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The Impact of Information Technology on the Procurement Process

(Case: The Procurement Department of the Petrochemical Complex 2 of Skikda)

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Abstract

Procurement is at the heart of businesses today. It can play a key role in a business's profitability and overall success. Hence, managers are in constant search for ways to improve procurement processes. This dissertation seeks to explore the impact of information technology software on the different stages of the procurement process. In order to achieve the objectives of this research, an extensive study of the related literature was included and a practical research was carried out in the Procurement Department of the Petrochemical Complex 2 of Skikda. A quantitative approach was adopted. Thus, a questionnaire was administered to the employees of the aforementioned department to check their attitudes towards the effectiveness of information technologies they use to accomplish the different tasks in addition to the challenges they may encounter. The results obtained from the statistical interpretation of the employees' responses showed that IT software plays a crucial role through the different procurement stages. It enhances the procurement triangle; cost, quality and time. This research produced a number of key findings that lead us to imply some suggestions that may help to optimise the use of IT. For instance, to gain a competitive advantage in a in a moving environment training programmes and adoption of the latest IT software become a must.

Key terms: procurement process, information technology, software, competitive advantage.

Résumé

Les approvisionnements sont aujourd'hui au cœur des entreprises. Ils peuvent jouer un rôle clé dans la rentabilité et le succès global d'une entreprise. Par conséquent, les managers sont constamment à la recherche de moyens afin d'améliorer les processus d'approvisionnement. Cette thèse vise à explorer l'impact des logiciels de technologie de l'information sur les différentes étapes du processus d'approvisionnement. Afin d'atteindre les objectifs de notre recherche, une étude approfondie de la littérature connexe a été incluse et une recherche pratique a été effectuée au sein du Département des Approvisionnements du Complexe Pétrochimique 2 de Skikda. Une approche quantitative a été adoptée. Ainsi, un questionnaire a été administré aux employés du département déjà cité afin de vérifier leurs attitudes face à l'efficacité des technologies de l'information qu'ils utilisent pour accomplir les différentes tâches. Les résultats obtenus à partir de l'interprétation statistique des réponses des employés ont montré que les logiciels informatiques jouent un rôle crucial à travers les différentes étapes d'approvisionnement. Ils améliorent le triangle des approvisionnements ; coût, qualité et délai. Cette recherche a produit un certain nombre de conclusions clés qui nous amènent à suggérer quelques solutions susceptibles d'aider à optimiser l'utilisation des technologies de l'information. Par exemple, pour obtenir un avantage concurrentiel dans un environnement mouvant, les programmes de formation et l'adoption des derniers logiciels informatiques deviennent indispensables.

Mots clés : processus d'approvisionnement, technologie de l'information, logiciel, avantage concurrentiel.

ملخّص

يلعب التموين دورًا رئيسيًا في زيادة أرباح الشركة ونجاحها بشكل عام. وعلى هذا الأساس، فإن المسيّرين يبحثون باستمرار عن طرق لتحسين عمليات التموين. يسعى هذا البحث إلى معرفة مدى تأثير برامج تكنولوجيا المعلومات على المراحل المختلفة لعملية التموين. ولتحقيق أهداف هذا البحث وزّع استبيان على موظفي قسم التموين بمجمع البتروكيماويات 2 بسكيكدة. يهدف هذا الاستبيان لتبيان مواقفهم تجاه فعالية تكنولوجيا المعلومات التي يستخدمونها لإنجاز المهام المختلفة وكذا التحديات التي قد يواجهونها. أظهرت النتائج التي تم الحصول عليها من التحليل الإحصائي لإجابات الموظفين أن برمجيات تكنولوجيا المعلومات تلعب دورًا هامًّا خلال مراحل التموين المختلفة حيث تعزز فعالية ثلاثية التكلفة والجودة والوقت. كما أسفر هذا البحث عن عدد من النتائج الرئيسية التي تقودنا إلى تضمين بعض الاقتراحات التي قد تساعد في تحسين استخدام تكنولوجيا المعلومات. على سبيل المثال لا الحصر، لغرض الحصول على ميزة تنافسية في بيئة متسارعة لابد من تنظيم دورات تدريبية واعتماد أحدث برامج تكنولوجيا المعلومات.

الكلمات المفتاحية: عملية التموين، تكنولوجيا المعلومات، البرمجيات، الميزة التنافسية.

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List of abbreviations and acronyms

BoM: Bill of Material

CP2/K: Complex Pétrochimique 2/Skikda

CRM: Customer Relationship Management

ERP: Entreprise Resource Planning

f: Frequency

ICT: Information and Communication Technology

IT: Information Technology

KTP: Knowledge Transfer Partnerships

Mo: Mode

MRP: Material Requirement Planning

PO: Purchase Order

PPV: Purchase Price Variance

PRs: Purchase Requisitions

SAP: Systems, Applications and Products for data processing

SONATRACH : SOciété NAtionale pour la recherche, la production, le transport, la TRAnsformation, et la Commercialisation des Hydrocarbures

Introduction

Procurement is at the heart of businesses today. It can play a key role in a business's profitability and overall success. It includes a broad range of related activities, each of which requires attention to detail to ensure that business gets the most value. Procurement plays a major role in manufacturing and trade, which can significantly influence a company's performance (Blunt, 2010).

Furthermore, procurement performance is an on-going, never-ending, integrated process that requires continuous reassessment and reformation. However, as a core function, it is subjected to the mega trends of the market. Its day-to-day existence is very much defined by growing procurement volumes due to greater concentration of business on core competences, globalisation of procurement markets, growing market dynamics as well as the ever-shorter product lifecycle (Blunt, 2010). For a procurement organisation, to operate both efficiently and effectively in such a complex environment, useful structures need to be created and suitable instruments should be adopted.

Information Technology (IT) proved itself to have an important function in this regard. Used appropriately, it can offer: smoother and faster process flow, efficient distribution of information, decentralization of tasks and decisions, increased transparency and better control. In addition, information technology helps not only to support internal processes, but also those involving business partners.

1. Rationale of the study

This research is a result of some strong held beliefs. In a competitive world, characterized by its instability, we think that to succeed as future managers, one of the major tools that we need to acquire is "information technology". Besides, we have decided to carry out our practical research in the most vital, sensitive sector, which is the oil sector because we believe that the entire economy of the country depends on the incomes of this sector. Hence, it must be put under scope to be more developed, to meet international requirements, and to gain more competitiveness and profitability, and IT is by no means one of the key factors to achieve this aim.

2. Significance of the Study

The interest in the study has been inspired by the existing literature. Previous researches offer mixed and inconclusive findings suggesting that a more in depth analysis is required.

Thus, the present study aims at providing an overview of the significance and current status of the use of information technology in procurement, mainly in procurement department of the Algerian Petrochemical Complex of Skikda. It also seeks to identify the challenges in the use of IT for procurement and it sheds light on employees' perception of the use of IT for procurement.

The study addresses decision makers in organisations who are affected in some way by IT solutions in procurement and aims to offer them orientation for the conception and further development of solutions. It spots the light on the reasons behind individuals' motives or resistance to IT. In addition, it should provide research and teaching faculties with up-to-date insight into the market.

3. Structure of the Study

To fit well the aim of the present study, the research will be basically divided into two main chapters. The first chapter deals with the theoretical framework of the study. It consists of two sections; section one is devoted to a general review of the literature related to the relationship between information technology and the procurement process, regarded from different perspectives. A choice of an analysis model will be discussed in this section.

The second section of chapter one focuses on the fundamental concepts of the current study. It provides some definitions and determines the key elements. It attempts to offer a conceptual positioning among the major theoretical approaches that present clear divergences.

The second chapter is devoted to the methodological framework including the data gathering technique used in this research, the population and sampling, the data analysis tool and a thorough discussion of the results obtained.

A general conclusion is set at the end of the research, containing the answer to the research questions set forth and some suggestions for a more effective use of information technology in the procurement process.

Problem statement and research methodology

1. Problem statement

Nowadays, organisations know that “whoever has information has power.” However, they continue to face business related problems like the collection of timely reliable and accurate information, processing, storing, and retrieval for decision-making and control of the organisation (Osmonbekov, Bello & Gilliland, 2002). As compared to modern IT-based procurement, traditional procurement was paper-based and conversation-based (Bartezzaghi & Ronchi, 2003). In recent years, this function has changed somewhat to become a strategic activity; procurement officers seek suppliers that fit with a company's overall strategy. Procurement has also become more significant in response to governance issues that companies face in terms of having a clear picture of how, why and with whom they spend money.

Despite the fact that companies around the world, and Algerian companies in particular (Petrochemical Complex of Skikda CP2/K as a case of our study), are aware of the crucial importance of information technology in enhancing the procurement process and hence in gaining a competitive advantage, many of these companies still underestimate this tool and do not place it on top of their strategic priorities.

1.1. Aim of research

The primary concerns of the present research can be summarised as follows:

- Providing an overview of the significance and current status of the use of information technology in procurement, mainly in the procurement department CP2/K.
- Identifying the challenges in the use of IT for procurement.
- Shedding light on employees’ perception of the use of IT for procurement.

1.2. Research Questions

The present study seeks to answer the following research question:

1. What is the impact of information technology on the procurement processes in Petrochemical Complex of Skikda (CP2/K)?

In order to answer the above research questions, we hypothesize that information technology software has a positive impact on the overall procurement process.

2. Research Methodology

In order to achieve the objectives of the study, a quantitative approach was followed. According to McMillan & Schumacher (1993, p.32), a quantitative approach "adopts a positivist philosophy of knowing the emphasised objectivity by using numbers, statistics and experimental control to quantify phenomena." This approach is context free and makes use of deductive methods. The relationships between different variables are stated in tabular and statistical forms.

A 5-point Likert scale questionnaire was the main instrument of data collection. The questionnaire was addressed to 25 employees from the procurement department in the Petrochemical Complex 2 of Skikda. It makes use mainly of the technique of close-ended questions but not exclusively. There are cases where respondents were allowed room to provide their own answers. For the sake of interpreting ordinal data, descriptive statistics was use; the mode was calculated and the results were presented in table and charts.

2.1. Case Study

The practical part of this research took place in the HDPE-Complex (High-Density Polyethylene Complex), which is located inside the SKIKDA industrial zone, with an area of 16.68 hectares, 10% of which is built. The complex started functioning on May 1, 2005.

The purpose of this complex is to build a high-density polyethylene (HDPE) production unit with a capacity of 130,000 t/year. It is intended for the supply of the national plastic processing industry and for export in terms of the surplus. The national clientele consists of various public enterprises such as ENPC, ENCG, and private sector processing enterprises.

The procurement department of the CP2/K petrochemical complex ensures the availability of the materials and equipment necessary for operations and maintenance and under the best possible economic and financial conditions.

CHAPTER ONE:

INFORMATION TECHNOLOGY IN THE PROCUREMENT PROCESS

Chapter 1

Information Technology in the Procurement Process

Preamble

This chapter aims, even at the risk of some oversimplification, to bring into clearer focus the following topics: a review of the literature related to the use of information technology for the procurement process, a selected analysis model, and some functional definitions of the key concepts of this research.

1. Literature Review

Procurement process involves the purchase of goods or services at the best possible cost to meet the needs of the purchaser in terms of quality and quantity, time and location. Procurement as a supply chain function has developed significantly over the decades; initially it was a purely administrative function until Porter (1980), prompted firms to think of procurement as a strategic function rather than an administrative one in his five forces model where he shows cases supplier and buyer power as two critical forces for competitiveness.

Information technology facilitates communication between individuals or groups who are not physically present at the same location (Raymond, 2008). Systems such as telephones, telex, fax, radio, television, and video are included, as well as more recent computer-based technologies, including electronic data interchange and e-mail.

Technology adoption research shows in almost all cases, especially in network technologies such as ICT, that S-shaped adoption curves can be observed; the diffusion of an innovation starts slowly with a few early adopters (Raymond, 2008).

IT is transforming the way that business is conducted. Computers prepare invoices, issue checks, and keep track of the movement of stock, and store personnel and payroll records. The personal computers are changing the patterns of office work, and the spread of information technology is affecting the efficiency and competitiveness of business, the structure of the work force, and the overall growth of economic output (Bertschek *et al.*, 2013). Purchasing department has been radically changed by the development of the Information Technology. Simply the communication channels widened enormously, and the information exchange has become significantly faster and broader, simplifying several steps

with regards to purchasing, and also enhancing fast decision making. In addition, the quality has improved, costs have been reduced, and speed has increased.

Varma and Khan (2014) in their study of Information Technology in Supply Chain concluded that many scholars have advocated for paperless transaction in procurement by adopting the use of System Applications and Products (SAP) in Data Processing by using Enterprise Resource Planning (ERP) systems, Automatic Identification and Electronic Data Interchange (EDI) modules. These systems guarantee transparency and security of the systems to both the user and the businesses. From the research conducted by Nair (2012) under the title of "RFID for Supply Chain Management", the findings were that the respondents thought that procurement based on IT tools easily controls and manages information interchange within key business functions, products, external and internal financial resources and contributes to business profitability by enhancing quality and alleviating coordination costs and trading risks.

Numerous analysts have debated on the use of IT tools in procurement. Among these is Nair (2012) who published a study titled E-Supply Chain Management using Software Agents. The findings had a common agreement that IT enhances information sharing, improves the performance and eradicates supply chain risks by providing system and procedure-based execution of tasks and presents information to decision makers in formats that it is needed.

More to the point, Musanzikwa (2013) conducted research on Enterprise Resource Planning (ERP) and concluded that IT played a critical role in the integration of suppliers and customers to ensure the right quantity and quality of products are supplied. Auramo *et al.* (2005) in their exploration of Benefits of IT in Supply Chain Management to Finnish Companies found out that IT was being applied to data entry, real time processing, and regularization of transaction that were expected to create a balance between supply and demand among procurement chain members. Brooks and Davenport in their 2004 study of Enterprise systems and the supply chain concluded that IT was a critical requirement for managing and control of procurement processes.

