumers to access relevant data. The emergence of customer relationship management has led to highly complex processes that can be automated using sophisticated software applications. In this regard, blockchain can enable data marketplaces in which consumers not only control their own personal data but can also capitalize on the use of such data. Companies with blockchain experience are more convinced than companies without blockchain experience that blockchain will lead to the demotion of third-party providers of customer relationship management services (Treiblmaier & Špan, 2022).

In addition, Saurabh et al. (2022) reveal that Decentralized Autonomous Organisations (DAOs) transform how businesses engage with customers based on blockchain technology. With the help of self-executing codes, DAOs can create a decentralized marketplace that allows for the execution of smart contracts between stakeholders, alliances, buyers, and sellers. This marketplace enables decentralized transactions that do not require manual intervention, ensuring greater efficiency in processing financial, compliance, governance, and audit transactions. Using unbreachable contracts, DAOs can help strengthen relationships and ensure trust and transparency. Additionally, the data-based marketplace helps businesses comply with regulations, maintain security, and preserve privacy, resulting in more sustainable relationships (Saurabh et al.,2022).

Khan et al. (2023) report that blockchain technology powered by AI helps small and medium-sized businesses maintain secure customer relationships through a customer-oriented strategy, encrypted exchange of information between customers and the ecosystem, protection of distributed node-to-node transactions, platform interoperability, and storage immutability (Khan et al., 2023).

Impact 6: Improving Trust.

In 2001, McKnight and Chervany study customer relationships in e-commerce. They found that online interactions between a company and its customers through the Internet are crucial. To establish trust with customers, a company should be able to display its reliability, knowledge, and trustworthiness. When customers perceive a company as trustworthy, they are more likely to engage in trust-related online behaviours such as making purchases, collaborating, and sharing information (McKnight & Chervany, 2001).

Likewise, Bagheri and Movahed (2016) report that the Internet of Things (IoT) impacts customer relationships in the education sector. Universities and colleges focus on building and maintaining relationships with their customers, which include students, faculty, and other stakeholders. The IoT supports providing a virtual and personalized experience, enabling real-time interactions (Bagheri & Movahed, 2016) in a trustworthy way.

Impacts on Value Propositions (VP)

According to prior research, integrating blockchain and other advanced technologies into value propositions can offer significant advantages to customers and businesses.

Impact 7: Developing New Products and Services.

Muhtaroğlu et al. (2013) discover that big data has enabled the emergence of many innovative and value-added applications that were previously unimaginable using traditional data paradigms, and they provided various examples of such applications that have emerged in multiple sectors. Transportation, such as smart taxi routing, is the first sector to use big data applications. For instance, CabSense uses Global Positioning System (GPS) points from millions of taxis in New York City to identify the best location to find a taxi nearby. Another innovative application, Street Bump, uses smartphone GPS and accelerometer sensors to detect and report potholes on Boston's roads automatically. Residents can help improve their neighbourhoods using these tools, while governments can address existing problems and make long-term investments. These smart routing applications can lead to significant savings in oil usage, reducing carbon dioxide emissions and estimating to save time for each traveller globally between 10 to 15 hours per year. The second sector, using big data applications, is the healthcare industry through online platforms. For example, PatientsLikeMe (www.patientslikeme.com) allows people to share their health-related experiences and support

others with similar diseases. The data collected from this platform will be used for health industry research and development purposes. The last sector uses big data applications and can add value for various sectors, including recruitment. An example of the recruitment sector is LinkedIn, which is a professional network with 225 million members across 200 countries. It enables professionals, companies, and job seekers in different industries to connect and access various job opportunities. Indeed, the potential for big data to develop innovative applications with unforeseen benefits for users and the broader community is tremendous (Muhtaroğlu et al., 2013).

Wortmann and Flüchter (2015) find that the Internet of Things (IoT) combines physical and digital components to create new products and business models. With advancements in power management, communication, memory, and microprocessor technologies, it is now possible to digitize functions of industrial-age products. Digitization opens up many opportunities for companies to generate additional value in the IoT. A light bulb, for instance, primarily provides light in a specific location. Enhancing it with IoT technology can detect human presence, serve as a low-cost security system, and send an alert to the owner's smartphone in case of an intrusion (Wortmann & Flüchter, 2015).

Regarding blockchain technology, Pucheanu et al. (2020) find how blockchain technology could affect firms' internal structure and redesign customer engagement activities by providing new value propositions. For example, digital currency creation can offer new product features and services for all industries, particularly finance. Also, transactions between business network participants are processed in a decentralized way (Pucheanu et al.,2020).

Impact 8: Improving Existing Products and Services.

Clarke (2008) report that mobile commerce, also known as m-commerce, offers four key value propositions: convenience, ubiquity, personalization, and localization. To illustrate, imagine a person waiting in line at their local grocery store, unable to access traditional e-commerce. They can use their wireless personal digital assistant (PDA) to transfer funds between personal bank accounts (convenience), receive an email reminder to pick up their dry-cleaning (ubiquity), watch a tailored promotion (personalization), and even find a product available at a nearby point-of-purchase display (localization). These are just a few examples of how m-commerce can benefit consumers in various ways (Clarke,2008).

Zutshi et al. (2021) declare that the value propositions of blockchain technology have a significant impact on existing digital platforms, especially in the management of memberships. Blockchain technology allows for the immutable recording of digital identities that can be

securely stored on the blockchain. This identity management solution gives users complete control over their data by tracking and managing how their information is distributed. With the user's permission, companies such as car insurance and mortgage lenders can obtain data on credit, title, and insurance information more efficiently, making the process faster and more seamless. This blockchain process can help digital platforms comply with stricter privacy laws while giving users greater control and audit trails on their data usage. By ensuring the security of user identities, digital platforms can provide authenticated and auditable voting services, thereby enhancing the perception of democracy. Corporate platforms can address users' concerns or feature requests and integrate transparent voting mechanisms to improve user engagement and customer satisfaction. A blockchain's membership management features can work alongside a digital platform's user interaction layer, which includes ensuring authentic identity verification using multiple security protocols such as biometrics, passwords, and mobile device verification. This is fundamental for building trust amongst users, as the digital platform creates digital profiles while logging the ratings and scores of each user or entity profile (Zutshi et al., 2021).

Impact 9: Reducing Cost for Organisation Customers.

Morkunas et al. (2019) report that blockchain technology can potentially increase customer value by offering access to products or services that were previously unavailable or only accessible at a higher cost or time commitment. For example, Swedish company Safello uses an open blockchain protocol to offer a transparent means for exchanging Bitcoin with fiat currencies. This approach enables users to obtain resources, such as foreign currency, that may have been otherwise unavailable or only available at additional cost. Similarly, Centbee, a South African company, allows its mobile app users to send Bitcoin to their contact lists. This feature will enable users to support their family and friends without excessive exchange fees by transferring money across borders at a lower cost. Both Safello and Centbee can eliminate the requirement for a centralized bank or reduce currency exchange service for transactions. Furthermore, blockchain technology can provide faster and more cost-effective transactions than those completed in traditional settings. For instance, by authenticating the document of the respective contracts, certified notaries offer a customer value proposition to homebuyers that focuses on easing the ownership transfer of the asset from seller to buyer. However, working with a notary for home purchases or sales requires time and often incurs high costs. ChromaWay's private blockchain protocol uses smart contracts that allow Swedish citizens to buy or sell a house with reduced time and costs during the transaction (Morkunas et al., 2019).

Wortmann and Flüchter (2015) find that the Internet of Things (IoT) combines physical and digital components to create new products and business models. With advancements in power management, communication, memory, and microprocessor technologies, it is now possible to digitize functions of industrial-age products. Digitization opens up many opportunities for companies to generate additional value in the IoT. A light bulb, for instance, primarily provides light in a specific location. Enhancing it with IoT technology can detect human presence, serve as a low-cost security system, and send an alert to the owner's smartphone in case of an intrusion (Wortmann & Flüchter, 2015).

Muhtaroğlu et al. (2013) state that uses big data applications in the retail industry, with one such application being price comparison services that offer pricing information on products from different retailers. According to studies, consumers can save an average of 10% when they use such services. For instance, RedLaser (www.redlaser.com) allows customers to scan a product's barcode using their smartphones to obtain price comparisons for the product with other product information. Additionally, Amazon (www.amazon.com) and eBay (www.ebay.com) are two web-based marketplaces that use big data applications to offer searchable product listings from many vendors, show their customers price transparency, and market and sales opportunities for niche businesses. These applications are also a source of product information, such as consumer reviews (Muhtaroğlu et al., 2013).

Impacts on Key Partners (KP)

Previous studies have proposed several reasons to adopt blockchain and other advanced technologies on key partners.

Impact 10: Adding New Partners.

In 2016, Tolboom demonstrate that advanced technologies and digital transformation have increased shared responsibility and collaboration between key partners and complementary vendors (Tolboom, 2016).

Regarding blockchain technologies Morkunas et al. (2019) find that using blockchain technology allows for peer-to-peer business interactions, which helps improve and extend supply chains. Also, blockchain technology may enable the addition of new partners, such as technology companies that design application programming interfaces (APIs) and software development kits (SDKs) and maintain transactional algorithms. For example, Centbee built a merchant payment ecosystem in South Africa to allow businesses to accept Bitcoin at the point of sale quickly and easily without additional terminal equipment (Morkunas et al., 2019).

Impact 11: Improving Existing Partners.

According to Muhtaroğlu et al. in 2013, big data technologies affect key partners in various ways, as Tolboom also found. Big data application companies often require partnerships to obtain data. Sometimes, the data is co-created with online communities. However, in other cases, partnerships may be necessary to acquire additional data, such as with map companies and governments. For example, Waze partnered with the Operations Center of the City of Rio de Janeiro in Brazil to inform drivers about major road closures during significant events. Similarly, some companies team up with advertisement companies to display location-based advertisements to their users. Besides partnerships for data acquisition, many big data application companies rely on application stores for marketing and sales support. They may also need to work with companies providing infrastructures and platforms. For instance, UFIDA Medical partnered with Intel for hardware and Hadoop-based big data software platforms used in their application. Developing a standard of partnerships to combine data sets from different providers as used in healthcare applications is necessary (Muhtaroğlu et al., 2013).

Impacts on Key Resources (KR)

Previous research has indicated that implementing blockchain and other advanced technologies is perceived to improve the management of various resources.

Impact 12: Improving the Management of Physical Resources.

Maletič et al. (2020) highlights the operational importance of physical asset management (PAM) practices, as these can significantly enhance operational performance. Likewise, Atnafu and Balda (2018), assert that effective inventory management practices significantly enhance an organisation's competitive advantage and overall performance, by delivering better customer service and higher-quality products, reducing costs, responding more flexibly to market demands, and ultimately enhancing organisational performance. To support such practices, Inmyxai and Takahashi (2010) emphasized that physical resources include location (such as land and buildings), technical sophistication, plants, equipment, and raw material stocks. They illustrate that when enhanced with advanced technology, a firm's physical resources can lead to increased production, improved services, and more efficient business operations. The actual value of these resources is reflected in how firms formulate and implement their strategies to enhance performance. Organisations that have successfully

utilized their physical assets to gain competitive advantage have done so through a history of careful decisions regarding acquiring and utilizing these resources.

More specifically, Morkunas et al. (2019) explain that blockchain technologies can impact resource management through the involvement of users who provide many essential resources and processes, using blockchain to enhance resource exchanges. For example, in real estate transactions that utilize smart contracts, the physical capital (assets) are contributed by the parties involved, while blockchain technologies facilitate the direct peer-to-peer exchange of these resources (Morkunas et al.,2019).

Impact 13: Improving the Management of Non-Physical Resources.

Firms manage many different types of non-physical resources (such as Intellectual Property (IP), market knowledge). Broadly we can understand these as data resources. Advanced technologies improve data management in many ways. Bhardwaj et al. (2020) studied AI and key resources, while Muhtaroğlu et al. (2013) researched big data applications and key resources. The study by Muhtaroğlu et al. (2013) find that big data applications require scalable infrastructures and distributed platforms to handle increasing usage requests. These applications can use in-house or cloud-based infrastructures, and distributed computing platforms like Hadoop (hadoop.apache.org) are commonly used with middle-class servers. Big data applications need to be developed and distributed with real-time processing capabilities. To achieve this, data analysis and machine learning techniques are essential. There is a growing need for human resources specialized in big data technologies and analytics, particularly those with a strong background in large-scale systems and data mining technologies. Moreover, the study found that large customer bases and communities are becoming a key resource for big data applications. For instance, communities that create data are essential for successfully executing several applications, such as Yelp. There is a network effect where each customer's data benefits both customers and application providers over time. Additionally, communities have a positive impact on the acquisition of new customers. A person's likelihood of using a particular application increases as more and more people in their social network use it (Muhtaroğlu et al., 2013).

In 2019, Morkunas et al. and in 2022, Treiblmaier and Špan suggest that blockchain technology significantly impacts key physical, financial, intellectual, or human resources. This impact is the foundation for creating value, reaching markets, maintaining customer relationships, and

generating revenue. For example, blockchain technology can store data or documentation resources, making them tamper-proof or tamper-evident data records. Additionally, blockchain audit resources facilitate audits by replacing the traditional third-party auditor with a smart contract on a decentralized network. Furthermore, blockchain technology simplifies and enhances the verification process, allowing anyone to transact with another party in a peer-to-peer network through public blockchain technology (Morkunas et al.,2019 and Treiblmaier & Špan, 2022).

Abdollahi et al. (2023) reveal that blockchain can extend new resources by three domains. First, blockchain technology provides a new way for startups to access financial resources. By issuing tokens and utilizing smart contracts, startups can now reach investors in previously inaccessible regions and micro-investors who were previously unable to participate due to their limited investments. One notable example is Starbase, which enables other startups to issue their tokens and raise funds (Starbase, 2024). Second, a Decentralized Autonomous Organisation (DAO) is a new governance mechanism that facilitates connections between firms. DAOs typically give their token holders the power to make strategic decisions for the organisation and view their customers as key stakeholders and shareholders. For example, Status, a decentralized communication platform, could more easily align customer needs with profitability by using a DAO. Additionally, DAOs could add new intellectual property revenue, reduce the costs of market research and information gathering, and enhance the credibility of collected data, thereby increasing trust in the organisation (Status, 2017, 2024). Last, blockchain technology enables crowdsourcing to be automated through smart contracts, ultimately adding other new resources, reducing costs, and increasing organisational efficiency. For instance, startups like Suncontract (Suncontract, 2017) and (Charg 2024a, 2024b) have leveraged this technology to crowdsource their infrastructure, such as solar panels in the case of Suncontract and electric vehicle chargers in the case of Charg. The new governance models offered by blockchain technology make this possible (Abdollahi et al.,2023).

Impact 14: Improving the Management of Human Resources.

According to Paauwe and Boon (2018), strategic human resource management (HRM) within the classical framework is characterized by a deliberate cognitive process grounded in the concept of the rational economic individual. The chief executive officer (CEO) is primarily responsible for this process. The decision-making approach is comprehensive and well-defined, with a clear distinction between strategy formulation and execution. This classical

view of strategy emphasizes the confidence in managers' ability and willingness to adopt profit-maximizing strategies through rational long-term planning. A study by Hendry and Pettigrew (1986) suggests that the pursuit of strategic human resource management involves several key elements: the utilization of planning, a coherent approach to designing and managing personnel systems guided by an employment policy and workforce strategy often based on a specific philosophy, the alignment of HRM activities with an explicit strategy, and the recognition of the organisation's people as a strategic resource essential for achieving competitive advantage (Paauwe & Boon, 2018).

In addition, Carroll and Wagar (2010) demonstrated that companies investing more in information and communication technology (ICT) tend to experience a higher frequency of changes in human resource management (HRM) practices. For example, adopting technology can enhance the human resource function, leading to increased employee commitment and satisfaction, a quicker response time to employee concerns, improved service, and ultimately, enhanced workplace performance (Carroll & Wagar, 2010).

Additionally, Bhardwaj et al. (2020) have identified recruitment and selection, training and development, and performance management as essential elements of human resource management. The authors propose the integration of artificial intelligence (AI) in human resource systems to enhance these functions. Recruitment and selection can be challenging for Human Resources (HR) executives, as they must screen through a large pool of applications to find a suitable candidate for the job. AI applications can assist by scanning and evaluating resumes and rejecting those unsuitable for the job. For instance, a Chatbot application can improve the candidate's experience by constantly updating requirements and providing suggestions. The Chatbot can assess the candidate's word choice, speech, and body language through the audio-video mode and analyse the characteristics that fit the job. AI can also improve employee engagement in training and development by offering innovative learning opportunities such as suggested videos or learning programs relevant to the employee's experience and tasks. AI can create micro-learning programs and visual representations of written documents. AI applications can help reduce and rectify biases in evaluating individual performance by providing feedback, continuously checking objectives, and promoting joint team efforts between employees. Additionally, AI can forecast performance indicators of high-performing and underperforming employees, which can help determine who needs to change positions. By collecting data from various perspectives, such as levels of employee engagement, performance data, and causes of employee turnover, AI applications can help

improve work and foster a more direct workforce within the organisation (Bhardwaj et al.,2020).

Impacts on Key Activities (KA)

Prior studies have utilized blockchain and other advanced technologies to make activities more effective and more efficient.

Impact 15: Making Activities More Effective.

Muhtaroğlu et al., (2013) report that businesses that use big data applications must continuously develop and maintain their infrastructure, platforms, and applications. These activities are particularly crucial when the number of users increases, and the data becomes more extensive, along with increased access rates. Businesses must continually innovate and find new solutions to customer problems to create value in businesses' lives and stay competitive. However, some companies may only be able to perform a few marketing and sales activities for individual consumers due to the application store model. Nevertheless, such activities may be necessary for software applications with specific target segments *(*Muhtaroğlu et al., 2013).

Morkunas et al. (2019) and Treiblmaier and Špan (2022) have stated that blockchain technology impacts a company's key activities that provide value to its consumers. One such activity companies consider adopting blockchain for is the establishment of peer-to-peer networks. For instance, Morkunas et al. (2019) used the example of smart contracts in real estate transactions where the transacting parties provide resources such as human capital (e.g., knowledge, skills, experience). At the same time, blockchain technologies facilitate the peer-to-peer exchange of these resources. Another activity of adopting blockchain involves the transformation of business processes. According to Treiblmaier and Špan (2022), blockchain technology transforms existing relationships, most notably by substituting traditional hierarchical structures with peer-to-peer (P2P) networks in which traditional intermediaries do not control and filter information flows. Instead, new types of intermediaries will emerge and take over new roles in blockchain-based economic transactions. As a result, adopting blockchain technology will lead to more activities within an organisation (Morkunas et al., 2019 and Treiblmaier & Špan, 2022).

Impact 16: Making Activities More Efficient.

In the previous section, Bhardwaj et al. (2020) find that AI and key resources in HRM and Salah et al. (2020) had the same perspective on Human Resource Management (HRM) but on

possibly applying blockchain technology in several HRM activities. Salah et al. (2020) discuss that blockchain technology has the potential to be used in various aspects of human resource management activities, like performance appraisal and verification of training centres and trainers' credentials. A performance appraisal activity uses blockchain to review candidate employees, which can eliminate bias and subjectivity and validate performance feasibility and suitability for the advertised job. Then, to verify training centres and trainers' credentials, staff training is an essential aspect of human resource management that can significantly enhance a company's success. There are benefits to offering training for employees, such as developing stronger skills, improving their job performance, and increasing job satisfaction. Also, training can lead to higher employee retention rates, which benefit both the employees and the organisation in the long run. Therefore, investing in staff training is a worthwhile and constructive activity for any company looking to improve its overall performance (Salah et al., 2020).

Impacts on Cost Structure (CS)

Previous studies have indicated that adopting blockchain technologies and other advanced technologies can decrease operational costs in many different ways.

Impact 17: Reducing the Cost of Transactions or Doing Business.

Madakam et al. (2019) report that the integration of Robotic Process Automation (RPA) technology into businesses has the potential to reduce costs, minimize errors, and eliminate risk. Also, RPA technology provides a dependable, productive, and low-cost digital workforce that can work together with a sustainable human workforce. With the help of RPA technology, businesses can augment their labour force and achieve outstanding results in their operations. For example, Blue Prism Version 6 is software that enables businesses to automate their manual administrative processes with a digital workforce. The software allows easy integration of technologies like Artificial Intelligence (AI) and Machine Learning (ML) with business operations to deliver value. This connected enterprise approach helps businesses become agile and cost-effective, reducing costs and improving accuracy. Blue Prism v6 is a pioneering digital workforce operating system in Robotic Process Automation software (Madakam et al., 2019).

Kopetz and Steiner (2022) provide a valuable example of how IoT devices have created new energy-saving and cost-reduction opportunities. Some of these opportunities include individual climate and lighting control in residential buildings, reduced energy loss in transmission by installing smart grids, and improved coordination of energy supply and demand by installing smart meters (Kopetz & Steiner, 2022).

Shim et al. (2019) find that the Internet of Things (IoT) can also revolutionize how businesses operate and society functions because of today's highly connected economy and environment. By providing greater transparency, increasing output and standardization, and reducing operating costs, IoT has the potential to bring about significant transformation. B2B businesses, in particular, have viewed IoT as an excellent opportunity to cut costs and improve tracking (Shim et al., 2019).

Moro-Visconti et al. (2023) describe that Artificial Intelligence (AI) can automate several tasks, lowering operational costs by reducing manual labour. Also, AI can streamline operations, increase efficiency, and reduce the chances of human error through automating repetitive and time-consuming processes. This reduction in costs has a positive impact on improving the scalability of a company (Moro-Visconti et al., 2023).

In terms of Blockchain, Morkunas et al. (2019) indicate that adopting blockchain can reduce transaction costs by eliminating intermediaries and reducing negotiation and search costs. The adoption of blockchain technology for financial transfers has the potential to reduce the duration of authorization holds currently utilized in banking and credit card processing (which may be several days due to authorization holds). These can be reduced to a few minutes in public blockchain protocols with the help of transaction consensus. Correspondingly, these delays are minimized to microseconds on private blockchains. For instance, citizens in Sweden can save time and money during the transaction by negotiating home purchases using blockchain-powered smart contracts that exclude third parties. A smart contract is a type of agreement between parties that uses self-executing code on a blockchain. This means that the terms of the agreement can be automatically implemented without the need for intermediaries. Smart contracts process transactions faster, with greater security and transparency (Morkunas et al., 2019).

Another study by Leelasantitham (2020) examine guidelines for a blockchain-based business model in electricity utility systems. The study emphasizes the potential of peer-to-peer energy

trading to simplify the electricity trading process between consumers and prosumers in the peer-to-peer network, allowing for a direct exchange of electricity without intermediaries. The use of an intermediary for electricity trading is not mandatory, and adopting blockchain technology presents the possibility of reducing costs for consumers, prosumers, and SMEs (Leelasantitham, 2020).

Finally, Kim et al. (2020) state that blockchain technology has great potential for technological expansion. Building, connecting, and expanding a blockchain application can be done easily using publicly available resources through reducing IT deployment and maintenance costs. Well-known examples include token development cases such as EOS and Binance Coin, both based on the Ethereum platform and accessible to anyone with minimal investments (Kim et al.,2020). In addition, the authors explained that the open characteristic of blockchain ensures transaction transparency. Even in a private blockchain, where access grants may be restricted, all participants are given access to all transaction records, which are connected by chained blocks. This feature significantly reduces regulatory costs and ensures security and surveillance while promoting free transactions (Kim et al.,2020).

Impacts on Revenue Streams (RS)

According to previous research, adopting blockchain and other advanced technologies can increase revenue in existing streams and new revenue streams in various ways.

Impact 18: Increasing Revenue in Existing Streams.

Car and Stıfanıch (2020) find that mobile technology has become a game-changer in the hotel industry. Current mobile applications have made it possible to book accommodation through mobile devices via online booking platforms or hotel mobile applications. Accommodation revenue is the largest source of a hotel's total revenue, but by offering additional services and deals directly to users, hotels can generate extra income through their mobile apps. Moreover, technological advancements have not only benefited hotel guests but also hotel service providers. A quality hotel application aims to provide guests with many options. In addition, hotels can significantly increase revenue from their existing facilities, including local attractions, services, or menus in their mobile app for their guests (Car and Stıfanıch, 2020).

Moro-Visconti et al. (2023) find that AI can increase revenue for companies by utilizing improved sales forecasting and predictive analytics. With the help of AI in predictive analytics

and forecasting to analyse historical data, identify patterns, and make highly accurate predictions. This capability enables companies to optimize inventory management, demand forecasting, and supply chain operations. Furthermore, AI can increase company revenue by enhancing customer satisfaction and engagement. With various AI-powered technologies like chatbots, virtual assistants, and recommendation systems, companies can improve the overall customer experience. These tools can provide personalized recommendations, offer real-time support, and automate customer interactions (Moro-Visconti et al., 2023).

Millauer and Vellekoop (2019) state that revenue management is a relatively new discipline in the hospitality industry that has experienced significant changes over time. One such change involves shifting from occupancy-driven to price-optimization revenue management. However, the existing revenue management software relies heavily on human manual input and maintenance. With artificial intelligence, computer software, and hardware development, revenue management software is becoming more reliable, accurate, and heuristic in decision-making. Implementing advanced technology, supercomputers, and cloud services allows for a shift from rule-based revenue management to science-based revenue management. Automatic and centralized revenue management systems can analyse all potential options and execute the most suitable choice per the hotel's holistic strategy. Automation opportunities in the hospitality industry can increase efficiency, lower costs, and ultimately result in higher profits for the hotel (Millauer & Vellekoop, 2019).

Regarding blockchain technologies and increasing the revenue in existing streams, Vijayakumar (2021) study the potential impact of implementing AI in blockchain technologies on a company's annual revenue growth. AI algorithms analyse customer data, including purchase history, interactions, and preferences. This analysis can generate insights that help create more targeted and personalized marketing strategies, improve customer service, and develop better products. Moreover, companies using machine learning models can identify cross-selling and upselling opportunities based on individual customer behaviour, which can increase revenue streams. Furthermore, chatbots and automated customer service tools can provide real-time assistance and problem-solving capabilities customized to individual customer needs. If customer data is stored in a blockchain, it has two advantages. Firstly, the decentralized structure ensures higher data security by eliminating the risks associated with centralized databases. Secondly, blockchain's transparency makes it easy to audit customer data, facilitating regulatory compliance and enhancing customer trust (Vijayakumar, 2021).

Impact 19: Adding New Revenue Streams.

Mithas et al (2012) report that the aim of Information Technology (IT) initiatives for new revenues often requires adapting to a range of possibilities. Such initiatives often involve making subtle changes to the interlinkages between business processes, which can be complex when multiple stakeholders are involved. However, when enabled by IT, such opportunities can help organisations learn and create competitive advantages that take work to overcome. For example, Dell uses IT, such as social media, to engage its employees and customers. Investing in online conversational spaces like IdeaStorm and EmployeeStorm creates interlinkages between its customers and business units, which allows Dell to provide better feedback and improves customer resource life-cycle management. Southwest Airlines also developed an integrated system that forms extensive links between customers, employees, and other airlines. Both Dell and Southwest demonstrate how IT investments can help firms build IT resources and capabilities, leading to higher revenues (Mithas et al., 2012).

Moro-Visconti et al. (2023) state that AI-powered technologies have the potential to unlock new revenue streams by enhancing the productivity and innovation of products and services. By automating repetitive tasks, employees can focus more on innovative and problem-solving work, leading to the development of new products and services. For example, the benefit for traditional manufacturing companies is to leverage AI to offer predictive maintenance solutions and transform their business from selling products to selling ongoing services. AI can potentially enhance a company's competitive advantage and revenue generation capabilities (Moro-Visconti et al., 2023).

Yao et al. (2015) exemplify the impact of the Internet of Things on e-commerce with a case study of Alibaba. Alibaba's AliCloud provides hosting services for IoT platforms used by manufacturers such as Philips and Midea. The platform enables easy connection and information sharing between IoT devices, performs extensive data analysis and cloud computing, and converts data into valuable knowledge. These services generate additional revenue streams for Alibaba that must be made available in their traditional e-commerce business model. Additionally, Alibaba recently launched two new business units: automotive and smart living. These units provide financing deals for car manufacturers and consumers. Also, these units allow small businesses to raise capital through the Internet. By offering innovative services previously unavailable in the e-commerce industry, Alibaba will be able to generate more revenue (Yao et al., 2015).

Piskar and Faganel (2009) describe that organisations frequently integrate customer relationship management (CRM) systems with other decision support systems across all functional areas, including enterprise resource planning systems, executive information systems, supply chain management systems, and product life-cycle management systems. This integration helps to create better management information for planning, acquiring, and controlling across all channels, leading to superior products and services, generating new revenues and profits, and improving quality and rapid response to customers' needs. For example, Sanolabor, a Slovenian service company, recognized the need to develop an analytical CRM system. The goal was to improve customer relations, monitor employee activity, and make better strategic decisions. The company upgraded its CRM to include monthly reports about customers, daily reports on customer visits, and reports on the number and value of offers made. Additionally, they wanted to track the degree of customer satisfaction, the percentage of time product managers spent visiting customers, and general reports on customer activities. These reports helped employees become more informed about customers' needs and organisational changes, resulting in better strategic decisions. The system also helped improve relationships with customers and motivated employees. The CRM system is a valuable tool that allows the company to effectively direct its work with customers, inform them better, and make better strategic decisions (Piskar& Faganel, 2009).

In terms of blockchain, prior research points to both new forms of financing and new (or increased) revenue streams. Morkunas et al. (2019) and Treiblmaier and Špan (2022) study the role of blockchain in corporate financing and found that blockchain-based technologies have introduced new ways of crowdfunding, such as initial coin offerings (ICOs), which make it easier to raise capital. Morkunas et al. (2019) explained that an initial coin offering (ICO) collects funds that utilize cryptocurrencies and blockchain-based trading. It provides an alternative to traditional financing options like debt and capital funding from private equity firms, venture capitalists, and banks. Unlike traditional financing methods, an ICO distributes tokens instead of shares to early investors in a business. These tokens can be traded in an aftermarket, and all transactions are verified on a blockchain (Morkunas et al., 2019).

Beyond financing, Rajnak and Puschmann (2021) find that blockchain technology is expected to create new revenue streams for banks. For instance, banks could offer new blockchain services as trusted advisors, such as know-your-customer or personal data storage. On the one hand, banks' current sales processes mainly depend on client advisors and do not usually allow

online processes. However, it is possible to create new online sales processes that involve different stakeholders in digital ecosystems using blockchain-based applications. For instance, a digital trade system could be created that allows businesses to access compliance data from multiple providers without duplicating efforts (Rajnak & Puschmann, 2021).

2.4 Research Gap and Objective

This chapter has characterised business models using Osterwalder and Pigneur's Business Model Canvas, defined disruptive technology and provided examples, and reviewed the literature to reveal 19 impacts of technology adoption on business model components. The literature highlights that the effective adoption of technology significantly influences organisations. However, a gap exists in the existing research, as many studies focus only on specific technologies or one aspect of the business model. Thus, this study seeks to provide a more comprehensive examination by analysing the perception of these 19 identified impacts of technology adoption on an organisation's business model across a range of technologies.

The research objective of this study is:

> *To explore the perceived impacts of blockchain and other advanced technologies adoption on an organisation's business model.*

This objective aims to address the gap in literature by surveying a diverse population of organisations, asking about a broad range of technologies, and measuring perceived impacts across all business model components.

To realise this objective, the study uses all 19 impacts identified in the literature and uses Osterwalder and Pigneur's (2010) business model canvas as a lens. It organizes the nine blocks from the canvas into four groups, each informing one of the study's four research questions. These are discussed in Chapter 3.

Chapter 3: Methodology

This chapter describes the research methodology selected for this study. Section 3.1 restates the research objective and the research questions and describes the high-level two-phase structure of the study. Section 3.2 describes the first phase (exploratory study) and Section 3.3 describes the second phase (extended study).

3.1 Research Objective, Research Questions (RQ), and Study Structure

The research objective of this study is:

> *To explore the perceived impacts of blockchain and other advanced technologies adoption on an organisation's business model.*

Osterwalder and Pigneur's (2010) business model canvas is used as a lens to operationalise the objective, by organizing the nine blocks from the canvas into four groups, each informing one of the study's four research questions (See Figure 3.1). Each group/RQ highlights a distinct aspect of the business model. The first group focuses on customers (segments, channels, and relationships). The second group focuses on value created by the firm (value propositions) value through product and service development and enhancement. The third group focuses on the organisation's core activities, partnerships, and resources necessary to the regular running of daily business activities. Lastly, the fourth group focuses on financial aspects, and the management of both costs and revenue.

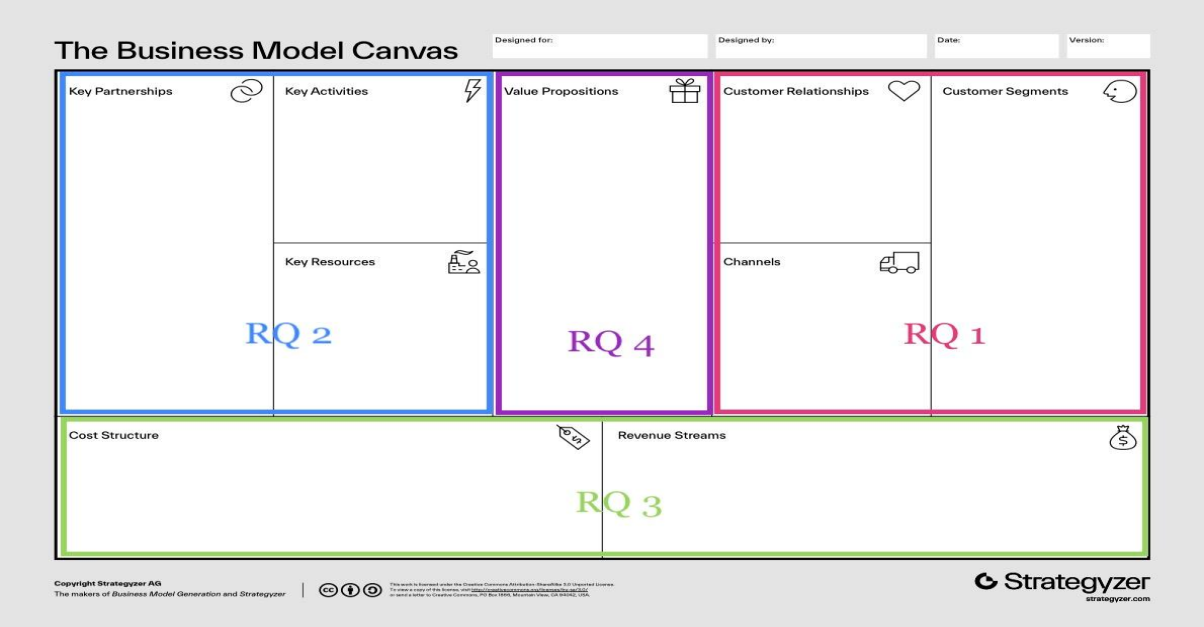


Figure 3.1: Business Model Canvas Organised as Four Research Questions

RQ1: What Are the Perceived Impacts of Blockchain and Advanced Technology Adoption on an Organisation's Customer Segments (CS), Channels (CH), and Relationships (CR)?

This question examines the perceived impacts of technology adoption on customer segments, channels, and relationships. A customer segment refers to a subset of a company's market that comprises a group of customers sharing common needs, expected behaviors, or other characteristics (Osterwalder & Pigneur, 2010). A channel is how a company connects with its customer segments to deliver a value proposition (Osterwalder & Pigneur, 2010). A customer relationship describes the type of relationship a company establishes with its various customer segments (Osterwalder & Pigneur, 2010).

RQ2: What Are the Perceived Impacts of Blockchain and Advanced Technology Adoption on an Organisation's Key Partnerships (KP), Key Resources (KR) and Key Activities (KA)?

This question examines the perceived impacts of adopting blockchain and advanced technologies on an organisation's partnerships, resources, and activities. Key partnerships (KP) are described by Osterwalder and Pigneur (2010) as the networking connections between suppliers and partners. Key resources (KR) are defined by them as the essential assets needed for a business model to succeed. Lastly, key activities (KA) are identified as the most critical components of a successful business model according to Osterwalder and Pigneur (2010).

RQ3: What Are the Perceived Impacts of Blockchain and Advanced Technology Adoption on an Organisation's Cost Structure (CS) And Revenue Streams (RS)?

This question explores the perceived impacts of adopting blockchain and advanced technologies on an organisation's cost structure and revenue streams. According to Osterwalder and Pigneur (2010), the cost structure encompasses all expenses associated with operating a business model, including both inflows and outflows that influence the organisation's financial status. Additionally, they define revenue streams as the income a business generates from each customer segment.

RQ4: What Are the Perceived Impacts of Blockchain and Advanced Technology Adoption on an Organisation's Value Propositions (VP)?

This question explores the perceived impacts of technology adoption on an organisation's value proposition. According to Osterwalder and Pigneur (2010), a company's value proposition is defined as the products or services it provides to its customers.

Structure of Study

The overall structure of the study comprised two phases as described below. Both phases of the study received ethical approval from the Social Research Ethics Committee (SREC) at the University College Cork (UCC).

The **exploratory study** was undertaken to develop more refined research questions and a better understanding of the research field. The exploratory study was narrow and focused on the perceived impacts of blockchain adoption only, within the specific context of small and medium enterprises in Saudi Arabia. As a result of the exploratory study, it became evident that the survey should consider a wider variety of organisation sizes and locations as well as additional technologies. The exploratory study also helped to refine the language of the survey and the measurement of various adoption, impacts, and business model characteristics. This enabled the extended study to have a more comprehensive understanding to effectively address the four research questions.

The **extended study** aimed to identify the research objective by exploring the perceived impacts of blockchain and other advanced technologies, such as Artificial Intelligence (AI), Customer Relationship Management (CRM), and the Internet of Things (IoT), on an organisation's business model. The extended study extended its scope to include a wider range

of organisation sizes, ages, and technologies, ensuring a more thorough analysis. Moreover, the survey was redesigned in response to insights gained from a exploratory study, which identified areas for improvement. With these changes, the extended study is anticipated to produce meaningful results.

3.2 Exploratory Study Methodology

This exploratory study was conducted in line with Marshall and Rossman's (1989) framework, which emphasizes the significance of the exploratory research method. Exploratory studies are focused on investigating phenomena that are not well understood, identifying crucial variables, and generating hypotheses for further research (Marshall and Rossman, 1989, pg. 78).

The exploratory study focused on blockchain technology adoption within small and medium enterprises (SMEs) in Saudi Arabia. The data was gathered from multiple technology organisations. The data was collected through an online questionnaire and short interviews (See Appendix A). The researcher also participated in several research events to share the research in progress and receive peer feedback. The exploratory study analysis was based on the number of responses to the online questionnaire and the interview data. Data about the respondent population also included LinkedIn posting performance data. This exploratory study provided initial insights and established the groundwork for further exploration of the perceived impacts of advanced technology adoption on business models.

3.2.1 Exploratory Study Topical Scope

In the exploratory study, the technology focus was on blockchain technology. This technology has four unique characteristics that are particularly relevant to this exploratory study and the research questions:

1. **Decentralized/Distributed Ledger Technology (DLT):** A distributed ledger is a digital ledger that stores information on a network of devices, reflects real-time updates, and authenticates it using a cryptographic signature (Deshpande et al., 2017). Yli-Huumo et al. (2016) defined a decentralized system as one in which no intermediaries or third parties are needed to transfer and transact data. For instance, Bitcoin uses a decentralized environment for cryptocurrency by digitizing the money to buy and exchange goods between the participants.

2. **Trust**: A blockchain-based authorization system for a trustworthy and protected monitoring solution comprises three fundamental components: a community gateway, a smart gateway, and a Resource Monitoring Smart Contract (RMSC). The proposed solution ensures that all transactions and tracking information are kept confidential and reliable (Alcarria et al.,2018).

3. **Transparency/Immutability:** With Blockchain, every transaction is visible to anyone with access to the system. The visibility is determined by each user or node, which has a unique character for identification. There is a choice to be anonymous or appear as proof of identity to other users (Iansiti and Lakhani, 2017). Viriyasitavat and Hoonsopon (2019) stated that this technology has tamper-proof resistance for storing data.

4. **Smart Contracts:** According to Tapscott and Tapscott (2016), Smart Contracts are innovative digital mechanisms designed to ensure the security and execution of recorded agreements between individuals and organisations (pg.101). Additionally, Smart Contracts have three main objectives: (1) increasing satisfaction with contract conditions, (2) reducing malicious behaviours and accidents, and (3) lowering the need for trust intermediaries (Tapscott & Tapscott, 2016, Pages 101 & 102).

3.2.2 Exploratory Study Sample Population

In the exploratory study, only SMEs in Saudi Arabia were included in the population sample. This sample was chosen because of several characteristics of Saudi Arabia's small and medium enterprises:

1. Economic Growth: In the Small Medium Enterprises in Saudi Arabia Report, (2016) reported that SMEs' power is due to Saudi Arabia's economic strategy of not depending on the oil sector. There are 1.97 million SMEs comprised of 90% registered businesses representing more than 50% of total employment.
2. IT Dependence: A study by Zafar et al (2015) found that Information Systems (IS) play an essential role in the competitive advantage of SMEs, through structural change, decreased cost, and improved use of data.

3. Readiness to Adopt IT Innovation: SMEs, particularly start-ups, are often early adopters of disruptive technology; for example, Clohessy (2019) describes the role of SMEs in adopting cloud computing technologies. In Saudi Arabia SMEs Afandi (2017) identifies that the percentage of SMEs adopting IT is sharply increasing in the country. However, there are also several unique challenges associated with the increased risk of adopting IT in SMEs in Saudi Arabia due to the lack of IT awareness and resources, and a shortage of IT support (Zafar et al., 2015; Small Medium Enterprises in Saudi Arabia Report, 2016; Afandi, 2017).

3.2.3 Exploratory Study Data Sampling Strategy

In the exploratory study, three primary data sources were used to recruit participants and ensure they meet the study's criteria. The organisation's headquarters must be in Saudi Arabia and the organisation must be a small or medium-sized company, preferably in the blockchain industry. While we considered other technologies, the company still had to be small or medium. We collected a list of eight blockchain Saudi SME companies, 61 non-blockchain Saudi SMEs, and 2000 IT companies from one of the three primary data sources:

1. Riyadh Chamber:

   The researcher received a list of around 2000 IT companies from the Riyadh Chamber, one of the business networks in Saudi Arabia. The Riyadh Chamber has a research and information center portal. Through this portal, researchers can apply to the center for the information they are looking for by filling out an information request service form (Information Request Service, 2024).

2. FinTech Saudi:

   In 2018, the Saudi fintech hub, FinTech Saudi, was established and launched by the Saudi Arabian Monetary Authority (SAMA) as part of the financial services development program. The objective of this non-profit organisation is to support the growth of the fintech industry in Saudi Arabia (About, 2024). For this study, two reports were utilized: the FinTech Saudi Report 2018/2019 and the Entrepreneur Report, the ultimate guide to fintech in KSA. These reports were used to identify which Saudi companies utilize advanced technology. The FinTech Saudi Report 2018/2019 covers various aspects of the Fintech Ecosystem in Saudi Arabia, including equity funding,

business tools, financial information providers, and payments or remittances (Fintech Saudi Annual Report, 2019). Additionally, "The Ultimate Guide to Fintech in KSA" lists 82 active fintech companies in Saudi Arabia (The Ultimate Guide to Fintech in KSA | Opportunities and Challenges in 2021, 2021).

3. Communications and Information Technology Commission (CITC):

   The Communications and Information Technology Commission (CITC) is a government office. The office website provides the Manassa Tech service. The Communications, Space, and Technology Commission (CST) developed that service. Manassa Tech aims to help achieve CST's vision of a connected nation for a digital economy by promoting market transparency and fair competition and developing the information technology (IT) and emerging technologies (ET) sectors. Manassa Tech's service includes a directory that serves as a reference list for IT and ET enterprises. These enterprises are categorized based on the IT and ET market business classification document issued by the CST Commission (Information Technology and Emerging Technology Enterprises, 2023). In addition, the exploratory study questionnaire was shared via a LinkedIn post to gather more responses and reach a more comprehensive network. The table below (See Table 3.1) provides a representation for analyzing the questionnaire posted on LinkedIn.

Post Performance	
Impressions	1936
Unique views	69
Reactions	14
Comments	10
Reposts	4

Table 3.1: Exploratory Study Questionnaire Recruitment on LinkedIn

3.2.4 Exploratory Study Data Collection Methods

In the exploratory study, the researcher used multiple methods, including online questionnaire, interviews, and research in progress was also reported at several research events.

Exploratory Study Questionnaire

The questionnaire had six sections focusing on blockchain technology and the business model canvas of SMEs in Saudi Arabia. Section 1 has general information about an organisation, such as its industry sector and age. Section 2 focused on the organisation and blockchain technology through understanding the role of this technology in the organisation; issues discussed might include product sales and service of the blockchain, as well as learning of blockchain application and how its application is relative to the organisation. Then, the potential use of blockchain in an organisation, like cryptocurrency or smart devices and automation, is discussed, and there is a question about the blockchain solution service a company offers to its customers. The remaining questionnaire questions from section 3 to section 6 are focused on the business model canvas with nine blocks adopted from Osterwalder and Pigneur (2010).

The questionnaire consists of 25 questions with different formats: multiple-choice, multiple-choice grid, checkbox, and checkbox grid questions. The multiple-choice questions are used to gather information about the organisation, such as its size, years of operation, and industry types. This question format is appropriate because it provides a variety of answers, and participants must choose one option from the list. The checkbox questions are used for participants to select multiple answers, and the questions cover topics such as the application of blockchain technology, its purpose, and its use cases. The multiple-choice grid questions are used to determine whether participants agree or disagree with statements. For example, the question related to most activities in the organisation used a Likert scale with several measurements, including strongly disagree, disagree, neutral, agree, strongly agree, and not applicable. The checkbox grid question measured different types of Likert scales from unlikely, natural, and likely for the question on revenue sources.

In line with Galliers (1991), the questionnaire in the exploratory study was used as a means of "capturing snapshots of practices, situations, or perspectives at a specific point in time" (p337) and to support other analytical techniques to draw inferences about the subject. It is important to consider the strengths and weaknesses of this approach. Although surveys may offer little insight into the process behind the studied phenomena and can be susceptible to bias in respondents and researchers at the time of the research, they are useful in their ability to describe real-world situations more easily (Galliers,1991). Thus, it was decided to use a questionnaire in the exploratory study to refine the research questions and methods for the extended study.

Exploratory Study Interviews

The exploratory study included interviews with two Saudi SME technology companies engaged with blockchain technology. These perspectives are based on interviews with the CEO of the first company and the Blockchain Solution Architect and Instructor of the second company. This interview allows the researcher to gather information and provide credible evidence of the adoption of blockchain technology within Saudi SME organisations.

Company 1 (C1): The company is known for providing excellent client services and has achieved great success. It offers various services, including network security, IT networking, microwave engineering, project management, and software development. The company is categorized as a small organisation with approximately 20 employees. In addition, the company collaborates with other Saudi-based companies with innovative solutions for blockchain development and training.

Company 2 (C2): The company focuses on operating and developing a blockchain network. The company is a vendor of the Hyperledger platform and serves as a general member and training partner. Founded by eight individuals, including blockchain technology consultants and developers, the company aims to provide solutions for business software and IT management services. These services include consultancy, software development, asset and securities tokenization, security token offering (STO), AI chatbot, and WhatsApp business solutions. Additionally, the company offers its own training programs, such as the Data Analysis with Python Masterclass and the Certified Hyperledger Fabric Administrator (CHFA) course, which prepares individuals for the exam. The interview process included seven questions about adopting blockchain technology:

1. What is your general opinion about Blockchain technology in SMEs? Is blockchain well understood? Is misunderstanding about blockchain a barrier?
2. What are the key factors that contribute to IT and business development within your organisation? Is it feasible to integrate blockchain technology into your organisation?
3. Are supply chain and HR the most common use cases of SMEs employing Blockchain?
4. What is the most significant barrier preventing SMEs from using Blockchain?
5. How does Blockchain technology solve SMEs' problems?
6. Are Ethereum or Corda the most common applications of Blockchain for SMEs?
7. Are Public, Private or Hybrid blockchains more suitable for SMEs and why?

Exploratory Study Research-in-Progress Presentations

During the exploratory study, the researcher presented research in progress to seven research events to gather peer feedback. These events resulted in several improvements to the theoretical framework, scope, and sample population, ultimately shaping the design of the extended study.

1. CUBS Postgraduate Research Blog

   Breaking Down Blockchain Technology, Cork University Business School, University College Cork, 8 Jan 2020.

2. CUBS Postgraduate Research Symposium

   Explore blockchain technology to reframe SMEs business model Saudi Arabia Cases. 30 July 2020. Presented online.

3. ECIS Doctoral Consortium

   Exploring The Impact of Blockchain Technology on SMEs Business Models, 11 June 2021, ECIS 2021. Online doctoral consortium.

4. AIS Chapter Event

   Exploring The Impact of Blockchain Technology on SMEs Business Models, Saudi Chapter of AIS Research Seminar, 1st February 2022. Presented online.

5. 5th MENA Conference on Information Systems (MENACIS)

   Alshabeeb, Z., Daly, M., Feller, J., (2022). The Potential Impact of Blockchain Technology in SMEs Business Model. Presented to the 5th MENA Conference on Information Systems (MENACIS), Dhahran, November 2022, Kingdom of Saudi Arabia. *(Proceedings still in press due to publication delays.)*

6. 5th MENA Conference on Information Systems (MENACIS) Doctoral Consortium

   The Potential Impact of Blockchain Technology in SMEs Business Model, 16 November 2022, the 5th MENA Conference on Information Systems (MENACIS), Dhahran, November 2022, Kingdom of Saudi Arabia.

3.2.5 Exploratory Study Data Analysis Methods

The questionnaire data from the exploratory study was analyzed based on 31 total responses, which were written in both Arabic and English. The exploratory study used various statistical analysis methods to summarize the results from 31 responses. Data from two Google Forms was imported. The Arabic forms were translated and then combined with the English forms. The exploratory study organized the data by addressing any blank or missing responses. In addition, the exploratory study used Microsoft Excel to create pivot tables, visualize data, and generate figures and tables. Additionally, the exploratory study used Excel's Find-and-Replace function to quickly search for and replace words or formats within a document, including the

Likert scale questions. Plus, the exploratory study used this function to code the answers and prepare the data for generating a frequency table using IBM SPSS Statistics.

The interview data was transcribed based on the interviewer's answers and then analyzed against the concepts from the questionnaire. It was also used to generate additional topics for understanding the adoption of blockchain technology in SMEs. The results of the exploratory study are presented in Chapter 4.

