

Readiness For The Digitalization Of Procurement In The Private Sector of Bangladesh

By

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A thesis submitted to the Department of BRAC Institute of Governance and
Development] in partial fulfillment of the requirements for the degree of
Masters in Procurement and Supply Management

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Declaration

It is hereby declared that

1. The thesis submitted is my/our own original work while completing degree at BRAC University.
2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. We have acknowledged all main sources of help.

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Approval

The thesis/project titled "Readiness For The Digitalization Of Procurement In The Private Sector" submitted by Nirbachita Roy (18182006) of Fall, 2020 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Masters in Procurement Supply Management on October 15, 2020

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Ethics Statement

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Abstract

Earlier, procurement was just a small support function catering to an organization's direct and indirect buying needs. However, over the last few years, it has transitioned into an integral part of an organization, with the contributions gaining more interest and importance. Companies are competing against one another and investing increasingly in technology enablers to adapt the best practices of procurement and stay ahead in the market. Digitalization is the new buzz word, and it is identified as a critical success factor in winning in today's competitive market. It promises to create an interconnected and transparent ecosystem amongst firms, suppliers, and customers with benefits in traceability, better decision making, efficiency, risk management, accuracy, speed, and end-to-end integration, among others.

After studying several papers, it was identified that globally, Artificial intelligence, Internet of things, and Robot process automation are the leading technologies in the future of procurement. A similar study was replicated for the private sector of Bangladesh to understand if Bangladesh is ready for the technological wave through a survey conducted on procurement professionals, with 40% of them having over 8 years of experience. Although the digital revolution is at an early stage, advents such as Blockchain is already in place. Applications in the fields of AI, Robotics, and 3D Printing are believed to come in the longer term.

There are opportunities to identify and prioritize capability building as a lever for adapting technological advancement. Moreover, as the literature suggests, the applications of Digitalization are beyond using the ERP solution, e-sourcing, e-auction, catalog buying and data analytics, which are some of the current practices in the country. Hence, it is of great importance that the management has a vision for the Digitalization, keep up with the upcoming trends from developing countries and go ahead in implementing them in their respective organizations.

Keywords: Industry 4.0, Digitalization, Internet of Things, Blockchain, Artificial Intelligence, and Robotic Process Automation, Big Data

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Table of Contents

Declaration.....	ii
Approval	iii
Ethics Statement.....	iv
Abstract.....	v
Acknowledgement	vi
Table of Contents	vii
List of Figures.....	x
List of Acronyms	xi
Chapter 1 Introduction.....	1
1.1 Overview	1
1.2 Motivation of Scope.....	2
1.3 Research Purpose	3
1.4 Research Objective	3
1.5 Significance of the study.....	3
Chapter 2 Literature Review	4
2.1 Procurement	4
2.1.1 The Procurement Process.....	5
2.1.2 Procurement and supply management on the verge of change.....	6
2.1.3 Traditional Procurement Skills vs. New Age Employability skills	7
2.2 Digitalization.....	8
2.2.1 What is Digitalization in Procurement?	8
2.2.2 Digitization in the heart of the Fourth Industrial Revolution	8
2.3 What Technologies exist within Digitalization?.....	10
2.4 Internet of Things.....	10

2.4.1 How is the Internet of Things impacting Procurement?	11
2.5 Big Data Analytics.....	12
2.5.1 How is Big Data Analytics impacting procurement?	12
2.6 Cloud Computing.....	18
2.6.1 How is Cloud Computing impacting procurement?	18
2.7 Artificial Intelligence and Robotic Process Automation	18
2.7.1 What is Artificial Intelligence?.....	18
2.7.2 What is Robotic Process Automation?	19
2.7.3 How is AI impacting procurement?.....	20
2.7.4 How is RPA impacting procurement?	21
2.8 Blockchain	23
2.8.1 How is Blockchain impacting Procurement?.....	23
2.9 3D Printing.....	25
2.9.1 Applications of 3D Printing	25
2.9.2 How is 3D Printing impacting procurement?	26
Chapter 3 Methodology and Research Design	27
3.1 Research Approach	27
3.2 Research Strategy.....	28
3.3 Sampling	29
3.4 Research Choice.....	29
3.5 Time Horizon	30
3.6 Collection of Primary Data	30

3.7 Collection of Secondary Data	30
3.8 Questionnaires.....	31
3.9 Approach to Data Analysis	31
Chapter 4 Empirical Results.....	32
4.1 Overview	32
4.2 Findings.....	32
3.3 Discussion	42
4.4 Conclusion	45
Bibliography	45
Appendix A: List of companies who participated in the Survey	52
.....	52
Appendix B: Google Forms Questionnaire.....	52

List of Figures

Figure 1 Decrease in the time taken(days) for the tender opening to the award	1
Figure 2 Number of registered tenderers with E-GP	2
Figure 3 The Procurement Process according to van Weele (2014) (Weele, 2014).....	6
Figure 4. Five Elements that are Key to Making Digital Procurement a Reality (Accenture Operations, 2017).....	7
Figure 5 Historical representation of the Four Stages of the Industrial Revolution (Achema Blog Engineering Industry 4.0 Manufacturing, 2015).....	9
Figure 6 Motivations for Digitalization. Source: (CIPS, Digitalisation in procurement and supply, 2019).....	10
Figure 7 Big Data 4 'V's (CIPS, Big Data and Data Analytics in Procurement, 2017)	12
Figure 8 Benefits identified by companies after using Big Data Analysis. Source: (Accenture, 2014)	15
Figure 9 Pareto Analysis to identify spend distribution through by supplier (Ruikka, Procurement Analytics Demystified, 2020).....	15
Figure 10: Power BI Procurement Analysis Sample (Procurement Analysis sample for Power BI: Take a tour, 2019).....	16
Figure 11: Supplier Quality Analysis sample in Power BI (Microsoft, Supplier Quality Analysis sample for Power BI, 2019).....	17
Figure 12 Defining the roles of Robots (Deloitte, 2019).....	19
Figure 13 A robot works alongside human workers on a BMW car door assembly line. Source: (MIT Technology Review, 2014)	20
Figure 14 Blockchain Transaction. Source: (Procurecon Indirect West, 2018)	23
Figure 15 Records generated from the purchasing process. Source: (Joseph, Closing the hall of mirrors - How Blockchain will simplify and transform the Supply Chain, 2018)	24

Figure 16 Designer of Li & Fung using 3D design for value creation throughout its supply chain. Source: (PwC, 2018)26

Figure 17 Deductive Reasoning in the research. Source: (Dudovskiy, 2018).....27

Figure 18 Types of research strategies. Source: (Saunders, Lewis, & Thornhill, 2007).....28

Figure 19 Participants of the above organizations contributed to the survey52

List of Acronyms

IoT	Internet of Things
OTIF	On-time and in full
AI	Artificial Intelligence
KPI	Key Performance indicator
ERP	Enterprise Resource Planning
RPA	Robotic Process Automation
SCM	Supply Chain Management
RFQ	Request for quotation
CPO	Chief Procurement Officer
S2P	Source to Pay

Chapter 1

Introduction

1.1 Overview

Around 10 billion USD are spent every year by the government of Bangladesh on public Procurement, a large segment of its annual development program, to build hospitals, schools, roads, and other development work. As there was no uniform regulatory framework for Procurement, it cost the country over 1.5% of GDP growth a year. Time-consuming, outdated, and cumbersome bureaucratic processes meant tenderers were not keen to participate. In 2011, to allocate public funds more transparently and efficiently and improve the ways of conducting business with private sectors, Bangladesh launched its electronic government portal (e-GP).

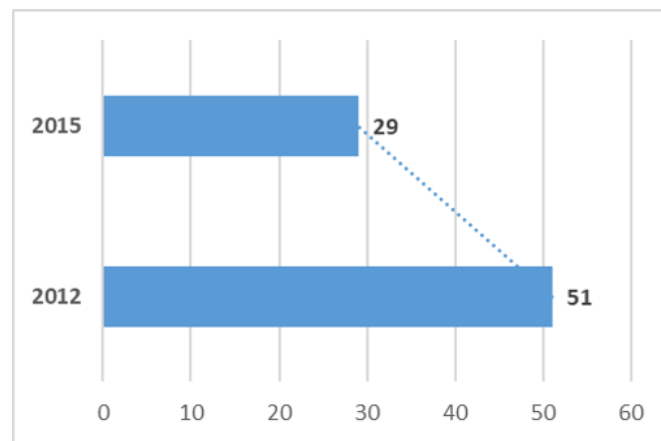


Figure 1 Decrease in the time taken(days) for the tender opening to the award

Since its roll-out in 2012, more than 28,000 tenders valued at about 3 billion dollars have been processed online with less processing time, as shown in Figure 1. It has improved efficiency and reduced delays due to procurement processes (WorldBank, 2015). Transforming public procurement digitally means it would enhance national development objectives and yield savings due to streamlining administrative procedures and increasing supplier competition, up to 20 percent in cost and 80 percent in time. It would further encourage the participation of SMEs, women lead companies, and disadvantaged groups to take part in public contracting, supporting their development and job growth. In 2017, Mexico was able to increase SME's winning of public contracts by 19.2 percent relative to the annual goal (Tayler, n.d.)

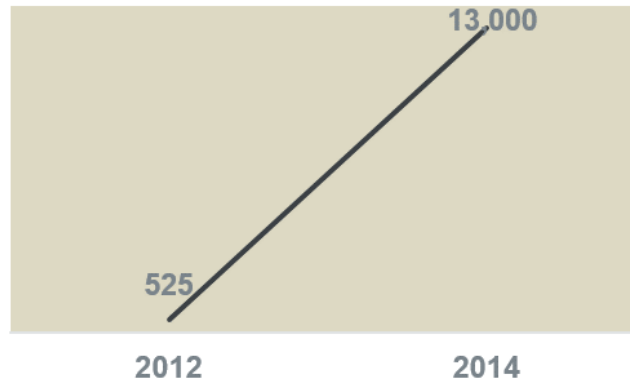


Figure 2 Number of registered tenderers with E-GP

Meanwhile, private organizations spend 55 percent through Procurement and are also now moving towards Digitalization with an expectation to cut down procurement cost by 40-50 percent. New technologies are coming in, but the current set of skills are not enough to adapt to the changes in Procurement. This research will shed light on how professionals can take part in the digital transformation and stand out in the organization.

1.2 Motivation of Scope

As a procurement practitioner of the world's largest nutrition, health, and wellness company- Nestlé, it is a privilege to observe how the organization is adapting the recent trends in Procurement by deploying an automated Source to Pay (S2P) process. Some of the notable examples of Digitalization adopted by the organization are the use of E-Sourcing (advantages are: shorter order fulfillment cycle time, decreased administrative costs, lower level of inventory, and more transparency because of using new technology with business partners (Vehviläinen, 2019) and E-Auction platform in Ariba (Ariba, n.d.). Recently, Nestlé has implemented Catalog Buying in its procurement process to give users an Amazon-like feel. It is one of the foremost private organizations to join hands with NBR to start the e-payment of customs duty (BangladeshCustoms, n.d.). Moreover, to digitize the financial transactions with its distributors, the company collaborates with Standard Chartered Bank for the distributor finance program (DhakaTribune, 2019) in which the transactions will be processed online, making the operation simpler, faster and more efficient.

As a result of my Computer Science and Engineering background, the use of technology to automate and simplify the procurement process fascinates me. Change management in this area is crucial, and it is fundamental to elevate the skillsets to be an early adopter of the changes.

Hence, staying updated with the current trend would enrich my portfolio and help me add value to my role and enhance my knowledge in this area.

1.3 Research Purpose

Most industries are adopting the Digitalization of Procurement and reviewing their procurement policies and model to adapt to the global disruptive technological changes. The purpose of this research is to apprehend how the private sectors of Bangladesh are embracing this change and to what extent they are adopting it, and finally to identify the critical future skills and competencies that procurement professionals require today to cope with the digital procurement revolution. The overall readiness would be studied in the industry and new areas of adoption. How Digitalization is going to change the future of Procurement, and its impact on the organization would be realized.

1.4 Research Objective

Some underlying questions would guide the thesis to achieve the purpose of the study and enable a more profound understanding:

1. Whether the private sector of Bangladesh is ready to adopt the Digitalization in their procurement process.
2. What are the main contributions that digital technologies bring to the procurement function?
3. Future Skills required for the digital transformation

1.5 Significance of the study

This research topic seems very relevant to the current context of globalization, where organizations are finding themselves in a progressively competitive environment, and the inefficiencies in supplier management must be addressed through "**Procurement 4**". This potential risk of supply chain disruption is because they do not have visibility of the supply chain beyond their 1st tier suppliers. However, organizations can save themselves from reputational and operational risk by improving transparency of pricing, supplier locations, and critical dependencies to deliver higher value to the business. (Deloitte, 2018).

To outline, "**Procurement 4**" is the concept used to elaborate on how Digitalization is used in the business process to enhance supplier relationship management and achieve optimization (Vehviläinen, 2019)). This topic will be intriguing for the procurement and supply chain professionals, researchers, and students who would like to stay updated with the global trend in this area.