Another study by Bertschek, Cerquera & Klein (2013) aimed to measure the impact of broadband internet on firm performance. The findings of this study illustrate that the internet had become the major source of information, products and services and e-procurement has become one of the most discussed topics in supply chain management and will revamp the mechanics and methods of purchasing in the coming years. More recently, Craig, Carter and

Washispack (2018) noted that both developed and developing nations have adopted IT to improve public service delivery, enhance the general populace's access to information and increase civil society participation in economic and political affairs.

It is noteworthy that leveraging information in electronic procurement enables visibility of organisational purchasing data, creating the opportunity to negotiate better terms with suppliers based on volumes, price and quality. Similarly, supplier performance metrics for on-time shipments, quality and invoicing can be considered when negotiating terms with suppliers and determining sourcing strategies for items/categories of items (Rai, Patnayakuni & Seth, 2006). Information can also be leveraged by end users to track status, delivery and payment terms.

In the same vein, Cheptora (2018) studied the impact of IT on procurement performance in manufacturing firms and found out that the e-procurement system is comprised of indent management, e-tendering, electronic auctioning, vendor management, catalogue management and contract management and further defined indent management as the software package that involves tender or bids preparations. Brooks (2004), however, in research that explored enterprise systems and the supply chain, observed that indent management permits online purchase requisitions, ordering, and tracking of ordered products and management of stocks.

Waigwa and Njeru (2016), in their study on the factors influencing management of procurement contracts in public security agencies, concluded that public sector entities utilize e-procurement to obtain gains such enhanced efficiency and cost savings, shorter procurement cycles and enhanced accountability to reduce corruption in procurement by avoiding face to face dealing with service providers. In the same line of thought, Adebanjo, Tickle, Lin & Bourlakis (2016), in their research on e-business capabilities in developed and developing countries, posited that the public sector had widely accepted e-procurement and its utilization graph has grown exponentially.

All the above-mentioned studies emphasize the importance of IT for a more efficient procurement process including cost reductions, closer relationships, improved information, increased efficiencies and the strategic use of purchasing staff. However, various studies reveal the different challenges that might appear while implementing IT for a procurement process. For example, According to Lysons (2003), globalization and international trade issues pose potential barriers to establishing procurement programmes for both governments

and private firms. Eco-labels have in the past, and likely in the future, will be discussed as a "barrier to trade" issue. There have been instances where Eco labelling has been designed to support certain products within specific markets (e.g., the overwhelming demand by consumers in the UK for labelling of GMO foods). As a result, eco labelling organisations tend to use clear, science based, environmental criteria when establishing their programmes. For instance, the Municipality of Kolding, Denmark, cannot request that products have an Eco label (such as the Nordic Swan or the EU flowers) when designing calls for tenders with environmental criteria. This is because such requests would not comply with the World Trade Organization's Government Procurement Agreement and European Union legislation on free market and equal opportunities. Instead, municipalities can specify environmental requirements similar or identical to those required by an Eco label (Lysons, 2003).

Another study conducted by Ambe (2016) highlights some other challenges that face the inclusion of IT in procurement process. High cost of introducing new ICT systems, lack of consultancy expertise in E-procurement, and lack of leadership were the challenges that were ranked high. Slow rate of suppliers linking with system, difficult in measuring usefulness and potential of IT and difficulty in measuring ease of use were some of the cited challenges. Further inquiry into the challenges brought the issues of resistance mainly from employees who perceive the introduction of technology takes away their jobs.

It is noteworthy that the majority of previous researches placed emphasis on the crucial role that IT may play in enhancing procurement activities. Nonetheless, they did not give much attention to individuals' perception of this tool. Hence, to deepen our understanding of the impact of information technology on the procurement process and to investigate procurement managers and executives' viewpoint towards IT, a further research is needed.

Armed with this assumption, the frame analysis used in this study was the Technology Acceptance Model (TAM) by Davis (2011). This model supports the concept that perception of users influences the degree and level to which technology is used in business and other organizations. According to this theory, emerging technologies cannot improve organizational effectiveness and performance if the change has not been accepted by the technology users. The Theory of Technology Acceptance is one of the most popular theories in understanding adoption of computer technologies. It avers that adoption of any innovation requires investment in computer-based tools to support decision-making, planning and

communication (Kamel, 2014). Before accepting any technology, users should be aware of the benefits, security and other risky issues involved.

This theory is essential for this research as it provides the factors that influence people to accept technology. The study of the impact of technology on procurement process revolves around this theory because the research is about exploring the extent to which IT is utilized by individuals.

2. Conceptual framework

The present research attempts to examine the impact that information technology might have on the overall procurement process in a given organisation (Petrochemical Complex of Skikda in our case). Hence, some key concepts are introduced in this section; these are: technology information (and its sub-concepts; enterprise resource planning systems such SAP and Oracle) which is the independent variable, and procurement performance as the dependent variable.

2.1. Information technology

Any supply chain encompasses three key flows; namely material, resource and information flows. Material flows enable delivery of fright, and resource flow, such as finance, ensure supply partners get paid. Information flows are more complex and multifaceted. Information is the key that unlocks supply chain responsiveness to demand.

Contemporary supply chain is information intense. Information complexity, proliferation, diffusion, velocity and accuracy are thus key drivers of developing increasingly sophisticated supply chain information technologies since it is not just the information itself that is important, but also how we store, retrieve and use it.

According to Stratman, information technology is "the use of any computers, storage, networking and other physical devices, infrastructure and processes to create, process, store, secure and exchange all forms of electronic data" (2007, p.42).

The phrase "information technology" traces its roots back to an article published in the Harvard Business Review in 1958. Authors Leavitt and Whisler defined several types of information technology:

- Techniques for the fast processing of information
- The use of statistical and mathematical models for decision-making

- The “simulation of higher-order thinking through computer programs.”

“While many aspects of this technology are uncertain, it seems clear that it will move into the managerial scene rapidly, with definite and far-reaching impact on managerial organization,” they wrote (as cited in Mangan *et al.*, 2012, p. 231)

Six decades later, it is clear that Leavitt and Whisler were onto something big. Today, information technology refers to everything that businesses use computers for. Information technology is building communications networks for a company, safeguarding data and information, creating and administering databases, helping employees troubleshoot problems with their computers or mobile devices, or doing a range of other work to ensure the efficiency and security of business information systems.

2.1.1. Information technology applications

As supply chains have evolved and grown, so have information flows and technologies. Information technologies (IT) such as material requirements planning (MRP) were developed in the 1970s to meet the planning and execution needs of individual operations. As business functions have become more integrated, so have IT applications. For example, enterprise resource planning (ERP), the modern derivative of MRP, spans across organisations. (Information technology applications used in the procurement process will be discussed later in this chapter).

2.2. Procurement:

The quality of relationships and communications are key elements in defining the interactions between individuals and organisations. Procurement is at the forefront of these developments in terms of addressing the wider issues relating to sourcing and contract management and renewal.

Put differently, procurement has been a vital, transactional part of conducting business for almost as long as commerce has existed. It is considered as a strategic activity within a business or organisation with a potential to improve profit but also in terms of the wider social, economic and environmental issues related to sourcing and procuring goods and services for many organisations.

In the past, some businesses have used the term procurement synonymously with purchasing. Nowadays, purchasing is often seen as just one stage in a larger, more strategic procurement process. In other words, procurement is an umbrella term with a subset of processes that help fulfil organisational requirements of goods and services. While Purchasing refers to the set of steps associated with executing a transaction between organizations and their suppliers to buy goods and services. Thus, as a process, purchasing is a subset of procurement. It starts and ends with placing and receiving an order.

The idea of a company operating in isolation is outdated. Contemporary procurement comprises every activity involved in obtaining the goods and services a company needs to support its daily operations, including sourcing, negotiating terms, purchasing items, receiving and inspecting goods as necessary and keeping records of all the steps in the process (Chimberengwa, 2015).

As Mangan *et al.* assert, "Procurement provides the interface and it is an essential link to markets and suppliers" (2012, p. 185). Therefore, it has a key role in defining and managing future supply chains, how they perform and the impact they have on society.

2.2.1. The procurement process

Procurement should be considered as a process or lifecycle. This process is repeated within a business as different contracts mature, expire and are renewed on a continual basis.

When accessing the needs of procurement, departments and agencies are responsible for realistically determining the goods or services they need and the manner in which they will be procured. They devise a mechanism, for planning in detail all proposed procurements within its available resources, delivery time or completion date and benefits that are likely to accrue in the future. Any unrealistic assessment of procurement would tend to minimize value for money or result in wastage of resources (Caldwell, Roehrich & Davies, 2009).

In risk assessment, risks associated with the procurement of goods are identified and strategy is developed to manage them contingent plans are also formulated. Sometimes risks are transferred to the contractor when he is considered most appropriate to manage them. However, sharing of risks between both parties in all the stages of procurement process is considered to be the best possible approach in managing risks (Caldwell, Roehrich & Davies, 2009).

Proper and detailed specification is critical to procurement of products of right quality and need. It identifies what is required from the contractor and he is expected to bid against the specifications given in the bid document. Specifications can be simple or complex depending on the nature of procurement (Caldwell, Roehrich & Davies, 2009). In order to ensure fair and impartial competition, the specifications should be defined in such a manner that allows widest possible competition and should not favour any single contractor or supplier nor put others at a disadvantage. Specifications should be generic and should not include references to brand names, model numbers, catalogue numbers or similar classifications (Caldwell, Roehrich & Davies, 2009).

When selecting the method of procurement, open competition is considered to be the best basis for efficient procurement to ensure that value for money has been obtained. Various methods of procurement are provided in the relevant manuals, rules and regulations and policy guidelines issued by the governments and international institutions (Caldwell, Roehrich & Davies, 2009).

During prequalification of bidders, in case of procurement of expensive and technically complex products, the procurement department ensures that only technically and financially capable firms/contractors having adequate managerial capability are invited to submit bids (Lewis & Roehrich, 2009). This is done prior to floating of tenders, invitation to proposals or offers in procurement process. Such pre-qualification is solely based upon the ability of the interested parties to perform that particular work satisfactorily. The procurement department while engaged in pre-qualification usually takes into consideration relevant experience, past performance, capabilities with respect to personnel, equipment, financial position, appropriate managerial capability of the contractors to ensure that contract will be performed successfully (Lewis & Roehrich, 2009). Prequalification process is notified and a set of pre-qualification documents is provided to all competitors. After pre-qualification process, the pre-qualified contractors are notified and they become entitled to participate further in the procurement process.

The bidding documents provide all the general and special conditions of contract and other necessary information to enable the potential bidder to clearly understand their requirements and submit his responsive bid in time. These documents define the risks and responsibilities of the buyer and the seller. The bidding documents should be carefully prepared by skilled

professionals to ensure that all the terms and conditions of the procurement are incorporated in these documents and they are clear, precise and definite (lewis & Roehrich, 2009).

This is post-advertisement stage in which the procurement managers and executives issue bid documents to the prospective contractors to enable them to submit bid for award of contract. Bid documents form the basis of award of contract to the successful bidder. Bid documents are very comprehensive and include invitation to bid, instructions to bidders, form of bid, form of contract, general or specialized conditions of contract, specifications and drawings or performance criteria (where applicable), delivery time or delivery schedule, bill of quantities or list of goods, bid evaluation criteria, format of all securities, details of standards to assess quality of goods and any relevant information required by the procurement department (Caldwell, Roehrich & Davies, 2009).

Evaluation of bids is the most important stage in the procurement process that leads to selection of the successful bidder. The bids are evaluated against the performance criteria (technical, commercial and financial) already laid in the bid documents. For the comparison of bids quoted in different currencies, the price is converted into a single currency specified in the bidding documents. After the bid is opened, no bidder is allowed to alter or modify his bid. The procurement department will not introduce any condition, which may discriminate between bidders. Award and signing of the contract is done on the basis of results of evaluation bid, the bidder with the lowest evaluated bid is awarded the procurement contract (Caldwell, Roehrich & Davies, 2009). The successful bidder furnishes the performance guarantee as per requirements specified in the bid documents. Usually no negotiation is allowed with the bidder having submitted the lowest evaluated bid or with any other bidder.

Contract administration is the implementation stage of the procurement process. A good contract administration is critical to the successful completion of a contract. A working mechanism is developed to ensure that it facilitates both parties to meet respective obligations as efficiently and effectively as possible (Caldwell, Roehrich & Davies, 2009).

The following table summarizes the various stages of the procurement process:

Table 1: Stages of the procurement process

Stage	Description	Key issues
Specify	Specify the requirements that the contract must deliver	• Requirements should be defined from a technical, commercial and end-user perspective. • In many cases, organisations do not understand the market better than suppliers. • Sometimes the specification is unclear or ambiguous.
Identify	Identify suitable potential suppliers who are able to meet the defined requirements or specification.	• Advertising and promoting the contract opportunity. • Determining an appropriate level of competition to reflect the risk and value being procured. • Attracting new or more interesting suppliers who may be able to add more value to your business versus incumbents. • Choosing which suppliers have the capability and capacity to deliver the required service.
Select	Select a suitable supplier or suppliers to deliver the contract	• Picking a winner from suppliers who have sufficient capability and capacity to deliver the contract. • The evaluation criteria in terms of quality and price. • The balance needed between quality and price.
Manage	Manage the contract to ensure that the key deliverables are fully met.	• Success criteria or key performance indicators are required to ensure that the contract requirements are being met. • Lessons learned are applied to subsequent contracts.

(Source: Mangan et al. 2012, p. 175)

2.2.2. The procurement performance

The procurement function has not been given the recognition it deserves in developing countries, in most public entities, regardless of the effort by the partners like the World Bank, the International Trade Organisation, the United Nations Conference on Trade and Development, the World Trade Organisation, and others. This could be deliberate or sheer ignorance about the value that the procurement function could bring to any organisation (Telgen, Zomer, & de Boer, 1997).

