An exploration of the impacts of digitalisation in the procurement sector

Research dissertation presented in partial fulfilment of the requirements for the degree of
MSc in International Procurement and Supply Chain Management

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Candidate Declaration

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I certify that the dissertation entitled:

An exploration of the impacts of digitalisation in the procurement sector submitted for the degree of MSc in International Procurement and Supply Chain Management is the result of my own work and that where reference is made to the work of others, due acknowledgment is given.

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Dedication

I dedicate this dissertation to my lovely husband, Eoin. Thank you so much for being a constant source of support during this dissertation project and life. Thank you for your understanding and patience during this master's degree, and all your encouraging words. I am truly thankful for having you in my life.

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Abstract

An exploration of the impact of digitalisation in the procurement sector

CINTHIA FERNANDES PINHO

This dissertation provides an overview of the leading digital technologies that will revolutionise procurement. The aim of this exploratory study was to investigate if procurement organisations and professionals are taking strategic actions to equip themselves with the changing business environment that digitalisation will bring to the procurement sector. An interpretivist approach has been taken for the purpose of understanding the different perspectives that research participants shared for the data collection. Therefore, a survey in the form of a semi-structured questionnaire has been conducted with seventy-three procurement professionals from a wide range of industries. The questionnaire was conducted through online platforms, which facilitated the process of approaching experts in the industry. Through primary data collected, it was found that companies and procurement professionals are aware of the impact of digitalisation in the procurement sector. However, most of the organisations presented in this study do not have a well-designed strategy that includes digital technology in their procurement processes. However, as leading companies have already adopted digital tools to transform the way their procurement operations, the lack of initiative from smaller players towards utilizing digital technology leads to missing opportunity in cost savings and competitiveness. Hence, this study aims to give an overview of the main digital technologies that will revolutionise procurement.

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List of Abbreviations

P&SCM: Procurement and Supply Chain Management

CPOs: Chief Procurement Officers

AI: Artificial Intelligence

IoT: Internet of Things

RPA: Robotic Process Automation

BDA: Big Data Analytics

P2P: Purchase to Pay

S2P: Source-to-pay

ERP: Enterprise resource planning

IT: Information technology

1. Introduction

This chapter provides a brief background, sets out the aims, objectives and research questions. It establishes the significance of the study and sets out the structure of the study.

1.1. Overview

Due to the higher pressure on organisations to maintain growth, cut costs, and beat the competition, companies have become aware that procurement is one of the keys to achieving more significant results. In fact, the sector is no longer viewed as a back-office operational function, but it is now at the forefront of organisations, directly assisting the process of decision-making (Zuckerman, 2016).

According to Deloitte (2017), business supply chains are watching dramatically changes due to the fast development of digital technology. The advancement of technology gives a chance for procurement to evolve from an operative, administrative role into a more strategic function. As a result of this development, all the procurement operations will become connected as strategic sourcing is beginning to be more predictive, transactional procurement is becoming more automated, and supplier relationship management is becoming more proactive.

Therefore, the use of advanced technology, such as Internet-of-Things, Artificial Intelligence, Big Data Analytics, Automation and Blockchain, will transform a large part of the classical operational purchasing, reduce staffing levels, boost transactional efficiencies, and bring complete transparency of the value chains, from raw material producer to the end consumer. However, new challenges require new solutions, which means that procurement will need to rethink their traditional models, understand the role of digital technology and include actions in their strategic planning in order to survive in the competitive marketplace (Knapp *et al.*, 2018).

According to Breault et al. (2018), procurement already faces challenges as most of companies are still either unprepared or utilising a 'wait and see' approach to digital technologies, frequently adopting them in a random or uncoordinated manner. A survey made by Younger and Umbenhauer (2018) shows that, although procurement leaders know the impact of digitalisation in procurement,

most of them are not investing in developing digital skills within their team, which slows down the progress of digitalisation in procurement as the skills required by procurement experts will be different in a post-digitized world to those prevalent today.

1.2.   Research Purpose

The overall purpose of this research is to identify the leading digital technologies that will impact procurement in the near future, the potential strategic contributions that digital technology will bring to the procurement sector and the most relevant skills required by digital procurement. Additionally, this research aims to find out if companies are building the new capabilities needed to transform operations, as well as determining if professionals are developing the required skills to help create an efficient digital procurement in the near future.

The justification for this research lies on the concern from recent study, which indicates that despite recognising the contributions of digital technology, their impact and imminent uses,17% of procurement leaders do not have a digital procurement strategy, and of those who do, less than one-third believe that their approach will enable procurement to reach its objectives and improve business value (Younger and Umbenhauer, 2018).

Another study conducted by Vollmer and Machholz (2018), with 452 procurement leaders across the globe, shows that 83 per cent of the participants believe that digital transformation will be impactful, but only 5 per cent have highly automated processes. Although they acknowledge that the Internet of Things is the most significant current technology, and Artificial Intelligence, as well as Robotic Process Automation will dominate the near future industry, 30 per cent of participants recognise talent management as a roadblock and companies do not have a talent management strategy to address it.

Additionally, tens of millions of skilled professional jobs will be eliminated as the digitalisation gathers place (Breault et al., 2018). The skills needed by professionals will be different in a post-digitised world to those prevalent today. Procurement and Supply Chain Management (P&SCM) leaders who have a solid knowledge of digitalisation, but do not invest in developing employees' capabilities, will not be able to make changes. The foundation of building an efficient digital procurement team lies on having procurement employees capable of accurately interpreting and

manipulating data, or even developing AI algorithms and automated routines, for instance, while ensuring precise recommendations and decisions. These people will be essential for the growth of digital procurement (Breault *et al.*, 2018).

1.3.   Research Objective

This is exploratory research and, as previously mentioned, its main objective is to find out if procurement organisations and procurement professionals are building the new capabilities needed to transform procurement operations by using digital technology. Thus, based on the overall objective described above, the research will be guided by the following questions:

- **Research Question 1 (RQ1):** Are procurement companies currently developing strategies to equip themselves for the radically changing business environment that digitalisation will bring to the procurement sector?

- **Research Question 2 (RQ2):** To what extent are procurement professionals currently developing their digital skills and capabilities in order to prepare themselves for the future of procurement?

- **Research Question 3 (RQ3):** What are the critical future skills and competencies that procurement professionals need to develop today to be able to contribute to the digital procurement revolution?

- **Research Question 4 (RQ4):** What are the main contributions that digital technology will bring to the procurement sector?

1.4. Significance of the study

Firstly, this topic can be of interest to the procurement industry, procurement professionals and supply chain students. The relevance and importance of this research are supported by Roland Berger's survey with 87 Chief Procurement Officers (CPOs) of Global Fortune 500 companies, where CPOs recognize that managing the amount of data from supplier to customer, leveraging decision making and increasing procurement efficiency is only possible with digital technologies, and companies who do not dominate the right tools will be out of the market place (Knapp *et al.*, 2018).

Numerous studies have attempted to explain that the traditional procurement function will not survive as it is today. Repetitive tasks will be automated, and the future procurement sector will require different skills, which means that companies need to develop employees' digital skills in order to fully benefit from digitalisation (Knapp *et al.*, 2018), (Accenture Operations, 2017).

Hence, the adoption of digital technology is a matter of survival in the marketplace for businesses. This study will support procurement professionals and companies with knowledge about how digitalisation will impact the procurement sector. Also, taking into consideration the survey carried out by Vollmer and Machholz (2018), which concludes that talent management and a lack of talent strategy are roadblocks for the future of procurement, the present research provides an understanding of some relevant skills and capabilities that procurement professionals may need to develop today in order to help to bring procurement to the next level.

1.5. Structure of the Study

This study is divided into five chapters. The first chapter presents the overall context of the research, outlines the objectives and the significance of the study. The second chapter details the literature review. It explains how digital technology, such as Big Data Analytics, Internet of Things, Artificial Intelligence, Automation and Blockchain, will revolutionise the future of the procurement function. Also, it presents some relevant skills that procurement professionals need to develop to equip themselves with the potential changes.

In sequence, the third chapter describes the methodology and research design. This section describes how the data was collected and analysed, as well as outlines the access and ethical issues of this research. Subsequently, the fourth chapter reports the findings of the quantitative data which have been collected through a survey that included 73 procurement professionals, as well as links the findings with the research questions. Finally, the fifth chapter includes the implications of the research findings, contributions, limitations and suggestions for future research.

2. Literature Review

2.1. Overview

This chapter aims to provide a theoretical foundation of digital technologies and the description of how digitalisation will revolutionise procurement in the coming years, what functions will be automated, and the primary skills required by digital procurement. The content of this chapter is built based on previous publications, including peer-reviewed studies, books, articles and websites.

2.2. Digitalisation

2.2.1. What is Digitalisation in Procurement?

Digitalisation is defined as the application of digital technologies in organisations to transform a business model and generate new revenue and value-producing opportunities (Gartner, 2019b).

Technologies such as Artificial Intelligence (AI), Internet of Things (IoT) and Blockchain promise greater efficiency in business operations, transparency and security (Mutagi, 2018). Some of the strategic contributions of digital technologies for procurement functions, such as sourcing, purchasing, contract and supplier management, presented by Accenture Operations (2017) and Younger and Umbenhauer (2018) include:

- Automating repeatable tasks to increase efficiency and potentially decrease costs;
- Managing spend in real-time access and predicting demand by using Artificial Intelligence;
- Knowing total value for commodities and predicting sources of future supply;
- Triggering payments and monitoring risks in real-time;
- Conducting supplier visits using augmented reality;
- Performing supplier audits through crowdsourcing;
- Monitoring sustainability using automated reporting/visualisation;
- Enhancing operational processes and decision making by using efficient data models;

Previous studies have reported that digitalisation is already a reality in procurement today. Robotics and automation are being used in functions such as invoice validation, purchase order creation, fraud detection, tender analysis and user set-ups, which frees up procurement team to focus on how to add value to the enterprise (Natoff *et al.*, 2018). On the other hand, supplier risk management and supplier management are the least digitised processes (Younger and Umbenhauer, 2018).

Another study predicts that supplier risk management, sourcing and operational buying, spend analytics and research will endure the most significant changes in the next five years due to digitalisation. In contrast, contracting and payment are least likely to be impacted by technology over the next five years (Younger and Umbenhauer, 2018). Figure 1 shows the most impacted procurement areas when implementing the technology.

Aspects of the procurement process expected to be most significantly impacted by technology in the next 5 years

Aspect	Least likely	Most likely
Business planning; strategy development (including spend analytics and research)	-18%	24%
Sourcing and operational buying	-5%	22%
Supplier management (including performance, risk, relationship and innovation)	-9%	20%
Requisition/ordering	-14%	16%
Category management	-17%	8%
Payment (including financing)	-18%	6%
Contracting	-19%	4%

Figure 1*:* Deloitte's Global Chief Procurement Officer Survey 2018
Source: Younger and Umbenhauer (2018)

Accenture Operations (2017) argues that most companies are classified as Procurement 1.0 organisation, which focuses on automating processes, as well as collecting information about what has happened. Some leading Procurement organisations are moving towards 2.0, which focuses on utilising technologies that allow them to deeply explore issues to get as much information as possible. The process of getting data is the foundation for predictive models that help to enhance future decision making. Lastly, Procurement 3.0 expects to take place in the next two to four years and will be responsible for providing intelligent capabilities guiding business decisions.

3.0	2.0	1.0
Operate and interact with information outside your own data ecosystem;	Recording why decisions are made in the procurement process; the context; the context within your own universe of data	Recording data and transactions through use of eProcurement technologies; digital process management
intelligent capabilities guide business decisions, not transactions	• Who won / who lost / why	• Who won
• Cognitive guides sourcing strategy	• Provides context for if / than	• Price paid
• Real-time Twitter monitoring translates and interprets potential supplier risk		

Table 1: The evolution from Procurement 1.0 to 2.0 to 3.0
Source: (Accenture Operations, 2017)

2.3.   What Technologies exist within Digitalisation?

Digitalisation incorporates an enormous number of technologies, and the ones applicable for this paper are mentioned below with a brief description. In the next section, these technologies will be explained in detail, as well as their impact on the procurement sector.

Big Data Analytics - It includes automating insights into a specific dataset, and it assumes the use of inquiries and data aggregation methods (Monnappa, 2016). It is focused on namely Value, Veracity and Visualization (Marr, 2015). Data without an accurate analysis is plane information, a noiseless gold mine that does not state anything. In this way, the investigation is a fundamental stage and should be executed, considering the company objectives in view (Coninck, 2017).

Artificial Intelligence (AI) – It is the use of algorithms to enable machines to make autonomous decisions, based on information, to maximise the chances of success in a given topic. It includes sub-technologies such as deep learning, machine learning and natural language processing (Sommer, 2017).

Blockchain – It is a shared network platform, which enables the process of recording each business transaction into unique blocks of digital data, creating an irreversible and immutable chain. This

technology allows the tracking of assets, which brings transparency to the network, as it eliminates the need to reconcile disparate ledgers (IBM, 2019).

Robotic Process Automation (RPA) – It is the use of software to automate repetitive tasks in business processes without a human workforce. RPA provides companies with the ability to decrease staffing costs and reduce human error (Deloitte, 2019).

Internet of Things (IoT) – It is a network of physical objects that interact with their internal states or the external environment by using the internet. This connection enables the collection of data, which allows organisations to predict events and respond with preventive actions (Hung, 2017).

A recent survey conducted by Vollmer and Machholz (2018) interviews 452 Chief Procurement Officers (CPOs) from worldwide to understand what digital technologies are currently used in procurement and which ones organisations plan to invest in for future use. The results, shown in Figure 2, indicate that Artificial intelligence, Machine learning, internet of things and robot process automation are the leading technologies in the future of procurement.
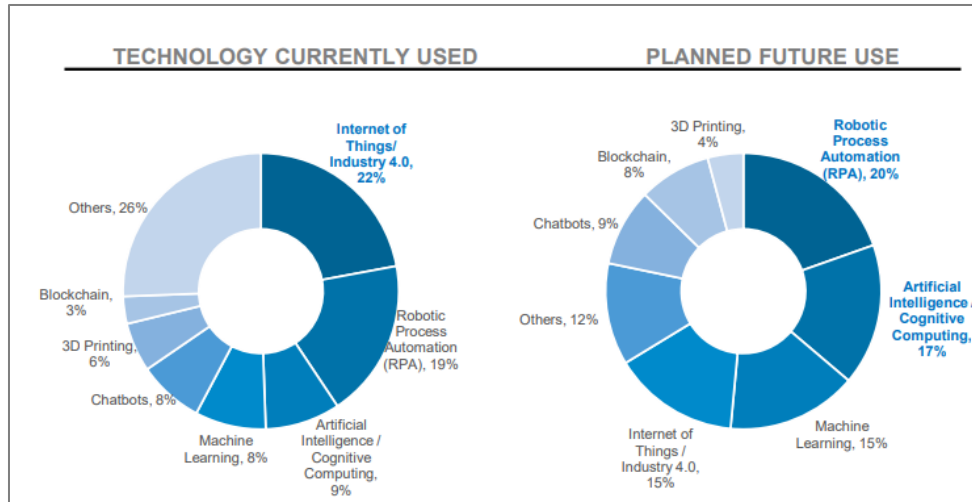
Figure 2: Results from CPO survey 2018 – What's the next big thing in Procurement
Source: Vollmer and Machholz (2018)

In addition, the results of the survey show that Big Data and IoT are the foundation of technologies such as AI and Automation (Vollmer and Machholz, 2018). Therefore, IoT generates a massive amount of data and AI, for instance, has the ability to make sense of, maximising the assertiveness of decision making (Cook, 2018). The selected technologies are described in the following sections.

2.4.   Big data and Analytics

The collection of data within companies' operation systems became popular in the 1980s, when companies developed Data Warehouses with the purpose of using data to support decision making (Nguyen et al., 2017). However, large data sets were named as Big Data just in 2005, when new platforms of data processing started to provide the right environment for the expansion of Big Data analytics (Foote, 2018). The amount of data generated in the past ten years has achieved a volume of more than a thousand Exabyte annually, and it is expected to expand in the following years (Abla et al.2016).

Due to a dynamic and volatile business environment, decision-makers nowadays value insights that are driven by data analytics instead of intuition-based heuristics. For this reason, companies are focusing on understanding and learning how to convert large-scale data into a competitive advantage. Big data contribute to supply chain networks with more prominent data accuracy,

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insights and clarity, prompting a more noteworthy e-contextual intelligence shared over the supply chains. It can be a useful tool for bringing supply chains to the next level (Tiwari, Wee and Daryanto, 2017).

2.4.1. Definition

Big data can be defined as the process of analysing and getting insights from massive amounts of data to generate business value. The main objective is discovering trends and correlations by combining data from a broad range of sources (Sauter, 2014). Thus, procurement companies can use analytics tools to describe, predict or enhance business performance (Viljanen, 2019). For this reason, recent research shows that most Chief Procurement Officers (CPOs) consider Big Data Analytics as the technology with the most impact on business (Younger and Umbenhauer, 2018).