As a part of the nation's dream to achieve the Digital Bangladesh **Vision 2021**, special consideration is given to use digital technologies to reach middle-income status. In the future, jobs will be more automated and digitized. Some of the new technologies such as Cloud computing, 3D Printing, Big data, Internet of Things are already in use globally. Bangladesh would soon be forced to use and adapt to these new technologies, which will need the expertise to adopt (The Daily Star, 2015). Hence, it essential that we learn about the new skills required to be future-ready, which is presented in this paper after doing a thorough literature review on several survey findings, which indicate that capability building is one of the integral parts of this revolution. According to (Deloitte, 2018), "**Digital transformation is inevitable and high-performing organizations are leading the way on adoption.**"

Chapter 2

Literature Review

This chapter aims to provide the theoretical groundwork of the current trends in Procurement, elucidate how the trends are going to change the source-to-pay process, identify the digital enablers and shed light on the primary skills required for digital Procurement.

The section is an accumulation of accounts containing several reports, master's thesis papers, conference papers, journals, and publications found from the Internet and Google Scholar. Search phrases included Digitalization in Procurement, Industry 4, Artificial Intelligence, future trends in Procurement, etc.

2.1 Procurement

Van Weele (Weele, 2014) defined Procurement as "The management of the company's external resources in a way that the supply of all the goods, services, capabilities and knowledge which are necessary for running, maintaining and managing the company's primary and support activities are secured at the most favorable conditions."

2.1.1 The Procurement Process

The public sector corporations have their own set of procedures for conducting procurement activities. In most cases, an open bid system is followed: which consists of advertising publicly in the press, checking against prequalification criteria, carrying out formal bidding and preparing contract documents, evaluating bids, and finally awarding to the lowest bidder. As the majority portion of public Procurement is externally funded, it follows the procedures that are mandated by the Development partner and adhere to strict global guidelines such as *World Bank Guidelines for International Competitive Bidding (ICB)* (WorldBank, 2002).

On the other hand, most private organizations have their own (internal procurement guideline, which is to be followed to meet the buying needs of the organization. This paper focuses on the private sector and excludes the discussion on public Procurement.

According to Van (Weele, 2014), the procurement activities can be divided into tactical purchasing and order function as per Figure 3. The tasks of the purchasing function are:

- **Determining the purchasing specification:** The purchase requester raises a requisition for the purchase of goods and services with proper scope (such as required quantity, quality, and other technical specifications). The purchase request is then analyzed by the buyer to check the first-time quality and completeness of the scope before starting the sourcing process.
- **Selecting the best possible supplier:** Selecting the right supplier is crucial to ensure the right quantity, while maintaining the right quality, at the right time.
- **Negotiation and Contracting:** Preparing and doing negotiation with the supplier to reach mutually accepted common ground on the terms and conditions.
- **Ordering:** Upon successful negotiation, an order is placed to the selected supplier(s), and handling routines are initiated.
- **Expediting and evaluation:** The order goes through a monitoring and control process to ensure timely delivery. Reminders are given to suppliers to expedite the order, and documents are exchanged (goods receipt, bill of lading, etc.) between the buyer and the supplier.

- **Follow-up and evaluation:** In the final stage, supplier evaluation is completed. The buyer must settle the claims, take feedback from the user regarding the supplier's service, and update the vendor database for future transactions.

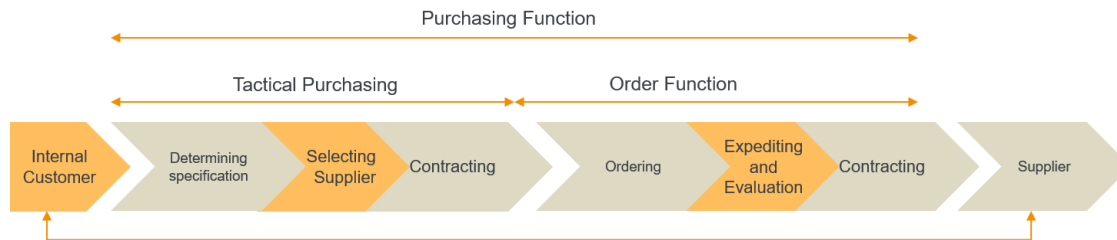


Figure 3 The Procurement Process according to van Weele (2014) (Weele, 2014)

2.1.2 Procurement and supply management on the verge of change

Modern consumers are used to a seamless buying process that allows full transparency when it comes to finding product specifications, prices, options, payment methodology, and delivery information. However, when it comes to organizational procurement, these same people face a tough time with complex and cumbersome processes. To marry these two concepts in a loop, self-serve procurement is predicted to be a new way of working for indirect purchases; Procurement's role will be to orchestrate with minimum intervention in every sourcing decision (AT&Kearney, 2009).

Some trends would be driving this movement towards strategic purchasing. The results of a focus group discussion involving supply management executives from 41 companies across USA (Cousins, 2006) represents the following factors as being the most relevant:

- Strategic relationships management with suppliers
- Strategic Cost reductions
- Integrated systems and collaboration
- Larger focus on minimizing the Total cost of ownership (TCO)
- Strategic versus tactical purchasing orientation

As the organizations shift from transactional to strategic activities, Digitalization is essential now more than ever. A digital procurement gives decision-makers the power to make effective decisions with proper visibility and enhanced compliance. As per a study, five key elements attribute to drastically achieve the digital procurement reality as depicted below: (Accenture Operations, 2017).

1. **Data:** It is the primary fuel for a digital procurement organization. It helps to predict the needs of people, know which goods or services best meet user needs would, determine the right supplier, and identify the right price to pay.
2. **Technology toolbox:** Technology is the engine for digital procurement. It is not limited to ERP; rather, it has the power to harness and make sense of data allowing companies to automate and simplify activities and processes.
3. **Intuitive User Experiences:** To succeed in the digital front, a company must provide an intuitive user experience that would enable stakeholders to use online procurement tools with ease.
4. **Skills and talents:** Data Scientist and AI experts, Category and business experts, IT professionals, and Design professionals would be the sort of talents that the digital organization would be keen to attract.
5. **New policies, procedures, and operating model:** Companies must review their policies and procedures to guarantee that people are alert of their roles and responsibilities that come with the new procurement process.



Figure 4. Five Elements that are Key to Making Digital Procurement a Reality (Accenture Operations, 2017)

2.1.3 Traditional Procurement Skills vs. New Age Employability skills

As per the finding of (Piluso, Leimer, & Zhang, 2016), the most significant talent gaps in the recruitment of the procurement professionals are:

- Data analytics skills (acknowledgment from 50% of the respondents)
- Category expertise (acknowledgment from 35% of the respondents)
- Innovation and collaboration skills (acknowledgment from 35% of the respondents)
- Negotiation (acknowledgment from 15% of the respondents)

Future procurement leaders will be expected to have good data analytics skills, be comfortable in managing complex categories while having expertise in negotiation skills. Alongside these, the ability to establish a long-lasting relationship with business partners is essential. According

to a survey done by (SCM WORLD, 2016), "communication and influence" is ranked higher than "foundational skills" for a supply chain executive of 2020.

2.2 Digitalization

2.2.1 What is Digitalization in Procurement?

Digitalization is defined as "The practice of redefining models, functions, operations, processes, and activities by leveraging technological advancements to build an efficient digital business environment to maximize operational and financial gains and minimize costs and risks" (CIPS, Digitalisation in procurement and supply, 2019). Some of the issues, such as globalization, social transparency, risk management, integration, and sustainability, will bring new challenges around the world by 2025. The Digitalization of procurement and supply chain practices promises to create an interconnected and transparent ecosystem amongst firms, suppliers, and customers. Smart automation and Digitalization are projected to contribute as much as 14 percent to global GDP gains by 2030, corresponding to about US\$15 trillion in today's value (PwC, 2018).

2.2.2 Digitization in the heart of the Fourth Industrial Revolution

The idea of the "Fourth Industrial Revolution" was first coined by the founder of The World Economic, a former professor named Klaus Schwab. His book, "The Fourth Industrial Revolution," defined it as an era of the technological revolution that is minimizing the lines between the physical, digital, and biological spheres. Further studies suggest, "Industry 4.0 relates to implementations of machines that make decisions autonomously, facilitated by data-driven machine-to-machine communication and cyber-physical systems that convert the analyzed and communicated information to action." according to the (Torn, 2017). The business implications for Industry 4 are interlinked Supply Chain, horizontally and vertically integrated business process, and smart factory.

The below illustration of Industry 4 articulates the journey from Industry 1 to Industry 4. The First Industrial Revolution was initiated in Great Britain around 1760 and spread to Europe and North America through the early 1800s. During this time, equipment was powered by steam and water. Soon new manufacturing processes were introduced, new factories created, and the textile industries started booming. From the late 1800s and in the 19th century, the Second

Industrial Revolution was initiated by mass production, and new trades like steel, oil, and electricity emerged. Significant inventions of this era were the light bulb, the telephone, and the internal combustion engine. The third Industrial Revolution was also known as the "digital revolution" due to the industrial advancement enabled by information technology. The present-day Industry 4.0 envisions to merge the physical and the digital world utilizing cyber-physical systems and machine-to-machine communication (Torn, Robbert-Jan, Pulles, Niels, Schiele and Holger, 2018).

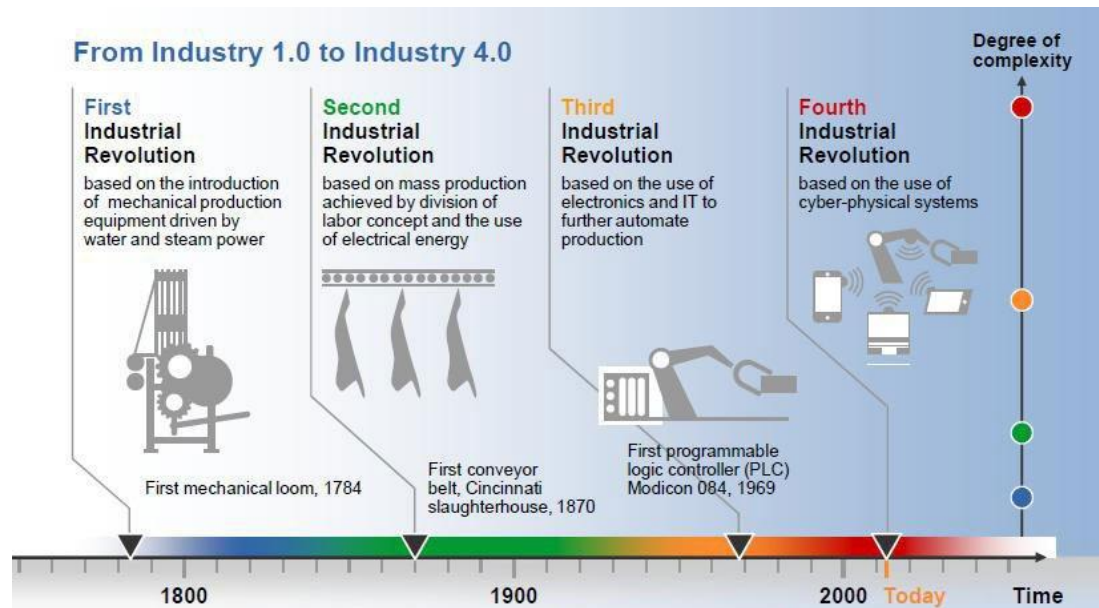


Figure 5 Historical representation of the Four Stages of the Industrial Revolution (Achema Blog Engineering Industry 4.0 Manufacturing, 2015)

As the hype towards industry 4.0 is increasing, a completely automated factory could mean higher production, reduction of costs, simplification of labor, which would change the face of the manufacturing industry (Achema Blog Engineering Industry 4.0 Manufacturing, 2015).

A PwC Global Digital Operations Study carried out in 2018, attempted to rank manufacturing executives across 26 countries by digital operations maturity (grouped into one of the four categories: Digital Novices, Digital Followers, Digital Innovators, or Digital Champions). Results suggested that while 10% of the global manufacturing companies are Digital Champions, almost two-third have hardly initiated the journey of Digitalization. The electronics and automotive industries were termed as the leading Digital Champions and when it came down to regions, Asia-Pacific was ahead, where 19% of manufacturers have achieved Digital Champion Status in comparison to America, Europe, Africa, and the Middle East (in that order). It is noteworthy that Asian companies are much faster at implementing

Digitalization compared to their counterparts, mainly because of the region's youth, tech-savvy executives, and the increasing production costs that are forcing companies to digitize the key operations to keep competitive. This region is expected to grow 17% in digital revenue in the next five years (PwC, 2018).

Motivating factors towards a digital journey include reduced operational costs, improved system performance, increased employee productivity, and removal of complexity within the value chain to drive revenue growth.