For any organisation to change its focus and become more competitive, Amaratunga & Baldry (2002) suggest that performance is a key driver to improving quality of services while its absence or use of inappropriate means can act as a barrier to change and may lead to deterioration of the purchasing function. Organisations which do not have performance means in their processes, procedures, and plans experience lower performance and higher customer dissatisfaction and employee turnover (Artley & Stroh, 2001; Amaratunga & Baldry, 2002). Measuring the performance of the purchasing function yields benefits to organisations such as cost reduction, enhanced profitability, assured supplies, quality improvements and competitive advantage as was noted by Batenburg & Versendaal (2006). An important step towards reducing these risks is to make a realistic assessment of those that are most likely to occur in any procurement. There are some of most likely risks can be avoided or controlled by careful preparation and good information (Artley & Stroh, 2001).

A traditional procurement measurement is purchase price variance (PPV). PPV is a measure of the variance between the actual price paid versus the standard cost of the item. The standard cost of an item would be included in a bill of material (BoM) for a particular product and is used to calculate the product cost. The performance of the buyer would then be measured as a variance around the standard cost or the original purchase price. A positive variance might suggest that the buyer is performing well while a negative variance might suggest that the buyer is not performing (Chimberengwa, 2015).

Procurement performance and metrics reflect a wider range of different key performance indicators and although price is a vital component, many now consider the wider aspects of performance and measure them on a regular basis.

2.3. Information technology used in procurement process

Procurement systems have developed dramatically from early packages that were bolted on to financial management systems and accounts payable packages to reflect the procurement lifecycle from sourcing to contract management. Larger enterprise resource planning (ERP) systems like SAP (a German-based global provider of ERP- software and systems including tendering and procurement modules) and Oracle (a suite of tools including a wide range of supply chain applications and modules such as advanced procurement for a wide range of sectors and businesses) tend to dominate the corporate marketplace, and support complex organisations with multiple activities in different locations.

Enterprise resource planning (ERP) integrates internal and external management information across an entire organisation, embracing finance/accounting, manufacturing, sales and service and CRM. ERP systems automate this activity with an integrated software application. Its purpose is to facilitate the flow of information between all business functions inside the boundaries of the organisation and manage the connections to outside stakeholders (Telgen, Zomer, & de Boer, 1997). Enterprise resource planning (ERP) as an extension of material requirements planning (MRP), later accounting resource planning and computer-integrated accounting. Without supplanting these terms, ERP came to represent a larger whole, reflecting the evolution of application integration beyond accounting (Raymond, 2005).

ERP is a business management system made up of a collection of applications or modules that integrate company functions such as marketing, finance, manufacturing and logistics (Helo & Szekely, 2005). ERP uses database technology to control and integrate information related to a company's business including data related to customers, suppliers, employees and finance. All business transactions, such as inventory management, production planning and distribution are entered, recorded, processed, monitored and reported (Helo *et al*., 2005).

There are also many standalone packages that can be integrated with ERP systems or are available as different modules, which provide a joined-up approach to sourcing, tendering, procurement and contract management.

Packages are now web or cloud based and this not only enables sharing of information within a business and across different locations but also with suppliers in terms of providing information about contract opportunities using electronic portals and/or catalogue management systems where suppliers' products are available online to any user who has the

access, authority and budget to procure those items. This include tender management software. Thus, allowing tenders to be submitted online ensuring secure deliver mechanisms and predetermined process and eliminates many of the administrative tasks associated with traditional procurement.

E-Auctions are common place and this has been enabled by the level of technology now available where pre-selected suppliers bid for a contract over a number of rounds or defined time period and at the same time have the visibility of competing bids. This is very popular with some buyers but is not so popular with suppliers, who may have a very different view from the customer. The perception is that e-auctions can be very impersonal and a rather blunt tool but it is hard to argue with the results that have been achieved in terms of reducing prices. E-auction software is best utilised alongside a service provider who will do the market research, develop a sourcing strategy for your particular items or services and prequalify candidates prior to the auction process.

The various tools and technology now available provide rich data and information that buyers never previously had access to. This enables them to analyse and review demand patterns and service levels from suppliers to inform future decision-making and category strategy for related items.

As one may notice, a tremendous number of researches were conducted to examine the relationship between information technology and the procurement process. However, IT utilisation in the procurement department of oil sectors, which is characterised by its complexity and international dimension, needs to be investigated further.

Now that the key elements in the present research are delimited, the next chapter will clarify the research design in terms of the aim, the description and the administration. It contains the interpretation of the scores as the analysis of the results obtained from the questionnaire.

CHAPTER TWO:

RESULTS AND DISCUSSION

Methodological Framework

To answer the research questions mentioned earlier, this chapter is divided into two sections; section one illustrates the methodological framework guiding this research, including a restatement of the research enquiries, a brief presentation of the field of practical research, the population and sample concerned by this research and the tools used for dada collection and analysis. Section two is devoted to the presentation, analysis and discussion of results obtained from the questionnaire.

1. Restatement of the research aim:

As aforementioned, the primary concerns of the present research can be summarised as follows:

- Providing an overview of the significance and current status of the use of information technology in procurement, mainly in the procurement department CP2/K.
- Identifying the challenges in the use of IT for procurement.
- Shedding light on employees' perception of the use of IT for procurement.

2. Case study

The practical part of this research took place in the procurement department of the Petrochemical Complex of Skikda (CP2/K), which is located inside the SKIKDA industrial zone, with an area of 16.68 hectares, 10% of which is built. The complex started functioning on May 1, 2005.

The HDPE complex is located on the coast, 06 km from the east of Skikda Province with an average height of about 06 m above the sea level. Its geographical position is:

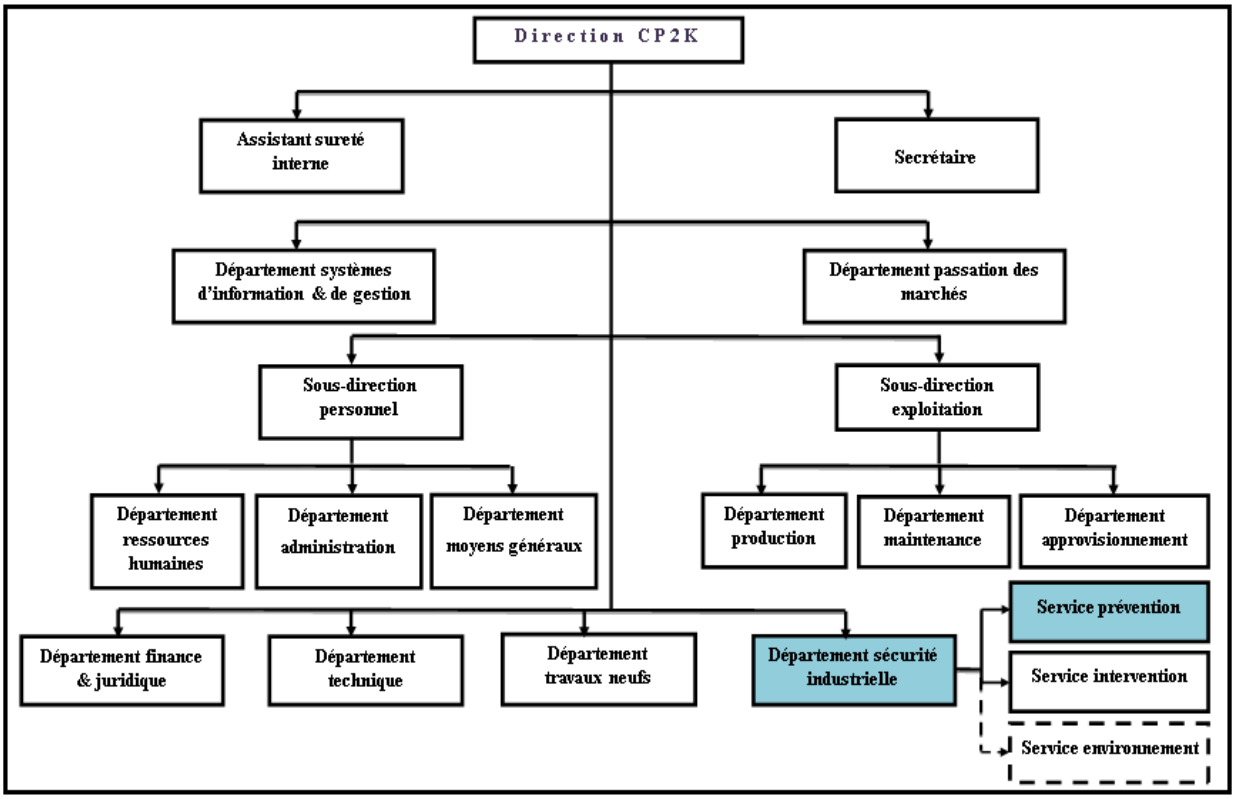
- To the South: The main road of the industrial zone;
- To the East: FIR (The Intervention and Reserve Force);
- To the West: CP1K (Plastic Material Complex).
- To the North: The Mediterranean Sea.

Figure 1: Location of the petrochemical complex (CP2/K) in Skikda industrial zone

Source: administration department of CP2/K

The Petrochemical Complex 2 of Skikda organizational chart is the pictorial representation of the company's internal structure in a top-down order. The chart shows how the departments at this company are modelled,

Figure 2: CP2/K organisational chart

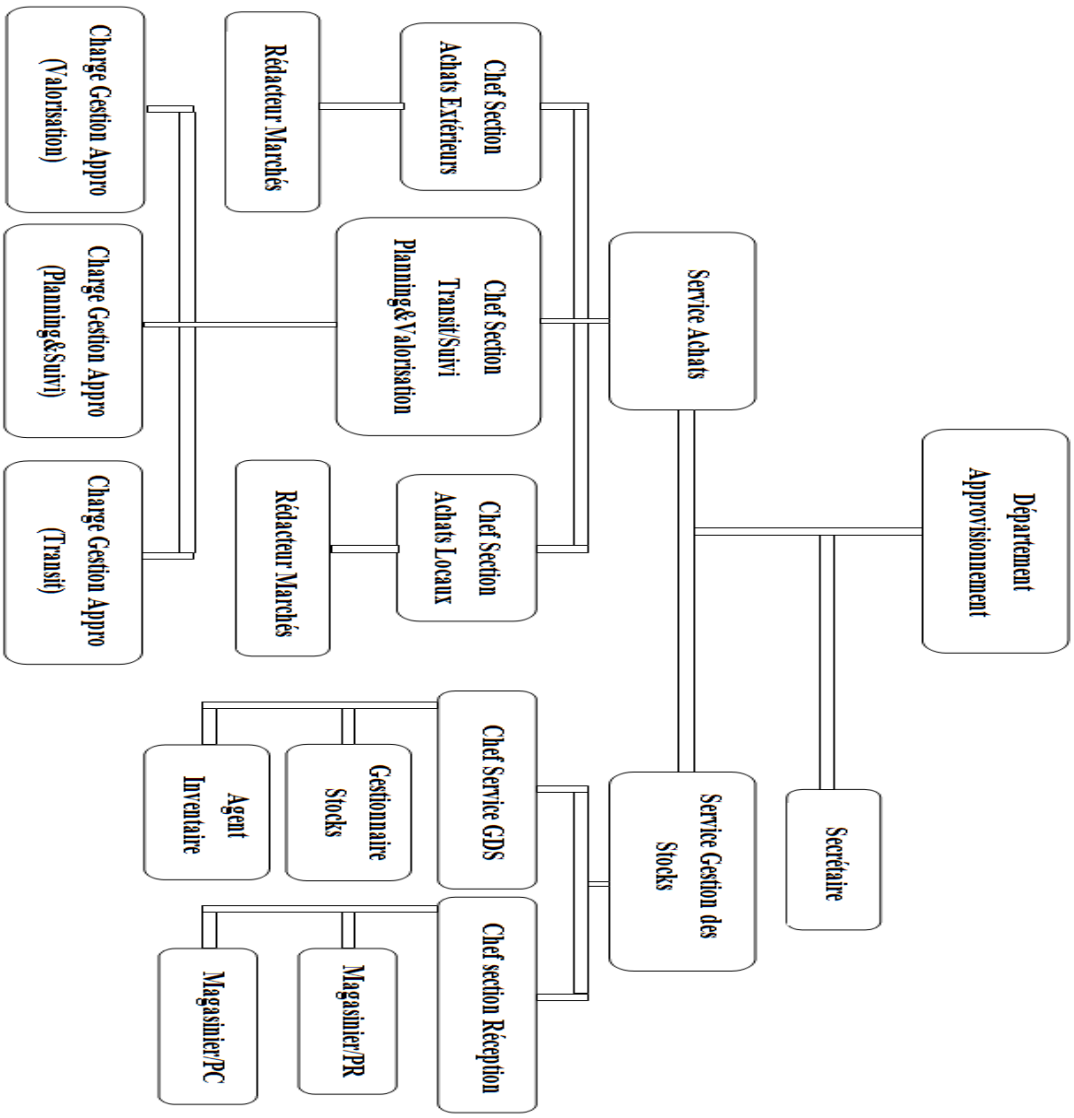


Source: administration department of CP2/K

The procurement department of the CP2/K petrochemical complex ensures the availability of the materials and equipment necessary for operations and maintenance and under the best possible economic and financial conditions.

The procurement department is basically divided into two main branches; the purchasing department and warehouse management department.