Big data is mostly utilised to describes large sets of data that can be vastly varied and move at high speed, and the main objective is analytics to lead to specific results (Sheldon, 2018). It is defined based on four dimensions, which are volume, variety, velocity, and veracity, as shown in Figure 3 (Japkowicz and Stefanowski, 2016).
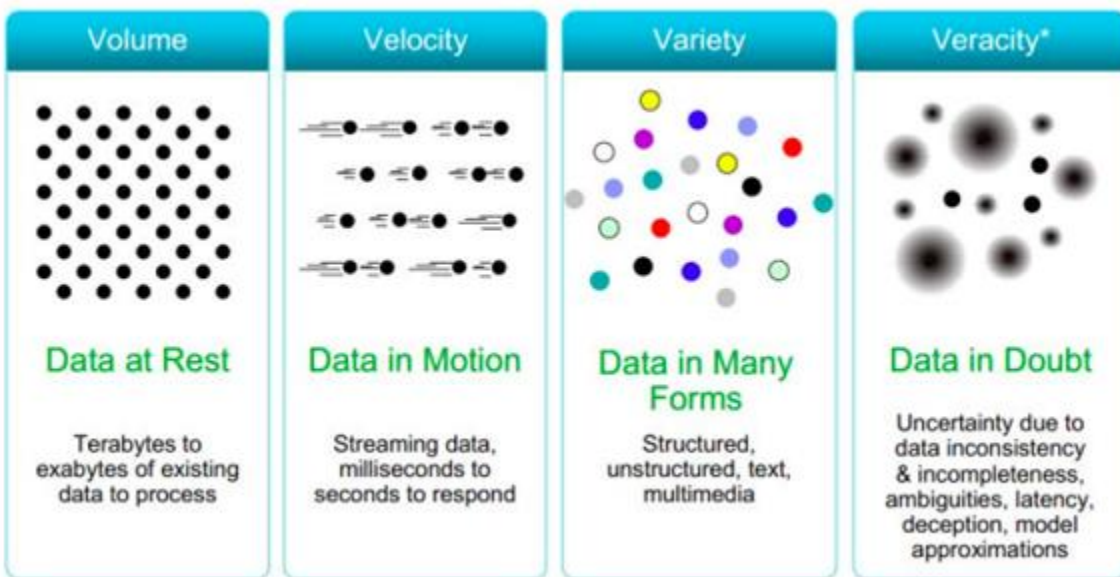
Figure 3*: Big Data 4 V's
Source: CIPS (2017)

Big Data Analytics is fundamental to deliver the insights that business management requires (Nowosel, Terrill and Timmermans, 2015). It includes automating insights into a specific dataset, and assumes the use of inquiries and data aggregation methods (Monnappa, 2016). It is focused on namely Value, Veracity and Visualization (Marr, 2015). Data without an accurate analysis is plane information, a noiseless gold mine that does not state anything. In this way, the investigation is a fundamental stage and should be executed, considering the company objectives in view (Coninck, 2017).

2.4.2. How Big Data and Analytics impact Procurement

In the past, analytical techniques were based on historical data, which means that the decisions were made based on information that was out-of-date. Nowadays, Big Data Analytics is providing more detailed information, often in real-time, which enable procurement teams to make smarter and accurate decisions with procurement operations (Hickey, 2018).

Distinct studies outline that Big Data Analytics will bring higher contributions to six procurement areas:

Managing everyday risk – Managing risks is a fundamental priority for procurement leaders. Analytics tools can track day-to-day risks, such as early and late deliveries, deliveries to the wrong destinations, supplier processes, political stability and other risks related to supplier's countries. Therefore, the ability to measure those risks will enable organisations to have a more comprehensive understanding of quantitative risks, such as the total risk in the supply chain, category and supplier risks and the right prices for risk transfers to suppliers (Piluso, Leimer and Zhang, 2016).

Commodity Pricing – Companies can utilise analytics to support procurement by introducing commodity price insights into the designing of contracts. By connecting advanced commodity pricing algorithms with more comprehensive procurement analytics, it is possible to understand the percentage of the cost contribution to a determined finished good that is constituted by a specific commodity (Nowosel, Terrill and Timmermans, 2015).

Negotiation – The first stage of negotiation is to prepare a fact base with data on past purchases. Therefore, Big Data Analytics algorithm can group historical data into statistically relevant categories, which can easily be displayed in any format. Advanced analytics can provide a list of potential suppliers and the prices they offer, as well as the average price of similar purchases. This quantitative data analysis will equip the buyer with useful information that can be used in the negotiation approach (Innamorato and Prilepok, 2017).

Quality and Reliability – Procurement will be able to better understand the reliability of the raw material it buys when integrating its analytics with other departments across the industry. As a result, it could arrange more significant warranty terms with suppliers and more closely adjust the raw material it is purchasing within the current demand to release working capital (Nowosel, Terrill and Timmermans, 2015).

Compliance – The possibility of accessing real-time data will allow companies to monitor real-time supplier performance, which enables immediate actions (Hickey, 2018). In fact, previous research affirms that organisations with poor supplier data management tend to have poor contract compliance (HICX, 2017). Therefore, Big Data Analytics will provide tools to compare each transaction and other purchasing behaviour with the appropriate contract to determine individual and overall compliance and the cost of non-compliance commodity (Nowosel, Terrill and Timmermans, 2015).

Supplier Collaboration – Supplier relationship management is known as one of the priority challenges in the procurement area. However, Big data Analytics can provide real-time reporting and intuitive dashboards to increase visibility and integration between supplier and buyer. The consequence of these Analytics tools is more aligned policies and processes, vision and goals sharing and mutually beneficial agreements. Furthermore, it will increase competitive advantage and joint innovation (Koifman, Freitas and Lamata, 2018).

Recent evidence suggests that over 45 per cent of procurement leaders assume that deficit of consolidation and poor quality data are dominant barriers to the productive implementation of digital technology in procurement, and the issue is highlighted by limiting stakeholder support and prioritisation (Younger and Umbenhauer, 2018). Figure 4 reports the main barriers to the practical application of digital technology in procurement, according to a survey conducted by Deloitte with 504 procurement leadership across various organisations.
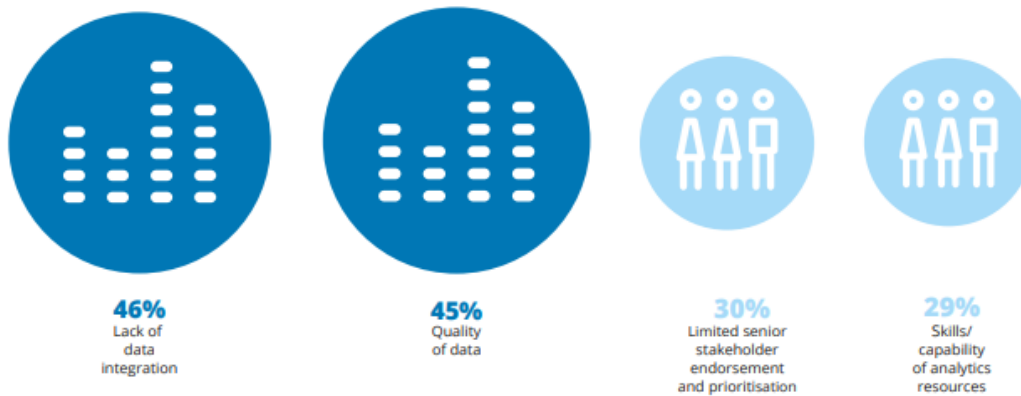
Figure 4: Main barriers to the useful application of digital technology in the procurement
Source: Younger and Umbenhauer (2018)

Therefore, the foundation for successful data analytics utilisation is useful historical data and data transparency. Also, most procurement functions, nowadays, rely on excel spreadsheets, which is still very basic and takes a lot of time. However, investing in the right tools is essential to take procurement to the next level. Lastly, even with useful data and proper technology, organisations still need the human workforce to generate value from analytics. Without skilled employees who know which questions to ask, the company will not have useful insights. Thus, people need to be prepared to use analytics software packages. Otherwise, it will result in little or no return on investment (Nowosel, Terrill and Timmermans, 2015).

2.5.   Internet of Things

The term "Internet of things" was coined by Kevin Ashton in 1999, when a machine-to-machine protocol was created by IBM in order to facilitate connections with remote locations, a factor that sped up the development of new connected devices (Rijmenam, 2017). Nowadays, the advances in computers and devices in general capable of connecting to the internet create the foundation for maximising communication between machines without human interference (Ismail, 2017).

The Internet of Things (IoT) is growing exponentially and is forecast to continue in the coming decade across industries (Reddy, 2014). Intel (2019) predicts 200 billion connected devices in 2020. Cisco (2016) foresees 5500 billion devices connected to the Internet by 2030. However,

most of the IoT intelligent devices are in business, factories and healthcare as they are fundamental to manage machines, track inventory, save costs, and increase efficiency (Intel, 2019).

2.5.1. Definition

The Internet of Things (IoT) refers to the use of wireless technology to provide the interconnection of different devices that communicate through a network to perform some application (Kranz, 2018). It is driven by a combination of factors, including smart devices, a junction of low-cost technologies (wireless networks, sensors, computing power and big data), extensive connectivity and provides the company with a high volume of data to supply the analytics engine (Reddy, 2014).

The technology of IoT does not perform tasks but provides support for automation by combining information and making smart decisions without human interference (Kranz, 2018) The connected devices generate data that IoT applications utilise to collect, examine and deliver insight, which creates more informed decisions and assertiveness (Cisco, 2016).

Some leading companies have already begun adopting mobile devices in procurement operations to gain access to analytics, order data and invoice approval (Reilly, 2018). In fact, IoT will bring more significant benefits to procurement in the next ten years, as it will enable procurement professionals to access a vast amount of data in real-time analysis, which is a trigger for fast and optimal decision making (Sahu, 2017).

2.5.2. How the Internet of Things impacts procurement

More devices connected to the internet will supply procurement professionals with real-time data produced from the sources, which will not just enable a more accurate decision making but will improve transparency in the whole supply chain (Waite, 2017). Such traceability could have considerable benefits for procurement, as there will be a large amount of information about suppliers at the product level, which would show, for instance, if they are genuinely engaged in sustainable actions (Nowosel, Terrill and Timmermans, 2015).

The Internet of Things has been used for anomaly detection and control. However, in the future, the vast amount of data generated by devices will be used for predictive analysis and optimisations,

which will enhance the use of analytics, creating an environment for automation and generating opportunities for new and innovative business models (Rishi and Saluja, 2019).

Challenging existing processes: IoT implementation requires innovation in the way procurement works. In fact, the understanding of how to reshape the process is the key to reaching considerable productivity, efficiency and cost contributions that IoT can bring. Furthermore, IoT is a gateway for other technologies, such as blockchain and machine learning, which means that to survive in the marketplace, procurement companies need to rethink how they operate and embrace innovations (Nowosel, Terrill and Timmermans, 2015).

Despite the strategic contributions generated by IoT, companies face some challenges, such as the high cost of implementation, connectivity, battery life, analytics and foremost, privacy and security. Currently, companies believe that their information is secure as there is no connection to networks, however, once the online data is a real danger if there is weak protection of information (Cohn, 2018).

2.6. Artificial Intelligence (AI)

2.6.1. Definition

Gartner (2019b) defines AI as a technology that learns from and reproduces human performance, applying advanced analysis and logic-based tools, such as machine learning, interpreting data, making predictions, reinforcing and automating decisions, and taking actions.

 Traditional systems react corresponding to how they are programmed to act. In contrast, AI machines can analyse and classify information, solve issues based on those interpretations, continuously learn from the data, always evolving and tuning their behaviour to meet the needs (Sheldon, 2018).

Hence, Artificial Intelligence is a software that is able to imitate human intelligence, learn from data and adapt its behaviour. It can help procurement companies to solve complex problems more efficiently and effectively utilising intelligent algorithms. Artificial Intelligence software can be

used in various processes of procurement, from spend analysis to contract management and strategic sourcing (Sievo, 2018).

2.6.2. How Artificial Intelligence impacts procurement

In a recent survey, 45 per cent of **CPOs** interviewed affirmed that they are using or planning to use AI (Younger and Umbenhauer, 2018). For instance, some companies have adopted the use of AI-driven tools, called guided buying, such as chatbots which assist the buying or ordering process without the participation of human procurement professionals. However, AI-driven tools today are still in their infancy and does not radically change the way procurement operates. Furthermore, the focus of procurement has been on cost reduction, but procurement managers need to search deeper for value investing in AI is touted as the solution (Breault *et al.*, 2018).

Conversely, although the basic procurement processes such as purchase to pay **(P2P)** and sourcing management are automated, the changes are not transformational innovations, and the operations have been performed in the same way for decades (Breault *et al.*, 2018). To see real changes, AI will need to start influencing the more strategic issues that nurture procurement (Younger and Umbenhauer, 2018).

Innovators are already developing AI tools that will dramatically impact procurement functions. Previous studies present four main ways that AI will change procurement processes:

Purchase to Pay (P2P) – Although the primary P2P processes are automated, AI will bring them to a superior level. The use of AI will automate invoice processing, aiding systems learning in how to handle non-common invoices or identify possible fraudulent issues (Breault et al., 2018).

Contract management – Although digital contracting has become common in procurement, it still requires manual contract analysis, which is normally expensive in price and time. However, AI tools will be able to extract a summary of supplier templates and compare to key terms automatically. Therefore, information can be gathered from documents to automate, improve and accelerate the accuracy of contract review (GEP, 2018).

Risk management – Companies already use computer to analyse structure data against rule sets. However, as AI softwares will provide cognitive analytics with the ability to learn, these AI

machines will also be able to gather insights and link information from unstructured data, which can anticipate and manage risk, enhancing competitive advantage as companies can use risk to master their performance (Hans, 2016).

Sourcing – AI will help organisations to quickly collect, present and analyse commodity and market to inform market strategies. Also, finding suppliers that can offer real value is a challenging process, especially with the amount of smaller and younger firms. AI will help to identify suppliers with required accreditations, suggest the best cluster of suppliers, invite them to participate in the selection stage, design the process and documents and assist the evaluation, which will be strongly automated (Breault et al., 2018).

A recent study with 3,000 executives from leading companies such as Google and Baidu, suggests that the use of Artificial Intelligence outside of the tech field is still in the experimental stage and few companies have adopted it at scale. Furthermore the findings show that early adopters of AI are already creating a competitive advantage, and the gap is set to grow in the next years (Bughin *et al.*, 2018).

However, companies face some challenges with the adoption of AI. The lack of computer power is also classified on the list of main challenges for AI expansion. It is evident that cloud computing and vastly process systems have provided the processing power in the short term. However, with the required growth of data volume and increasingly complex algorithms created by deep learning, there will still be a bottleneck to slow progress (Marr, 2019).

2.7. Robotic Process Automation (RPA)

2.7.1. Definition

Robotic process automation refers to a type of software programmed to perform human activities that are repetitive manual, and rule-based (Gartner, 2018). Companies can apply RPA for processing standard transactions, data entry, triggering responses, and communicating with other digital systems. RPA systems are not replacement for business applications, but they are able to automate manual tasks of human workers (Boulton, 2018).