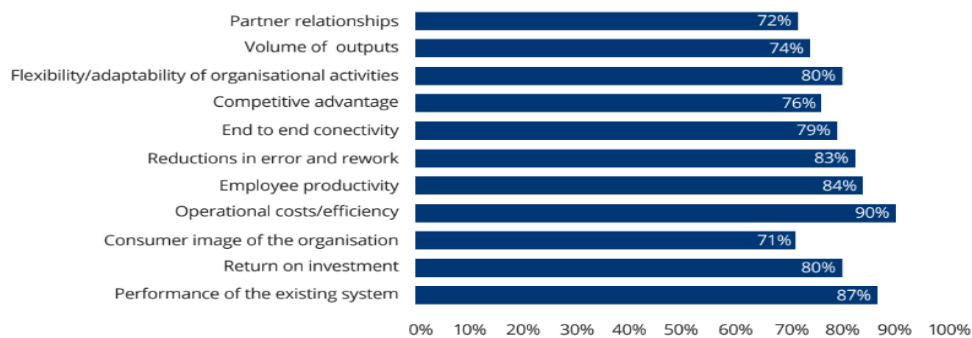


Figure 6 Motivations for Digitalization. Source: (CIPS, Digitalisation in procurement and supply, 2019)

2.3 What Technologies exist within Digitalization?

Digitalization encompasses a plethora of different technologies that are interrelated. The major Industry 4.0 technologies include Internet of Things, Big Data Analytics, Cloud Computing, Artificial Intelligence, Robotic Process Automation, 3D Printing, and Blockchain, all of which have significance in improving the procurement and supply management process of organizations.

2.4 Internet of Things

Internet of Things (IoT) enables the interrelated computing devices, objects, and people that are facilitated by sensors to allow transmission of data over a network without the need for human intervention. The physical world can communicate with computers to decentralize analytics and decision making. Therefore business trends are analyzed with ease because of having a real-time response (CIPS, Digitalisation in procurement and supply, 2019). By 2020, it is predicted that 200 billion devices will be connected (accounting for the total global worth to amount to USD 6.2 trillion, predominantly from manufacturing and healthcare fronts) in comparison to 2 billion objects in 2006 (Intel, 2019).

2.4.1 How is the Internet of Things impacting Procurement?

Forward-thinking organizations understand the potential of the mobile networks and their connection to industrial IoT, and they believe that it will change the procurement function drastically in the next decade. Mobile technology can help procurement staff to gain quicker and more flexible access to sourcing data, tracking orders, requesting a contract, viewing invoices, and approving requests. The benefits are further explicated in the report of (Nowosel, Terrill, & Timmermans, 2015):

- **Increases traceability:** IoT allows companies to trace products and material throughout the value chain: from the supplier of raw materials through production and shipping to the end consumer. An example of a benefit of this increased supply-chain transparency would come in the elimination of the usage of expired products - manufacturers would have a better insight into the shelf life of products sitting in stock given the knowledge on the source of the product. With such detailed information about suppliers, procurement practitioners can drive sustainable sourcing and keep a check on the suppliers to know if they are engaged in sustainable efforts.
- **Enhances the uses of Analytics:** Companies use analytics to generate insights to make better decisions, and IoT serves rich data, which gives a more accurate picture of the state of the operations. One such example is: a company buys two pumps from two different vendors with a similar specification. Pump B is 10 percent costly compared to Pump A. By adding sensors to the pumps, the company realizes that Pump A failed 10 percent more than Pump B under certain weather conditions. Purchasers can extend this learning to predict failure rates to make a better-informed choice of selecting Pump B, despite its initial higher cost, to increase reliability, reduce part complexity, and minimize warranty claims.

Some additional benefits highlighted by Cognizant reports (Reddy, 2017) include:

- **Improved Asset Utilization:** Companies can locate assets and run preventive maintenance on critical pieces of infrastructure and machinery to improve throughput and utilization.
- **Cost Savings:** Costs can be minimized through improved asset utilization, process efficiencies and productivity. Examples include the use of smart meters instead of manual meter readings and remote monitoring of patients in clinical settings.

The gains from the IoT in Procurement can be achieved through Big Data. IoT helps improve the volume and quality of the data available and assists organizations with the right data and analytics to formulate business strategies (James, 2018).

2.5 Big Data Analytics

Data, when collected and evaluated from various internal and external sources to support real-time decision making, can be termed as Big Data. Large data sets like contracts, expenses, project portfolio, performance measurement, and virtual machine data help in running supply chain operations efficiently. The benefits of big data include faster response to inquiries, more accuracy in predicting demand to solve sourcing challenges, and reducing operational cost significantly in the process (CIPS, Digitalisation in procurement and supply, 2019). Big data can further be explained by the four 'V's, namely Volume, Velocity, Variety, and Veracity, as depicted in Fig 6 (Japkowicz & Stefanowski, 2016).

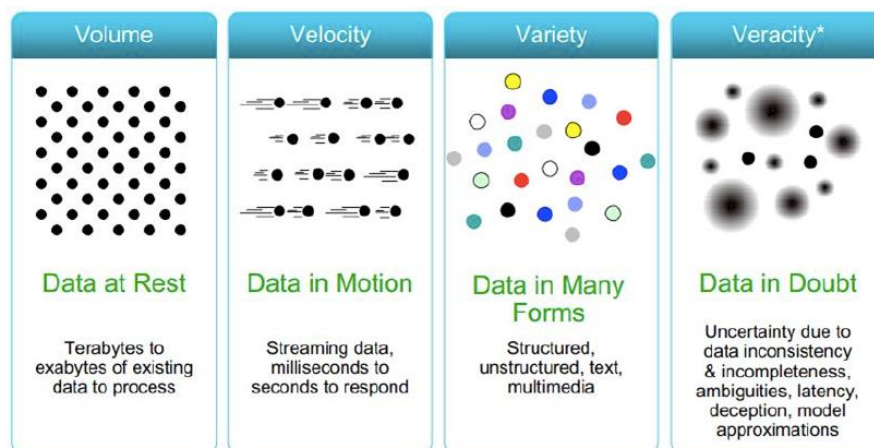


Figure 7 Big Data 4 'V's (CIPS, Big Data and Data Analytics in Procurement, 2017)

Procurement teams make crucial decisions for the business, and making them right requires an excellent quality of data. Big data analytics plays an indispensable role in the analysis of information to integrate supplier decisions with internal customer priorities. In the next decade, the common practice for companies will be to shift towards a more "real-time" analysis (as opposed to carrying out historical spend analysis), which will give leaders the Power to transform their supply chain (Piluso, Leimer, & Zhang, 2016).

2.5.1 How is Big Data Analytics impacting procurement?

Distinct studies suggest that Big Data Analytics will help the selection of best supplier through:

- a) **Supplier Analysis and Collaboration:** Supply analysis is a primary activity of purchase, where suppliers are short-listed for initiating the sourcing process. Through business analytics, procurement can make better decisions for supplier with strategic items, evaluate new suppliers for existing projects, forecast supply risk and get insight on fraud-detection (Piluso, Leimer, & Zhang, 2016).
- b) **Category Analysis:** The core responsibility of a category manager is to implement a sourcing strategy right after carrying out supply analysis. In this stage, the spend impact in relation to company spend is assessed. Analysis on suppliers' capacity and understanding of raw-materials requirements can be achieved through business analytics. Alongside this, scenario analysis through risk-weighting can be done, which will give crucial information on costs associated with supplier changeover, supply failure, innovation, and competitive advancement (Piluso, Leimer, & Zhang, 2016).
- c) **Contract Analysis and Commodity pricing:** Companies can leverage analytics and use advanced commodity pricing algorithms in the design phase of contracts to analyze the percentage of the cost impact on specific finished goods that are represented by a particular commodity. It helps to determine price, risk factors due to dependency on one supplier and their impact on the buying organization. Most importantly, it allows companies to build dynamic pricing models to modify terms and negotiation frequency (Nowosel, Terrill, & Timmermans, 2015).
- d) **Managing everyday risk:** According to (Piluso, Leimer, & Zhang, 2016) five significant sources of risk that will be faced by the supply chain professionals are:
- Execution: This risk includes supplier failure to provide the right service at the right time and the risk stemming from their inability to meet safety and environmental regulations.
 - Commercial: It refers to the failure to track if the suppliers can comply with contractual terms and submit bills accordingly.
 - Continuity: Certain risks such as natural calamity or issues regarding financial stability can seriously challenge long term business continuity.
 - Competition: Suppliers may steal intellectual property or have conflict of interest.
 - Compliance: A business must know if the suppliers can adhere to legal and regulatory requirements, which include labor laws, tax laws, country law, anti-corruption legislation, and other government requirements.

Right analytics using big data can help identify these risks and devise proper corrective interventions so that these do not impact an organization in the days to come.

- e) **Negotiation:** Advanced analytics can help the manufacturer identify a group of suppliers by searching with the item description for their recent purchase (for example, a specific product that is within the 50 miles radius from the plant). A list of cluster data with the information such as the average price of similar products, a list of available vendors, and the price they offer are summarised that can guide the buyers to take preparation for the negotiation. Buyers would be having access to qualitative historical data and have the necessary information on vendors operating in the same space (Innamorato, Prilepok, & Schillinger, 2017).
- f) **Compliance:** Spend reports allow a comparison between the 'actual spends vs. planned spend' on a day to day basis. From this analysis, contract compliance can be analyzed at an organizational or individual user level. Moreover, access to real-time data tends to improve supplier relationship management as procurement professionals can monitor the performance, allowing them to do contingency planning to minimize organizational risk. (Hickey, 2018)
- g) **Quality and reliability:** Analytics will play a vital role in the purchase of equipment and parts on the premise of integration of analytics engine across other departments, which gives procurement a better understanding on quality and reliability being sought. Buyer can then negotiate extended warranty terms with business partners to free up working capital. (Nowosel, Terrill, & Timmermans, 2015).

According to a survey done by Accenture the following benefits of big data analytics were derived as shown in Fig 7:



Figure 8 Benefits identified by companies after using Big Data Analysis. Source: (Accenture, 2014)

Depending on the industry that an organization belongs to there can be several applications of procurement analytics. Some of the widely used examples include:

- **Spend Analysis:** This refers to the analysis of procurement spend data using external or internal data sources, through which we can get an overview of the spend of categories compared to last year, last quarter, and so on.

Spend distribution through suppliers can be done by Pareto, which is the 80/20 law suggesting what percentage of spend goes to what portion of the vendor base. This analysis allows us to identify opportunities for supplier consolidation and look for new suppliers in monopolistic environments

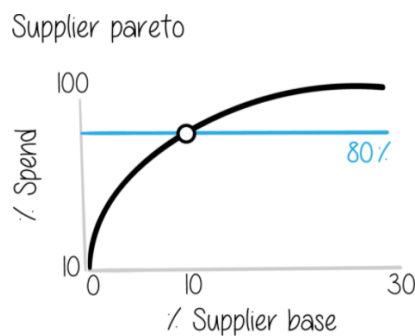


Figure 9 Pareto Analysis to identify spend distribution through by supplier (Ruikka, Procurement Analytics Demystified, 2020)

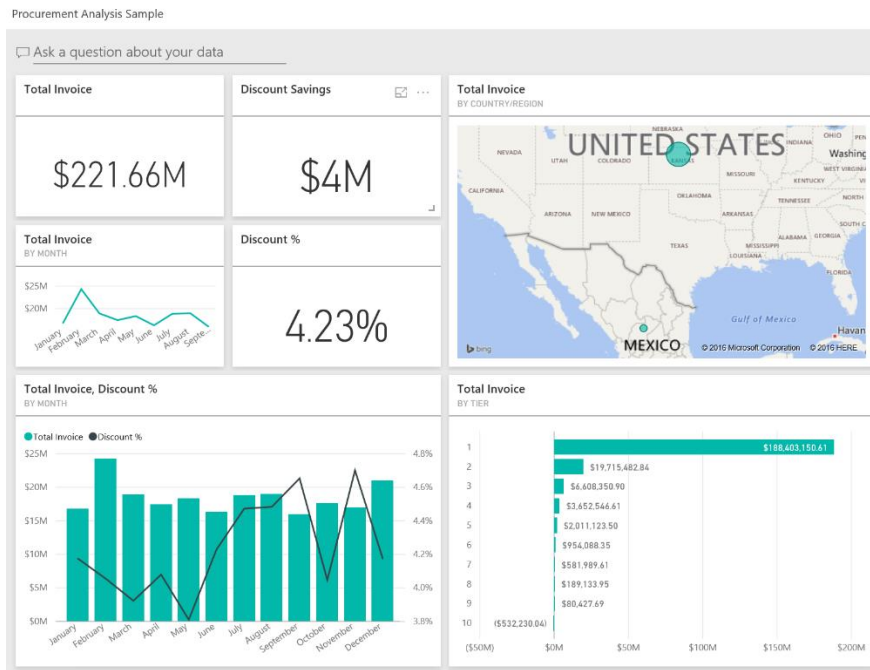


Figure 10: Power BI Procurement Analysis Sample (Procurement Analysis sample for Power BI: Take a tour, 2019)

- **Contract Analysis:** The analysis of contracts with suppliers and the study of the meta-data such a payment terms, expiration dates, open quantity, order quantity, payment status, and others.
- **Supplier Analysis:** It is the analysis of individual suppliers' performance through the supplier scorecard to measure performance on parameters such right quantity, right quality, at the right time (OTIF).



Figure 11: Supplier Quality Analysis sample in Power BI (Microsoft, Supplier Quality Analysis sample for Power BI, 2019)

Additionally, supplier segmentation helps create optimization like analyzing data of the biggest suppliers and their growth in spending in comparison to the previous year. It can further be cross-referenced with the category data (Ruikka, Procurement Analytics Demystified, 2020).