Figure 3: Organisational chart of the procurement department



Source: Administration department of CP2/K

3. Research design and methodology

In any research study, the researcher usually goes through a series of interrelated phases that together make up the design of the research. A research design therefore refers to the general plan of data collection and the procedures used in the analysis of data in order to shed light

on the problem(s) under investigation. The aim is to obtain data, which will serve to answer the research questions. Thus, a research design, in this sense, can be defined as “the procedures for conducting the study, including when, from whom and under what conditions data were obtained. Its purpose is to provide the most valid, accurate answers as possible to research questions (McMillan & Schumacher, 1993, p.31)

As far as our research is concerned, data collection is handled using a quantitative approach. According to Goodwin and Goodwin (1996), a quantitative approach uses statistical data in the description of observations. McMillan & Schumacher (1993, p.32) expressed the same idea and added that the quantitative approach “adopts a positivist philosophy of knowing the emphasised objectivity by using numbers, statistics and experimental control to quantify phenomena.” This approach is context free and makes use of deductive methods. The relationships between different variables are stated in tabular and statistical forms. The researcher’s sample, according to McCracken (1988), is of a definite size and type and his conclusions will be generalised to a larger population. The steps involved in this type of research are outlined by Goodwin and Goodwin (1996, p.34) as follows:

- Identify the target population.
- Select the type of instrumentation needed.
- Choose or construct the needed measures.
- Collect data.
- Analyse the data.
- Report the results.

This research takes the position that "the social world can only be understood from the standpoint of the individuals who are part of the on-going action being investigated" (Cohen et al. 2003, p. 19). Hence, we believe that a quantitative approach would serve better the aims the present research sets itself to achieve. This is motivated by the fact that this kind of approach allows the researcher to state the research problem using very specific and definable terms which in turn help to follow the set research aims. The use of this method allows the researcher to enjoy high reliability of data collection and contributes to the objectivity of the conclusions reached. More importantly, this kind of method helps to determine whether the predictive hypothesis underlying the present research holds true (Frankfort-Nachmias Nachmias, 1992).

In the light of the above, it would now be appropriate to turn to the research instrument, the sample and the sampling procedures used in this research

4. Data collection technique

The quality of research depends to a large extent on the quality of the data collection instruments used. The research instrument used for gathering information to investigate the impact of information technology on the procurement process is a questionnaire that was addressed to managers and executives in the procurement department of CP2/K.

4.1.Description of the questionnaire

The questionnaire is addressed to employees of the procurement department and makes use mainly of the technique of close-ended questions but not exclusively. There are cases where respondents are allowed room to provide their own answers. Very briefly, the participants are given various response options to choose from by ticking one of them. All in all, the types of questions used are the following:

- Numeric question items: these questions ask for specific background information such as age, work experience, etc.
- Open-ended questions are those that allow respondents to answer in their own words. These are mainly meant to seek free responses and aim to determine the respondents' opinions of the subject under study.
- Close-ended questions (multiple-choice): one type of close-ended questions is a "dichotomous" question, which allows respondents to choose one of two answer choices (e.g. 'Yes' or 'No'). The second is the multi-choice questions, which allow respondents to choose one of many answer choices. Sometimes, if none of the items provided applies, the respondent has the option 'Other' category followed by an open-ended question of the kind "Please specify"
- The Likert five-point rating scale was strongly adopted to measure participants' attitude towards the usefulness of IT in the procurement process. Likert scale provides five possible answers to a statement or question that allows respondents to indicate their positive-to-negative strength of agreement or strength of feeling regarding the question or statement.

As explained above, some questions are in the form of clarification questions in the sense that they constitute a follow up to the previous question. Questions of this type are in the form of 'Other, please specify'.

The choice of this type of questionnaire is motivated by the desire to involve the participants fully and avoid any superficial engagement with the topic. In addition, being aware that the task is difficult and time consuming, care was taken to ensure that the questions be phrased and ordered in such a way that enables the participants to express their views as they wished. As shown in appendix 1, the questionnaire is divided into four sections:

- Section one: socio-demographical information (questions 1 to 6)
- Section two: current use of IT applications (questions 7 to 12)
- Section three: IT applications in the procurement process (questions 13 to 23)
- Section four: future perspectives (questions 24 and 25)

It consists of 25 questions. Each question is related, sometimes indirectly, to a specific aspect (part) of the present research.

At the end, it is worth specifying that the questions that make up the present questionnaire were largely conceptualised on the basis of the literature review and the analysis model described in the theoretical part of the present research.

4.2.Administration of the questionnaire

As far as the questionnaire final administration is concerned, the questionnaire was distributed through drop and pick method; it was handed directly to twenty five (25) participants from the Procurement Department at the CP2/K and an arrangement with different participants for the completed form to be returned later was made. The personal contact with the participants permitted to explain the purpose of the study, to answer enquiries made by the respondents and to encourage cooperation.

5. Population and sampling

The questionnaire was addressed to the total number of employees in the procurement department, which is twenty five (25) workers distributed as follows: 17 employees in the purchasing section and 8 employees in the warehouse management section. Hence, the type of sampling we are dealing with is the convenience sample.

6. Data analysis technique

The process of data analysis involved several stages: the completed questionnaires were edited for completeness and consistency, checked for errors and omissions and then coded. Data was analysed using mainly descriptive statistics. A Likert scale assumes that the

strength/intensity of an attitude is linear, i.e. on a continuum from strongly agree to strongly disagree, and makes the assumption that attitudes can be measured.

For instance, each of the five responses would have a numerical value (1-5), which would be used to measure the attitude under investigation. The response categories in Likert scales have a rank order, but the intervals between values cannot be presumed equal. Therefore, the mean (and standard deviation) are inappropriate for ordinal data and the mode is probably the most suitable for easy interpretation. The results were presented in table and charts. For the sake of clarity, findings are reported in tabular form and each table is allocated a number. The system of consecutive numbering is adopted throughout this chapter.

7. Data Analysis

Now that the research method, the research instrument and procedures are highlighted, this chapter gives a full analysis and discussion of the data generated by the research instrument used, which is the questionnaire survey. This questionnaire is used to investigate the situation of Information Technology usage in the Procurement Departments of the Petrochemical Complex of Skikda (CP2/K), the users' attitudes towards the use of IT and their future perspectives.

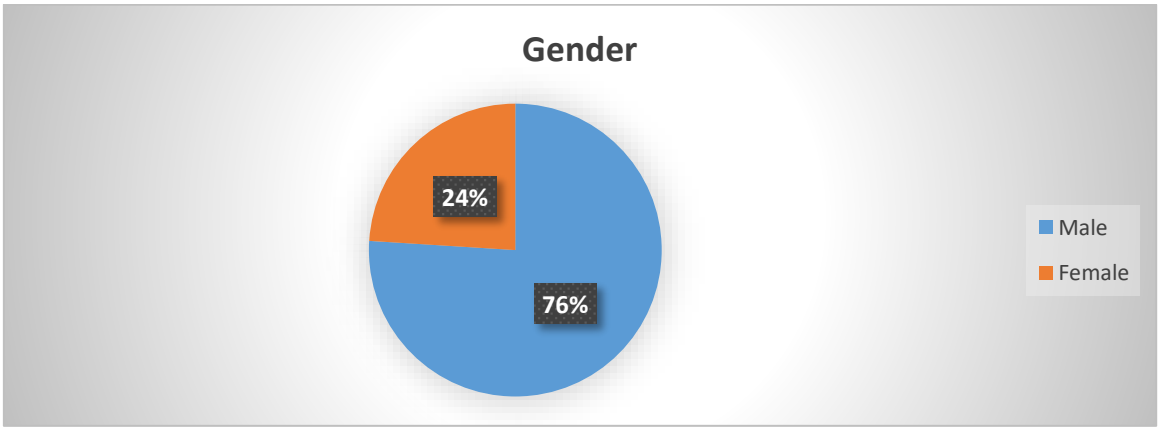
1. Section one: Socio-demographic information:

Q1: Gender:

Table 2: Gender of participants

Option	Male	Female	Total
Number of respondents	19	06	25
Frequency (%)	**76%**	**24%**	100%

Figure 4: Gender of participants



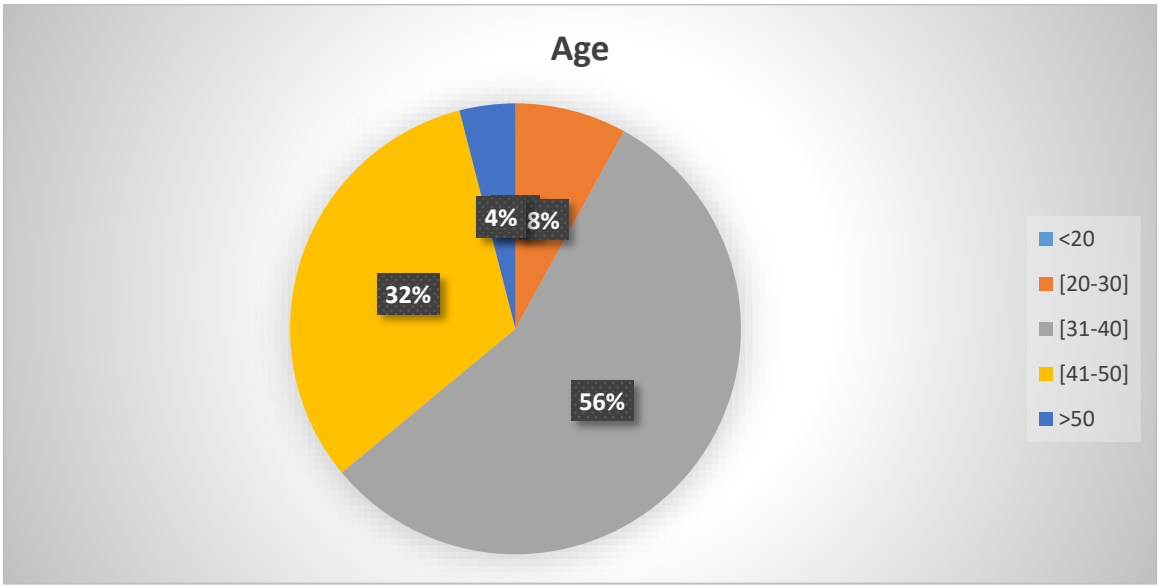
The first question aims to determine the gender of the participants. As the pie chart illustrates, the majority of respondents (i.e. 76%) are males while only 24§% of them are females.

Q2: Age:

Table 3: Age of participants

Age interval	<20	[20-30]	**[31-40]**	[41-50]	>50	Total
Frequency (*f*)	0	2	**14**	8	1	25
Frequency (%)	**0%**	**8%**	**56%**	**32%**	**4%**	100%

Figure 5: Age of participants



Since we have a grouped data of age intervals, we need to calculate the **mode (Mo)** to find out the age with the highest frequency.

We may calculate the mode of grouped data using the formula:

Mode = L + [(f1-f0)/(2f1-f0-f2)]h

where,

- L is the lower limit of the modal class
- h is the size of the class interval
- f1 is the frequency of the modal class
- f0 is the frequency of the class preceding the modal class
- f2 is the frequency of the class succeeding the modal class

Mo= 31+ [(14-2)/ (2x14-2-8)] x9

Mo= 37

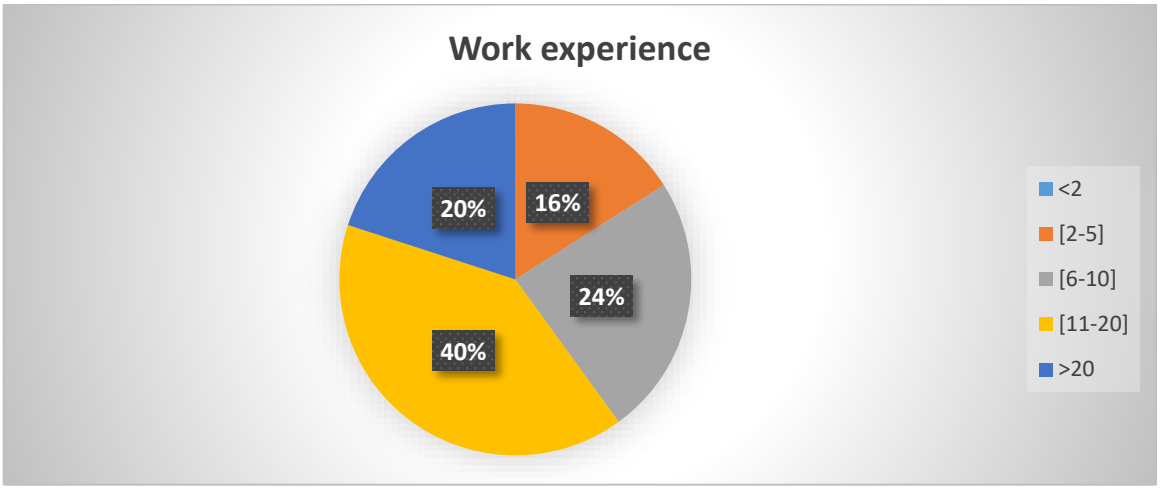
As the above chart shows, more than half of the participants age between 31 and 40 years. The calculation of the mode for interval scale provides more precise insights; 56% of the employees in the procurement department of CP2/K are around 37 years old.