3.2.6 Exploratory Study Ethical Approval

The exploratory study questionnaire was distributed through Google Forms software. An information sheet on the first page of the questionnaire includes the researcher's bio and explains the research's purpose and duration to complete the questionnaire. Also, there is a consent form that contains a Data Protection Notice.

SREC quotes this notice and declares that

> "*The survey data will be securely held for a minimum period of ten years after the completion of a research project, in line with University College Cork's Code of Research Conduct (2016). After being anonymised, the survey data will be disclosed ONLY to my supervisors to seek their advice. After the project is finished, the anonymised data will be retained by UCC.*"

In addition, there is a question for participants to answer about their consent to participate in this study, acknowledging that their participation is voluntary nature of the study, the anonymity of the participants, and the right to withdraw their responses. This form also includes the researcher's contact email if participants have questions or comments about the questionnaire.

The Social Research Ethics Committee (SREC) approved the study's questionnaire at the University College Cork (UCC). This approval is necessary for social research that involves indirect interaction with human participants, such as web questionnaires. Furthermore, the approval process enables the student researcher to conduct ethical and responsible research. SREC provides student researchers with the necessary tools and resources to ensure their research meets ethical standards and responsible research practices.

The exploratory study provided valuable insights into the research domain, and these insights shaped my research direction for the extended study.

3.3 Extended Study Methodology

The findings from the exploratory study enabled the design of extended study. These design decisions included extending the topical scope, extending the target population, and extending the structure and format of the survey.

The extended study explores the perceived impacts of adopting any advanced technology (not limited to blockchain) on an organisation's business model. The data was collected through a survey with an extensive sample size (company size and location are independent). The analysis is based on the survey form. This extended study complements the exploratory study by providing valuable additional insights and recommendations.

3.3.1 Extended Study Topical Scope

The extended study extended to a broader range of technologies, in contrast to the exploratory study, which specifically focused on blockchain technology, including its features such as distributed ledgers, trust, transparency, and smart contracts. This initial focus was narrow, as numerous emerging technologies and ongoing development of existing ones deserve attention. For instance, the significance of Artificial Intelligence (AI), cloud computing, and the Internet of Things (IoT) should also be recognized. The International Organisation for Standardization (ISO) has published an article titled "*What is AI? All you need to know about artificial intelligence.*" This article explained various artificial intelligence (AI) concepts, such as learning, reasoning, and perception. AI learning is a part of machine learning. It enables machines to acquire knowledge from data, identify patterns, and make decisions without explicit instructions. Advances in deep learning help AI software understand complicated patterns by analyzing large datasets. AI reasoning is thinking logically because it allows computers to stimulate the human brain and conclude the instructions given or from available information to create ideas and develop plans to solve a problem. AI perfection uses temperature sensors and cameras to understand what is around them, a process called computer vision, which helps machines recognize images, faces, and objects (ISO, 2024). Besides, Jadeja and Modi (2012) described the characteristics of cloud computing, such as maintenance and security. Cloud computing applications simplify maintenance by removing the necessity for installation on individual user computers. The quality of security in cloud systems can match or exceed that of traditional systems, as providers can allocate resources to address security issues that may be beyond the means of many customers. Despite this, the security of

confidential data remains a significant concern, causing some delays in adopting cloud computing (Jadeja & Modi, 2012). Furthermore, Patel et al. (2016) stated that the Internet of Things has fundamental characteristics such as interconnectivity, things-related services, and heterogeneity. The term interconnectivity refers to the ability to connect anything to the global information and communication infrastructure of the IoT. The term things-related services refer to the capabilities of the Internet of Things (IoT) to deliver services related to physical objects while upholding privacy and ensuring semantic consistency between physical objects and their virtual representations. Meeting these requirements involves changes in both physical and informational technologies. The term heterogeneity in IoT refers to the interaction of devices with different hardware platforms through various networks (Patel et al., 2016). These three different explanations of advanced technology illustrate why the study falls within the extensive scope of technology. This insight can provide a valuable understanding of how embracing advanced technologies can help reshape an organisation's business model.

3.3.2 Extended Study Data Sampling Strategy

In order to ensure sufficient survey responses, multiple resources were used to publicise the survey in a purposeful manner. Initially, a link to the survey was shared on LinkedIn, along with an invitation for responses. This link was reposted multiple times to remind and encourage interested participants to engage with the survey. Table 3.2 presents the performance metrics for one of the survey post links, including impressions, unique views, reactions, and reposts. Additionally, Table 3.3 displays the demographic analytics for one of the survey posts on LinkedIn, revealing that most respondents work in companies with over 10,000 employees, predominantly within the IT Services and IT Consulting industries.

Post URL	https://www.linkedin.com/feed/update/urn:li:share:7165721647025508354
Post Date	Feb 20, 2024
Post Performance	
Impressions	1350
Unique views	669
Reactions	22
Reposts	10

Table 3.2: The Engagement Analytics of one of The Survey Post in LinkedIn

Category	Value	%
Company size	1001-5000 employees	23%
Company size	10,001+ employees	23%
Company size	51-200 employees	9%
Company size	11-50 employees	6%
Company size	5001-10,000 employees	6%
Job titles	Professor	5%
Job titles	Lecturer	3%
Job titles	Software Engineer	2%
Job titles	Business Analyst	1%
Job titles	Data Analyst	1%
Locations	Cork Metropolitan Area	16%
Locations	Eastern Region	8%
Locations	Greater Dublin	6%
Locations	Pune/Pimpri-Chinchwad Area	3%
Locations	Makkah Region	3%
Companies	University (Anonymised)	4%
Companies	University (Anonymised)	2%
Companies	Petrochemicals Manufacturers	1%
Companies	Consultancy	1%
Companies	Energy Company	1%
Industries	IT Services and IT Consulting	22%
Industries	Higher Education	11%
Industries	Software Development	7%
Industries	Financial Services	4%
Industries	Banking	4%

Table 3.3: The Top Demographic Analytics of one of The Survey Post in LinkedIn

Secondly, the invitation to the survey was sent to approximately 300 individuals via direct messages on LinkedIn. The extended study survey also targeted around 250 companies from various countries, including Saudi Arabia, Ireland, and others. This multi-source approach aims to strengthen the robustness of our research sample and enhance the credibility of our data.

3.3.3 Extended Study Sample Population

The extended study survey collected 72 responses, representing a sample across organisation size, age, and industry. For organisation size based on 72 actual responses, most of the responses are from a very large organisation, at 52.8% (See Figure 3.2). Refer to Table 5.1 in Chapter 5, which describes descriptive statistics of the size of the organisation, and here is an interpretation of size statistics:

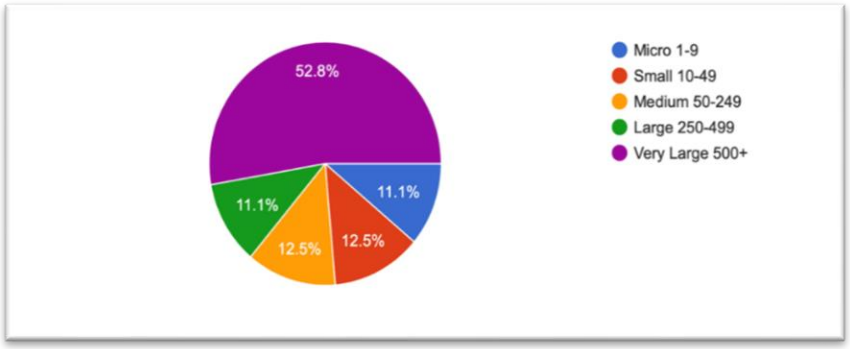


Figure 3.2: The Size of Organisation (N=72)

- Range: The range of a data set is the difference between the maximum and minimum values. The range of 4 indicates that the difference between the maximum and minimum values is 5 and 1. In other words, all size categories are present in the data. 5 is indicated for very large and 1 for micro. Thus, 4 indicates that the organisation size is large in the range.

- Mean: The average size of the organisations in the sample is approximately 3.82. The mean of 3.82 does not correspond to any specific category but reflects a weighted average of categories since the organisation size variable measures as ordinal data. However, the mean of 3.82 indicates that the organisation size is medium or larger on average.

- Standard Deviation: The standard deviation measures the extent of variability or dispersion around the mean. A standard deviation of 1.466 means that the size of many organisations is close to the mean of 3.82.

- Skewness: The skewness of organisation size is approximately -0.808. A negative skew suggests that the distribution of size is slightly skewed to the right, meaning there may be a longer tail on the left side of the distribution. The right skew indicates that the majority of the organisation size is a very large organisation, and the longer tail on the left is the distribution of other organisation sizes: large, medium, small, and micro.

- Kurtosis: The kurtosis is -0.870. A negative kurtosis indicates that the distribution has lighter tails and is slightly less peaked than a normal distribution. The distribution is slightly less peaked because the majority and more than half of the respondents are in organisations of very large size.

For organisation age most of the organisation have been operating for more than 20 years 43.1% (See Figure 3.3). Refer to Table 5.3 in Chapter 5, which describes descriptive statistics of the age of the organisation, and here is an interpretation of age statistics:

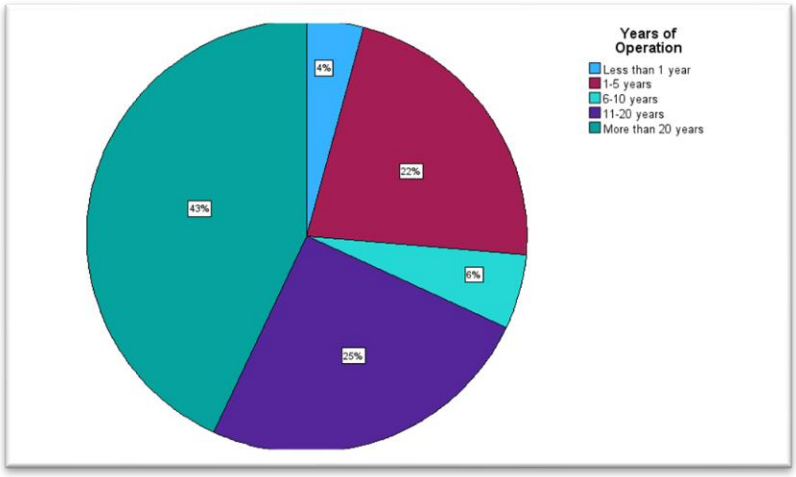


Figure 3.3: Organisation Age (N=72)

- Range: The range of a data set is the difference between the maximum and minimum values. For example, a range of 4 indicates that the difference between the minimum and maximum values is 1and 5. In other words, the age categories are present in the data. 5 is indicated for organisation age more than 20 years and 1 for organisation age less than 1 year. Thus, 4 indicates that the organisation age is 11-20 years in the range.
- Mean: The average age of the organisations in the sample is approximately 3.81. The mean of 3.81 does not correspond to any specific category but sits between the 6-10 year and 11–20 year brackets. Thus, the mean of 3.81 indicates that the organisation age is more than 5 years on average.
- Standard Deviation: The standard deviation measures the extent of variability or dispersion around the mean. A standard deviation of 1.318 means that the age of many organisations is close to the mean of 3.81.
- Skewness: The skewness of organisation age is approximately -0.694. A negative skew suggests that the distribution of age is slightly skewed to the right, meaning there may be a longer tail on the left side of the distribution. The right skew indicates that the majority of the organisation age is more than 20 years of operation, and the longer tail on the left is the distribution of other organisation ages less than 1 year, 1-5 years, 6-10 years, and 11-20 years.
- Kurtosis: The kurtosis is -0.992. A negative kurtosis indicates that the distribution has lighter tails and is slightly less peaked than a normal distribution. The distribution is slightly less peaked and close to a normal distribution because the majority and more than half of the respondents are in organisations with more than 20 years of operation.

For the organisation industry, Tables 3.4 and 3.5 illustrate the frequency distributions across various industries. Chapter 5 provides a detailed discussion. According to Figure 3.4, the largest industry group is in the information technology sector, including hardware and software. The next largest sectors are education and consultancy, followed by manufacturing and financial services. Smaller groups are in government, supply chain management, retail, and healthcare.

Organisation Industry		
	N	%
IT	19	26.4%
Education/Training	11	15.3%
Consultancy	10	13.9%
Financial services	6	8.3%
Manufacturing/Wholesales	6	8.3%
Supply Chain Management	3	4.2%
Government	3	4.2%
Retail	2	2.8%
Health	1	1.4%
Other	11	15.3%

Table 3.4: Frequency Statistics of Organisation Industry (N=72)

Other Industries of Organisation	
Oil and Gas	3
Energy and Engineering	1
Defense	1
Management System Certification	1
D&D	1
Travel	1
Marine	1
FMCG	1
Real Estate Development	1

Table 3.5: Frequency Statistics for Other Industries of Organisation (N=11)

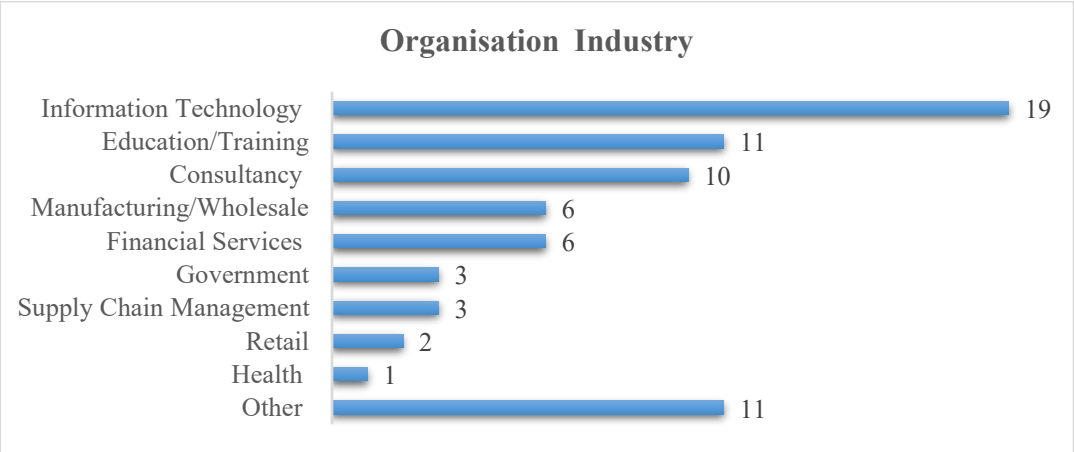


Figure 3.4: Organisation Industry (N=72)

3.3.4 Extended Study Data Collection Methods

The extended study uses the survey method. According to Creswell (2009), designing a survey involves examining a population sample in numeric and quantitative terms and describing a population according to trends, attitudes, or opinions. Creswell (2009) discussed four components of planning a survey. The first component is identifying the intended use of the survey. The second is identifying the reason for using a survey in the data collection procedure, i.e., to explain the advantages of identifying a large population from a small group of individuals. The third is deciding between a cross-sectional or longitudinal survey, with data collection occurring at one point in time or over time. The last component specifies the data collection format, such as self-administrated questionnaires and interviews (Creswell, 2009).

The survey is divided into six sections. The first section consists of three general information questions about the organisation (1.1, 1.2, 1.3). This section is crucial as it ensures the survey is completed accurately and provides basic information about the organisation. The following section will discuss the organisation's use of blockchain technology and advanced technologies through four questions (2.1, 2.2, 2.3, 2.4). These questions aim to provide a clear understanding of the role of blockchain technology in an organisation, the different blockchain platforms, potential use cases of blockchain technology such as cryptocurrency and smart devices, and the advanced technologies that the organisation has adopted. These questions will provide insights into how organisations can benefit from adopting new advanced technologies and blockchain technologies. From section 3 to section 6, the survey will focus on the nine blocks of the business model canvas as proposed by Osterwalder and Pigneur (2010).

The main difference between the questionnaire for the exploratory study and the survey for the extended study is the inclusion of a question regarding the type of advanced technology being adopted within the organisation. Additionally, the extended study examines the perceived impacts of advanced technologies, including blockchain technology, on the organisation's business model, specifically within the nine blocks of the business model canvas. Below is the extended survey for the study on adopting blockchain and advanced technologies within an organisation's business model (Also See Appendix A).

Section 1: Organisation Information

1.1: What is the size of your organisation (based on the number of employees)?

- ☐ Micro 1-9
- ☐ Small 10-49
- ☐ Medium 50-249
- ☐ Large 250-499
- ☐ Very Large 500+

1.2: How many years has your organisation operated?

- ☐ Less than 1 year
- ☐ 1- 5 years
- ☐ 6- 10 years
- ☐ 11-20 years
- ☐ More than 20 years

1.3: What is your organisation's **primary** industry?

- ☐ Supply Chain Management/Logistics/Transport
- ☐ Financial Services (Banking, Insurance, and Investment)
- ☐ Information Technology (Hardware or Software)
- ☐ Consultancy (Technology or Business)
- ☐ Education/Training
- ☐ Health (Medical, Pharmaceutical)
- ☐ Government
- ☐ Non-profit/Non-Government Organisation (NGO)
- ☐ Manufacturing/Wholesale
- ☐ Retail
- ☐ Other

Section 2: Organisation Information and Blockchain and Advanced Technologies

2.1: What is the role of blockchain technology in your organisation?

- ☐ We sell products built around blockchain.
- ☐ We sell services built around blockchain.

- ☐ We use blockchain in internal business operations.
- ☐ We provide customization and/or support of blockchain technology.
- ☐ We do not use blockchain in our organisation, but it is used elsewhere in our industry sector.
- ☐ No use of blockchain in our organisation nor in our industry sector.
- ☐ Other

2.2: Which blockchain technology platforms are relevant to your organisation and/or industry sector?

- ☐ None
- ☐ IBM Blockchain
- ☐ Corda
- ☐ Ethereum
- ☐ Hyperledger Fabric
- ☐ Quorum
- ☐ Other

2.3: Which blockchain use cases/functionalities are relevant to your organisation and/or industry sector?

- ☐ None
- ☐ Distributed Ledgers
- ☐ Smart Contracts
- ☐ Cryptocurrencies
- ☐ IoT (Internet of Things)
- ☐ Smart Devices
- ☐ Automation
- ☐ Asset Management
- ☐ “Trustless” Consensus Mechanisms
- ☐ Other

2.4: Which of the following advanced technologies have been adopted by your Organisation?

- ☐ Enterprise/Manufacturing Resource Planning (ERP/MRP)
- ☐ Automated Control and Monitoring Systems
- ☐ 3D Printing/Additive Manufacturing

- ☐ Customer Relationship Management (CRM)
- ☐ IoT (Internet of Things)
- ☐ Databases, Data warehouses, Unstructured Data, Big Data
- ☐ Cloud-based Systems
- ☐ Artificial Intelligence
- ☐ Mobile Apps
- ☐ Robotics
- ☐ Cybersecurity
- ☐ Other

Section 3: Customer Segments, Channels, and Relationships

3.1: Which best describes your **primary** customer segments?

- ☐ Customers are concentrated in one or two broad segments.
- ☐ Customers are differentiated into multiple more narrow segments.

3.2: Which best describes your **primary** customer segments?

- ☐ Individual Consumers (B2C)
- ☐ Micro, Small and Medium Enterprises (B2B)
- ☐ Large and Very Large Enterprises (B2B)
- ☐ Government and Public Agencies (B2G)
- ☐ Individual Citizens (G2C)
- ☐ Other

3.3: Where are your customers **mostly** located?

- ☐ Inside our organisation's primary country
- ☐ Outside our organisation's primary country
- ☐ Both/Varies

3.4: What **Channels** do you use when interacting with your customers?

- ☐ Online Communications (Email, Website, Social Media, Telephone/VoIP, etc.)
- ☐ In-person Communications (Meetings, Workshops, Community Events, etc.)
- ☐ Automated/Self-Service (Web and Mobile Applications)

☐ Other

3.5: To what extent do you agree or disagree with the following statements?
Likert Scale: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Not Applicable.

- The adoption of **advanced technologies** has increased the number of customers in our existing customer segments.
- The adoption of **advanced technologies** has helped us to add new customer segments.
- The adoption of **advanced technologies** has created new channels between the organisation and our customers.
- The adoption of **advanced technologies** has helped to strengthen the transparency between the organisation and our customers.
- The adoption of **advanced technologies** has helped us to improve data security.
- The adoption of **advanced technologies** has helped us to improve customer trust in our organisation.
- The adoption of **blockchain technologies** has increased the number of customers in our existing customer segments.
- The adoption of **blockchain technologies** has helped us to add new customer segments.
- The adoption of **blockchain technologies** has created new channels between the organisation and the customers.
- The adoption of **blockchain technologies** has helped us to strengthen the transparency between the organisation and the customers.
- The adoption of **blockchain technologies** has helped us to improve data security.
- The adoption of **blockchain technologies** has helped us to improve customer trust in our organisation.

Section 4: Key Partnerships, Resources, and Activities

4.1: Who are your organisation's main **partners** (Suppliers, Collaborators, Fulfillment Partners, Consultants, etc.)?

☐ Banks and Financial Service Companies
☐ Government Agencies
☐ Information Technology Companies
☐ Electronics Equipment Companies

☐ Food Producers
☐ Restaurants
☐ Publishing/Design Companies
☐ Marketing/Advertising
☐ Education/Training
☐ Transportation Companies
☐ Specialty Wholesale/Retailers
☐ Real Estate Companies
☐ Other

4.2: How important are physical, non-physical, and human resources to your organisation? Importance scale. Very important, important, somewhat important, and not important.

☐ Physical (Plant, Buildings, etc.)
☐ IT (HW and SW)
☐ IPR (TM, Patents, CR, etc.)
☐ Data and Knowledge (Market, Local, Collab partners, and etc.)
☐ HR (Product/Service development and Delivery)
☐ HR (Admin, Finance, etc.)
☐ HR (Sales and Marketing)

4.3: To what extent do you agree or disagree with the following statements? Likert Scale: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Not Applicable.

- The adoption of **advanced technologies** has allowed us to add new partners.
- The adoption of **advanced technologies** has improved our collaboration with existing partners.
- The adoption of **advanced technologies** has improved our development and use of the organisation's physical resources.
- The adoption of **advanced technologies** has improved our development and use of the organisation's non-physical resources.
- The adoption of **advanced technologies** has improved our development and use of the organisation's human resources.
- The adoption of **advanced technologies** has made our organisation’s activities more effective.

- The adoption of **advanced technologies** has made our organisation's activities more efficient.
- The adoption of **blockchain technologies** has allowed us to add new partners.
- The adoption of **blockchain technologies** has improved our collaboration with existing partners.
- The adoption of **blockchain technologies** has improved our development and use of the organisation's physical resources.
- The adoption of **blockchain technologies** has improved our development and use of the organisation's non-physical resources.
- The adoption of **blockchain technologies** has improved our development and use of the organisation's human resources.
- The adoption of **blockchain technologies** has made our organisation's activities more effective.
- The adoption of **blockchain technologies** has made our organisation's activities more efficient.

Section 5: Cost Structure, and Revenue Streams

5.1: What is the primary cost for your organisation?

- ☐ Mostly Fixed costs (rent, utilities, and salaries)
- ☐ Mostly Capital costs (physical plant)
- ☐ Mostly Variable costs (consumables, running costs, cost of sales)
- ☐ I don't know/other

5.2: What is the primary revenue stream for your organisation?

- ☐ Product sales
- ☐ Service sales
- ☐ Usage fees
- ☐ Subscription fees
- ☐ Leasing/lending/renting fees
- ☐ Service fees
- ☐ Licensing fees
- ☐ Brokerage fees
- ☐ I don't know/other

5.3: To what extent do you agree or disagree with the following statements?
Likert scale: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Not Applicable.

- The adoption of **advanced technologies** reduces the cost of transactions/doing business.
- The adoption of **advanced technologies** increases revenue in existing streams.
- The adoption of **advanced technologies** adds new revenue streams.
- The adoption of **blockchain technologies** reduces the cost of transactions/doing business.
- The adoption of **blockchain technologies** increases revenue in existing streams.
- The adoption of **blockchain technologies** adds new revenue streams.

Section 6: Value Propositions

6.1: To what extent do you agree and disagree with the following statements? Likert scale from Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, to Not Applicable.

- The adoption of **advanced technologies** helps us to develop new products and services.
- The adoption of **advanced technologies** helps us to improve existing products and services.
- The adoption of **advanced technologies** helps us to reduce costs for our customers.
- The adoption of **blockchain technologies** helps us to develop new products and services.
- The adoption of **blockchain technologies** helps us to improve existing products and services.
- The adoption of **blockchain technologies** helps us to reduce costs for our customers.

3.3.5 Extended Study Data Analysis Methods

The survey for the extended study implemented two primary steps for data analysis. The first step involved importing and cleaning the data, which included assigning variable names to the survey questions and classifying the types of variables. In total, there are 112 variables, comprised of 64 nominal and 48 ordinal measurements. There are two of the variables are

derived: the adoption of blockchain technology variable (yes or no) and the number of advanced technologies adopted variable (count) (See Table 3.6).

Variable Name/ (Survey Q)	Type	Description	Variable Name/ (Survey Q)	Type	Description
ORG-Size (1.1)	Ordinal	Organisation Information	BCUse- Products (2.1)	Nominal	The Uses of BC Adoption
ORG-Age (1.2)	Ordinal		BCUse- Services (2.1)	Nominal	
ORG-Industry (1.3)	Nominal		BCUse- Internal (2.1)	Nominal	
BCPL-No platforms (2.2)	Nominal	The Platforms of BC	BCUse- Support (2.1)	Nominal	
BCPL-IBM (2.2)	Nominal		BCUse- Sector (2.1)	Nominal	
BCPL-Ethereum (2.2)	Nominal		Adoption of BC *	Nominal	The Adoption of BC
BCPL-Other platforms (2.2)	Nominal		Adv Tech- (ERP/MRP) (2.4)	Nominal	The Adoption of Advanced Technologies
BCPL-Hyperledger Fabric (2.2)	Nominal		Adv Tech- Automated Control and Monitoring Systems (2.4)	Nominal	
BCPL-Corda (2.2)	Nominal		Adv Tech- 3D Printing/Additive Manufacturing (2.4)	Nominal	
BCPL-Quorum (2.2)	Nominal		Adv Tech- (CRM) (2.4)	Nominal	
BCUC-No Use Case (2.3)	Nominal	The Use Cases of BC	Adv Tech- (IoT) (2.4)	Nominal	
BCUC-Distributed Ledgers (2.3)	Nominal		Adv Tech- Databases, Data warehouses, Unstructured Data, Big Data (2.4)	Nominal	
BCUC-Smart Contracts (2.3)	Nominal		Adv Tech- Cloud-based Systems (2.4)	Nominal	
BCUC-Cryptocurrencies (2.3)	Nominal		Adv Tech- (AI) (2.4)	Nominal	
BCUC- IoT (2.3)	Nominal		Adv Tech- Mobile Apps (2.4)	Nominal	
BCUC- Smart Devices (2.3)	Nominal		Adv Tech- Robotics (2.4)	Nominal	
BCUC- Automation (2.3)	Nominal		Adv Tech- Cybersecurity (2.4)	Nominal	
BCUC- Asset Management (2.3)	Nominal		Other Adv Tech (2.4)	Nominal	
BCUC- "Trustless" Consensus Mechanisms (2.3)	Nominal		Number of Adv Tech Adopt *	Nominal	The Numbers of Advanced Technologies Adoption
BCUC- Other Use Cases (2.3)	Nominal		Adv Tech- Increased the Existing Customer Base (3.5)	Ordinal	The Perceived Impacts of Advanced Technologies on Customer Segments
CS-Group (3.1)	Ordinal	The Group of Customer Segments	Adv Tech- Helped the Organisation Add New Customer Segments (3.5)	Ordinal	
CS-(B2C) (3.2)	Nominal	The Types of Customer Segments (CS)	Adv Tech- Created New Channels for Organisation to Connect with Customers (3.5)	Ordinal	The Perceived Impacts of Advanced Technologies on Channels
CS-(B2B) (3.2)	Nominal		Adv Tech- Improved Transparency Between Organisation and Customers (3.5)	Ordinal	The Perceived Impacts of Advanced Technologies on Customer Relationships
CS-(B2B) (3.2)	Nominal		Adv Tech- Improved the organisation Data Security (3.5)	Ordinal	
CS- (B2G) (3.2)	Nominal		Adv Tech- Strengthened Customer Trust in the Organisation (3.5)	Ordinal	
CS-(G2C) (3.2)	Nominal		BC Tech- Increased the Existing Customer Base (3.5)	Ordinal	The Perceived Impacts of Blockchain Technologies on Customer Segments

Variable Name/ (Survey Q)	Type	Description	Variable Name/ (Survey Q)	Type	Description
Other CS (3.2)	Nominal		BC Tech- Helped the Organisation Add New Customer Segments (3.5)	Ordinal	
Location of Customers (3.3)	Nominal	The Location of Customers	BC Tech- Created New Channels for Organisation to Connect with Customers (3.5)	Ordinal	The Perceived Impacts of Blockchain Technologies on Channels
CH- Online Communications (3.4)	Nominal	The Channels for Customers	BC Tech- Improved Transparency Between Organisation and Customers (3.5)	Ordinal	The Perceived Impacts of Blockchain Technologies on Customer Relationships
CH- In-person Communications (3.4)	Nominal		BC Tech- Improved the Organisation Data Security (3.5)	Ordinal	
CH- Automated/Self-Service (3.4)	Nominal		BC Tech- Strengthened Customer Trust in the Organisation (3.5)	Ordinal	
KP- Banks and Financial Service Companies (4.1)	Nominal	The Key Partners	KR- Physical (4.2)	Ordinal	The Key Resources
KP- Government Agencies (4.1)	Nominal		KR- IT (4.2)	Ordinal	
KP- Information Technology Companies (4.1)	Nominal		KR- IPR (4.2)	Ordinal	
KP- Electronics Equipment Companies (4.1)	Nominal		KR- Data and Knowledge (4.2)	Ordinal	
KP- Food Producers (4.1)	Nominal		KR- HR (Product/Service development and Delivery) (4.2)	Ordinal	
KP- Restaurants (4.1)	Nominal		KR- HR (Admin, Finance, etc.) (4.2)	Ordinal	
KP- Publishing/Design Companies (4.1)	Nominal		KR- HR (Sales and Marketing) (4.2)	Ordinal	
KP- Marketing/Advertising (4.1)	Nominal		Adv Tech- Allows Organisation to Add New Partners (4.3)	Ordinal	The Perceived Impacts of Advanced Technologies on Key Partners
KP- Education/Training (4.1)	Nominal		Adv Tech- Improved Organisation's Collaboration with Existing Partners (4.3)	Ordinal	
KP- Transportation Companies (4.1)	Nominal		Adv Tech- Improved the Organisation's Development and the Use of the Organisation's Physical Resources (4.3)	Ordinal	The Perceived Impacts of Advanced Technologies on Key Resources
KP- Specialty Wholesale/Retailers (4.1)	Nominal		Adv Tech- Improved the Organisation's Development and the Use of Its Non-Physical Resources (4.3)	Ordinal	
KP- Real Estate Companies (4.1)	Nominal		Adv Tech- Improved the Organisation's Development and Use of The Organisation's Human Resources (4.3)	Ordinal	
KP- Other Partners (4.1)	Nominal		Adv Tech- Made the Organisation's Activities More Effective (4.3)	Ordinal	The Perceived Impacts of Advanced Technologies on Key Activities
BC Tech- Allow Organisations to Add New Partners (4.3)	Ordinal		Adv Tech- Made the Organisation's Activities More Efficient (4.3)	Ordinal	

Variable Name/ (Survey Q)	Type	Description	Variable Name/ (Survey Q)	Type	Description
BC Tech- Improved Organisations' Collaboration with Existing Partners (4.3)	Ordinal	The Perceived Impacts of Blockchain Technologies on Key Partners	BC Tech- Made the Organisation's Activities More Effective (4.3)	Ordinal	The Perceived Impacts of Blockchain Technologies on Key Activities
BC Tech- Improved the Organisation's Development and The Use of The Organisation's Physical Resources (4.3)	Ordinal	The Perceived Impacts of Blockchain Technologies on Key Resources	BC Tech- Made the Organisation's Activities More Efficient (4.3)	Ordinal	
BC Tech- Improved the Organisation's Development and The Use of Its Non-Physical Resources (4.3)	Ordinal		CS- Cost (5.1)	Nominal	The Types of Cost Structure
BC Tech- Improved the Organisation's Development and Use of the Organisation's Human Resources (4.3)	Ordinal		RS- Revenue Streams (5.2)	Nominal	The Potentials of Revenue Streams
Adv Tech- Reduce the Cost of Transactions/Doing Business (5.3)	Ordinal	The Perceived Impacts of Advanced Technologies on Cost Structure	BC Tech- Reduce the Cost of Transactions/Doing Business (5.3)	Ordinal	The Perceived Impacts of Blockchain Technologies on Cost Structure
Adv Tech- Increase Revenue in Existing Streams (5.3)	Ordinal	The Perceived Impacts of Advanced Technologies on Revenue Streams	BC Tech- Increase Revenue in Existing Streams (5.3)	Ordinal	The Perceived Impacts of Blockchain Technologies on Revenue Streams
Adv Tech- Add New Revenue Streams (5.3)	Ordinal		BC Tech- Add New Revenue Streams (5.3)	Ordinal	
Adv Tech- Help Organisations to Develop New Products and Services (6.1)	Ordinal	The Perceived Impacts of Advanced Technologies on Value Propositions	BC Tech- Help Organisations to Develop New Products and Services (6.1)	Ordinal	The Perceived Impacts of Blockchain Technologies on Value Propositions
Adv Tech- Help Organisations Improve Existing Products and Services (6.1)	Ordinal		BC Tech- Help Organisations Improve Existing Products and Services (6.1)	Ordinal	
Adv Tech- Help Organisations Reduce Costs for Their Customers (6.1)	Ordinal		BC Tech- Help Organisation Reduce Costs for Their Customers (6.1)	Ordinal	

Table 3.6: Data Variables for the Extended Study Survey

The second step involved conducting various statistical tests on the dataset. When performing tests on variables related to blockchain adoption details and perceived impacts of blockchain adoption, only a subset of responses was used (the 41 adopters of blockchain technology). These 41 adopters represent a subset of the 72 respondents who either reported using blockchain directly or who reported that their industry made use of it. Collectively, the researcher refers to this whole group as "adopters."

The descriptive analysis for all variables includes measures of central tendency: the mean, mode, and median. The mean is calculated by dividing the sum of all values by the number of values (Almquist et al., 2014, p. 38). The mode is the most frequently occurring value in a distribution (Almquist et al., 2014, p. 39). The median is the value located in the absolute middle of the distribution (Almquist et al., 2014, p. 39). In addition to measures of central tendency, ordinal variables also utilize measures of variation and distribution. Measures of variation include the minimum (min), maximum (max), range, and standard deviation. The minimum is the lowest value, while the maximum is the highest value. The range is the difference between the lowest and highest values, and the standard deviation indicates the dispersion of the values from the mean (Almquist et al., 2014, p. 42). Distribution measurements include skewness and kurtosis. Skewness is a measure of the symmetry of a distribution and can be positive (with a longer right tail) or negative (with a longer left tail) (Almquist et al., 2014, p. 31). On the other hand, kurtosis measures a distribution’s shape or peakiness (Almquist et al., 2014, p. 31). For categorical variables (nominal and ordinal), a frequency table is used to display the absolute number of observations within each category (Almquist et al., 2014, p. 49). This function also allows the creation of specific graphs to visualize the data, such as bar charts, column charts, and histograms (Almquist et al., 2014, p. 50).

All the above tests were run using SPSS, as detailed in Chapter 5. Below is a list of relevant findings organized by subsection:

- Subsection (5.1.1): Run a Descriptive Statistics of Organisation Size (Table 5.1), Frequency Statistics of Organisation Size (Table 5.2), Histogram of Organisation Size (Figure 5.1).
- Subsection (5.1.2): Run a Descriptive Statistics of Organisation Age (Table 5.3), Frequency Statistics of Organisation Age (Table 5.4), Histogram of Organisation Age (Figure 5.2).

- Subsection (5.1.3): Run a Descriptive Statistics of Organisation Industry (Table 5.5), Frequency Statistics of Organisation Industry (Table 5.6), Frequency Statistics for Other Industries of Organisation (Table 5.7), Bar Chart for Industry of the Organisation (Figure 5.3).
- Subsection (5.2.1): Run a Descriptive Statistics for Blockchain Technology Adoption (Table 5.8), Frequency Statistics for Blockchain Technology Adoption (Table 5.9), Descriptive Statistics for Use of Blockchain Technology Adoption (Table 5.10), Frequency Statistics for The Use of Blockchain Technology in Organisation (Table 5.11), Column Chart for The Use of Blockchain Technology in Organisation (Figure 5.4), Descriptive Statistics for Blockchain Platforms (Table 5.15), Frequency Statistics for Blockchain Platforms (Table 5.16), Descriptive Statistics for Blockchain Use Cases (Table 5.20), Frequency Statistics for Blockchain Use Cases (Table 5.21), Column Chart for Blockchain platforms (Figure 5.5), Column Chart for The Blockchain Use Cases (Figure 5.6).

- Subsection (5.2.2): Run a Descriptive Statistics for Number of Advanced Technologies Adopted (Table 5.25), Frequency Statistics for Total Number of Different Advanced Technologies Adopted (Table 5.26), Frequency Statistics of Specific Advanced Technologies (Table 5.27).

- Subsection (5.3.1): Run a Descriptive Statistics for Customer Segments Group (Table 5.31), Frequency Statistics of Customer Segments Group (Table 5.32), Descriptive Statistics for type of Customer Segments (Table 5.33), Frequency Statistics for Types of Customer Segments (Table 5.34), Descriptive Statistics for Location of Customers (Table 5.35), Frequency Statistics for Location of Customers (Table 5.36) , Descriptive Statistics for Types of Channels with Customers (Table 5.37), Types of Channels with Customers (Figure 5.7).

- Subsection (5.3.2): Run a Descriptive Statistics for Key Partnerships (Table 5.38), Descriptive Statistics for Physical Resources (Table 5.39), The Frequency Statistics for Importance of Physical Resources (Table 5.40), Descriptive Statistics for Non-Physical Resources (Table 5.41), The Frequency Statistics for Importance of Non-Physical Resources (Table 5.42), Descriptive Statistics for Human Resources (Table 5.43), The

Frequency Statistics for Importance Human Resources (Table 5.44), The Main Partners (Figure 5.8).

- Subsection (5.3.3): Run a Descriptive Statistics for Cost Structure (Table 5.45), The Frequency Statistics for Cost Structure (Table 5.46), Descriptive Statistics for Revenue Streams (Table 5.47), The Frequency Statistics for Revenue Streams (Table 5.48).
- Subsection (5.4.1): Run a Descriptive Statistics for Perceived Impacts of Advanced Technologies Adoption (Table 5.49), Frequency Statistics for Perceived Impacts of Advanced Technologies Adoption on Customer Segments (Table 5.50), Frequency Statistics for Perceived Impacts of Advanced Technologies Adoption on Channels (Table 5.51), Frequency Statistics for Perceived Impacts of Advanced Technologies Adoption on Customer Relationships (Table 5.52), Descriptive Statistics for Perceived Impacts of Blockchain Technologies Adoption (Table 5.57), Frequency Statistics for Perceived Impacts of Blockchain Technologies Adoption on Customer Segments (Table 5.58), Frequency Statistics for Perceived Impacts of Blockchain Technologies Adoption on Channels (Table 5.59), Frequency Statistics for Perceived Impacts of Blockchain Technologies Adoption on Customer Relationships (Table 5.60).

- Subsection (5.4.2): Run a Descriptive Statistics for Perceived Impacts of Advanced Technologies Adoption on Key Partners (KP), Key Resources (KR), Key Activities (KA) (Table 5.67), Frequency Statistics for Perceived Impacts of Advanced Technologies Adoption on KP (Table 5.68), Frequency Statistics for Perceived Impacts of Advanced Technologies Adoption on KR (Table 5.69), Frequency Statistics for Perceived Impacts of Advanced Technologies Adoption on KA (Table 5.70), Descriptive Statistics for Perceived Impacts of Blockchain Technologies Adoption on KP, KR, KA (Table 5.75), Frequency Statistics for Perceived Impacts of Blockchain Technologies Adoption on KP (Table 5.76), Frequency Statistics for Perceived Impacts of Blockchain Technologies Adoption on KR (Table 5.77), Frequency Statistics for Perceived Impacts of Blockchain Technologies Adoption on KA (Table 5.78).
- Subsection (5.4.3): Run a Descriptive Statistics for Perceived Impacts of Advanced Technologies Adoption on Cost Structure (CS) and Revenue Streams (RS) (Table 5.83), Frequency Statistics for Perceived Impacts of Advanced Technologies Adoption on CS (Table 5.84), Frequency Statistics for Perceived Impacts of Advanced Technologies Adoption on RS (Table 5.85), Descriptive Statistics for Perceived Impacts of Blockchain Technologies Adoption on CS and RS (Table 5.90), Frequency Statistics

for Perceived Impacts of Blockchain Technologies Adoption on CS (Table 5.91), Frequency Statistics for Perceived Impacts of Blockchain Technologies Adoption on RS (Table 5.92).

- Subsection (5.4.4): Run a Descriptive Statistics for Perceived Impacts of Advanced Technologies Adoption on Value Propositions (VP) (Table 5.97), Frequency Statistics for Perceived Impacts of Advanced Technologies Adoption on VP (Table 5.98), Descriptive Statistics for Perceived Impacts of Blockchain Technologies Adoption on VP (Table 5.103), Frequency Statistics for Perceived Impacts of Blockchain Technologies Adoption on VP (Table 104).

Additionally, when analysing key ordinal variables such as the Likert scale measurements of perceived impacts, both comparison of means testing and correlation analysis was used to explore the relationship between these variables and company age, size, industry, etc. All the above tests were run using SPSS, as detailed in Chapter 5. Below is a list of relevant findings organized by subsection:

- Subsection (5.2.1): Run a comparative mean test between five dependent variables related to blockchain use and the size (Table 5.12), age (Table 5.13), and industry (Table 5.14) variables as independent variables.
- Subsection (5.2.1): Run a comparative mean test between seven dependent variables related to blockchain platforms and the size (Table 5.17), age (Table 5.18), and industry (Table 5.19) variables as independent variables.

- Subsection (5.2.1): Run a comparative mean test between 10 dependent variables related to blockchain use cases and the size (Table 5.22), age (Table 5.23), and industry (Table 5.24) variables as independent variables.
- Subsection (5.2.2): Run a comparative mean test between the dependent variable of a total number of different advanced technologies adopted and the size (Table 5.28), age (Table 5.29), and industry (Table 5.30) variables as independent variables.
- Subsection (5.4.1): Run a comparative mean test between the dependent variables of advanced technology adoption on customer segments (CS), channels (CH), and customer relationships (CR) and the size (Table 5.53), age (Table 5.54), industry (Table 5.55) variables as independent variables.
- Subsection (5.4.1): Run a bivariate correlation between all Likert scale six variables of advanced technologies specifically Spearman correlation coefficients (Table 5.56).
- Subsection (5.4.1): Run a comparative mean test between the dependent variables of blockchain technology adoption on customer segments (CS), channels (CH), and customer relationships (CR) and the size (Table 5.61), age (Table 5.62), and industry (Table 5.63) variables as independent variables.
- Subsection (5.4.1): Run a bivariate correlation between all Likert scale six variables of blockchain technologies specifically Spearman correlation coefficients (Table 5.64).
- Subsection (5.4.2): Run a comparative mean test between the dependent variables of advanced technology adoption on key partnerships (KP), key resources (KR), and key activities (KA) and the size (Table 5.71), age (Table 5.72), and industry (Table 5.73) variables as independent variables.
- Subsection (5.4.2): Run a bivariate correlation between all Likert scale seven variables of advanced technologies specifically Spearman correlation coefficients (Table 5.74).

- Subsection (5.4.2): Run a comparative mean test between the dependent variables of blockchain technology adoption on key partnerships (KP), key resources (KR), and key activities (KA) and the size (Table 5.79), age (Table 5.80), and industry (Table 5.81) variables as independent variables.
- Subsection (5.4.2): Run a bivariate correlation between all Likert scale seven variables of blockchain technologies specifically Spearman correlation coefficients (Table 5.82).
- Subsection (5.4.3): Run a comparative mean test between the dependent variables of advanced technology adoption on cost structure and revenue streams and the size (Table 5.86), age (Table 5.87), and industry (Table 5.88) variables as independent variables.
- Subsection (5.4.3): Run a bivariate correlation between all Likert scale three variables of advanced technologies specifically Spearman correlation coefficients (Table 5.89).
- Subsection (5.4.3): Run a comparative mean test between the dependent variables of blockchain technology adoption on cost structure and revenue streams and the size (Table 5.93), age (Table 5.94), and industry (Table 5.95) variables as independent variables.
- Subsection (5.4.3): Run a bivariate correlation between all Likert scale three variables of blockchain technologies specifically Spearman correlation coefficients (Table 5.96).
- Subsection (5.4.4): Run a comparative mean test between the dependent variables of advanced technology adoption on value propositions and the size (Table 5.99), age (Table 5.100), and industry (Table 5.101) variables as independent variables.
- Subsection (5.4.4): Run a bivariate correlation between all Likert scale three variables of advanced technologies specifically Spearman correlation coefficients (Table 5.102).
- Subsection (5.4.4): Run a comparative mean test between the dependent variables of blockchain technology adoption on value propositions and the size (Table 5.105), age (Table 5.106), and industry (Table 5.107) variables as independent variables.
- Subsection (5.4.4): Run a bivariate correlation between all Likert scale three variables of blockchain technologies specifically Spearman correlation coefficients (Table 5.108).

Comparison of means testing allows the researcher to compare one or more categorical variables in terms of their central tendency for another variable, effectively summarizing them across categories (LibGuides: SPSS Tutorials: Descriptive Stats by Group (Compare Means), 2019). For example, in Table 5.99, the comparative mean test shows that perceived impacts of

advanced technology adoption on value propositions (VP) vary across different size organisations. Very large organisations tended towards a higher mean (fewer perceived impacts), while small organisations tended towards a lower mean (more perceived impacts).

For all variable-pairs where comparison of means tests were run, correlation analysis was also used to explore the relationship between the variables. Specifically, both the strength and direction of this relationship was measured using the Spearman rank-order correlation coefficient, or Spearman's correlation. Spearman's correlation is a nonparametric measure that evaluates the strength and direction of the association between two variables (nominal or ordinal), can be applied to non-normally distributed variables, and has relatively low sensitivity to outliers, providing valid results even when outliers are present in the data (Laerd Statistics, 2018). For example, the Spearman rank correlation coefficient can range from +1 to -1, indicating a relationship's strength and direction. Table 5.102 presents the correlation between the adoption of advanced technologies and various value propositions (VP). The value of 0.307** signifies a weak positive correlation between organisational size and adopting advanced technologies that facilitate the development of new products and services. Additionally, a correlation value of 0.289* indicates a weak positive relationship between size and adopting technologies that enhance existing products and services. Furthermore, the value of 0.330** suggests a weak positive correlation between size and adopting advanced technologies to reduce costs for both organisations and their customers. Overall, the correlation values for all three variables range from 0.6 to 0.8, reflecting a strong positive correlation with advanced technology and size concerning all questions related to value propositions for organisations.

3.3.6 Extended Study Data Ethical Approval

Due to the changes in the study moving from the exploratory study to the extended study (See this chapter and also chapter 4), the researcher had to seek additional ethical approval from UCC SREC, which was received. These changes included changes to the survey title, target population of respondents, and the wording of questions in the final extended -study survey.

Chapter 4: The Exploratory Study

The **exploratory study** was undertaken to develop more refined research questions and a better understanding of the research field. The exploratory study focused on blockchain technology adoption within small and medium enterprises (SMEs) in Saudi Arabia. This chapter is organized into four sections that explore the exploratory study. Section 4.1 outlines the questionnaire results in relation to blockchain technology. Section 4.2 highlights the interview findings, illustrating the relevance of this technology for companies in Saudi Arabia. Section 4.3 provides an example of a business model canvas (BMC) as used by a specific company. Section 4.4 concludes the chapter with a summary of the exploratory study's findings.

4.1: Questionnaire Results

The results from the questionnaire, organized into six sections, are presented in detail below.

4.1.1: Organisation Information

The exploratory study questionnaire started with general questions about the organisation such as size, age and industry.

Organisation Size

The exploratory questionnaire received 31 responses, with an equal percentage of 29% from medium and micro organisations, together representing over half of the total responses (See Figure 4.1).

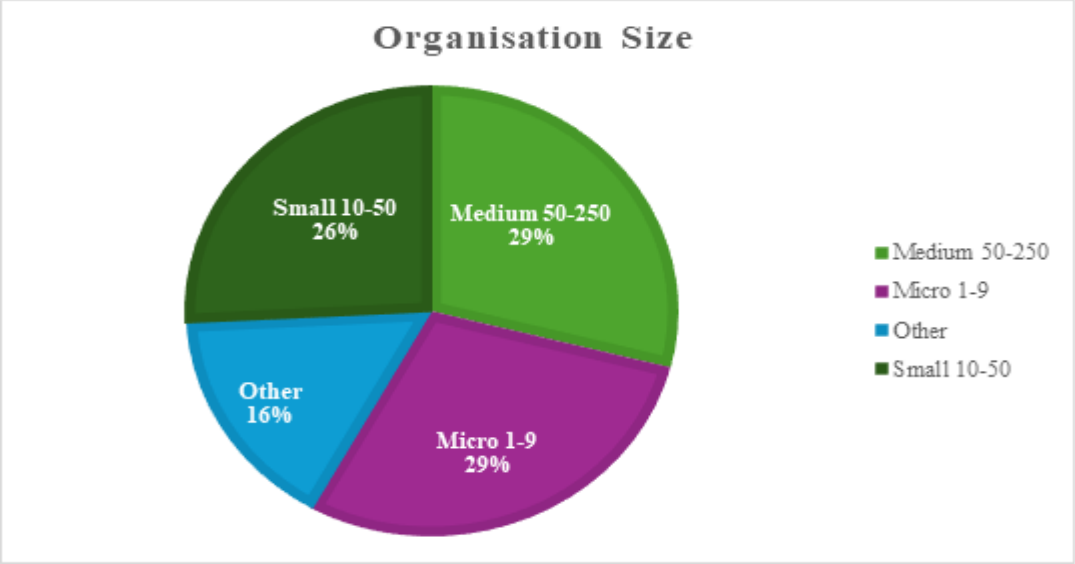


Figure 4.1: Organisation Size (N=31)

Organisation Age

The majority of the organisations, 58%, have been in operation for more than five years, while other organisations have operated for 1 to 2 years, less than one year, and more than 2 years (See Figure 4.2).