The line between Robotic process automation and artificial intelligence can be hard to differentiate in some cases, but they are not the same. RPA systems focus on the automation of routine tasks, while non-routine activities require a higher level of intelligence, which can be provided by AI (Accenture Operations, 2017). Also, AI can learn from data, while RPA remains the same (Gurkhe, 2019). Figure 5 illustrates the main differences between AI and RPA.
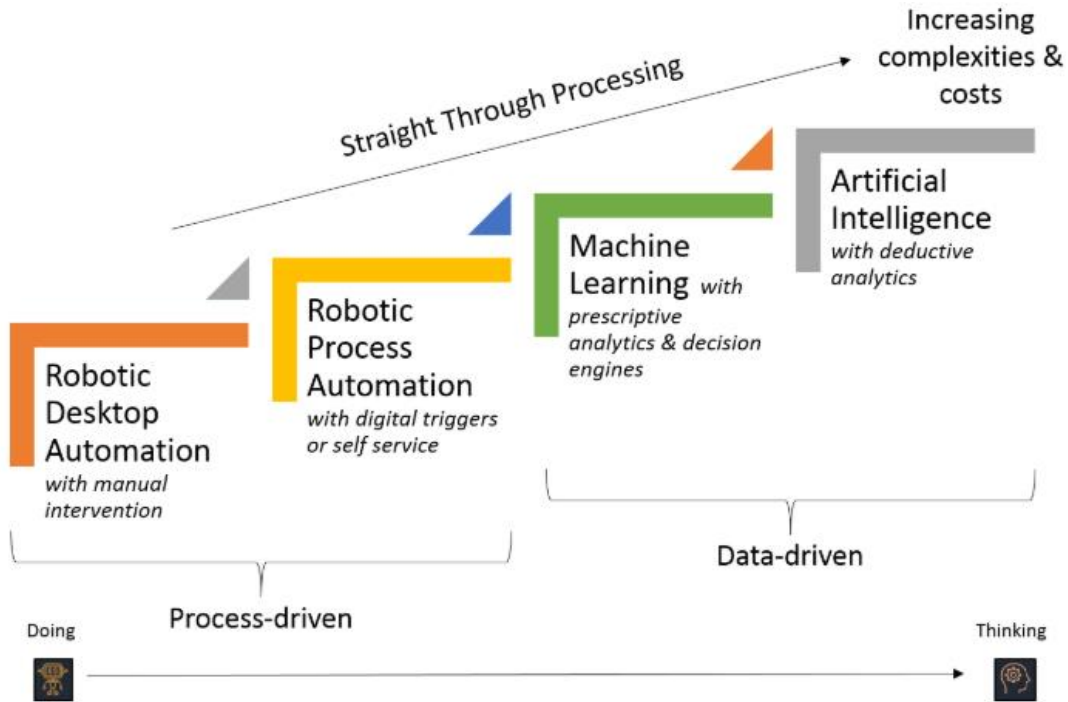
Figure 5: Difference between RPA and AI
Source: Gurkhe (2019)

2.7.2. How Robot Process Automation impacts procurement

Robotic process automation is still at a nascent stage in procurement, but it is a valuable technology in terms of efficiency, cost reduction and strategy. Although it is at the beginning of its journey in procurement, some companies are already using RPA technology in processes such as raising purchasing requests by using chatbots with back-end process orchestration, which avoid multiple back-end processes. Also, regarding payable functions, procurement bots can digitalise invoices

through image scanning, get approval and process payments, and help reduce invoice reconciliation errors (Gurkhe, 2019).

Zubler *et al.* (2018) describe some specific procurement functions that can be executed by bots:

Contract management – Usually, the enterprise resource planning (ERP) system is responsible for gathering and ingesting contracts from the organisation and filing them in the Source-to-Pay (S2P) system. However, bots can audit these contracts, compare them against templates, and bring up unusual terms and conditions.

Supplier management and risk management – Bots can identify discounts, remuneration changes or penalties associated with service-level agreement issues, alter invoice payments to account for diminished payments, scan procurement professional emails and identify the suppliers that have the highest volume of interactions and escalations, which help professionals analyze if the time spent on a supplier is in accordance with its relationship type.

Supplier onboarding and enablement – Procurement bots can automate a series of these manual and repetitive activities, including supplier document audit, background checks, and follow-up in instances of missing data or documents.

Category management - Dependence on manual procedures makes it hard to classify transactions in an exact and timely way. Procurement bots can categorise procurement transactions as they are demanded, utilising machine learning to distinguish category assignments dependent on the demand's text. If the data is not enough to allow a category, the bot can start follow-up inquires to the supplier to clarify spend category.

Procurement performance management – Procurement bots can be implemented to concentrate procurement information from numerous systems utilised for purchasing products and services at specific times and file this data in specific areas. After gathering data from these systems, the bot can assist with data transformation, which frees a lot of time for professionals

According to Wiles (2019), most procurement companies that adopted RPA start the process of implementation with redundant manual tasks that involve human interaction with an IT system. The author suggests general recommendations for companies who are considering embracing RPA in the procurement processes:

- Start with time-consuming, repetitive, lower-value processes.
- Consider how new processes fit into larger procurement workflows.
- Determine the type of data that will be fundamental to train the robot.
- Use a proof of concept to build support for adopting robotics.
- Design a short-term pilot plan with explicit upfront goals that detail the impact on procurement and how the effect supports the business's priorities.
- Fail quickly in the short term to prevent significant financial and time investments on ineffective solutions.

Hence, RPA is predicted to gain considerable traction in the next five years in the procurement function. The potential contributions of this technology include faster implementation and faster Return on investment. Recent research indicates a return on investment between 600 per cent to 800 per cent for specific tasks. Therefore, the more the technologies such as big data analytics, internet of things and AI continue to evolve, the more sophisticated will be the levels of automation, which has the potential to revolutionise enterprises (Zubler et al., 2018).

2.8. Blockchain

2.8.1. Definition

Blockchain is a shared and decentralised system, which ensures the integrity of the information added to the system by encrypting, validating, and excluding the possibility of altering the transactions (Gartner, 2019a). It was released in 2008 by Satoshi Nakamoto, whose identity is still unknown, as the technology that runs bitcoin, the first and most popular cryptocurrency. The goal of blockchain was to eliminate the need of a third party, such as banks and payment processors (Marr, 2018).

Although blockchain was created with bitcoin, they are not the same. Lately, businesses started to realise that blockchain could be used far beyond cryptocurrency, it has the power to alter many different types of operations such as orders, payments and account tracking (Marr, 2018).

2.8.2. How Blockchain impacts procurement

Blockchain technology is already a reality for some industries. For instance, to enhance food tracking, traceability and safety, Walmart made a partnership with IBM to use blockchain to trace and keep records of pork sources in China. The success of the project led to the creation of the "Food Safety Alliance", a project launched by IBM, Walmart, Tsinghua University and JD.com, and big companies such as Unilever and Nestle are using the IBM-built blockchains to track some raw materials (Collins, 2019).

Some consulting companies such as Deloitte, KPMG and EY have heavily invested in developing the expertise to assist companies to implement blockchain. Deloitte, for instance, has 1,400 full-time blockchain employees. However, IBM is considered the biggest and most successful player of all (Castillo, 2019).

Thus, the security-focused and the transparent nature of blockchain provides considerable contributions which can leverage the effectiveness and efficacy of procurement. Francis (2018) points out how Blockchain will simplify and transform the procurement:

Reduction of copies of material – Traditional procurement generates a high volume of documents, which leads to endless complexity and desynchronized processes. This process is demonstrated in Figure 6:
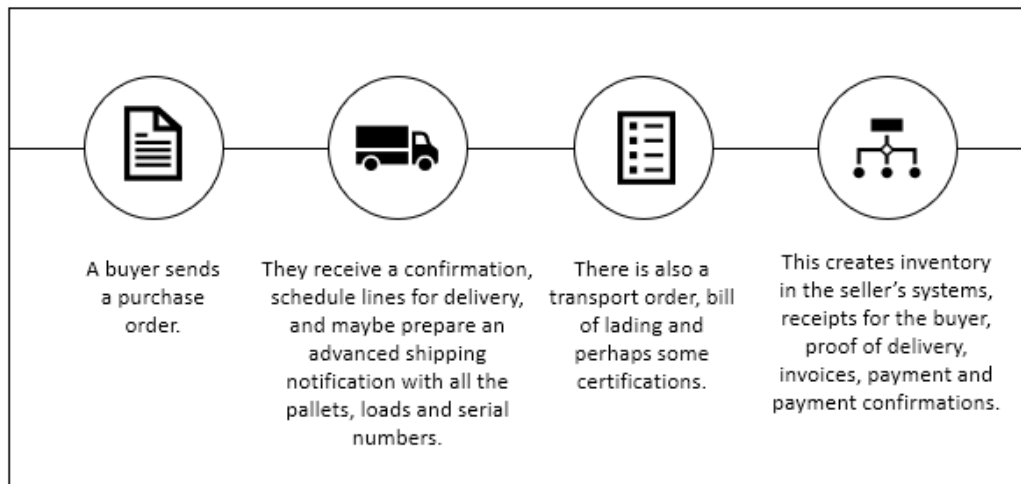
Figure 6: Records generated from the purchasing process
Source: Francis (2018)

Blockchain will eliminate the need for documents, copies of transactions, purchase orders, inventory receipts and other paperwork as all the transactions can be stored in one place and shared among the players that have access to the network, without the possibility of altering or deleting them (Francis, 2018).

Increased transparency – As blockchain records every transaction in the ledger, any suspicious transaction is tough to conceal. This enhances transparency in the supply chain, which consequently mitigates the risk of criminal operation such as money laundering (Collins, 2019).

Smart contracts – They are executed by a software program built on blockchain technology, to facilitate and verify the negotiation and performance of a contract. Once the code is triggered in a blockchain contract, it is not possible to modify the contract, which ensures that the buyer and seller will do their part. Therefore, blockchain can empower the development of tamper-proof smart contracts that naturally creates terms of the multi-party arrangement. Intelligent contracts can self-verify their own rules and self-execute by making payments to a suitable recipient (GEP, 2019). It will avoid miscommunication, unnecessary reconciliation and weak enforcement of common contract standards, leading to cost reduction and efficiency benefits to supply chain operations (Francis, 2018).

Sit (2018) suggests that the biggest challenge to implement blockchain is the mindset change as it is not just the company adopting the system, but many players in the supply chain. To overcome this challenge, Walmart, for instance, started the process of implementation by selecting one of its most critical players, and it is now replicating the same procedure with other smaller players.

Another challenge around blockchain is that each transaction requires an internet connection to be validated (Francis, 2018). Although technology relies on cryptography and peer-to-peer networks, which makes it resilient and robust, the history of the internet has proved the risk of hacking information. Even if Blockchain is unhackable, systems around it may be vulnerable to attacks and bugs (Maltaverne, 2018). For this reason, companies such as Coca-Cola and JPMorgan Chase were initially sceptical of cryptocurrency (Castillo, 2019).

2.9.   Future skills required for digital Procurement professionals

According to The World Economic Forum (2018), the global labour market is shifting due to the Fourth industrial revolution. Wise management of these transformations can lead to economic growth, good jobs and improved quality of life. In contrast, poor management of these transformations can result in skill gaps, greater inequality and broader polarisation.

Bughin *et al.* (2018) affirm that technologies such as Automation and Artificial Intelligence are likely to generate economic growth, but it will also shift the skills required of human workers. The World Economic Forum (2018) points out that one of the consequences of the fourth industrial revolution is the reduction of the numbers of workers required for specific work tasks. The technological change that is already happening will increase demand for new roles and new skills which may result in talent shortages, mass unemployment and growing inequality. Therefore, it is fundamental that companies take actions to support their employees through upskilling, that professionals be proactive in learning, and that government enable the right environment to support these efforts.

Bughin *et al.* (2018) expect that, when technologies such as AI and Automation become the central part of businesses in general, digital skills will have the fastest rise. Having that in view, different authors have raised the discussion about the importance of understanding what skills procurement professionals need to have in order to generate value from digital technology. This discussion is due to help companies avoid the risk of investing in an analytics software package, for instance, and not have expertise in how to use it, resulting in little or no return on investment (Breault *et al.*, 2018; Knapp *et al.*, 2018; Accenture Operations, 2017).

According to Accenture Operations (2017), procurement companies should focus on building deep skills in all four areas below and combine them to maximise end results:

- AI experts and Data Scientists who understand how to develop and apply models to operate the data and find out unrelated connections;
- Business experts who have strong industry knowledge who can accurately advise whether those connections are relevant or just coincidences;

- IT professionals to ensure that the technology is integrated with the correct organisation's systems and present solutions to issues that create real value, instead of just incorporating the tools to the existing IT infrastructure.
- Design professionals who are skilled at creating convincing experiences that persuade stakeholders to utilise the tools offered rather than make excuses to avoid them.

Radell and Schannon (2018) suggest that skills such as data science and analytics will be crucial for procurement teams in digital procurement. According to the authors, the combination of data analytics skills and deep market and industry knowledge with the ability to translate and apply the output of analytics to improve business performance will be the main characteristics that recruiters will be searching for in the next five to seven years.

In fact, data record will continue to increase, especially with the expansion of Internet of Things within industry (Accenture Operations, 2017). Therefore, Breault *et al.* (2018) affirm that understanding the data generated by the company and extracting relevant information from it is a critical skill that procurement professionals need to develop in order to be able to both have a holistic view of the business and increase assertiveness in decision making.

In addition, data security will be crucial for the future of procurement. Booth and Sharma (2019) affirm that procurement professionals will have access to a more considerable amount of data, from structured to unstructured. Structured data can be gathered from business processes, supplier networks or industry groups, when unstructured data can be captured from Internet of Things, video, texts and social platforms, also from both inside and outside of the company. Thus, increased scales require increased data security. Therefore, procurement professionals need to be able to protect shared data.

Nevertheless, according to Dorr and LaPierre (2019), the adoption of digital platforms also requires some skills that are not necessarily digital in nature. While the authors highlight the importance of possessing knowledge of analytical tools and methodologies, procurement professionals will also need strong cognitive skills and competencies such as critical thinking, creativity and innovation. In fact, those skills are the foundation for the development, progress and efficiency of digital technologies (Bughin *et al.*, 2018).

Richter (2019) also argues that negotiation has been always a vital aspect of the job for procurement and will still be in demand when digitalisation takes place. Although there is research

and experiments into AI bots that will be able to negotiate, such as the Facebook AI bots (Lewis and Yarats, 2017), it will acquire cognitive abilities to get these bots to negotiate to the same level as human beings. An efficient negotiation involves having a lot of information, as well as a high level of communication skills. However, AI bots are still at the level of holding short conversations, which indicates that there is a long path to be explored before autonomous AI negotiators take place, confirming that negotiation skills will still be in high demand for digital procurement (Richter, 2019).

Current studies emphasise that, despite the awareness about the importance of developing digital skills, procurement teams have not taken a leadership position and are often receiving directions in regard to digital technology implementation (Nowosel, Terrill and Timmermans, 2015). This view is supported by Breault *et al.* (2018), who argue that most of the procurement organisations are unprepared, often adopting technology in an uncoordinated way. From this perspective, Natoff *et al.* (2018) suggest that the first step for real changes starts with procurement managers, acknowledging the impact of digital technologies and immersing themselves in a learning path in order to utilise the maximum value from technology.

Research shows that 51 per cent of procurement leaders recognise that their teams do not have the required level of skills to contribute to their current digital procurement strategy. The same report shows that 72 per cent of procurement leaders are investing less than 2 per cent of their budget on training and development programmes for their teams, and finding procurement expertise outside of the company with the appropriate skills to embrace technology is still a problematic factor (Younger and Umbenhauer, 2018).

The analysis above demonstrates that, even though there is a little investment in developing the procurement skillset, the focus appears to be on technical procurement skills. As shown in Figure 7, only 16 per cent of procurement leaders chose to develop digital skills (Younger and Umbenhauer, 2018).

Area of training focus planned for 2018

- 41% — Technical procurement skills (e.g. negotiation training, strategic sourcing training)
- 36% — Soft skills (e.g. conflict management, emotional intelligence, business partnering/relationship management, collaboration skills, etc.)
- 16% — Digital skills (e.g. big data synthetisation, predictive analytics)
- 7% — No formal training is planned

Figure 7: Deloitte's Global Chief Procurement Officer Survey 2018
Source: Younger and Umbenhauer (2018)

Thus, new technologies will give birth to new job tasks, occupations and industries. In order to obtain a positive outcome for employees and businesses, it will require lifelong learning for professionals, as well as reskilling and upskilling plans for companies to build up their talent pool in order to avoid losing competitiveness due to the obsolescence of the workforce's skillsets (World Economic Forum, 2018).

2.10. Conclusion

In conclusion, it is demonstrated that digitalisation and has the potential to change the future of procurement, it is a competitive necessity since continuing to run antiquated procurement processes will hinder growth and prevent organisations from going forward. However, the implementation of digitalisation takes time and requires significant investment. It takes three to five years to collect relevant data and develop suitable systems and processes. For this reason, it is fundamental for companies to start taking steps today (Accenture Operations, 2017).

Radell and Schannon (2018) point out three steps about how to create a procurement strategy and roadmap and make the most of the opportunities from digital technologies:

1 – It is crucial to develop a well-designed strategy by gathering information on digital trends from the organisation's leadership, the industry, the market and procurement experts. It is essential to

be clear about the organisation's digital goals and strategy and find out what solutions and vendors procurement leaders are adopting in the industry in question. The information from these questions provides a critical context to identify the right digital procurement strategy.

2 – The next action is creating a vision for procurement's future role. Procurement leaders need to be clear about what processes should be digital and what solutions they want to implement, as well as what operating model and partnerships will be required.

3 – Lastly, companies need a roadmap to execute the vision for a new role for procurement. When the essential components for the digital move are set up, CPOs can set priorities including near term objectives that can leverage change, crucial investments, a well-explained business case for the investment and a timeframe.

Radell and Schannon (2018) predict that four years from now, companies that invested resources in digital transformation will benefit from a robust strategic procurement function. In contrast, companies that are reacting to the shifting landscape will remain on the sidelines and become less competitive. Also, procurement professionals who can make the transition will not just have high-efficiency gains, but they will lead the transformation, helping to enable the digital vision for the whole company.