Q3: Work experience

Table 4: Work experience

Work experience interval	<2	[2-5]	[6-10]	**[11-20]**	>20	Total
Frequency (*f*)	0	4	6	**10**	5	25
Frequency (%)	**0%**	**16%**	**24%**	**40%**	**20%**	100%

Figure 6: Work experience



The third question aims at determining the average work experience of the participants involved in our questionnaire. Experienced employees may provide better insights to the use of IT. As the graph highlights, the highest number of respondents (40%) falls in the work experience interval [11-20] years. More precise data can be obtained by calculating the mode as follows:

Mo = L + [(f1-f0)/ (2f1-f0-f2)] h

Mo = 11 + [(10-6)/ (2x10-6-5)] x9

Mo = 15

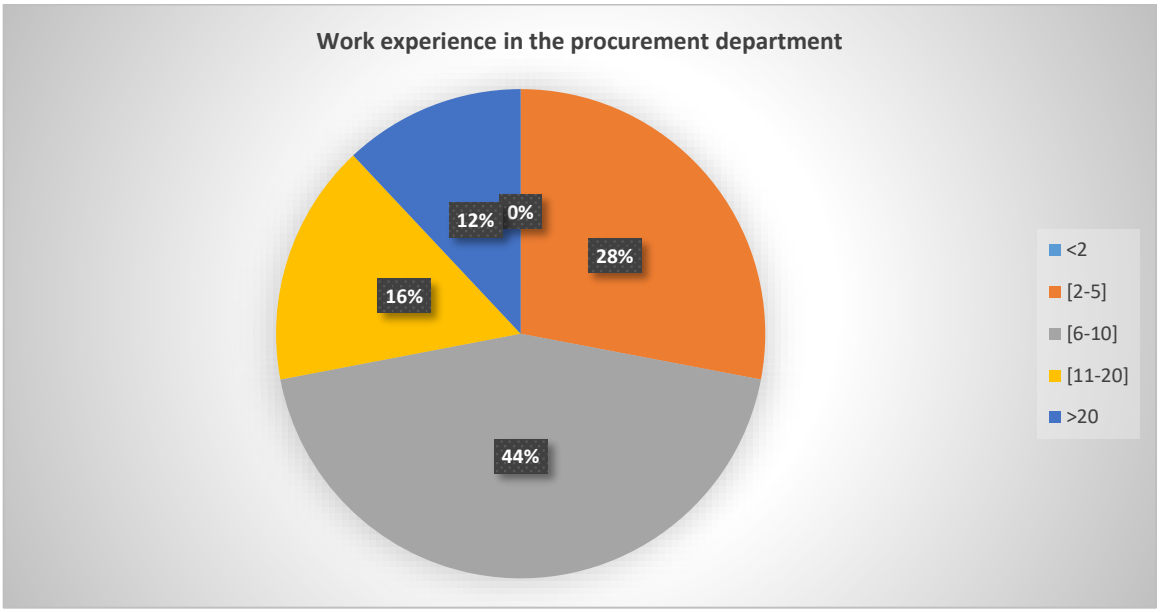
The average work experience is 15 years. Therefore, our sample consists mostly of experienced employees that may share their experience and provide valuable information concerning the importance of IT.

Q4: Work experience in the procurement department

Table 5: Work experience in the procurement department

Work experience interval	<2	[2-5]	**[6-10]**	[11-20]	>20	Total
Frequency (*f*)	0	7	**11**	4	3	25
Frequency (%)	**0%**	**28%**	**44%**	**16%**	**12%**	100%

Figure 7: Work experience in the procurement department



The purpose of this question is to determine the average number of years spent in the procurement department. The results show that 11 employees out of 25 asked (which represent 44% of the sample) have an experience of 6 to 10 years. By the calculation of the mode, we find out that the average number of experience years in the procurement department is nearly 7 years and a half.

Mo = L + [(f1-f0)/ (2f1-f0-f2)] h

Mo = 6 + [(11-7)/ (2x11-7-4)] x4

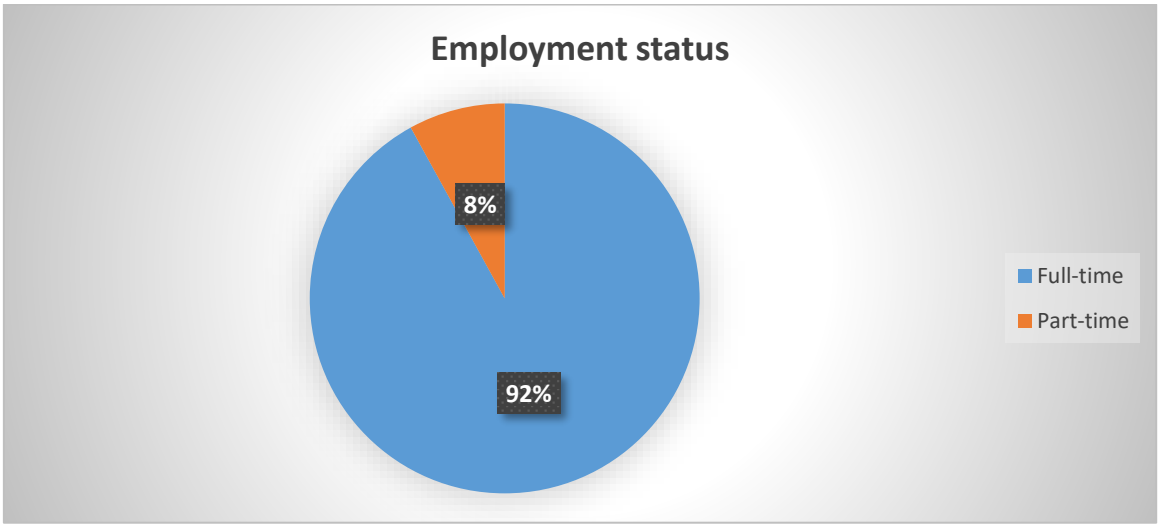
Mo = 7.45

Q5: Employment status

Table 6: Employment status

Employment status	Full-time	Part-time	Total
Frequency (*f*)	23	02	25
Frequency (%)	**92%**	**8%**	100%

Figure 8: Employment status



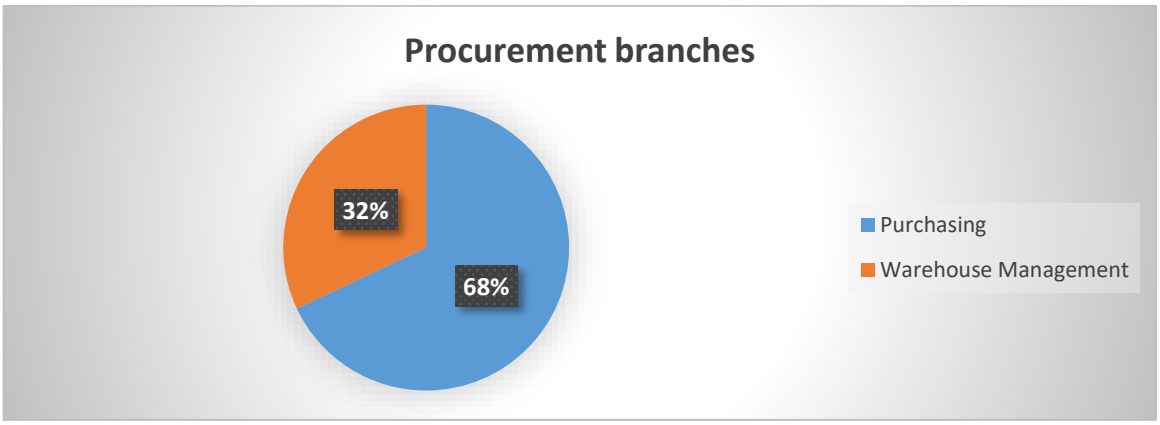
The fifth questions aims at investigating the employment status of the questioned respondents. As the chart demonstrates, the great majority (i.e. 98%) of workers in the procurement department have permanent jobs.

Q6: In which branch of the procurement department do you work?

Table 7: Procurement branches

Procurement branches	Purchasing	Warehouse Management	Total
Frequency (*f*)	17	8	25
Frequency (%)	**68%**	**32%**	100%

Figure 9: Procurement branches



The aim of question six is to determine the distribution of workers between the different branches of the procurement department. As illustrated in the above graph, most workers belong to the purchasing service where they are required to accomplish various tasks such as identifying and screening potential suppliers, selecting a supplier, negotiating terms of payment and arranging any logistical concerns.

2. Section two: Current use of IT applications

Q7: What sort of information technology application(s) do you use for tasks completion?

The purpose of this question is to explore the different information technology applications used to accomplish the various procurement-related activities. The key application that was mentioned by all the questioned workers was "GATIOR", which is a management tool recently adopted by the national company SONATRACH for different departments such as the procurement department. It is a database that allows the storage, treatment, retrieval and sharing of information between the several branches.

Workers in the warehouse management department added "STK", which is a software used mainly for managing geographical spaces in platforms. Other basic computer software programmes were mentioned. These include email servers, telephone, websites, mobile applications, etc.

Q8: Would you please mention other IT applications used in other departments of your company?

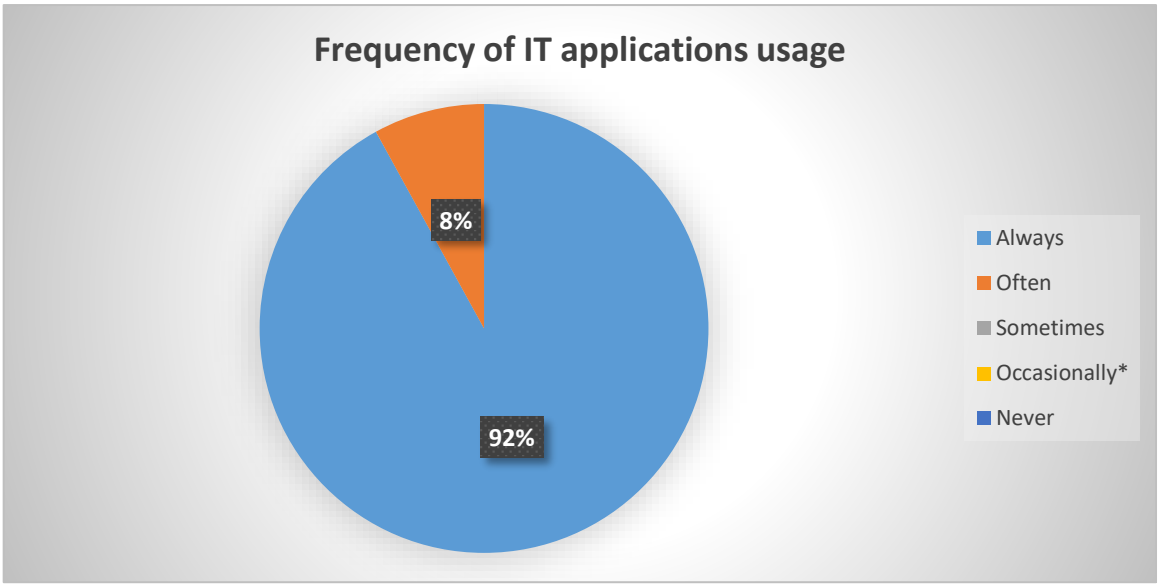
This question aims to investigate the other IT applications adopted in other departments. Some respondents indicated that they have no idea about the software applications used in other departments. However, others mentioned IT software such as "RELEX" in the Maintenance and General Sources Departments, «KTP» in the Financial Department and "J-SORT" in Human Resources Department.

Q9: How often do you use IT applications for performing the different procurement activities?

Table 8: Frequency of IT applications usage

Options	Always (5)	Often (4)	Sometimes (3)	Occasionally (2)	Never (1)	Total
Frequency (*f*)	**23**	2	0	0	0	25
Frequency (%)	**92%**	**8%**	**0%**	**0%**	**0%**	100%

Figure 10: Frequency of IT applications usage



In this question, the workers are asked about the frequency of the use of IT applications to accomplish the daily tasks related to the procurement process. To interpret the overall impression of the sample, we calculate the mode for ungrouped data, which is defined as the value that has a higher frequency in a given set of values. It is the value that appears the most number of times.

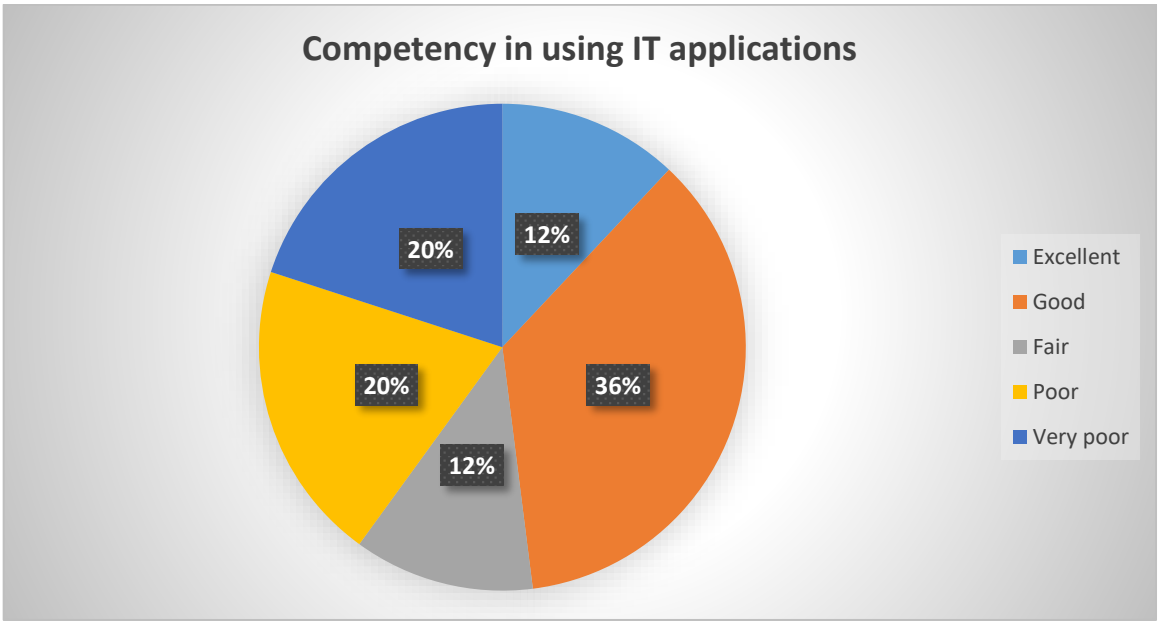
Hence, Mo = 5 (always), that means the majority of workers in the procurement department (92%) consider IT applications, mainly GATIOR, as an indispensable tool that they always use to treat and share the different information needed for tasks fulfilment.

Q10: How would you describe your level of competency in using IT applications utilized in your department?