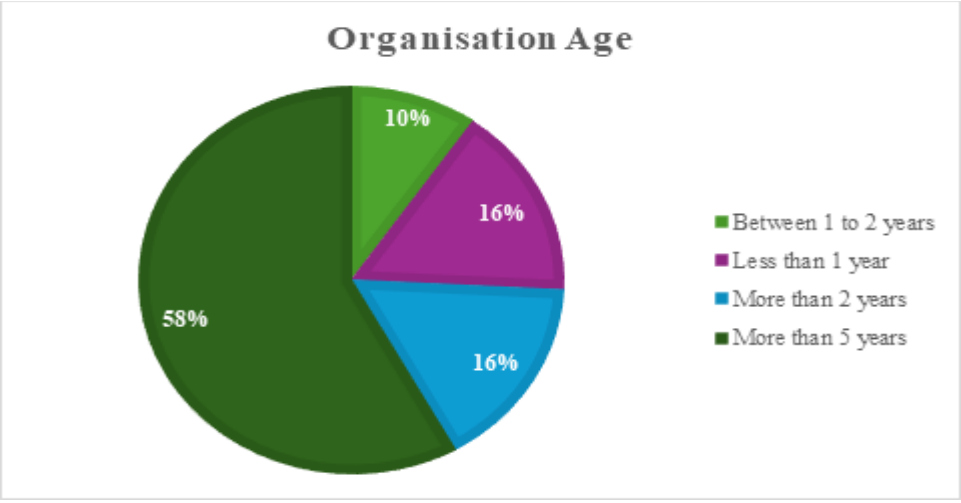


Figure 4.2: Organisation Age (N=31)

Organisation Industry

The results indicated that most organisations primarily operate in Consultancy (including blockchain services, IT, and Business), with eight out of 31 organisations, and Information Technology (including equipment and software vendors), with six out of 31 organisations (See Figure 4.3).

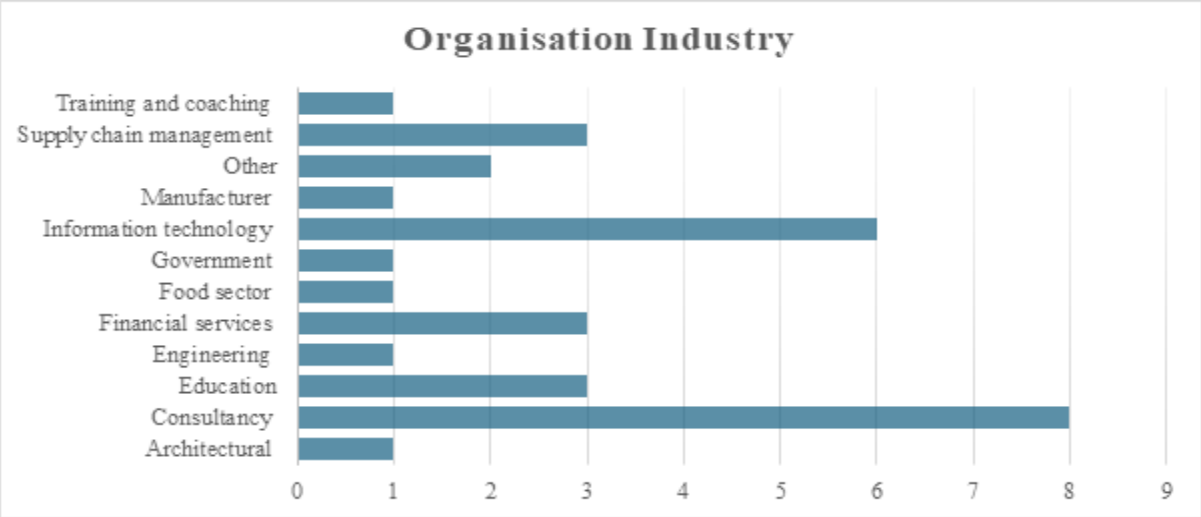


Figure 4.3: Organisation Industry (N=31)

4.1.2: Organisation Information and Blockchain Technology

This section considers five questions concerning the adoption of blockchain technology, including its role, application, purpose, use cases, and solution services.

What is the Role of Blockchain Technology in an Organisation?

The exploratory study is investigating the adoption of blockchain technology in small and medium-sized organisations. Eight companies used blockchain products and services in their organisation and the remaining companies are involved in either selling or customizing and supporting blockchain technology in their products and services (See Figure 4.4).

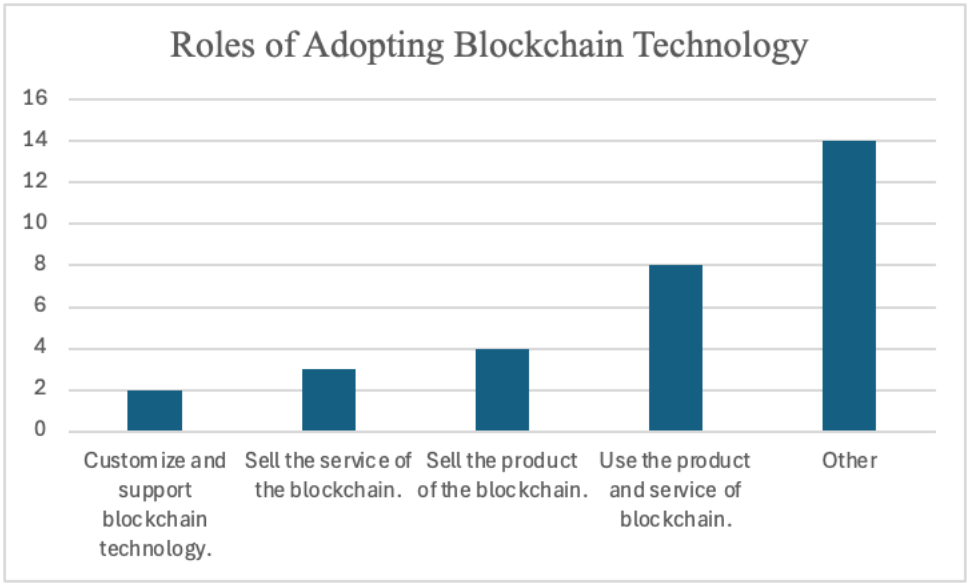


Figure 4.4: The Roles of Adopting Blockchain Technology (N=31)

What Blockchain Application is Most Relevant for an Organisation's Customers?

46% of small and medium enterprises in the exploratory study do not use any of the suggested applications to adopt blockchain technology; they use others. However, 14% of SMEs use Bitcoin, and 16% use Ethereum applications (See Figure 4.5).

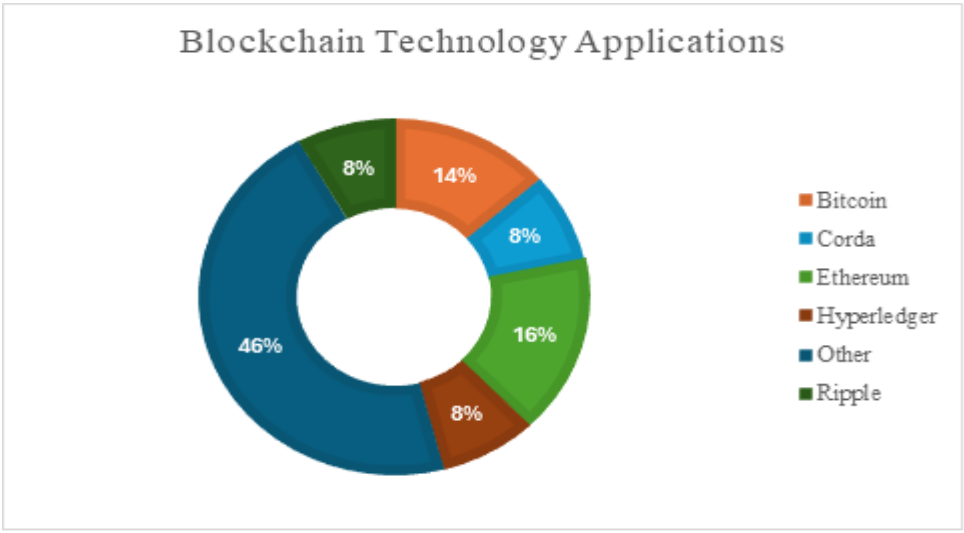


Figure 4.5: Blockchain Technology Applications (N=31)

What Purpose of Blockchain Technology Are Relevant to an Organisation's Customers?

The questionnaire data indicated that the primary purpose for adopting blockchain technology with organisations and customers includes smart contracts (34%) and consensus mechanisms (29%). Consensus mechanisms include Proof of Work (PoW), Proof of Stake (PoS), Practical Byzantine Fault Tolerance (PBFT), Delegated Proof of Stake (DPoS), Federated Byzantine Agreement (FBA), Proof of Authority (PoAu), Proof of Elapsed Time (PoET), Proof of Activity (PoAc), Proof of Burn (PoB), and Proof of Capacity (PoC) (See Figure 4.6).

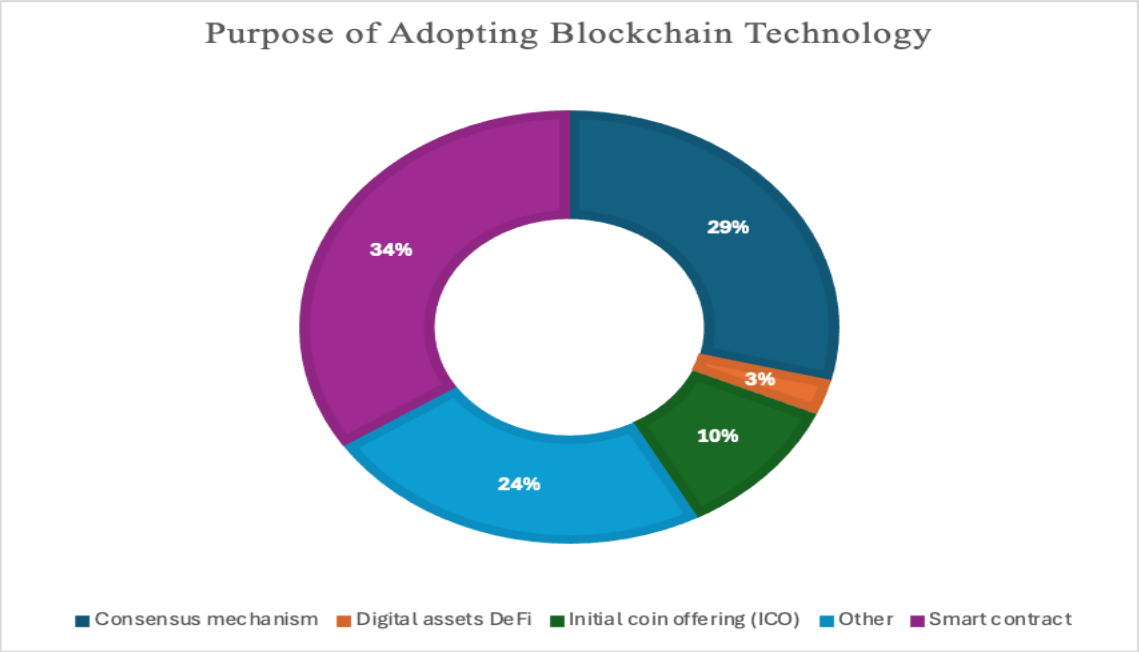


Figure 4.6: The Purpose of Adopting Blockchain Technology (N=31)

What Are the Applicable Use Cases of Blockchain Technology in Organisations?

The majority of small and medium enterprises use cases for adopting blockchain technology are smart devices and automation, 34%. Then, asset management is the second most common use case for adopting this technology, 28%. Approximately 10% each is used in use cases on the Internet of Things (IoT), cryptocurrency, and green certificates (See Figure 4.7).

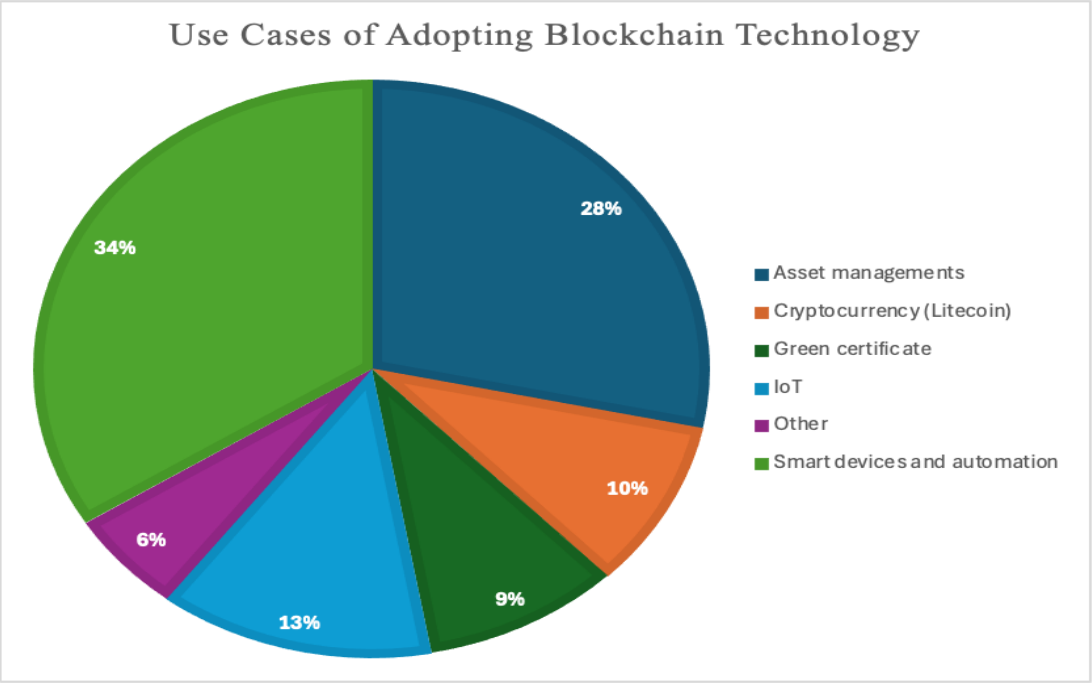


Figure 4.7: The Use Cases of Adopting Blockchain Technology (N=31)

What Services Do Blockchain Technology Solutions Offer to Customers Within an Organisation?

The exploratory study of small and medium enterprises indicated the adoption of blockchain technology as providing various solutions services. The top three solutions services provided are transaction payments, transparency in operations, and trust between partners (See Figure 4.8).

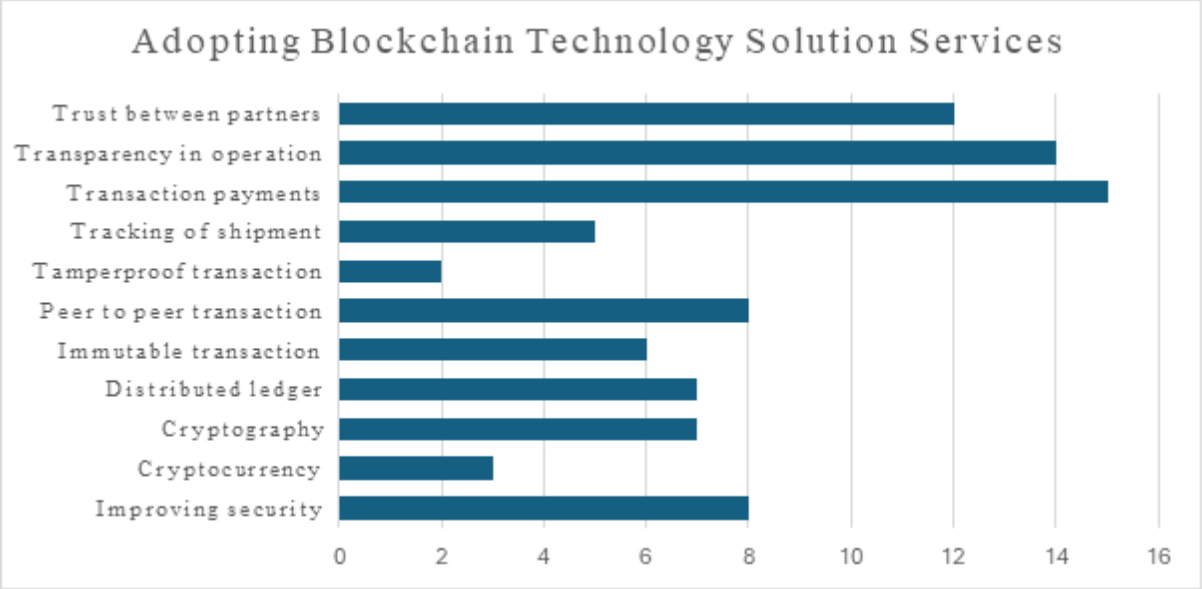


Figure 4.8: Adopting Blockchain Technology Solution Services (N=31)

4.1.3: Business Model Components: Customer Segments (CS), Channels (CH), and Relationships (CR)

This exploratory study considered how SME organisations communicate with their customers. This communication will represent the Customer Segments (CS), Channels (CH), and Relationships (CR) mechanisms of the business model canvas (BMC). For customer segmentation, the questionnaire data showed that 48% of small and medium enterprises served customers in several segments (See Figure 4.9). The dominant segment of buyers for small and medium enterprises is other small and medium enterprises, accounting for 55% (See Figure 4.10). Furthermore, 61% of the customer base for small and medium enterprises is located in Saudi Arabia (See Figure 4.11).

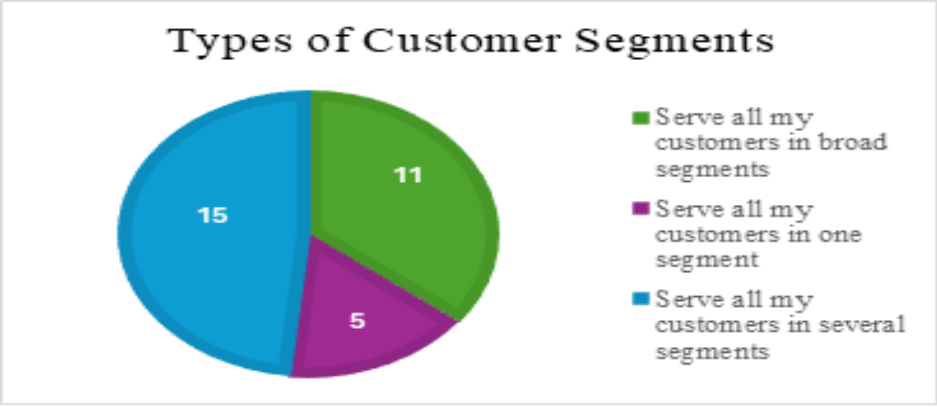


Figure 4.9: The Types of Customer Segments (N=31)

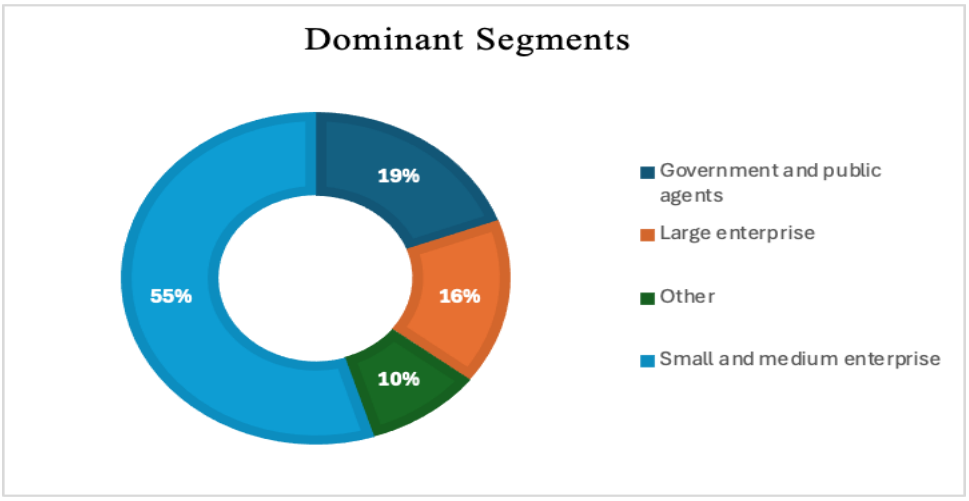


Figure 4.10: The Dominant Segments (N=31)

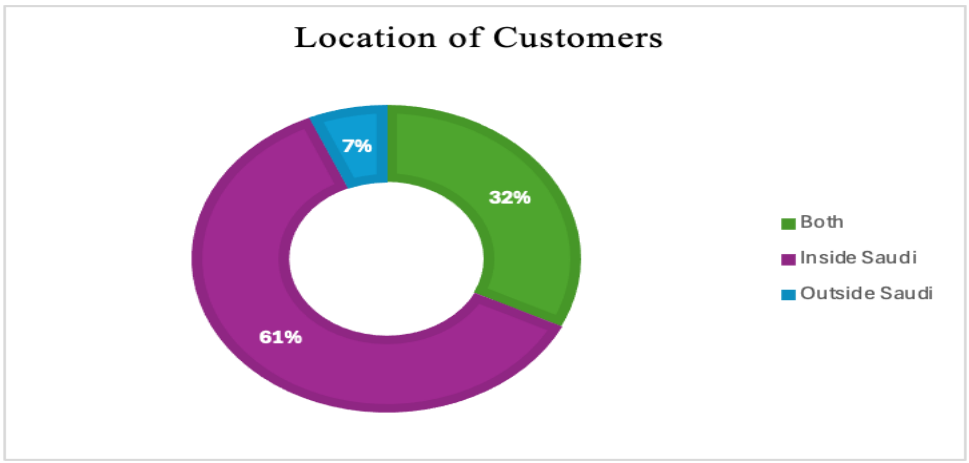


Figure 4.11: The Location of Customers (N=31)

The questionnaire looked for communication formats that an organisation would use when selling the adoption of blockchain technology. For channel, the questionnaire data showed that small and medium enterprises are likely to communicate with customers to sell the adoption of blockchain technology through email and in-person meetings or workshops. However, SMEs are unlikely to use training courses (See Table 4.1).

Channels	Usage	Non-usage
Email	24	7
In-person meeting/ workshops	21	10
Telephone	17	14
Mobile application	17	14
Website	19	12
Social Media	17	14
Customer satisfaction surveys	15	16
Training courses	14	17
Technical and installation	19	12
Support on-site visit	15	16
Help center	16	15

Table 4.1: The Frequency of Use of the Channels to Sell Blockchain Technology Adoption (Based on 31 Respondents)

The questionnaire requested the use of Blockchain features in relation to the perceived impacts of building customer relationships. For customer relationships, the exploratory questionnaire data showed that it is highly efficient for small and medium enterprises to build relationships with their customers by encouraging them to participate in the company community, and direct interaction also improves the company's performance with their customers. However, the SME organisation remains neutral about whether self-service enhances the relationship between the organisation and their customer (See Table 4.2).

Statements	Agree	Neutral	Disagree
Direct interaction improves your company's performance with your customers.	22	7	2
Self-service is improving your company's relationship with your customers.	17	11	3
Automated service is improving your company's relationship with your customers.	19	9	3
Participating in the company community improves your company’s relationship with your customers.	23	6	2

Table 4.2: Perceived Impacts of Building a Relationships with Customers (Based on 31 Respondents)

4.1.4: Business Model Components: Key Partnerships (KP) and Key Resources (KR)

This section considers seven questions about the organisation's key partnerships and resources. The first four questions focus on key partnerships, which involve the company's main partners and suppliers and the development of relationships with them. The remaining three questions about key resources cover physical, non-physical, and human resources.

The exploratory study of small and medium-sized companies showed that their main partners are the government and banks, followed by information technology (See Figure 4.12). In addition, their main suppliers are also the government and information technology (See Figure 4.13). Therefore, building relationships with partners and suppliers in small and medium enterprises is efficient in reducing costs, providing better access to customers, and reducing risk in a company. However, some companies indicated that building relationships with suppliers to reduce costs and risk in an organisation is neutral (See Table 4.3).

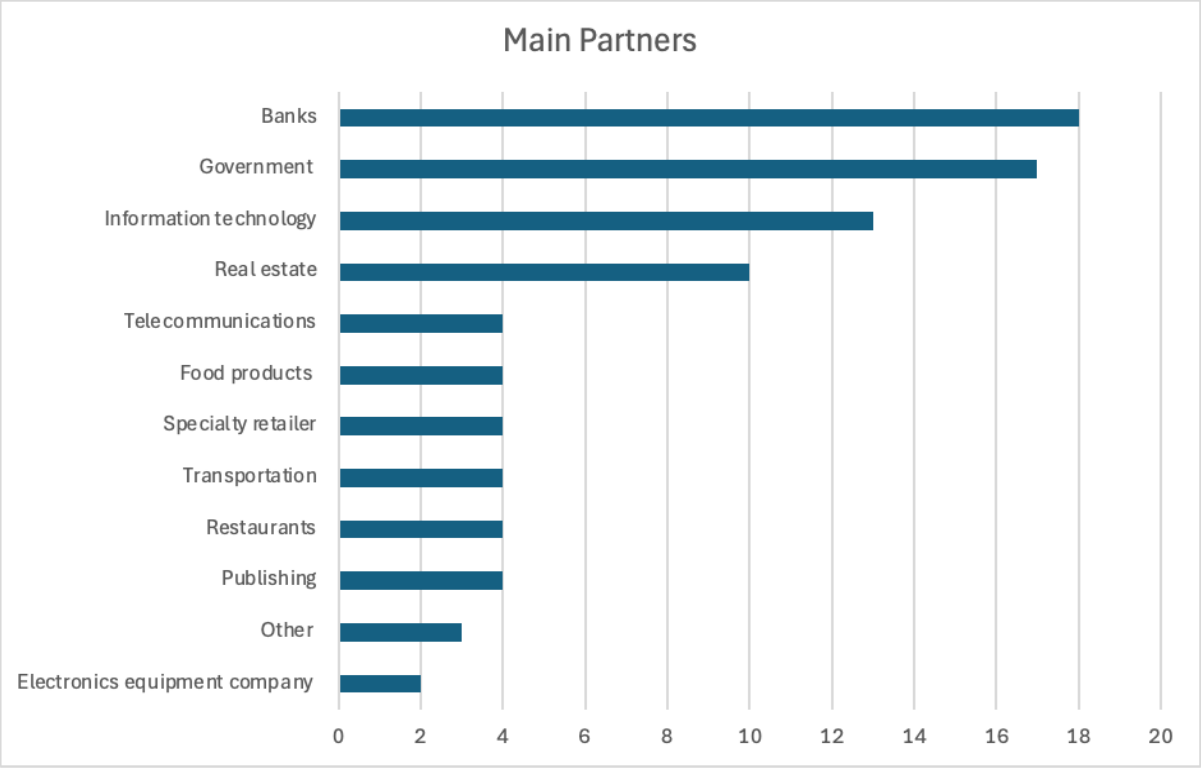


Figure 4.12: The Main Partners (N=31)

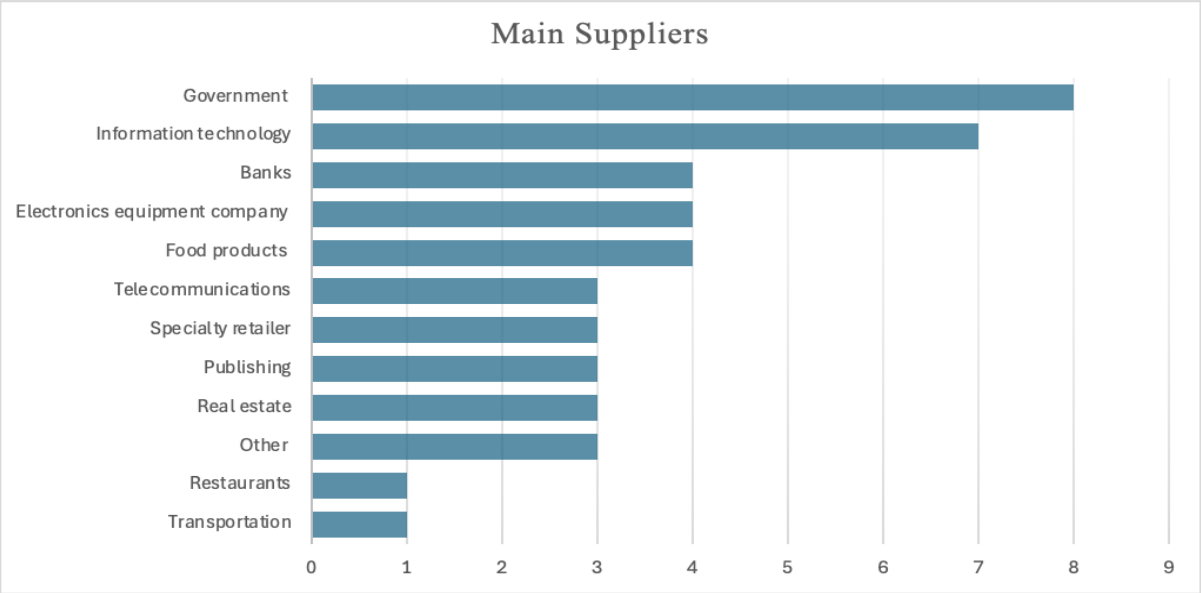


Figure 4.13: The Main Suppliers (N=31)

Statements	Agree	Neutral	Disagree	Not applicable
Partnership relationships are helpful to reduce costs.	19	8	4	0
Partnership relationships provide better access to your customers.	18	9	4	0
Partnership relationships are reducing risk in your company.	18	10	3	0
Supplier relationships are helpful to reduce costs.	17	11	2	1
Supplier relationships provide better access to your customers.	19	7	4	1
Supplier relationships are reducing risk in your company.	14	13	3	1

Table 4.3: Perceived Impacts of Building a Relationships with Partners and Suppliers (Based on 31 Respondents)

The data indicated that 47% of small and medium enterprises primarily use physical resources, such as IT/IS systems, mobile devices, and Wi-Fi networks (See Figure 4.14). Furthermore, small and medium enterprises have three main non-physical resources. The first resource is partnerships and collaboration, 26%, and the second and third resources are equal, 24%, in branding and trademarks and customer data (See Figure 4.15). The most important human resources for small and medium enterprises are IT experts, with 21 responses, followed by sales and marketing, with 18, and software developers, with 14 (See Figure 4.16).

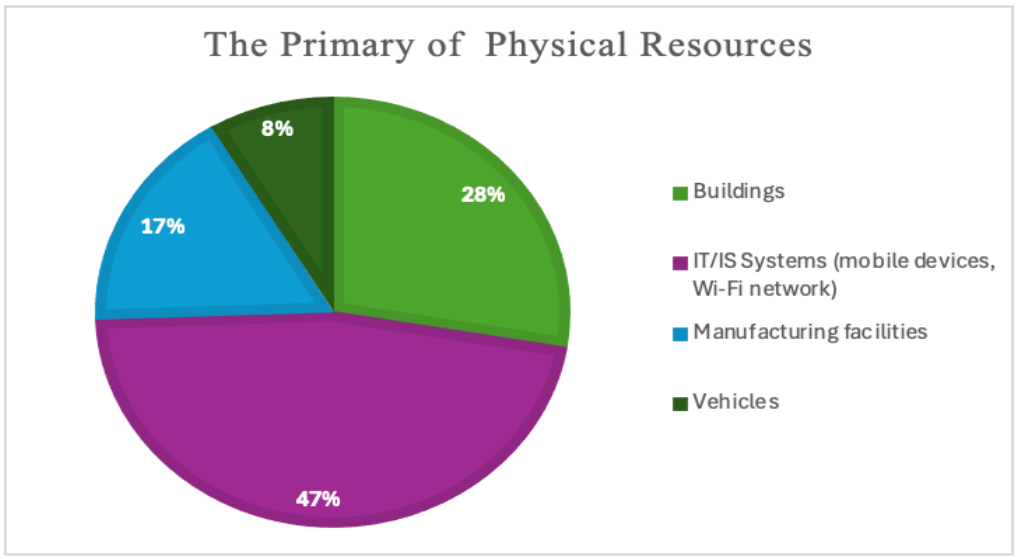


Figure 4.14: The Primary Physical Resources (N=31)

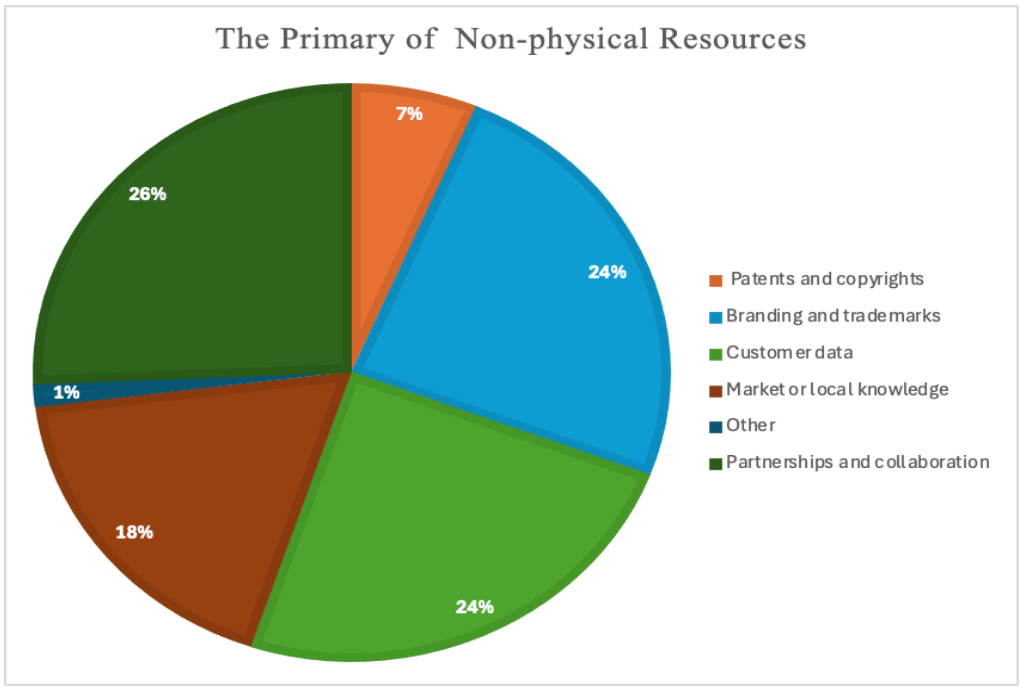


Figure 4.15: The Primary Non-Physical Resources (N=31)



Figure 4.16: The Most Significant Human Resources (Based on 31 Respondents)

4.1.5: Business Model Components: Key Activities (KA), Cost Structure (CS), and Revenue Streams (RS)

This section in the exploratory study considers four questions about the organisation's key activities, cost structure, and revenue streams.

What Activities Does a Company Engage in to Grow Its Business?

In the exploratory questionnaire, participants identified the most common activities related to the Business Model Canvas (BMC) and how small and medium enterprises (SMEs) implemented these activities. SMEs engage in various activities to grow their businesses, including problem-solving, innovation, software development, introducing new ideas and features, and providing consultancy and training for product and service design (See Figure 4.17).

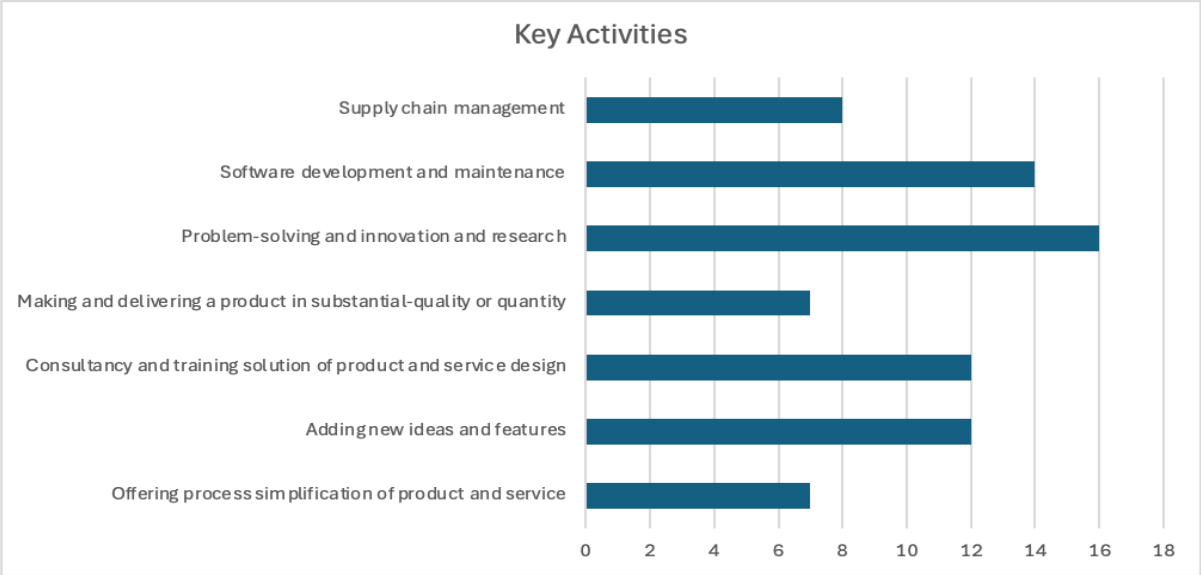


Figure 4.17: The Key Activities (Based on 31 Respondents)

How Does the Organisation Describe the Most Active Activity for an Organisation?

SMEs emphasize the importance of activities such as searching for new ideas, maintaining software, finding solutions, and managing the significant impacts of people costs on business operations (See Table 4.4).

Statements	Agree	Neutral	Disagree	Not applicable
Searching for new ideas is core to your business.	21	9	1	0
Finding a solution is reshaping your business.	17	12	2	0
Maintaining software increases the efficiency of your business.	19	10	2	0
Service provisioning activity is necessary to your business.	16	12	3	0
People affect operating a cost of your business.	17	11	3	0
Buying new materials changes the cost of your business.	14	12	3	2
Production activity in either quality or quantity is dominating your business in your Organisation.	14	9	6	2

Table 4.4: Perceived Impacts of Key Activities in BMC Perspective (Based on 31 Respondents)

What Does the Cost Structure of an Organisation Look Like?

The majority of small and medium enterprises, 28%, consider themselves cost-driven, while other SMEs consider themselves value-driven at 24%. Other SMEs focus on fixed costs such as rent and salary at 22% as the primary cost structure (See Figure 4.18).

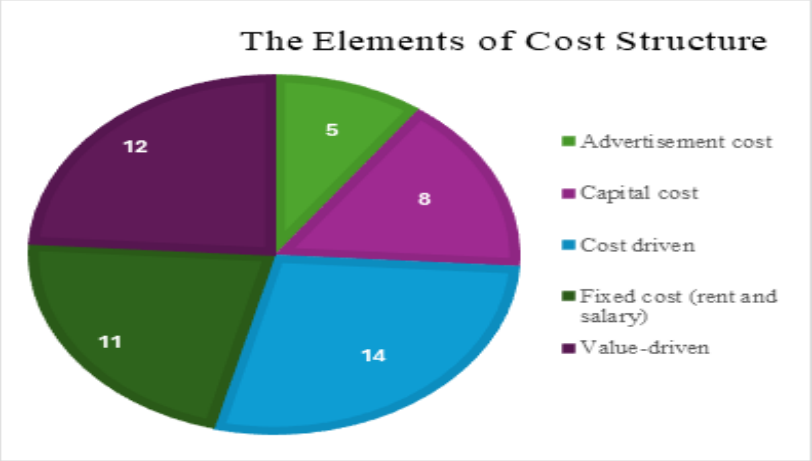


Figure 4.18: The Elements of Cost Structure (Based on 31 Respondents)

What Are the Potential Revenue Streams for an Organisation?

Service fees and client projects are the main revenue streams identified by SMEs, and a few SMEs' post-sale fees, such as asset sales, subscription fees, and Leasing/ lending/renting fees, are potential revenue streams (See Figure 4.19).

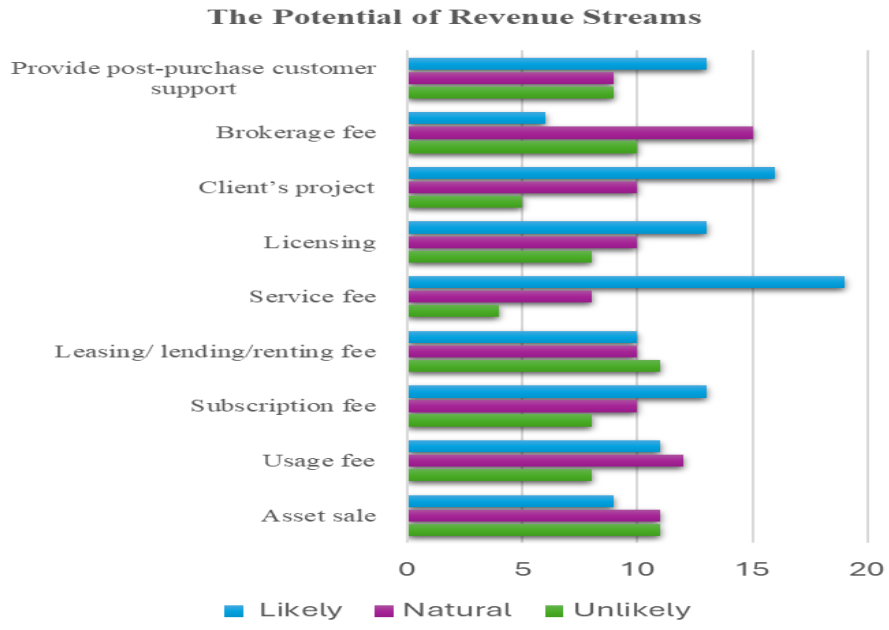


Figure 4.19: The Potential Revenue Streams (Based on 31 Respondents)

4.1.6: Business Model Components: Value Propositions (VP)

The exploratory questionnaire explores the perceived impacts of blockchain adoption on an organisation's value propositions. The questionnaire specifically inquired about improvements in quality, new products and services, and innovation. Emerging technologies such as

blockchain adoption will create new opportunities for SME organisations and influence their business models. Since the adoption of blockchain technology will have a perceived impacts on the organisation's offerings, it will also have a perceived impacts on the organisation's customers, infrastructure, and financial sustainability.

The exploratory questionnaire data revealed that there is agreement that there are multiple primary benefits of adopting blockchain technology. These benefits include producing high-quality products and services for the company, improving organisational performance, managing data security, generating new ideas, and facilitating a quick transition process. However, some small and medium-sized enterprises (SMEs) do not agree that adopting blockchain technology could significantly impacts their value proposition by offering lower product and service pricing, maintaining good relationships with their partners or collaborating with other partners, expanding the customer base, and reducing structure costs for SMEs (See Table 4.5).

Statements	Agree	Neutral	Disagree	Not Applicable
Adopting blockchain technology is improving product and service performance in your organisation.	19	9	3	0
Adopting blockchain technology is developing a better quality of your company.	21	9	1	0
Adopting blockchain technology is offering a lower price of products and services.	14	13	3	1
Adopting blockchain technology is maintaining an excellent collaboration with other partners.	13	17	1	0
Adopting blockchain technology is securing data sufficiently.	18	12	1	0
Adopting blockchain technology is differentiate a small and medium-sized company.	16	14	1	0
Adopting blockchain technology is replacing a new business for your organisation.	15	13	3	0
Adopting blockchain technology is increasing the number of customers.	14	14	3	0
Adopting blockchain technology is enhancing better productivity for your customer services.	15	14	2	0
Adopting blockchain technology is helping to innovate new ideas.	18	12	1	0
Adopting blockchain technology is convenient to use by speed service on a transaction.	18	12	1	0
Adopting blockchain is reducing the risk of purchasing products and services.	17	11	2	1
Adopting blockchain technology is helping to increase the trust relationship between your company and your customer.	16	13	1	1
Adopting blockchain technology is offering loyalty to your customer.	15	14	1	1
Adopting blockchain technology is helping your company to reduce costs.	13	13	3	2

Table 4.5: Perceived Impacts of Blockchain Technology Adoption on Value Propositions (Based on 31 Respondents).

Indeed, the exploratory questionnaire findings indicate that the researcher needs to conduct a follow-up survey, with a wider focus on multiple technologies. Also, the exploratory study demonstrate a substantial understanding of the perceived impacts of adopting blockchain technology in the business models of small and medium-sized enterprises (SMEs) in Saudi Arabia, further exploration is warranted as blockchain technology adoption is limited within the region and is in the early stage of adoption.

4.2: Exploratory Study Interview Results

As part of the exploratory study, a questionnaire on blockchain technology was conducted, and two interviews were held with two Saudi SME technology companies engaged with blockchain technology. The information on the two companies is described in Chapter Three in the section on data collection methods. Below is a summary of the interview data:

1. **What is your general opinion about Blockchain technology in SMEs? Is blockchain well understood? Is misunderstanding about blockchain a barrier?**

Company 2 (C2) believed that SMEs can benefit from this technology, even if the definition is difficult to understand. They pointed out that blockchain could reduce costs, increase credibility, and develop an ecosystem. C2 stated that "*Blockchain can reduce cost, by removing intermediaries in the chain of business, can track the provenance for their products thus getting more credibility. SMEs usually try to compete with bigger enterprises, using DLT in its business can help them connect with potential players globally, thus getting more coverage. However, implementing it in SME can be challenging, as you need to come up a unique value preposition such that it can only be solved using blockchain to gain the trust, then develop an eco-system around, getting the required funding, and then to maintain and scale the operations if required. This all can be achieved by getting the right resources with good connections/PR and then going about in small iterations*." The comment on reducing cost was notable as that was different from the findings of the questionnaire data.

On the other hand, Company 1 (C1) pointed out that the unclear definitions of blockchain technology leads to uncertainty in regulation and difficult to know its growth rate. C1 stated that "*There is the problem of technology and regulatory uncertainty here, and there's the problem of having a clear cut on how blockchain will help them SMEs grow*." From this

comment, it can be assumed that a fair percentage of respondents chose 'another' option regarding the questionnaire data on the role and purpose of adopting blockchain technology in SMEs.

2. **What are the key factors that contribute to IT and business development within your organisation? Is it feasible to integrate blockchain technology into your organisation?**

Both companies agreed they can adopt blockchain but must evaluate the market and all aspects of a business problem. For example, a company must have adequate in-house resources and leadership with an agile mindset to demonstrate the ability to use or integrate blockchain technology. C2 stated that "*Yes, blockchain has an ability to do wonders in any organization if it is implemented with good research around pros and cons, scalable design, and security measures. Covering all the aspect around a business problem. Then you need to have adequate inhouse resources and a leadership having an Agile mindset*." According to the questionnaire data, IT experts are identified as the most crucial human resource for small and medium-sized enterprises. Additionally, several factors are critical for reasonably adopting blockchain technology, including restructuring legacy systems, resource training, talent acquisition, extensive experimentation, and setting metrics to track progress. C2 stated that "*Enabling IT and business development requires a strong vision and change in mindset towards more customer centric. It involves revamping the legacy systems, training the resources, inducting new talents/assets, lots of experiments and most importantly needs to set the metric to track the progress*." The questionnaire data emphasized the importance of resource training, but this channel (course training) was not frequently used to promote the adoption of blockchain technology from the organisation to customers. Furthermore, Company 1 (C1) emphasized the significant role of timing, as the company's customer use cases are in the early stages when they apply Ethereum to their market use cases. C1 stated that "*We thought of multiple use case, and we developed a prototype for giving honest customer rating on top of Ethereum, but at the end we felt it's might be early to push such use cases to the market (as timing plays a critical role here*)." This comment from C1 agrees with the questionnaire data which showed that 16% of SMEs use Ethereum applications.

3. **Are supply chain and HR the most common use cases of SMEs employing Blockchain?**

Both interviewees agreed that the most dominant use cases for adopting blockchain in SMEs are in the finance sector. In Saudi Arabia, many SMEs are adopting various advanced financial technologies. Also, the data showed that 10 % of the financial industry utilized them. These technologies assist SMEs with payment and settlement, automating accounting controls, and transitioning to crowdfunding models to attract investments for business expansion. However, the supply chain sector comes second in the use cases of blockchain due to its numerous benefits, including traceability and transparency. Nevertheless, there is no global or massive eco-system for SMEs to enable tracking and provenance in logistics. C1 stated that "*Supply chain is the one of the most tangible application that would benefit the traceability and transparency of goods, and at very efficient cost. However, cryptocurrency and distributed finance are on the rise lately. These blockchain implementations will indeed transform business to a new level*." C2 said that "*for SMEs, the best use cases lie in the finance sector, it can be payments and settlement, reconciliations of records, automating accounting controls and moving to crowd funding models to attract investments for scaling business. Supply chain will come second, as SMEs do not have such global or massive eco-system, to enabling tracking and provenance in logistics. So, it all depends upon what business you are in, and what value preposition you can create*." For instance, questionnaire data reveals that 34% of SMEs utilize smart devices and automation, while 28% focus on asset management when adopting blockchain technology. Therefore, it can be assumed that the finance sector in Saudi Arabia utilizes blockchain technology to manage these advanced financial technologies. Ultimately, adopting blockchain technology has perceived impacts on a company's business and value proposition, offering a new level of business transformation.

4. **What is the most significant barrier preventing SMEs from using Blockchain?**

These two SME technology companies have identified various issues that prevent the use of blockchain. These include:

- the need for greater awareness and understanding of blockchain and distributed ledger technology (DLT). C1 stated that*" Lack of awareness, lack of understanding the blockchain and DLT technology*."
- lack of standards and regulations, a sense of the potential benefits and the unknown or uncertain risks associated with using blockchain. C1 stated that" *Lack of standards and*

regulations, lack of understanding the potential benefits and indeed the unknown or uncertain risks associated with using blockchain, which I believe will be elevated soon as we move forward with digital transformation and get much better clarity on related policies and regulations."

- lack of resources, information technology skills, and funds. These issues may arise due to Saudi Arabia's shift towards digital transformation and the need for clear policies and regulations for advanced technology implementation. Additionally, organisational governance must establish an advisory board to mentor internal resources and bring in industry experts to enhance credibility. C2 stated that "*Lack of resources, skillset and funds are the biggest challenges the SMEs have. Need to work on inhouse trainings, outsourcing model can also help initially. The leadership needs to set up an advisory board to mentor the internal resources and induct a few industry experts to attain some credibility to move to crowdfunding campaigns*."

These issues may indicate that 45% of SMEs do not have a role in adopting blockchain technology, as questionnaire data showed, and 24% do not understand the purpose of adopting blockchain technology.

5. How does Blockchain technology solve SMEs' problems?

The recommendation from the blockchain solution architect is not to start using blockchain to store data for SMEs immediately. Instead, a Distributed Application (DApp) is suggested to be begun that utilizes a smart contract to digitalize the business process. Then, tokenization in SMEs can be developed for utility, such as loyalty programs. C2 stated that" *I will not recommend an SME to start with the use case of storing data initially. Storing data for an SME can be done more effectively using a SQL or a NOSQL DB with a managed Cloud Infrastructure. Try with building a daPP using smart contracts for automating a business process, then to add tokenization to be used as a utility, like loyalty programs. Then as the business grows, try to build a hybrid model with an offline/on chain DB, assess the security aspect like GDPR before jumping on to storing data in blockchain only*."