3. Methodology and Research Design

3.1. Overview

This chapter describes the methodological approach of the study as well as the research design. It first details the research philosophy and approach adopted to develop this study, followed by the strategy used to reach the objectives. Besides, it provides a detailed explanation regarding data collection and data analysis, followed by the issues and limitations of this research.

3.2. Research Philosophy

According to Saunders, Lewis and Thornhill (2007), the research philosophy refers to the relevant assumptions about the development of knowledge in a specific field. Dudovskiy (2018) affirms that it deals with the source, nature and development of knowledge. In other words, it is how data about a phenomenon should be gathered, analysed and utilised.

Gouldner (1971) points out that this process of understanding the research philosophy requires the author to question his/her own research beliefs and assumptions to define the most suitable research philosophy for the study. These assumptions will be part of each stage of the research, and it is the foundation for the research strategy.

Saunders, Lewis and Thornhill (2007) present three types of research assumptions to discern research philosophy:

Ontology – It is concerned with the nature of reality. In other words, it takes into consideration the way that the researcher sees the world of business and management and the commitment held to specific views. It is divided in two main aspects:

- Objectivism: It assumes that the social entities exist in reality, independently of how the researcher thinks of them. The objectivist believes that there is only one true social reality experienced by all social actors (people). Therefore, it aims to investigate universal facts and laws that influence social behaviours.

- Subjectivism: It incorporates the perceptions and actions of social actors. The subjectivists consider that the concept of reality depends on each person's experiences. For this reason, they argue that it would not be possible to define a single reality. In this aspect of ontology, it is fundamental for the researcher to include historical, geographical and socio-cultural contexts to clarify how realities are being experienced.

Epistemology – It considers that there is already a source of knowledge in the field of study, and it seeks to investigate what is known and how it is known. Thus, the main aspects of epistemologies are (Dudovskiy, 2018; Saunders, Lewis and Thornhill, 2007):

- Positivism: Positivists argue that credible data can be gathered just by observation of social reality. Therefore, it focuses on causality and law-like generalisations.
- Realism: It affirms that there is a reality independently of the mind, which means that what the human sense experiences as reality is the truth. Realism assumes a scientific approach to the development of data.
- Interpretivism: It explains human behaviour through an individual's subjective worldview. Therefore, Interpretivists take into consideration humans' interpretations to observe and describe a phenomenon.

Axiology – It concerns the values and ethics within the research process. Researchers present axiological abilities when their values are the foundation for choosing a research topic, as well as the choice of data technique. For instance, the researcher may prefer to do a qualitative study through an interview due to the fact of having interaction as a personal value (Saunders, Lewis and Thornhill, 2007).

According to Dudovskiy (2018), sources of knowledge can be divided into four categories:

- Intuitive knowledge: It is related to human feelings. Therefore, it is based on beliefs, faith or intuition.
- Authoritarian knowledge: It relies on information from books, articles, experts, research papers, and so on.

- Logical Knowledge: It is the development of new knowledge through the implementation of logical reasoning.
- Empirical knowledge: It depends on objective facts that have been accepted and proved.

Hence, this research relies on authoritarian knowledge, which has as source of existent knowledge information from articles, past peer-reviewed researches and various websites with insights from experts in the procurement industry.

The literature review reinforces that digitalisation is already a reality in procurement today. Robotics and Automation are being used in functions such as invoice validation, purchase order creation, fraud detection, tender analysis and user set-ups (Natoff *et al.*, 2018). Furthermore, Accenture Operations (2017) affirms that some leading procurement organisations are moving towards procurement 3.0, which means that in the next two to four years the digital procurement will be responsible for providing intelligent capabilities guiding business decisions.

Taking that into consideration, the research assumption utilised in this study is not created by what the researcher believes, which eliminates the possibility of it being an ontological study. Also, the possibility of an axiological study is eliminated as the values of the researcher are not the basis of this study. In fact, this study investigates what is known to be true. As mentioned above, digital technologies are already being implemented in the procurement sector, and this research aims to identify if companies and procurement professionals are taking actions to equip themselves with the changes, which means that there is an existent knowledge, and the researcher intends to investigate if that is true. Therefore, this study focuses on what contributions to the existent knowledge it can make, which classifies it as an epistemology philosophy.

The research analyses a consistent external reality, which is the fact that the procurement sector is already being impacted by digitalisation, and, as shown in the literature review, some processes will be automated, new tasks will be created and new skills will be required. Therefore, the researcher aims to investigate, through quantitative data, how well procurement organisations and professionals are prepared for the changing business environment that digitalisation will bring to the procurement sector.

Therefore, considering that this research includes people's opinions and experiences to understand a phenomena, the positivist philosophy would not be consistent with this study as the positivism

focuses on testing an existent hypothesis by using an objective approach in the data collection, which means that the participant's opinions do not have a relevant impact in the results. As this research aims to collect data based on the views of procurement professionals concerning their workplace, management and their level of understanding about digital technologies, this research is consistent with the interpretivism philosophy.

Interpretivism

The Interpretivist paradigm argues that social reality is not objective and singular, but it is designed by human experiences of the external world. Therefore, interpretivist researchers take into consideration subjective interpretations of the research participants (Mukherji and Albon, 2014).

According to Dudovskiy (2018), the epistemological interpretivism supports the idea that there is no separation between people and their knowledge, and furthermore, the researcher is connected to the research subject. The assumptions in the interpretivism are socially constructed and the focus of interest is related to what is unique, specific and deviant. While the sample of a positivist approach is random due to the purpose of generalisation, the interpretivist researchers consider specific characteristics and choose the sample according to the phenomenon being studied.

Therefore, this is an interpretivism research as it studies the context of participants and focuses on collecting personal opinions from the sample. The researcher selected the sample according to the participants' background in the procurement sector. The personal opinions collected in this research varied both according to the participants' knowledge regarding digital technologies and how much their workplaces are investing in developing an efficient digital procurement sector.

3.3. Research Approach

The research approach refers to the plans and the procedure of the research that consists of the steps of broad assumptions to comprehensive methods of data collection, analysis and interpretation (Grover, 2015). Saunders, Lewis and Thornhill (2007) affirm that the research approach can be divided into two types:

- **Deductive** – It was created in the natural science. It starts from an existent theory from the academic literature, and it aims to explain contextual relationships between concepts and variables. To test the theory, the deductive approach is more likely to test a hypothesis to quantitative data as facts need to be measured. The steps for a deductive approach are described in the picture below:
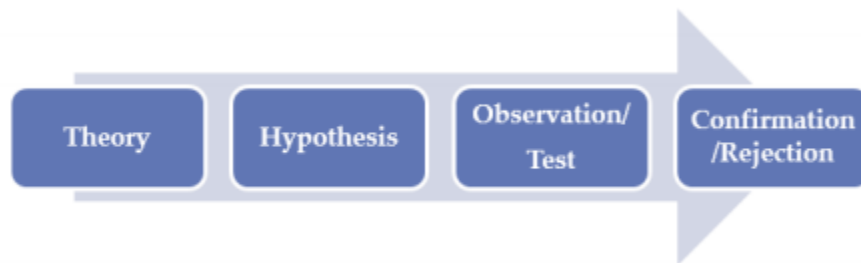
Figure 8: Deductive process in the research

Source: Dudovskiy (2018)

- **Inductive** – It occurs when the first step of the research is collecting data to explore a phenomenon. The inductive researchers explore the context in which the events take place, prioritise talk to social actors about what is known to be true, then the results of the analysis would be the construction of a theory. Therefore, the inductive approach allows a study with small samples, and it is more likely to work with qualitative data. The steps for an inductive approach are described in the picture below:
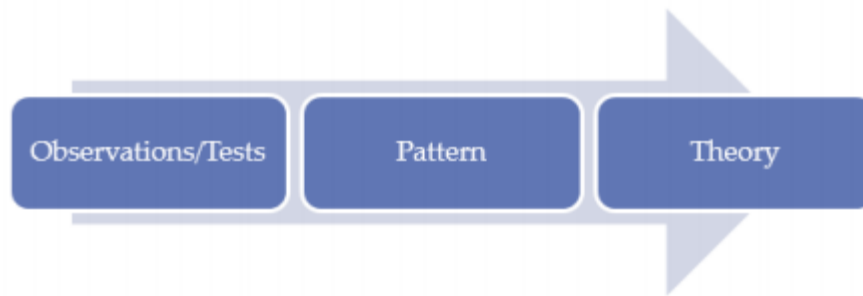
Figure 9: Inductive process in the research

Source: Dudovskiy (2018)

This research presents a premise that procurement companies are already being affected by digital technologies and, as found in the literature review, the changing environment will require strategic actions from procurement professionals and organisations to survive in the competitive market. Therefore, there is a relationship between the level of awareness/knowledge from companies and procurement professionals regarding to digital technologies and the wiliness to bring digital technologies to the core of the strategic vision, as well as to consider lifelong learning the key to equip themselves with the new skills that will be required.

Therefore, the researcher aims to investigate this level of awareness regarding the changes that digitalisation will bring to the procurement sector, the strategic actions that companies and procurement professionals are taking to equip themselves with the new skills required in the future of procurement. The inexistence of a hypothesis and the need for collecting information and analyse patterns in order to create a conceptual framework leads this study to an inductive approach.

3.4. Research Strategy

The research strategy is the plan and structure of investigation used to obtain answers for the research questions. It describes the techniques used to collect data, as well as the type of sample (Cooper and Schindler, 1998).

The research purpose is classified as an exploratory study as it is concerned with clarifying an understanding of a problem by seeking new insights into the data collection. According to Dudovskiy (2018), the exploratory study is used to investigate a problem that is not clearly defined, and the main objective is having a better understanding of this existent problem. Therefore, the purpose of an exploratory study is not providing conclusive results as the identified issues can be further explored in future research.

Saunders, Lewis and Thornhill (2007), presents seven types of research strategies that can be used in a study:

Figure 10: Types of research strategies

Source: Saunders, Lewis and Thornhill (2007)

The most appropriate type of research strategy for this study is a survey. The survey method and the reasons why the researcher chose this method are described in the following section.

Survey

Brannick and Roche (1997) describe a survey as a systematic collation of specific information, usually collected from an individual respondent with a version of a questionnaire. It can be utilised to describe the characteristics of a sample and to test hypotheses about the nature of relationships within a sample (Dudovskiy, 2018).

The survey approach is well-used in researches since it enables the researcher to collect a large amount of data from a sizeable sample, which facilitates the process of explaining and understanding the data. The survey strategy permits the collection of quantitative data that will be analysed quantitatively using descriptive and inferential statistics. In order to ensure the reliability of the results, the sample needs to be representative with a reasonable response rate (Wisker, 2007).

The overall purpose of this research is to find out if organisations and procurement professionals are taking actions to equip themselves with the digital transformation in the procurement function in the next coming years. In order to find an answer to this question, the most appropriate data collection method is a survey applied with the version of a questionnaire. The survey was conducted online due to the possibility of reaching a broader target audience and, consequently, increasing the response rates. Besides, online surveys have a short lead time, as the data is gathered automatically, which also reduces the margin of error as the responses are entered directly into the system (Parahoo, 2014).

Lastly, the choice of conducting an online survey was done due to time constraints. A survey is an easy tool for participants, which increases the number of responses. Also, there is a wide range of online platforms that facilitate the approach with fundamental people for the survey. This direct approach with key procurement professionals by social media raised either the number of responses and the reliability of the data collected in this research.

Sampling

A sample is defined as a group of people, items or objects chosen from a wider population to gain information about the whole. Sampling is the process of selecting a suitable sample to determine characteristics of the whole population by observing only a portion of the population (Webster, 1985).

The sampling techniques are classified into two categories (Singh, 2018):

- Probability sampling: It involves the use of randomisation to ensure that every element of the population have an equal chance to be part of the sample. It occurs when there is no prior information about the target population.
- Non-probability sampling: The researcher considers selecting a specific target of population that best suit for the purpose of the study.

Brannick and Roche (1997) point out the using samples in a survey can bring many contributions, such as speed or turnaround time for results, lower costs, good quality of data collected and practicality.

Thus, this study englobes non-probability sampling, where the participants were carefully chosen according to their experience in the procurement sector. The need for selecting non-random participants for this research is since the research questions and objectives require specific knowledge and background in relation to the procurement area. Therefore, selecting only participants who work in the procurement field was the primary filter for choosing the sample.

3.5. Research Choice

The method choice is used to distinguish both data collection techniques and data analysis procedures, and it is divided into quantitative and qualitative data. The qualitative research is used when the research intention is describing and understanding experiences, beliefs, values or ideas. The data is usually collected by in-depth interviews, where the researcher seeks for non-numerical data (Saunders, Lewis and Thornhill, 2007).

The quantitative data is used when the researcher intends to measure variables in order to explain a particular phenomenon. The data is normally collected through a questionnaire, and the data analysis is done by graphs or statistics (Wisker, 2007).

Quantitative methods are based on unsystematic sampling and structured data collection instruments. The results of the investigation in the quantitative study are easy to summarise, present and generalise. In contrast, the qualitative method is usually based on systematic sampling methods and non-quantifiable information, such as feelings and words. The table below presents the main differences between quantitative and qualitative methods (Dudovskiy, 2018):

		Quantitative	Qualitative
Require ment	Question	Hypothesis	Interest
	Method	Control and randomization	Curiosity and reflexivity
	Data collection	Response	Vewpoint
	Outcome	Dependent variable	Accounts
Ideal	Data	Numerical	Textual
	Sample size	Large (power)	Small (saturation)
	Context	Eliminated	Highlighted
	Analysis	Rejection on null	Synthesis

Table 2: Main differences between qualitative and quantitative methods
Source: Dudovskiy (2018)

Quantitative data can be divided into two groups: Quantifiable and categorical. Quantifiable data occurs when values are measured numerically as quantities, which means that the data can be analysed by using a wide range of statistics. On the other hand, the categorical group present data that can not be measured numerically, but can be either organised into categories or placed in rank orders (Saunders, Lewis and Thornhill, 2007).

This research aims to quantify the number of companies and procurement professionals taking actions to equip themselves regarding digitalisation and the skills needed to survive in the digital world. The collection method is based on numbers and mathematical calculations, which classifies the research in the quantitative technique.

 The quantitative data collection method used in this study was a questionnaire composed of eighteen closed-ended questions (quantifiable data) and two open-ended questions (categorical data). Although the questionnaire aims to quantify information, the questions presented in the

questionnaire were particularly subjective as they depend on each participant background. The questionnaire will be further explained in the section "techniques and procedures".

3.6. Time Horizon

Time horizon refers to the period of time that the research is undertaken. There are two types of time horizons, which are cross-sectional and longitudinal. Cross-sectional studies are limited to a particular time frame, and are usually undertaken with time constraints. On the contrary, longitudinal studies are repeated over a longer period of time in order to investigate events changes.

This research is classified as a cross-sectional study as it is investigating particular phenomena from a population at one specific period of time. The participants were selected according to one variable of interest: Working in the procurement sector. The cross-sectional method was selected in this study due to the possibility of collecting a considerable amount of data in a short period of time from a large pool of participants.

3.7. Techniques and Procedures

3.7.1. Collection of Primary Data

Primary data is an original data source, collected directly by the researcher to answer the research questions (Cooper and Schindler, 1998). It can be structured or unstructured, and it can be obtained by using questionnaires, conducting in-depth interviews or observing participants (Brannick and Roche, 1997). Considering that the researcher should use an objective and efficient method to collect quantitative data (Robson, 2007), the data collection method selected for this research was a semi-structured questionnaire.

Questionnaires

A questionnaire is a method of data collection administrated to a wide sample of participants, and it is shaped by the aims of the research and epistemological tradition (Parahoo, 2014). According to (Brannick and Roche, 1997), a questionnaire should contain four types of questions:

1. Knowledge questions;
2. Behaviour questions;
3. Attitudes/opinions and;
4. Classificatory/demographic questions.

Having in view that questionnaires tend to have a low return rate (Parahoo, 2014), the researcher considered that the best way to get more responses would be conducting a questionnaire with eighteen closed-ended questions and two open-ended questions. As the research strategy is collecting quantitative data, the closed-ended questions are more efficient for measuring and analysing the data. Besides, to increase the response rate, the researcher published the questionnaire in 6 LinkedIn groups, 2 Facebook groups. Besides that, the researcher contacted, via private messages on LinkedIn, 160 procurement experts with more than ten years' experience in the procurement sector. The contact was made with a cover letter explaining the aim of the research and ensuring the confidentiality of the responses.

Therefore, the survey was conducted by online questionnaires designed on Google Forms and published in procurement groups on social media. Primary data was collected from procurement professionals from different levels and backgrounds in the procurement sector. The online questionnaire was published on 6 LinkedIn groups and 2 Facebook groups. Both platforms include a large pool of procurement professionals worldwide. Also, the author also contacted procurement professionals through personal network, as well as through private messages on LinkedIn.