Table 9: level of competency in using IT applications

Degree of competency	Excellent (5)	Good (4)	Fair (3)	Poor (2)	Very poor (1)	Total
Frequency (*f*)	3	**9**	3	5	5	25
Frequency (%)	**12%**	**36%**	**12%**	**20%**	**20%**	100%

Figure 11: level of competency in using IT applications



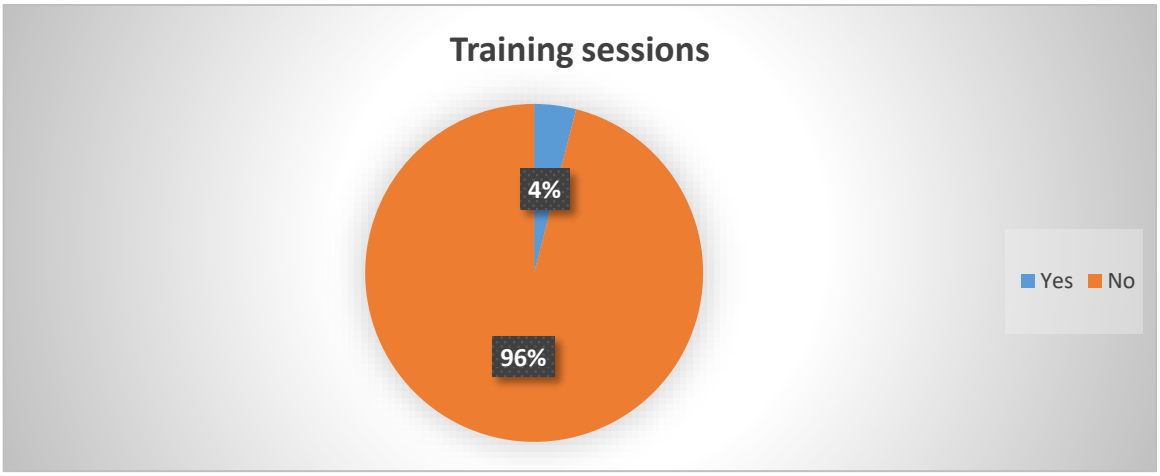
The purpose of this question is to investigate the participants' competency in using IT applications, mainly the newly adopted "GATIOR". The chart shows that the higher frequency (Mo) is that of respondents who claim they have a "good" level of competency and can easily accomplish the different tasks assigned to them (i.e. 36%). However, a significant number of workers (20%) declare that they have either "poor" or "very poor" level of competency.

Q11: Did you receive any training for using IT applications adopted by your company?

Table 10: Training for using IT applications

Option	Yes	No	Total
Frequency (*f*)	01	24	25
Frequency (%)	**4%**	**96%**	100%

Figure 12: Training for using IT applications



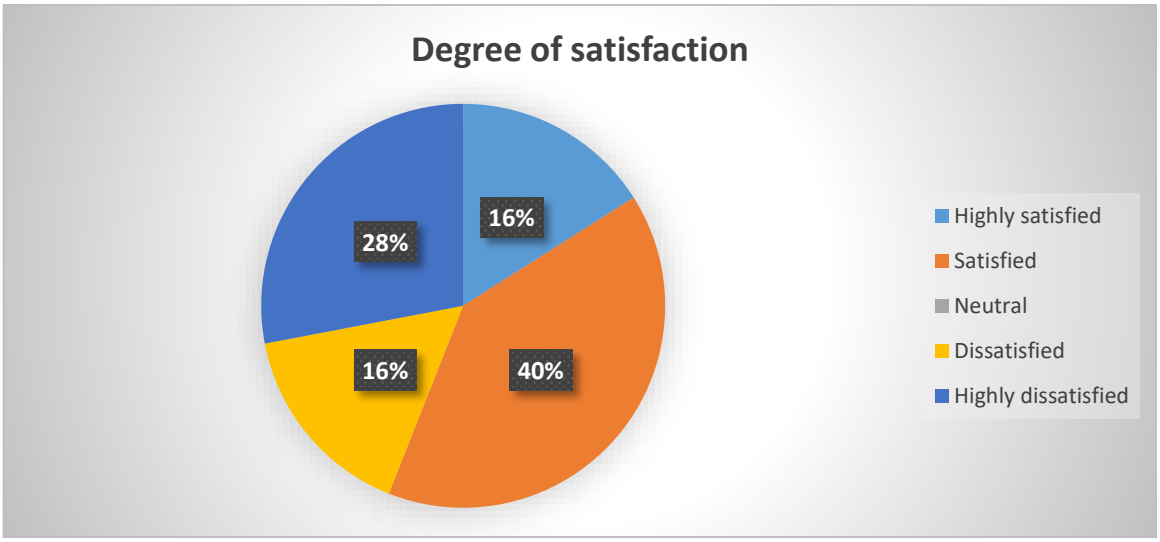
This questions aims to investigate whether the workers in the procurement department received any training programmes to increase their competency. Surprisingly, the great majority of participants (i.e. 96%) did not receive any training despite the complexity of recent software "GATIOR", which provides a multiplicity of options including identifying the company's needs, selecting the suppliers, establishing contracts and managing the level of stocks. Only the Head of the Procurement Department received a short-term training on how to use GATIOR.

Q12: How would you describe your satisfaction with the current applications used for the procurement processes?

Table 11: Degree of Satisfaction

Degree of Satisfaction	Highly satisfied (5)	Satisfied (4)	Neutral (3)	Dissatisfied (2)	Highly dissatisfied (1)	Total
Frequency (*f*)	4	**10**	0	4	7	25
Frequency (%)	**16%**	**40%**	**0%**	**16%**	**28%**	100%

Figure 13: Degree of satisfaction



The answers to this question provide insights about the degree of satisfaction with the current applications used for achieving procurement operations. As illustrated in the table, the mode (Mo) equals 4 (satisfied). In other words, the larger part of workers (i.e. 40%) show their satisfaction with the efficacy of IT applications in accomplishing the different tasks. Nevertheless, a considerable number of workers express either their dissatisfaction (16%) or high dissatisfaction (28%) with the IT used. They claim that lack of any sort of training hinders the optimal use of "GATIOR".

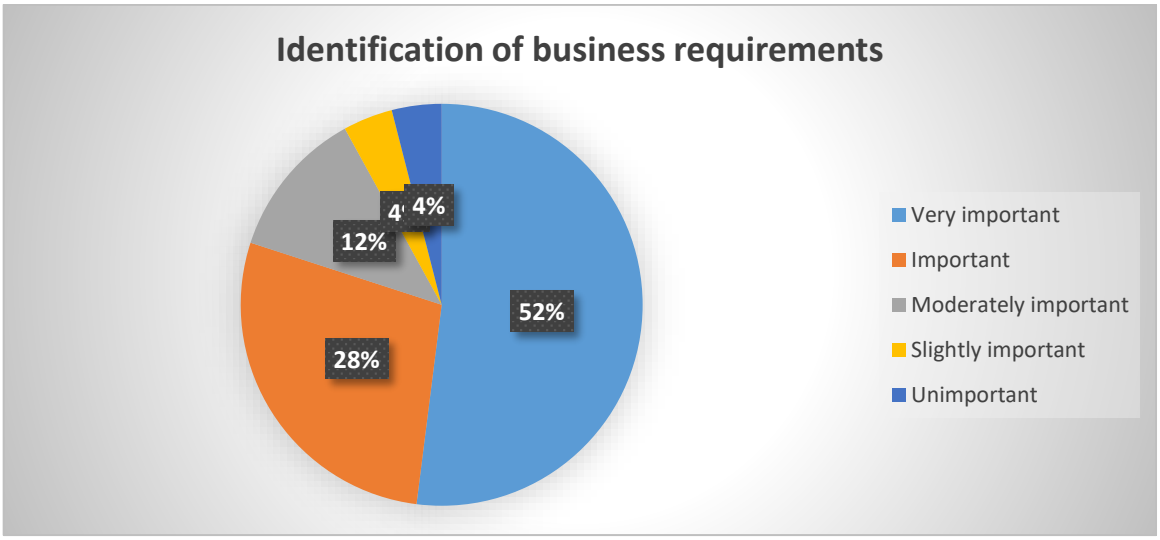
3. Section three: IT applications in procurement process

Q13: To what extent do you think IT applications affect the identification of business requirements?

Table 12: Importance of IT in identifying business requirements

Degree of Importance	Very important (5)	Important (4)	Moderately important (3)	Slightly important (2)	Unimportant (1)	Total
Frequency (*f*)	**13**	**7**	3	1	1	25
Frequency (%)	**52%**	**28%**	**12%**	**4%**	**4%**	100%

Figure 14: Importance of IT in identifying business requirements



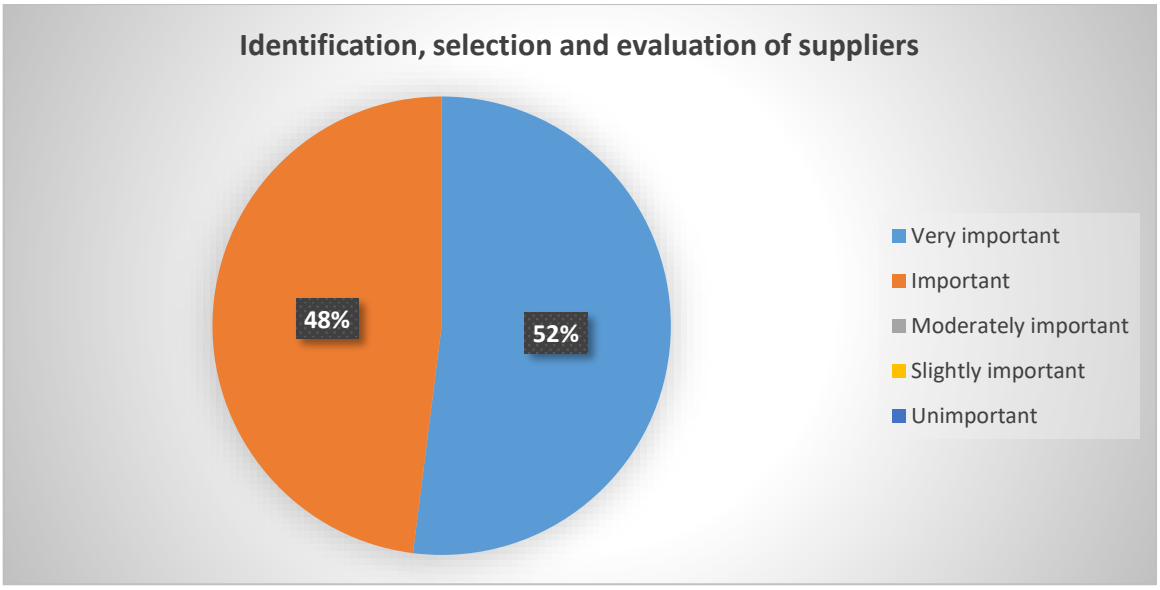
This questions aims to investigate the usefulness of IT applications in identifying the needs of the company, both for internal customers (other departments such as the production department and maintenance department) and external customers. The chart shows that more than half of the workers (52%) consider IT as a very important tool to identify business needs. They state that the shared database between the different departments permits them to announce their needs to the warehouse management section, which in turn, reports its needs to the purchasing section.

Q14: To what extent do you think IT applications affect the identification, selection and evaluation of suppliers?

Table 13: Importance of IT in identifying, selecting and evaluating suppliers

Degree of Importance	Very important (5)	Important (4)	Moderately important (3)	Slightly important (2)	Unimportant (1)	Total
Frequency (*f*)	**13**	12	0	0	0	25
Frequency (%)	**52%**	**48%**	**0%**	**0%**	**0%**	100%

Figure 15: Importance of IT in identifying, selecting and evaluating suppliers



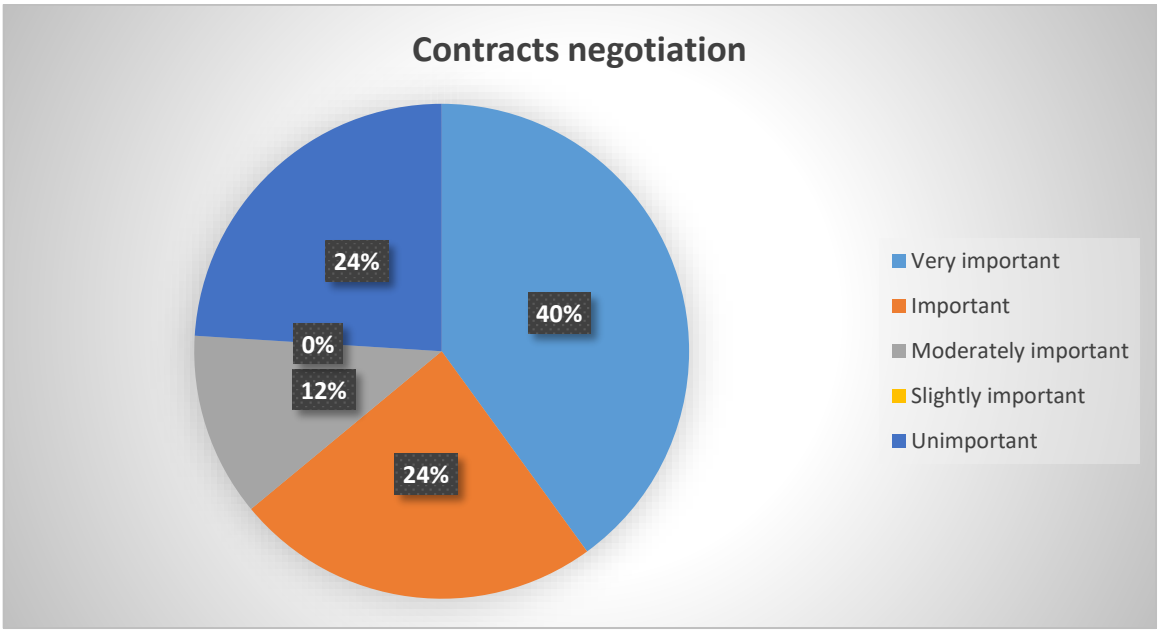
The purpose of this question is to assess the participants' attitudes towards the importance of IT applications for an effective identification, selection and evaluation of potential suppliers. The chart illustrates that the respondents nearly share the same attitudes; they consider IT software as either important (48%) or very important (52%). GATIOR for instance, allows for storing tremendous information about the potential suppliers for different goods/services, their names, addresses, phone numbers, the offers they make, their competence, pricing, after-sale service, potential risks, etc., both on a national and an international level.