Another perspective from the CEO for SMEs is to incorporate blockchain during the assessment and customer engagement phase while understanding blockchain technology requirements. C1 stated that "*Blockchain is not for everyone, thus, a careful understanding of the SMEs pain points and requirements will help determine if the blockchain transformation is*

the ideal solution here. Therefore, "Blockchain Fitment" framework must be employed during the assessment and customer engagement phase."

In the questionnaire data showed that solutions for SMEs adopting blockchain technology include security improvements, trust between partners, peer-to-peer interaction, transaction payments, and operational transparency. These services help SMEs solve their business problems.

6. Are Ethereum or Corda the most common applications of Blockchain for SMEs?

C2 recommended Ethereum as the most common application. Corda is also a viable option for a company. C2 stated that "*Ethereum for sure, as it is public, much cheaper, bigger community and adoption, and you can find good resources having expertise on Ethereum. Also, you can leverage built in tokenization using Ethereum. On the other hand, CORDA is good too, if your use cases need notary and have a good established eco-system*."

C1 mentioned that Corda and Hyperledger are commonly used for many permissioned setups. C1 stated that "*Hard to tell as the field is constantly growing, but Corda and Hyperledger are quite the go for many permissioned setup (private implementation of blockchain). We will see new blockchain platforms/protocols that might be the next iOS or Windows OS (as long as more developers and business joins the pool)*." According to questionnaire data, SMEs use blockchain technology applications: Corda 8%, Ethereum 16%, and Hyperledger 8%.

7. Are Public, Private or Hybrid blockchains more suitable for SMEs and why?

Although C1 stated that the choice depends on the enterprise's nature and requirements. C1 said that "*Dependent on the nature and requirements – for SMEs what are they trying to improve or solve? From their you will indeed justify your blockchain deployment model (private, public, hybrid*)".

C2 suggested that adoption is a process that could start with a public platform and then transition to a hybrid model instead of using a private model. Another consideration for the use case is whether it involves confidential or public data. C2 stated that "*Go for Public platform, then use Hybrid, before going onto private. The reason being, private blockchain are expensive plus need good resources that will be expensive for SME. Maintaining security of a private blockchain also will incur a good cost. It depends on the use case also, if there is a confidentiality concern then you can use a hybrid model, such that confidential data can be stored offline, in encrypted form and publicly data can be stored on public blockchain*".

According to the questionnaire, SMEs also indicated that adopting blockchain technology is more effective in ensuring data security. Indeed, both companies strongly urge Saudi Small and Medium-sized Enterprises (SMEs) to take the opportunity to implement blockchain technology in their business operations.

4.3: Exploratory Study: Sample Company BMC

In addition to the exploratory study questionnaire and the two interviews, the researcher had the opportunity to work with an additional company who shared their own use case of adopting blockchain technology, particularly the implementation of non-fungible tokens (NFT) within Saudi Arabia. This SME company is the first in the Saudi Arabian NFT marketplace. The company aims to establish a comprehensive infrastructure for NFTs in the Middle East and North Africa (MENA) region, support artists, and introduce new investment opportunities. The company reported their experience on the use of NFTs through an adapted Business Model Canvas (BMC), which showed this technology can effectively present and ensure value creation and delivery.

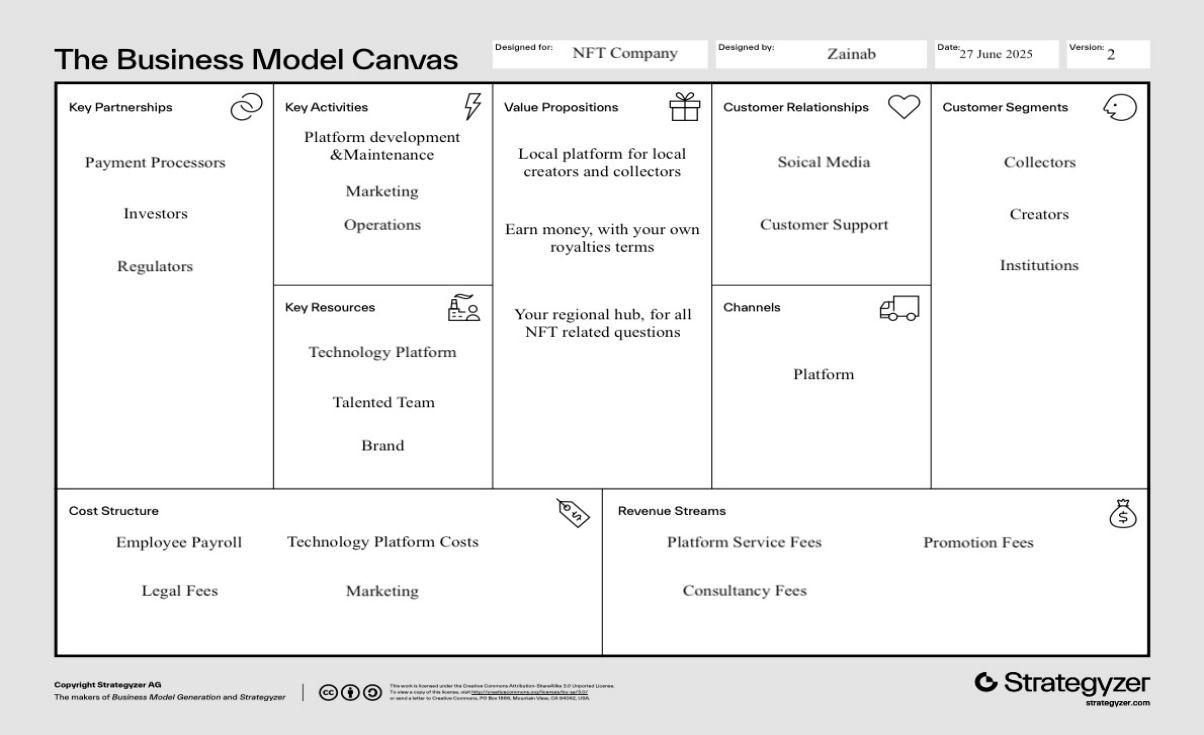


Figure 4.20: BMC Visualizes the NFT Service Company

This Business Model Canvas (BMC) represents how the NFT company utilizes blockchain technology to operate and provide value. The company engages with a diverse customer base, which includes collectors, creators, and institutions, through its digital platform, serving as the main communication channel. It aims to position itself as a regional hub for all NFT-related inquiries, offering localized support and services. To deliver its value propositions, the company collaborates with key partners such as payment processors, investors, and regulators. Its core activities encompass platform development, ongoing maintenance, marketing, and operational management. The essential resources required for these activities include a powerful technology platform, a skilled team, and a strong brand reputation. On the financial side, the company manages costs associated with employee salaries, technology infrastructure, legal compliance, and marketing efforts. Revenue is generated through platform service fees, consultancy services, and promotional fees (See Figure 4.20).

4.4: Conclusion: Learning from the Exploratory Study

In summary, the findings from the company sample BMC, interviews, and questionnaires provide valuable insights into the potential benefits of adopting blockchain technology within Saudi SMEs. In line with the diffusion of innovation (DOI) literature, Saudi SMEs can be seen as early adopters of blockchain technology, and the exploratory study revealed barriers and resistance typical of early stages of technology adoption.

The research objective is to explore the perceived impacts of technologies on an organisation's business model. The exploratory study revealed that Small and Medium-sized Enterprises (SMEs) in Saudi Arabia are willing to adopt blockchain technology to improve their operations, particularly in sectors such as information technology and consultancy. By utilizing blockchain, these enterprises enable organisations to operate more efficiently and enhance the quality of their products and services.

One of the perceived benefits of blockchain is its ability to facilitate faster and more secure transactions. This not only accelerates service delivery but also improves customer convenience and satisfaction. Moreover, the transparency and traceability offered by blockchain contribute to greater trust and accountability in business operations. However, integrating blockchain into SME operations requires careful planning and consideration. It involves significant considerations in terms of time, expertise, and financial investment. To successfully implement such advanced technology, SMEs must adopt a strategic approach that balances innovation with practical resource management. As Saudi Arabia continues to encourage or promote the development of technology under its Vision 2030, the role of blockchain in transforming SMEs is becoming increasingly vital. Understanding its potential and challenges is essential for promoting sustainable growth and competitiveness in the local and global markets.

The exploratory study revealed that small and medium-sized enterprises (SMEs) have a complex attitude toward adopting blockchain technology. The impact of blockchain on non-fungible tokens (NFTs) is demonstrated in the business model canvas (See Figure 4.20). The survey of 31 respondents indicated that blockchain is perceived to influence the business model. This dataset is a significant step towards achieving the study's objectives and addressing the research questions, as blockchain creates an ecosystem for organisations.

The findings from the questionnaire, interviews, and company samples contributed to an extended study. This exploratory research provides valuable insights into motivations, enablers, barriers, and perceived value, which will help refine the study's questions and enhance data collection efforts.

This research will present the extended study which will continue with empirical research to address the existing gap in exploring advanced technologies, including blockchain technology, and their application to the Business Model Canvas (BMC) within small and medium-sized enterprises (SMEs). To effectively bridge this gap, the extended study will extend its focus from a single technology to multiple technologies. Also, in the extended study, there is a need to develop multiple iterations of survey questions in order to make the questions understandable. The next chapter (Chapter Five) will analyse the survey results from the extended study.

Chapter 5: The Extended Study

This chapter presents and analyses the data collected in the extended study survey, which has four main sections. Section 5.1 considers demographic information such as the organisation's age, size, and industry. This information helps us to understand better how the survey results vary between different kinds of organisations. Section 5.2 explores how organisations adopt blockchain technologies and various other advanced technologies. Section 5.3 includes the nine components of the business model: customer segments, channels, customer relationships, value propositions, key partners, key resources, key activities, cost structure, and revenue streams. Section 5.4 explores the perceived impacts of adopting blockchain and advanced technologies on organisation business model components.

In addition, this chapter used the SPSS program to statistically analyse the survey results concerning adopting blockchain and advanced technologies in organisations. The analysis employs descriptive statistics, frequency analysis, comparative means, and correlation methods, which will provide insightful results from the survey data.

5.1: Organisation Information

The organisation information section contains general details about the organisation. The extended survey included three variables related to organisation information: size, years of operation (age), and industry.

5.1.1: Organisation Size

There are two analyses for the variable organisation size: descriptive and frequency. The value labels for the organisation size variable are 1 for micro, 2 for small, 3 for medium, 4 for large, and 5 for very large. Descriptive statistics (See Table 5.1) describe the variable organisation size based on a sample of 72 companies. Here is an interpretation of size statistics:

- Range: The range of a data set is the difference between the maximum and minimum values. All organisational size categories are present in the data. 5 is indicated for very large and 1 for micro. Thus, 4 indicates that the organisation size is large in the range.
- Mean: The average size of the organisations in the sample is approximately 3.82. This mean of 3.82 indicates that the organisation size is medium or larger on average.
- Standard Deviation: The standard deviation measures the extent of variability or dispersion around the mean. A standard deviation of 1.466 means that the size of many organisations is close to the mean of 3.82.

The histogram graph clearly shows skewness and kurtosis, which indicate the distribution of organisation size (See Figure 5.1). Moreover, in Table 5.2, the median and the mode are equal by 5, indicating that most of the organisations are very large. The median is the middle value of the dataset, while the mode is the number that occurs most frequently in the dataset. Furthermore, Table 5.3 indicates that more than half of respondents come from very large organisations, at 52.8% of organisation size, and 47.2% are between micro, small, medium, and large.

Statistics		
Size		
N	Valid	72
	Missing	0
Mean		3.82
Median		5.00
Mode		5
Std. Deviation		1.466
Skewness		-.808
Std. Error of Skewness		.283
Kurtosis		-.870
Std. Error of Kurtosis		.559
Range		4
Minimum		1
Maximum		5

Table 5.1: Descriptive Statistics of Organisation Size

Organisation Size		
	N	**%**
Micro	8	11.1%
Small	9	12.5%
Medium	9	12.5%
Large	8	11.1%
Very large	38	52.8%

Table 5.2: Frequency Statistics of Organisation Size (N=72)

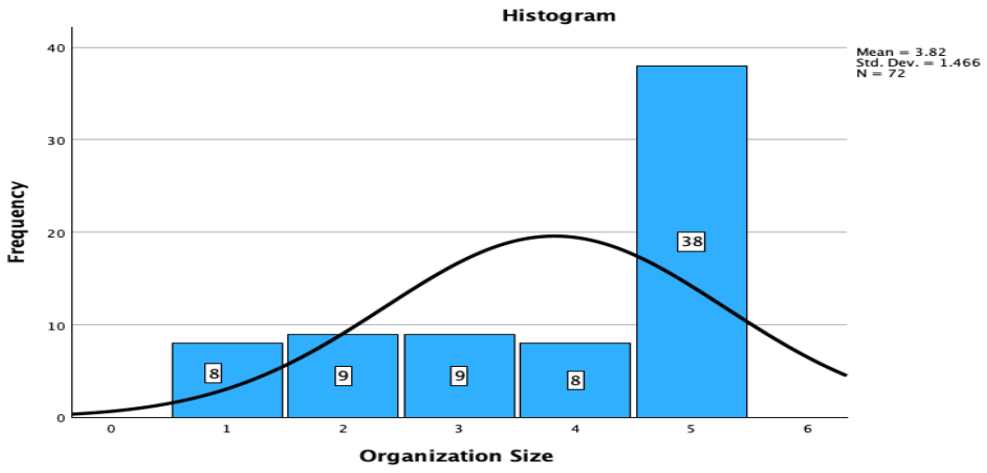


Figure 5.1: Histogram of Organisation Size (N=72)

5.1.2: Organisation Age

There are two analyses for the variable organisation age: descriptive and frequency. There are five value labels for the organisation's age variable: 1 for those less than one year, 2 for those one to five years, 3 for those six to ten years, 4 for those 11-20 years, and 5 for those more than 20 years. Descriptive statistics (See Table 5.3) describe the variable organisation age based on a sample of 72 companies. Here is an interpretation of age statistics:

- Range: All age categories are present in the data. 5 is indicated for organisation age more than 20 years and 1 for organisation age less than 1 year. Thus, 4 indicates that the organisation age is 11-20 years in the range.
- Mean: The average age of the organisations in the sample is approximately 3.81. Thus, the mean of 3.81 indicates that the organisation age is more than 5 years on average.
- Standard Deviation: The standard deviation measures the extent of variability or dispersion around the mean. A standard deviation of 1.318 means that the age of many organisations is close to the mean of 3.81.

The histogram graph clearly shows skewness and kurtosis, which indicate the distribution of organisation age (See Figure 5.2). Furthermore, in Table 5.4, the median is 4, which indicates the middle value of the dataset is a large organisation, and the mode is 5, which means the mode of number that occurs most frequently in the data is a very large organisation. Additionally, in Table 5.6, the frequency data shows that 43.1% of organisations are considered mature because they have been operating for more than 20 years, 30.6% are in the growth stage because they have been operating for over 5 years, and 26.4% are classified as startups because they have operated for less than 5 years.

Statistics		
Age		
N	Valid	72
	Missing	0
Mean		3.81
Median		4.00
Mode		5
Std. Deviation		1.318
Skewness		-.694
Std. Error of Skewness		.283
Kurtosis		-.992
Std. Error of Kurtosis		.559
Range		4
Minimum		1
Maximum		5

Table 5.3: Descriptive Statistics of Organisation Age

Organisation Age		
	N	**%**
Less than 1 year	3	4.2%
1-5 years	16	22.2%
6-10 years	4	5.6%
11-20 years	18	25.0%
More than 20 years	31	43.1%

Table 5.4: Frequency Statistics of Organisation Age (N=72)

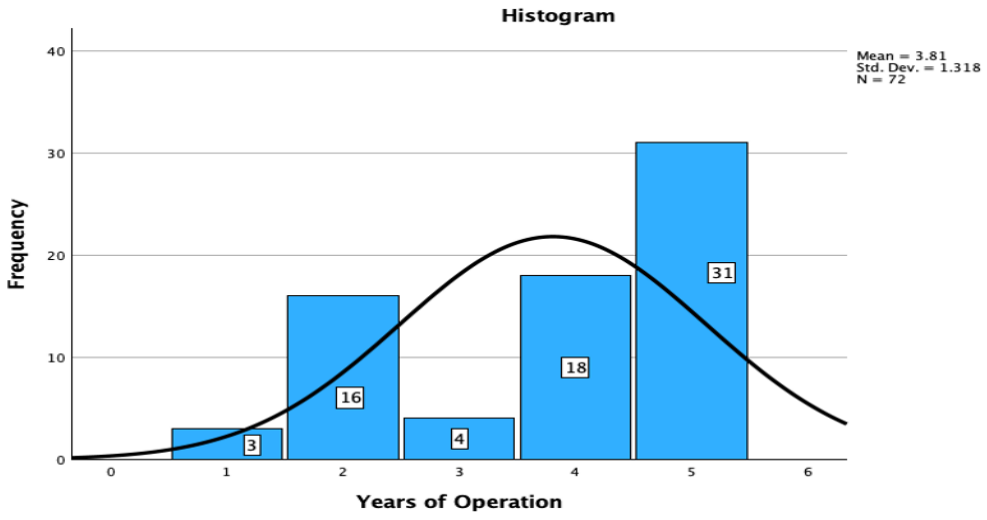


Figure 5.2: Histogram of Organisation Age (N=72)

5.1.3: Organisation Industry

There are 10 value labels for the organisation industry variable. This variable is measured as nominal. 1 for supply chain management/logistics/transport, 2 for financial services, 3 for IT, 4 for consultancy, 5 for education, 6 for health, 7 for government, 8 for manufacturing, 9 for retail, and 10 for other industries.

Table 5.5 shows the organisation industry's mean, median, and mode. The mean of 5.14 indicates that the average organisation industry is in education. The median of 4 indicates that the dataset's middle value is consultancy. The mode of 3 indicates that the number that occurs most frequently in the data is in the IT industry.

The top three industries in this analysis are information technology (IT), education/training, and consultancy. IT is the dominant industry, accounting for 26.4% of the respondents, followed by education/training at 15.3% and consultancy at 13.9% (See Table 5.6). Unsurprisingly, the survey focused on technology adoption and business model impacts, attracting respondents who were either involved in producing technology, advising on technology, or researching technology. Out of the 19 organisations in the IT industry, there were six very large organisations. Four out of six operated for over 20 years; the other two were between 11 and 20 years in the business. Of the 11 organisations in education/training, there were nine very large organisations. Seven of these nine operated in the business for more than 20 years, and the other two operated in the business for 11 to 20 years. Of the 10 organisations in consultancy, there were four very large organisations; three out of these four operated in the business for more than 20 years, and one operated for six to 10 years.

In addition, the survey also attracted different industries interested in supporting IT, such as financial services and manufacturing at 8.3%, supply chain management or logistics or transport and government at 4.2%, retail at 2.8%, and health at 1.4% (See Table 5.6). Of the six organisations in the financial services industry, half were very large organisations. Of the six organisations in the manufacturing industry, there were four very large organisations. Of the three organisations in supply chain management or logistics or transport, there were two very large organisations and one large. Of the three organisations in the government industry, two very large organisations operated for over 20 years; one small organisation operated between 11 and 20 years. Of the two organisations in the retail industry, both were micro-organisation sizes, but one operated in the business for one to five years, and the other operated

for less than one year. Of the organisations in the health industry, this one was very large and operated in the business for over 20 years.

Furthermore, 15.3% of respondents selected different industries (See Table 5.6), including D&D (information technology and service), FMCG (fast-moving consumer goods), defence, management system certification, marine, real estate development, travel, energy and engineering, and oil and gas (See Table 5.7). These other industries participated in this technology survey because technology is involved in their industries. There were three organisations in the oil and gas industry; all were very large and had operated in the business for over 20 years. The energy and engineering organisation was very large and had operated in the business for over 20 years. In the defense industry, this organisation was very large and operated in the business for six to 10 years. The organisation in the management system certification was medium and operated in the business for 11 to 20 years. The organisation in the D&D industry specializing in information technology and service; this organisation was very large and operated in the business for eleven to 20 years. The organisation in the FMCG (fast-moving consumer goods) industry was very large and operated in the business for over 20 years. The organisation in the marine industry was small and operated for one to five years. The real estate development organisation was medium and operated for one to five years. The travel organisation was medium and operated for one to five years. Additionally, the bar chart shows the distribution of the organisation industry (See Figure 5.3).

Statistics		
Organisation Industry		
N	Valid	72
	Missing	0
Mean		5.14
Median		4.00
Mode		3

Table 5.5: Descriptive Statistics of Organisation Industry

Organisation Industry		
	N	%
IT	19	26.4%
Education/Training	11	15.3%
Consultancy	10	13.9%
Financial Services	6	8.3%
Manufacturing/Wholesales	6	8.3%
Supply chain management	3	4.2%
Government	3	4.2%
Retail	2	2.8%
Health	1	1.4%
Other	11	15.3%

Table 5.6: Frequency Statistics of Organisation Industry (N=72)

Other Industries of Organisation	
Oil and Gas	3
Energy and Engineering	1
Defense	1
Management System Certification	1
D&D	1
Travel	1
Marine	1
FMCG	1
Real Estate Development	1

Table 5.7: Frequency Statistics for Other Industries of Organisation (N=11)

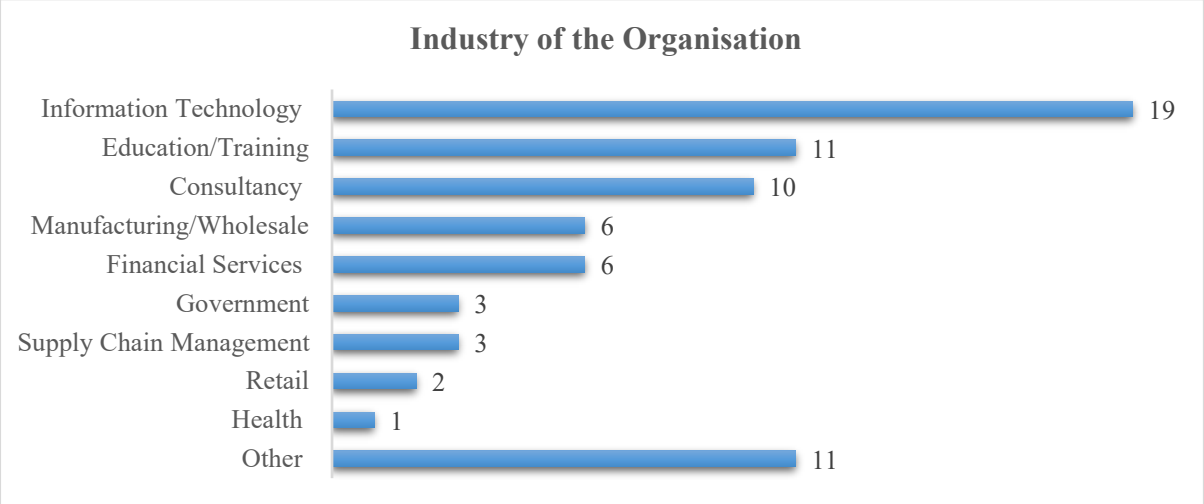


Figure 5.3: Bar Chart for Industry of the Organisation (N=72)

5.2 Adoption of Blockchain (BC) and Advanced Technology

This section will focus on adopting blockchain and other advanced technologies within the organisation. The extended study survey for this section comprised four questions, which will be divided into two sections during the analysis.

Section 5.2.1 will cover three of these four questions and concentrate on adopting blockchain technologies, including their use, platform, and use cases within the organisation. For these three questions about adopting blockchain technology, we will only consider the participants who have adopted it out of the total participants.

Section 5.2.2 will address the different platforms used to adopt advanced technologies. This section was the remaining question from the four in the survey. The researcher will provide details about the various platforms later in the section. This question will consider the total number of participants who have adopted advanced technology.

5.2.1 Blockchain Technology Adoption Patterns

Analysing the sample of 72 organisations, the researcher assigned two value labels for the blockchain technology adoption variable: 1 for adopters and 2 for non-adopters. The descriptive statistics in (See Table 5.8) describe this variable. The mean is 1.43, indicating that organisations, on average, adopt blockchain technology. The median and mode are both 1, indicating that most values in the dataset are centered around adoption.

41 of 72 organisations reported they adopted blockchain technology in their organisation (See Table 5.9). Out of these 41 organisations, 11 were in the IT industry, nine were in the consultancy, five were in financial services, three were in manufacturing/wholesale, three were in the oil and gas, two were in the government, two were in supply chain management/logistics/transport, and two were in education/training. The remaining four organisations were from different industries: one in health, one in retail, one in travel, and one in D&D.

31 of 72 organisations reported they did not adopt blockchain in their organisation nor their industry sector (See Table 5.9). Out of these 31 organisations, nine were in the education/training industry, eight were in the IT industry, two were in the consultancy industry, and two were in the manufacturing/wholesale industry. The remaining ten organisations were from different industries: one in defense, one in energy and engineering, one in financial services, one in FMCG, one in government, one in management system certification, one in marine, one in retail, one in real estate development, and one in supply chain management/logistics/transport.

Blockchain Adoption Vs Non-Adoption

Statistics		
Blockchain Technology Adoption		
N	Valid	72
	Missing	0
Mean		1.43
Median		1.00
Mode		1
Std. Deviation		.499

Table 5.8: Descriptive Statistics for Blockchain Technology Adoption

Blockchain Technology Adoption		
	N	**%**
Yes	41	56.9%
No	31	43.1%

Table 5.9: Frequency Statistics for Blockchain Technology Adoption (N=72)

Analysis of BC Adoption: Uses

This survey question explored how organisations can utilize blockchain technology, either within their industry sector but not within their own organisation, for specific purposes, for other uses, or not at all. The focus will be on 41 adopters of this technology in their 0rganisations. The question includes five variables, each with two value labels: 1 for selected and 0 for not selected. The BC Products variable sells products built around blockchain. The BC Services variable sells services built around blockchain. The BC Internal variable uses blockchain in internal business operations. The BC Support provides customization and/or support of blockchain technology. The BC Sector does not use blockchain in the organisation but is used elsewhere in our industry sector.

Statistics						
		BC Products	BC Services	BC Internal	BC Support	BC Sector
N	Valid	41	41	41	41	41
	Missing	0	0	0	0	0
Mean		.10	.22	.37	.22	.49
Median		.00	.00	.00	.00	.00
Mode		0	0	0	0	0
Std. Deviation		.300	.419	.488	.419	.506

Table 5.10: Descriptive Statistics for Use of Blockchain Technology Adoption

According to Table 5.10, the highest mean score is 0.49, indicating that many organisations recognize the use of blockchain technology adoption in their industry sector and not in their organisation. Conversely, the lowest mean score is 0.10, suggesting that fewer organisations sell products related to adoption of blockchain technology. The median and mode are 0 for each variable, indicating that the dataset's middle and most frequent values are not used. However, organisations may select multiple uses for this question.

Uses of Blockchain Adoption	**N**
BC Sector	20
BC Internal	15
BC Support	9
BC Services	9
BC Products	4

Table 5.11: Frequency Statistics for The Use of Blockchain Technology Adoption in Organisation (N=41)

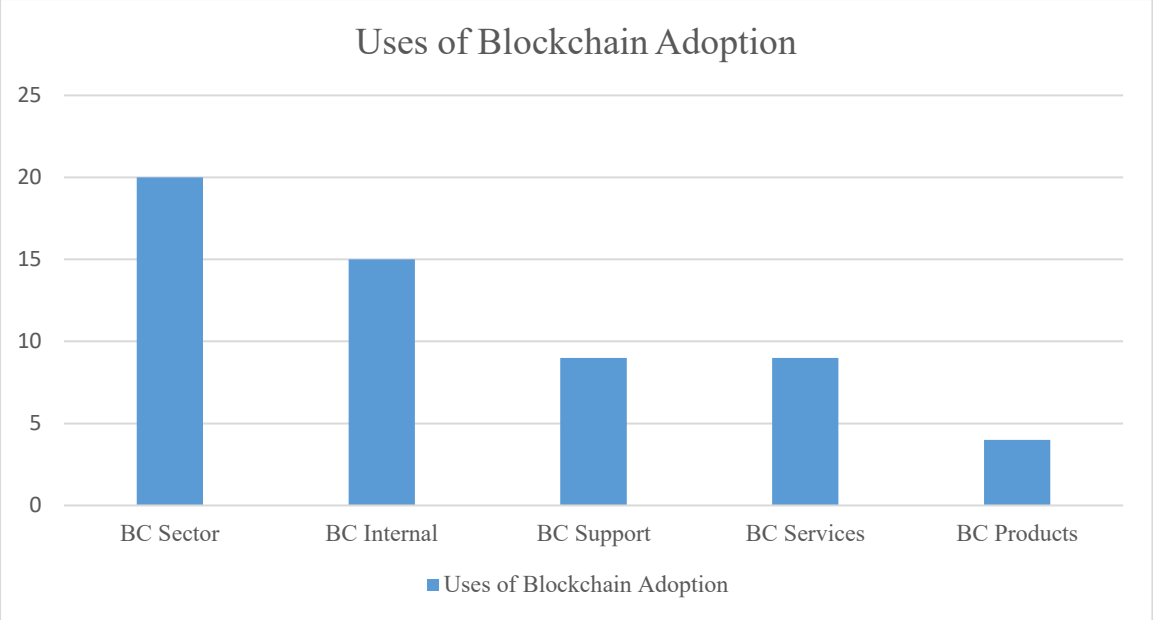


Figure 5.4: Column Chart for The Use of Blockchain Technology Adoption in Organisation (N=41)

Table 5.11 presents the results of organisations that have adopted blockchain technology within the industry sector, highlighting it as the most common adoption. Another significant adoption of this technology is in internal business operations. In addition, organisations that offer blockchain-related services and provide customization or support for adopting blockchain technology demonstrate moderate adoption for these two purposes. In contrast, organisations that sell products related to blockchain technology are the least common adoption of this technology. Figure 5.4 visualizes the results of adopting blockchain technologies in organisations.

Analysis of BC Adoption: Organisation Size

Next, the researcher analysed 41 adopters of blockchain technology by conducting a comparative mean test between five dependent variables related to blockchain use and the size variable as independent variables.

Uses of Blockchain Technology Adoption * Size						
Size		**BC Products**	**BC Services**	**BC Internal**	**BC Support**	**BC Sector**
Micro	Mean	.17	.17	.00	.00	.83
	N	6	6	6	6	6
	Std. Deviation	.408	.408	.000	.000	.408
Small	Mean	.00	.00	1.00	.00	.00
	N	2	2	2	2	2
	Std. Deviation	.000	.000	.000	.000	.000
Medium	Mean	.00	.00	.25	.00	.75
	N	4	4	4	4	4
	Std. Deviation	.000	.000	.500	.000	.500
Large	Mean	.00	.29	.14	.29	.43
	N	7	7	7	7	7
	Std. Deviation	.000	.488	.378	.488	.535
Very large	Mean	.14	.27	.50	.32	.41
	N	22	22	22	22	22
	Std. Deviation	.351	.456	.512	.477	.503
Total	Mean	.10	.22	.37	.22	.49
	N	41	41	41	41	41
	Std. Deviation	.300	.419	.488	.419	.506

Table 5.12: Size Affect Use of Blockchain Technology Adoption

According to Table 5.12, an organisations size impacts its adoption of blockchain technology. Micro organisations adopt this technology more in selling services around blockchain and in the organisation industry sector, as indicated by the higher overall mean of these two purposes. Small organisations mainly utilize blockchain for internal needs. Medium organisations adopt more blockchain within the organisation industry sector, as their mean exceeds the overall average. Large organisations adopt blockchain technology more to sell services around blockchain technology and provide support and customization about the technology, as indicated by a higher mean than the total mean for these two purposes. For very large organisations, the mean across four specific adoptions of blockchain technology is considerably higher, indicating an increased level of adoption. However, it is noteworthy that the mean for very large organisations utilizing blockchain adoption in their industry sector is lower than the overall mean.

Analysis of BC Adoption: Organisation Age

In addition, the researcher analysed 41 adopters of blockchain technology by conducting a comparative mean test between five dependent variables related to blockchain use and the age variable as independent variables.

Uses of Blockchain Technology Adoption * Age						
Age		**BC Products**	**BC Services**	**BC Internal**	**BC Support**	**BC Sector**
Less than 1 year	Mean	.00	.00	.00	.33	.67
	N	3	3	3	3	3
	Std. Deviation	.000	.000	.000	.577	.577
1-5 years	Mean	.20	.20	.60	.00	.20
	N	5	5	5	5	5
	Std. Deviation	.447	.447	.548	.000	.447
6-10 years	Mean	.00	.00	.00	.00	1.00
	N	2	2	2	2	2
	Std. Deviation	.000	.000	.000	.000	.000
11-20 years	Mean	.08	.08	.17	.17	.75
	N	12	12	12	12	12
	Std. Deviation	.289	.289	.389	.389	.452
More than 20 years	Mean	.11	.37	.53	.32	.32
	N	19	19	19	19	19
	Std. Deviation	.315	.496	.513	.478	.478
Total	Mean	.10	.22	.37	.22	.49
	N	41	41	41	41	41
	Std. Deviation	.300	.419	.488	.419	.506

Table 5.13: Age Affect Use of Blockchain Technology Adoption

Based on Table 5.13, it is evident that an organisations age impacts its adoption of blockchain technology. organisations less than one year old had higher mean scores than the total, which indicates that this age group is adopting more customization or support of blockchain technology adoption and more adoption of blockchain technology within the organisation industry sector.

organisations aged one to five years had higher mean scores than the total in adopting blockchain in internal business operations and selling products built around blockchain, which indicates that these two purposes are more common in this age group of organisations. All organisations aged six to ten agreed to adopt blockchain technology within the organisation industry sector. organisations aged 11 to 20 had higher mean scores in adopting blockchain technology within the organisation industry sector, which indicates that this age group adopts

blockchain more for this purpose. Organisations aged more than 20 years have had higher mean scores than the total for four purposes: selling products built around blockchain, selling services built around blockchain, adopting blockchain in internal business operations, and providing customization or support of blockchain technology. These four purposes are adopted more in this age group of organisations. However, it is interesting that this group notified lower mean scores than the total for adopting blockchain technology within their industry sector.

Analysis of BC Adoption: Organisation Industry

Furthermore, the researcher analysed 41 adopters of blockchain technology by conducting a comparative mean test between five dependent variables related to blockchain use and the industry variable as independent variables.

Uses of Blockchain Technology Adoption * Industry						
Industry		**BC Products**	**BC Services**	**BC Internal**	**BC Support**	**BC Sector**
Supply Chain Management	Mean	.00	.00	.50	.50	.50
	N	2	2	2	2	2
	Std. Deviation	.000	.000	.707	.707	.707
Financial Services	Mean	.00	.00	.20	.20	.60
	N	5	5	5	5	5
	Std. Deviation	.000	.000	.447	.447	.548
IT	Mean	.36	.45	.27	.36	.45
	N	11	11	11	11	11
	Std. Deviation	.505	.522	.467	.505	.522
Consultancy	Mean	.00	.33	.11	.11	.67
	N	9	9	9	9	9
	Std. Deviation	.000	.500	.333	.333	.500
Education	Mean	.00	.00	.50	.00	.50
	N	2	2	2	2	2
	Std. Deviation	.000	.000	.707	.000	.707
Health	Mean	.00	.00	1.00	.00	.00
	N	1	1	1	1	1
	Std. Deviation	.000	.000	.000	.000	.000
Government	Mean	.00	.50	.50	.50	.50
	N	2	2	2	2	2
	Std. Deviation	.000	.707	.707	.707	.707
Manufacturing	Mean	.00	.00	.33	.00	.67
	N	3	3	3	3	3
	Std. Deviation	.000	.000	.577	.000	.577
Retail	Mean	.00	.00	.00	.00	1.00
	N	1	1	1	1	1
	Std. Deviation	.000	.000	.000	.000	.000
Other	Mean	.00	.00	1.00	.20	.00
	N	5	5	5	5	5
	Std. Deviation	.000	.000	.000	.447	.000
Total	Mean	.10	.22	.37	.22	.49
	N	41	41	41	41	41
	Std. Deviation	.300	.419	.488	.419	.506

Table 5.14: Industry Affect Use of Blockchain Technology Adoption

Based on Table 5.14, it is evident that an organisations industry impacts its adoption of blockchain technology. The supply chain management industry had a higher mean than the total for adopting blockchain in internal business operations, providing support or customization for blockchain technology, and adopting it within the industry sector, which indicates organisations in the supply chain management industry have more adoption of blockchain technology for these purposes. The financial service industry had a higher mean than the total for adopting blockchain technology in internal business operations, which indicates that this industry mainly adopts it for this purpose. The IT industry had a higher mean than the total for selling products and services related to blockchain and offering customization or support for blockchain technology. This result indicates that the IT industry adopts blockchain technology more for these purposes. However, the IT industry's mean adopts of blockchain for internal business operations and adopting it within the industry sector was lower than the total. This reveals that the IT industry adopts blockchain less for these specific purposes. The consultancy industry had a higher mean than the total for selling services related to blockchain technology adoption and adopting blockchain technology within the organisation industry sector. This result indicates more adopt of blockchain technology for these two purposes in this industry. The education industry had a higher mean than the total for adopting blockchain in internal business operations and within the organisation industry sector. This result indicates that this technology is primarily adopted for these two purposes in that industry. The healthcare industry mainly adopts blockchain technology for internal business operations. The government industry had a higher mean than the total for selling services related to blockchain technology adoption, adopting blockchain in internal business operations, offering customization or support for blockchain technology adoption, and adopting blockchain technology within the organisation industry sector. The findings showed that government organisations rely more on technology for various purposes. The Manufacturing industry had a higher mean than the total for adopting blockchain technology within the organisation industry sector, which indicates that this industry adopts this technology more for this purpose. The retail industry mainly adopts blockchain technology within the organisation industry sector. The other industries had a higher mean than the total in adopting blockchain technology in internal business operations, indicating more adopt of this purpose in the other industries.

Analysis of BC Adoption: Platforms

This survey question includes several platforms related to blockchain technology. The researcher listed five platforms: IBM, Ethereum, Hyperledger Fabric, Corda, and Quorum, as well as "none" and "other" choices. The focus will be on 41 adopters who have adopted this technology within their organisations. This question includes seven variables. Each platform has two value labels: 1 indicates that the platform was selected, while 0 indicates that it was not selected.

Statistics								
		None Platforms	**IBM Blockchain**	**Ethereum**	**Other Platforms**	**Hyperledger Fabric**	**Corda**	**Quorum**
N	Valid	41	41	41	41	41	41	41
	Missing	0	0	0	0	0	0	0
Mean		.22	.34	.22	.20	.12	.07	.07
Median		.00	.00	.00	.00	.00	.00	.00
Mode		0	0	0	0	0	0	0
Std. Deviation		.419	.480	.419	.401	.331	.264	.264

Table 5.15: Descriptive Statistics for Blockchain Platforms

According to Table 5.15, the highest mean score is 0.34, indicating that many organisations use IBM Blockchain to adopt blockchain technology. Conversely, the lowest mean score is 0.07, indicating that fewer organisations use these two platforms, Corda and Quorum. The median and mode are 0 for each variable, indicating that the not-selected platform is the dataset's middle and most frequent value. However, organisations may select multiple platforms for this question.

Blockchain Platforms	**N**
IBM Blockchain	14
Ethereum	9
None	9
Other	8
Hyperledger Fabric	5
Corda	3
Quorum	3

Table 5.16: Frequency Statistics for Blockchain Platforms (N=41)

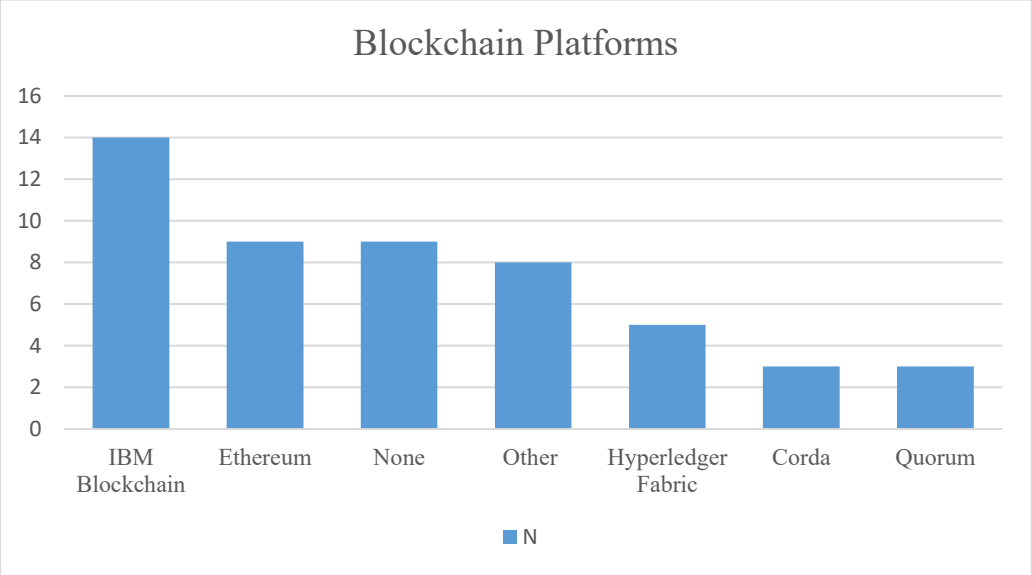


Figure 5.5: Column Chart for Blockchain platforms (N=41)

Table 5.16 shows that IBM blockchain platforms are the most popular choice among organisations adopting blockchain technologies, followed by Ethereum platforms in second place. Some organisations did not select any of the five listed platforms and opted for "None" because they were unsure which platform they had adopted. Additionally, some organisations chose the "Other" option; for instance, the Oracle platform was selected, which was not included in the original list. Lastly, Hyperledger Fabric, Corda, and Quorum are the three platforms' organisations use the least. Figure 5.5 visualizes the results of the blockchain platforms utilized by these organisations.

Analysis of BC platforms: Organisation Size

Next, the researcher analysed 41 adopters of blockchain technology by conducting a comparative mean test between seven dependent variables related to blockchain platforms and the size variable as independent variables.

Blockchain Platforms * Size								
Size		**None Platforms**	**IBM Blockchain**	**Ethereum**	**Other Platforms**	**Hyperledger Fabric**	**Corda**	**Quorum**
Micro	Mean	.33	.33	.33	.00	.33	.00	.17
	N	6	6	6	6	6	6	6
	Std. Deviation	.516	.516	.516	.000	.516	.000	.408
Small	Mean	.00	.50	.50	.00	.00	.00	.00
	N	2	2	2	2	2	2	2
	Std. Deviation	.000	.707	.707	.000	.000	.000	.000
Medium	Mean	.25	.50	.25	.25	.00	.00	.00
	N	4	4	4	4	4	4	4
	Std. Deviation	.500	.577	.500	.500	.000	.000	.000
Large	Mean	.00	.43	.14	.29	.14	.00	.00
	N	7	7	7	7	7	7	7
	Std. Deviation	.000	.535	.378	.488	.378	.000	.000
Very large	Mean	.27	.27	.18	.23	.09	.14	.09
	N	22	22	22	22	22	22	22
	Std. Deviation	.456	.456	.395	.429	.294	.351	.294
Total	Mean	.22	.34	.22	.20	.12	.07	.07
	N	41	41	41	41	41	41	41
	Std. Deviation	.419	.480	.419	.401	.331	.264	.264

Table 5.17: Size Affect Platforms of Blockchain Technology Adoption

According to table 5.17, it is clear that the size of an organisation affects the adoption of the IBM blockchain. Among large, medium, and small organisations, the mean of adopting the IBM blockchain is higher than the total mean. This result showed that various organisations utilize this platform more frequently. Conversely, very large organisations have a lower mean adoption rate, indicating less use of the IBM blockchain platform within this particular size category. Following, among medium, small, and micro organisations, the mean of adopting the Ethereum platform is higher than the total mean, indicating that these three organisations were more used to this platform. In addition, in large and micro organisations, the means of adopting the Hyperledger Fabric platform is higher than the total. Conversely, very large organisations show a lower mean adoption rate of this platform. This result showed that this platform is used more in large and micro organisations and less in very large organisations. Instead, very large organisations indicate a higher mean adoption rate of the Corda platform, which indicates that this platform is more commonly adopted in this size category. Additionally, in micro and very large organisations, the mean is higher than the total mean for the Quorum, indicating that this platform is adopted more in these two sizes of organisations.

Analysis of BC platforms: Organisation Age

Furthermore, the researcher analysed 41 adopters of blockchain technology by conducting a comparative mean test between seven dependent variables related to blockchain platforms and the age variable as independent variables.

Blockchain Platforms * Age								
Age		**None Platforms**	**IBM Blockchain**	**Ethereum**	**Other Platforms**	**Hyperledger Fabric**	**Corda**	**Quorum**
Less than 1 year	Mean	.33	.00	.33	.33	.00	.00	.00
	N	3	3	3	3	3	3	3
	Std. Deviation	.577	.000	.577	.577	.000	.000	.000
1-5 years	Mean	.00	.60	.40	.00	.20	.00	.20
	N	5	5	5	5	5	5	5
	Std. Deviation	.000	.548	.548	.000	.447	.000	.447
6-10 years	Mean	.00	.50	.50	.00	.00	.00	.00
	N	2	2	2	2	2	2	2
	Std. Deviation	.000	.707	.707	.000	.000	.000	.000
11-20 years	Mean	.33	.08	.25	.08	.08	.17	.17
	N	12	12	12	12	12	12	12
	Std. Deviation	.492	.289	.452	.289	.289	.389	.389
More than 20 years	Mean	.21	.47	.11	.32	.16	.05	.00
	N	19	19	19	19	19	19	19
	Std. Deviation	.419	.513	.315	.478	.375	.229	.000
Total	Mean	.22	.34	.22	.20	.12	.07	.07
	N	41	41	41	41	41	41	41
	Std. Deviation	.419	.480	.419	.401	.331	.264	.264

Table 5.18: Age Affect Platforms of Blockchain Technology Adoption

Based on table 5.18, organisations aged between one to five years, six to ten years, and more than 20 years had a higher mean than the total mean in the IBM platform. This result indicates that organisations of different sizes adopt more of this platform. Conversely, this platform is less adopted in organisations aged 11 to 20 years, as indicated by a lower mean.

In addition, organisations aged less than one year, one to five years, six to ten years, and 11 to 20 years had a higher mean than the total mean on the Ethereum platform, indicating that organisations of these different sizes adopt more of this platform.

Furthermore, organisations aged one to five years and more than 20 years had a higher mean than the total in the Hyperledger Fabric, indicating more adopt of this platform in these two groups of organisation sizes. In contrast, this platform has a lower mean in organisations aged 11 to 20 years, which indicates less adoption of this platform in this age group of organisations.

Next, organisations aged between 11 and 20 adopted more Corda because the mean is higher than the total in this age group. In contrast, the mean for organisations that have operated for more than 20 years is lower, indicating that fewer organisations of this age adopted this platform.

Additionally, the Quorum had a higher mean in organisations aged one to five and 11 to 20, indicating more adoption of this platform in these two-group age.

Analysis of BC platforms: Organisation Industry

Following, the researcher analysed 41 adopters of blockchain technology by conducting a comparative mean test between seven dependent variables related to blockchain platforms and the industry variable as independent variables.

Blockchain Platforms * Industry								
Industry		**None Platforms**	**IBM Blockchain**	**Ethereum**	**Other Platforms**	**Hyperledger Fabric**	**Corda**	**Quorum**
Supply Chain Management	Mean	.00	.00	.50	.00	.50	.50	.00
	N	2	2	2	2	2	2	2
	Std. Deviation	.000	.000	.707	.000	.707	.707	.000
Financial Services	Mean	.00	.00	.40	.40	.00	.20	.20
	N	5	5	5	5	5	5	5
	Std. Deviation	.000	.000	.548	.548	.000	.447	.447
IT	Mean	.18	.55	.27	.09	.18	.09	.09
	N	11	11	11	11	11	11	11
	Std. Deviation	.405	.522	.467	.302	.405	.302	.302
Consultancy	Mean	.44	.33	.22	.11	.00	.00	.00
	N	9	9	9	9	9	9	9
	Std. Deviation	.527	.500	.441	.333	.000	.000	.000
Education	Mean	.00	.50	.50	.00	.00	.00	.00
	N	2	2	2	2	2	2	2
	Std. Deviation	.000	.707	.707	.000	.000	.000	.000
Health	Mean	.00	.00	.00	1.00	.00	.00	.00
	N	1	1	1	1	1	1	1
	Std. Deviation	.000	.000	.000	.000	.000	.000	.000
Government	Mean	.50	.50	.00	.00	.50	.00	.00
	N	2	2	2	2	2	2	2
	Std. Deviation	.707	.707	.000	.000	.707	.000	.000
Manufacturing	Mean	.00	.00	.00	.67	.00	.00	.33
	N	3	3	3	3	3	3	3
	Std. Deviation	.000	.000	.000	.577	.000	.000	.577
Retail	Mean	1.00	.00	.00	.00	.00	.00	.00
	N	1	1	1	1	1	1	1
	Std. Deviation	.000	.000	.000	.000	.000	.000	.000
Other	Mean	.20	.60	.00	.20	.20	.00	.00
	N	5	5	5	5	5	5	5
	Std. Deviation	.447	.548	.000	.447	.447	.000	.000
Total	Mean	.22	.34	.22	.20	.12	.07	.07
	N	41	41	41	41	41	41	41
	Std. Deviation	.419	.480	.419	.401	.331	.264	.264

Table 5.19: Industry Affect Platforms of Blockchain Technology Adoption

According to table 5.19, organisations within the IT industry have reported higher mean scores for adopting five blockchain platforms: IBM, Hyperledger Fabric, Ethereum, Corda, and Quorum. This result shows that these platforms are more commonly adopted in this industry.

Organisations within the consultancy industry have reported that the mean of the sample is equal to the total mean for all industries. The equality result shows a positive indication for this industry in the Ethereum platforms. However, this industry reported a slightly lower mean adoption rate for the IBM platform, indicating less adoption of that platform in this industry.

Organisations in the financial services industry had a higher mean of adopting Ethereum, Corda, and Quorum, indicating more adopt of these platforms. Organisations in the supply chain management industry indicated higher mean scores in three platforms for blockchain technology adoption: Ethereum, Hyperledger Fabric, and Corda. This result indicates that this industry adopts more of these platforms. Organisations in the education industry have a higher mean in the Ethereum and IBM platforms, which indicates that this industry adopts more of these two platforms. The government and other industries had higher means in IBM and Hyperledger fabric platforms, which indicates that these two platforms are adopted more in these groups of industries. The Manufacturing industry had a higher mean in the Quorum platform, which indicates that this platform is more commonly adopted in this industry. The health industry mainly adopted other platforms, which indicates that the platform is unknown in this industry. The retail industry mainly adopts none of the platforms listed.