- **Savings Lifecycle Analysis:** The reporting and analysis of cost reduction and cost avoidance projects and their impact on the financial bottom-line can be analyzed to improve procurement performance.
- **Spend forecasting:** The progressive forecast of the procurement spend data and its impact on profitability. Forecasting is done to align KPIs to business ambitions, to anticipate future risks and to look for areas of opportunities well ahead of time.
- **Procurement benchmarking:** It refers to the comparison of procurement organizations' performance to peer or other industries.

With access to a widespread range of advanced analytics and a range of innovative technologies, CPOs can carry out the procurement process in a strategic manner. Similarly, CFOs can leverage the spend analytics to influence profitability, cash flow management, new product development, and concentrate on the expansion of the overall business (Duffy, 2018).

2.6 Cloud Computing

Cloud computing refers to data sharing with minimal effort across multiple sites. It moves the traditional complex ERP-built system to a new application-driven user interface that is effective, economical, and secure (CIPS, Digitalisation in procurement and supply, 2019). Cloud-based applications are used as tools for collaboration between the procurement teams and the suppliers for the integration of platforms, social media, and applications simultaneously by allowing supply chain transparency.

2.6.1 How is Cloud Computing impacting procurement?

Companies use Office 365, which is a cloud-based application that gives users access to manage their applications, documents, and files virtually from any device at any time. Microsoft Teams is a cloud-based software used for team collaboration that is part of the Microsoft Office 365 suite of applications allowing business calling, video meetings, messaging, and file sharing. Among many other companies, PepsiCo has recently partnered with Microsoft to provide Microsoft's cloud-based applications to PepsiCo's associates worldwide to improve service delivery and operational agility against the growing demand for essential goods. (Microsoft, 2020).

Cloud computing is a reliable and low-cost technology that helps speed up global sourcing and supply chain decisions. For telephonic conversations and video conferencing, cloud-based peer-to-peer software platforms like Skype for business and Zoom are widely used, alongside Microsoft Teams.

2.7 Artificial Intelligence and Robotic Process Automation

2.7.1 What is Artificial Intelligence?

Artificial Intelligence (AI) is when a machine performs a task "intelligently." The intelligence is from the business perspective when decisions are taken based on the available information, which increases the probability of success in an area. Powered by sub-technologies such as machine learning, deep learning, and natural language processing, AI can provide suitable recommendations (Sommer, 2017).

2.7.2 What is Robotic Process Automation?

Robotic Process Automation (RPA) is the software tool used to partially or fully automate manual, highly repetitive, prone to error, time-critical and seasonal, and rule-based human activities (Deloitte, 2019). It is the use of the algorithms making computers perform tasks autonomously that would earlier require human work skills. They replicate the human activities that are done in interaction with one or more software applications to perform jobs like data entry, respond to customer service queries, and process standard transactions. The "chat box" that is ubiquitous on websites is mostly a robotic process automation tool instead of an actual human. It is programmed to handle standard queries like resetting passwords and finding something on a website (Boulton, 2018).

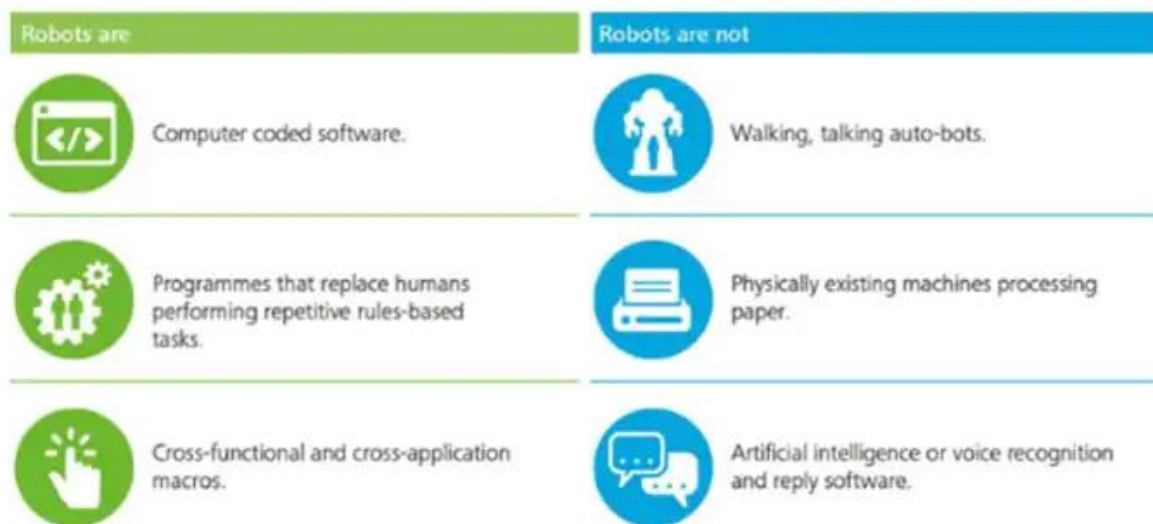


Figure 12 Defining the roles of Robots (Deloitte, 2019)

As Robots have become safe and smart to work alongside people in some of the manufacturing production lines, it is observed that there is a reduction of 85% workers' idle time when they collaborate with Robots (MIT Technology Review, 2014). Some of the applications of Robotics include picking, palletizing, and (un)loading (ATKearney, 2015).

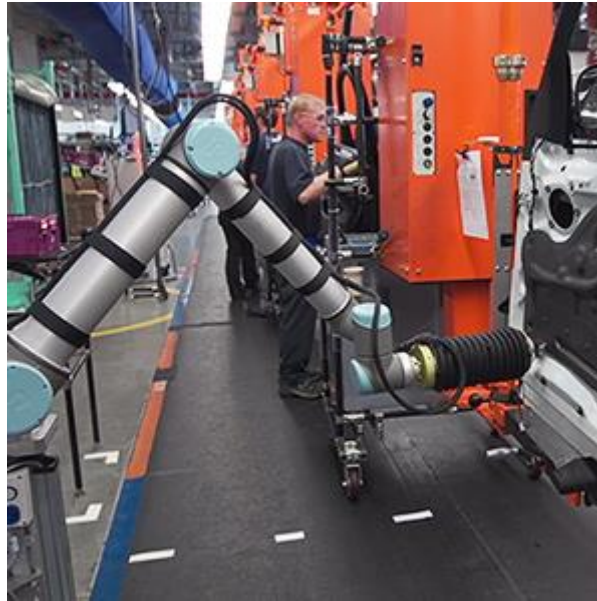


Figure 13 A robot works alongside human workers on a BMW car door assembly line. Source: (MIT Technology Review, 2014)

The benefits of RPA solutions include (Deloitte, 2019):

- Improved accuracy
- Reduced cycle times and improved throughput
- Flexibility and scalability
- Gives more time to innovate and concentrate on customer satisfaction
- Detailed data capture
- Improved employees' self-esteem to allow them to add more value

RPA is closely related to Artificial Intelligence. Still, it is only used to perform routine tasks while AI has a broad range of usage due to the ability to self-learn (Accenture Operations, 2017).

2.7.3 How is AI impacting procurement?

Artificial intelligence works towards enhancing operational decision making and automating manual and cognitive tasks. Among the Digital Champions who have implemented AI, 52% say that there is insufficiency in people skills to implement AI systems. Furthermore, people are not conformable with the full-scale deployment as they don't know the maturity of the data. Even in this arena, Asian companies are leading with a 15% implementation rate compared to EMEA-base companies behind with a 5% (PwC, 2018). Data suggests that although a minimal

number of companies are adopting this technology due to its futuristic nature, there is a gap in the required skill set to implement it.

For preparing the RFQ document, it would be helpful if the historical data stating all the parameters of the past offers were available. The hurdle of analyzing lengthy proposals can be minimized by incorporating a text mining system and AI to examine offers and pre-select them. Hence, a significant number of proposals can be considered instead of a small number of offers for evaluation, which would increase competition (Torn, Robbert-Jan, Pulles, Niels, Schiele and Holger, 2018).

According to (KPMG, 2016), the following areas will be automated because of the use of Artificial Intelligence:

- a) *Self Management of the supply of spare parts (2030)*: Smart machines can order their replacement parts or manufacture them independently before there is a breakdown. It can be achieved by predictive maintenance and AI. Procurement will play a minimal role in the order of spare parts, and so can be more involved in tactical and strategic activities.
- b) *Smart contract management (2025)*: Plausibly, intelligent systems will hand the contract management in the shortest time and provide paperless solutions using the algorithm-based system. It further opens the window to check contracts cross-departmentally, to identify risks, and the system can negotiate their own "smart" contracts with the help of Big Data and contract databases independently. In a futuristic world, the system using AI is expected to prompt negotiation strategy recommendations, conflict cost calculations, and additionally, IP and license management automation.

Artificial Intelligence is identified as a game-changer for procurement. It can contribute up to \$15.7 trillion to the global economy in 2030, which is more than the combined input of China and India. The applications range from digital assistants to medical diagnosis to fraud detection, among many others. Although many organizations understand its importance, it is still at an early stage of development, and the adoption is still low compared to the vast opportunities it can bring (Dr. Anand & Gerard, 2017).

2.7.4 How is RPA impacting procurement?

Some of the procurement functions that can be performed by bots are elaborated upon below (Zubler, et al., 2018):

- **Contract Management and Tactical Procurement:** Generally, the enterprise resource planning (ERP) gathers and ingests contracts from across the organization and feeds them in the Source-to-pay (S2P) system. The procurement bot reviews these contracts, makes a comparison against standard templates and identifies anomaly such as any non-standard terms and conditions. This automation further allows the procurement staff to dedicate more time to strategic contracts.
- **Supplier management and risk management:** Bots can be utilized for scanning emails and highlighting the suppliers that have the highest number of escalation and interactions. Furthermore, it can identify discounts, remuneration changes, or penalties related to service-level issues and alter invoice payments to account for diminished payments. It will help the staff to determine if the supplier needs to be managed strategically or tactically, and if the time spent on a supplier is in line with the proper category management.
- **Supplier onboarding and enablement:** Supplier onboarding can be a lengthy process concerning the collection of several documents and require a comprehensive background check, which is presently done manually. Bots can make things simpler by automation in background checks, supplier document review, and follow-up with vendors in case any document or information is missing. The process of supplier onboarding is done with increasing accuracy and timeliness and increase supplier collaboration.
- **Account payables:** Intelligent procurement bots make account payables less expensive, more efficient, and more accurate. After a supplier submits an invoice, the bot ingests the paper invoice, digitizes it, and perform various checks. It can identify gaps such as missing information, purchase order limit, supplier name, and discrepancies in other terms and conditions. Based on the predefined rules, the bot decides what to do if there is any discrepancy and uses intelligent automation to resolve the exceptions. It can further prevent unwanted payments to suppliers if the right information is missing and request suppliers to provide the correct data.

The above-discussed examples are just some of the many applications of RPA. It can further help the procurement function in master data management, procurement performance management, spend management, and visibility. To summarize, RPA is considered to impact us in the next five years. The expected contributions of this technology are faster Return on investment (between 600% to 800% for specific tasks) and quicker implementation (Zubler, et al., 2018).

2.8 Blockchain

A blockchain is a technology that uses cryptography to create a distributed ledger of transactions that record items in a "chain" of a secure block. Once recorded, the data in a given block cannot be altered without the alteration of all subsequent blocks. The blockchain technology allows transactions to be completed on a peer-to-peer basis without the need for a trusted third-party intermediary. Blockchain is a secure, public, and external system of record, which allows participants to inspect, audit, and update (Procurecon Indirect West, 2018). The figure below demonstrates a blockchain transaction:

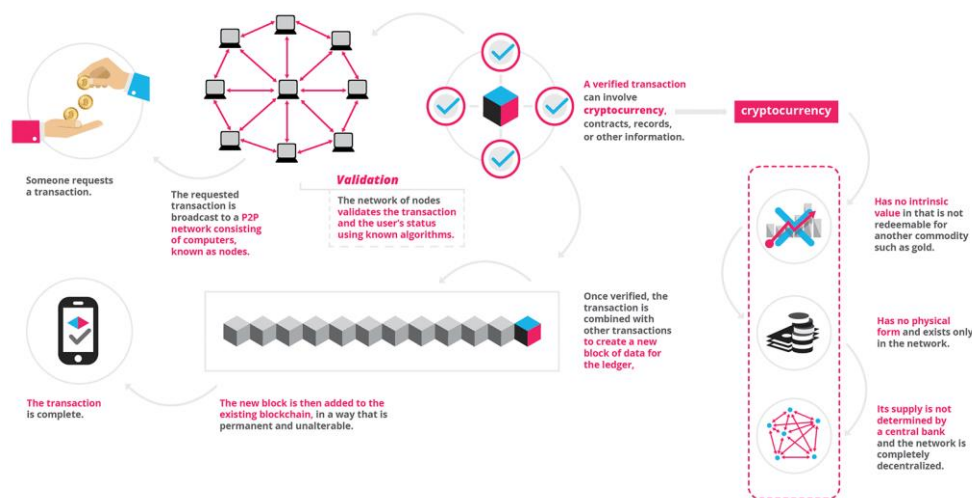


Figure 14 Blockchain Transaction. Source: (Procurecon Indirect West, 2018)

The term Blockchain was first Coined in 2008 by Satoshi Nakamoto, whose identity is unknown. The applications of Blockchain range in several industries such as Retail, Healthcare, Finance, Logistics, Real Estate (Rosic, What is Blockchain Technology? A Step-by-Step Guide For Beginners, 2020).