As mentioned previously, the survey was conducted through Google Forms, which is a free and reliable platform that gives the option to ask numerous questions and to get real-time answers in different styles. The platform is well-known in the industry and allows the possibility of getting anonymous answers to tough questions, which would not compromise either organisations or

employees. Therefore, as an easy and straightforward tool, Google Forms efficiently helped with the conduction of the survey.

The development of the presented survey aimed to address the research questions. The data was collected by a semi-structured questionnaire, composed of 18 closed and 2 open-ended questions, answered by 73 procurement professionals worldwide in August 2019.

The first four questions of the questionnaire aimed to understand the background characteristics of the participants. These questions provided context for the collected data and allowed the researcher to better describe the respondents. The other questions have as a main objective to investigate if organisations are taking strategic actions to implement digitalisation in the procurement process, as well as to analyse if procurement professionals are aware of the skills required by digital procurement and investing in developing their skills and capabilities in order to equip themselves with the changing business environment that digitalisation will bring to the procurement sector.

The primary goal of this study was initially developing a qualitative analysis by using in-depth interviews with procurement companies to collect data about their understanding and their actions regarding the inclusion of the presented technologies in the procurement processes. However, due to mainly complications in organising interviews, this primary goal did not become possible. However, despite the changes in the development of the research, the quantitative method chosen answered the research questions and met the objectives.

3.7.2. Sources

This research was supported by a collection of primary and secondary data. Primary quantitative data was collected through a survey in the form of an online questionnaire provided to procurement professionals through social media. As mentioned previously, the research questions were composed of open and closed questions, and the aim of primary data was to answer the research questions and objectives.

The secondary data was assessed by academic literature from different sources such as articles, books, journals, past peer-reviewed researches and several websites related to digital technologies and digital procurement. The secondary data was the foundation for a solid base of knowledge, as

well as how this research would contribute to the rising of procurement through digital technology. The relevant information was further collected as primary data to answer the research questions.

3.7.3. Access and Ethical Issues

Saunders, Lewis and Thornhill (2007) affirm that it is fundamental to think carefully about how to gain access to the data in the chosen organisations and about possible ethical concerns that might arise from the conduct of the entire research. Furthermore, obtaining the correct sources of data is crucial for the development of the study.

About the research ethics, it is necessary to ensure that the way the research is designed is both methodologically sound and morally defensible to all the individuals who are part of it, which will be affected by broader social norms of behaviour (Saunders, Lewis and Thornhill, 2007).

Therefore, the researcher ensured the transparency of the survey and specified on the description of the online questionnaire that the survey was totally anonymous and had only an academic purpose. Additionally, the participation of the respondents is voluntary. There was no pressure for any of the group's members to take the survey.

3.7.4. Approach to Data Analysis

According to Parahoo (2014), the data analysis is a crucial part of the research design as it is the process of making sense of the data before presenting them in a comprehensible manner. Dudovskiy (2018) argues that there are different data analysis methods for qualitative and quantitative data. For the qualitative data collected by using interviews, experiments or focus groups, the analysis involves finding common patterns in the responses and accurately analyse them to complete research aims and objectives. On the other hand, the data analysis for quantitative data includes precisely analysis of figures and numbers by using mathematical or statistical modelling.

As mentioned previously, the quantitative data collected for this research was divided into quantifiable data for the closed-ended questions and categorical data for the open-ended questions.

The closed-ended questions were analysed by using pie-charts and histograms. These methods were chosen due to the following reasons:

- Pie-chats: The possibility of displaying the percentage as a whole for the data collected from the demographic questions and statements in the questionnaire will facilitate the visual appeal and simplify complex data, facilitating comparisons.
- Histograms: The histograms are used to facilitate the analysis for the questions that require comparison within the items. Also, histograms have high visual strength and enable the possibility to notice tendencies within data (Dudovskiy, 2018).

The questionnaire created by Google Forms automatically generates well-detailed graphs with real-time information. The charts contain statistical measurements, which support in the development of a consistent explanation of the results.

Regarding the open-ended questions, the answers were analysed one by one and the most common words were identified and further grouped into categories by order of importance, with a column describing the number of times that those words appeared within the answers.

3.8. Conclusion

This chapter has presented the methodology and research design that was used to conduct this study. In conclusion, this is an epistemological study as it focuses on providing contributions for existent knowledge presented in the literature review. The research aims to collect information based on the participants' backgrounds and experiences in the procurement sector, which leads this study to the use of an interpretivist philosophy as it englobes personal interpretations.

In order to collect data to explore a phenomenon, this study took an inductive approach, using the survey strategy in the form of a questionnaire composed of twenty questions, both categorial quantitative data (two open-ended questions) and quantifiable quantitative data (eighteen closed-ended questions). The participants of the sample were approached by using online platforms and the researcher also used personal contacts. The data collection was conducted for a short period of time, which classifies it as a cross-functional study. The data collected was analysed through pie-charts and histograms automatically generated by Google Forms. Therefore, the picture below visually summarises the methodology utilised in this study:
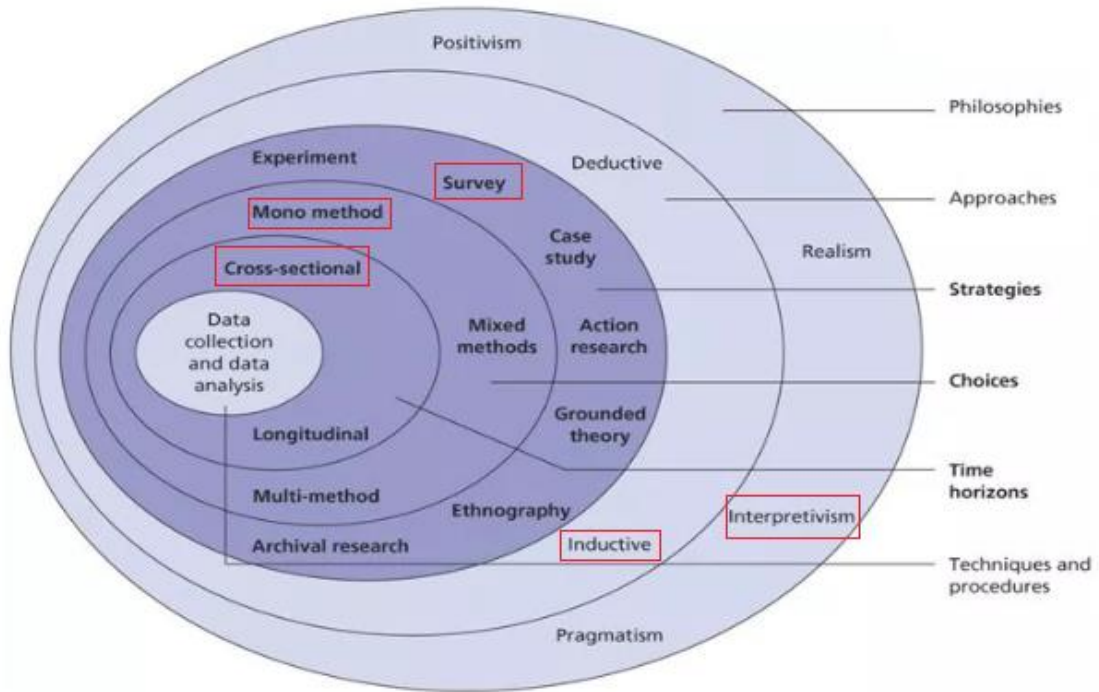
Figure 11: Research Onion

Source: (Saunders, Lewis and Thornhill, 2007)

4. Presentation and Discussion of Findings

4.1. Overview

This chapter has as main objective presenting the primary research findings, discuss common patterns, and compare the findings with the literature review in order to explain controversies if such exist.

This exploratory study aimed to gather quantitative data by using a survey in the form of a questionnaire designed by Google Forms, where 73 procurement professionals contributed with their responses and insights. The questionnaire focused on gathering reliable data to answer the research questions and meet the objectives of the study.

Lastly, this chapter is divided into three parts. The first part is composed of the "Findings", where primary data collected is analysed. The second part is the "Discussion", where the results are compared with the literature review, as well as co-relations between them are identified. Finally, the "Conclusion" describes the holistic picture of the discussion and summarises the understanding of the subject researched.

4.2. Findings

Question 1: *How many years of experience do you have in the Procurement sector?*
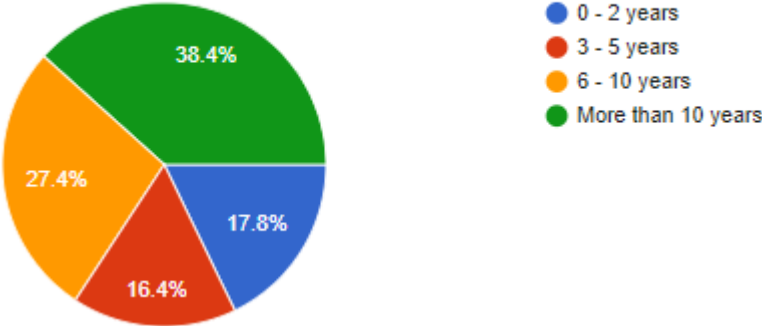
The pie-chart shows that 38.4% of the participants have more than ten years of experience in the Procurement sector, followed by 27.9% of participants who have between 6 to 10 years of experience. Therefore, the two groups together constitute 65.8% of experienced Procurement professionals, which increases the reliability of the data collected in this research. Lastly, 16.4% of participants have between 2 to 5 years, and 17.8% of participants have between no experience to 2 years' experience.

Question 2: What is the level of your current position?
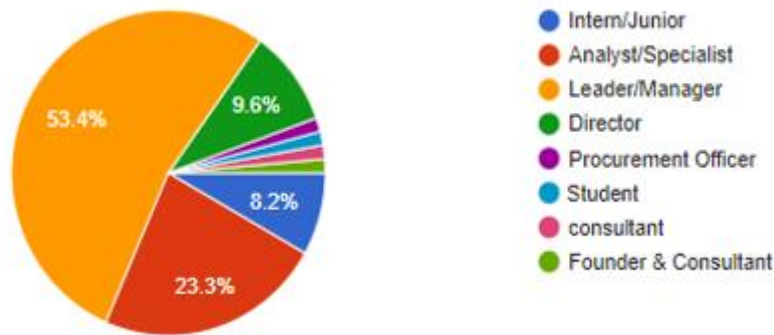
As presented in the pie chart, 39 out of 73 people are leaders or managers (53.4%), while 7 out of 73 people are directors (9.6%) in the procurement sector. These figures combined represent 63% of the respondents, which justifies the level of experience shown in question 1. Specialists and analysts represent the second biggest group of participants, displaying 23.3% (17 participants). Intern and junior positions represent 8.2% of participants, followed by consultants, procurement officers and founder & consultant, which represent an average of 1.4% of participants.

*Question 3: What kind of industry are you working currently?*

From the information shown in the chart, a considerable number of people who answered the survey work in the Pharmaceutical industry, which accounts for 15.1% of the respondents. The second position is led by the Manufacturing Industry, Financial services/Insurances, and Food/Drinks Industry, which accounts for 12.3% of the participants each, while 9.6% of the participants come from the Construction Industry. Lastly, 38.4 of the participants are distributed between Services, Agribusiness, Mass Media, Hospitality, Health care, Water Industry, and Computer Industry.

Question 4: *What is your gender?*
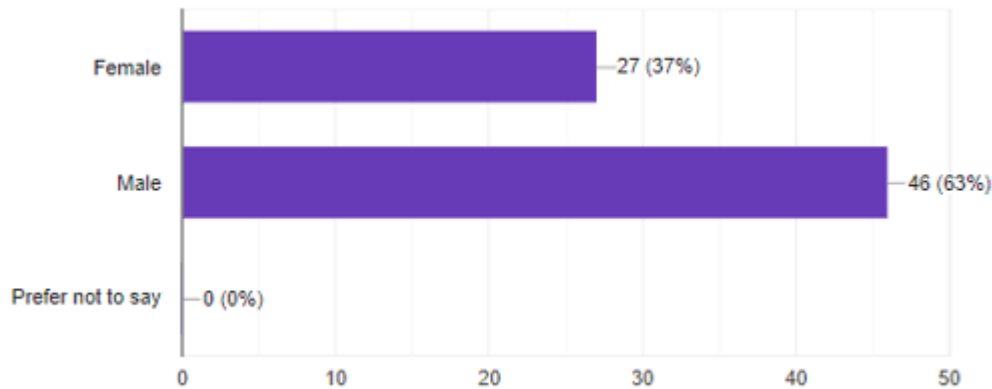
The relevance of this question lies in the aim of showing inclusiveness in the questionnaire. Also, the result ensures that the sample is representative, where the majority of the participants are male, accounting 63%, while 37% of them are female.

Question 5*: My workplace has a well-designed digital procurement strategy that includes the adoption of digital technologies in a short, medium or long-term plan.*
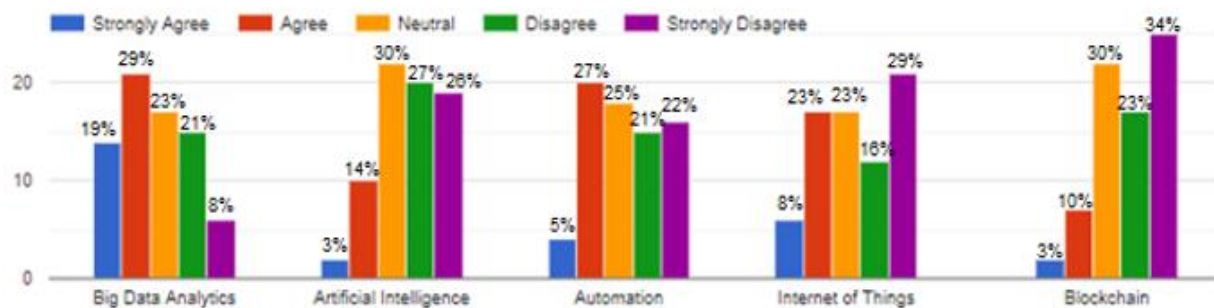
The histogram shows that almost half of the participants believe that their workplace has a well-designed plan for Big Data Analytics, representing a total of 48% of participants, accounting for 19% who strongly agree and 29% who agree with the statement. In contrast, the majority of the participants do not believe that their workplace has included other technologies in their digital

procurement plan. For instance, just 3% of people strongly agree that Artificial Intelligence or Blockchain is part of the future of procurement, neither in short, medium nor long term.

Concerning the Internet of Things and Automation, although some participants seem to agree that these technologies are included in the company's strategic plan, many of them still do not agree with the statement. A total of 43% of participants do not believe that Automation is included in the strategic plan, while 45% of them do not believe that Internet of things is included neither.

Blockchain presents the highest level of rejection, with 34% of participants who strongly disagree and 23% of them who disagree that Blockchain is included in the company's strategic plan. Those figures together account for 57% of participants, followed by Artificial Intelligence, with a total of 53% of rejection. Lastly, an average of 26% of participants neither agree nor disagree with the statement.

Therefore, the results suggest that companies tend to have a well-designed plan for Big Data Analytics (48%), followed by automation (32%) and Internet of Things (31%). Blockchain and Artificial Intelligence are still distant from the companies' strategic plan, according to the participants.

Question 6: I feel that the management of my workplace is prepared to implement digital technology and lead the team towards a digital procurement.
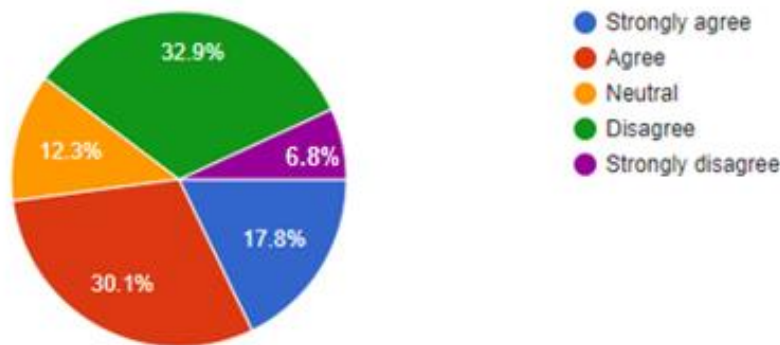
Almost half of the participants believe that the management of their workplace is prepared to embrace digitalisation, representing 17.8% who strongly agree and 30.1% who agree with the statement. Contrarily, 32.9% of participants disagree, and 6.8% strongly disagree that their

management is prepared for digitalisation. Lastly, 12.3% of the participants neither agree nor disagree with the statement.