Analysis of BC Adoption: Use Cases

This survey question includes multiple use cases for blockchain technologies. There are eight use cases in the survey. They are smart contracts, automation, asset management, smart devices, the Internet of Things (IoT), Distributed Ledgers (DL), cryptocurrencies, and "trustless" consensus mechanisms. There were also "other" and "none" choices. The focus will be on 41 adopters who have adopted this technology within their organisations. This question includes eight variables. Each use case has two value labels: 1 indicates that the use cases were selected, while 0 indicates that it was not selected.

Statistics											
		None Use Cases	Distributed Ledgers	Smart Contracts	Cryptocurrencies	IoT (Internet of Things) BC	Smart Devices	Automation	Asset Mgmt	"Trustless" Consensus Mechanisms	Other Use Cases
N	Valid	41	41	41	41	41	41	41	41	41	41
	Missing	0	0	0	0	0	0	0	0	0	0
Mean		.10	.37	.54	.15	.41	.37	.51	.39	.10	.02
Median		.00	.00	1.00	.00	.00	.00	1.00	.00	.00	.00
Mode		0	0	1	0	0	0	1	0	0	0
Std. Deviation		.300	.488	.505	.358	.499	.488	.506	.494	.300	.156

Table 5.20: Descriptive Statistics for Blockchain Use Cases

According to table 5.20, the highest mean is 0.54, indicating that many organisations apply smart contracts as use cases of adopting blockchain technology. In contrast, the lowest mean is 0.10, indicating that fewer organisations apply trustless consensus mechanisms as use cases of adopting blockchain technology. For the median, the smart contract and automation use cases that had value of 1 which indicate that these two use cases are most selected in the dataset. Also, these two use cases were the most frequent value in the dataset as the mode value for them is 1. However, organisations may select multiple use cases for this question.

Blockchain Use Cases	**N**
Smart Contracts	22
Automation	21
IoT (Internet of Things) BC	17
Asset Management	16
Distributed Ledgers	15
Smart Devices	15
Cryptocurrencies	6
None	4
"Trustless" Consensus Mechanisms	4
Other	1

Table 5.21: Frequency Statistics for Blockchain Use Cases (N=41)

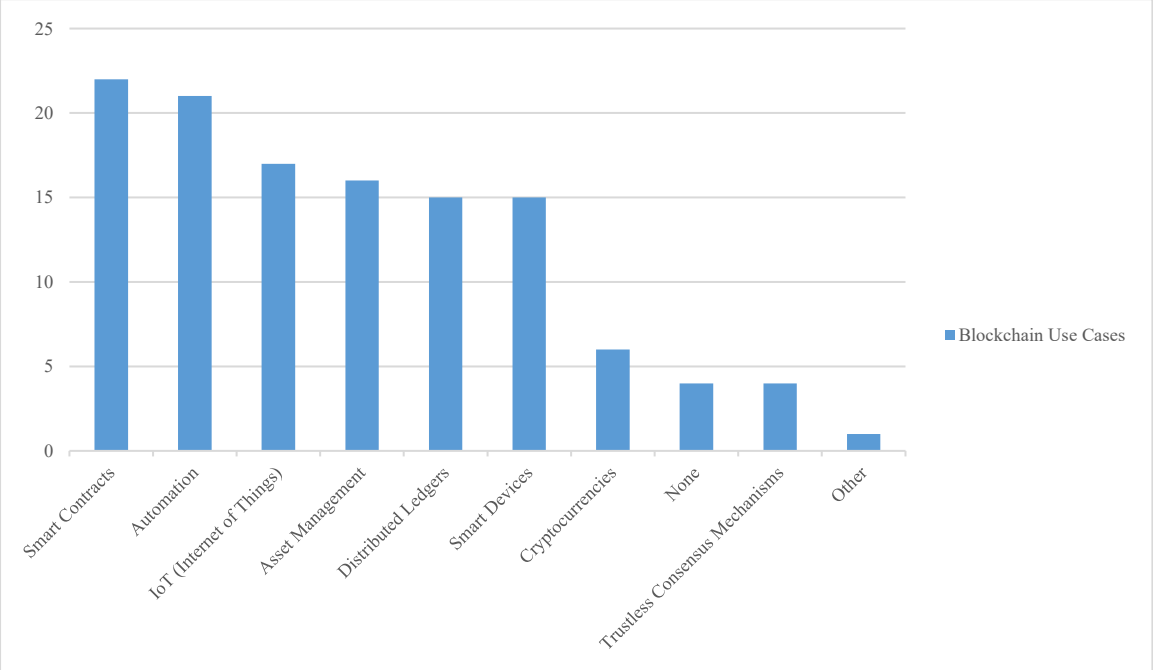


Figure 5.6: Column Chart for The Blockchain Use Cases

According to the data presented in table 5.21, most organisations have opted for smart contracts and automation use cases. Additionally, under 20 organisations selected multiple use cases, including the Internet of Things (IoT), asset management, smart devices, and distributed ledger technology. Meanwhile, fewer organisations chose use cases involving cryptocurrency and trustless consensus mechanisms. Some organisations indicated specific use cases, such as central bank digital currency (CBDC), while others selected "none" from the provided options. Figure 5.6 visualizes the results of the organisations that have used cases of adopting blockchain technologies.

Analysis of BC Use Cases: Organisation Size

Next, the researcher analysed 41 adopters of blockchain technology by conducting a comparative mean test between 10 dependent variables related to blockchain use cases and the size variable as independent variables.

Blockchain Use Cases * Size											
Size		**None Use Cases**	**Distributed Ledgers**	**Smart Contracts**	**Crypto currencies**	**IoT BC**	**Smart Devices**	**Automation**	**Asset Mgmt**	**"Trustless" Consensus Mechanisms**	**Other Use Cases**
Micro	Mean	.17	.33	.67	.17	.67	.33	.50	.33	.00	.00
	N	6	6	6	6	6	6	6	6	6	6
	Std. Deviation	.408	.516	.516	.408	.516	.516	.548	.516	.000	.000
Small	Mean	.00	.00	1.00	.00	.00	.50	.00	.00	.00	.00
	N	2	2	2	2	2	2	2	2	2	2
	Std. Deviation	.000	.000	.000	.000	.000	.707	.000	.000	.000	.000
Medium	Mean	.25	.25	.50	.25	.00	.25	.25	.25	.50	.00
	N	4	4	4	4	4	4	4	4	4	4
	Std. Deviation	.500	.500	.577	.500	.000	.500	.500	.500	.577	.000
Large	Mean	.00	.29	.57	.14	.57	.43	.57	.43	.00	.00
	N	7	7	7	7	7	7	7	7	7	7
	Std. Deviation	.000	.488	.535	.378	.535	.535	.535	.535	.000	.000
Very large	Mean	.09	.45	.45	.14	.41	.36	.59	.45	.09	.05
	N	22	22	22	22	22	22	22	22	22	22
	Std. Deviation	.294	.510	.510	.351	.503	.492	.503	.510	.294	.213
Total	Mean	.10	.37	.54	.15	.41	.37	.51	.39	.10	.02
	N	41	41	41	41	41	41	41	41	41	41
	Std. Deviation	.300	.488	.505	.358	.499	.488	.506	.494	.300	.156

Table 5.22: Size Affect Use Cases of Blockchain Technology Adoption

According to the data in table 5.22 smart contract blockchain use cases are more common in micro organisations with a higher mean and less common in very large organisations with a lower mean. On the other hand, automation use cases are more frequently found in very large organisations, where the mean is higher, and they are less common in medium-sized organisations, which have a lower mean. Additionally, distributed ledger use cases are primarily seen in very large organisations, given their higher mean, while they are less common in large organisations with lower means.

Analysis of BC Use Cases: Organisation Age

Next, the researcher analysed 41 adopters of blockchain technology by conducting a comparative mean test between 10 dependent variables related to blockchain use cases and the age variable as independent variables.

Blockchain Use Cases * Age											
Age		None Use Cases	Distributed Ledgers	Smart Contracts	Crypto currencies	IoT BC	Smart Devices	Automation	Asset Mgmt	"Trustless" Consensus Mechanisms	Other Use Cases
Less than 1 year	Mean	.33	.33	.67	.00	.33	.00	.33	.33	.00	.00
	N	3	3	3	3	3	3	3	3	3	3
	Std. Deviation	.577	.577	.577	.000	.577	.000	.577	.577	.000	.000
1-5 years	Mean	.00	.20	.80	.00	.20	.40	.00	.20	.00	.00
	N	5	5	5	5	5	5	5	5	5	5
	Std. Deviation	.000	.447	.447	.000	.447	.548	.000	.447	.000	.000
6-10 years	Mean	.00	.50	.00	.50	.00	.00	1.00	.50	.00	.00
	N	2	2	2	2	2	2	2	2	2	2
	Std. Deviation	.000	.707	.000	.707	.000	.000	.000	.707	.000	.000
11-20 years	Mean	.17	.33	.58	.17	.50	.33	.42	.25	.08	.08
	N	12	12	12	12	12	12	12	12	12	12
	Std. Deviation	.389	.492	.515	.389	.522	.492	.515	.452	.289	.289
More than 20 years	Mean	.05	.42	.47	.16	.47	.47	.68	.53	.16	.00
	N	19	19	19	19	19	19	19	19	19	19
	Std. Deviation	.229	.507	.513	.375	.513	.513	.478	.513	.375	.000
Total	Mean	.10	.37	.54	.15	.41	.37	.51	.39	.10	.02
	N	41	41	41	41	41	41	41	41	41	41
	Std. Deviation	.300	.488	.505	.358	.499	.488	.506	.494	.300	.156

Table 5.23: Age Affect Use Cases of Blockchain Technology Adoption

According to the data in table 5.23 smart contract blockchain use cases are more common in organisations operated for one to five years, as their mean is higher, and less common in organisations operated for more than 20 years, as their mean is lower. Automation use cases are more common in organisations operated for more than 20 years, as their mean is higher, and less common in organisations operated for less than one year, as their mean is lower. Distributed ledgers use cases are more common in organisations that have operated for six to ten years, as their mean is higher, and less common in organisations that have operated for one to five years, as their means are lower.

Analysis of BC Use Cases: Organisation Industry

Next, the researcher analysed 41 adopters of blockchain technology by conducting a comparative mean test between 10 dependent variables related to blockchain use cases and the industry variable as independent variables.

Blockchain Use Cases * Industry											
Industry		**None Use Cases**	**Distributed Ledgers**	**Smart Contracts**	**Crypto currencies**	**IoT BC**	**Smart Devices**	**Automation**	**Asset Mgmt**	**"Trustless" Consensus Mechanisms**	**Other Use Cases**
Supply Chain Management	Mean	.00	.00	1.00	.50	1.00	.50	1.00	.50	.00	.00
	N	2	2	2	2	2	2	2	2	2	2
	Std. Deviation	.000	.000	.000	.707	.000	.707	.000	.707	.000	.000
Financial Services	Mean	.00	.60	1.00	.20	.60	.40	.40	.40	.00	.20
	N	5	5	5	5	5	5	5	5	5	5
	Std. Deviation	.000	.548	.000	.447	.548	.548	.548	.548	.000	.447
IT	Mean	.09	.27	.36	.18	.45	.27	.45	.45	.09	.00
	N	11	11	11	11	11	11	11	11	11	11
	Std. Deviation	.302	.467	.505	.405	.522	.467	.522	.522	.302	.000
Consultancy	Mean	.22	.33	.44	.22	.33	.22	.56	.44	.11	.00
	N	9	9	9	9	9	9	9	9	9	9
	Std. Deviation	.441	.500	.527	.441	.500	.441	.527	.527	.333	.000
Education	Mean	.00	.50	.50	.00	.00	.50	.00	.00	.00	.00
	N	2	2	2	2	2	2	2	2	2	2
	Std. Deviation	.000	.707	.707	.000	.000	.707	.000	.000	.000	.000
Health	Mean	.00	.00	.00	.00	.00	.00	.00	1.00	.00	.00
	N	1	1	1	1	1	1	1	1	1	1
	Std. Deviation	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Government	Mean	.00	1.00	1.00	.00	.50	1.00	.50	.50	.00	.00
	N	2	2	2	2	2	2	2	2	2	2
	Std. Deviation	.000	.000	.000	.000	.707	.000	.707	.707	.000	.000
Manufacturing	Mean	.00	.33	1.00	.00	.67	.33	1.00	.00	.00	.00
	N	3	3	3	3	3	3	3	3	3	3
	Std. Deviation	.000	.577	.000	.000	.577	.577	.000	.000	.000	.000
Retail	Mean	1.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
	N	1	1	1	1	1	1	1	1	1	1
	Std. Deviation	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Other	Mean	.00	.40	.20	.00	.20	.60	.60	.40	.40	.00
	N	5	5	5	5	5	5	5	5	5	5
	Std. Deviation	.000	.548	.447	.000	.447	.548	.548	.548	.548	.000
Total	Mean	.10	.37	.54	.15	.41	.37	.51	.39	.10	.02
	N	41	41	41	41	41	41	41	41	41	41
	Std. Deviation	.300	.488	.505	.358	.499	.488	.506	.494	.300	.156

Table 5.24: Industry Affect Use Cases of Blockchain Technology Adoption

According to the data in table 5.24 smart contract blockchain use cases are less common in the IT industry as their mean is lower. Automation use cases are more common in the consultancy industry, as their mean is higher, and less common in the financial industry, as their mean is lower. It is also less common in the IT industry, as their mean is lower. Distributed ledgers use

cases are more common in the financial industry, as their mean is higher, and less common in the IT industry, as their means are lower. IoT and asset management use cases are more common in the IT industry as their mean is higher for these two use cases.

5.2.2 Advanced Technology Adoption Patterns

Analysing the sample of 72 organisations for various advanced technologies adopted in organisations. In the extended survey, the researcher listed 11 advanced technologies, and there was also the "other" option in the list:

1. Cloud-based systems
2. Cybersecurity
3. Mobile apps
4. Databases, data warehouses, unstructured data, and big data
5. Artificial Intelligence (AI)
6. Enterprise/Manufacturing Resource Planning (ERP/MRP)
7. Customer Relationship Management (CRM)
8. Automated control and monitoring systems
9. Internet of Things (IoT)
10. Robotics
11. 3D printing and additive manufacturing
12. Other

The advanced technology adoption variable has 12 value labels. The value 1 for one technology, 2 for two technologies, 3 for three technologies, 4 for four technologies, 5 for five technologies, 6 for six technologies, 7 for seven technologies, 8 for eight technologies, 9 for nine technologies, 10 for ten technologies, 11 for eleven technologies, and 12 for other technologies. The mean of 5.49 indicates that the average number of advanced technology adoptions in an organisation is five to six technologies. The median of 5.00 indicates that the middle value of the dataset is five technologies. In the mode of 1, multiple modes exist. The smallest value is shown in the table where the organisation had one technology (See Table 5.25).

Statistics		
Number of Advanced Technologies Adopted		
N	Valid	72
	Missing	0
Mean		5.49
Median		5.00
Mode		1[a]
a. Multiple modes exist. The smallest value is shown		

Table 5.25: Descriptive Statistics for Number of Advanced Technologies Adopted

Table 5.26 below shows the distribution of advanced technology adoption levels within the organisation (i.e. how many different technologies were adopted). More than half of the participants reported lower levels of advanced technology adoption, meaning they utilized between one and six types of advanced technologies (i.e. bottom two quartiles). In contrast, the remaining participants demonstrated high levels of adoption, indicating they had implemented seven or more technologies.

Number of Advanced Technologies Adopted		
	N	**%**
One Tech	9	12.5%
Two Tech	9	12.5%
Three Tech	5	6.9%
Four Tech	8	11.1%
Five Tech	9	12.5%
Six Tech	7	9.7%
Seven Tech	4	5.6%
Eight Tech	1	1.4%
Nine Tech	9	12.5%
Ten Tech	7	9.7%
Eleven Tech	1	1.4%
Twelve Tech	3	4.2%

Table 5.26: Frequency Statistics for Total Number of Different Advanced Technologies Adopted (N=72)

Table 5.27 lists the advanced technologies used by the organisation. The organisation primarily uses a cloud-based system, followed by cybersecurity, mobile apps, databases, data

warehouses, unstructured data, big data, and other technologies. The remaining technologies are used at a moderate level within the organisation.

Advanced Technologies Adoption	N
Cloud-based systems	49
Cybersecurity	42
Mobile Apps	41
Databases, data warehouses, unstructured data, and big data	40
Artificial Intelligence (AI)	39
Enterprise/Manufacturing Resource Planning (ERP/MRP)	38
Customer Relationship Management (CRM)	38
Automated control and monitoring systems	26
Internet of Things (IoT)	25
Robotics	15
3D printing and additive manufacturing	6
Other	5

Table 5.27: Frequency Statistics of Specific Advanced Technologies Adopted (N=72)

Analysis of Advanced Technologies Adoption: Organisation Size

Next, the researcher analysed 72 adopters of advanced technologies by conducting a comparative mean test between the dependent variable of advanced technology adoption and the size variable as independent variables.

Advanced Technologies Adopted * Size			
Number of Advanced Technologies Adopted			
Size	**Mean**	**N**	**Std. Deviation**
Micro	4.12	8	3.758
Small	3.22	9	1.787
Medium	3.44	9	2.506
Large	6.75	8	2.375
Very large	6.53	38	3.302
Total	5.49	72	3.293

Table 5.28: Size Affects Total Number of Different Advanced Technologies Adopted

Table 5.28 indicates that the higher mean for large and very large organisations indicates more adoption of advanced technology in their organisation. In contrast, the lower mean for medium, small, and micro organisations indicates less adoption of advanced technology.

Analysis of Advanced Technologies Adoption: Organisation Age

The researcher analysed 72 adopters of advanced technologies by conducting a comparative mean test between the dependent variable of advanced technology adoption and the age variable as independent variables.

Advanced Technologies Adopted * Age			
Number of Advanced Technologies Adopted			
Age	**Mean**	**N**	**Std. Deviation**
Less than 1 year	4.00	3	4.359
1-5 years	4.50	16	3.615
6-10 years	6.25	4	2.630
11-20 years	4.39	18	3.109
More than 20 years	6.68	31	2.948
Total	5.49	72	3.293

Table 5.29: Age Affects Total Number of Different Advanced Technologies Adopted

The data in table 5.29 indicate that organisations aged between six and ten and those older than twenty tend to have a higher mean, suggesting adoption of more advanced technologies. In contrast, organisations between one to five years old, those aged eleven to twenty, and those less than one year indicate a lower mean, indicating adoption less of advanced technology.

Analysis of Advanced Technologies Adoption: Organisation Industry

The researcher analysed 72 adopters of advanced technologies by conducting a comparative mean test between the dependent variable of advanced technology adoption and the industry variable as independent variables.

Advanced Technologies Adopted * Industry			
Number of Advanced Technologies Adopted			
Industry	**Mean**	**N**	**Std. Deviation**
Supply Chain Management	3.67	3	2.887
Financial Services	5.33	6	3.386
IT	5.21	19	3.066
Consultancy	5.20	10	3.676
Education	6.00	11	2.646
Health	5.00	1	.000
Government	4.67	3	3.786
Manufacturing	6.17	6	3.710
Retail	6.50	2	7.778
Other	6.00	11	3.899
Total	5.49	72	3.293

Table 5.30: Industry Affects Total Number of Different Advanced Technologies Adopted

According to table 5.30, four industries have a higher mean than the total, which indicates that they adopted more advanced technologies in their organisations. In contrast, six industries have a lower mean than the total, which indicates that they adopted fewer advanced technologies in their organisations.

5.3 Business Model Characteristics

This section focuses on the business model components, such as the customer connection, channels used, key partners, key activities, key resources involved in a business or product, financial aspects, and the value offered to its target customers and the organisation itself.

5.3.1 Customer Segments and Channels

Customer components involve understanding customer segments, the dominant segment, customer locations, and the channels to reach them.

Customer Segments: Narrow or Broad?

This survey question includes two value labels for the customer segments variable: in value 1, the group of customers is concentrated in one or two broad segments. In value 2, the group of customers is differentiated into multiple, more narrow segments. Table 5.31 showed that the two segments are very close, but the segment of customers is differentiated into multiple, more narrow segments is higher than the segment of customers concentrated in one or two broad segments. In addition, descriptive statistics (See Table 5.32) describe the variable customer segments based on a sample of 72 companies.

Customer Segments Group		
	N	**%**
Customers are concentrated in one or two broad segments	34	47.2%
Customers are differentiated into multiple more narrow segments	38	52.8%

Table 5.31: Frequency Statistics of Customer Segments Group (N=72)

Statistics			
Customer Segments Group			**Interpretation**
N	Valid	72	
	Missing	0	
Mean		1.53	The average group of customers in the sample is approximately 1.53. The mean of 1.53 does not correspond to any specific category but states that more customers for organisations are differentiated into multiple, more narrow segments.
Median		2.00	The middle-value dataset is customer differentiated into multiple, more narrow segments
Mode		2	The most frequent in the dataset is customer differentiated into multiple, more narrow segments

Table 5.32: Descriptive Statistics for Customer Segments Group

Who Are Your Customers?

The following survey question involves the dominant segment with five variables plus the other variable option. Each variable is assigned a value of 1 if selected and 0 if not selected. These variables indicate the most prominent customer segment for an organisation.

Types of Customer Segments	N
Large and Very Large Enterprises (B2B)	49
Government and Public Agencies (B2G)	38
Micro, Small and Medium Enterprises (B2B)	34
Individual Customer (B2C)	23
Individual Citizens (G2C)	12
Other Customer	1

Table 5.33: Frequency Statistics for Types of Customer Segments (N=72)

Statistics							
		Individual Customer (B2C)	Micro, Small and Medium Enterprises (B2B)	Large and Very Large Enterprises (B2B)	Government and Public Agencies (B2G)	Individual Citizens (G2C)	Other Customer
N	Valid	72	72	72	72	72	72
	Missing	0	0	0	0	0	0
Mean		.32	.47	.68	.53	.17	.01
Median		.00	.00	1.00	1.00	.00	.00
Mode		0	0	1	1	0	0
Std. Deviation		.470	.503	.470	.503	.375	.118

Table 5.34: Descriptive Statistics for type of Customer Segments

Table 5.33 shows that among these segments, large and very large enterprises (B2B) represent the most dominant group, followed by government and public agencies (B2G) and then micro, small, and medium enterprises (B2B). The least dominant segment is individual citizens (G2C).

In addition, table 5.34 shows that large and very large enterprises (B2B) have the highest mean, indicating they are the most significant customer segment for many organisations. In contrast, individual citizens (G2C) have the lowest mean, indicating they are the least important customer segment of most organisations. The median and mode for large and very large enterprises (B2B) and Government and Public Agencies (B2G) are equal to 1, indicating that these two segments represent the middle value in the dataset and are the most frequently occurring.

Where Are Your Customers?

The customer group location variable includes three values: 1 for inside, 2 for outside, and 3 for both. According to the data indicated that the most common customer location for an organisation is both inside and outside, followed by inside only, while the least common location is outside (See Table 5.35). Additionally, the statistics table, the mean is 2.03, indicating that the average customer location is outside. The median is 2, indicating the middle value is the outside customer. The mode is 3, indicating that the most frequent location is both (See Table 5.36).

Location of Customers		
	N	**%**
Inside	32	44.4%
Outside	6	8.3%
Both	34	47.2%

Table 5.35: Frequency Statistics for Location of Customers (N=72)

Statistics		
Location of Customers		
N	Valid	72
	Missing	0
Mean		2.03
Median		2.00
Mode		3
Std. Deviation		.964

Table 5.36: Descriptive Statistics for Location of Customers

Channels: How Does the Organisation Communicate with Customers?

There are three variables for the channels, and each variable has two values and labels. The value 1 is for selected, and the value 2 is for not selected. The statistics table showed that the median and mode for the online channel is 1, indicating that the dataset's middle value and the most frequent channel used is the online channel in the organisation. Also, the organisation used in-person channels because the mode and median value is 1. However, for the automated channels, the mean and mode are 0, which indicates that the organisation has not used this channel (See Table 5.37).

Statistics				
		Online Communications (Email, Website, Social Media, Telephone/VoIP, etc.)	**In-person Communications (Meetings, Workshops, Community Events, etc.)**	**Automated/Self-Service (Web and Mobile Applications)**
N	Valid	72	72	72
	Missing	0	0	0
Mean		.90	.74	.42
Median		1.00	1.00	.00
Mode		1	1	0
Std. Deviation		.298	.444	.496

Table 5.37: Descriptive Statistics for Types of Channels with Customers

According to the bar chart (See Figure 5.7), the most common communication channel with customers is online, followed by in-person communication, while the least utilized method is automated or self-service communication.

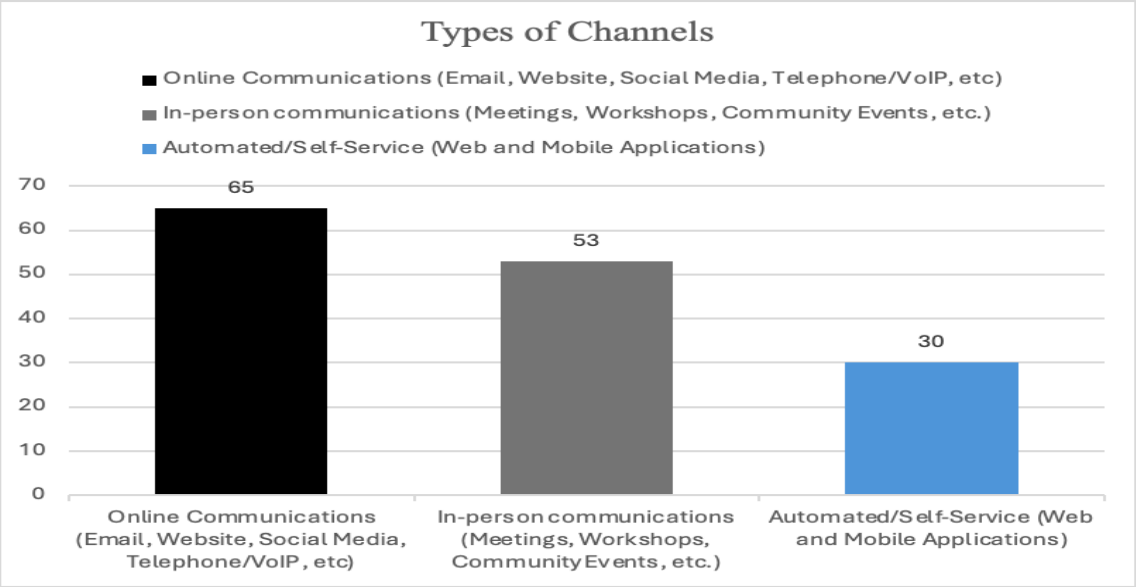


Figure 5.7: Types of Channels with Customers (N=72)

5.3.2 Key Partnerships and Resources

The "key partnerships" component consists of 13 partners:

1. P1: Banks and Financial Service Companies
2. P2: Government Agencies
3. P3: Information Technology Companies
4. P4: Electronics Equipment Companies
5. P5: Food Producers
6. P6: Restaurants
7. P7: Publishing/Design Companies
8. P8: Marketing/Advertising
9. P9: Education/Training
10. P10: Transportation Companies
11. P11: Specialty Wholesale/Retailers
12. P12: Real Estate Companies
13. P13: Other

The "key resources" component includes three resources are:

1. Physical
2. Non-Physical
3. Human Resources

Who Are the Organisation Partners?

This survey question included 13 variables, each with two possible values: 1 for "selected" and 2 for "not selected." As shown in table 5.38, the higher mean is information technology companies indicating the most common partners for the organisation. The lower mean is real estate companies indicating the least common partners for the organisation. The median value for government agencies and information technology companies is 1, indicating that these two partners are the primary partnerships for the organisation and represent the dataset's middle value. The mode is also 1 for these partners, signifying that they are the most frequently selected in the dataset.

Statistics													
		P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**	**P12**	**P13**
N	Valid	72	72	72	72	72	72	72	72	72	72	72	72	72
	Missing	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean		.47	.56	.63	.28	.19	.14	.18	.21	.29	.26	.18	.13	.17
Median		.00	1.00	1.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Mode		0	1	1	0	0	0	0	0	0	0	0	0	0
Std. Deviation		.503	.500	.488	.451	.399	.348	.387	.409	.458	.444	.387	.333	.375

Table 5.38: Descriptive Statistics for Key Partnerships

Furthermore, Figure 5.8 revealed that most organisations selected three top partners for their organisations among the 13 partners. These were information technology companies, government agencies, and banks and financial service companies. The upper middle partners included education/training, electronics equipment companies, and transportation companies. The lower middle partners were marketing or advertising, food producers, and specialty wholesalers or retailers. Lastly, minor partners included publishing or design companies, restaurants, and real estate companies.

Additionally, organisations in the "other" options are different partners, and these partners were not listed. For example, oil and gas, suppliers, company consultants internally, medical supplies, marine and yachting, manufacturing organisations, petrochemicals, professional services, consultancy, construction, users, polyclinics, dental, and hospitals.



Figure 5.8: The Main Partners (N=72)

How Important Are Physical, Non-Physical, And Human Resources to The Organisation?

This section of the extended survey measures the importance of physical, non-physical, and human resources. The researcher ranked the importance of each resource on a scale from one to four, where one indicated very important, and four indicated not important.

Physical Resources

This survey question includes four values and labels: value one is "very important," value two is "important," value three is "somewhat important," and value four is "not important." The physical resources considered in this survey include plant and buildings.

Table 5.39 indicates that most organisations view physical resources as very important, while few do not consider them significant.

Physical Resources		
	N	**%**
Very Important	36	50.0%
Important	17	23.6%
Somewhat Important	12	16.7%
Not Important	7	9.7%

Table 5.39: The Frequency Statistics for Importance of Physical Resources (N=72)

In addition, table 5.40 shows that the mean score for the physical resource variable is 1.86, indicating that, on average, organisations recognize the importance of having physical resources. The median score is 1.50, indicating that the organisations in the dataset mostly agree on the significance of physical resources. Additionally, the mode is 1, indicating that the most common response is "very important," emphasizing that many organisations consider physical resources important.

Statistics		
Physical		
N	Valid	72
	Missing	0
Mean		1.86
Median		1.50
Mode		1

Table 5.40: Descriptive Statistics for Physical Resources

Non-Physical Resources

This survey question includes four values and labels: value one is "very important," value two is "important," value three is "somewhat important," and value four is "not important." Non-physical resources like information technologies (IT) include hardware (HW) and software (SW), Intellectual property (IPR), and Data and knowledge resources.

Non-Physical Resources						
	IT		**IPR**		**Data And Knowledge**	
	N	**%**	**N**	**%**	**N**	**%**
Very Important	55	76.40%	21	29.20%	35	48.60%
Important	13	18.10%	27	37.50%	31	43.10%
Somewhat Important	4	5.60%	16	22.20%	5	6.90%
Not Important	0	0.00%	8	11.10%	1	1.40%

Table 5.41: The Frequency Statistics for Importance of Non-Physical Resources (N=72)

Table 5.41 indicates that most organisations view IT non-physical resources as very important, while few do not consider the IRP and data and knowledge significant.

Statistics				
		IT	**IPR**	**Data and Knowledge**
N	Valid	72	72	72
	Missing	0	0	0
Mean		1.29	2.15	1.61
Median		1.00	2.00	2.00
Mode		1	2	1

Table 5.42: Descriptive Statistics for Non-Physical Resources

In addition, table 5.42 shows that the mean score for all three non-physical resources, on average, is important in the organisation. The median for IPR and data and knowledge are 2, indicating that these two non-physical resources are important for the organisation. The median for IT is 1, which indicates that it is very important for the organisation. The modes for IT, data, and knowledge are the same. It is 1, indicating it is very important to have these two non-physical resources, and the IPR resource is important too, but not more frequent than the other two resources.

Human Resources (HR)

This survey question includes four values and labels: value one is "very important," value two is "important," value three is "somewhat important," and value four is "not important." There are three types of human resources: product/Service development and Delivery, administration and Finance, and Sales and Marketing.

Table 5.43 supports the highest number of organisations by indicating that all three categories of human resources are significant to the organisation.

Human Resources (HR)						
	HR (Product/Service Development and Delivery)		**HR (Admin, Finance, Etc.)**		**HR (Sales and Marketing)**	
	N	**%**	**N**	**%**	**N**	**%**
Very Important	36	50.00%	31	43.10%	28	38.90%
Important	22	30.60%	25	34.70%	26	36.10%
Somewhat Important	11	15.30%	14	19.40%	15	20.80%
Not Important	3	4.20%	2	2.80%	3	4.20%

Table 5.43: The Frequency Statistics for Importance Human Resources (N=72)

Statistics				
		HR (product/Service development and Delivery)	**HR (Admin, Finance, etc.)**	**HR (Sales and Marketing)**
N	Valid	72	72	72
	Missing	0	0	0
Mean		1.74	1.82	1.90
Median		1.50	2.00	2.00
Mode		1	1	1

Table 5.44: Descriptive Statistics for Human Resources

Furthermore, table 5.44 demonstrates that the mean score for all three categories of human resources is approximately 2, which highlights their importance within the organisation. The median scores for administrative, finance, and sales and marketing human resources are also 2, further emphasizing the significance of these resources. Additionally, the mode for all three types of human resources is 1, suggesting that they are very important to the organisation.

5.3.3 Cost Structure and Revenue Streams

The cost structure components involve three types of costs: fixed, variable, and capital. The revenue stream components include eight potential sources of income: service and product sales, service fees, subscription fees, usage fees, leasing fees, licensing fees, brokerage, and others.

What Is the Primary Cost for the Organisation?

This survey question involved four types of costs, each with its corresponding label: value one for fixed costs, value two for variable costs, value three for capital costs, and value four for other costs. The data shows that organisations primary costs are mainly fixed costs, such as rent, utilities, and salaries. These are followed by variable costs, which include consumables, operational expenses, and the cost of sales. The least significant costs are capital costs related to physical assets (See Table 5.45). For example, 12 out of 19 companies in the IT industry emphasize fixed costs, while five out of six companies in the financial services sector also prioritize fixed costs. Additionally, nine out of 72 organisations chose the "other" category. These nine organisations belong to various industries: four are in education/training, three are in IT, one is in consultancy, and one is in government.

Cost Structure		
	N	**%**
Fixed Cost	35	48.6%
Variable Cost	16	22.2%
Capital Cost	12	16.7%
Other	9	12.5%

Table 5.45: The Frequency Statistics for Cost Structure (N=72)

Furthermore, table 5.46 shows that the mean is approximately two, indicating that the organisations average cost is variable. Additionally, the median value in the dataset is a variable cost. The mode is one, indicating that the most frequently occurring number in the dataset is fixed cost in the organisation.

Statistics		
Cost Structure		
N	Valid	72
	Missing	0
Mean		1.99
Median		2.00
Mode		1

Table 5.46: Descriptive Statistics for Cost Structure

What Is the Primary Revenue Stream for the Organisation?

This survey question comprises nine labels: service sales, product sales, service fees, subscription fees, leasing fees, usage fees, licensing fees, brokerage fees, and other revenue.

Revenue Streams		
	N	**%**
Service Sales	23	31.9%
Product Sales	20	27.8%
Services Fee	10	13.9%
Subscription Fee	4	5.6%
Leasing Fee	2	2.8%
Usage Fee	2	2.8%
Licensing Fee	2	2.8%
Brokerage Fee	1	1.4%
Other	8	11.1%

Table 5.47: The Frequency Statistics for Revenue Streams (N=72)

Table 5.47 shows that the organisations highest potential revenue is generated from service sales, product sales, and service fees, while the lowest potential revenue comes from various other sources. Seven out of 19 companies in the IT industry identified service sales as a potential revenue stream. Similarly, seven out of 11 companies recognized service sales as a potential revenue source in the education and training sector. Four out of 10 companies in the consultancy industry also selected service sales as a potential revenue.

Additionally, eight out of the 72 organisations chose the “other” option, which included three from the education and training sector, two from government, one from IT, and one from consultancy.

Statistics		
Revenue Streams		
N	Valid	72
	Missing	0
Mean		3.50
Median		2.00
Mode		2

Table 5.48: Descriptive Statistics for Revenue Streams

Table 5.48 shows that the mean for the revenue stream variable is 3.50, indicating the organisations average revenue from usage fees and subscription fees. The median is 2, indicating that the organisations middle value from the dataset is service sales. Also, service sales occur most frequently within the dataset.

5.4 Perceived Impacts

The extended survey will explore how advanced technologies and blockchain technologies perceived impacts each component of business model within the organisation. The researcher conducted several statistical tests to evaluate the perceived impacts, including descriptive statistics, frequency statistics, comparative means, and correlations for each component.

5.4.1 Perceived Impacts of Advanced and Blockchain Technologies Adoption on Customer Segments, Channels, and Customer Relationships (RQ1)

This section includes 12 variables, divided into two categories: six related to blockchain technology and six related to advanced technologies. Each variable is assigned a value and is evaluated using a Likert scale that ranges from one to six. A score of one indicates "strongly agree," five indicates "strongly disagree," while a score of six indicates "not applicable."

Perceived Impacts of Advanced Technologies Adoption on Customer Segments, Channels, and Customer Relationships

This question in the survey identifies how the adoption of advanced technologies can benefit organisations in various ways, such as increasing existing customers, adding new customer segments, adding new channels, enhancing transparency between the organisation and its customers, improving data security, and improving trust.

Statistics							
		Adv Tech Increase Existing Customer Segments	**Adv Tech Add new Customer Segments**	**Adv Tech Add New Channel**	**Adv Tech Strengthen Transparency**	**Adv Tech Improve Data Security**	**Adv Tech Improve Trust**
N	Valid	72	72	72	72	72	72
	Missing	0	0	0	0	0	0
Mean		2.33	2.40	2.17	2.49	2.35	2.38
Median		2.00	2.00	2.00	2.00	2.00	2.00
Mode		2	2	2	2	2	2

Table 5.49: Descriptive Statistics for Perceived Impacts of Advanced Technologies Adoption

Table 5.49 shows that the highest mean was in the variable of the adoption of advanced technologies helping strengthen the transparency between the organisation and customers, indicating high agreement from the respondents. The median is 2 for all six variables, indicating that the agreed label is the middle value in the dataset. Similarly, the mode is also 2

for each of the six variables, signifying that this value appears most frequently in the dataset and illustrating a general agreement among the organisations regarding all six variables.

Perceived Impacts of Advanced Technologies Adoption on Customer Segments

For Customer Segments, the survey results indicated that most respondents agreed on advanced technologies, expanding their existing customer segments, and adding new customer segments (See Table 5.50).

Adv Tech Increase Existing Customer Segments			**Adv Tech Add new Customer Segments**	
	N	**%**	**N**	**%**
Strongly Agree	18	25.00%	18	25.00%
Agree	31	43.10%	27	37.50%
Neutral	12	16.70%	15	20.80%
Disagree	4	5.60%	5	6.90%
Strongly Disagree	6	8.30%	6	8.30%
Not Applicable	1	1.40%	1	1.40%

Table 5.50: Frequency Statistics for Perceived Impacts of Advanced Technologies Adoption on Customer Segments (N=72)

Perceived Impacts of Advanced Technologies Adoption on Channels

For channels, respondents agreed that adopting advanced technologies has facilitated the creation of new channels between the organisation and its customers (See Table 5.51).

Adv Tech Add New Channel		
	N	**%**
Strongly Agree	24	33.3%
Agree	30	41.7%
Neutral	7	9.7%
Disagree	5	6.9%
Strongly Disagree	5	6.9%
Not Applicable	1	1.4%

Table 5.51: Frequency Statistics for Perceived Impacts of Advanced Technologies Adoption on Channels (N=72)

Perceived Impacts of Advanced Technologies Adoption on Customer Relationships

For customer relationships, respondents agreed that adopting advanced technologies has helped strengthen transparency between the organisation and its customers, improve data security, and enhance customer trust (See Table 5.52).

Adv Tech Strengthen Transparency			Adv Tech Improve Data Security		Adv Tech Improve Trust	
	N	%	N	%	N	%
Strongly Agree	17	23.60%	20	27.80%	19	26.40%
Agree	26	36.10%	28	38.90%	27	37.50%
Neutral	14	19.40%	12	16.70%	15	20.80%
Disagree	8	11.10%	5	6.90%	3	4.20%
Strongly Disagree	6	8.30%	5	6.90%	7	9.70%
Not Applicable	1	1.40%	2	2.80%	1	1.40%

Table 5.52: Frequency Statistics for Perceived Impacts of Advanced Technologies Adoption on Customer Relationships (N=72)

Analysis of Perceived Impacts of Adv Tech: Organisation Size

Next, the researcher analyzed 72 adopters of advanced technologies by conducting a comparative mean test between the dependent variables of advanced technology adoption on customer segments (CS), channels (CH), and customer relationships (CR) and the size variable as independent variables.

Advanced Technologies Adoption on Customer Segments, Channels, and Customer Relationships * Size							
Size		Adv Tech Increase Existing Customer Segments	Adv Tech Add New Customer Segments	Adv Tech Add New Channel	Adv Tech Strengthen Transparency	Adv Tech Improve Data Security	Adv Tech Improve Trust
Micro	Mean	2.00	2.00	2.13	2.13	2.00	2.00
	N	8	8	8	8	8	8
	Std. Deviation	.756	.756	.835	.835	.756	.926
Small	Mean	2.22	2.22	2.00	1.78	2.22	2.33
	N	9	9	9	9	9	9
	Std. Deviation	1.481	1.563	1.581	.667	1.563	1.500
Medium	Mean	1.89	2.00	1.67	2.22	1.67	2.00
	N	9	9	9	9	9	9
	Std. Deviation	1.269	1.323	1.000	1.394	1.000	1.323
Large	Mean	2.25	2.00	1.88	2.25	2.00	2.25
	N	8	8	8	8	8	8
	Std. Deviation	1.282	1.069	.991	1.035	1.414	1.035
Very large	Mean	2.55	2.71	2.39	2.84	2.68	2.58
	N	38	38	38	38	38	38
	Std. Deviation	1.245	1.250	1.326	1.405	1.317	1.328
Total	Mean	2.33	2.40	2.17	2.49	2.35	2.38
	N	72	72	72	72	72	72
	Std. Deviation	1.233	1.252	1.245	1.278	1.302	1.272

Table 5.53: Size Affect Adopt of Advanced Technology on CS, CH, CR

Table 5.53 shows that very large organisations have a higher mean across all six variables, indicating disagreement regarding the benefits of adopting advanced technologies. In contrast, medium-sized organisations report a lower mean for adopting advanced technology to expand existing customer segments, indicating that fewer of these organisations agree. Additionally, small organisations show a lower mean concerning the perceived impacts of advanced technologies adoption in enhancing transparency, which implies that fewer small organisations agree with this question. Furthermore, medium-sized organisations have a lower mean of improving data security through advanced technologies, indicating fewer agree.

Analysis of Perceived Impacts of Adv Tech: Organisation Age

Next, the researcher analyzed 72 adopters of advanced technologies by conducting a comparative mean test between the dependent variables of advanced technology adoption on customer segments (CS), channels (CH), and customer relationships (CR) and the age variable as independent variables.

Advanced Technologies Adoption on Customer Segments, Channels, and Customer Relationships * Age							
Age		**Adv Tech Increase Existing Customer Segments**	**Adv Tech Add New Customer Segments**	**Adv Tech Add New Channel**	**Adv Tech Strengthen Transparency**	**Adv Tech Improve Data Security**	**Adv Tech Improve Trust**
Less than 1 year	Mean	1.67	1.67	1.67	2.00	1.67	2.33
	N	3	3	3	3	3	3
	Std. Deviation	1.155	1.155	1.155	1.000	1.155	1.155
1-5 years	Mean	2.12	2.06	1.94	1.88	2.12	2.06
	N	16	16	16	16	16	16
	Std. Deviation	1.408	1.436	1.340	1.025	1.360	1.436
6-10 years	Mean	2.25	2.25	2.25	3.75	2.00	1.75
	N	4	4	4	4	4	4
	Std. Deviation	1.258	1.258	1.258	1.708	.000	.500
11-20 years	Mean	2.67	2.78	2.39	2.67	2.44	2.78
	N	18	18	18	18	18	18
	Std. Deviation	1.188	1.353	1.335	1.237	1.294	1.353
More than 20 years	Mean	2.32	2.45	2.19	2.58	2.52	2.39
	N	31	31	31	31	31	31
	Std. Deviation	1.194	1.091	1.195	1.285	1.387	1.202
Total	Mean	2.33	2.40	2.17	2.49	2.35	2.38
	N	72	72	72	72	72	72
	Std. Deviation	1.233	1.252	1.245	1.278	1.302	1.272

Table 5.54: Age Affect Adopt of Advanced Technology on CS, CH, CR

Table 5.54 reveals that organisations aged between 11 to 20 years have had a higher mean across all variables, indicating disagreements regarding the benefits of adopting advanced technologies in these variables. organisations that have been in operation for over 20 years also have had a higher mean in five variables, indicating disagreements on the advantages of utilizing advanced technologies. Additionally, organisations aged six to ten years demonstrate a higher mean in two variables, reflecting a disagreement on the benefits of adopting advanced technologies. In contrast, less than one year old organisations have had a lower mean in all variables, indicating that fewer organisations agree on the perceived impacts of adopting advanced technologies on all aspects of customer segments (CS), channels (CH), and customer relationships (CR).

Analysis of Perceived Impacts of Adv Tech: Organisation Industry

Next, the researcher analyzed 72 adopters of advanced technologies by conducting a comparative mean test between the dependent variables of advanced technology adoption on

customer segments (CS), channels (CH), and customer relationships (CR) and the industry variable as independent variables.

Advanced Technologies Adoption on Customer Segments, Channels, and Customer Relationships * Industry							
Industry		**Adv Tech Increase Existing Customer Segments**	**Adv Tech Add New Customer Segments**	**Adv Tech Add New Channel**	**Adv Tech Strengthen Transparency**	**Adv Tech Improve Data Security**	**Adv Tech Improve Trust**
Supply Chain Management	Mean	3.67	4.00	3.67	3.67	3.00	3.67
	N	3	3	3	3	3	3
	Std. Deviation	1.528	1.732	1.528	1.528	1.732	2.309
Financial Services	Mean	2.17	2.33	2.33	2.33	2.33	2.50
	N	6	6	6	6	6	6
	Std. Deviation	1.602	1.751	1.751	1.751	1.751	1.761
IT	Mean	2.21	2.11	2.05	2.32	2.21	2.26
	N	19	19	19	19	19	19
	Std. Deviation	1.134	1.049	.911	1.108	1.398	.933
Consultancy	Mean	1.90	2.00	1.70	2.70	2.00	1.90
	N	10	10	10	10	10	10
	Std. Deviation	.568	.667	.675	1.418	.667	.876
Education	Mean	2.73	2.73	2.36	2.73	3.36	2.73
	N	11	11	11	11	11	11
	Std. Deviation	1.272	1.272	1.433	1.348	1.502	1.348
Health	Mean	1.00	1.00	1.00	1.00	3.00	1.00
	N	1	1	1	1	1	1
	Std. Deviation	.000	.000	.000	.000	.000	.000
Government	Mean	1.33	1.67	1.00	2.00	1.00	1.67
	N	3	3	3	3	3	3
	Std. Deviation	.577	1.155	.000	1.000	.000	1.155
Manufacturing	Mean	2.50	2.67	2.67	2.67	3.00	2.83
	N	6	6	6	6	6	6
	Std. Deviation	.837	.516	1.366	1.366	1.095	1.169
Retail	Mean	2.50	2.50	2.50	2.50	2.50	2.50
	N	2	2	2	2	2	2
	Std. Deviation	.707	.707	.707	.707	.707	.707
Other	Mean	2.55	2.73	2.18	2.27	1.64	2.27
	N	11	11	11	11	11	11
	Std. Deviation	1.695	1.679	1.537	1.272	.505	1.555
Total	Mean	2.33	2.40	2.17	2.49	2.35	2.38
	N	72	72	72	72	72	72
	Std. Deviation	1.233	1.252	1.245	1.278	1.302	1.272

Table 5.55: Industry Affect Adopt of Advanced Technology on CS, CH, CR

Table 5.55 shows that the supply chain industry has had a higher mean among all questions of adopting advanced technologies in the organisation, indicating disagreements regarding the benefits of these technologies in this industry. In contrast, the health industry has had a lower mean in five questions, indicating fewer organisations agree on the perceived impacts of adopting advanced technology on increased existing customer segments, added new customer segments, added new channels, strengthened transparency, and improved trust. Except for improved data security question, which indicated that all organisations in the health industry agree with this question.

Analysis of Perceived Impacts of Adv Tech: Correlation

The researcher analyzed 72 adopters of advanced technologies by conducting a bivariate correlation between all Likert scale six variables specifically Spearman correlation coefficients. The Spearman rank correlation can take a value from +1 to -1 to give the strength of the relationship. Also, this test gives the direction of the relationship.

Correlations											
			Size	**Age**	**Industry**	**Adv Tech Increase Existing Customer Segments**	**Adv Tech Add New Customer Segments**	**Adv Tech Add New Channel**	**Adv Tech Strengthen Transparency**	**Adv Tech Improve Data Security**	**Adv Tech Improve Trust**
Spearman's rho	Size	Correlation Coefficient	1.000	.603**	.134	.208	.266*	.152	.273*	.267*	.166
		Sig. (2-tailed)	.000	<.001	.260	.080	.024	.203	.020	.023	.164
		N	72	72	72	72	72	72	72	72	72
	Age	Correlation Coefficient	.603**	1.000	.193	.117	.203	.122	.170	.163	.122
		Sig. (2-tailed)	<.001	.000	.104	.328	.088	.308	.154	.171	.307
		N	72	72	72	72	72	72	72	72	72
	Industry	Correlation Coefficient	.134	.193	1.000	.017	.085	-.066	-.038	-.013	-.035
		Sig. (2-tailed)	.260	.104	.000	.887	.479	.584	.753	.912	.773
		N	72	72	72	72	72	72	72	72	72
	Adv Tech Increase Existing Customer Segments	Correlation Coefficient	.208	.117	.017	1.000	.876**	.855**	.714**	.552**	.759**
		Sig. (2-tailed)	.080	.328	.887	.000	<.001	<.001	<.001	<.001	<.001
		N	72	72	72	72	72	72	72	72	72
	Adv Tech Add New Customer Segments	Correlation Coefficient	.266*	.203	.085	.876**	1.000	.830**	.726**	.552**	.753**
		Sig. (2-tailed)	.024	.088	.479	<.001	.000	<.001	<.001	<.001	<.001
		N	72	72	72	72	72	72	72	72	72
	Adv Tech Add New Channel	Correlation Coefficient	.152	.122	-.066	.855**	.830**	1.000	.691**	.595**	.736**
		Sig. (2-tailed)	.203	.308	.584	<.001	<.001	.000	<.001	<.001	<.001
		N	72	72	72	72	72	72	72	72	72
	Adv Tech Strengthen Transparency	Correlation Coefficient	.273*	.170	-.038	.714**	.726**	.691**	1.000	.539**	.688**
		Sig. (2-tailed)	.020	.154	.753	<.001	<.001	<.001	.000	<.001	<.001
		N	72	72	72	72	72	72	72	72	72
	Adv Tech Improve Data Security	Correlation Coefficient	.267*	.163	-.013	.552**	.552**	.595**	.539**	1.000	.487**
		Sig. (2-tailed)	.023	.171	.912	<.001	<.001	<.001	<.001	.000	<.001
		N	72	72	72	72	72	72	72	72	72
	Adv Tech Improve Trust	Correlation Coefficient	.166	.122	-.035	.759**	.753**	.736**	.688**	.487**	1.000
		Sig. (2-tailed)	.164	.307	.773	<.001	<.001	<.001	<.001	<.001	.000
		N	72	72	72	72	72	72	72	72	72
**. Correlation is significant at the 0.01 level (2-tailed).											
*. Correlation is significant at the 0.05 level (2-tailed).											