2.8.1 How is Blockchain impacting Procurement?

Blockchain technology is already in force for some industries. For instance, Nestlé is using IBM's Food Trust enterprise blockchain for **traceability** of its Zoégas coffee brand. The application of Blockchain here is to record data related to the farmers, time of harvest, transaction certificate shipments, as well as the roasting period. Zoégas will have a QR code that gives the consumers the option to scan the code and trace the origin of the coffee beans (Ledger Insights, 2020). Similarly, Walmart partnered with IBM to use Blockchain to keep track of the pork it sources from China, which records information of each piece of meat - its

origin, where it's processed, stored, and its sell-by-date. Other food giants such as Unilever and Dole are also using IBM Blockchain to improve the traceability of products (Procurecon Indirect West, 2018).

Another application of Blockchain technology is for **vendor payment**, which is the ultimate stage of the Source-to-Pay cycle. In recent news by the (The Business Standard, 2020), Standard Chartered Bank has made Bangladesh's first ever Blockchain for an exporter of RMG. The payment was completed through a Letter of Credit (LC) over the Contour blockchain Network, the transaction being entirely paperless and digital. As rightfully identified by the chairman and CEO of the RMG conglomerate, Viyellatex Group, in his own words, "Blockchain technology will certainly increase trading efficiency and reduce the turnaround time of the LC process. It is a real-time payment and the easiest of processes, like mobile financial services".

Reduction of copies of material- The traditional procurement process generates a copious amount of documentation, leading to vast complexity and desynchronization as shown in Figure 15:

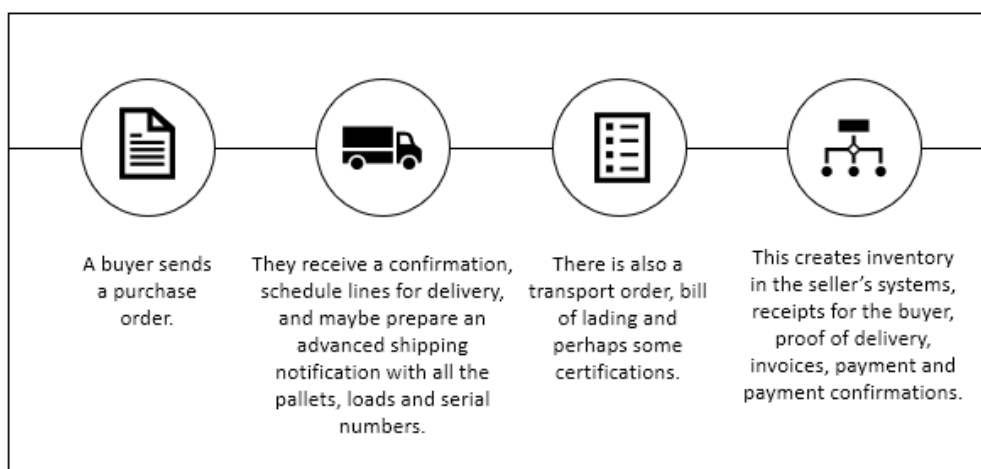


Figure 15 Records generated from the purchasing process. Source: (Joseph, Closing the hall of mirrors - How Blockchain will simplify and transform the Supply Chain, 2018)

With Blockchain technology, all the parties having the right authority has access to copies of documents within the network, without the possibility of altering or deleting them. It eliminates the need for documents such as purchase orders, transport documents (such as bill of lading), some certificates (Joseph, Closing the hall of mirrors - How Blockchain will simplify and transform the Supply Chain, 2018).

Smart Contract: In this concept, Blockchain allows the creation of tamper-proof smart contracts that automatically generate terms and conditions of multi-party agreements, verify them, and release payment of the appropriate party. Under the Blockchain, there will no longer be dubious invoices or options for claiming misplaced or lost invoices, eliminating errors (GEP, 2020).

Some renowned consulting companies such as Deloitte, KPMG, and EY have heavily invested in developing the expertise to assist companies in implementing Blockchain. Deloitte, for instance, has 1,400 full-time blockchain employees. However, IBM is considered the biggest and most successful player of all. Blockchain opens new windows for the value chain across organizations. Yet some companies like Coca-Cola and JPMorgan Chase were initially skeptical as they fear that systems around Blockchain can be prone to attacks and bugs as the Internet has historically proved the risk of hacking information (Castillo, 2019).

2.9 3D Printing

3D printing technology relies on an additive manufacturing process where products are built on a layer-by-layer basis to print three-dimensional models using CAD software. Using 3D printers, simple objects can be printed in less than 1 hour. It has the latent to disrupt the manufacturing industry and the overall supply chain (LÖFNERTZ, 2018).

The characteristics of the 3D printing area as described by (Berman, 2011):

- Simpler Supply Chain integration as it can use readily available supplies coming from multiple vendors
- It provides economies of scale as it can produce custom products at a lower price, maintain a low inventory level, and enrich the working capital management.
- It gives flexibility in producing a range of products such as prototypes, mockups, replacement parts, dental crowns, and artificial limbs.

2.9.1 Applications of 3D Printing

The use of 3D Printing is increasing in the healthcare sector. According to a report by (SCM WORLD, 2016), the healthcare industry and the pharmaceutical industry is doing innovation in the area of 3D Printing. The ability to create patient-specific designs easily and more precisely than the traditional manufacturing techniques is indeed making 3D Printing a lucrative technology for them. It is listed as disruptive and essential to supply chain strategy.

Li & Fung is using 3D design technology across its supply chain to enable designers and merchandisers to work collaboratively, allowing fast and effective decision making. Designers have more visibility to see how a garment looks and fits on a person and, in the process, work with buyers and merchandisers to understand the implications of design adjustments in a virtual environment. Digitalization works wonders in this area as the fashion industry is changing faster than ever, and it also reduces the time-to-market and eliminates waste (Zubler, et al., 2018).



Figure 16 Designer of Li & Fung using 3D design for value creation throughout its supply chain. Source: (PwC, 2018)

2.9.2 How is 3D Printing impacting procurement?

Based on the results of an interview conducted on a group of various experts within the field of Digitalization, it was highlighted that 3D Printing could change the role of traditional purchase as it will have more focus on purchasing the right CAD models instead of the right components. It allows companies to achieve both speed and high customization. In this master's thesis, the study was done on the company SKF. The scenario was set where the organization would use 3D-printers at all factories to print all required components for production and just-in-time. They would follow a make-to-order approach, which allows manufacturing to start after a customer order has been placed. For the company, it would mean shorter lead time for production and reduction in waste, and hence, SKF would use the MTO approach resulting in lower stock levels and capital cost. As SKF can print whatever variant of guide ring they need, they are not dependent on the current suppliers of the guide rings. However, the raw material

supplier will be of greater importance, and the partnerships with these critical suppliers need to be developed and nurtured (LÖFNERTZ, 2018).

Although 3D technologies are at a nascent stage, it has potentials to revolutionize the entire supply chain.

Chapter 3

Methodology and Research Design

3.1 Research Approach

Research approach defines the plans and procedures to conduct the research that includes the sets of assumptions to comprehensive methods of data collection, analysis of data, and, finally, the interpretation. According to the (Saunders, Lewis, & Thornhill, 2007), the research approach can be divided into two types:

- **Deductive:** This reasoning was created in natural Science and refers to the formation of a conclusion about particulars based on generally accepted statements or facts. For the verification of the theory, hypotheses are tested against quantitative data to measure facts. The steps are:

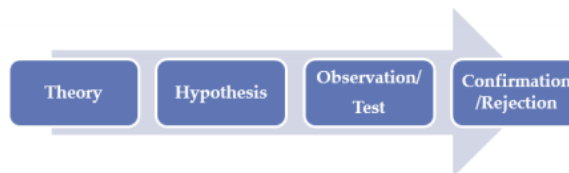


Figure 177 Deductive Reasoning in the research. Source: (Dudovskiy, 2018)

- **Inductive:** In induction method reasoning, generalized conclusion are inferred from particular instances. The first step is data collection to explore a phenomenon. Inductive reasoning works with a small sample of qualitative data where the results are derived from the analysis of discussion with the social actors. The steps are:

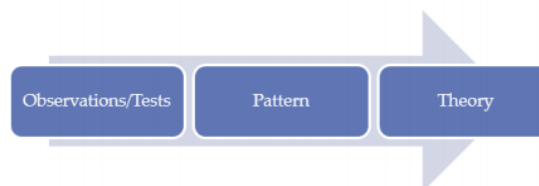


Figure 18 Inductive Reasoning in the research. Source: (Dudovskiy, 2018)

This research sets the premise that disruptive technological advancements are impacting procurement and changing the way of working for the greater good. As identified in the literature review, the volatile environment will require strategic, leadership-driven actions to implement changes in order to stay ahead of the curve. We can summarize that there is a relationship between the level of awareness or knowledge from companies and procurement practitioners regarding digital technologies and the eagerness to bring it to the heart of an organization's strategic vision.

The absence of a hypothesis and the requirement to collect information and evaluate patterns to create a conceptual framework makes this a study with an **inductive approach**.

3.2 Research Strategy

Research strategy refers to the plan and structure used to gather the answers related to the research questions. It sheds light on the approach used to collect data and the type of choice of sample.

There are seven different types of research strategies that can be used in a study (Saunders, Lewis, & Thornhill, 2007):



Figure 18 Types of research strategies. Source: (Saunders, Lewis, & Thornhill, 2007)

For this research, **Survey** was the most suited since it allows the research to gather an extensive data set from a sizeable sample in order to help process the data. In order to craft the survey questionnaire and get insights into the implication of Digitalization of procurement in the country's private sector, several global surveys were analyzed as a part of the literature review which was then tailored to suit the scope of the research.

The survey questionnaire was subsequently uploaded in an online platform, Google Forms, which is highly accessible and served as a fast mean to collect data from the participants.

3.3 Sampling

Investopedia (TUOVILA, 2020) defines the sampling as a process used in statistical analysis in which a prearranged number of observations are taken from a larger population. It is the process of selecting a suitable sample to determine the characteristics of the whole population by observing only a portion of the total.

Sampling techniques can be grouped into two categories (Singh, 2018):

- **Probability sampling:** When there is no prior information about the target population, probability sampling is used. It involves the use of randomization to ensure that every element of the population have an equal chance to be part of the sample.
- **Non-probability sampling:** The researcher considers selecting a specific target of the population that best suits the study.

For the interest of the research, **Non-probability sampling** was used. Only existing procurement practitioners were selected as participants according to their experience in the procurement sector.

The data was collected from a diverse set of industries such as FMCG, Pharmacy, Healthcare, Automatic, Paint, Electronics, and others to get a representation of the overall private sector landscape. In total, respondents from 17 industries participated. The initial idea was to collect survey results from a minimum of 30 participants to get a standard result. However, finally, more than 50 people responded, which has vastly increased the reliability of the outcomes.

3.4 Research Choice

Research choice is used to differentiate both data collection techniques and data analysis procedures, and can be divided into quantitative and qualitative data.

Quantitative data is used when the researcher wants to measure a specific variable for explaining a particular phenomenon. The data is assembled through a questionnaire, and the analysis is done through graphs or statistics. On the flipside, **qualitative research** is conducted when the researcher intends to describe and understand experiences, values, beliefs, or ideas.

The mode of data collection is through in-depth interviews, grounded theory studies, and case studies.

This study has used quantitative data collection method in terms of fifteen close-ended questions asked in the questionnaire shared with the participants. Although the questionnaire aims to quantify information, the questions presented in the questionnaire were particularly subjective as they depend the background of each participant and seeks to capture their experiences.

3.5 Time Horizon

There are mainly two types of time horizons that can be considered: cross sectional and longitudinal. Cross-sectional studies are done in a particular time frame especially in researches where there are time constraints. Longitudinal studies are repetitive over a more extended time to observe events changes and draw conclusions from that.

For this research, **cross-sectional method** was chosen in this study due to the possibility of collecting a considerable amount of data in a short span of time from a large pool of participants.

3.6 Collection of Primary Data

Primary data is an original data source, collected directly by the researcher to answer the research questions. The various sources of primary data collected in this study includes:

- Survey of procurement practitioners with various years of experience in large private sector organizations in a wide range of industries
- One to one discussion with senior colleagues in my organization to gather idea and take suggestions

3.7 Collection of Secondary Data

Extensive literature review was carried out due to the futuristic nature of the research, which prompted continuous iterative studying of various journals, reports, masters thesis papers, web-pages, book extracts, articles, etc. collected through Google Scholar through web searches. Search phrases included Digitalization, Procurement, Blockchain, artificial intelligence, 3D Printing, future skills, etc.

An exhaustive list of all the content used is present in the "Bibliography".

3.8 Questionnaires

The questionnaire prepared for the Survey was limited to closed-ended questions with the aim to increase the response rate, keeping in mind the time value of the participants, and considering their ease to answer with minimum effort. The researcher contacted the respondents via private messages on LinkedIn and through prominent supply chain and MPSM groups.