Question 7: I believe that my procurement team possess the skills and capabilities to maximize the use of current and future digital technologies.
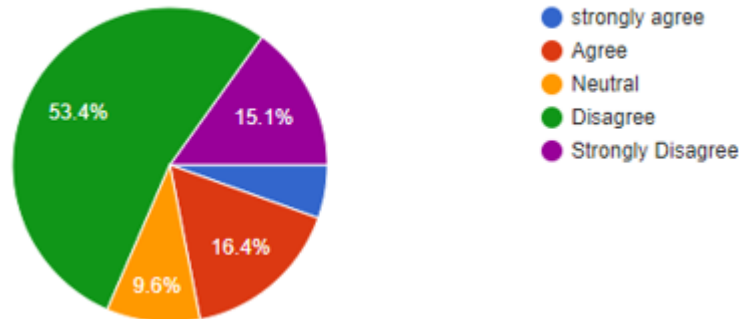

Considering that 63% of participants occupy a leadership position, 68.5% (53.4% +15.1%) of them believe that their team do not have digital skills to maximise the potentiality of digital technologies. On the other hand, only 5.5% of the participants strongly agree that their team have the skills to maximise the use of digital technologies, while 16.4% also agree with the statement. 9.6% of the participants neither agree nor disagree with the statement.

Question 8: I believe that organisations and procurement professionals need to build up digital skills such as data science and analytics expertise in order to avoid losing competitiveness in the future market.
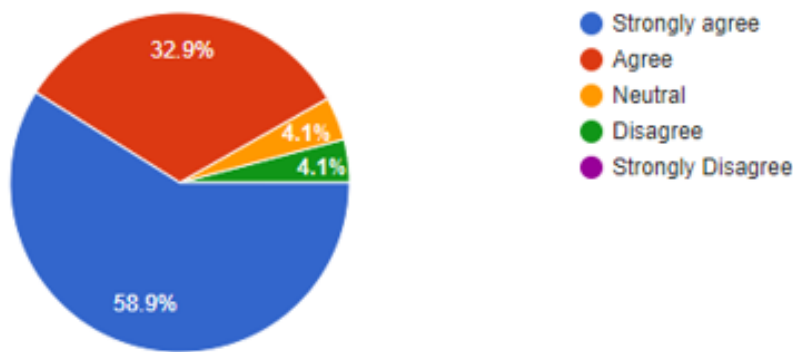
The majority of the participants recognise that data science and analytics expertise will be characteristics that procurement professionals will need to have in the near future, otherwise, companies will take the risk of losing competitiveness in the marketplace. Only 4.1% disagree that those tech skills will not be relevant, while 58.9% strongly agree, and 32.9% agree, accounting for 91.8% of participants. Lastly, 4.1% of the participants neither agree nor disagree with the statement.

Question 9: My workplace invests in training and development programs to build up my digital skills.
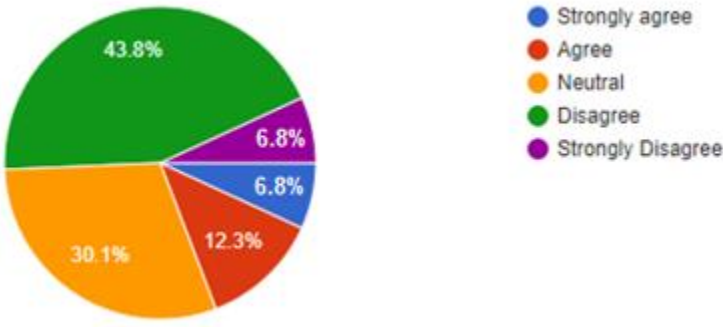
Only 19.1% of organisations are focusing on developing digital skills within their teams, while 50.6% of participants confessed that their workplace does not have a training and development program to help them build their digital skills. Lastly, 30.1% of the participants neither agree nor disagree with the statement.

Question 10: What digital training and development programmes does your workplace offer to its employees?

Training and development programmes	Occurrences	Rank
Funding towards external courses	8	1
E-Procurement - SRM Platform	4	2
Data Analytics	2	3
Blockchain for specific individuals	1	4
Plethora of training tools of all formats available to staff on tech and innovation.	1	4
Use of Adopting systems to get rid of manual paperwork	1	4

Table 3: Training and development programmes offered by companies

This open-ended question shows that 17 out of 73 participants admitted that their workplace provides digital training and development programmes. In reality, 8 participants said that their workplace does do not offer it in-house, but they support procurement employees with funds towards external courses. E-procurement training by using a platform called Supplier Relationship Management (SRM) occupies the second position, occurring four times within the responses. Data Analytics (2 participants), Blockchain (1 participant), Plethora (1 participant) and other systems to get rid of manual paperwork (1 participant) are some types of training provided by the participants' workplace to advance their digital skills.

Question 11: *My workplace uses data analytics tools to translate data into accurate information for decision making.*
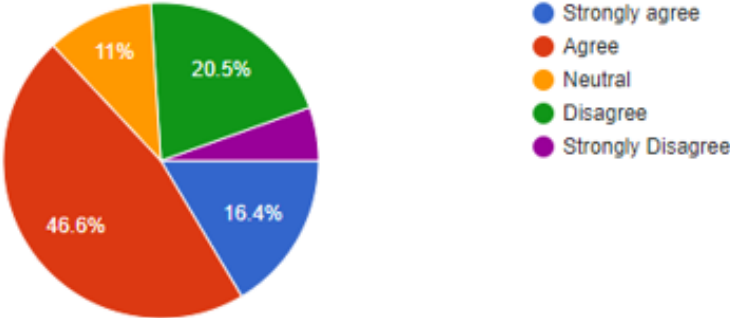
Although Big Data Analytics has been used by organisations for over 15 years (Foote, 2018), the pie-chart shows that 20.5% disagree and 5.5% strongly disagree that their companies use data analytics tools to support decision making. However, 63% (46.6% + 16.4%) of the participants confirm that their workplace has been using data analytics tools to generate insightful information, which is a positive point, as Big Data is the foundation for more developed technologies, such as Artificial Intelligence and Automation (Sheldon, 2018). Lastly, 11% of participants neither agree nor disagree with the statement.

Question 12: *Consider today's development of Artificial Intelligence (AI). How likely is it that your workplace will adopt AI-driven tools to assist procurement tasks such as the buying or ordering process?*
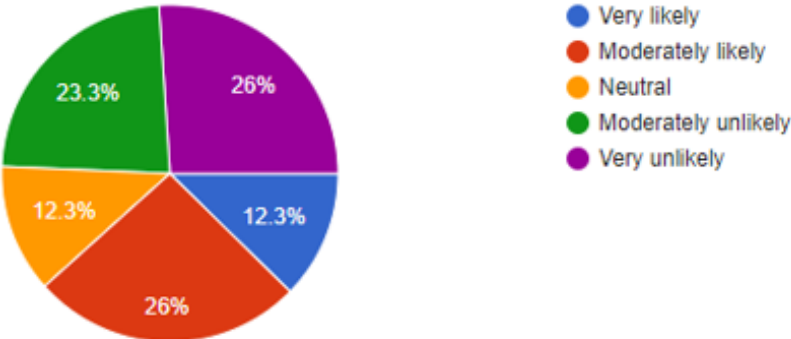
Only 12.3% of participants believe that it is very likely that their organisation will adopt AI-driven tools to assist procurement operations, such as buying or ordering process, while 26% consider it moderately likely. In contrast, 49.3% (26% + 23.3%) of participants do not believe that their companies will adopt AI tools in the procurement operations. Lastly, 12.3% of the participants neither agree nor disagree with the statement.

Question 13: Consider today's development of Robot Process Automation. How likely is it that your workplace will use bots to automate procurement tasks such as Purchase Order creation or invoice validation?
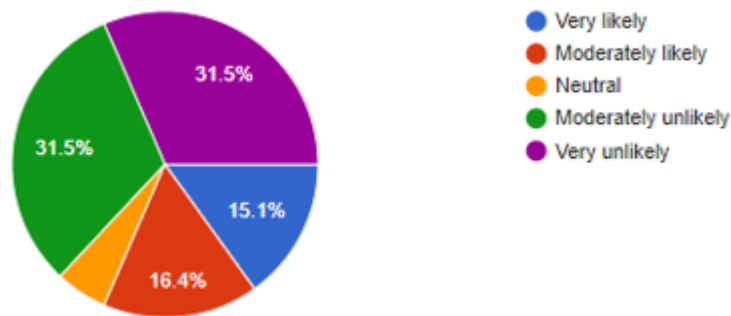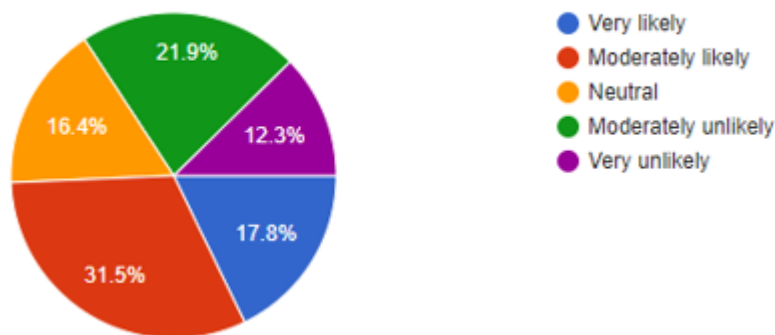

Only 15.1% of participants believe that it is very likely that their workplace will use bots to automate procurement operations, such as Purchase Order creation or invoice validation, while 16.4% consider this possibility moderately unlikely. In contrast, the majority of the participants believe that the use of automation for procurement tasks is either very unlikely (31.5%) or moderately unlikely (31.5%) to happen, which together accounts for 63% of the responses. Lastly, 5.5% of the participants neither agree nor disagree.

Question 14: Consider today's development of Blockchain technology. How likely is it that your workplace will adopt Blockchain to track procurement transactions in the next five years?
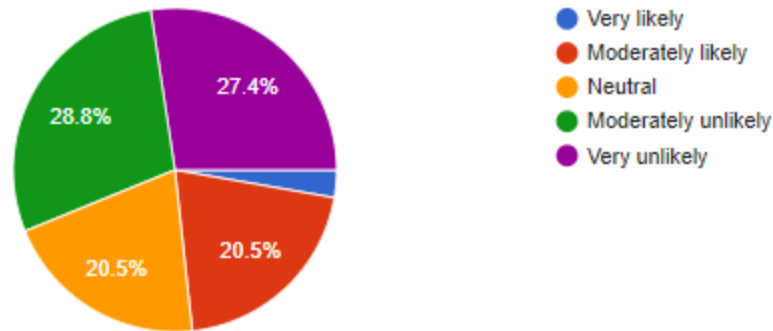
The figure 26 shows that 27.4% of respondents do not believe that their workplace will adopt Blockchain in their procurement process in the next five years, while 28.8% of them affirm that the statement is moderately unlikely. These figures together account for 56.2% in total (41 participants). Only 2.7% of the respondents believe that it is likely that their workplace will adopt Blockchain technology, followed by 20.5% who think that this possibility is moderately likely. Lastly, 20.5% neither agree nor disagree.

Question 15: *Consider today's development of the Internet of Things. How likely is it that your workplace will invest in devices to increase traceability across the supply chain in real-time?*

Almost half of the participants believe that it is either very likely (17.8%) or moderately likely (31.5%) that their workplace will invest in devices to increase traceability across the supply chain.

However, 34.2% of participants (21.9% + 12.3%) still do not consider the Internet of Things a reality for their workplace. 16.4% of the participants neither agree nor disagree.

Question 16: Based on your experience and knowledge, when will the below digital technologies impact Procurement?
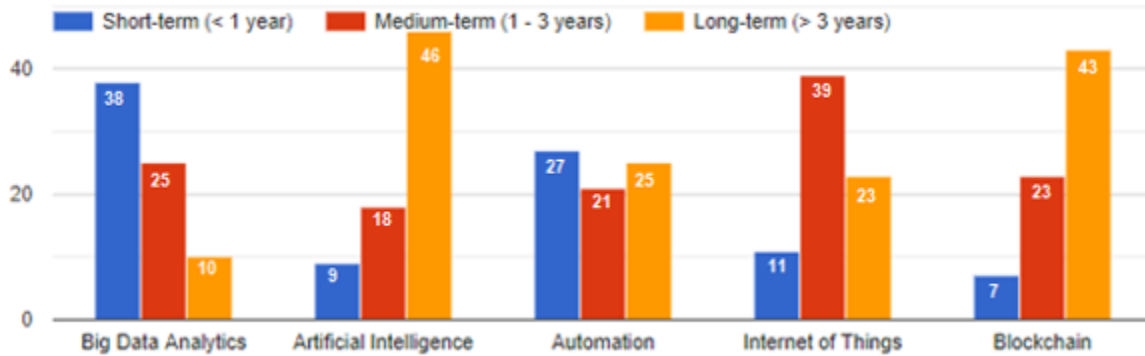

According to 52% of participants (38 people), Big Data Analytics will impact procurement in a short-term, while 48% of participants believe that Big Data Analytics will impact procurement in a Medium (34%) or Long term (14%).

Interestingly, 37% of professionals believe that Automation is the second technology that will impact procurement in the short term, while 29% of them think that it will impact procurement in a medium-term, and 34% of participants say that it will impact procurement in a long-term.

Internet of Things will impact procurement medium-term, according to 53.4% of participants, while 23 out of 73 people, which accounts for 31.5%, believe that Internet of Things will impact procurement in the long term. The minority of them (15.1%) think that it will impact procurement in a short-term.

The majority of the participants believe that Artificial Intelligence and Blockchain will impact procurement in a long-term, which accounts for 63% and 59% of the participants, consecutively. Only 12.3% of them believe that Artificial Intelligence will affect procurement in a short-term, while 24.6% of people say that its impact will be in a medium-term. Similarly, the short-term is also a minority for Blockchain, accounting for 9.6%, while 31.5% believes that its impact will be in a medium-term.

Question 17: *Recent studies affirm that procurement professionals will need to develop some of the skills below in order to equip themselves with the digital transformation of the procurement sector. Based on your opinion, please rank the following required skills on a scale of 1 to 5, with 1 being the most relevant.*
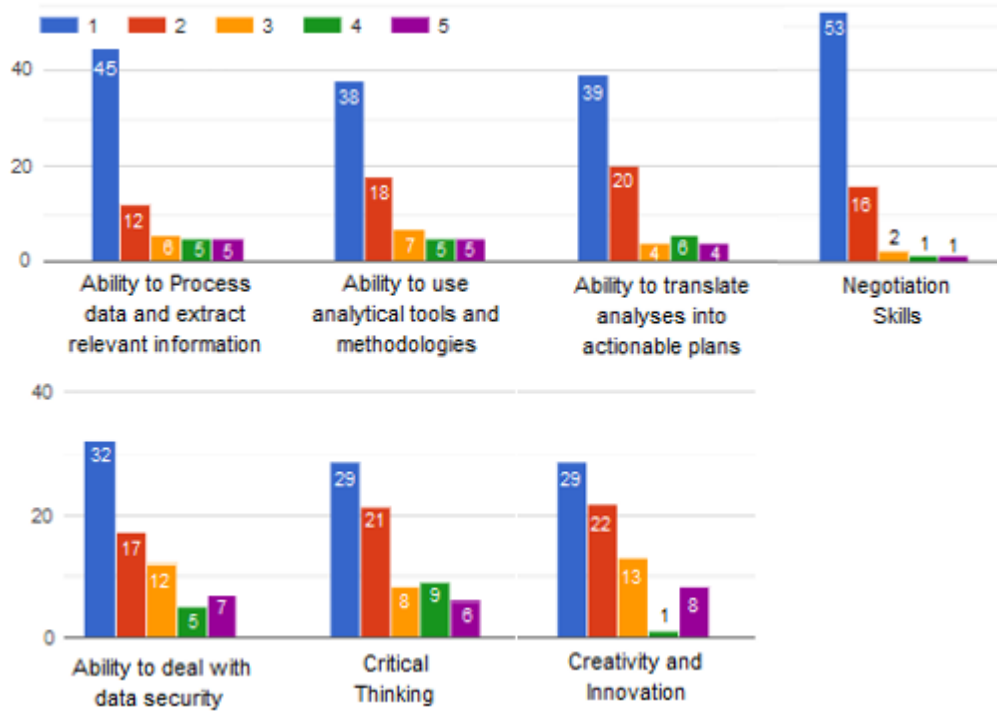
The participants of this survey consider that, within the skills presented on the histogram, the most essential skill for the future of procurement will still be negotiation, which was selected as the most relevant skill by 72% of participants. Only 2 participants selected the number four and five on the scale, which means that they believe that negotiation will not be very relevant for the future of procurement.

The second most important skill (within the skills shown) according to the participants is "ability to process data and extract relevant information", which was selected by 61.6% of participants as a very relevant skill (scale 1). Only 13.8% of participants do not consider this skill very relevant, which influenced them to select scale 4 (6.9%) and 5 (6.9%) in the histogram.