Q15: To what extent do you think IT applications affect the negotiation of contract with the selected suppliers?

Table 14: Importance of IT in negotiating contracts with suppliers

Degree of Importance	Very important (5)	Important (4)	Moderately important (3)	Slightly important (2)	Unimportant (1)	Total
Frequency (*f*)	**10**	6	3	0	6	25
Frequency (%)	**40%**	**24%**	**12%**	**0%**	**24%**	100%

Figure 16: Importance of IT in negotiating contracts with suppliers



In this question, workers are asked to express their opinions about the importance of IT applications in establishing and negotiating purchasing contracts with the suppliers. The mode (5- very important) indicates that a large number of employees (40%) consider IT applications, chiefly GATIOR, as an essential instrument for negotiating contracts with suppliers since it provides details about the nature of the target product, its technical characteristics, quality, quantity, price, way of payment, incoterm selected, deadlines, etc. However, an undeniable number of employees (24%) admit that IT applications are of no

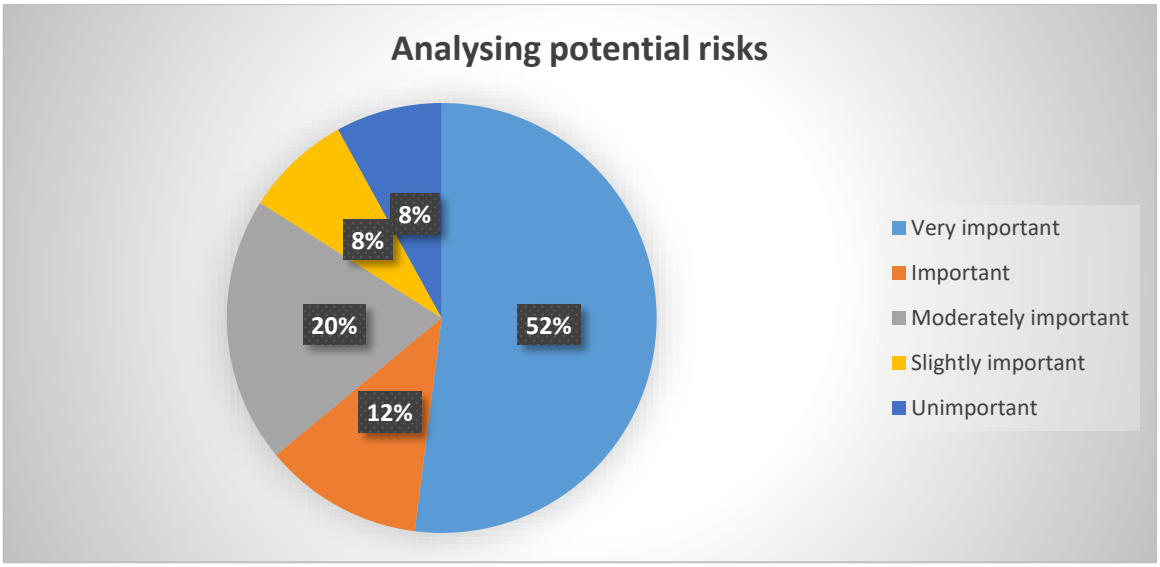
importance at all. They claim that sometimes even after the selection of the most suitable supplier and the negotiation of procurement contracts, some contracts are imposed on them from decision-makers.

Q16: To what extent do you think IT applications affect the analysis of the risks related to various procurement tasks?

Table 15: Importance of IT in analysing potential risks

Degree of Importance	Very important (5)	Important (4)	Moderately important (3)	Slightly important (2)	Unimportant (1)	Total
Frequency (*f*)	13	**3**	5	2	2	25
Frequency (%)	**52%**	**12%**	**20%**	**8%**	**8%**	100%

Figure 17: Importance of IT in analysing potential risks



The purpose of this question is to uncover participants' attitudes about the importance of IT applications in analysing potential risks. The mode (5 – very important) indicates that more than half a sample (52%) asserts that IT is of great importance in detecting risks like operational risk, financial risk, data security risks, etc. GATIOR for instance helps to identify

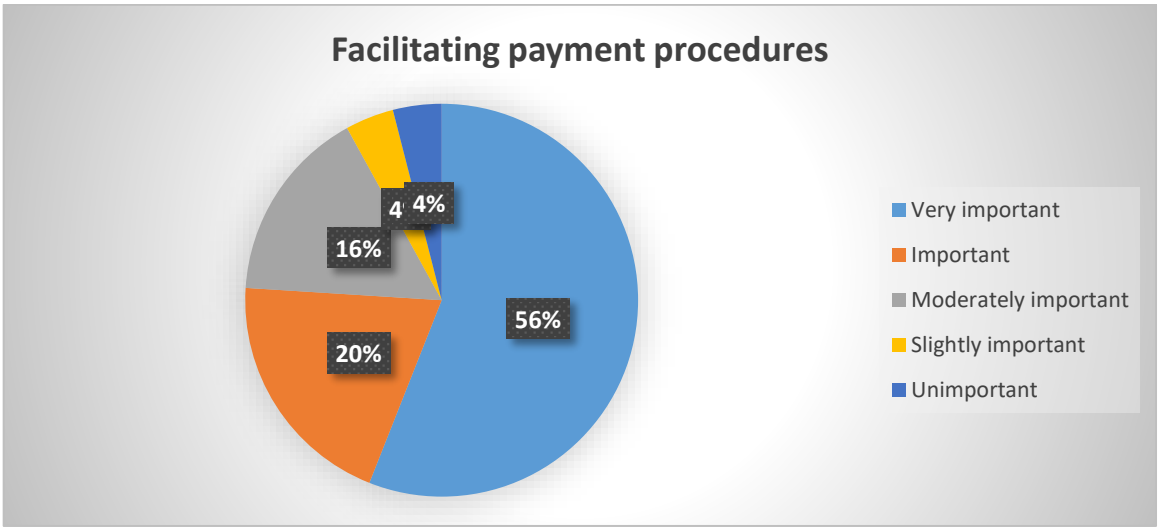
risks with business impact and mitigate them by enforcing compliance amongst all the stakeholders.

Q17: To what extent do you think IT applications affect the facilitation of payment procedures to the suppliers?

Table 16: Importance of IT in facilitating payment procedures

Degree of Importance	Very important (5)	Important (4)	Moderately important (3)	Slightly important (2)	Unimportant (1)	Total
Frequency (*f*)	14	5	4	1	1	25
Frequency (%)	**56%**	**20%**	**16%**	**4%**	**4%**	100%

Figure 18: Importance of IT in facilitating payment procedures



This question aims to reveal the participants opinion about the effectiveness of IT applications in facilitating payment procedures. The mode (Mo = 5—very important) denotes that more than half a sample considers IT as a crucial tool in affecting the different payment procedures with the suppliers. Another 20% state that it is an important instrument. They both claim that IT applications such as GATIOR help them a lot in initiating payments by releasing Purchase Requisitions (PRs) that act as internal approvals for procuring goods and services from suppliers. Once the relevant authorities approve the PRs, the finance team

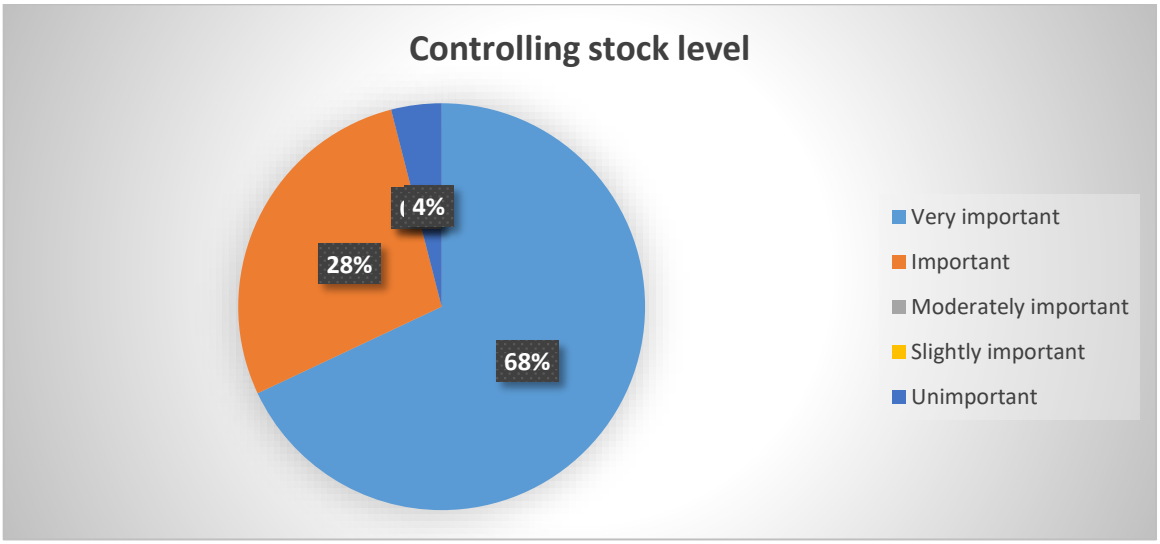
releases a Purchase Order (PO) for the supplier. POs contain critical information like payment terms, pricing and quantity, supplier information, etc. Once the supplier receives the PO, an invoice is sent to the organization. Based on the payment terms, before or after the delivery, they release the payment. The shared database facilitates the transactions between all stakeholders.

Q18: To what extent do you think IT applications affect the control of stocks level?

Table 17: Importance of IT in controlling stock level

Degree of Importance	Very important (5)	Important (4)	Moderately important (3)	Slightly important (2)	Unimportant (1)	Total
Frequency (*f*)	**17**	7	0	0	1	25
Frequency (%)	**68%**	**28%**	**0%**	**0%**	**4%**	100%

Figure 19: Importance of IT in controlling stock level



This question aims to check the participants' attitudes towards the importance of IT applications in controlling stock levels for the different products. As the pie chart demonstrates, the larger part of our sample considers IT applications as a very important tool for monitoring the storage capacity of the different goods by giving them codes in form of serial numbers. Tasks like creating tracking numbers, filing orders, checking inventory, making a purchase history, are all automated which provides us with accurate real-time data.

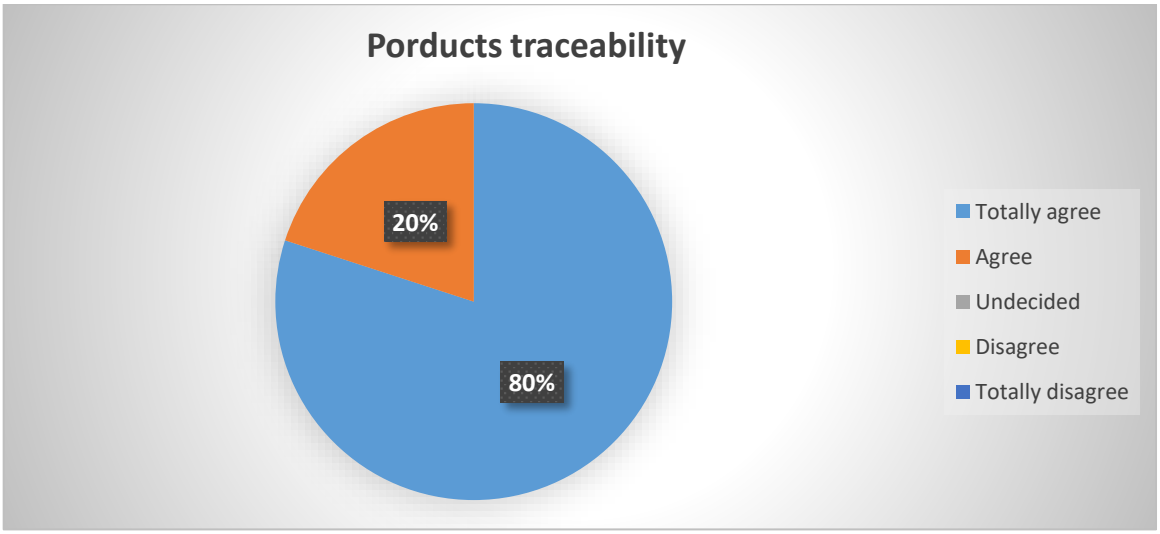
Because IT applications such as GATIOR and STK are always managing the inventory levels, one will know what stock he has on hand, and what needs to be ordered to complete a job. He will also be able to create a PO with one click—saving time and streamlining the purchasing process. Hence, they help avoid production interruptions by eliminating surprise material shortages and replenish based on actual on-the-job demand or for inventory.

Q19: In your opinion, does IT applications help in increasing procured products traceability?