The first four questions were designed to understand the background of the participants. These questions provided context for the collected data and allowed the researcher to understand the respondents better.

The remaining questions sought to focus on:

- Checking the knowledge of the participants regarding the Digitalization of procurement process
- Familiarising the respondents with procurement priorities and seeking their opinion
- Analyzing the skills required by digital procurement
- Learning from experts the time horizon in which these technologies will affect the private sector of the country
- Identifying the existing technologies used in the organizations

3.9 Approach to Data Analysis

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

- **Pie-charts & bar charts:** The possibility of displaying the percentage as a whole for the data collected from the demographic questions in the questionnaire will facilitate the visual appeal and simplify complex data, enabling comparisons.
- **Histograms:** Histograms are used to allow the analysis of the questions that require comparison within the items. They tend to have high visual strength and will enable the possibility to notice tendencies within data (Dudovskiy, 2018).

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

Chapter 4

Empirical Results

4.1 Overview

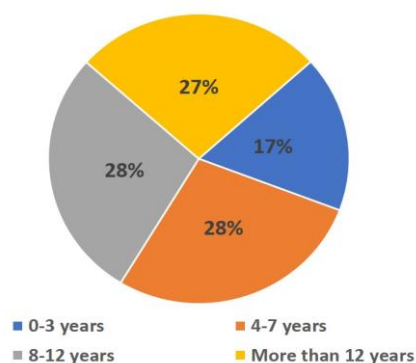
This chapter aims to present the primary research findings, discuss the expected pattern and compare the results with the literature review to create more relevance of the study targeted to understand the implications of Digitalization on procurement and supply management in the private sector of Bangladesh. It would portray how the procurement practitioners are taking actions to equip themselves for the digital transformations.

This study aimed to gather quantitative data by using a survey in the form of a questionnaire designed by Google Forms, where **86 procurement practitioners** from **53 organizations** (names of the organizations are listed in the appendix section) contributed with their insightful responses, which was significant to conduct the research.

In the first part of the chapter, titled "Findings", the outcome of the primary data collected is presented and thoroughly described. In the next segment, "Discussion", the results are compared with the literature review to bring out definitive co-relations. Lastly, in the "Conclusion" part, the overall discussion is presented, and the understanding of the study is described.

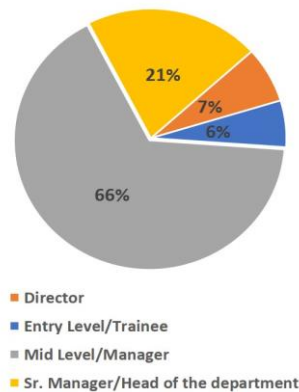
4.2 Findings

1. How many years of experience do you have in the field of supply chain management or procurement?



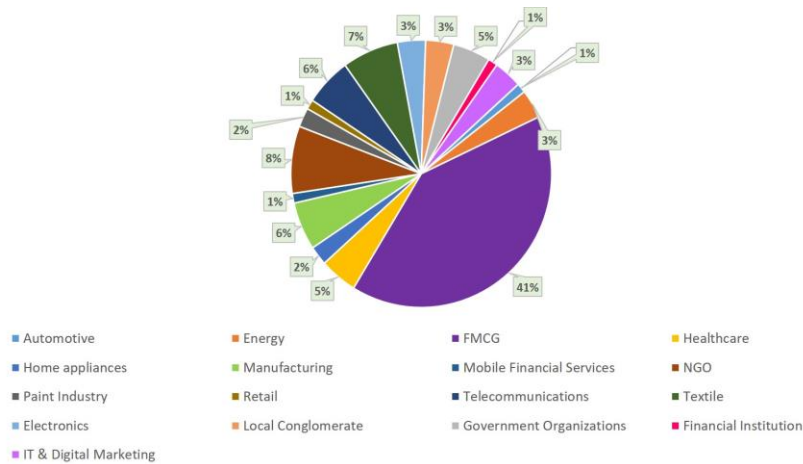
In order to be more representative amongst the procurement community, the Survey was shared with practitioners varying in their years of experience and service. The biggest groups fall within 4-7 years of experience and 8-12 years of experience, which take equal 28% weightage each, followed by 27% contribution of professionals with more than 12 years of experience. Finally, 17% of the respondents have less than 3 years of experience.

2. How would you define your level in the current position?



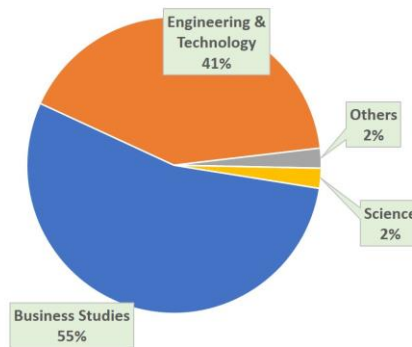
Alongside years of experience, the survey also captured at what organization level the respondents are currently engaged. 66% of the respondents are now working as mid-level managers, which comprises mainly of professionals with 0-3 years, 4-7 years, and 8-12 years of experience, while a particular segment of the practitioners with 0-3 years' experience belonging within entry-level or trainee, which has 6% contribution. Alongside this, 17 out of the 86 respondents are Senior Managers or Heads of the department. The rest 6, contributing to 7% of the total, are Supply Chain directors within their respective organizations, who are directly responsible for formulating their company's procurement and SCM strategies and visions.

3. What industry are you currently working in?



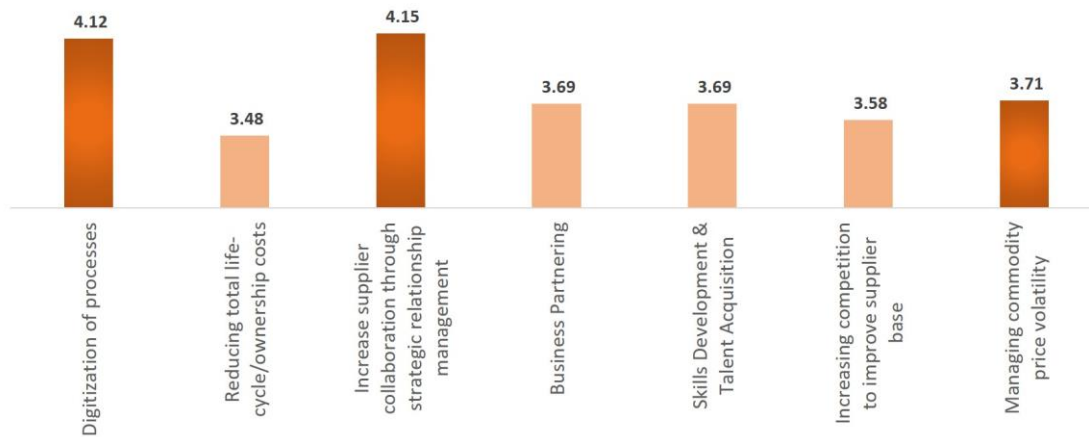
Participants belonged to **17 different industries** - the majority (35 out of 86) being from the FMCG sector (41%). The second highest in the list are the professionals from NGOs accounting for 8% (7 out of 86). Next in the rank are the professionals from Textile industry, which consists of 7% (6 out of 86). The other 44% of the professionals are spread out across Telecommunications, Government Organizations, Manufacturing, Healthcare, Energy, Local Conglomerate, Automotive, Electronics, Retail, Paint Industry, IT & Digital Marketing, Home Appliances, and Financial Institutional. The data collected from the professionals of diverse industries gives a holistic perspective on the private sector of the country.

4. What is your educational background?



This question was asked to the respondents to find out their educational background and understand the kind of degree required for procurement roles. The two majority educational backgrounds that came across as significant are Business studies (contributing to 55% of the total) and Engineering and Technology, owing to 41% of the total. It ties in well with the fact that this business facing field of Procurement is on its journey towards digitalization, and the need to have knowledge on engineering and technology in becoming increasingly imperative.

5. In your opinion, which of the procurement strategies would be used to deliver value over the next 12 months? Please rate the following required skills on a scale of 1 to 5, with 5 being the most relevant.



We must learn about the procurement priorities to identify the significance of Digitalization, if at all, to the procurement community. This question is crafted to recognize the vision and direction towards which Procurement of the private sector is headed. The choices to this question are the usual priorities and agenda to drive value for the organizations.

On average, the highest number of respondents chose **"Increase supplier collaboration through strategic relationship management"** as their most prioritized cells. Given that the procurement spends account for almost 60% of the company's spend, it is essential to enhance the relationships with the business partners.

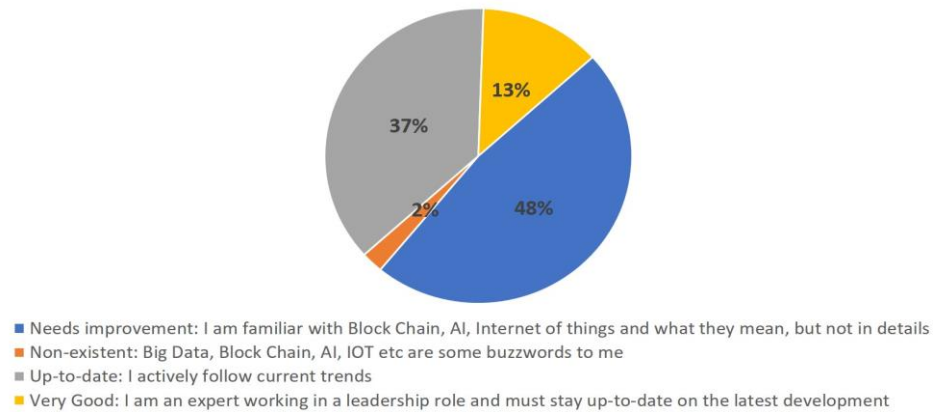
Subsequently, the next popular choice is **"Digitalization of processes"**. This answer reinforces the relevance of the research topic in the current context. Organizations recognize Digitalization as one of the top three priorities.

Thirdly, **"Managing commodity price volatility"** is a crucial priority for procurement. As the world becomes more VUCA, the need to manage commodity pricing dynamically becomes ever so important to drive topline and bottom-line ambitions of the organizations.

Following that, **"Business Partnering"** and **"Skills Development & Talent Acquisition"** received equal ratings. It signifies that procurement practitioners put emphasis in value partnering with business stakeholders and resonate with the needs of developing relevant skills within their teams to take the digital journey head on.

The two priorities that came up with the lowest rating are "**Increase competition to improve the supplier base**", and "**Reducing total lifecycle/ownership costs**".

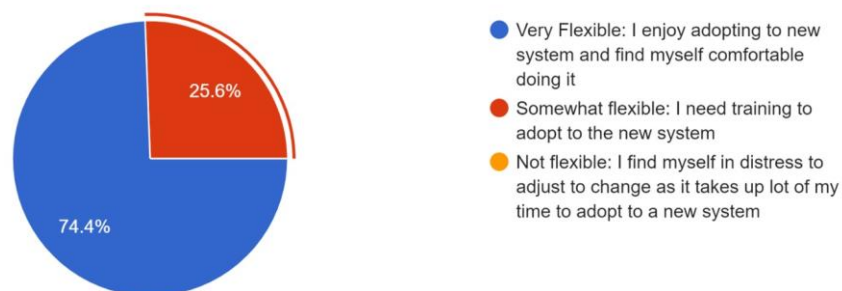
6. Your personal knowledge of Digitalization in Procurement is?



According to 48% of the respondents, their understanding of Digitalization in procurement **Needs improvement**. This result suggests that the knowledge level of half the population regarding Digitalization is not commendable. Thus, there is room to upskill among the staff. In contrast, 37% of the respondents are **Up to date** with the Digitalization by following current trends. The people who claim to be Up to date are the ones who are interested in the global trend and can shift to the "Very Good" knowledge quadrant with practice.

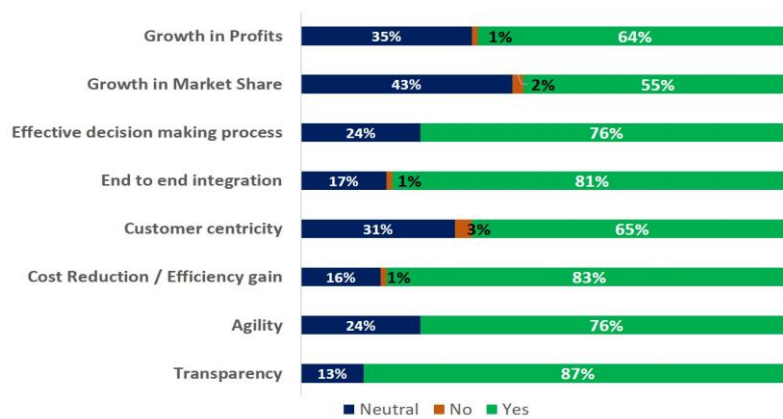
13% of the respondents having **Very Good** knowledge about Digitalization are the change-makers to formulate strategies and lead the company towards the technological shift. Only a small number (2%) of the respondent's familiarity with Digitalization in procurement is **Non-existent**. This group of people are not familiar with the implications of Digitalization and needs the training to prepare themselves for the future better.