However, extracting relevant information from data is not enough; it is fundamental to translate this information into actionable plans (Radell and Schannon, 2018; Dorr and LaPierre, 2019). Most of the participants consider it as a very relevant (53.4%) or relevant (27.4%) skill for digital procurement. 16 out of 73 participants distributed the selection from scale 3 to scale 5, which means that they do not consider this skill very relevant or relevant for digital procurement, bringing this skill to the third position of relevance.

Subsequently, the fourth position in the rank is occupied by "the ability to use analytical tools and methodologies". In fact, 52% of participants agree that this skill will be very relevant for procurement professionals, followed by 24.6% of them who selected 2 in the scale of importance. On the other hand, only 6.8% of the respondents believe that this skill will not be relevant for digital procurement.

Within the seven skills presented on the histogram, the ability to deal with data security occupies the fifth position as the most relevant skill for procurement professionals. 44% of the respondents strongly believe that procurement professionals will need to be capable of securing the data generated in the procurement process, and 23.3% of them selected the number two in the scale, which means that it may be a relevant skill. Contrarily, 6.8% of the respondents believe that this skill may not be relevant, while 9.6% of them selected number five in the scale, which means that this skill is not relevant at all.

Lastly, 39.7% of the respondents believe that critical thinking, as well as creativity and innovation, will be very relevant for digital procurement. 28.7% of the respondents believe that critical thinking may be relevant, while 30.1% of them selected the same for creativity and innovation. On the other hand, 12.3% of the respondents believe that critical thinking may not be relevant, while 8.21% of them affirm that this skill will not be relevant at all. Regarding Creativity and Innovation, just one participant believes that this skill may not be relevant, while 8 participants affirm that creativity and innovation will not be relevant at all.

Question 18: Do you use any of the below learning and development practices to build up your digital skills
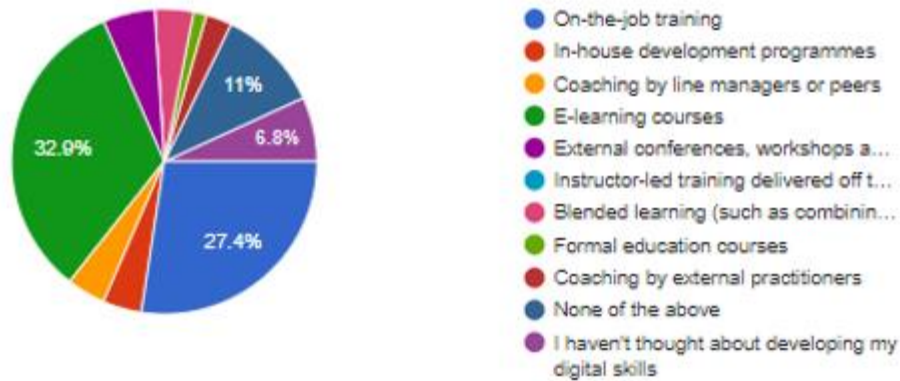
The pie chart shows that the majority of participants uses e-learning courses (32.9%) and on-the-job training (27.4%) to develop their digital skills. On the other hand, 17.8% of them neither use any of the programmes above (11%) nor have not thought about developing their digital skills (6.8%). A small percentage of participants selected other methods of learning, such as external conferences (5.5%), blended learning (4.1%), in-house development programmes (4.1%), coaching by line managers (4.1%), coaching by external practitioners (2.7%), and lastly formal education courses (1.4%).

Question 19: *What technology listed below would you like to have more insight into?*
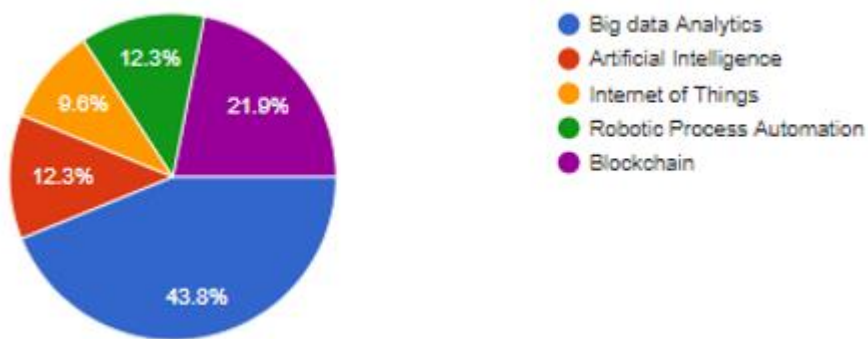
The pie chart demonstrates that 43.8% of the responders would like to have more insight into Big Data Analytics, while 21.9% of them selected Blockchain instead. Equally, 12.3% of the participants would like to learn more about into Artificial Intelligence and Automation, and lastly, 9.6% chose the Internet of Things.

This result suggests that 32 out of 73 participants are still learning or willing to learn about the foundation of digital technology, which is Big Data Analytics. This fact may justify the responses from 68.3% of participants who do not believe that their team have the skills and capabilities to maximise the use of digital technologies.

Question 20: *Based on your own experience and knowledge, please outline one contribution that one of these technologies (Big Data Analytics, Internet of Things, Automation, Blockchain or Artificial Intelligence) will bring to the procurement operations.*

This was an open-ended question, and its objective was gathering insights from procurement professionals regarding the main contributions of digitalisation in the procurement sector. Only nine participants replied to this question with a symbol or letter to fill out space for the answer. Also, two participants replied with a short answer that did not aggregate value to this question. The remaining answers, which account for 62 out of 73 answers, aggregated some value to the question. Within these answers, the most common words were "efficiency", "accuracy", "speed" and "cost reduction". Efficiency appeared 15 times, followed by accuracy (12 times), and cost reduction (11 times). These and other words that appeared with a frequency are shown in the table below:

Word	Occurrence	Rank
Efficiency	15	1
Accuracy	12	2
Cost reduction	11	3
Speed	9	4
Transparency	6	5
Better strategic decisions	6	5
Real time supplier data	3	6

Table 4: Presentation of survey answers

Based on these identified similarities, the researcher selected some answers from the participants that better represents the idea behind those common words, which are presented below:

I.   *Blockchain will enhance **efficiency** and **accuracy** in transactions.*

II. *Digital technology will improve **efficiency** in procurement processes and help with **cost reduction**.*

III. *I have been involved with automation, and my experience is that the transactional elements of the function will disappear, and procurement will be reinvented, smaller and more **efficient**.*

IV. *Artificial Intelligence, if done correctly, can reduce the burden on procurement professions and improve **efficiency** by focusing on the strategic aspect of their jobs and not nonvalue add activities.*

V.   *Big data will drive trend management and analytic opportunity for the foreseeable future, which will give buyers **accurate information** for the best opportunities to leverage spend.*

VI. *Proper use of big data will allow procurement teams to leverage more **accurate** and relevant data.*

VII. *Artificial Intelligence support **cost reduction** and a workforce with the potential of working 24 hours a day.*

VIII. *Automation will allow **cost reduction** and time saving, while Big Data will provide more **accurate** information and consequently a more **assertive decision making**.*

IX. *Blockchain will automate, expatiate, **cut costs**, create trust & **transparency** in the supply chain. Look at Foxconn & Apple / Amazon in recent news. Corporates must be held accountable for unethical behaviour in the manufacturing process.*

X.   *Automation is going to have a large effect on our company going forward as any small orders will be generated automatically on the system. This will give us the opportunity to work on more substantial orders. Working harder on the more valuable orders in turn leading to more **cost savings** and technical clarifications being met more accordingly.*

XI. *Internet of Things will provide more **data in real time**, which will facilitate the process of decision making*

XII. ***Quicker processes*** *and more* ***accurate*** *communications between different languages and cultures in an ever-shrinking world will be some results of digital technology.*

XIII. *Blockchain will bring* ***transparency*** *to the purchasing process and will build trust in the supplier relationship.*

XIV. *Greater* ***transparency*** *with Blockchain will provide value to supply chains in order to increase profit and reduction of waste.*

XV. *Digital technology will allow* ***better strategic decisions****, less manual work, improved data quality and user satisfaction.*

XVI. *Digital technology will bring* ***speed, accuracy*** *and insight into business trends to allow* ***improved business decisions*** *and risk management.*

Hence, these words were also found in the literature review, which proves the consistency between the answers from procurement professionals and academic research.

According to Mutagi (2018), technologies such as Artificial Intelligence, Internet of Things and Blockchain promise greater **efficiency** in business operations, as well as **transparency** and security.

Big Data Analytics allows the possibility of making predictions of future outcomes using past and current data and analytics tools such as machine learning and statistical modelling, which support **better decision making** (Edwards, 2019)

Knapp *et al.* (2018) affirm that managing the amount of data from supplier to customer, **leveraging decision making** and increasing procurement **efficiency** is only possible with digital technology. Intel (2019) argues that Internet of Things intelligent devices are fundamental to manage machines, track inventory, **save costs**, and increase **efficiency.** Furthermore**,** Internet of Things will improve the traceability across the entire supply chain and provide data in **real-time** (Nowosel, Terrill and Timmermans, 2015).

According to Breault *et al.* (2018), data **accuracy** is the foundation for useful contributions from AI machines. This accuracy can be reached by useful historical data and data transparency (Nowosel, Terrill and Timmermans, 2015)

In relation to Automation, Procurement bots can be implemented to concentrate procurement information from numerous systems utilised for purchasing products and services at specific times and file this data in particular areas. After gathering data from these systems, the bot can assist with data transformation, which takes a lot of time from professionals. Therefore, it will increase the **speed** of procurement processes (Zubler *et al.*, 2018).

As blockchain records every transaction in the ledger, any suspicious transaction is tough to conceal. This enhances **transparency** in the supply chain, which consequently mitigates the risk of criminal operation such as money laundering (Collins, 2019).

4.3. Discussion

The research question 1 aimed to investigate if organisations are taking strategic actions to implement digitalisation in their procurement process. The results suggest that 48% of the companies have a well-designed plan for Big Data Analytics. In fact, 63% of participants agree that their workplace has been using data analytics tools to generate insightful information for decision making. In contrast, Artificial Intelligence and Blockchain appear to be not included in the companies' strategic plan yet, even in the long-term plan, according to the majority of participants. When asked if it is likely that their workplace may adopt Artificial Intelligence in their procurement operations, 26% of the participants believe that it is very unlikely and 23.3% of them believes to be moderately unlikely. Similarly, 56.2% of the participants do not believe that their workplace will use Blockchain in the next five years.

Although 49.3% of participants believe that it is likely that their workplace will invest in devices to increase traceability across the supply chain, 45% of them confirm that their workplace still does not have a strategic plan that includes Internet of Things in the procurement process. Concerning Automation, 43% of participants affirm that their workplace does not include Automation, neither in the short-term plan nor in the medium- or long-term plan. Furthermore, 63% of them believe to be unlikely that their workplace will use Automation in tasks such as Purchase Order Creation or Invoice Validation.

Evidences presented in the literature review show that, although Big Data Analytics have been used by organisations for over 15 years (Foote, 2018), many procurement companies nowadays still rely on excel spreadsheets, which is very basic and takes a lot of time from procurement professionals (Nowosel, Terrill and Timmermans, 2015). However, as high quality of data is the foundation for an efficient use of digital technology, previous research shows that 45 per cent of procurement leaders believe that poor quality of data and deficit of consolidation are still the a bottleneck for the adoption of digital technology by their workplaces (Younger and Umbenhauer, 2018). Thus, this evidence, as well as the findings, suggest that companies still need to work on generating reliable data in order to get the most value from digital technology.

Regarding training and development programmes, 50.6% of the participants do not have any training and development program offered by their workplace. In fact, just 19.1% them confess to have digital training at work. When asked about what type of training they have, 8 out of 17 employees admitted that their workplace does not provide it in-house, but they support procurement employees with funds towards external courses. E-procurement training by using a platform called Supplier Relationship Management (SRM), Data Analytics, Blockchain, and Plethora are some types of trainings provided by the participants' workplace in order to advance their digital skills.

Almost half of the participants believe that the management of their workplace is prepared to embrace digitalisation. However, 68.5% of them believe that their team do not have the skills and capabilities to maximise the use of current and future digital technology. In contrast, studies carried out by Nowosel, Terrill and Timmermans (2015) present a different point of view. The authors argue that the management of procurement teams is not prepared to implement digitalization in the procurement sector. Furthermore, Breault *et al.* (2018) affirm that many organisations are adopting technology in an uncoordinated way due to the lack of preparation from management. Therefore, Natoff et al. (2018) suggest that the first step for real changes starts with procurement managers, acknowledging the impact of digital technologies and immerse themselves in a learning path in order to utilise the maximum value out of technology.

Therefore, it can be said that the majority of the companies analysed in this research are not currently developing strategies to equip themselves with the changing business environment that

digitalisation will bring to the procurement sector. This result reinforce recent study which demonstrates that despite recognising the contributions of digital technology, their impact and imminent uses, many procurement leaders do not have a digital procurement strategy, and of those who do, less than one-third believe that their approach will enable procurement to reach its objectives and improve business value (Younger and Umbenhauer, 2018).

The second research question investigates, firstly, if procurement professionals are aware that new skills will be required by digital procurement, and secondly, if they are investing in lifelong learning to equip themselves with the skills needed by digital procurement. 91.8% of the participants recognise that new skills will be required in the future of procurement, such as data science and analytics expertise. However, 63% of them do not believe that their procurement team possess the skills required by digital procurement. In fact, 43% of the respondents admitted that they still need to have more insight into Big Data Analytics, which is the foundation for further technologies, such as Automation and Artificial Intelligence. This may be related to the fact the majority of the participants believe that Artificial Intelligence (63%) and Blockchain (59%) will impact procurement in the long-term, which may postpone their initiative to deeply learn about the use of these technologies in procurement. Internet of Things will impact procurement in medium-term, according to 53.4% of participants, while Big data Analytics (52%) and Automation (37%) will impact procurement in the short term.

However, the participants who are taking actions to develop their digital skills use distinct methods. 32.9% of them use e-learning courses, followed by external conferences (5.5%), blended learning (4.1%), in-house development programmes (4.1%), coaching by line managers (4.1%), coaching by external practitioners (2.7%), and lastly formal education courses (1.4%).

The research question 3 explores some key skills and competencies that procurement professionals will need to develop in order to be able to contribute to digital procurement revolution. The skills were identified in the literature review as some of the most relevant skills for the future of procurement. This question aimed to investigate their level of relevance, according to the procurement professionals that participated in this study.

Although negotiation is a crucial skill for procurement today, research shows that it will still be very relevant for digital procurement as it involves having a lot of information and requires a high level of communication skills, which cannot yet be reproduced by Artificial Intelligence, which

will take a long development path to get Artificial Intelligence bots to negotiate similar to humans (Richter, 2019). Having that in view, Negotiation skills occupy the first position in the rank (compared to the other six skills presented in the histogram), with 72% of the participants who agree that it will be still in demand in the future.

The second most important skill for participants is the "ability to process data and extract relevant information", selected by 61.6% of participants who considered it very relevant for digital procurement. In fact, the amount of data generated by the procurement operations is continually increasing (Accenture Operations, 2017), therefore, processing this data in order to extract relevant information from it is the key to have a holistic view of the business, as well as achieving greater assertiveness in decision making (Breault *et al.*, 2018). Also, it is fundamental to translate this information into actionable plans, according to Radell and Schannon (2018) and Dorr and LaPierre (2019), which was selected by 53.4% of participants as the third most relevant skill to have in the future of procurement.

According to Accenture Operations (2017) and Dorr and LaPierre (2019), procurement professionals will need to be able to use analytical tools and methodologies in digital procurement. This ability was considered very relevant for 52% of participants, whereas only 6.8% do not consider it relevant for digital procurement. In sequence, the ability to deal with data security was considered a very relevant skill by 44% of the participants. Booth and Sharma (2019) point out that increased scales of data means increased data security, and procurement professionals need to be able to protect shared data.

Lastly, Bughin *et al.* (2018) predict that cognitive skills, such as critical thinking, creativity and innovation will also be very relevant for the world of technology as they are the foundation for the development, progress and efficiency of digital technologies. However, those skills occupy the last two positions of relevance when compared to other skills.

Therefore, according to the histogram, the majority of the participants consider that the skills identified in the literature review are in fact relevant to the future of procurement. In order of relevance, the first most crucial skill is negotiation (72%), followed by the ability to process data and extract relevant information (61.6%), ability to translate analyses into actionable plans (53.4%) and ability to use analytical tools and methodologies (52%). The last three positions in the rank

are occupied by the Ability to deal with data security (44%), critical thinking (39.7%) and Creativity & innovation (39.7%).

The research question 4 had the purpose of investigating the main contributions that digitalisation will bring to the procurement sector. The literature review presents some of the main contributions that each of the presented digital technology will bring to the procurement sector. For instance, Mutagi (2018) affirms that technologies such as Artificial Intelligence, Internet of Things and Blockchain promise greater efficiency in business operations, transparency and security. In addition, Accenture Operations (2017) says that digitalisation will bring that possibility of managing spend and risks in real time, as well as it will enhance decision making by using efficient data models.