Table 5.56: Correlation of Adopt Advanced Technologies on CS, CH, CR

Table 5.56 shows that the value of 0.603** indicates a moderate positive correlation between the Size and Age variables. In addition, the values of 0.266*, 0.273*, and 0.267* indicate that the Size variable has a weak positive correlation with the following variables: adding new customer segments through advanced technologies, strengthening transparency by advanced technologies, and improving data security through advanced technologies. Furthermore, the range of values between 0.5 and 0.8 for the six variables indicates a moderate to strong positive correlation.

Perceived Impacts of Blockchain Technologies Adoption on Customer Segments, Channels, and Customer Relationships

This question in the survey identifies how the 41 adopters of BC technology perceive the impacts of blockchain adoption in terms of increasing existing customer segments, adding new customer segments, adding new channels, enhancing transparency between the organisation and its customers, improving data security, and improving trust.

Statistics							
		BC Increase Existing Customer Segments	**BC Add new Customer Segments**	**BC Add New Channel**	**BC Strengthen Transparency**	**BC Improve Data Security**	**BC Improve Trust**
N	Valid	41	41	41	41	41	41
	Missing	0	0	0	0	0	0
Mean		3.22	3.37	3.29	3.17	3.12	3.15
Median		3.00	3.00	3.00	3.00	3.00	3.00
Mode		2	3	2	2	2	2

Table 5.57: Descriptive Statistics for Perceived Impacts of Blockchain Technologies Adoption

Table 5.57 reveals that the highest mean is associated with the variable regarding adopting blockchain technologies to add new customer segments, indicating disagreement among respondents. The median value for all six variables is 3, indicating that the middle value of the dataset is neutral. The mode is 2 for five of the variables and 3 for the variable related to blockchain technologies that facilitate the addition of new customer segments. A mode of 2 indicates that the most common response for these five variables reflects agreement. In contrast, a mode of 3 signifies that the most common response for the blockchain technology variable that helps add new customer segments is neutral.

Perceived Impacts of Blockchain (BC) Technologies Adoption on Customer Segments

The survey results indicated that the respondents agreed that adopting blockchain technologies would enhance existing customer segments and develop new ones. Also, the respondents expressed neutrality on the perceived impacts of blockchain technology on increased existing and added new customer segments, reflecting a lack of strong opinions, while only a low number disagreed, suggesting minimal resistance. Additionally, some respondents considered the question irrelevant to their current roles or business concerns (See Table 5.58).

BC Increase Existing Customer Segments			**BC Add New Customer Segments**	
	N	**%**	**N**	**%**
Strongly Agree	4	9.80%	3	7.30%
Agree	13	31.70%	11	26.80%
Neutral	11	26.80%	12	29.30%
Disagree	3	7.30%	6	14.60%
Strongly Disagree	3	7.30%	1	2.40%
Not Applicable	7	17.10%	8	19.50%

Table 5.58: Frequency Statistics for Perceived Impacts of Blockchain Technologies Adoption on Customer Segments (N=41)

Perceived Impacts of Blockchain Technologies Adoption on Channels

For Channels, the respondents are more likely to adopt blockchain technologies for adding new channels in their organisation (See Table 5.59).

BC Add New Channels		
	N	**%**
Strongly Agree	3	7.3%
Agree	15	36.6%
Neutral	8	19.5%
Disagree	5	12.2%
Strongly Disagree	2	4.9%
Not Applicable	8	19.5%

Table 5.59: Frequency Statistics for Perceived Impacts of Blockchain Technologies Adoption on Channels (N=41)

Perceived Impacts of Blockchain Technologies Adoption on Customer Relationships

The survey results indicated that the respondents agreed that adopting blockchain technologies would strengthen transparency between the organisation and the customers, improve data security, and improve trust for customer relationships. Also, the respondents expressed neutrality on these three statements, reflecting a lack of strong opinions, while only a low

number disagreed, suggesting minimal resistance. Additionally, some respondents found the question irrelevant to their current roles or business concerns (See Table 5.60).

BC Strengthen Transparency			BC Improve Data Security		BC Improve Trust	
	N	%	N	%	N	%
Strongly Agree	5	12.20%	6	14.60%	8	19.50%
Agree	12	29.30%	14	34.10%	10	24.40%
Neutral	11	26.80%	8	19.50%	9	22.00%
Disagree	4	9.80%	3	7.30%	4	9.80%
Strongly Disagree	2	4.90%	2	4.90%	2	4.90%
Not Applicable	7	17.10%	8	19.50%	8	19.50%

Table 5.60: Frequency Statistics for Perceived Impacts of Blockchain Technologies Adoption on Customer Relationships (N=41)

Analysis of Perceived Impacts of Blockchain Technology: Organisation Size

Next, the researcher analyzed 41 adopters of blockchain technologies by conducting a comparative mean test between the dependent variables of blockchain technology adoption on customer segments (CS), channels (CH), and customer relationships (CR) and the size variable as independent variables.

Blockchain Technologies Adoption on CS, CH, CR * Size							
Size		BC Increase Existing Customer Segments	BC Add new Customer Segments	BC Add New Channels	BC Strengthen Transparency	BC Improve Data Security	BC Improve Trust
Micro	Mean	3.83	4.00	4.00	3.83	3.33	3.50
	N	6	6	6	6	6	6
	Std. Deviation	1.722	1.673	1.673	1.722	2.160	2.074
Small	Mean	4.00	4.00	4.00	3.50	3.50	3.50
	N	2	2	2	2	2	2
	Std. Deviation	2.828	2.828	2.828	3.536	3.536	3.536
Medium	Mean	3.25	3.50	3.50	3.50	3.50	3.50
	N	4	4	4	4	4	4
	Std. Deviation	2.062	2.082	2.082	2.082	2.082	2.082
Large	Mean	3.43	3.43	3.57	3.29	3.57	3.43
	N	7	7	7	7	7	7
	Std. Deviation	1.813	1.813	1.813	1.380	1.902	1.902
Very large	Mean	2.91	3.09	2.91	2.86	2.82	2.86
	N	22	22	22	22	22	22
	Std. Deviation	1.444	1.377	1.477	1.521	1.468	1.583
Total	Mean	3.22	3.37	3.29	3.17	3.12	3.15
	N	41	41	41	41	41	41
	Std. Deviation	1.620	1.577	1.647	1.626	1.735	1.769

Table 5.61: Size Affect Adopt of Blockchain Technology on CS, CH, CR

Table 5.61 shows that small organisations have higher mean on adoption blockchain technology to increase existing customer segments, add new customer segments, and add new channels indicating disagreement in these three variables. Micro organisations have higher mean on adoption blockchain technology to add new customer segments, add new channels indicate disagreement in these two variables. Large organisations have had higher mean on adoption blockchain technology to improve data security indicate disagreement with this variable. In contrast, very large organisations have had lower mean on adoption blockchain technology to increase existing customer segments, add new customer segments, and add new channels indicate agreement in these three variables.

Analysis of Perceived Impacts of Blockchain Technology: Organisation Age

Next, the researcher analyzed 41 adopters of blockchain technologies by conducting a comparative mean test between the dependent variables of blockchain technology adoption on customer segments (CS), channels (CH), and customer relationships (CR) and the age variable as independent variables.

Blockchain Technologies Adoption on CS, CH, CR* Age							
Age		**BC Increase Existing Customer Segments**	**BC Add new Customer Segments**	**BC Add New Channels**	**BC Strengthen Transparency**	**BC Improve Data Security**	**BC Improve Trust**
Less than 1 year	Mean	5.00	5.00	5.00	5.00	5.00	5.00
	N	3	3	3	3	3	3
	Std. Deviation	1.732	1.732	1.732	1.732	1.732	1.732
1-5 years	Mean	2.80	2.80	2.80	2.60	2.20	2.20
	N	5	5	5	5	5	5
	Std. Deviation	1.924	1.924	1.924	2.074	2.168	2.168
6-10 years	Mean	4.00	4.50	4.00	3.00	4.00	4.00
	N	2	2	2	2	2	2
	Std. Deviation	2.828	2.121	2.828	1.414	2.828	2.828
11-20 years	Mean	3.58	3.42	3.25	3.33	3.08	3.42
	N	12	12	12	12	12	12
	Std. Deviation	1.564	1.443	1.603	1.614	1.730	1.676
More than 20 years	Mean	2.74	3.11	3.11	2.95	3.00	2.84
	N	19	19	19	19	19	19
	Std. Deviation	1.327	1.449	1.487	1.471	1.453	1.537
Total	Mean	3.22	3.37	3.29	3.17	3.12	3.15
	N	41	41	41	41	41	41
	Std. Deviation	1.620	1.577	1.647	1.626	1.735	1.769

Table 5.62: Age Affect Adopt of Blockchain Technology on CS, CH, CR

Table 5.62 shows that organisations aged less than one year have had higher mean in all six variables of adopting blockchain technologies indicating that organisations disagree in these six variables of adopting blockchain technologies on customer segments, channels, and customer relationships. In contrast, organisations operated more than 20 years have had lower mean on adopting blockchain technologies in increase existing customer segments indicating that organisation agreed with this question. In addition, organisations aged one to five years have had lower mean on adopting blockchain technologies to add new customer segments and improve data security indicating agreement of these two questions.

Analysis of Perceived Impacts of Blockchain Technology: Organisation Industry

Next, the researcher analyzed 41 adopters of blockchain technologies by conducting a comparative mean test between the dependent variables of blockchain technology adoption on

customer segments (CS), channels (CH), and customer relationships (CR) and the industry variable as independent variables.

Blockchain Technologies Adoption on CS, CH, CR * Industry							
Industry		**BC Increase Existing Customer Segments**	**BC Add new Customer Segments**	**BC Add New Channels**	**BC Strengthen Transparency**	**BC Improve Data Security**	**BC Improve Trust**
Supply Chain Management	Mean	3.50	2.50	3.50	3.50	3.00	3.00
	N	2	2	2	2	2	2
	Std. Deviation	2.121	.707	2.121	2.121	2.828	2.828
Financial Services	Mean	5.80	5.40	5.40	5.40	5.40	5.40
	N	5	5	5	5	5	5
	Std. Deviation	.447	1.342	1.342	1.342	1.342	1.342
IT	Mean	2.91	3.09	3.27	2.64	2.64	2.82
	N	11	11	11	11	11	11
	Std. Deviation	1.221	1.300	1.272	.924	1.502	1.401
Consultancy	Mean	3.56	3.67	3.56	3.56	3.56	3.44
	N	9	9	9	9	9	9
	Std. Deviation	1.667	1.581	1.667	1.667	1.667	1.810
Education	Mean	2.50	2.50	2.50	1.50	1.50	2.50
	N	2	2	2	2	2	2
	Std. Deviation	.707	.707	.707	.707	.707	2.121
Health	Mean	1.00	1.00	1.00	1.00	3.00	1.00
	N	1	1	1	1	1	1
	Std. Deviation	.000	.000	.000	.000	.000	.000
Government	Mean	1.00	3.50	3.50	3.50	3.50	3.50
	N	2	2	2	2	2	2
	Std. Deviation	.000	3.536	3.536	3.536	3.536	3.536
Manufacturing	Mean	3.00	3.33	2.67	3.00	3.00	2.67
	N	3	3	3	3	3	3
	Std. Deviation	1.000	1.155	1.155	1.000	1.000	.577
Retail	Mean	3.00	3.00	3.00	3.00	3.00	3.00
	N	1	1	1	1	1	1
	Std. Deviation	.000	.000	.000	.000	.000	.000
Other	Mean	2.40	2.60	1.80	2.40	1.80	2.00
	N	5	5	5	5	5	5
	Std. Deviation	1.140	1.140	.447	1.140	.447	1.225
Total	Mean	3.22	3.37	3.29	3.17	3.12	3.15
	N	41	41	41	41	41	41
	Std. Deviation	1.620	1.577	1.647	1.626	1.735	1.769

Table 5.63: Industry Affect Adopt of Blockchain Technology on CS, CH, CR

Table 5.63 shows that in the financial services industry organisations have had higher mean in adopting blockchain technologies in all six variables indicating that these questions are disagreement in their organisations. In contrast, in health industry organisation had lower mean indicating this organisation agree with the variable of adopting blockchain technologies improve trust.

Analysis of Perceived Impacts of Blockchain Tech: Correlation

The researcher analyzed 41 adopters of blockchain technologies by conducting a bivariate correlation between all Likert scale six variables specifically Spearman correlation coefficients. The Spearman rank correlation can take a value from +1 to -1 to give the strength of the relationship. Also, this test gives the direction of the relationship.

Correlations											
			Size	**Age**	**Industry**	**BC Increase Existing Customer Segments**	**BC Add new Customer Segments**	**BC Add New Channels**	**BC Strengthen Transparency**	**BC Improve Data Security**	**BC Improve Trust**
Spearman's rho	Size	Correlation Coefficient	1.000	.551**	.177	-.223	-.181	-.274	-.236	-.130	-.151
		Sig. (2-tailed)	.000	<.001	.269	.161	.257	.083	.138	.418	.345
		N	41	41	41	41	41	41	41	41	41
	Age	Correlation Coefficient	.551**	1.000	.236	-.238	-.148	-.109	-.106	-.016	-.113
		Sig. (2-tailed)	<.001	.000	.138	.133	.355	.497	.510	.923	.481
		N	41	41	41	41	41	41	41	41	41
	Industry	Correlation Coefficient	.177	.236	1.000	-.404**	-.232	-.480**	-.306	-.284	-.318*
		Sig. (2-tailed)	.269	.138	.000	.009	.145	.001	.052	.071	.043
		N	41	41	41	41	41	41	41	41	41
	BC Increase Existing Customer Segments	Correlation Coefficient	-.223	-.238	-.404**	1.000	.821**	.793**	.785**	.691**	.804**
		Sig. (2-tailed)	.161	.133	.009	.000	<.001	<.001	<.001	<.001	<.001
		N	41	41	41	41	41	41	41	41	41
	BC Add new Customer Segments	Correlation Coefficient	-.181	-.148	-.232	.821**	1.000	.868**	.861**	.762**	.870**
		Sig. (2-tailed)	.257	.355	.145	<.001	.000	<.001	<.001	<.001	<.001
		N	41	41	41	41	41	41	41	41	41
	BC Add New Channels	Correlation Coefficient	-.274	-.109	-.480**	.793**	.868**	1.000	.888**	.839**	.900**
		Sig. (2-tailed)	.083	.497	.001	<.001	<.001	.000	<.001	<.001	<.001
		N	41	41	41	41	41	41	41	41	41
	BC Strengthen Transparency	Correlation Coefficient	-.236	-.106	-.306	.785**	.861**	.888**	1.000	.858**	.923**
		Sig. (2-tailed)	.138	.510	.052	<.001	<.001	<.001	.000	<.001	<.001
		N	41	41	41	41	41	41	41	41	41
	BC Improve Data Security	Correlation Coefficient	-.130	-.016	-.284	.691**	.762**	.839**	.858**	1.000	.871**
		Sig. (2-tailed)	.418	.923	.071	<.001	<.001	<.001	<.001	.000	<.001
		N	41	41	41	41	41	41	41	41	41
	BC Improve Trust	Correlation Coefficient	-.151	-.113	-.318*	.804**	.870**	.900**	.923**	.871**	1.000
		Sig. (2-tailed)	.345	.481	.043	<.001	<.001	<.001	<.001	<.001	.000
		N	41	41	41	41	41	41	41	41	41
**. Correlation is significant at the 0.01 level (2-tailed).											
*. Correlation is significant at the 0.05 level (2-tailed).											

Table 5.64: Correlation of Adopt Blockchain Technologies on CS, CH, CR

Table 5.64 shows that the value of -0.404** indicates a moderate negative correlation between the industry and adopting blockchain technology help to increase existing customer segments. In addition, the value of -0.480** indicates moderate negative correlation between the industry and adopt blockchain technologies help to add new channels. Also, the value of -0.318* indicates weak negative correlation between the industry and adopting blockchain technology help to improve trust. But, for the six variables the amount is from 0.6 to 0.9 positive moderate to strong correlation with each other.

5.4.2 Perceived Impacts of Advanced and Blockchain Technologies Adoption on Key Partners, Key Recourse, and Key Activities (RQ2)

This section contains 14 variables, with seven related to blockchain and seven related to advanced technologies. The Likert scale in this section ranked from one to six, with one indicating "strongly agree", five indicating "strongly disagree" and six indicating "not applicable."

Perceived Impacts of Advanced Technologies Adoption on Key Partnerships (KP), Key Resources (KR), and Key Activities (KA)

This survey question examines how adopting advanced technologies can enhance organisations by focusing on key partnerships, resources, and activities. It analyses the various benefits, such as establishing new partnerships, maintaining existing ones, optimizing physical resources, improving non-physical resources, developing human resources, increasing the effectiveness of activities, and increasing overall efficiency.

Statistics								
		Adv Tech Allow Add New Partners	**Adv Tech Improve Existing Partners**	**Adv Tech Improve Physical Resources**	**Adv Tech Improve Non-Physical Resources**	**Adv Tech Improve Human Resources**	**Adv Tech Make Activities More Effective**	**Adv Tech Make Activities More Efficient**
N	Valid	72	72	72	72	72	72	72
	Missing	0	0	0	0	0	0	0
Mean		2.46	2.31	2.58	2.40	2.50	2.28	2.44
Median		2.00	2.00	2.00	2.00	2.00	2.00	2.00
Mode		2	2	2	2	2	2	2

Table 5.65: Descriptive Statistics for Perceived Impacts of Advanced Technologies Adoption on KP, KR, KA

Table 5.65 shows that the highest mean was in the variable for the adoption of advanced technologies helping to improve physical resources, indicating disagreement from the respondents. The median is 2 for all seven variables, indicating that the agreed label is the middle value in the dataset. Similarly, the mode is also 2 for each of the seven variables, signifying that this value appears most frequently in the dataset and illustrating a general agreement among the organisations regarding all seven variables.

Perceived Impacts of Advanced Technologies Adoption on Key Partnerships

For key partners, the survey results showed that most respondents agreed that adopting advanced technologies has allowed organisations to add new partners and improved their collaboration with their existing partners (See Table 5.66).

Adv Tech Allow Add New Partners			**Adv Tech Improve Existing Partners**	
	N	**%**	**N**	**%**
Strongly Agree	15	20.80%	15	20.80%
Agree	36	50.00%	38	52.80%
Neutral	6	8.30%	9	12.50%
Disagree	6	8.30%	4	5.60%
Strongly Disagree	6	8.30%	4	5.60%
Not Applicable	3	4.20%	2	2.80%

Table 5.66: Frequency Statistics for Perceived Impacts of Advanced Technologies Adoption on KP (N=72)

Perceived Impacts of Advanced Technologies Adoption on Key Resources

Respondents agreed that adopting advanced technologies has enhanced organisation development in three key areas: physical, non-physical, and human resources (See Table 5.67).

Adv Tech Improve Physical Resources			**Adv Tech Improve Non-Physical Resources**		**Adv Tech Improve Human Resources**	
	N	**%**	**N**	**%**	**N**	**%**
Strongly Agree	14	19.40%	16	22.20%	16	22.20%
Agree	29	40.30%	31	43.10%	27	37.50%
Neutral	15	20.80%	13	18.10%	17	23.60%
Disagree	4	5.60%	6	8.30%	4	5.60%
Strongly Disagree	7	9.70%	4	5.60%	5	6.90%
Not Applicable	3	4.20%	2	2.80%	3	4.20%

Table 5.67: Frequency Statistics for Perceived Impacts of Advanced Technologies Adoption on KR (N=72)

Perceived Impacts of Advanced Technologies Adoption on Key Activities

The respondents agreed that adopting advanced technologies has made organisations activities more effective and efficient (See Table 5.68).

Adv Tech Make Activities More Effective			**Adv Tech Make Activities More Efficient**	
	N	**%**	**N**	**%**
Strongly Agree	19	26.40%	19	26.40%
Agree	31	43.10%	27	37.50%
Neutral	12	16.70%	12	16.70%
Disagree	5	6.90%	6	8.30%
Strongly Disagree	3	4.20%	5	6.90%
Not Applicable	2	2.80%	3	4.20%

Table 5.68: Frequency Statistics for Perceived Impacts of Advanced Technologies Adoption on KA (N=72)

Analysis of Perceived Impacts of Adv Tech: Organisation Size

Next, the researcher analyzed 72 adopters of advanced technologies by conducting a comparative mean test between the dependent variables of advanced technology adoption on key partnerships (KP), key resources (KR), and key activities (KA) and the size variable as independent variables.

Advanced Technologies Adoption on KP, KR, and KA * Size								
Size		**Adv Tech Allow Add New Partners**	**Adv Tech Improve Existing Partners**	**Adv Tech Improve Physical Resources**	**Adv Tech Improve Non-Physical Resources**	**Adv Tech Improve Human Resources**	**Adv Tech Make Activities More Effective**	**Adv Tech Make Activities More Efficient**
Micro	Mean	2.63	2.75	3.25	2.63	2.88	2.50	2.75
	N	8	8	8	8	8	8	8
	Std. Deviation	1.685	1.581	1.832	1.598	1.458	1.604	1.669
Small	Mean	2.00	1.89	2.22	2.22	2.56	1.89	2.00
	N	9	9	9	9	9	9	9
	Std. Deviation	1.581	1.616	1.563	1.481	2.007	1.616	1.581
Medium	Mean	2.00	2.00	2.11	2.00	2.00	1.89	2.00
	N	9	9	9	9	9	9	9
	Std. Deviation	1.225	1.225	1.364	1.323	1.323	1.054	1.323
Large	Mean	2.00	2.13	2.50	2.38	2.38	2.00	2.00
	N	8	8	8	8	8	8	8
	Std. Deviation	.926	.991	1.069	.916	1.188	.535	.756
Very large	Mean	2.74	2.42	2.66	2.50	2.55	2.47	2.68
	N	38	38	38	38	38	38	38
	Std. Deviation	1.329	1.030	1.258	1.180	1.155	1.156	1.358
Total	Mean	2.46	2.31	2.58	2.40	2.50	2.28	2.44
	N	72	72	72	72	72	72	72
	Std. Deviation	1.363	1.194	1.361	1.241	1.322	1.213	1.373

Table 5.69: Size Affect Adoption of Advanced Technology on KP, KR, and KA

Table 5.69 shows that micro-organisations had a higher mean in adopting advanced technologies to improve physical resources variables compared to the total mean on key resources indicating that organisations disagree for adoption of advanced technologies had an impacts on key resources. In addition, very large organisations had a higher mean than that total mean in adopting advanced technologies on all seven aspects, indicating that organisation disagree for adoption of advanced technologies on all seven aspects. However, small and medium organisations had a lower mean in six variables than the total mean, indicating that organisations agreed on these six variables.

Analysis of Perceived Impacts of Adv Tech: Organisation Age

Next, the researcher analyzed 72 adopters of advanced technologies by conducting a comparative mean test between the dependent variables of advanced technology adoption on key partnerships (KP), key resources (KR), and key activities (KA) and the age variable as independent variables.

Advanced Technologies Adoption on KP, KR, and KA * Age								
Age		**Adv Tech Allow Add New Partners**	**Adv Tech Improve Existing Partners**	**Adv Tech Improve Physical Resources**	**Adv Tech Improve Non-Physical Resources**	**Adv Tech Improve Human Resources**	**Adv Tech Make Activities More Effective**	**Adv Tech Make Activities More Efficient**
Less than 1 year	Mean	2.00	2.33	3.67	2.33	2.00	2.00	2.33
	N	3	3	3	3	3	3	3
	Std. Deviation	1.000	1.155	2.082	1.155	1.000	1.000	1.155
1-5 years	Mean	2.37	2.37	2.44	2.50	2.75	2.25	2.38
	N	16	16	16	16	16	16	16
	Std. Deviation	1.708	1.708	1.711	1.673	1.844	1.653	1.708
6-10 years	Mean	1.50	2.00	2.50	2.25	2.00	2.25	3.50
	N	4	4	4	4	4	4	4
	Std. Deviation	.577	.000	.577	.500	.816	1.258	1.915
11-20 years	Mean	2.61	2.44	2.67	2.56	2.56	2.28	2.39
	N	18	18	18	18	18	18	18
	Std. Deviation	1.461	1.294	1.414	1.199	1.294	1.179	1.335
More than 20 years	Mean	2.58	2.23	2.52	2.29	2.45	2.32	2.39
	N	31	31	31	31	31	31	31
	Std. Deviation	1.205	.920	1.151	1.131	1.121	1.045	1.174
Total	Mean	2.46	2.31	2.58	2.40	2.50	2.28	2.44
	N	72	72	72	72	72	72	72
	Std. Deviation	1.363	1.194	1.361	1.241	1.322	1.213	1.373

Table 5.70: Age Affect Adopt of Advanced Technology on KP, KR, and KA

Table 5.70 shows that organisations less than one year old have a higher mean score than the overall average when it comes to adopting advanced technologies to improve physical resources, indicating that these organisations disagree with the effectiveness of the perceived impacts of advanced technology on key resources. Conversely, organisations aged six to ten years have lower mean scores compared to the overall average across six variables, indicating their agreement with the perceived impacts of adopting advanced technology on key partners, resources, and activities. However, these same organisations show higher means of adopting advanced technologies to enhance efficiency in their activities, indicating a disagreement with this particular question on the perceived impacts of adopting advanced technology on key activities. Additionally, organisations over twenty years old have lower mean scores than the overall average in adopting advanced technologies for improving existing partners, improving physical resources, improving non-physical resources, enhancing human resources, and increasing the efficiency of activities, indicating that organisations agree with the effectiveness of the perceived impacts of adopting advanced technology on key partners, key resources and key activities.

Analysis of Perceived Impacts of Adv Tech: Organisation Industry

Next, the researcher analyzed 72 adopters of advanced technologies by conducting a comparative mean test between the dependent variables of advanced technology adoption on key partnerships (KP), key resources (KR), and key activities (KA) and the industry variable as independent variables.

Advanced Technologies Adoption on KP, KR, and KA * Industry								
Industry		**Adv Tech Allow Add New Partners**	**Adv Tech Improve Existing Partners**	**Adv Tech Improve Physical Resources**	**Adv Tech Improve Non-Physical Resources**	**Adv Tech Improve Human Resources**	**Adv Tech Make Activities More Effective**	**Adv Tech Make Activities More Efficient**
Supply Chain Management	Mean	3.67	3.33	3.67	3.33	3.67	3.33	3.67
	N	3	3	3	3	3	3	3
	Std. Deviation	1.528	1.155	1.528	1.155	1.528	1.155	1.528
Financial Services	Mean	2.50	2.50	3.00	2.17	2.17	2.17	2.33
	N	6	6	6	6	6	6	6
	Std. Deviation	1.378	1.517	1.789	1.329	1.602	1.602	1.633
IT	Mean	2.47	2.37	2.79	2.63	3.00	2.21	2.42
	N	19	19	19	19	19	19	19
	Std. Deviation	1.541	1.342	1.548	1.257	1.563	1.228	1.346
Consultancy	Mean	1.70	2.00	1.90	1.90	2.10	1.90	2.50
	N	10	10	10	10	10	10	10
	Std. Deviation	.675	.471	.738	.568	.738	.738	1.434
Education	Mean	2.36	2.27	2.82	2.45	2.36	2.55	2.45
	N	11	11	11	11	11	11	11
	Std. Deviation	1.027	1.104	1.168	1.368	1.120	1.128	1.214
Health	Mean	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	N	1	1	1	1	1	1	1
	Std. Deviation	.000	.000	.000	.000	.000	.000	.000
Government	Mean	2.00	1.67	2.67	2.33	2.00	2.00	2.00
	N	3	3	3	3	3	3	3
	Std. Deviation	.000	.577	.577	.577	1.000	1.000	1.000
Manufacturing	Mean	3.33	2.83	2.83	3.17	2.83	2.83	3.17
	N	6	6	6	6	6	6	6
	Std. Deviation	1.211	1.472	1.472	1.472	.753	1.169	1.329
Retail	Mean	2.50	2.50	2.50	2.50	2.50	2.50	2.50
	N	2	2	2	2	2	2	2
	Std. Deviation	.707	.707	.707	.707	.707	.707	.707
Other	Mean	2.64	2.09	2.09	2.00	2.09	2.09	2.00
	N	11	11	11	11	11	11	11
	Std. Deviation	1.859	1.375	1.446	1.483	1.514	1.578	1.612
Total	Mean	2.46	2.31	2.58	2.40	2.50	2.28	2.44
	N	72	72	72	72	72	72	72
	Std. Deviation	1.363	1.194	1.361	1.241	1.322	1.213	1.373

Table 5.71: Industry Affect Adopt of Advanced Technology on KP, KR, and KA

Table 5.71 shows that the supply chain management and manufacturing industries have a higher mean across all seven variables. This suggests that these organisations tend to disagree with the effectiveness of the perceived impacts of adopting advanced technologies on key partners, resources, and activities. In contrast, in education, a lower mean regarding adopting advanced technologies to add new partners, improve existing partners, enhance non-physical resources, and improve human resources indicates that organisations agreed with the effectiveness of the perceived impacts of adopting advanced technology on key partners and some aspects of key resources. In addition, a higher mean in the financial services industry for adopting advanced technologies to improve physical resources indicates that organisations disagree with this particular question on key resources. Next, in the IT industry, the higher mean about advanced technologies emphasizes their role in enhancing human resources, indicating that organisations disagree with this particular question on perceived impacts of adopting advanced technology on some aspect of key resources. However, in this industry, the lower mean of adopting advanced technologies makes activities more effective and efficient, indicating that the organisations agreed with these two particular questions on key activities. Moreover, the consultancy industry declares a lower mean for adopting advanced technologies in six variables. This suggests that organisations generally agree on the positive impacts of adopting advanced technology on key partners and resources. However, this agreement does not extend to all aspects of key activities.

Analysis of Perceived Impacts of Adv Tech: Correlation

The researcher analyzed 72 adopters of advanced technologies by conducting a bivariate correlation between all Likert scale seven variables specifically Spearman correlation coefficients. The Spearman rank correlation can take a value from +1 to -1 to give the strength of the relationship. Also, this test gives the direction of the relationship.

Correlations												
			Size	Age	Industry	Adv Tech Allow Add New Partners	Adv Tech Improve Existing Partners	Adv Tech Improve Physical Resources	Adv Tech Improve Non-Physical Resources	Adv Tech Improve Human Resources	Adv Tech Make Activities More Effective	Adv Tech Make Activities More Efficient
Spearman's rho	Size	Correlation Coefficient	1.000	.603**	.134	.245*	.175	.062	.105	.072	.206	.179
		Sig. (2-tailed)	.000	<.001	.260	.038	.141	.604	.378	.550	.082	.132
		N	72	72	72	72	72	72	72	72	72	72
	Age	Correlation Coefficient	.603**	1.000	.193	.190	.046	.021	-.021	.062	.127	.034
		Sig. (2-tailed)	<.001	.000	.104	.109	.699	.859	.863	.605	.286	.779
		N	72	72	72	72	72	72	72	72	72	72
	Industry	Correlation Coefficient	.134	.193	1.000	.009	-.132	-.174	-.141	-.156	-.034	-.117
		Sig. (2-tailed)	.260	.104	.000	.939	.270	.144	.237	.191	.774	.328
		N	72	72	72	72	72	72	72	72	72	72
	Adv Tech Allow Add New Partners	Correlation Coefficient	.245*	.190	.009	1.000	.811**	.595**	.672**	.668**	.766**	.636**
		Sig. (2-tailed)	.038	.109	.939	.000	<.001	<.001	<.001	<.001	<.001	<.001
		N	72	72	72	72	72	72	72	72	72	72
	Adv Tech Improve Existing Partners	Correlation Coefficient	.175	.046	-.132	.811**	1.000	.698**	.789**	.711**	.843**	.812**
		Sig. (2-tailed)	.141	.699	.270	<.001	.000	<.001	<.001	<.001	<.001	<.001
		N	72	72	72	72	72	72	72	72	72	72
	Adv Tech Improve Physical Resources	Correlation Coefficient	.062	.021	-.174	.595**	.698**	1.000	.766**	.679**	.774**	.728**
		Sig. (2-tailed)	.604	.859	.144	<.001	<.001	.000	<.001	<.001	<.001	<.001
		N	72	72	72	72	72	72	72	72	72	72
	Adv Tech Improve Non-Physical Resources	Correlation Coefficient	.105	-.021	-.141	.672**	.789**	.766**	1.000	.807**	.816**	.810**
		Sig. (2-tailed)	.378	.863	.237	<.001	<.001	<.001	.000	<.001	<.001	<.001
		N	72	72	72	72	72	72	72	72	72	72
	Adv Tech Improve Human Resources	Correlation Coefficient	.072	.062	-.156	.668**	.711**	.679**	.807**	1.000	.841**	.794**
		Sig. (2-tailed)	.550	.605	.191	<.001	<.001	<.001	<.001	.000	<.001	<.001
		N	72	72	72	72	72	72	72	72	72	72
	Adv Tech Make Activities More Effective	Correlation Coefficient	.206	.127	-.034	.766**	.843**	.774**	.816**	.841**	1.000	.880**
		Sig. (2-tailed)	.082	.286	.774	<.001	<.001	<.001	<.001	<.001	.000	<.001
		N	72	72	72	72	72	72	72	72	72	72
	Adv Tech Make Activities More Efficient	Correlation Coefficient	.179	.034	-.117	.636**	.812**	.728**	.810**	.794**	.880**	1.000
		Sig. (2-tailed)	.132	.779	.328	<.001	<.001	<.001	<.001	<.001	<.001	.000
		N	72	72	72	72	72	72	72	72	72	72
**. Correlation is significant at the 0.01 level (2-tailed).												
*. Correlation is significant at the 0.05 level (2-tailed).												

Table 5.72: Correlation of Adopt Advanced Technologies on KP, KR, and KA

Table 5.72 shows that the value of 0.603** indicates a moderate positive correlation between the size and age variables. Additionally, a value of 0.245* reflects a weak positive correlation between size and adopting advanced technologies to establish new partnerships. For all seven variables, the correlation values range from 0.5 to 0.8, suggesting a moderate to strong positive correlation with adopting advanced technology in all statements related to key partnerships, key resources, and key activities for organisations.

Perceived Impacts of Blockchain Technologies Adoption on Key Partnerships (KP), Key Resources (KR), and Key Activities (KA)

This survey question examines how adopting blockchain technologies can enhance organisations by focusing on key partnerships, resources, and activities. It analyses the various benefits, such as establishing new partnerships, maintaining existing ones, optimizing physical resources, improving non-physical resources, developing human resources, increasing the effectiveness of activities, and increasing overall efficiency.

Statistics								
		BC Tech Allow Add New Partners	**BC Tech Improve Existing Partners**	**BC Tech Improve Physical Resources**	**BC Tech Improve Non-Physical Resources**	**BC Tech Improve Human Resources**	**BC Tech Make Activities More Effective**	**BC Tech Make Activities More Efficient**
N	Valid	41	41	41	41	41	41	41
	Missing	0	0	0	0	0	0	0
Mean		3.46	3.41	3.56	3.46	3.59	3.39	3.41
Median		3.00	3.00	3.00	3.00	3.00	3.00	3.00
Mode		2	2	3	2[a]	3	2	2
a. Multiple modes exist. The smallest value is shown								

Table 5.73: Descriptive Statistics for Perceived Impacts of Blockchain Technologies Adoption on KP, KR, KA

Table 5.73 shows that the highest mean was in the variable of adopting blockchain technologies to help improve human resources, indicating disagree from the respondents. The median value of 3 indicates that respondents neither agree nor disagree. In addition, the mode has two values. The first value is 2 for five variables, indicating that the most frequent values in the dataset are agreed. The second value is 3 for the other two variables, indicating that the most frequent value in the dataset is neutral.

Perceived Impacts of Blockchain Technologies Adoption on Key Partnerships (KP)

The survey results indicated that the respondents agreed that adopting blockchain technologies would allow organisations to add new partners and improve their collaboration with their existing partners. Also, the respondents expressed neutrality on these two questions, reflecting a lack of strong opinions, while only a low number disagreed, suggesting minimal resistance.

Additionally, some respondents considered the question irrelevant to their current roles or business concerns (See Table 5.74).

BC Tech Allow Add New Partners			BC Tech Improve Existing Partners	
	N	%	N	%
Strongly Agree	4	9.80%	4	9.80%
Agree	10	24.40%	11	26.80%
Neutral	9	22.00%	10	24.40%
Disagree	7	17.10%	5	12.20%
Strongly Disagree	3	7.30%	2	4.90%
Not Applicable	8	19.50%	9	22.00%

Table 5.74: Frequency Statistics for Perceived Impacts of Blockchain Technologies Adoption on KP (N=41)

Perceived Impacts of Blockchain Technologies Adoption on Key Resources (KR)

The survey results revealed that the respondents were neutral about the potential of blockchain technology to improve human resources, with only a small number either agreeing or disagreeing. In contrast, the respondents considered agreeing to adopt blockchain technology to improve physical and non-physical resources. For these two questions, the respondents remained neutral, and only a few disagreed, indicating limited resistance. Furthermore, regarding all questions that related to key resources, some respondents considered the questions irrelevant to their current roles or business concerns (See Table 5.75).

BC Tech Improve Physical Resources			BC Tech Improve Non-Physical Resources		BC Tech Improve Human Resources	
	N	%	N	%	N	%
Strongly Agree	2	4.90%	3	7.30%	2	4.90%
Agree	11	26.80%	11	26.80%	9	22.00%
Neutral	12	29.30%	11	26.80%	13	31.70%
Disagree	3	7.30%	5	12.20%	6	14.60%
Strongly Disagree	4	9.80%	2	4.90%	2	4.90%
Not Applicable	9	22.00%	9	22.00%	9	22.00%

Table 5.75: Frequency Statistics for Perceived Impacts of Blockchain Technologies Adoption on KR (N=41)

Perceived Impacts of Blockchain Technologies Adoption on Key Activities (KA)

The survey results indicated that the respondents agreed that adopting blockchain technologies has made organisations activities more effective and efficient (See Table 5.76).

BC Tech Make Activities More Effective			**BC Tech Make Activities More Efficient**	
	N	**%**	**N**	**%**
Strongly Agree	3	7.30%	3	7.30%
Agree	14	34.10%	13	31.70%
Neutral	9	22.00%	10	24.40%
Disagree	3	7.30%	3	7.30%
Strongly Disagree	3	7.30%	3	7.30%
Not Applicable	9	22.00%	9	22.00%

Table 5.76: Frequency Statistics for Perceived Impacts of Blockchain Technologies Adoption on KA (N=41)

Analysis of Perceived Impacts of Blockchain Tech: Organisation Size

Next, the researcher analyzed 41 adopters of blockchain technologies by conducting a comparative mean test between the dependent variables of blockchain technology adoption on key partnerships (KP), key resources (KR), and key activities (KA) and the size variable as independent variables.

Blockchain Technologies Adoption on KP, KR, KA * Size								
Size		**BC Tech Allow Add New Partners**	**BC Tech Improve Existing Partners**	**BC Tech Improve Physical Resources**	**BC Tech Improve Non-Physical Resources**	**BC Tech Improve Human Resources**	**BC Tech Make Activities More Effective**	**BC Tech Make Activities More Efficient**
Micro	Mean	3.00	4.33	4.50	4.33	4.67	4.33	4.33
	N	6	6	6	6	6	6	6
	Std. Deviation	1.789	2.066	1.761	2.066	1.506	2.066	2.066
Small	Mean	4.00	3.50	4.00	4.50	4.00	4.00	4.00
	N	2	2	2	2	2	2	2
	Std. Deviation	2.828	3.536	2.828	2.121	2.828	2.828	2.828
Medium	Mean	3.25	4.00	4.00	4.00	4.00	4.00	4.00
	N	4	4	4	4	4	4	4
	Std. Deviation	2.217	1.826	1.826	1.826	1.826	1.826	1.826
Large	Mean	3.71	3.71	3.86	3.71	3.71	3.71	3.71
	N	7	7	7	7	7	7	7
	Std. Deviation	1.704	1.704	1.773	1.704	1.704	1.890	1.890
Very large	Mean	3.50	2.95	3.09	2.95	3.14	2.86	2.91
	N	22	22	22	22	22	22	22
	Std. Deviation	1.535	1.397	1.411	1.397	1.356	1.390	1.377
Total	Mean	3.46	3.41	3.56	3.46	3.59	3.39	3.41
	N	41	41	41	41	41	41	41
	Std. Deviation	1.645	1.688	1.629	1.645	1.565	1.701	1.688

Table 5.77: Size Affect Adopt of Blockchain Technology on KP, KR, and KA

Table 5.77 shows that micro-organisations have had a higher mean adopting blockchain technology to improve existing partners, physical resources, non-physical resources, human resources, and activities more effectively and efficiently, indicating many organisations disagree with the effectiveness of adopting blockchain technology on key partners, key resources, and key activities. In addition, small organisations have had a higher mean of adopting blockchain technology to add new partners, indicating that more organisations disagree with this particular question. In contrast, very large organisations have had a lower mean for adopting blockchain technologies to improve existing partners and make activities more efficient, indicating that more organisations agreed on these particular two questions.

Analysis of Perceived Impacts of Blockchain Tech: Organisation Age

Next, the researcher analyzed 41 adopters of blockchain technologies by conducting a comparative mean test between the dependent variables of blockchain technology adoption on key partnerships (KP), key resources (KR), and key activities (KA) and the Age variable as independent variables.

Blockchain Technologies Adoption on KP, KR, KA * Age								
Age		**BC Tech Allow Add New Partners**	**BC Tech Improve Existing Partners**	**BC Tech Improve Physical Resources**	**BC Tech Improve Non-Physical Resources**	**BC Tech Improve Human Resources**	**BC Tech Make Activities More Effective**	**BC Tech Make Activities More Efficient**
Less than 1 year	Mean	3.33	5.00	5.00	5.00	5.00	5.00	5.00
	N	3	3	3	3	3	3	3
	Std. Deviation	2.517	1.732	1.732	1.732	1.732	1.732	1.732
1-5 years	Mean	3.60	3.20	3.60	3.60	3.80	3.40	3.40
	N	5	5	5	5	5	5	5
	Std. Deviation	2.191	2.588	2.191	2.302	2.049	2.408	2.408
6-10 years	Mean	4.50	4.50	4.00	5.00	5.00	4.50	4.50
	N	2	2	2	2	2	2	2
	Std. Deviation	2.121	2.121	2.828	1.414	1.414	2.121	2.121
11-20 years	Mean	3.25	3.42	3.50	3.42	3.42	3.33	3.42
	N	12	12	12	12	12	12	12
	Std. Deviation	1.485	1.564	1.508	1.564	1.564	1.614	1.564
More than 20 years	Mean	3.47	3.11	3.32	3.05	3.26	3.05	3.05
	N	19	19	19	19	19	19	19
	Std. Deviation	1.577	1.449	1.493	1.433	1.368	1.508	1.508
Total	Mean	3.46	3.41	3.56	3.46	3.59	3.39	3.41
	N	41	41	41	41	41	41	41
	Std. Deviation	1.645	1.688	1.629	1.645	1.565	1.701	1.688

Table 5.78: Age Affect Adopt of Blockchain Technology on KP, KR, and KA

Table 5.78 shows that organisations aged six to ten years have had a higher mean for adopting blockchain technologies, indicating that more organisations do not agree with this adoption helps them add new partners, enhance non-physical resources, and improve human resources. In addition, organisations aged less than one year have had a higher mean in six variables, indicating that organisations disagree with these six variables; however, they agree with the question regarding the addition of new partners, as indicated by a lower mean score. For organisations over 20 years old, the mean in six variables is lower, indicating agreement with these six variables. Nonetheless, the mean score in one variable is higher, indicating disagreement with the benefit of adopting blockchain technology to add new partners.

Analysis of Perceived Impacts of Blockchain Tech: Organisation Industry

Next, the researcher analyzed 41 adopters of blockchain technologies by conducting a comparative mean test between the dependent variables of blockchain technology adoption on key partnerships (KP), key resources (KR), and key activities (KA) and the industry variable as independent variables.

Blockchain Technologies Adoption on KP, KR, KA * Industry								
Industry		**BC Tech Allow Add New Partners**	**BC Tech Improve Existing Partners**	**BC Tech Improve Physical Resources**	**BC Tech Improve Non-Physical Resources**	**BC Tech Improve Human Resources**	**BC Tech Make Activities More Effective**	**BC Tech Make Activities More Efficient**
Supply Chain Management	Mean	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	N	2	2	2	2	2	2	2
	Std. Deviation	1.414	1.414	1.414	1.414	1.414	1.414	1.414
Financial Services	Mean	4.80	5.40	5.40	5.40	5.40	5.40	5.40
	N	5	5	5	5	5	5	5
	Std. Deviation	2.168	1.342	1.342	1.342	1.342	1.342	1.342
IT	Mean	3.45	3.73	4.00	3.64	3.82	3.73	3.73
	N	11	11	11	11	11	11	11
	Std. Deviation	1.753	1.555	1.549	1.567	1.471	1.618	1.618
Consultancy	Mean	3.44	3.67	3.67	3.78	4.00	3.67	3.67
	N	9	9	9	9	9	9	9
	Std. Deviation	1.333	1.658	1.581	1.641	1.323	1.658	1.658
Education	Mean	2.50	2.00	2.50	3.00	2.50	2.00	2.50
	N	2	2	2	2	2	2	2
	Std. Deviation	.707	1.414	.707	.000	.707	.000	.707
Health	Mean	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	N	1	1	1	1	1	1	1
	Std. Deviation	.000	.000	.000	.000	.000	.000	.000
Government	Mean	4.00	4.00	4.00	4.00	4.00	4.00	4.00
	N	2	2	2	2	2	2	2
	Std. Deviation	2.828	2.828	2.828	2.828	2.828	2.828	2.828
Manufacturing	Mean	3.33	2.67	3.00	2.67	2.67	2.33	2.33
	N	3	3	3	3	3	3	3
	Std. Deviation	.577	.577	.000	.577	.577	.577	.577
Retail	Mean	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	N	1	1	1	1	1	1	1
	Std. Deviation	.000	.000	.000	.000	.000	.000	.000
Other	Mean	3.20	1.80	2.00	1.80	2.20	1.80	1.80
	N	5	5	5	5	5	5	5
	Std. Deviation	1.924	.447	.707	.447	.837	.447	.447
Total	Mean	3.46	3.41	3.56	3.46	3.59	3.39	3.41
	N	41	41	41	41	41	41	41
	Std. Deviation	1.645	1.688	1.629	1.645	1.565	1.701	1.688

Table 5.79: Industry Affect Adopt of Blockchain Technology on KP, KR, and KA

Table 5.79 shows that the financial service industry has had a higher mean in adopting blockchain technology in all seven variables, indicating that more organisations reported disagreement in this industry. In contrast, the supply chain management industry has had a lower mean in all seven variables in adopting blockchain technologies, indicating that organisations reported agreement with these seven variables. In the IT industry, there is a higher mean in six variables, indicating that the organisation disagrees with these six variables.

Analysis of Perceived Impacts of Blockchain Tech: Correlation

The researcher analyzed 41 adopters of blockchain technologies by conducting a bivariate correlation between all Likert scale seven variables specifically Spearman correlation coefficients. The Spearman rank correlation can take a value from +1 to -1 to give the strength of the relationship. Also, this test gives the direction of the relationship.

Correlations												
			Size	Age	Industry	BC Tech Allow Add New Partners	BC Tech Improve Existing Partners	BC Tech Improve Physical Resources	BC Tech Improve Non-Physical Resources	BC Tech Improve Human Resources	BC Tech Make Activities More Effective	BC Tech Make Activities More Efficient
Spearman's rho	Size	Correlation Coefficient	1.000	.551**	.177	.083	-.282	-.301	-.342*	-.316*	-.319*	-.304
		Sig. (2-tailed)	.000	<.001	.269	.605	.074	.056	.029	.044	.042	.054
		N	41	41	41	41	41	41	41	41	41	41
	Age	Correlation Coefficient	.551**	1.000	.236	.012	-.169	-.145	-.261	-.208	-.206	-.220
		Sig. (2-tailed)	<.001	.000	.138	.939	.291	.367	.100	.192	.196	.168
		N	41	41	41	41	41	41	41	41	41	41
	Industry	Correlation Coefficient	.177	.236	1.000	-.168	-.481**	-.459**	-.459**	-.456**	-.499**	-.490**
		Sig. (2-tailed)	.269	.138	.000	.294	.001	.003	.003	.003	<.001	.001
		N	41	41	41	41	41	41	41	41	41	41
	BC Tech Allow Add New Partners	Correlation Coefficient	.083	.012	-.168	1.000	.589**	.628**	.549**	.585**	.577**	.576**
		Sig. (2-tailed)	.605	.939	.294	.000	<.001	<.001	<.001	<.001	<.001	<.001
		N	41	41	41	41	41	41	41	41	41	41
	BC Tech Improve Existing Partners	Correlation Coefficient	-.282	-.169	-.481**	.589**	1.000	.950**	.960**	.942**	.970**	.979**
		Sig. (2-tailed)	.074	.291	.001	<.001	.000	<.001	<.001	<.001	<.001	<.001
		N	41	41	41	41	41	41	41	41	41	41
	BC Tech Improve Physical Resources	Correlation Coefficient	-.301	-.145	-.459**	.628**	.950**	1.000	.904**	.927**	.925**	.932**
		Sig. (2-tailed)	.056	.367	.003	<.001	<.001	.000	<.001	<.001	<.001	<.001
		N	41	41	41	41	41	41	41	41	41	41
	BC Tech Improve Non-Physical Resources	Correlation Coefficient	-.342*	-.261	-.459**	.549**	.960**	.904**	1.000	.927**	.966**	.974**
		Sig. (2-tailed)	.029	.100	.003	<.001	<.001	<.001	.000	<.001	<.001	<.001
		N	41	41	41	41	41	41	41	41	41	41
	BC Tech Improve Human Resources	Correlation Coefficient	-.316*	-.208	-.456**	.585**	.942**	.927**	.927**	1.000	.923**	.928**
		Sig. (2-tailed)	.044	.192	.003	<.001	<.001	<.001	<.001	.000	<.001	<.001
		N	41	41	41	41	41	41	41	41	41	41
	BC Tech Make Activities More Effective	Correlation Coefficient	-.319*	-.206	-.499**	.577**	.970**	.925**	.966**	.923**	1.000	.988**
		Sig. (2-tailed)	.042	.196	<.001	<.001	<.001	<.001	<.001	<.001	.000	<.001
		N	41	41	41	41	41	41	41	41	41	41
	BC Tech Make Activities More Efficient	Correlation Coefficient	-.304	-.220	-.490**	.576**	.979**	.932**	.974**	.928**	.988**	1.000
		Sig. (2-tailed)	.054	.168	.001	<.001	<.001	<.001	<.001	<.001	<.001	.000
		N	41	41	41	41	41	41	41	41	41	41
**. Correlation is significant at the 0.01 level (2-tailed).												
*. Correlation is significant at the 0.05 level (2-tailed).												