7. How flexible are you to adopt the new process associated with Digitalization?



The primary aim of this question was to get a sense of the mental readiness of current procurement practitioners regarding their extent of willingness to adopt to new ways of working with the introduction of new technologies. **74.4%** of the respondent marked themselves as **Very Flexible** and **25.6%** market themselves as **Somewhat flexible**. The answer to this question came out significantly positive, as all the respondents marked themselves flexible to changes, which indicates that with proper training and strategic intervention from the leadership, the industry can start its transition towards Digitalization.

8. Do you expect benefits in the following fields from the investments in digital technologies cumulatively over the next five years?



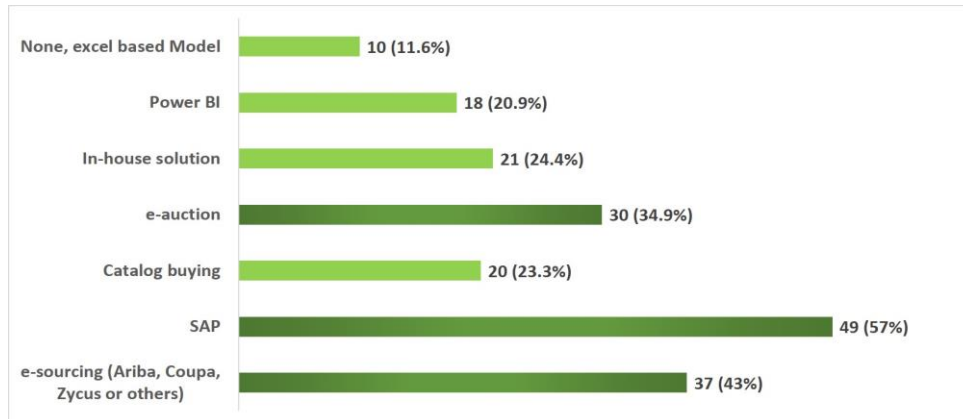
It is important for procurement practitioners to acknowledge the advantages of Digitalization and where they envision the benefits to come in. The options for this question were determined after reading several papers and getting insight into the expected benefits from the implementation of Digitalization. The most popular choices were **transparency (87%)**, **Cost Reduction or Efficiency Gain (83%)**, and **End to end integration (81%)** where the majority of the respondents chose these three as the key gains from the investments in digital technologies cumulatively over the next five years.

The results are similar to the outcomes of the literature review. Most technologies, such as IoT and Blockchain, increase traceability, Big Data Analysis, and RPA, helps in automation and end-to-end integration. All the technologies discussed in the literature review talks about efficiency improvement, more or less.

An equal number of people, which accounts for 76% of the participants, picked **Agility** and **Effective decision-making process** as advantages of the investment in Digitalization, which

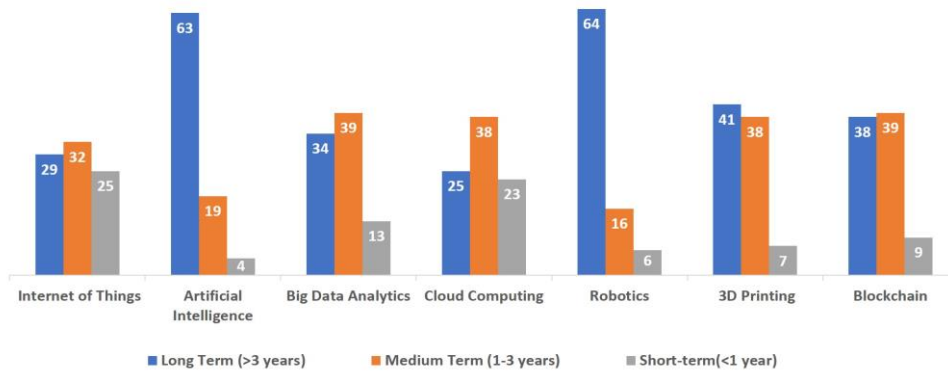
ties with findings in the literature review as well. Faster operational processes will improve agility and allow managers to take quick decisions on impediments. Many AI technologies will also be equipped with algorithms that will make them recommend the most efficient course of action, which will further help in taking correct decision.

9. What digital solutions are you currently using in your source to pay process?



Out of 86, 49 respondents (57%) use **SAP**. Next, 37 respondents (43%) reported using **e-sourcing tools such as (Ariba, Coupa, Zycus, or others)**. 30 respondents (34.9%) use **e-auction** in their source to pay processes. The other 68.6% of the respondents (20.9%+24.4%+23.3%) use **Power BI, In-house solutions, and Catalog buying**, respectively. Only a small number (11.6%) of the respondents use **only excel based models** in their source-to-pay process. Additionally, some of the respondents mentioned using solutions such as **Atlas, eGP, ERP, Tableau (for Data visualization & Dashboard development), IBM WATSON, MATLAB, Vendor management system, IFS, Oracle SaaS, Phoenix (for a financial system)**, and other customized solutions.

10. According to you, when will the below technologies impact procurement and supply management in Bangladesh?



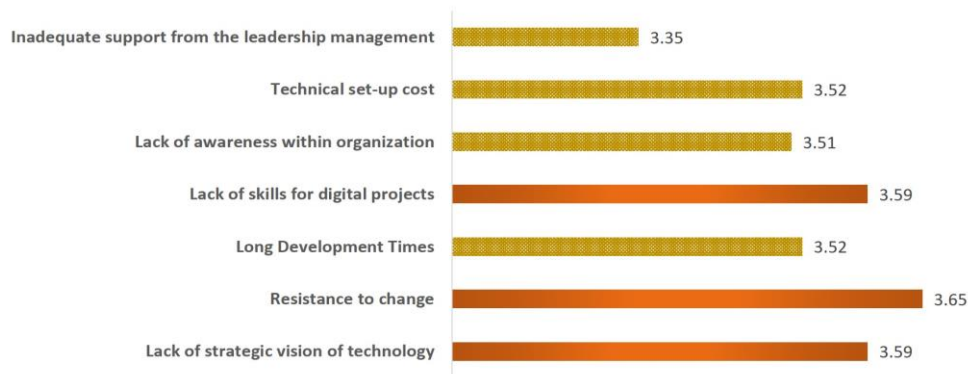
This experience-based question is designed to define the trend and timeline by which the technologies will take the procurement department to the next level. Short term technologies are easier to implement and will be adopted in less than a year; medium-term technologies will require even better understanding and feasibility assessment before deployment, which will require between 1-3 years; and technologies under the long term would require more than 3 years since they come with longer development hours, higher cost, greater complexity, or absence of technical skills to develop them.

Internet of Things (IoT) and **Cloud Computing** are two technologies which received highest responses under the short-term category. Many organizations are already on a transition to move towards incorporating cloud computing apps such as Microsoft Teams or Office 365 to allow their employees to be more flexible.

Big Data Analytics, **Blockchain** and **3D Printing** came out as technologies which received high responses in the medium-term domain, which signifies that many procurement professionals are already seeing active usage of these technologies in their peer markets.

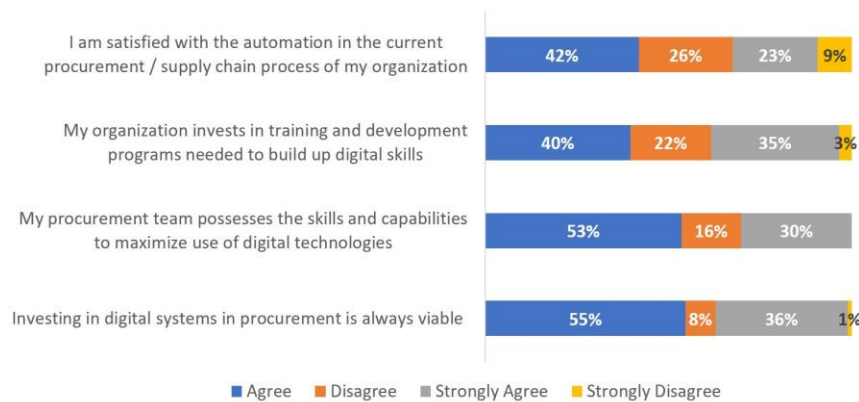
Artificial Intelligence and **Robotics** have been tagged as technologies which will impact procurement activities and supply management in the long term, according to 73% and 74% of the participants, respectively. A lot of interventions are required from both government and private sector in order to integrate these two technologies in the value chain of the companies, which will definitely take more than 3 years.

11. Based on your experience and knowledge, please rate the following challenges in digitizing on a scale of 1 to 5, with 5 being the most relevant.



Despite the growing interest in adopting Digitalization, organizations still find many challenges in this path of excellence. As shown in the graph, **resistance to change, lack of strategic vision of technology, and lack of skills for digital projects** have been tagged as major roadblocks. All these three factors can be taken head on by designing proper interventions by the organization in terms of training and grooming resources up. There needs to be a clear strategic intent from the leadership on how these technologies intertwine with the existing processes, which will help practitioners conceptualize and implement changes.

12. State your extent of agreement to the following statements



91% of the respondents either agree or strongly agree to the statement that **Investing in digital systems in procurement is always viable**. This clearly indicates that there exists a strong acknowledgement among practitioners regarding the need to digitalize the supply chain in order to extract more value.

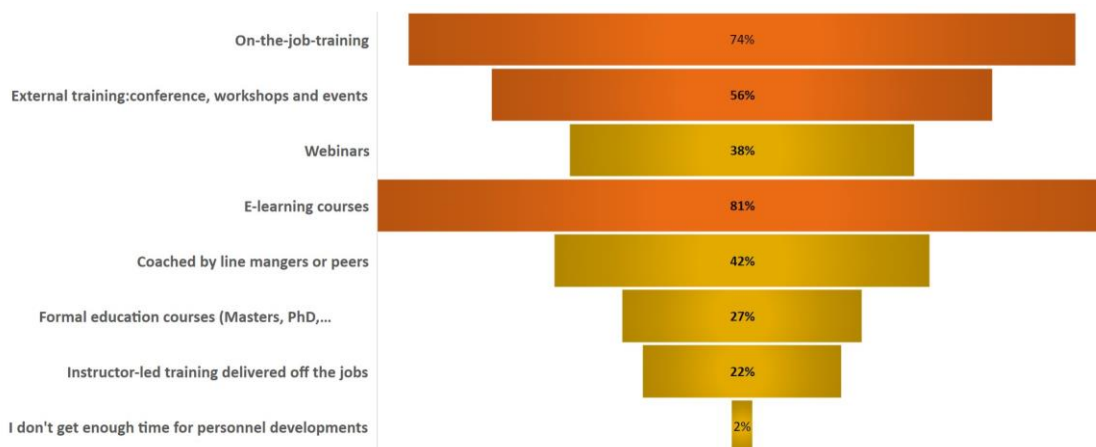
Considering the 28% of the participants are in a leadership role and 66% of them are Mid-Level Managers, 83% of the respondents either agree or strongly agree to the statement that their **procurement team possesses the skills and capabilities to maximize use of digital**

technologies. This belief in the capability of the team will help in the necessary transition towards digitalization.

75% of people believe that **their organization invests in the training and development program needed to build digital skills.** 25% of the respondents are thus still unhappy regarding the extent of training and development which makes us conclude that there is still a need for this.

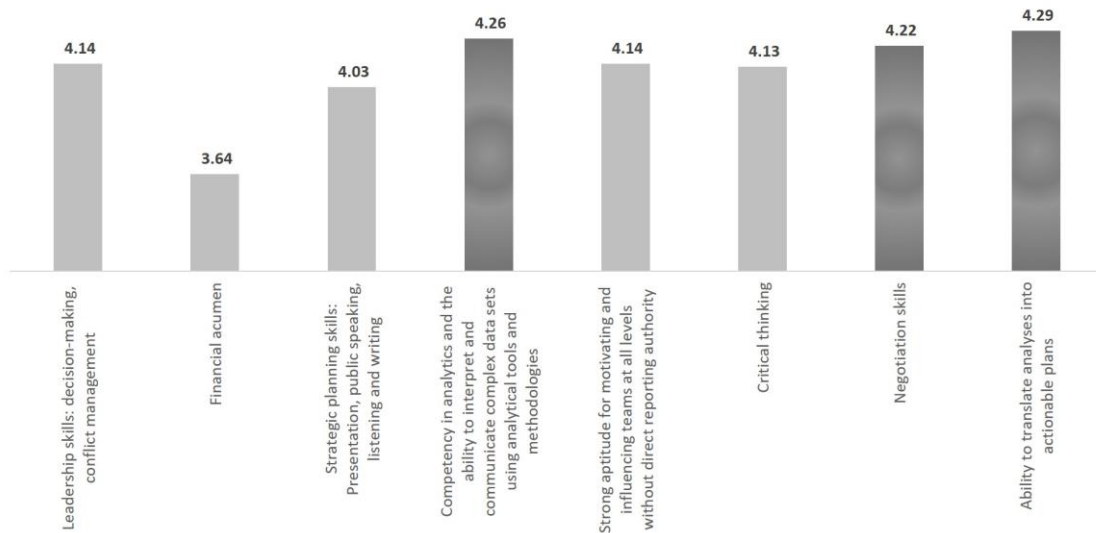
Only **65%** of the respondents are satisfied with **the level of automation in the current procurement or supply chain process** of their organization. This indicates that the procurement professionals are finding out opportunities to venture into new avenues and would be happier if the transition into the short-term technologies such as IoT and Cloud Computing was faster.