IBM (2019) affirms that Blockchain will bring transparency to procurement operations, while Deloitte (2019) highlights that digitalisation will decrease costs and human error. Besides, Zubler *et al.* (2018) point out that Automation will increase the speed of procurement processes with the use of bots, freeing time for procurement professionals to invest in more strategic tasks.

Nevertheless, the contributions presented in the literature review were reinforced for the participants. When asked to outline one contribution that one of the presented digital technologies will bring to the procurement sector, the main words that emerged from the answers were efficiency, accuracy, cost reduction, speed, transparency, better strategic decisions and real time supplier data. Therefore, the studies presented in the literature review, as well as the findings, have answered the research question 4.

4.4. Conclusion

The findings of this study suggest that, although procurement professionals are aware of the impact of digitalisation in the procurement sector, they are not taking enough strategic actions to equip themselves with the changing business environment. Furthermore, the majority of the companies in this study do not support employees with digital training and development programmes. This may be a consequence of not having a well-designed plan in the company's strategy for technologies such as Automation, Artificial Intelligence, Internet of Things and Blockchain.

This results reinforce current studies presented in the literature review, which indicates that despite recognising the contributions of digital technology, their impact and imminent uses, a greater percentage of procurement leaders do not have a digital procurement strategy, and of those who do, less than one-third believe that their approach will enable procurement to reach its objectives and improve business value (Younger and Umbenhauer, 2018).

Despite the lack of actions, the majority of the participants believe that procurement professionals will need digital skills to help to bring procurement to the next level. In fact, many of the participants agree that the skills identified in the literature review and presented in the questionnaire will be very relevant to the future of procurement.

Lastly, some of the contributions that digitalisation will bring to the procurement sector presented in the literature review were reinforced by procurement professionals through an open-ended question, which can be concluded that the majority of the participants are familiar with the contributions that digitalisation will bring to the procurement sector.

Hence, considering primary data (questionnaire) and secondary data (literature review, theory, peer-reviewed papers and articles), this study answered the research questions and met the objectives.

5. Concluding thoughts on the Contribution of this Research, its limitations and Suggestions for Further Research

5.1. Implications of Findings for the Research Questions

The implementation of digital technology is a necessity in the procurement sector, as continuing to run antiquated procurement processes can stop growth and prevent organisations from going forward. However, the implementation of digital technology takes time and requires significant investment. In fact, it takes between three to five years to collect relevant data and develop suitable digital systems and processes (Accenture Operations, 2017).

Nevertheless, primary data analysis identified that, within the procurement professionals surveyed, their organisations have a well-designed strategy only for Big Data Analytics. However, other technologies, such as Automation, Artificial Intelligence, Internet of Things and Blockchain, have not been included in the companies' digital strategy. Also, although most of the participants agreed that digitalisation will require the development of new skills, such as data science and analytics, the majority of them admitted that they still need to learn more about Big Data Analytics, which is the foundation for more advanced technology.

According to Radell and Schannon (2018), leading companies have already adopted digital tools to transform the way their procurement operations work, however, many companies still rely on systems using Microsoft Office. Therefore, the main implication from the lack of initiative towards adopting digital technology is missing opportunity in cost savings and competitiveness. Therefore, as digital technology increases the speed and quality of procurement, while reducing risk and stimulating innovation, companies who are not adopting it will drastically lose competitiveness and, furthermore, they will stand the risk of being overtaken in the marketplace.

5.2. Contributions and Limitations of this Research

This research provides a first insight into how digitalisation will revolutionise the procurement sector. In fact, this topic also induced the researcher to explore the work of various authors, which

enhanced her knowledge towards this subject, and from now on the researcher can contribute with insights to the procurement sector of her workplace.

Regarding the limitations, time constraint was the most relevant issue as the researcher intended, initially, to use qualitative data gathered from interviews. However, the lack of replies received from companies to participate in the interview prompted the researcher to adopt another approach to collect data, which delayed deadlines.

There are a wider variety of digital technologies that will impact the procurement area. However, the scope of this research was limited to cover only a few of the digital technologies. Besides, this study did not explore how to implement the mentioned technologies in the procurement operations nor the main challenges that companies may face when implementing those.

Another limitation was the size of the sample for the survey. A sample with 73 participants may be small compared to the number of industries worldwide. Also, as 33.6% of the sample has between zero to five years' experience in the procurement sector, they may not have access to their workplace's strategy in relation to the adoption of digitalisation. However, as the results from the survey are consistent with the literature review, the researcher believes that, even if it was a bigger sample, the results would be similar to the ones provided by 73 procurement professionals.

5.3. Recommendations for Future Research

This research had outlined some strategic contributions that digitalisation will bring to the procurement area. However, as presented in the literature review and findings, companies have been slow to embrace digital technologies in the procurement sector. Further research should be conducted in order to identify the main reasons that stop companies from taking strategic actions to equip themselves with the digital revolution in the procurement sector. Also, although many studies affirm that procurement professionals will need data science and analytics expertise, further research should identify the most effective way for companies to develop their employees' digital skills.

Even when companies have a well-designed digital strategy, many of them face real challenges when implementing digital technology for procurement processes. Therefore, further research should also identify the main challenges faced by these organisations when implementing

digitalisation in the procurement operations and suggest recommendations on how to address those challenges.

In addition, although many companies recognise that digitalisation will revolutionise the procurement and supply chain as a whole, the return on investment is not clear, which may slow down the use of digital technology (Radell and Schannon, 2018). Therefore, another recommendation for further research is investigating the return on investment that leading companies have had with the use of digital technology in their procurement operations.

5.4. Final Conclusion and Reflections

In conclusion, most of the organisations presented in this study do not have a well-designed strategy that includes digital technology in their procurement processes. However, this study demonstrates that the use of advanced technology, such as Internet-of-Things, Artificial Intelligence, Big Data Analytics, Automation and Blockchain, will transform a large part of the classical operational purchasing, reduce staffing levels, boost transactional efficiencies, and bring complete transparency of the value chains, from raw material producer to the end consumer (Knapp *et al.*, 2018).

Nevertheless, companies that are only reacting to the shifting landscape caused by digitalisation will remain on the side-lines and become less competitive. Also, procurement professionals who can transit to the new scene will not have just high-efficiency gains, but they will lead the transformation and enable the digital vision for the whole company. Therefore, the adoption of digital technologies is a matter of survival in the marketplace

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Appendices

Appendix A

Google Forms Questionnaire

Questionnaire - Masters Dissertation

This questionnaire is a method of data collection in support of my research, which aims to investigate if organisations and Procurement professionals are taking actions to equip themselves with the digital transformation in the procurement sector for the coming years.

1. How many years of experience do you have in the Procurement sector? *

◯ 0 - 2 years

◯ 3 - 5 years

◯ 6 - 10 years

◯ More than 10 years

2. What is the level of your current position? *

◯ Intern/Junior

◯ Analyst/Specialist

◯ Leader/Manager

◯ Director

◯ Student

◯ Other...

3. What kind of industry are you working currently? *

1. Aerospace
2. Agriculture / Agribusiness
3. Chemical industry / Pharmaceutical industry
4. Computer industry / Software industry
5. Construction industry
6. Defence industry / Arms industry
7. Education industry
8. Energy industry
9. Entertainment industry
10. Financial services industry / Insurance industry
11. Food / Drinks industry

12. Health care industry
13. Hospitality industry
14. Information industry
15. Manufacturing
16. Mass media
17. Mining
18. Telecommunications industry
19. Transport industry
20. Water industry
21. Services
22. Other

4. What is your gender? *

- [ ] Female
- [ ] Male
- [ ] Prefer not to say

5. My workplace has a well-designed digital procurement strategy that includes the adoption of digital technologies in a short, medium or long-term plan. *

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Big Data Analytics	○	○	○	○	○
Artificial Intellige...	○	○	○	○	○
Automation	○	○	○	○	○
Internet of Things	○	○	○	○	○
Blockchain	○	○	○	○	○

6. I feel that the management of my workplace is prepared to implement digital technology and lead the team towards digital procurement. *

- ○ Strongly agree
- ○ Agree
- ○ Neutral
- ○ Disagree
- ○ Strongly disagree

7. I believe that my procurement team possess the skills and capabilities to maximize the use of current and future digital technologies. *

- ○ Strongly agree
- ○ Agree
- ○ Neutral
- ○ Disagree
- ○ Strongly Disagree

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8. I believe that organizations and procurement professionals need to build *
up digital skills such as data science and analytics expertise in order to avoid
losing competitiveness in the future market.

○ Strongly agree

○ Agree

○ Neutral

○ Disagree

○ Strongly Disagree

9. My workplace invests in training and development programs to build up my *
digital skills.

○ Strongly agree

○ Agree

○ Neutral

○ Disagree

○ Strongly Disagree

10. What digital training and development programmes does your workplace
offer to its employees?

Short-answer text

11. My workplace uses data analytics tools to translate data into accurate *
information for decision making.

○ Strongly agree

○ Agree

○ Neutral

○ Disagree

○ Strongly Disagree

12. Consider today's development of Artificial Intelligence (AI). How likely is it *
that your workplace will adopt AI-driven tools to assist procurement tasks
such as the buying or ordering process?

○ Very likely

○ Moderately likely

○ Neutral

○ Moderately unlikely

○ Very unlikely

13. Consider today's development of Robot Process Automation. How likely is it that your workplace will use bots to automate procurement tasks such as Purchase Order creation or invoice validation? *

- ⚪ Very likely
- ⚪ Moderately likely
- ⚪ Neutral
- ⚪ Moderately unlikely
- ⚪ Very unlikely

14. Consider today's development of Blockchain technology. How likely is it that your workplace will adopt Blockchain to track procurement transactions in the next five years? *

- ⚪ Very likely
- ⚪ Moderately likely
- ⚪ Neutral
- ⚪ Moderately unlikely
- ⚪ Very unlikely

15. Consider today's development of the Internet of Things. How likely is it that your workplace will invest in devices to increase traceability across the supply chain in real-time? *

- ⚪ Very likely
- ⚪ Moderately likely
- ⚪ Neutral
- ⚪ Moderately unlikely
- ⚪ Very unlikely

16. Based on your experience and knowledge, when will the below digital technologies impact Procurement? *

	Short-term (< 1 year)	Medium-term (1 - 3 years)	Long-term (> 3 years)
Big Data Analytics	⚪	⚪	⚪
Artificial Intelligence	⚪	⚪	⚪
Automation	⚪	⚪	⚪
Internet of Things	⚪	⚪	⚪
Blockchain	⚪	⚪	⚪

17. Recent research affirms that procurement professionals will need to develop some of the skills below in order to equip themselves with the digital transformation of the procurement sector. Based on your opinion, please rank the following required skills on a scale of 1 to 5, with 1 being the most relevant.

	1	2	3	4	5
Ability to Process...	◯	◯	◯	◯	◯
Ability to use anal...	◯	◯	◯	◯	◯
Ability to translat...	◯	◯	◯	◯	◯
Ability to use mac...	◯	◯	◯	◯	◯
Ability to deal wit...	◯	◯	◯	◯	◯
Teamwork with vi...	◯	◯	◯	◯	◯
Ability to evaluate...	◯	◯	◯	◯	◯
Creativity and Inn...	◯	◯	◯	◯	◯

18. Do you use any of the below learning and development practices to build up your digital skills?

1. On-the-job training
2. In-house development programmes
3. Coaching by line managers or peers
4. E-learning courses
5. External conferences, workshops and events
6. Instructor-led training delivered off the job
7. Blended learning (such as combining instructor-led training with online learning)
8. Formal education courses
9. Coaching by external practitioners
10. None of the above
11. I haven't thought about developing my digital skills

19. What technology listed below would you like to have more insight into?

◯ Big data Analytics
◯ Artificial Intelligence
◯ Internet of Things
◯ Robotic Process Automation
◯ Blockchain

20. Based on your own experience and knowledge, please outline one contribution that one of these technologies (Big Data Analytics, Internet of Things, Automation, Blockchain or Artificial Intelligence) will bring to the procurement process.

Long-answer text

Appendix B

Below are all the answers for question 10: *What digital training and development programmes does your workplace offer to its employees?*

Plethora of training tools of all formats available to staff on tech and innovation.
It allocate funds towards upskilling
E-procurement
The company covers external expenses for courses
Funding
Blockchain for specific individuals
E PROCUREMENT - SRM PLATFORM
Data Analytics
The company helps with funds towards studies
The organisation I work for wants to be a leader in digital, so it provides funds towards courses
Funding towards external courses
SRM
I havent undertaken any course yet currently but the company does provide funding for employees towards courses relating to their specific job
SRM Platform
The company provides funding for employees towards courses
Online Data Analytics training
Use of Adopting systems to get rid of manual paperwork

Below are all the answers for question 20: *Based on your own experience and knowledge, please outline one contribution that one of these technologies (Big Data Analytics, Internet of Things, Automation, Blockchain or Artificial Intelligence) will bring to the procurement operations.*

.
N/A
Blockchain will bring transparency to the purchasing process and will build trust in the supplier relationship.
Overall costs will decrease with Automation
Proper use of big data will allow procurement teams to leverage more accurate and relevant data.
Internet of Things will provide data in real time
Big data = accuracy
speedy availability of relevant and accurate information in a user friendly way.
More accurate decisions
Reduce time in public procurement, increase speed and quality of purchases
Expedite volume and speed of work
N/A
Automation
Digital technology will allow better strategic decisions, less manual work, improved data quality and user satisfaction.
Security along the entire supply chain using Blockchain and speed with Automation
Big datta will bring accuracy to procurement operations
...
Artificial Intelligence support cost reduction and a workforce with the potential of working 24 hours a day.
Automation will considerably reduce costs
Efficiency and accuracy in transactions.
Automation will allow cost reduction and time-saving, while Big Data will provide more accurate information and consequently a more assertive decision making.
It will increase transparency and bring the suppliers closer, which will facilitate the interaction between the parts.
Automating data processing activities is an easy win and simple to implement.
w
Efficiency, process improvement
N/A
I dont have too much knowlege on that, but I would say all of them are really important for the future of the procurement
Analysis will improve strategic decisions
Efficiency and smart contracts
the most important saving is time for purchasers to focus on higher value-added work: srm, innovation...
Will increase efficiency in procurement processes and help in saving
N/A
Reduce waste and speed up the procurement processes

Automation=quicker access
I have been involved with automation, and my experience is that the transactional elements of the function will disappear, and procurement will be reinvented, smaller and more efficient.
Artificial Intelligence, if done correctly, can reduce the burden on procurement professions and improve efficiency by focusing on the strategic aspect of their jobs and not nonvalue add activities.
The utilisation of blockchain will increase visibility from dispatch to receipt and stop the risk of fraud.
Blockchain has the potential to enhance supply chain transparency and simplify contracts.
Greater transparency with Blockchain will provide value to supply chains in order to increase profit and reduction of waste.
Big data will drive trend management and analytic opportunity for the foreseeable future, which will give buyers accurate information for the best opportunities to leverage spend.
Blockchain will automate, expatiate, cut costs, create trust & transparency in the supply chain. Look at Foxconn & Apple / Amazon in recent news. Corporates must be held accountable for unethical behaviour in the manufacturing process.
Quicker processes and more accurate communications between different languages and cultures in an ever-shrinking world will be some results of digital technology.
Real time supplier data
Accurate decisions
less time spent manually collecting this data, which will enhance speed of procurement process
precise information readily available
Blockchain will bring transparency, which will improve supplier-buyer relationship
IoT will allow just in time procurement to be more efficient
Better strategic decisions
reduction in non-value add tasks and realignment of procurement as a strategic enabler of business decisions
Digital technology will bring speed, accuracy and insight into business trends to allow improved business decisions and risk management.
More accurate and efficient forecasting which will help save costs when purchasing in the long run
...
Big data can help assist in decision making where there is a degree of speculation involved.
It will enable faster supply chains, efficient processes, more data visibility, effective decision making.
Hhh
Higher quality decisions
Accurate information available
N/A
Improve spend visibility (as accurate as possible)
Digital technology will improve efficiency in procurement processes and help with cost reduction.
Precise information
1
Automation is going to have a large effect on our company going forward as any small orders will be generated automatically on the system. This will give us the opportunity to work on more substantial orders. Working harder on the more valuable orders in turn leading to more cost savings and technical clarifications being met more accordingly.

Internet of Things will provide more data in real time, which will facilitate the process of decision making.
Create efficiencies through value added
Cost savings with Automation
Digitalization will increase efficiency in the entire supply chain.
The growing need for accuracy will be fulfilled with Big Data.
Blockchain will enhance efficiency and accuracy in transactions.
I work in a small company, so they're far from thinking about digital technology.
Big data will allow better decisions in the entire supply chain
Automation will reduce overall costs while improving efficiency