Table 5.80: Correlation of Adopt Blockchain Technologies on KP, KR, and KA

Table 5.80 shows that the value of 0.551** indicates a moderate positive correlation between the size and age variables. Additionally, a value of -0.342* indicates a weak negative correlation between the size and the adoption of blockchain technologies to improve non-physical resources. Also, a value of -0.316* indicates a weak negative correlation between the size and the adoption of blockchain technologies to improve human resources. Moreover, a value of -0.319* indicates a weak negative correlation between the size and the adoption of blockchain technologies to make activities more effective. Furthermore, there are values of -0.481**, -0.459**, -0.459**, -0.456**, -0.499**, and -0.490** indicate a moderate negative correlation between these six variables and the industry variable. For all seven variables, the

correlation values range from 0.5 to 0.9, suggesting a moderate to strong positive correlation with adopting advanced technology in all statements related to key partnerships, key resources, and key activities for organisations.

5.4.3 Perceived Impacts of Blockchain and Advanced Technologies Adoption on Cost Structure (CS) and Revenue Streams (RS) (RQ3)

This section contains six variables, with three related to blockchain and three related to advanced technologies. The Likert scale used in this section ranked from one to six, with one indicating "strongly agree", five indicating "strongly disagree", and six indicating "not applicable."

Perceived Impacts of Advanced Technologies Adoption on Cost Structure (CS) and Revenue Streams (RS)

This survey question examines how adopting advanced technologies can enhance organisations by focusing on cost structure and revenue streams. It analyses the various benefits, such as reduction in cost of transactions/doing business, increases in revenue in existing streams, and addition of new revenue streams.

Statistics				
		Adv Tech Reduces Cost of Transactions/Doing Business	**Adv Tech Increases Revenue in Existing Streams**	**Adv Tech Adds New Revenue Streams**
N	Valid	72	72	72
	Missing	0	0	0
Mean		2.07	2.19	2.25
Median		2.00	2.00	2.00
Mode		2	2	2

Table 5.81: Descriptive Statistics for Perceived Impacts of Advanced Technologies Adoption on CS and RS

Table 5.81 demonstrates that the highest mean score corresponds to the variable of adopting advanced technologies to add new revenue streams, indicating agreement among respondents. The median score for all three variables is 2, indicating that "agree" represents the midpoint of the dataset. The mode for each variable is also 2, indicating the organisations agreement on all three variables.

Perceived Impacts of Advanced Technologies Adoption on Cost Structure (CS)

Respondents agreed that adopting advanced technologies reduces the cost of transactions or business (See Table 5.82).

Adv Tech Reduces Cost of Transactions/Doing Business		
	N	**%**
Strongly Agree	24	33.3%
Agree	30	41.7%
Neutral	10	13.9%
Disagree	5	6.9%
Strongly Disagree	3	4.2%

Table 5.82: Frequency Statistics for Perceived Impacts of Advanced Technologies Adoption on CS (N=72)

Perceived Impacts of Advanced Technologies Adoption on Revenue Streams (RS)

Respondents agreed that adopting advanced technologies increases revenue in existing revenue streams and creates new revenue streams for the organisation (See Table 5.83).

Adv Tech Increases Revenue in Existing Streams			**Adv Tech Adds New Revenue Streams**	
	N	**%**	**N**	**%**
Strongly Agree	21	29.20%	20	27.80%
Agree	25	34.70%	29	40.30%
Neutral	20	27.80%	14	19.40%
Disagree	4	5.60%	4	5.60%
Strongly Disagree	1	1.40%	4	5.60%
Not Applicable	1	1.40%	1	1.40%

Table 5.83: Frequency Statistics for Perceived Impacts of Advanced Technologies Adoption on RS (N=72)

Analysis of Perceived Impacts of Adv Tech: Organisation Size

Next, the researcher analyzed 72 adopters of advanced technologies by conducting a comparative mean test between the dependent variables of advanced technology adoption on cost structure and revenue streams and the size variable as independent variables.

Advanced Technologies Adoption on Cost Structure and Revenue Streams * Size				
Size		**Adv Tech Reduces Cost of Transactions/Doing Business**	**Adv Tech Increases Revenue in Existing Streams**	**Adv Tech Adds New Revenue Streams**
Micro	Mean	2.13	2.75	2.00
	N	8	8	8
	Std. Deviation	.835	1.488	.756
Small	Mean	1.56	1.56	2.22
	N	9	9	9
	Std. Deviation	.527	.726	1.641
Medium	Mean	1.78	1.78	1.78
	N	9	9	9
	Std. Deviation	.833	.833	.833
Large	Mean	1.50	2.00	1.88
	N	8	8	8
	Std. Deviation	1.069	1.195	1.356
Very large	Mean	2.37	2.37	2.50
	N	38	38	38
	Std. Deviation	1.172	.970	1.133
Total	Mean	2.07	2.19	2.25
	N	72	72	72
	Std. Deviation	1.066	1.057	1.172

Table 5.84: Size Affect Adopt of Advanced Technology on CS and RS

Table 5.84 shows that micro-organisations have had a higher mean of adopting advanced technology in reducing the cost of transactions or of doing business and increasing revenues in existing streams, indicating that the organisations disagreed with the perceived impacts of adopting advanced technology on cost structures and one particular aspect of revenue streams. However, micro-organisations have had a lower mean on adoption of advanced technologies in adding new revenue streams, indicating that fewer organisations agreed with the perceived impacts of adopting advanced technology on one particular aspect of revenue streams. In addition, very large organisations have had a higher mean on adoption of advanced technologies in reducing the cost of transactions or of doing business, increasing revenues in existing streams, and adding new revenue streams, indicating that more organisations disagreed with perceived impacts of adopting advanced technology on all three variables of cost structure and revenue streams. In contrast, small, medium and large have had a lower mean of adopting advanced technology in reducing the cost of transactions or of doing business, increasing revenues in existing streams, and adding new revenue streams, indicating that these three sizes of organisation agreed with the perceived impacts of adopting advanced technology on all fixed variables of cost structure and revenue streams.

Analysis of Perceived Impacts of Adv Tech: Organisation Age

Next, the researcher analyzed 72 adopters of advanced technologies by conducting a comparative mean test between the dependent variables of advanced technology adoption on cost structure and revenue streams and the age variable as independent variables.

Advanced Technologies Adoption on Cost Structure and Revenue Streams * Age				
Age		**Adv Tech Reduces Cost of Transactions/Doing Business**	**Adv Tech Increases Revenue in Existing Streams**	**Adv Tech Adds New Revenue Streams**
Less than 1 year	Mean	1.67	1.67	2.00
	N	3	3	3
	Std. Deviation	1.155	1.155	1.000
1-5 years	Mean	1.62	1.88	1.94
	N	16	16	16
	Std. Deviation	.619	1.258	1.289
6-10 years	Mean	1.50	1.75	1.50
	N	4	4	4
	Std. Deviation	.577	.500	.577
11-20 years	Mean	2.61	2.61	2.78
	N	18	18	18
	Std. Deviation	1.461	1.195	1.396
More than 20 years	Mean	2.10	2.23	2.23
	N	31	31	31
	Std. Deviation	.908	.845	.956
Total	Mean	2.07	2.19	2.25
	N	72	72	72
	Std. Deviation	1.066	1.057	1.172

Table 5.85: Age Affect Adopt of Advanced Technology on CS and RS

Table 5.85 shows that organisations aged 11 to 20 years have a higher mean than the total mean among all three variables on adopting advanced technologies, indicating that more organisations disagree with the perceived impacts of adopting advanced technology on all aspects of cost structures and revenue streams. In contrast, organisations aged less than one year have a lower mean in all three variables on adopting advanced technologies, indicating that fewer organisations agree with the perceived impacts of adopting advanced technology on all aspects of cost structures and revenue streams. In addition, organisations aged six to ten years have a lower mean than the total mean on adopting advanced technologies in reducing the cost of transactions/doing business and adding new revenue streams, indicating fewer organisations agree with the perceived impacts of adopting advanced technology on cost structures and one particular aspect of revenue streams.

Analysis of Perceived Impacts of Adv Tech: Organisation Industry

Next, the researcher analyzed 72 adopters of advanced technologies by conducting a comparative mean test between the dependent variables of advanced technology adoption on cost structure and revenue streams and the industry variable as independent variables.

Advanced Technologies Adoption on Cost Structure and Revenue Streams * Industry				
Industry		**Adv Tech Reduces Cost of Transactions/Doing Business**	**Adv Tech Increases Revenue in Existing Streams**	**Adv Tech Adds New Revenue Streams**
Supply Chain Management	Mean	3.33	3.67	3.33
	N	3	3	3
	Std. Deviation	2.082	.577	2.082
Financial Services	Mean	2.00	2.00	2.17
	N	6	6	6
	Std. Deviation	1.673	1.673	1.602
IT	Mean	1.74	2.16	2.11
	N	19	19	19
	Std. Deviation	.733	1.259	1.329
Consultancy	Mean	2.10	2.00	2.10
	N	10	10	10
	Std. Deviation	.738	.816	.738
Education	Mean	2.27	2.27	2.45
	N	11	11	11
	Std. Deviation	.786	.647	.820
Health	Mean	1.00	1.00	1.00
	N	1	1	1
	Std. Deviation	.000	.000	.000
Government	Mean	2.33	2.00	2.00
	N	3	3	3
	Std. Deviation	1.528	1.000	1.000
Manufacturing	Mean	2.83	2.67	3.00
	N	6	6	6
	Std. Deviation	1.472	1.033	1.414
Retail	Mean	3.00	2.50	2.50
	N	2	2	2
	Std. Deviation	.000	.707	.707
Other	Mean	1.55	1.91	1.91
	N	11	11	11
	Std. Deviation	.688	.831	.944
Total	Mean	2.07	2.19	2.25
	N	72	72	72
	Std. Deviation	1.066	1.057	1.172

Table 5.86: Industry Affect Adopt of Advanced Technology on CS and RS

Table 5.86 shows that the supply chain management industry had a higher mean in all three variables compared to the total mean, indicating that all organisations in this industry disagree with the perceived impacts of adopting advanced technology on all aspects of cost structures and revenue streams. In contrast, the health industry had a lower mean in all three variables

than the total, indicating that fewer organisations agreed with the perceived impacts of adopting advanced technology on all aspects of cost structures and revenue streams.

Analysis of Perceived Impacts of Adv Tech: Correlation

The researcher analyzed 72 adopters of advanced technologies by conducting a bivariate correlation between all Likert scale questions using three variables of perceived impacts of advanced technology on cost structure and revenue streams, specifically Spearman correlation coefficients. The Spearman rank correlation can take a value from +1 to -1 to give the strength of the relationship. Also, this test gives direction to the relationship.

Correlations								
			Size	**Age**	**Industry**	**Adv Tech Reduces Cost of Transactions/Doing Business**	**Adv Tech Increases Revenue in Existing Streams**	**Adv Tech Adds New Revenue Streams**
Spearman's rho	Size	Correlation Coefficient	1.000	.603**	.134	.209	.166	.222
		Sig. (2-tailed)	.000	<.001	.260	.078	.164	.061
		N	72	72	72	72	72	72
	Age	Correlation Coefficient	.603**	1.000	.193	.189	.209	.144
		Sig. (2-tailed)	<.001	.000	.104	.113	.078	.229
		N	72	72	72	72	72	72
	Industry	Correlation Coefficient	.134	.193	1.000	.035	-.022	.038
		Sig. (2-tailed)	.260	.104	.000	.769	.852	.748
		N	72	72	72	72	72	72
	Adv Tech Reduces Cost of Transactions/Doing Business	Correlation Coefficient	.209	.189	.035	1.000	.721**	.708**
		Sig. (2-tailed)	.078	.113	.769	.000	<.001	<.001
		N	72	72	72	72	72	72
	Adv Tech Increases Revenue in Existing Streams	Correlation Coefficient	.166	.209	-.022	.721**	1.000	.648**
		Sig. (2-tailed)	.164	.078	.852	<.001	.000	<.001
		N	72	72	72	72	72	72
	Adv Tech Adds New Revenue Streams	Correlation Coefficient	.222	.144	.038	.708**	.648**	1.000
		Sig. (2-tailed)	.061	.229	.748	<.001	<.001	.000
		N	72	72	72	72	72	72
**. Correlation is significant at the 0.01 level (2-tailed).								

Table 5.87: Correlation of Adopt Advanced Technologies on CS and RS

Table 5.87 shows that the value of 0.603** indicates a moderate positive correlation between the size and age variables. For all three variables, the correlation values range from 0.6 to 0.7, indicate a moderate to strong positive correlation with adopting advanced technology in all statements that are related to cost structure and revenue streams for organisations.

Perceived Impacts of Blockchain Technologies Adoption on Cost Structure (CS) and Revenue Streams (RS)

This survey question examines how adopting blockchain technologies can enhance organisations by focusing on cost structure and revenue streams. It analyses the various benefits, such as reducing cost of transactions/doing business, increase in revenue in existing streams, and the addition of new revenue streams.

Statistics				
		BC Tech Reduces Cost of Transactions/Doing Business	**BC Tech Increases Revenue in Existing Streams**	**BC Tech Adds New Revenue Streams**
N	Valid	41	41	41
	Missing	0	0	0
Mean		3.44	3.54	3.66
Median		3.00	3.00	3.00
Mode		2	2	3

Table 5.88: Descriptive Statistics for Perceived Impacts of Blockchain Technologies Adoption on CS and RS

Table 5.88 demonstrates that the highest mean score corresponds to the variable of adopting blockchain technologies to add new revenue streams, indicating disagree among respondents. The median score for all three variables is 3, indicating that "neutral" represents the midpoint of the dataset. The mode has two values. There were two variables with value 2 indicating the most frequent value was agree, and one variable with value 3 indicating the most frequent value was neutral.

Perceived Impacts of Blockchain Technologies Adoption on Cost Structure (CS)

The respondents agreed that adopting blockchain technologies reduces transactions or business costs (See Table 5.89).

BC Tech Reduces Cost of Transactions/Doing Business		
	N	**%**
Strongly Agree	2	4.9%
Agree	15	36.6%
Neutral	9	22.0%
Disagree	2	4.9%
Strongly Disagree	4	9.8%
Not Applicable	9	22.0%

Table 5.89: Frequency Statistics for Perceived Impacts of Blockchain Technologies Adoption on CS (N=41)

Perceived Impacts of Blockchain Technologies Adoption on Revenue Streams (RS)

The survey results indicated that the respondents agreed that adopting blockchain technologies would increase revenue from existing streams. Also, the respondents, however, expressed neutrality on this question, suggesting a lack of strong opinions; only a small number disagreed, indicating minimal resistance to the question. In contrast, responses regarding the potential for adding new revenue streams through blockchain adoption were more varied, with only a portion of respondents expressing agreement or disagreement. This division also highlighted general neutrality among most participants, reflecting a lack of strong opinions on the question. Furthermore, some respondents considered the two questions irrelevant to their current roles or business concerns (See Table 5.90).

BC Tech Increases Revenue in Existing Streams			**BC Tech Adds New Revenue Streams**	
	N	**%**	**N**	**%**
Strongly Agree	2	4.90%	3	7.30%
Agree	12	29.30%	7	17.10%
Neutral	10	24.40%	12	29.30%
Disagree	5	12.20%	7	17.10%
Strongly Disagree	3	7.30%	3	7.30%
Not Applicable	9	22.00%	9	22.00%

Table 5.90: Frequency Statistics for Perceived Impacts of Blockchain Technologies Adoption on RS (N=41)

Analysis of Perceived Impacts of Blockchain Tech: Organisation Size

Next, the researcher analyzed 41 adopters of blockchain technologies by conducting a comparative mean test between the dependent variables of blockchain technology adoption on cost structure and revenue streams and the size variable as independent variables.

Blockchain Technologies Adoption on CS, RV* Size				
Size		**BC Tech Reduces Cost of Transactions/Doing Business**	**BC Tech Increases Revenue in Existing Streams**	**BC Tech Adds New Revenue Streams**
Micro	Mean	3.83	3.83	3.67
	N	6	6	6
	Std. Deviation	1.722	1.835	2.066
Small	Mean	4.00	4.00	4.50
	N	2	2	2
	Std. Deviation	2.828	2.828	2.121
Medium	Mean	3.75	3.75	3.75
	N	4	4	4
	Std. Deviation	2.217	2.217	2.217
Large	Mean	3.57	3.57	3.86
	N	7	7	7
	Std. Deviation	1.813	1.813	1.574
Very large	Mean	3.18	3.36	3.50
	N	22	22	22
	Std. Deviation	1.593	1.465	1.439
Total	Mean	3.44	3.54	3.66
	N	41	41	41
	Std. Deviation	1.689	1.629	1.591

Table 5.91: Size Affect Adopt of Blockchain Technology on CS and RV

Table 5.91 shows that small organisations had a higher mean than the total mean on adopting blockchain technology in all three variables, indicating that they disagree with the perceived impacts of adopting blockchain technology on all aspects of cost structures and revenue streams. In contrast, very large organisations had a lower mean than the total on adopting blockchain technology in all three variables, indicating that they agree with the perceived impacts of adopting blockchain technology on all aspects of cost structures and revenue streams.

Analysis of Perceived Impacts of Blockchain Tech: Organisation Age

Next, the researcher analyzed 41 adopters of blockchain technologies by conducting a comparative mean test between the dependent variables of blockchain technology adoption on cost structure and revenue streams and the age variable as independent variables.

Blockchain Technologies Adoption on CS, RV * Age				
Age		**BC Tech Reduces Cost of Transactions/Doing Business**	**BC Tech Increases Revenue in Existing Streams**	**BC Tech Adds New Revenue Streams**
Less than 1 year	Mean	3.67	3.67	3.67
	N	3	3	3
	Std. Deviation	2.082	2.082	2.082
1-5 years	Mean	3.60	3.40	3.40
	N	5	5	5
	Std. Deviation	2.302	2.408	2.510
6-10 years	Mean	4.50	4.50	5.00
	N	2	2	2
	Std. Deviation	2.121	2.121	1.414
11-20 years	Mean	3.67	3.92	4.17
	N	12	12	12
	Std. Deviation	1.826	1.676	1.467
More than 20 years	Mean	3.11	3.21	3.26
	N	19	19	19
	Std. Deviation	1.449	1.357	1.327
Total	Mean	3.44	3.54	3.66
	N	41	41	41
	Std. Deviation	1.689	1.629	1.591

Table 5.92: Age Affect Adopt of Blockchain Technology on CS and RV

Table 5.92 shows that organisations aged six to ten years have had a higher mean than the total on adopting blockchain technologies in all three variables, indicating that they disagree with the perceived impacts of adopting blockchain technology on all aspects of cost structures and revenue streams. In contrast, organisations aged more than twenty years have had a lower mean than the total, indicating that they are in agreement with the perceived impacts of adopting blockchain technology on all aspects of cost structures and revenue streams.

Analysis of Perceived Impacts of Blockchain Tech: Organisation Industry

Next, the researcher analyzed 41 adopters of blockchain technologies by conducting a comparative mean test between the dependent variables of blockchain technology adoption on cost structure and revenue streams and the industry variable as independent variables.

Blockchain Technologies Adoption on CS, RV * Industry				
Industry		**BC Tech Reduces Cost of Transactions/Doing Business**	**BC Tech Increases Revenue in Existing Streams**	**BC Tech Adds New Revenue Streams**
Supply Chain Management	Mean	3.00	3.00	3.50
	N	2	2	2
	Std. Deviation	1.414	1.414	.707
Financial Services	Mean	5.00	5.00	5.00
	N	5	5	5
	Std. Deviation	1.732	1.732	1.732
IT	Mean	3.73	3.82	3.82
	N	11	11	11
	Std. Deviation	1.737	1.722	1.722
Consultancy	Mean	3.89	3.78	3.78
	N	9	9	9
	Std. Deviation	1.364	1.481	1.641
Education	Mean	2.00	2.00	3.50
	N	2	2	2
	Std. Deviation	.000	.000	.707
Health	Mean	1.00	1.00	1.00
	N	1	1	1
	Std. Deviation	.000	.000	.000
Government	Mean	4.00	4.00	4.00
	N	2	2	2
	Std. Deviation	2.828	2.828	2.828
Manufacturing	Mean	3.00	3.00	3.33
	N	3	3	3
	Std. Deviation	1.732	1.000	.577
Retail	Mean	3.00	3.00	3.00
	N	1	1	1
	Std. Deviation	.000	.000	.000
Other	Mean	1.80	2.60	2.60
	N	5	5	5
	Std. Deviation	.447	1.140	1.140
Total	Mean	3.44	3.54	3.66
	N	41	41	41
	Std. Deviation	1.689	1.629	1.591

Table 5.93: Industry Affect Adopt of Blockchain Technology on CS and RV

Table 5.93 shows that the financial services industry had a higher mean in all three variables compared to the total mean, indicating that all organisations in this industry disagree with the perceived impacts of adopting blockchain technology on all aspects of cost structures and revenue streams. In contrast, the health industry had a lower mean in all three variables than the total, indicating that fewer organisations agreed with the perceived impacts of adopting blockchain technology on all aspects of cost structures and revenue streams.

Analysis of Perceived Impacts of Blockchain Tech: Correlation

The researcher analyzed 41 adopters of blockchain technologies by conducting a bivariate correlation between all Likert scale questions using three variables of perceived impacts of blockchain technology on cost structure and revenue streams, specifically Spearman correlation coefficients. The Spearman rank correlation can take a value from +1 to -1 to give the strength of the relationship. Also, this test gives the direction of the relationship.

Correlations

			Size	Age	Industry	BC Tech Reduces Cost of Transactions/Doing Business	BC Tech Increases Revenue in Existing Streams	BC Tech Adds New Revenue Streams
Spearman's rho	Size	Correlation Coefficient	1.000	.551**	.177	-.197	-.093	-.086
		Sig. (2-tailed)	.000	<.001	.269	.217	.562	.595
		N	41	41	41	41	41	41
	Age	Correlation Coefficient	.551**	1.000	.236	-.144	-.096	-.160
		Sig. (2-tailed)	<.001	.000	.138	.370	.549	.318
		N	41	41	41	41	41	41
	Industry	Correlation Coefficient	.177	.236	1.000	-.426**	-.306	-.306
		Sig. (2-tailed)	.269	.138	.000	.006	.052	.052
		N	41	41	41	41	41	41
	BC Tech Reduces Cost of Transactions/Doing Business	Correlation Coefficient	-.197	-.144	-.426**	1.000	.921**	.864**
		Sig. (2-tailed)	.217	.370	.006	.000	<.001	<.001
		N	41	41	41	41	41	41
	BC Tech Increases Revenue in Existing Streams	Correlation Coefficient	-.093	-.096	-.306	.921**	1.000	.937**
		Sig. (2-tailed)	.562	.549	.052	<.001	.000	<.001
		N	41	41	41	41	41	41
	BC Tech Adds New Revenue Streams	Correlation Coefficient	-.086	-.160	-.306	.864**	.937**	1.000
		Sig. (2-tailed)	.595	.318	.052	<.001	<.001	.000
		N	41	41	41	41	41	41

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5.94: Correlation of Adopt Blockchain Technologies on CS and RS

Table 5.94 shows that the value of 0.551** indicates a moderate positive correlation between the size and age variables. In addition, the value of -0.426** indicates a moderate negative correlation between industry and adopting blockchain technologies, which helps to reduce the cost of transactions or doing business. For all three variables, the correlation values range from

0.8 to 0.9, indicating a strong positive correlation with blockchain technology in all statements related to cost structure and revenue streams for organisations.

5.4.4 Perceived Impacts of Blockchain and Advanced Technologies Adoption on Value Propositions (VP) (RQ4)

This section contains six variables, with three related to blockchain and three related to advanced technologies. The Likert scale used in this section ranked from one to six, with one indicating "strongly agree", five indicating "strongly disagree" and six indicating "not applicable."

Perceived Impacts of Advanced Technologies Adoption on Value Propositions

This survey question examines how adopting advanced technologies can enhance organisations by focusing on value propositions. It analyses the various benefits, such as the development of new products and services, improvement of existing products and services, and reduction of costs for organisation customers.

Statistics				
		Adv Tech Develop New Products and Services	**Adv Tech Improve Existing Products and Services**	**Adv Tech Reduce Costs for Organisation Customers**
N	Valid	72	72	72
	Missing	0	0	0
Mean		2.08	2.06	2.15
Median		2.00	2.00	2.00
Mode		2	2	2

Table 5.95: Descriptive Statistics for Perceived Impacts of Advanced Technologies Adoption on VP

Table 5.95 demonstrates that the highest mean score corresponds to the variable of adopting advanced technologies to reduce costs for organisation customers, indicating agreement among respondents. The median score for all three variables is 2, indicating that "agree" represents the midpoint of the dataset. The mode for each variable is also 2, indicating the organisations agreement on all three variables.

Perceived Impacts of Advanced Technologies Adoption on Value Propositions

Respondents agreed that adopting advanced technologies has positive impacts on the development of new products and services, improvement of existing products and services, and reduction of costs for organisation customers (See Table 5.96).

Adv Tech Develop New Products and Services			**Adv Tech Improve Existing Products and Services**		**Adv Tech Reduce Costs for Organisation Customers**	
	N	**%**	**N**	**%**	**N**	**%**
Strongly Agree	24	33.30%	24	33.30%	19	26.40%
Agree	32	44.40%	33	45.80%	32	44.40%
Neutral	8	11.10%	8	11.10%	14	19.40%
Disagree	3	4.20%	2	2.80%	5	6.90%
Strongly Disagree	4	5.60%	4	5.60%	2	2.80%
Not Applicable	1	1.40%	1	1.40%	0	0.00%

Table 5.96: Frequency Statistics for Perceived Impacts of Advanced Technologies Adoption on VP (N=72)

Analysis of Perceived Impacts of Adv Tech: Organisation Size

Next, the researcher analyzed 72 adopters of advanced technologies by conducting a comparative mean test between the dependent variables of advanced technology adoption on value propositions and the size variable as independent variables.

Advanced Technologies Adoption on VP * Size				
Size		**Adv Tech Develop New Products and Services**	**Adv Tech Improve Existing Products and Services**	**Adv Tech Reduce Costs for Organisation Customers**
Micro	Mean	1.75	2.38	1.75
	N	8	8	8
	Std. Deviation	.707	1.598	.707
Small	Mean	2.00	1.33	1.56
	N	9	9	9
	Std. Deviation	1.658	.500	.527
Medium	Mean	1.78	1.78	2.22
	N	9	9	9
	Std. Deviation	1.394	1.394	1.394
Large	Mean	1.63	1.63	1.87
	N	8	8	8
	Std. Deviation	1.061	.744	.991
Very large	Mean	2.34	2.32	2.42
	N	38	38	38
	Std. Deviation	1.047	1.068	.948
Total	Mean	2.08	2.06	2.15
	N	72	72	72
	Std. Deviation	1.160	1.137	.988

Table 5.97: Size Affect Adopt of Advanced Technology on VP

Table 5.97 shows that very large organisations have had a higher mean in adopting advanced technologies on the development of new products and services, improvement of existing products and services, and reduction of costs for organisation customers, indicating that more organisations disagreed with all aspects of advanced technology on value propositions. In addition, micro-organisations have had a higher mean in adopting advanced technologies on the improvement of existing products and services, indicating micro-organisations disagree with one particular aspects of advanced technology on value propositions. In contrast, large organisations have had a lower mean in adopting advanced technologies on the development of new products and services, and improvement of existing products and services, indicating that fewer organisations agreed with the two particular aspects of adopting advanced technology on value propositions. Also, small organisations have had a lower mean on the on the development of new products and services, improvement of existing products and services, and reduction of costs for organisation customers, indicating that fewer organisations agreed with all aspects of adopting advanced technology on value propositions.

Analysis of Perceived Impacts of Adv Tech: Organisation Age

Next, the researcher analyzed 72 adopters of advanced technologies by conducting a comparative mean test between the dependent variables of advanced technology adoption on value propositions and the age variable as independent variables.

Advanced Technologies Adoption on VP * Age				
Age		**Adv Tech Develop New Products and Services**	**Adv Tech Improve Existing Products and Services**	**Adv Tech Reduce Costs for Organisation Customers**
Less than 1 year	Mean	1.67	1.67	2.00
	N	3	3	3
	Std. Deviation	1.155	1.155	1.000
1-5 years	Mean	1.88	1.88	1.81
	N	16	16	16
	Std. Deviation	1.500	1.500	1.047
6-10 years	Mean	2.00	2.00	1.75
	N	4	4	4
	Std. Deviation	.000	.000	.500
11-20 years	Mean	2.61	2.56	2.56
	N	18	18	18
	Std. Deviation	1.461	1.464	1.149
More than 20 years	Mean	1.94	1.90	2.16
	N	31	31	31
	Std. Deviation	.727	.651	.860
Total	Mean	2.08	2.06	2.15
	N	72	72	72
	Std. Deviation	1.160	1.137	.988

Table 5.98: Age Affect Adopt of Advanced Technology on VP

Table 5.98 shows that organisations aged 11 to 20 years have had a higher mean in all three variables, indicating that more organisations disagreed with the perceived impacts on all aspects of value propositions. In contrast, organisations aged less than one year have had a lower mean in adopting advanced technologies on the development of new products and services, and improvement of existing products and services, indicating that fewer organisations agreed with the perceived impacts on the two aspects of adopting advanced technology on value propositions. Furthermore, organisations aged six to ten have had a lower mean in adopting advanced technologies on the development of new products and services, improvement of existing products and services, and reduction of costs for organisation customers, indicating that fewer organisations agreed with all aspects of perceived impacts of adopting advanced technology on value propositions.

Analysis of Perceived Impacts of Adv Tech: Organisation Industry

Next, the researcher analyzed 72 adopters of advanced technologies by conducting a comparative mean test between the dependent variables of advanced technology adoption on value propositions and the industry variable as independent variables.

Advanced Technologies Adoption on VP * Industry				
Industry		**Adv Tech Develop New Products and Services**	**Adv Tech Improve Existing Products and Services**	**Adv Tech Reduce Costs for Organisation Customers**
Supply Chain Management	Mean	3.67	3.67	3.33
	N	3	3	3
	Std. Deviation	1.528	1.528	1.155
Financial Services	Mean	2.00	2.00	2.17
	N	6	6	6
	Std. Deviation	1.673	1.673	1.602
IT	Mean	2.05	2.00	2.00
	N	19	19	19
	Std. Deviation	1.433	1.374	1.106
Consultancy	Mean	1.90	1.90	2.20
	N	10	10	10
	Std. Deviation	.738	.738	.632
Education	Mean	1.91	1.91	2.36
	N	11	11	11
	Std. Deviation	.539	.539	.809
Health	Mean	1.00	1.00	1.00
	N	1	1	1
	Std. Deviation	.000	.000	.000
Government	Mean	2.00	1.67	1.67
	N	3	3	3
	Std. Deviation	1.000	.577	.577
Manufacturing	Mean	2.83	2.83	2.33
	N	6	6	6
	Std. Deviation	1.472	1.472	1.033
Retail	Mean	2.50	2.50	2.50
	N	2	2	2
	Std. Deviation	.707	.707	.707
Other	Mean	1.73	1.73	1.91
	N	11	11	11
	Std. Deviation	.647	.647	.831
Total	Mean	2.08	2.06	2.15
	N	72	72	72
	Std. Deviation	1.160	1.137	.988

Table 5.99: Industry Affect Adopt of Advanced Technology on VP

Table 5.99 shows that the supply chain management industry had a higher mean in all three variables compared to the total mean, indicating that all organisations in this industry disagree with all of aspects of the perceived impacts of adopting advanced technology on value propositions. In contrast, the health industry had a lower mean in all three variables than the total, indicating that fewer organisations agreed with all of aspects of the perceived impacts of adopting advanced technology on value propositions.

Analysis of Perceived Impacts of Adv Tech: Correlation

The researcher analyzed 72 adopters of advanced technologies by conducting a bivariate correlation between all Likert scale using three variables of perceived impacts of advanced technology on value propositions, specifically Spearman correlation coefficients. The Spearman rank correlation can take a value from +1 to -1 to give the strength of the relationship. Also, this test gives the direction of the relationship.

Correlations								
			Size	**Age**	**Industry**	**Adv Tech Develop New Products and Services**	**Adv Tech Improve Existing Products and Services**	**Adv Tech Reduce Costs for Organisation Customers**
Spearman's rho	Size	Correlation Coefficient	1.000	.603**	.134	.307**	.289*	.330**
		Sig. (2-tailed)	.000	<.001	.260	.009	.014	.005
		N	72	72	72	72	72	72
	Age	Correlation Coefficient	.603**	1.000	.193	.123	.127	.156
		Sig. (2-tailed)	<.001	.000	.104	.305	.288	.192
		N	72	72	72	72	72	72
	Industry	Correlation Coefficient	.134	.193	1.000	.014	.009	-.026
		Sig. (2-tailed)	.260	.104	.000	.910	.937	.828
		N	72	72	72	72	72	72
	Adv Tech Develop New Products and Services	Correlation Coefficient	.307**	.123	.014	1.000	.832**	.730**
		Sig. (2-tailed)	.009	.305	.910	.000	<.001	<.001
		N	72	72	72	72	72	72
	Adv Tech Improve Existing Products and Services	Correlation Coefficient	.289*	.127	.009	.832**	1.000	.681**
		Sig. (2-tailed)	.014	.288	.937	<.001	.000	<.001
		N	72	72	72	72	72	72
	Adv Tech Reduce Costs for Organisation Customers	Correlation Coefficient	.330**	.156	-.026	.730**	.681**	1.000
		Sig. (2-tailed)	.005	.192	.828	<.001	<.001	.000
		N	72	72	72	72	72	72
**. Correlation is significant at the 0.01 level (2-tailed).								
*. Correlation is significant at the 0.05 level (2-tailed).								

Table 5.100: Correlation of Adopt Advanced Technologies on VP

Table 5.100 shows that the value of 0.603** indicates a moderate positive correlation between the size and age variables. In addition, the value of 0.307** indicates a weak positive correlation between size and adoption of advanced technologies, which helps to develop new products and services. Furthermore, the value of 0.289* indicates a weak positive correlation between size and adoption of advanced technologies that help to improve existing products and services. Also, the value of 0.330** indicates a weak positive correlation between the size and adoption of advanced technologies, which helps to reduce costs for organisation customers. All three variables' correlation values range from 0.6 to 0.8, indicating a strong positive correlation with advanced technology in all statements related to value propositions for organisations.

Perceived Impacts of Blockchain Technologies Adoption on Value Propositions

This survey question examines how adopting blockchain technologies can enhance organisations by focusing on value propositions. It analyses the various benefits, such as the development of new products and services, improvement of existing products and services, and reduction of costs for organisation customers.

Statistics				
		BC Tech Develop New Products and Services	**BC Tech Improve Existing Products and Services**	**BC Tech Reduce Costs for Organisation Customers**
N	Valid	41	41	41
	Missing	0	0	0
Mean		3.27	3.32	3.41
Median		3.00	3.00	3.00
Mode		3	3	3

Table 5.101: Descriptive Statistics for Perceived Impacts of Blockchain Technologies Adoption on VP

Table 5.101 demonstrates that the highest mean score corresponds to the variable of adopting blockchain technologies to reduce costs for organisation customers, indicating neutrality among respondents. The median score for all three variables is 3, indicating that "neutral" represents the midpoint of the dataset. The mode is 3 for all three variables, indicating the most frequent value was neutral.

Perceived Impacts of Blockchain Technologies Adoption on Value Propositions

The survey results indicated that the respondents agreed that adopting blockchain technologies would develops new products and services, improves existing products and services, and reduces costs for value propositions. Also, the respondents, however, expressed neutrality on these questions, suggesting a lack of strong opinions. Only a small number disagreed, indicating minimal resistance to these questions. Furthermore, some respondents considered the three questions irrelevant to their current roles or business concerns (See Table 5.102).

BC Tech Develop New Products and Services			**BC Tech Improve Existing Products and Services**		**BC Tech Reduce Costs for Organisation Customers**	
	N	**%**	**N**	**%**	**N**	**%**
Strongly Agree	6	14.60%	6	14.60%	3	7.30%
Agree	10	24.40%	9	22.00%	11	26.80%
Neutral	11	26.80%	11	26.80%	12	29.30%
Disagree	3	7.30%	4	9.80%	4	9.80%
Strongly Disagree	3	7.30%	3	7.30%	3	7.30%
Not Applicable	8	19.50%	8	19.50%	8	19.50%

Table 5.102: Frequency Statistics for Perceived Impacts of Blockchain Technologies Adoption on VP (N=41)

Analysis of Perceived Impacts of Blockchain Tech: Organisation Size

Next, the researcher analyzed 41 adopters of blockchain technologies by conducting a comparative mean test between the dependent variables of blockchain technology adoption on value propositions and the size variable as independent variables.

Blockchain Technologies Adoption on VP* Size				
Size		**BC Tech Develop New Products and Services**	**BC Tech Improve Existing Products and Services**	**BC Tech Reduce Costs for Organisation Customers**
Micro	Mean	2.50	2.50	2.83
	N	6	6	6
	Std. Deviation	1.975	1.975	1.722
Small	Mean	3.50	3.50	4.00
	N	2	2	2
	Std. Deviation	3.536	3.536	2.828
Medium	Mean	3.75	3.75	3.75
	N	4	4	4
	Std. Deviation	2.217	2.217	2.217
Large	Mean	3.71	3.86	3.71
	N	7	7	7
	Std. Deviation	1.704	1.676	1.704
Very large	Mean	3.23	3.27	3.36
	N	22	22	22
	Std. Deviation	1.510	1.486	1.465
Total	Mean	3.27	3.32	3.41
	N	41	41	41
	Std. Deviation	1.718	1.709	1.612

Table 5.103: Size Affect Adopt of Blockchain Technology on VP

Table 5.103 shows that medium size organisations have had a higher mean than the total in all three variables indicating that organisations disagree with perceived impacts of adopting blockchain technologies on the development of new products and services, improvement of existing products and services, and reduction of costs for organisation customers. In contrast, micro-organisations have had a lower mean than the total for all three variables indicating that organisations agree with perceived impacts of adopting blockchain technologies on the development of new products and services, improvement of existing products and services, and reduction of costs for organisation customers.

Analysis of Perceived Impacts of Blockchain Tech: Organisation Age

Next, the researcher analysed 41 adopters of blockchain technologies by conducting a comparative mean test between the dependent variables of blockchain technology adoption on value propositions and the age variable as independent variables.

Blockchain Technologies Adoption on VP* Age				
Age		**BC Tech Develop New Products and Services**	**BC Tech Improve Existing Products and Services**	**BC Tech Reduce Costs for Organisation Customers**
Less than 1 year	Mean	3.33	3.33	3.67
	N	3	3	3
	Std. Deviation	2.517	2.517	2.082
1-5 years	Mean	2.00	2.00	2.40
	N	5	5	5
	Std. Deviation	2.236	2.236	2.074
6-10 years	Mean	4.00	4.50	5.00
	N	2	2	2
	Std. Deviation	2.828	2.121	1.414
11-20 years	Mean	3.83	3.92	3.75
	N	12	12	12
	Std. Deviation	1.749	1.676	1.765
More than 20 years	Mean	3.16	3.16	3.26
	N	19	19	19
	Std. Deviation	1.302	1.344	1.284
Total	Mean	3.27	3.32	3.41
	N	41	41	41
	Std. Deviation	1.718	1.709	1.612

Table 5.104: Age Affect Adopt of Blockchain Technology on VP

Table 5.104 shows that organisations aged six to 10 years have had a higher mean in all three variables, indicating that organisations of this age disagree with the perceived impacts of adopting blockchain technology on the development of new products and services, improvement of existing products and services, and reduction of costs for organisation customers. In contrast, organisations aged one to five years have had a lower mean in all three variables, indicating that organisations agreed with the perceived impacts of adopting blockchain technology on the development of new products and services, improvement of existing products and services, and reduction of costs for organisation customers.

Analysis of Perceived Impacts of Blockchain Tech: Organisation Industry

Next, the researcher analyzed 41 adopters of blockchain technologies by conducting a comparative mean test between the dependent variables of blockchain technology adoption on value propositions and the industry variable as independent variables.

Blockchain Technologies Adoption on VP* Industry				
Industry		**BC Tech Develop New Products and Services**	**BC Tech Improve Existing Products and Services**	**BC Tech Reduce Costs for Organisation Customers**
Supply Chain Management	Mean	3.00	3.00	3.00
	N	2	2	2
	Std. Deviation	1.414	1.414	1.414
Financial Services	Mean	4.80	4.80	5.00
	N	5	5	5
	Std. Deviation	2.168	2.168	1.732
IT	Mean	3.09	3.18	3.36
	N	11	11	11
	Std. Deviation	1.758	1.779	1.748
Consultancy	Mean	3.56	3.67	3.89
	N	9	9	9
	Std. Deviation	1.740	1.658	1.453
Education	Mean	1.50	2.00	2.50
	N	2	2	2
	Std. Deviation	.707	1.414	.707
Health	Mean	1.00	1.00	1.00
	N	1	1	1
	Std. Deviation	.000	.000	.000
Government	Mean	4.00	4.00	4.00
	N	2	2	2
	Std. Deviation	2.828	2.828	2.828
Manufacturing	Mean	3.67	3.67	2.67
	N	3	3	3
	Std. Deviation	.577	.577	.577
Retail	Mean	3.00	3.00	3.00
	N	1	1	1
	Std. Deviation	.000	.000	.000
Other	Mean	2.40	2.20	2.40
	N	5	5	5
	Std. Deviation	.894	.837	.894
Total	Mean	3.27	3.32	3.41
	N	41	41	41
	Std. Deviation	1.718	1.709	1.612

Table 5.105: Industry Affect Adopt of Blockchain Technology on VP

Table 5.105 shows that financial service industry organisations have had a higher mean than the total in all three questions, indicating that they disagree with perceived impacts of adopting blockchain technology on the development of new products and services, improvement of existing products and services, and reduction of costs for organisation customers. In contrast, health industry organisations have had a lower mean than the total of all three variables, indicating that fewer organisations agree with all the aspects of the perceived impacts of adopting blockchain technology on value propositions.

Analysis of Perceived Impacts of Blockchain Tech: Correlation

The researcher analyzed 41 adopters of blockchain technologies by conducting a bivariate correlation between all Likert scale using three variables of perceived impacts of blockchain technology on value propositions, specifically Spearman correlation coefficients. The Spearman rank correlation can take a value from +1 to -1 to give the strength of the relationship. Also, this test gives the direction of the relationship.

Correlations								
			Size	**Age**	**Industry**	**BC Tech Develop New Products and Services**	**BC Tech Improve Existing Products and Services**	**BC Tech Reduce Costs for Organisation Customers**
Spearman's rho	Size	Correlation Coefficient	1.000	.551**	.177	.073	.076	.050
		Sig. (2-tailed)	.000	<.001	.269	.652	.638	.757
		N	41	41	41	41	41	41
	Age	Correlation Coefficient	.551**	1.000	.236	.117	.063	.045
		Sig. (2-tailed)	<.001	.000	.138	.466	.697	.779
		N	41	41	41	41	41	41
	Industry	Correlation Coefficient	.177	.236	1.000	-.172	-.210	-.278
		Sig. (2-tailed)	.269	.138	.000	.283	.188	.079
		N	41	41	41	41	41	41
	BC Tech Develop New Products and Services	Correlation Coefficient	.073	.117	-.172	1.000	.968**	.878**
		Sig. (2-tailed)	.652	.466	.283	.000	<.001	<.001
		N	41	41	41	41	41	41
	BC Tech Improve Existing Products and Services	Correlation Coefficient	.076	.063	-.210	.968**	1.000	.906**
		Sig. (2-tailed)	.638	.697	.188	<.001	.000	<.001
		N	41	41	41	41	41	41
	BC Tech Improve Existing Products and Services	Correlation Coefficient	.050	.045	-.278	.878**	.906**	1.000
		Sig. (2-tailed)	.757	.779	.079	<.001	<.001	.000
		N	41	41	41	41	41	41
**. Correlation is significant at the 0.01 level (2-tailed).								

Table 5.106: Correlation of Adopt Blockchain Technologies on VP

Table 5.106 shows that the value of 0.551** indicates a moderate positive correlation between the size and age variables. In addition, for all three variables, the correlation values range from 0.8 to 0.9, indicating a strong positive correlation with blockchain technology in all questions related to value propositions for organisations.

5.5: Conclusion: Learning from the Extended Study Survey

The extended study survey examined the perceived impacts of adopting multiple of advanced technologies, including blockchain, on an organisation's business model. Furthermore, this survey provides the researcher with valuable insights about technology adoption across organisations of varying sizes, ages, and industries. This chapter thoroughly analysed the survey data to answer the research questions. Next, Chapter 6 will discuss the findings, the contributions of the work, and implications for research and practice.

Chapter 6: Discussion and Conclusion

This chapter presents a comprehensive discussion and conclusion for the research study. Section 6.1 reviews and discusses the research findings. Section 6.2 highlights the study's key contributions to academic knowledge and practical applications. Finally, Section 6.3 offers a critical perspective on the scope and constraints of the study and proposes recommendations for future research, exploration, and development.

6.1 Discussion of Findings

The objective of the research was:

> *RO: To explore the perceived impacts of blockchain and other advanced technologies adoption on an organisation's business model.*

The research objective was operationalised as four research questions, using the Business Model Canvas (BMC) as a lens. The research has two phases. First, the exploratory study (Chapter 4), where a specific technology, one geographic location, and one type of organisation were explored. Second, the extended study (Chapter 5), which explored the perceived impacts of various technologies on organisational business models. The answers to the four research questions are visualised and discussed below. This is done in two parts. First, all 4 RQs are discussed in terms of the perceived impacts of advanced technology adoption. Second, all 4 RQs are discussed again in terms of the perceived impacts of blockchain adoption.

The four research questions of the research were:

> RQ1: What Are the Perceived Impacts of Blockchain and Advanced Technology Adoption on an Organisation’s Customer Segments (CS), Channels (CH) and Relationships (CR)?
>
> RQ2: What Are the Perceived Impacts of Blockchain and Advanced Technology Adoption on an Organisation’s Key Partnerships (KP), Key Resources (KR) and Key Activities (KA)?
>
> RQ3: What Are the Perceived Impacts of Blockchain and Advanced Technology Adoption on an Organisation’s Cost Structure (CS) And Revenue Streams (RS)?

RQ4: What Are the Perceived Impacts of Blockchain and Advanced Technology Adoption on an Organisation's Value Propositions (VP)?

6.1.1 Perceived Impacts of Advanced Technology Adoption

In this study, the BMC is used to analyse the perceived impacts of technology adoption. Figure 6.1 illustrates the perceived impacts of adopting advanced technology on an organisation's business model. Each of the nine blocks includes one or more perceived impacts.

Based on the data from all 72 respondents, each perceived impact has been colour coded. "Green" is "positive" which indicates that the combined total of "strongly agree" and "agree" responses were equal to or greater than 50% of the population. "Green and Bold" is "very positive", which meets the same criteria but also that the "strongly agree" responses account for 25% or more. Conversely, "Red" is "negative" which indicates that the combined total of "strongly disagree" and "disagree" responses were equal to or greater than 50% of the population. "Red and Bold" is "very negative, which meets the same criteria but also that the "strongly disagree" responses account for 25% or more. Finally, for impacts where the data does not match any of the above (i.e. high levels of neutral, and mixed agreements/disagreements, "Orange" is used to indicate "mixed.")

In addition to the colour coded "positivity" scale, whenever a perceived impact correlated significantly with either size, age, or industry ($p \leq 0.4$), this is indicated in the figure, and a breakdown by the correlated variable is given.