13. Which of the below learning and development practices do you use to build up your digital skills?



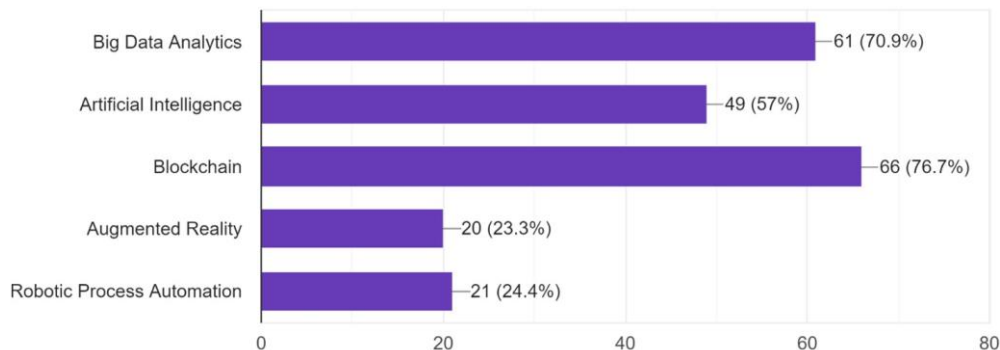
Most participants use **e-learning courses (81%), on-the-job training (74%)** and **external trainings like conference, workshops, and events (56%)** to develop their digital skills. Organizations will need to focus their training efforts through contents specific to these channels in order for the procurement professionals to develop the required skillset.

14. Recent studies indicate that some of the skills below are required to prepare professionals for the digital transformation of the procurement sector. Based on your experience, please rate the following required skills on a scale of 1 to 5, with 5 being the most relevant.



The top three skills required to prepare professionals for digital transformation came out as **"Ability to translate analyses into actionable plans"**, **"Competency in analytics and the ability to interpret and communicate complex data sets using analytical tools and methodologies"** and **"Negotiation Skills"**.

15. Which technologies listed below are you interested to know more about?



The bar chart demonstrates that 76.7% (66 people) of the respondents would like to have more insight into Blockchain, followed by a close 70.9% (61 people), who would like to have more knowledge on Big Data Analytics. Following these two, 57% of the respondents (49 people) have expressed interest to learn more about Artificial Intelligence.

3.3 Discussion

The **research question 1** aims to investigate if organizations are ready to adopt Digitalization in their procurement process. 50% of the respondents have good knowledge of Digitalization,

where 37% of them are Up-to-date, and 13% have very sound knowledge regarding this topic. It indicates that procurement professionals are not just limited to their roles and responsibilities within their respective organizations but also dedicated to following the trend. Moreover, 91% of people affirm that it is viable to invest in digital technologies, and 83% of the people believe that their procurement teams possess the skill to adapt to the digital revolution.

When asked about the digital tools that the organizations are using, the answers included SAP by a majority (57%), followed by e-sourcing tools like Ariba, Coupa, Zycus and others (43%), e-auction (34.9%), and others use In-house solution(24.4%), catalog buying(24%), Power BI(21%). The results show that organizations have e-sourcing and analytical tools (Power BI) in place.

However, the number of people with excellent knowledge in this domain is still minimal and not up to the global level. Significant challenges that were highlighted through this survey are lack of skills for digital projects, resistance to change, and lack of strategic vision of technologies, which are the main impediments to implement the change. Although a small number of industry experts suggest that the Internet of things (29%) and Cloud computing (27%) will impact in the short term, a larger portion (38~39%) says that most technologies will impact in the middle-term. From our literature study, we have already seen the application of Blockchain in payment and logistics, which are in place in Bangladesh, but respondents still hold the opinion that this is one technology that will not come into the picture any time soon. Interestingly, however, 77% of the people are eager to know more about Blockchain suggesting that people are familiar or heard about this technology and 61% of them are interested to learn about Big Data Analytics.

Thus, it implies that Digitalisation will still take a minimum of 3 years or more to affect the private sector of Bangladesh. The results of Artificial Intelligence (73%) and Robotic (74%) influencing procurement in the long term also match the literature review as these are sophisticated technologies, and the implementation will require high technical expertise in this area.

Research question 2 talks about the main contributions that digital technologies bring to the procurement function. These are highlighted through the survey question 8 were participants picked transparency, cost reduction and efficiency gain, end to end integration, effective decision-making process, and agility as the main contributors. The literature review has also identified some positive outcomes of Digitalization, such as traceability, managing everyday

risk, supplier collaboration, automation, cost savings, and analytics with better data, among many others.

Research question 3 delves into the future skills required for the digital transformation and explores some key skills and competencies that procurement professionals need to acclimatize themselves with to contribute to digital procurement revolution. Having identified key skills such as through literature review, the survey investigated their level of relevance, according to the procurement professionals that participated in this study. The most important skill for participants came out as the "ability to translate analysis into actionable plans", rated as 4.29 on average on a scale of 1 to 5. The amount of data generated by the procurement operations is continually increasing and thus, processing this data in order to extract relevant information from it is key to have a holistic view of the business, as well as achieving greater assertiveness in decision making.

The second popular choice was the "competency to be able to use analytical tools and methodologies in digital procurement" which received an overall rating of 4.26. Without this skill the professionals will not be able to work with large data set. Big Data analysis is all about doing analysis of complex data and making it useful for the business. Without the analytical background, professionals will not be able to access the data quality or feed the right information to the system.

Thirdly, "negotiation" will remain as a crucial skill for procurement (rated 4.22 in the survey). Studies suggest that it will still be very relevant for digital procurement as it requires having a high level of communication with the stakeholders and business partners, which cannot yet be replaced by Artificial Intelligence. It will take long development path to get AI bots to negotiate with the same level of personalization as a human does these days.

Additionally, throughout the literature review, global experts recommend digital experts, data analysts, and experts of the field in Science, engineering, technology, and math (STEM) would increase. We have already seen through our survey how the current practitioners are requiring both business and engineering and technology knowledge to be successful in their fields. Skills like innovation, collaboration, and category management expertise will get more emphasis.

4.4 Conclusion

The findings of this study suggest that while half the procurement professionals are aware of the impact of Digitalization in the procurement sector and are eager to adopt a new system, the use of digital tools is mostly limited to e-sourcing and data analytics. This paper presents a vast opportunity in terms of the application of digital solutions, which can bring efficiency, reduce repetitive work, and free up the resources from operational tasks. Professionals can focus on strategic tasks such as implementing Digitalization, which was ranked second among priorities for procurement function.

Moreover, leadership teams need to plan the necessary training of the procurement team to upskill and reskill them. The changing environment requires addition of new dimensions into analytics, digital, problem-solving, communication and social skills.

Most of the theories studied in the literature review were reinforced through the survey, but some deviations were indicating that although globally a lot of technologies are in place, Bangladesh's private sector might still need at least 3 more years to start implementing them into their core processes, Hence, considering primary data (survey) and secondary data (literature review), this study answered the research questions and met the objectives.

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Appendix A: List of companies who participated in the Survey

1. Nestle Bangladesh Limited	16. Japan Tobacco International	31. Unilever Bangladesh Limited	46. British Council
2. KEA Supply AG Bangladesh	17. Berger Paints Bangladesh Limited	32. Singer Bangladesh	47. Bangladesh Weather and climate Service Project
3. Runner Footwear Limited	18. Elanco Bangladesh Limited	33. Megha Group of Industries	48. Signify
4. Dabur Bangladesh	19. Marico Bangladesh Ltd	34. Coats Bangladesh Limited	50. Palli Kama-Sahayak Foundation (PKSF)
5. Bitopi Group	20. Robi Axiata Limited	35. Avery Dennison	51. Devnet Limited
6. Bkash	21. US Department of State	36. Butterfly Group	52. Dotcreat Ltd
7. Rangs Workshop Limited	22. UNDP	37. Petromax LPG Ltd	53. Training Institute for Chemical Industries (TICI)
8. Akij Group	23. Procter and Gamble	38. The Coca Cola International Pvt	
9. APS Logistics (Expo Group)	24. Transcom Beverages Limited	39. IDCOL	
10. Brac	25. British American Tobacco	40. USAID	
11. Pran RFL Group	26. Save the Children	41. LafargeHolcim Bangladesh	
12. Walton Hi Tech Industries Ltd	27. Novo Nordisk	42. Omera LPG	
13. Apex Footware Limited	28. Reckitt Benckiser	43. Grameenphone	
14. Walton Micro-tech	29. TotalGaz Bangladesh	44. Ericsson	
15. Orion Home Appliances Ltd	30. Invert Technology Ltd	45. Palmal Group of Industries	

Figure 19 Participants of the above organizations contributed to the survey

Appendix B: Google Forms Questionnaire

Questionnaire-Masters Dissertation

This questionnaire is an approach of data collection to facilitate my masters research with an aim to understand the readiness for the digitalisation of procurement and how the procurement practitioners are taking actions to equip themselves for the digital transformations in the Private Sector.

It will take only 5 mins to answer. Also, this survey is completely anonymous.

* Required

1. How many years of experience do you have in the field of supply chain management/procurement? *

0-3 years
 4-7 years
 8-12 years
 More than 12 years

2. How would you define your level in the current position? *

Entry Level/Trainee
 Mid Level/Manager
 Sr. Manager/Head of the department
 Director

3. What industry are you currently working in? *

- FMCG
- IT
- RMG
- Healthcare
- NGO
- Telecommunications
- Other: _____

4. What is your educational background? *

- Engineering & Technology (EEE, CSE, IP, Mechanical, Electrical, others)
- Business Studies (Finance, Marketing, HR, Supply Chain)
- Science(Physics, Mathematics, Chemistry, Statistics, others)
- Arts
- Others

5. In your opinion, which of the procurement strategies would be used to deliver value over the next 12 months? Please rate the following required skills on a scale of 1 to 5, with 5 being the most relevant. *

	1	2	3	4	5
Digitization of processes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reducing total life-cycle/ownership costs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increase supplier collaboration through strategic relationship management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Business Partnering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Skills Development & Talent Acquisition	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increasing competition to improve supplier base	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Managing commodity price volatility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. Your personal knowledge of digitization in procurement is: *

- Non-existent: Big Data, Block Chain, AI, IOT etc are some buzzwords to me
- Needs improvement: I am familiar with Block Chain, AI, Internet of things and what they mean, but not in details
- Up-to-date: I actively follow current trends
- Very Good: I am an expert working in a leadership role and must stay up-to-date on the latest development

7. How flexible are you to adopt the new process associated with digitization? *

- Very Flexible: I enjoy adopting to new system and find myself comfortable doing it
- Somewhat flexible: I need training to adopt to the new system
- Not flexible: I find myself in distress to adjust to change as it takes up lot of my time to adopt to a new system

8. Do you expect benefits in the following fields from the investments in digital technologies cumulatively over the next five years? *

	Yes	Neutral	No
Transparency	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cost Reduction / Efficiency gain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Customer centricity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
End to end integration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Effective decision making process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Growth in Market Share	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Growth in Profits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. What digital solutions are you currently using in your source to pay process? *

- e-sourcing (Ariba, Coupa, Zycus or others)
- SAP
- Catalog Buying
- e-auction
- In-house solution
- Power BI
- None, excel based models
- Other: _____

10. According to you when will the below technologies impact procurement and supply management in Bangladesh? *

	Short-term(<1 year)	Medium Term (1-3 years)	Long Term (>3 years)
Artificial Intelligence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Internet of Things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Big Data Analytics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cloud Computing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Robotics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3D Printing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Blockchain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11. Based on your experience and knowledge, please rate the following challenges in digitizing on a scale of 1 to 5, with 5 being the most relevant *

	1	2	3	4	5
Lack of strategic vision of technology	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Resistance to change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Long Development Times	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of skills for digital projects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of awareness within organization	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Technical set-up cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Inadequate support from the leadership management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

12. State your extent of agreement to the following statements *

	Strongly Agree	Agree	Disagree	Strongly Disagree
Investing in digital systems in procurement is always viable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My procurement team possesses the skills and capabilities to maximize use of digital technologies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My organization invests in training and development programs needed to build up digital skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am satisfied with the automation in the current procurement / supply chain process of my organization	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

13. Which of the below learning and development practices do you use to build up your digital skills? *

*

- On-the-job training
- External training: conference, workshops and events
- Webinars
- E-learning courses
- Coaching by line managers or peers
- Formal education courses (Masters, PhD, certifications)
- Instructor-led training delivered off the job
- I don't get enough time for personnel developments

14. Recent studies indicates that some of the skills below are required to prepare professionals for the digital transformation of the procurement sector. Based, on your experience, please rate the following required skills on a scale of 1 to 5, with 5 being the most relevant. *

	1	2	3	4	5
Leadership skills: decision-making, conflict management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Financial acumen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strategic planning skills: Presentation, public speaking, listening and writing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Competency in analytics and the ability to interpret and communicate complex data sets using analytical tools and methodologies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Strong aptitude for motivating and influencing teams at all levels without direct reporting authority	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Critical thinking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Negotiation skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ability to translate analyses into actionable plans	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

15. Which technologies listed below are you interested to know more about? *

- Big Data Analytics
- Artificial Intelligence
- Blockchain
- Augmented Reality
- Robotic Process Automation