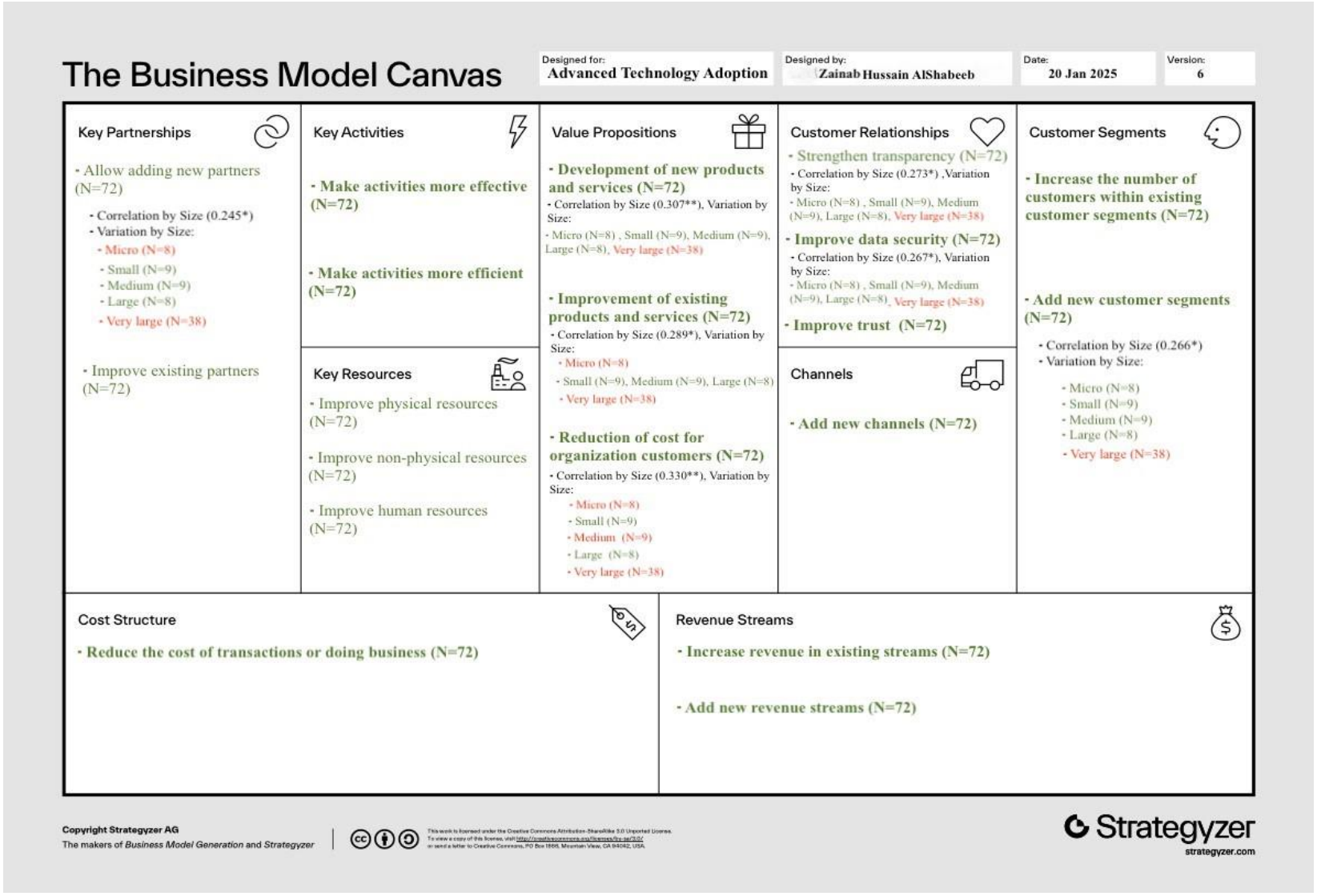


Figure 6.1: Summary of Findings on Advanced Technology Adoption (N=72)

Figure 6.1 illustrates that all 72 respondents in the extended study perceived the 19 impacts of adopting advanced technology, as identified in the literature (See Chapter 2). Furthermore, 13 of these perceived impacts, highlighted in green and bold, indicated that 25% of the responses showed a strong agreement regarding the adoption of advanced technology. Lastly, 7 perceived impacts demonstrated a significant correlation between the size of the organisation and the variance in responses based on size, marked with green (indicating strong agreement) and red (indicating low agreement).

RQ1: Customer Segments, Channels, and Relationships

First Research Question concerning customers, explored six perceived impacts from a total of 19. With regards to RQ1, this study agreed with previous research regarding the perceived impacts of adopting advanced technology on customer segment growth (Macron et al., 2022; Hashem et al., 2023; Rathore, 2023; Muhtaroğlu et al., 2013; Piller, 2024). This study demonstrates that adopting advanced technology is perceived to positively impact on customer segments by increasing the number of customers in existing segments and by adding new segments. Additionally, the findings agreed with earlier research on the perceived impact of adopting advanced technology on channels (Muhtaroğlu et al., 2013; Metzler & Muntermann, 2020), indicating that advanced technology adoption is perceived to introduce new communication channels. Furthermore, this study agreed with previous research related to the positively perceived impacts of adopting advanced technology on customer relationships, particularly aspects of consumer trust and the transparency and security of transactions between organisations and their customers (McKnight & Chervany, 2001; Bagheri & Movahed, 2016; Dijkman et al., 2015; Mohamad et al., 2014; Muhtaroğlu et al., 2013). Overall, the majority of respondents perceived that adopting advanced technology is perceived to have had an impact on customer relationships, improving trust, transparency, and data security.

RQ2: Key Partnerships, Resources, and Activities

Second Research Question focused on core activities, partnerships, and resources, revealing seven perceived impacts. In terms of RQ2, this study agreed with the previous research on perceived impacts of advanced technology adoption on organisational key partnerships (Tolboom, 2016; Muhtaroğlu et al., 2013). The adoption of advanced technology is perceived to help establish new partnerships and enhance collaboration with existing ones. Additionally, the study agreed with earlier research on the perceived impacts of advanced technology

adoption on key resources (Bhardwaj et al., 2020). Respondents perceive that advanced technology improves their management of physical, non-physical, and human resources. Furthermore, the result of the study agreed with prior research on the perceived impacts of advanced technology adoption on key activities (Muhtaroğlu et al., 2013). The respondents perceive that adopting advanced technologies has made organisational activities more effective and efficient.

RQ3: Cost Structure and Revenue Streams

Third Research Question related to financial aspects revealed three perceived impacts. For RQ3, the study agreed with the perceived impacts of advanced technology adoption on an organisational cost structure (Madakam et al., 2019; Kopetz & Steiner, 2022; Shim et al., 2019; Moro-Visconti et al., 2023). The findings show adoption of advanced technologies are perceived to reduce the costs associated with transactions and business operations. Furthermore, the study agreed with prior research on the perceived impacts of technology adoption on revenue streams (Moro-Visconti et al.,2023; Mithas et al., 2012; Piskar & Faganel, 2009; Car & Stıfanıch, 2020). The findings show adopting advanced technologies are perceived to increase revenue in existing streams and add new revenue streams.

RQ4: Value Propositions

Finally, Fourth Research Question examined the value of an organisation, identified three perceived impacts. For RQ4, the study agreed with prior research on the perceived impacts of advanced technology adoption on an organisational value proposition (Muhtaroğlu et al., 2013; Wortmann & Flüchter, 2015; Clarke, 2008). The findings show that adoption of advanced technologies is perceived to support the development of new products and services (as anticipated by Muhtaroğlu et al., 2013; Wortmann & Flüchter, 2015), improve existing products and services (as anticipated by Muhtaroğlu et al., 2013; Wortmann & Flüchter, 2015; Clarke, 2008), and reduce costs for customers (as anticipated by Muhtaroğlu et al., 2013; Wortmann & Flüchter, 2015).

6.1.2 Correlation Analysis of Advanced Technology Adoption

As reported in Figure 6.1, several perceived impacts correlated with company size. In the survey data, **Very Large** Organisations reported **higher levels of adoption of advanced technologies** than others (Mean average of number of advanced technologies adopted. See

Section 5.2.2, Table 5.28). However, the findings indicated that Very Large Organisations were **less likely to perceive impacts** in several areas:

- Adding new customer segments,
- Strengthening transparency,
- Improving data security,
- Developing new products and services,
- Improving existing products and services,
- Reducing costs for Organisation customers, and
- Adding new partners.

Conversely, **Large** Organisations (which also report **high levels of adoption of advanced technology**) are **more likely to perceive impacts** of advanced technology adoption on

- Adding new customer segments,
- Strengthening transparency,
- Improving data security,
- Developing new products and services,
- Improving existing products and services,
- Reducing costs for Organisation customers, and
- Adding new partners.

Furthermore, the survey data revealed that **Medium** Organisations (which reported **lower levels of adoption of advanced technology)** are **less likely to perceive impacts** of advanced technology adoption on

- Reducing costs for Organisation customers.

In contrast, **Medium** Organisations (which also report **lower levels of adoption** advanced technology) are **more likely** to perceive impacts of advanced technology adoption on

- Adding new customer segments,
- Strengthening transparency,
- Improving data security,
- Developing new products and services,
- Improving existing products and services, and
- Adding new partners.

Moreover, the survey data revealed that **Small** Organisations (which reported **lower levels of adoption** of advanced technology) are **more likely** to perceive impacts of advanced technology adoption on

- Adding new customer segments,
- Strengthening transparency,
- Improving data security,
- Developing new products and services,
- Improving existing products and services,
- Reducing costs for Organisation customers, and
- Adding new partners.

In addition, the survey data revealed that **Micro** Organisations (which reported **lower levels of adoption** of advanced technology) are **less likely** to perceive impacts of advanced technology adoption on

- Improving existing products and services,
- Reducing costs for Organisation customers, and
- Adding new partners.

In contrast, **Micro** Organisations (which also reported **lower levels of adoption** of advanced technology) are **more likely** to perceive impacts of advanced technology adoption on

- Adding new customer segments,
- Strengthening transparency,
- Improving data security, and
- Developing new products and services.

These findings challenge our assumptions about both adoption patterns and perceived impacts and suggest the need for additional research (See Section 6.4). Of particular interest are the lower perceived impacts for Very Large Organisations. Possible explanations for this trend include decreasing returns, as the very large organisations in the study adopted more advanced technologies than other organisations (See Table 5.28 and Section 5.2.2). Another explanation could be lower capacity to utilize innovative solutions, as larger firms often face challenges in adopting new technologies due to size and complexity (Hall & Khan 2003). This issue is further complicated when networks are involved, as updating an entire network to support new technology can be particularly expensive (Hall & Khan 2003). It is also possible that these impacts are simply harder to perceive as return on investment (ROI) on specific technology investment is often difficult to gauge (Leonard-Barton & Kraus, 1985; Strategyzer, 2024).

6.1.3 Perceived Impacts of Blockchain Technology Adoption

In this study, the BMC is used to analyse the perceived impacts of technology adoption. Figure 6.2 illustrates the perceived impacts of adopting blockchain on an organisation's business model. Each of the nine blocks includes one or more perceived impacts. It is based on the data from the 41 blockchain adopters. Again, each perceived impact has been colour coded. "Green" is "positive" which indicates that the combined total of "strongly agree" and "agree" responses were equal to or greater than 50% of the population. "Green and Bold" is "very positive", which meets the same criteria but also that the "strongly agree" responses account for 25% or more. Conversely, "Red" is "negative" which indicates that the combined total of "strongly disagree" and "disagree" responses were equal to or greater than 50% of the population. "Red and Bold" is "very negative", which meets the same criteria but also that the "strongly disagree" responses

account for 25% or more. Finally, for impacts where the data does not match any of the above (i.e. high levels of neutral, and mixed agreements/disagreements, “Orange” is used to indicate “mixed.”

In addition to the colour coded “positivity” scale, whenever a perceived impact correlated significantly with either size, age, or industry ($p \leq -0.5$) this is indicated in the figure. Due to the large number of correlations, the detailed breakdown by the correlated variables is given separately in Table 6.1.

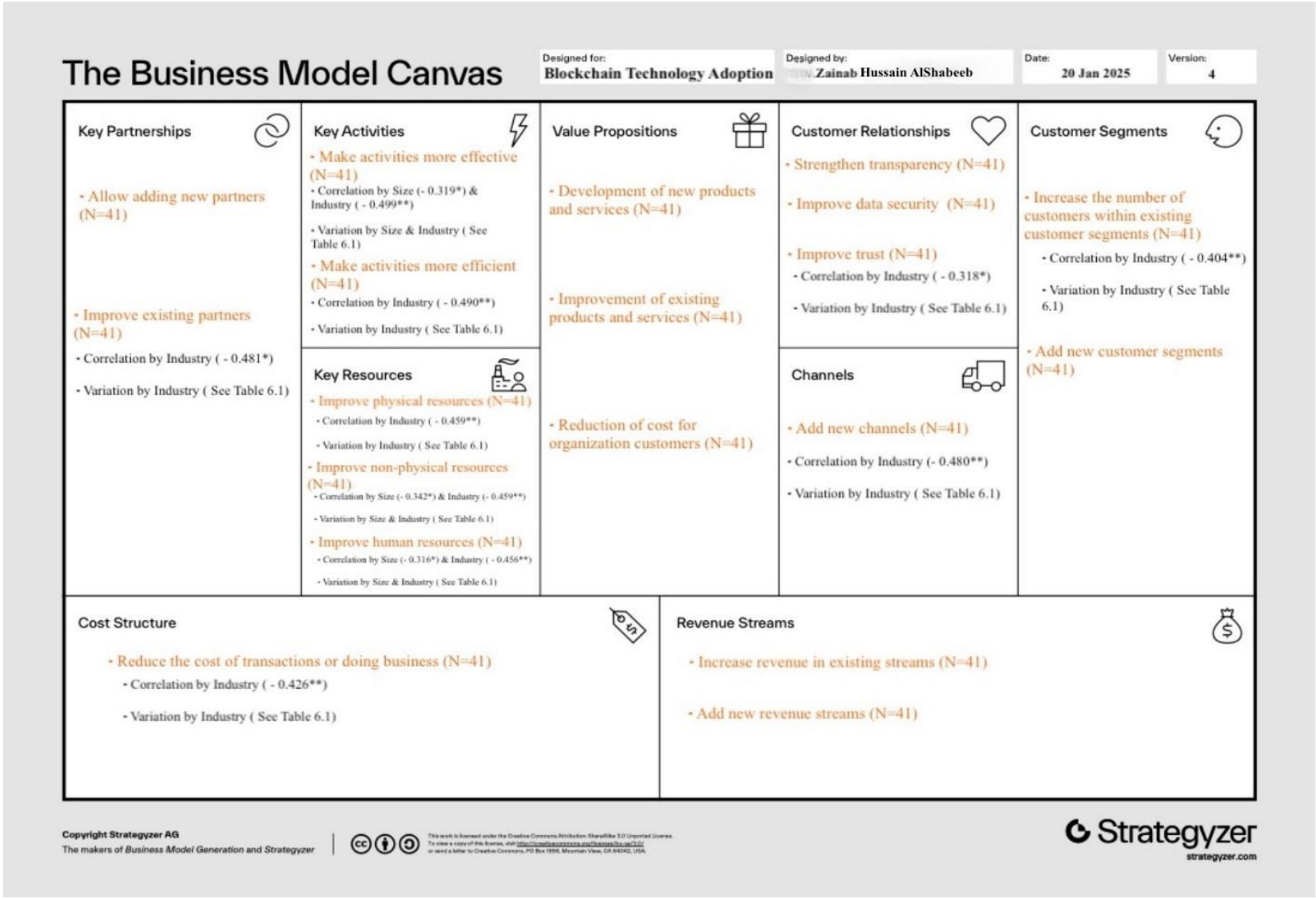


Figure 6.2: Summary of Findings on Blockchain Technology Adoption (N=41)

Perceived Impact	Correlation	Data
Increase the number of customers within existing customer segments.	Industry	▪ Supply Chain Management (N=2) ▪ Financial Services (N=5) ▪ IT (N=11) ▪ Consultancy (N=9) ▪ Education (N=2) ▪ Health (N=1) ▪ Government (N=2) ▪ Manufacturing (N=3) ▪ Retail (N=1) ▪ Other (N=5)
Add new channels.	Industry	▪ Supply Chain Management (N=2) ▪ Financial Services (N=5) ▪ IT (N=11) ▪ Consultancy (N=9) ▪ Education (N=2) ▪ Health (N=1) ▪ Government (N=2) ▪ Manufacturing (N=3) ▪ Retail (N=1) ▪ Other (N=5)
Improve trust.	Industry	▪ Supply Chain Management (N=2) ▪ Financial Services (N=5) ▪ IT (N=11) ▪ Consultancy (N=9) ▪ Education (N=2) ▪ Health (N=1) ▪ Government (N=2) ▪ Manufacturing (N=3) ▪ Retail (N=1) ▪ Other (N=5)
Improve existing partners.	Industry	▪ Supply Chain Management (N=2) ▪ Financial Services (N=5) ▪ IT (N=11) ▪ Consultancy (N=9) ▪ Education (N=2) ▪ Health (N=1) ▪ Government (N=2) ▪ Manufacturing (N=3) ▪ Retail (N=1) ▪ Other (N=5)
Improve physical resources.	Industry	▪ Supply Chain Management (N=2) ▪ Financial Services (N=5) ▪ IT (N=11) ▪ Consultancy (N=9) ▪ Education (N=2) ▪ Health (N=1) ▪ Government (N=2) ▪ Manufacturing (N=3) ▪ Retail (N=1) ▪ Other (N=5)
Improve non-physical resources.	Size	▪ Micro (N=6) ▪ Small (N=2) ▪ Medium (N=4) ▪ Large (N=7) ▪ Very large (N=22)
Improve non-physical resources.	Industry	▪ Supply Chain Management (N=2) ▪ Financial Services (N=5) ▪ IT (N=11) ▪ Consultancy (N=9) ▪ Education (N=2) ▪ Health (N=1) ▪ Government (N=2) ▪ Manufacturing (N=3) ▪ Retail (N=1) ▪ Other (N=5)

Perceived Impact	Correlation	Data
Improve human resources.	Size	▪ Micro (N=6) ▪ Small (N=2) ▪ Medium (N=4) ▪ Large (N=7) ▪ Very large (N=22)
Improve human resources.	Industry	▪ Supply Chain Management (N=2) ▪ Financial Services (N=5) ▪ IT (N=11) ▪ Consultancy (N=9) ▪ Education (N=2) ▪ Health (N=1) ▪ Government (N=2) ▪ Manufacturing (N=3) ▪ Retail (N=1) ▪ Other (N=5)
Make activities more effective.	Size	▪ Micro (N=6) ▪ Small (N=2) ▪ Medium (N=4) ▪ Large (N=7) ▪ Very large (N=22)
Make activities more effective.	Industry	▪ Supply Chain Management (N=2) ▪ Financial Services (N=5) ▪ IT (N=11) ▪ Consultancy (N=9) ▪ Education (N=2) ▪ Health (N=1) ▪ Government (N=2) ▪ Manufacturing (N=3) ▪ Retail (N=1) ▪ Other (N=5)
Make activities more efficient.	Industry	▪ Supply Chain Management (N=2) ▪ Financial Services (N=5) ▪ IT (N=11) ▪ Consultancy (N=9) ▪ Education (N=2) ▪ Health (N=1) ▪ Government (N=2) ▪ Manufacturing (N=3) ▪ Retail (N=1) ▪ Other (N=5)
Reduce the cost of transactions or doing business.	Industry	▪ Supply Chain Management (N=2) ▪ Financial Services (N=5) ▪ IT (N=11) ▪ Consultancy (N=9) ▪ Education (N=2) ▪ Health (N=1) ▪ Government (N=2) ▪ Manufacturing (N=3) ▪ Retail (N=1) ▪ Other (N=5)

Table 6.1: Breakdown of blockchain technology adoption based on Size and Industry (N=41)

As illustrated in Figure 6.2, among the 41 respondents who are blockchain adopters, 19 perceived impacts of adopting blockchain technology within their organisations went unrecognized. For these 19 impacts, which are discussed in previous research (See Chapter 2), there were mixed levels of agreement, with over 50% of respondents indicating they neither agreed nor disagreed. Furthermore, Table 6.1 provides a breakdown of blockchain technology adoption by organisation size and industry. Notably, three perceived impacts show significant correlations with the size of the organisation and the level of agreement. Additionally, ten perceived impacts demonstrate a significant correlation with the industry of the organisation and the variance in agreement.

RQ1: Customer Segments, Channels, and Relationships

First Research Question concerning customers, explored six perceived impacts from a total of 19. In terms of RQ1, this study challenged earlier research on the perceived impacts of adopting blockchain technology on customer segments (growth and new) (Treiblmaier & Špan, 2022, and Morkunas et al., 2019). However, this study finds that among blockchain adopters, the majority do not perceive these impacts. Additionally, this study challenges earlier research on the perceived impacts of adopting blockchain technology on channels (Treiblmaier & Špan, 2022, and Morkunas et al., 2019). Again, this study finds that the majority of blockchain technology adopters do not perceive the impact when creating new communication channels. Furthermore, the study challenged earlier research on the perceived impacts of adopting blockchain technology on customer relationships, namely improving trust, transparency, and data security (Saurabh et al., 2022; Khan et al., 2023; Treiblmaier & Špan, 2022). This study indicates that the majority of blockchain technology adopters do not perceive these impacts.

RQ2: Key Partnerships, Resources, and Activities

Second Research Question focused on core activities, partnerships, and resources, revealing seven perceived impacts. This study challenged prior research on the perceived impacts of adopting blockchain technology on organisational key partnerships (add new partners and grow existing partners) (Morkunas et al., 2019). This study finds that the majority of blockchain technology adopters do not perceive these impacts. Also, the study challenged earlier research on the perceived impacts of adopting blockchain technology on organisational key resources (importance of physical, non-physical, and human resources) (Treiblmaier & Špan, 2022;

Abdollahi et al., 2023; Morkunas et al., 2019). This study indicates that the majority of blockchain technology adopters do not perceive these impacts.

In addition, this study challenged prior research on the perceived impacts of blockchain technology adoption on organisational key activities (make activities more efficient and effective) (Treiblmaier & Špan, 2022; Morkunas et al., 2019; Salah et al., 2020). This study finds that the majority of blockchain technology adopters do not perceive these impacts.

RQ3: Cost Structure and Revenue Streams

Third Research Question related to financial aspects revealed three perceived impacts. This study challenged prior research on the perceived impacts of adopting blockchain technology on organisational cost structure (Morkunas et al., 2019; Leelasantitham, 2020; Kim et al.,2020). This study finds that the majority of blockchain technology adopters do not perceive the impact in reducing the costs associated with transactions and business operations. In addition, this study challenged prior research on the perceived impacts of adopting blockchain technology on organisational revenue streams (grow existing revenue streams and add new revenue streams) (Morkunas et al., 2019; Treiblmaier & Špan, 2022; Rajnak & Puschmann, 2021; Vijayakumar, 2021) indicating that the majority of blockchain technology adopters do not perceive these impacts.

RQ4: Value Propositions

Finally, Fourth Research Question examined the value of an organisation, identified three perceived impacts. This study challenged prior research on the perceived impacts of adopting blockchain technology on developing new products and services (Pucheanu et al., 2020). Also, this study challenged prior research on the perceived impacts of adopting blockchain technology on improving existing products and services (Morkunas et al., 2019; Zutshi et al., 2021). Additionally, this study challenged prior research on the perceived impacts of adopting blockchain technology on reducing customer costs (Morkunas et al., 2019). This study finds that the majority of blockchain technology adopters do not perceive these impacts.

6.1.4 Correlation Analysis of Blockchain Adoption

As reported in Figure 6.2, the perception of several impacts correlated with company size and industry.

Correlation with Size

The findings indicate that the majority of **Very Large Organisations** were **more likely** to perceive impacts of blockchain technology adoption as follows:

- Improving the management of non-physical resources,
- Improving the management of human resources, and
- Making activities more effective.

Interestingly, **size** did not correlate with these three perceived impacts when exploring advanced technology adoption in general. This relationship was specific to blockchain.

One potential interpretation is that very large organisations recognize the advantages of adopting blockchain technology more frequently due to the use cases they focus on. In the survey **Very Large Organisations** reported **higher levels** of automation (activity and resource management) and distributed ledger use cases (activity transparency and resource accounting) for blockchain technology adoption (See Section 5.2.1, Table 5.22). These findings suggest that very large organisations have numerous tasks that can benefit from automation and utilize this type of ledger because it records the inputs and outputs of transactions without requiring a central authority. Additionally, very large organisations are known to prioritise technology investment to support resource management such as Enterprise Resource Planning (ERP) systems. ERP systems establish a common database accessible to the entire company to manage both resources and activities (AboAbdo et al.,2019).

Conversely, the findings indicated that the majority of **Micro, Small, Medium, and Large Organisations** did not perceive impacts of blockchain technology adoption on:

- Improving the management of non-physical resources,
- Improving the management of human resources, and
- Making activities more effective.

Again, this may be explained to some extent by the use cases implemented. For example, **Micro, Medium, and Large Organisations** reported **lower levels** of distributed ledger use cases for their blockchain adoption, and **Micro and Medium Organisations** reported **lower**

levels of automation use cases. Note that **Small Organisations** reported **no use** of blockchain technology adoption use cases at all (See Section 5.2.1, Table 5.22).

The overall trend among **non-Very Large** organisations towards reporting positive impacts of adopting blockchain less often may also be due to integration and appropriation challenges. Prior research, such as Jemala (2012) highlights the importance of addressing these challenges through adequate technological knowledge and information protection, through a case study of an affordable server solution that provides networking, security, data management, business support, remote access, and additional features specifically designed for SMEs (Jemala, 2012).

Correlation with Industry

In addition to the size correlation, the industry sector also correlates with other perceived impacts. The findings indicated that the majority of **IT sector Organisations** are **more likely** to perceive impacts of blockchain technology adoption on:

- Increasing the number of customers within existing customer segments,
- Adding new channels, and
- Improving trust.

Again, one possible explanation is use case. In the survey data, **IT sector** organisations were reported **more likely** adopting blockchain technology use cases for cryptocurrency (See Table 5.24, Section 5.2.1). This use case offers many opportunities across various fields for enhancing transparency, preventing fraud, and ensuring privacy. There is a growing demand for financial inclusion in both developed and developing countries. The rise in popularity of Non-Fungible Tokens (NFTs) among content creators and the increasing interest in cryptocurrencies further drive the adoption of blockchain, as does the need to manage renewable energy effectively (as investment demand) (CST, 2025). In addition, Morkunas et al. (2019) highlighted the role of Initial Coin Offerings (ICOs) as an alternative to conventional financing methods like venture capital, private equity, and bank loans. In an ICO, early investors receive tokens rather than shares in the company. These tokens can be traded in secondary markets, and all transactions are validated through blockchain (as payment mechanism). Moreover, Aponte-Novoa et al. (2021) emphasized that double-spending attacks

are considered a significant risk to blockchain security, particularly when miners control more than 51% of the mining power, which raises an alert. To mitigate this issue, an effective technique for preventing a 51% attack involves a combination of Proof of Work (PoW) and Proof of Stake (PoS), referred to as a 2-hop blockchain. By implementing this technique, miners aim to enhance integrity and trust within the system. If a miner owns more than 51% of the mining power, the chances of successfully executing a fraudulent action remain minimal (as trustless architecture).

In contrast, the findings indicated that the majority of the three largest sectors represented in the survey, namely, **Financial Services, IT, and Consultancy Organisations** did not perceive impacts of blockchain technology adoption on:

- Improving existing partners,
- Improving the management of physical resources,
- Improving the management of non-physical resources
- Improving the management of human resources,
- Making activities more effective,
- Making activities more efficient, and
- Reducing the cost of transactions or doing business.

Morkunas et al. (2019) and Treiblmaier and Špan (2022) show that blockchain technology can enable peer-to-peer business interactions. However, industries like financial services, IT, and consultancy still often use old internal processes. These industries have the chance to update their operations and become more efficient.

As previously discussed, one possible explanation for the low levels of impact reporting is the use cases adopted. In the study, **Financial Service** sector organisations reported a **lower level** of automation use cases (which would relate to activity efficiency, effectiveness, and cost)**. IT** sector organisations reported a **lower level** of distributed ledger, smart contracts, smart devices, automation, asset management, and "Trustless" consensus mechanisms use cases (potentially relevant to all of the impacts listed). Finally, the **Consultancy** sector organisations reported a

lower level of distributed ledger, smart contracts, the Internet of Things (IoT), and smart devices use cases, all of which are potentially relevant to both resource management and activity optimisation (See Table 5.24, Section 5.2.1).

These findings suggest that organisations in the **Financial Services, IT, and Consultancy sectors** have different use cases for adopting blockchain technology because they perform their tasks manually or use a centralized ledger.

Overall, the findings related to the adoption of blockchain technology challenge our assumptions about adoption patterns and their perceived impacts, suggesting the need for further research. Notably, the lower perceived impacts in the Financial Services, IT, and Consultancy sectors require closer examination (See Section 6.3). Possible explanation includes these sectors need to remove intermediaries or automate the process to reduce the cost of transactions or doing business, or other factors that make adoption impacts harder to perceive.

Additionally, the lower perceived impacts across Micro, Small, Medium, and Large organisations also need further examination (See Section 6.3). These findings suggest that organisations (micro, small, medium, and large) may find that the expected improvements in effectiveness, such as increased speed, are not realized as intended. This may result in a perception of reduced impact or other factors that make adoption impacts harder to perceive.

6.2 Contribution

This section discusses the contributions made by the research to academic knowledge and to practice.

Firstly, the study supports prior research findings related to advanced technology adoption. Specifically, the 19 business model impacts identified in the literature related to **adopting advanced technologies** were perceived by the majority of respondents (n=72). The study also extends prior research by identifying correlations between 7 of the perceived impacts and company size (See Figure 6.1).

Secondly, the study challenges prior findings related to blockchain adoption. Specifically, the 19 business model impacts identified in the literature related to **adopting blockchain** were NOT perceived by the majority of respondents (n=41). The study also extends prior research

by identifying correlations between 10 perceived impacts and industry sector, and between 3 perceived impacts and company size (See Figure 6.2).

6.3 Limitations of the Study and Recommendations for Future Research and Practice

6.3.1 Limitations

The generalisability and depth of this study were limited in three ways:

1. **Depth of Tech Coverage**: The survey included some additional questions about blockchain technology adoption (e.g. use cases), which turned out to have explanatory benefit. In future work, other disruptive technologies, like Artificial Intelligence (AI), Internet of Things (IoT), and cybersecurity, should also be expanded in this way.

2. **Sample Size:** The relatively small sample size limits the generalizability of the findings, particularly due to the disproportion between small and large organisations. This difference affects the ability to draw broad conclusions. Additionally, the study includes only a few participants from the supply chain management sector, so it would be beneficial to increase the number of respondents from this sector.

3. **Study Method:** The study employed a two-phase approach with an exploratory study (questionnaire and interviews) and a quantitative (survey) extended study. While this approach had strengths, it could have further benefited from additional qualitative work to explore the findings of the main study, which should be considered in future work.

6.3.2 Recommendations for Future Research

Based on this study, the researcher makes three recommendations for future research:

1. **Exploration of Variations Correlated with Organisation Size**:

There is a need for further research into very large organisations with more than 500 employees. Why do survey results show lower perceived impacts when these organisations adopt so many advanced technologies? What additional perceived impacts might they be seeking or observing? In contrast, very large organisations that implement blockchain technology tend to report significantly higher perceived impacts than smaller organisations, again raising the question “Why?”.

2. **Exploration of Variations Correlated with Industry Sector**:

The adoption of blockchain technology varies across different sectors, such as financial services, IT, and consulting. These industries generally reported a lower perceived impact from implementing blockchain technology, which raises questions about the specific perceived impacts they are seeking. Future researchers should thus investigate industry sector variance in organisational intentions and expectations.

3. **Use Case Level Comparative Exploration:**

Use-case comparison helps organizations evaluate real-world applications in specific industries. This targeted approach enables businesses to make informed decisions that increase effectiveness and drive innovation. In the extended study, a question was raised regarding the use of cases. The question was "Which blockchain use cases/functionalities are relevant to your organisation and/or industry sector?" According to the data presented in Table 5.21, most organisations have opted for smart contracts and automation use cases.

In an exploratory study, one of the interview questions was asked: "What is the most common use case for blockchain among SMEs?" Both interviewees stated that the leading use of blockchain in small and medium-sized enterprises (SMEs) is in finance. It helps with payments, settlements, automates accounting controls, and supports crowdfunding for investment. Supply chain management is the second primary use case due to its benefits of traceability and transparency. Overall, blockchain adoption has a significant impact on operations and value propositions, creating new opportunities for business transformation.

Therefore, future researchers should explore the variations between sectors in terms of use cases for blockchain and other disruptive technology adoption. Researchers should focus on the specific use cases adopted in areas such as healthcare, supply chain management, or real estate. Such future research may reveal why some use cases attract more interest and excitement than others.

6.3.3 Recommendations for Practice

The study draws attention to the potential importance of (1) use case focus (See Figure 4.7 and See Table 5.21), (2) right-sizing the scale of adoption, (3) levels of integration and training, (4) attention to ROI, and other factors in leveraging the potential of adopted technologies, and specifically blockchain.

These findings have direct practical implications for industry, particularly in terms of strategy. For example, the study revealed the importance of use case alignment (See Table 5.21). However, it can be challenging for organisations to correctly anticipate optimal use cases when adopting new technology. Thus, I argue that organisations should seize the opportunity to explore various use cases by initiating projects that involve new technologies. By launching small initiatives, participating in technology market forums or conferences, organizing hackathon competitions, and collaborating with academic and non-academic associations for workshops, organisations can provide individuals, researchers, and experts with valuable opportunities to familiarize themselves with these new technologies. Similarly, striking a balance between the number of technologies adopted and internal capacity to manage them, should also be considered. This is likely particularly true in terms of levels of integration and training related to technology adoption and development. Effective technology integration and training can be enhanced when organisations collaborate with one another. Additionally, cross-industry partnerships can facilitate knowledge sharing and resource pooling, ultimately leading to improved outcomes in technology adoption and development processes. Finally, measuring ROI is a necessary consideration in organisations that adopt and develop technology. Which technologies will inspire organisations to invest, how much will they commit, and what kind of return on investment can they expect, and when? Exploring the dynamic landscape of tech investments provides insight into the future of technology.

6.4 Conclusion

In conclusion, the discussions in this chapter highlight the complexities and variations in the perceived impacts of technology adoption. This is particularly true for emerging specialised technologies like blockchain. It is essential to understand how organisations seek to utilize technologies (use cases), the standards they set for their adoption and use (integration and training), and the outcomes following their implementation (ROI and measurement). Future researchers should thus adopt a more holistic and contextualised approach, as the study makes clear that technology is not “one size fits all.” While organisations stand to benefit significantly from utilizing technology, they must acquire the necessary knowledge to do so effectively.

Appendix A

Exploratory Study (Questionnaire)

Title: Blockchain Technology (BC) and Business Model (BM) of Small and Medium Enterprises (SMEs) in the Kingdom of Saudi Arabia (KSA)

Section 1: Organisation Information

1.1: Is your organisation consider a small or medium size (based on the number of employees)?

- ☐ Micro 1-9
- ☐ Small 10-49
- ☐ Medium 50-250
- ☐ Other

1.2: How many years has your firm operate?

- ☐ Less than 1 year
- ☐ Between 1 to 2 years
- ☐ More than 2 years
- ☐ More than 5 years

1.3: What is your organisation's industry?

- ☐ Supply chain management, Transportation (logistics)
- ☐ Financial services (banking, insurance, and investment)
- ☐ Information technology (equipment and software vendors)
- ☐ Consultancy (blockchain service, IT, and Business)
- ☐ Education
- ☐ Health (Medical, Pharmaceutical)
- ☐ Government
- ☐ Non-profit Government Organisation (NGO)
- ☐ Manufacturing/Retail
- ☐ Other

Section 2: Organisation Information and Blockchain Technology

2.1: What is the role of blockchain technology in your organisation?

- ☐ Sell the product of the blockchain.
- ☐ Sell the service of the blockchain.
- ☐ Use the product and service of blockchain.
- ☐ Customize and support blockchain technology.
- ☐ Other

2.2: Which application of blockchain technology is relevant to your customers?

- ☐ Bitcoin
- ☐ Ethereum
- ☐ Hyperledger
- ☐ Ripple
- ☐ Corda
- ☐ Other

2.3: What purpose of blockchain technology features is relevant to your customers?

- ☐ Initial coin offering (ICO)
- ☐ Smart Contract
- ☐ Consensus mechanism: Proof of Work (PoW), Proof of Stake (PoS), Practical Byzantine Fault Tolerance (PBFT), Delegated Proof of Stake (DPoS), Federated Byzantine Agreement (FBA), Proof of Authority (PoAu), Proof of Elapsed Time (PoET), Proof of Activity (PoAc), Proof of Burn (PoB), Proof of Capacity (PoC).
- ☐ Other

2.4: What blockchain technology use cases are applicable in your organisation?

- ☐ Cryptocurrency (Litecoin)
- ☐ Green certificate
- ☐ IoT
- ☐ Smart devices and automation
- ☐ Asset management

2.5: What do blockchain technology solution services in your company offer to customers?

- ☐ Transaction payment
- ☐ Tracking of shipment
- ☐ Trust between partners
- ☐ Transparency in operation
- ☐ Distributed ledger
- ☐ Immutable transaction
- ☐ Tamperproof transaction
- ☐ Peer to peer transaction
- ☐ Improving security
- ☐ Cryptocurrency
- ☐ Cryptography
- ☐ If other, please specify

Section 3: Your organisation business model and your customer segmentation, channel distribution, and customer relationship

3.1: How many different customer segments do you have?

- ☐ Serve all my customers in one segment
- ☐ Serve all my customers in several segments
- ☐ Serve all my customers in broad segments

3.2: Which dominant segments best describe your customer segments? Individual consumers (buyers)

- ☐ Small and medium enterprises
- ☐ Large enterprise
- ☐ Government and public agents
- ☐ If other, please specify

3.3: Where are your customers mostly located?

- ☐ Inside Saudi
- ☐ Outside Saudi
- ☐ Both

3.4: How often do you do each of the following when selling a blockchain technology in your company?

Channel	Never	Rarely	Sometimes	Often	Always	Not applicable
Email						
In-person meeting/ workshops						
Telephone						
Mobile application						
Website						
Social media						
Customer satisfaction surveys						
Training courses						
Technical and installation						
Support on-site visit						
Help center						

3.5: To what extent do you agree or disagree with the following statements? (In relating to building a relationship with your customers).

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not applicable
Direct interaction improves your company's performance with your customers.						
Self-service is improving your company's relationship with your customers.						
Automated service is improving your company's relationship with your customers.						
Participating in the company community improves your company's relationship with your customers.						

Section 4: Your organisations business model and your partnerships and key resources

4.1: Who are the main **partners** to your company? Check all that apply.

- ☐ Banks
- ☐ Government
- ☐ Information Technology
- ☐ Electronics equipment company
- ☐ Restaurants
- ☐ Publishing
- ☐ Food products
- ☐ Transportation
- ☐ Specialty retailer
- ☐ Real estate
- ☐ Telecommunication
- ☐ If other, please specify

4.2: Who are the main **suppliers** to your company? Check all that apply.

- ☐ Banks
- ☐ Government
- ☐ Information Technology
- ☐ Electronics equipment company
- ☐ Restaurants
- ☐ Publishing
- ☐ Food products
- ☐ Transportation
- ☐ Specialty retailer
- ☐ Real estate
- ☐ Telecommunication
- ☐ If other, please specify

4.3: To what extent do you agree or disagree with the following statements? (In relating to building a relationship with your **partners**).

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not applicable
Partnerships are helpful to reduce costs.						
Partnerships provide better access to your customers.						
Partnerships are reducing risk in your company.						

4.4: To what extent do you agree or disagree with the following statements? (In relating to building a relationship with your **suppliers**).

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not applicable
Supplier relationships are helpful to reduce costs.						
Supplier relationships provide better access to your customers.						
Supplier relationships are reducing risk in your company.						

4.5: Which physical resources are applied to your business? Check all that apply.

- ☐ Manufacturing facilities
- ☐ Buildings
- ☐ IT/IS Systems (mobile devices, Wi-Fi network)
- ☐ Vehicles
- ☐ If other, please specify

4.6: Which non-physical resources are applied to your business? Check all that apply.

- ☐ Branding and trademarks
- ☐ Market or local knowledge
- ☐ Customer data
- ☐ Partnerships and collaboration
- ☐ Patents and copyrights
- ☐ If other, please specify

4.7: Which human resources categories are important to your business? Check all that apply.

- ☐ IT experts
- ☐ Administrator
- ☐ Software developer
- ☐ CEO and manager
- ☐ Sales and marketing
- ☐ General management
- ☐ Manufacturing and delivery
- ☐ If other, please specify

Section 5: Your organisation business model and your activity, cost structure, and revenue streams

5.1: What is the most activity do your company work to develop your business? Check all that apply.

- ☐ Software development and maintenance
- ☐ Supply chain management
- ☐ Problem-solving and innovation and research
- ☐ Adding new ideas and features
- ☐ Consultancy and training solution of product and service design
- ☐ Offering process simplification of product and service
- ☐ Making and delivering a product in substantial-quality or quantity

5.2: To what extent do you agree and disagree with the following statements in describing the most activity for your company.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not applicable
Searching for new ideas is core to your business						
Finding a solution is reshaping your business						
Maintaining software increases the efficiency of your business						
Service provisioning activity is necessary to your business						
People affect operating a cost of your business.						
Buying new materials changes the cost of your business						
Production activity in either quality or quantity is dominating your business in your organisation						

5.3: What is the cost structure of your company? Check all that apply.

- ☐ Cost driven
- ☐ Value-driven
- ☐ Fixed cost (rent and salary)
- ☐ Capital cost
- ☐ Advertisement cost

5.4: In the table below, reconsider the following revenue sources are relative to your firm.

	unlikely	natural	likely
Asset sale			
Usage fee			
Subscription fee			
Leasing/ lending/renting fee			
Service fee			
Licensing			
Client's project			
Brokerage fee			
Provide post-purchase customer support			

Section 6: Your organisation business model and your value proposition

6.1: To what extent do you agree and disagree with the following statements for your company to create value for your specific customer segmentation.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not applicable
Adopting blockchain technology is improving product and service performance in your organisation.						
Adopting blockchain technology is developing a better quality of your company.						
Adopting blockchain technology is offering a lower price of products and services						
Adopting blockchain technology is maintaining an excellent collaboration with other partners						
Adopting blockchain technology is securing data sufficiently.						
Adopting blockchain technology is differentiate a small and medium-sized company.						
Adopting blockchain technology is replacing a new business for your organisation.						
Adopting blockchain technology is increasing the number of customers						
Adopting blockchain technology is enhancing better productivity for your customer services.						
Adopting blockchain technology is helping to innovate new ideas.						
Adopting blockchain technology is convenient to use by speed service on a transaction						
Adopting blockchain is reducing the risk of purchasing products and services						
Adopting blockchain technology is helping to increase the trust relationship between your company and your customer						
Adopting blockchain technology is offering loyalty to your customer.						
Adopting blockchain technology is helping your company to reduce costs.						

Exploratory Study Interview Questions

1. What is your general opinion about Blockchain technology in SMEs? Is blockchain well understood? Is misunderstanding about blockchain a barrier?

2. What are the key factors that contribute to IT and business development within your organisation? Is it feasible to integrate blockchain technology into your organisation?

3. Are supply chain and HR the most common use cases of SMEs employing Blockchain?

4. What is the most significant barrier preventing SMEs from using Blockchain?

5. How does Blockchain technology solve SMEs' problems?

6. Are Ethereum or Corda the most common applications of Blockchain for SMEs?

7. Are Public, Private or Hybrid blockchains more suitable for SMEs and why?

Extended Study Survey

Title: Perceived Impacts of Advanced Digital Technologies on Business Models

Section 1: Organisation Information

1.1: What is the size of your organisation (based on the number of employees)?

- ☐ Micro 1-9
- ☐ Small 10-49
- ☐ Medium 50-249
- ☐ Large 250-499
- ☐ Very Large 500+

1.2: How many years has your organisation operated?

- ☐ Less than 1 year
- ☐ 1- 5 years
- ☐ 6- 10 years
- ☐ 11-20 years
- ☐ More than 20 years

1.3: What is your organisation's **primary** industry?

- ☐ Supply Chain Management/Logistics/Transport
- ☐ Financial Services (Banking, Insurance, and Investment)
- ☐ Information Technology (Hardware or Software)
- ☐ Consultancy (Technology or Business)
- ☐ Education/Training
- ☐ Health (Medical, Pharmaceutical)
- ☐ Government
- ☐ Non-profit/Non-Government Organisation (NGO)
- ☐ Manufacturing/Wholesale
- ☐ Retail
- ☐ Other

Section 2: Organisation Information and Blockchain and Advanced Technologies

2.1: What is the role of blockchain technology in your organisation?

- ☐ We sell products built around blockchain.
- ☐ We sell services built around blockchain.
- ☐ We use blockchain in internal business operations.
- ☐ We provide customization and/or support of blockchain technology.
- ☐ We do not use blockchain in our organisation, but it is used elsewhere in our industry sector.
- ☐ No use of blockchain in our organisation nor in our industry sector.
- ☐ Other

2.2: Which blockchain technology platforms are relevant to your organisation and/or industry sector?

- ☐ None
- ☐ IBM Blockchain
- ☐ Corda
- ☐ Ethereum
- ☐ Hyperledger Fabric
- ☐ Quorum
- ☐ Other

2.3: Which blockchain use cases/functionalities are relevant to your organisation and/or industry sector?

- ☐ None
- ☐ Distributed Ledgers
- ☐ Smart Contracts
- ☐ Cryptocurrencies
- ☐ IoT (Internet of Things)
- ☐ Smart Devices
- ☐ Automation
- ☐ Asset Management
- ☐ "Trustless" Consensus Mechanisms
- ☐ Other

2.4: Which of the following advanced technologies have been adopted by your organisation?

- ☐ Enterprise/Manufacturing Resource Planning (ERP/MRP)
- ☐ Automated Control and Monitoring Systems
- ☐ 3D Printing/Additive Manufacturing
- ☐ Customer Relationship Management (CRM)
- ☐ IoT (Internet of Things)
- ☐ Databases, Data warehouses, Unstructured Data, Big Data
- ☐ Cloud-based Systems
- ☐ Artificial Intelligence
- ☐ Mobile Apps
- ☐ Robotics
- ☐ Cybersecurity
- ☐ Other

Section 3: Customer Segments, Channels, and Relationships

3.1: Which best describes your **primary** customer segments?

- ☐ Customers are concentrated in one or two broad segments.
- ☐ Customers are differentiated into multiple more narrow segments.

3.2: Which best describes your **primary** customer segments?

- ☐ Individual Consumers (B2C)
- ☐ Micro, Small and Medium Enterprises (B2B)
- ☐ Large and Very Large Enterprises (B2B)
- ☐ Government and Public Agencies (B2G)
- ☐ Individual Citizens (G2C)
- ☐ Other

3.3: Where are your customers **mostly** located?

- ☐ Inside our organisation's primary country
- ☐ Outside our organisation's primary country
- ☐ Both/Varies

3.4: What **Channels** do you use when interacting with your customers?

- ☐ Online Communications (Email, Website, Social Media, Telephone/VoIP, etc.)
- ☐ In-person Communications (Meetings, Workshops, Community Events, etc.)
- ☐ Automated/Self-Service (Web and Mobile Applications)
- ☐ Other

3.5: To what extent do you agree or disagree with the following statements?

Likert Scale: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Not Applicable.

- The adoption of **advanced technologies** has increased the number of customers in our existing customer segments.
- The adoption of **advanced technologies** has helped us to add new customer segments.
- The adoption of **advanced technologies** has created new channels between the organisation and our customers.
- The adoption of **advanced technologies** has helped to strengthen the transparency between the organisation and our customers.
- The adoption of **advanced technologies** has helped us to improve data security.
- The adoption of **advanced technologies** has helped us to improve customer trust in our organisation.
- The adoption of **blockchain technologies** has increased the number of customers in our existing customer segments.
- The adoption of **blockchain technologies** has helped us to add new customer segments.

- The adoption of **blockchain technologies** has created new channels between the organisation and the customers.
- The adoption of **blockchain technologies** has helped us to strengthen the transparency between the organisation and the customers.
- The adoption of **blockchain technologies** has helped us to improve data security.
- The adoption of **blockchain technologies** has helped us to improve customer trust in our organisation.

Section 4: Key Partnerships, Resources, and Activities

4.1: Who are your organisation's main **partners** (Suppliers, Collaborators, Fulfillment Partners, Consultants, etc.)?

☐ Banks and Financial Service Companies
☐ Government Agencies
☐ Information Technology Companies
☐ Electronics Equipment Companies
☐ Food Producers
☐ Restaurants
☐ Publishing/Design Companies
☐ Marketing/Advertising
☐ Education/Training
☐ Transportation Companies
☐ Specialty Wholesale/Retailers
☐ Real Estate Companies
☐ Other

4.2: How important are physical, non-physical, and human resources to your organisation? Importance scale. Very important, important, somewhat important, and not important.

☐ Physical (Plant, Buildings, etc.)
☐ IT (HW and SW)
☐ IPR (TM, Patents, CR, etc.)
☐ Data and Knowledge (Market, Local, Collab partners, and etc.)
☐ HR (Product/Service development and Delivery)

☐ HR (Admin, Finance, etc.)

☐ HR (Sales and Marketing)

4.3: To what extent do you agree or disagree with the following statements? Likert Scale: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Not Applicable.

- The adoption of **advanced technologies** has allowed us to add new partners.
- The adoption of **advanced technologies** has improved our collaboration with existing partners.
- The adoption of **advanced technologies** has improved our development and use of the organisation's physical resources.
- The adoption of **advanced technologies** has improved our development and use of the organisation's non-physical resources.
- The adoption of **advanced technologies** has improved our development and use of the organisation's human resources.
- The adoption of **advanced technologies** has made our organisation’s activities more effective.
- The adoption of **advanced technologies** has made our organisation’s activities more efficient.
- The adoption of **blockchain technologies** has allowed us to add new partners.
- The adoption of **blockchain technologies** has improved our collaboration with existing partners.
- The adoption of **blockchain technologies** has improved our development and use of the organisation's physical resources.
- The adoption of **blockchain technologies** has improved our development and use of the organisation's non-physical resources.
- The adoption of **blockchain technologies** has improved our development and use of the organisation's human resources.
- The adoption of **blockchain technologies** has made our organisation’s activities more effective.
- The adoption of **blockchain technologies** has made our organisation’s activities more efficient.

Section 5: Cost Structure and Revenue Streams

5.1: What is the primary cost for your organisation?

- ☐ Mostly Fixed costs (rent, utilities, and salaries)
- ☐ Mostly Capital costs (physical plant)
- ☐ Mostly Variable costs (consumables, running costs, cost of sales)
- ☐ I don't know/other

5.2: What is the primary revenue stream for your organisation?

- ☐ Product sales
- ☐ Service sales
- ☐ Usage fees
- ☐ Subscription fees
- ☐ Leasing/lending/renting fees
- ☐ Service fees
- ☐ Licensing fees
- ☐ Brokerage fees
- ☐ I don't know/other

5.3: To what extent do you agree or disagree with the following statements?
Likert scale: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Not Applicable.

- The adoption of **advanced technologies** reduces the cost of transactions/doing business.
- The adoption of **advanced technologies** increases revenue in existing streams.
- The adoption of **advanced technologies** adds new revenue streams.
- The adoption of **blockchain technologies** reduces the cost of transactions/doing business.
- The adoption of **blockchain technologies** increases revenue in existing streams.
- The adoption of **blockchain technologies** adds new revenue streams.

Section 6: Value Propositions

6.1: To what extent do you agree and disagree with the following statements? Likert scale from Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, to Not Applicable.

- The adoption of **advanced technologies** helps us to develop new products and services.
- The adoption of **advanced technologies** helps us to improve existing products and services.
- The adoption of **advanced technologies** helps us to reduce costs for our customers.
- The adoption of **blockchain technologies** helps us to develop new products and services.
- The adoption of **blockchain technologies** helps us to improve existing products and services.
- The adoption of **blockchain technologies** helps us to reduce costs for our customers.

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