Table 18: Importance of IT in increasing procured products traceability

Attitude	Totally agree (5)	Agree (4)	Undecided (3)	Disagree (2)	Totally disagree (1)	Total
Frequency (*f*)	**20**	5	0	0	0	25
Frequency (%)	**80%**	**20%**	**0%**	**0%**	**0%**	100%

Figure 20: Importance of IT in increasing procured products traceability



In this question, participants are invited to express their degree of agreement concerning the usefulness of IT applications in increasing the procured products traceability. The chart displays that the great majority of workers (80%) totally agree (Mo = 5) on the importance of IT applications as they provide the ability to track products easily. Some notifications will

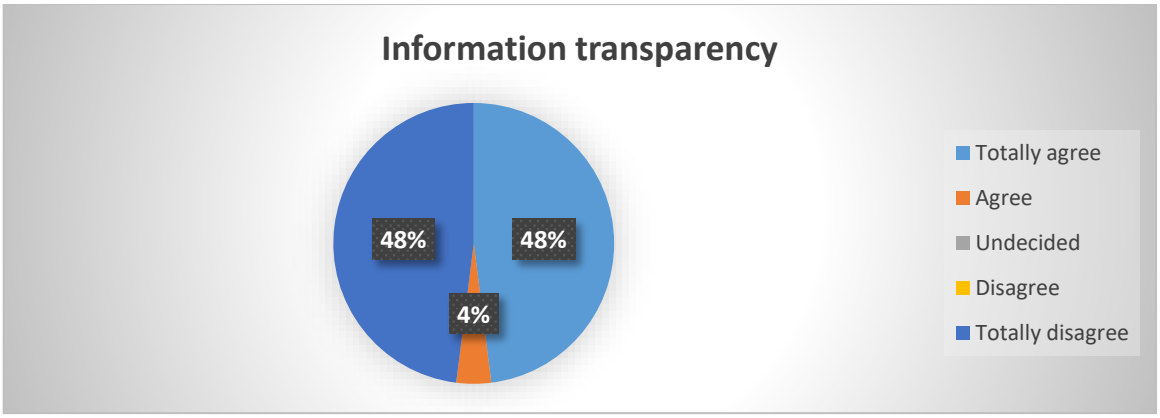
appear automatically when the order has been sent and received. The rest of the sample (20%) also agrees on the effectiveness of IT applications in supervising products' path.

Q20: Do you think IT applications help in increasing information transparency between all the involved parties in the procurement process?

Table 19: Importance of IT in increasing information transparency

Attitude	Totally agree (5)	Agree (4)	Undecided (3)	Disagree (2)	Totally disagree (1)	Total
Frequency (*f*)	**12**	1	0	0	**12**	25
Frequency (%)	**48%**	**4%**	**0%**	**0%**	**48%**	100%

Figure 21: Importance of IT in increasing information transparency



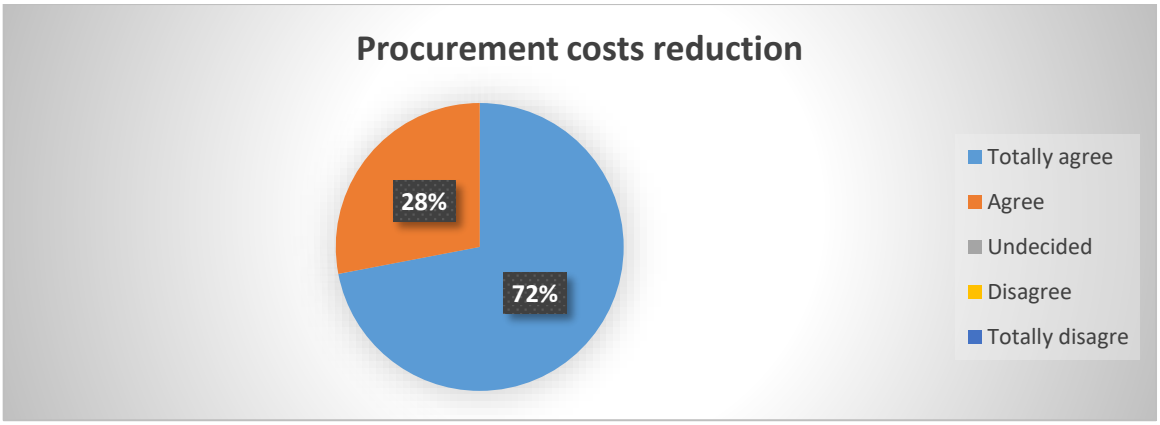
Through this question, respondents are asked to express their opinions about the importance of IT in increasing information transparency. Statistically speaking, this sample is bimodal (Mo1 = 5 / Mo2 = 1), i.e. there are two options with equal number of answers (12 for each). Surprisingly, the answers are equally divided between workers who either totally agree or totally disagree about the usefulness of IT applications for increasing the information availability. Some employees has access to all data but others' access is very limited.

Q21: In your opinion, does IT applications help in reducing costs related to procurement activities?

Table 20: Importance of IT in reducing procurement costs

Attitude	Totally agree (5)	Agree (4)	Undecided (3)	Disagree (2)	Totally disagree (1)	Total
Frequency (*f*)	**18**	7	0	0	0	25
Frequency (%)	**72%**	**28%**	**0%**	**0%**	**0%**	100%

Figure 22: Importance of IT in reducing procurement costs



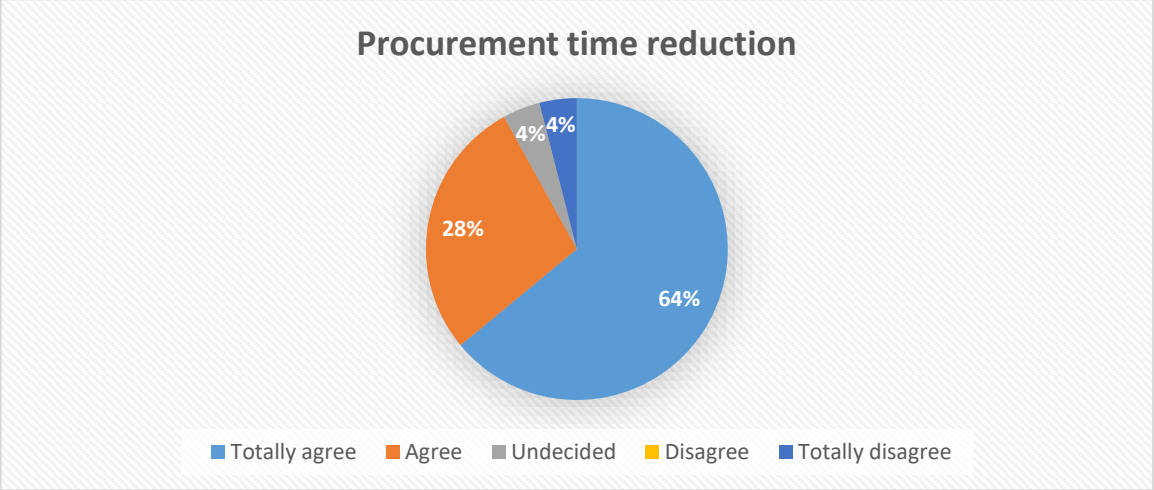
The purpose of this question is to check workers attitudes about the importance of IT applications in reducing procurement costs. The respondents of our sample either totally agree (72%) or agree (28%) on the effectiveness of IT for minimizing costs though the selection of the most suitable suppliers that offer the lower costs and automating processes.

Q22: Do you think IT applications help in reducing time allotted for different procurement activities?

Table 21: Importance of IT in reducing time

Attitude	Totally agree (5)	Agree (4)	Undecided (3)	Disagree (2)	Totally disagree (1)	Total
Frequency (*f*)	16	**7**	1	0	1	25
Frequency (%)	**64%**	**28%**	**4%**	**0%**	**4%**	100%

Figure 23: Importance of IT in reducing time



This question reveals facts about the importance of IT applications in reducing time allocated for the different procurement tasks. The chart shows that the majority of respondents either totally agree (64%) or agree (28%) about the usefulness of IT applications in saving time since they help streamline and automate many of the purchasing tasks and processes. However, a minority (4%) totally disagree with this statement.

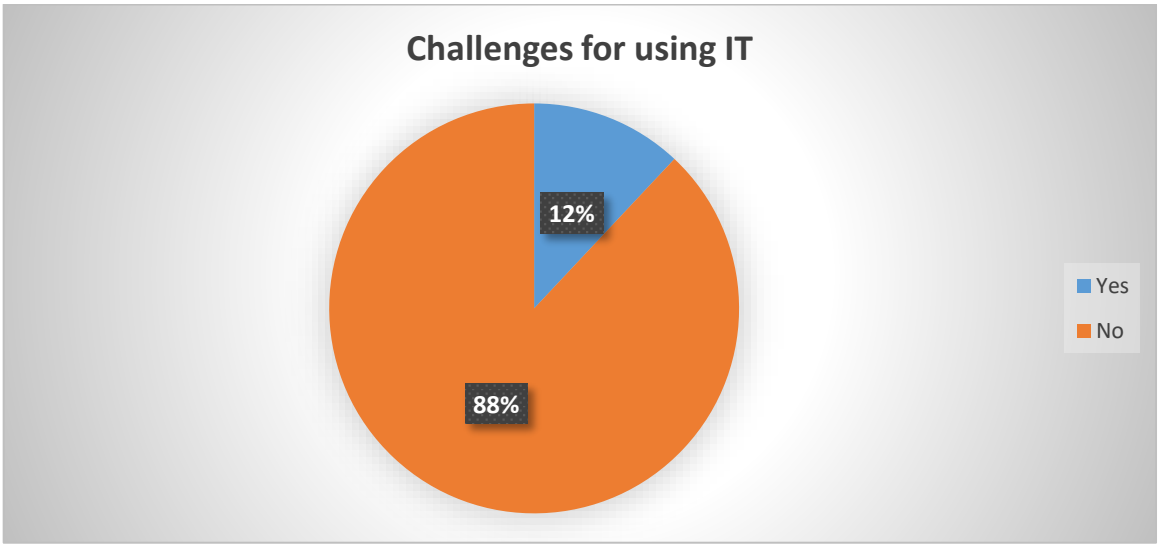
Q23: Are there any challenges that you face while using IT applications?

- If "yes", please specify.

Table 22: Challenges for using IT applications

Option	Yes	No	Total
Frequency (*f*)	3	22	25
Frequency (%)	**12%**	**88%**	100%

Figure 24: Challenges for using IT applications



This question aims to shed light on the challenges that IT users may encounter when accomplishing the different tasks. The majority of respondents assert that though they did not receive any training, they do not face any problems while using GATIOR because of the simplicity of its surface.

The three respondents that declared that they face challenges declared that lack of training programmes prevents the optimal use of IT.

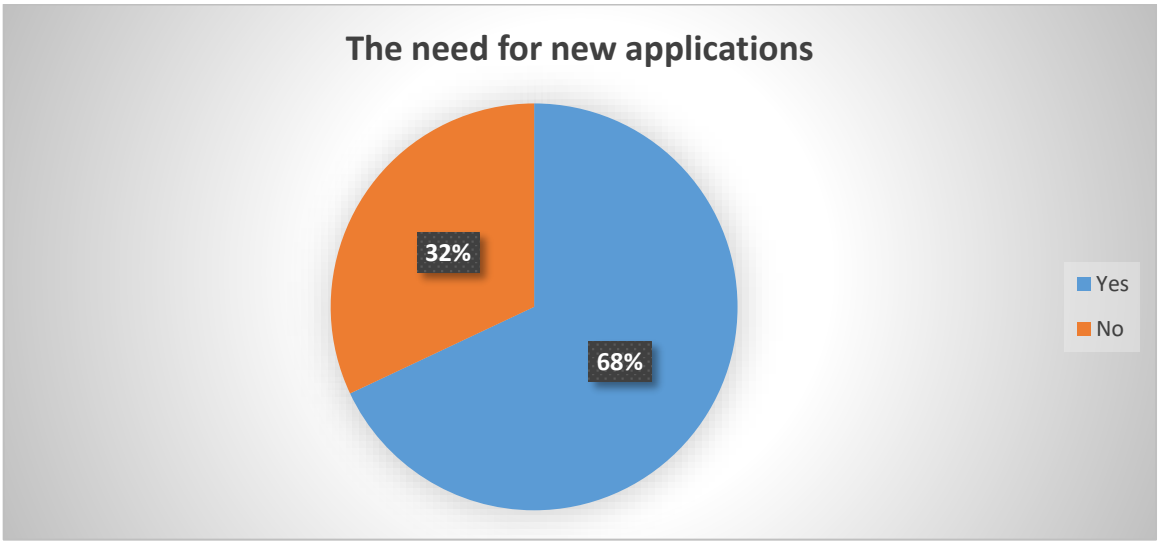
4. Section four: Future perspectives

Q24: Do you think a new IT application is needed for enhancing the procurement performance?

Table 23: The need for new IT applications

Option	Yes	No	Total
Frequency (*f*)	17	8	25
Frequency (%)	**68%**	**32%**	100%

Figure 25: The need for new IT applications



In this question, participants are asked to express their perspectives regarding the adoption of new IT applications. A large number of respondents (68%) are for the adoption of new applications. However, a significant number (32%) are totally satisfied with the current software.

Q25: If your answer to the previous question was "yes", please mention some suggestions.

In this last question, respondents are given room to voice out their suggestions about the applications they think are more effective for enhancing the procurement performance. 9 respondents out of the 17 who said "yes" to the previous question proposed "SAP", which is an enterprise resource planning software developed by the German company SAP SE. SAP ERP incorporates the key business functions of an organization. Business Processes included in SAP ERP are Operations such as Sales & Distribution, Materials Management, Production Planning, Logistics Execution, and Quality Management, Financials, Human Capital Management and Corporate Services.

One respondent said, " Voir les TI qui sont adaptées au niveau mondiale". Another one added, « IL y a plusieurs applications plus avancées dans le domaine des industries. »

Discussion

The analysis of the questionnaire has revealed many facts about the participants' attitudes toward the impact of IT applications on the different stages of the procurement process, the challenges they meet and their future perspectives.

- ✓ The first section helped us to shape the general profile of the participants in our survey; most of them are men, between 30 and 40 years old. They have an experience of about 11 to 20 years and the majority of them have a full-time job.
- ✓ The second section provides data about the Information Technology software presently used in the different departments of the Petrochemical Complex of Skikda. Results show that the decision-makers are aware of the importance of IT for the various operations. Thus, different IT applications are adopted in different departments.
- ✓ GATIOR is the mostly used IT application to accomplish the different operations related to procurement. GATIOR is a newly adopted programme. Workers consider it as an indispensable tool that they use daily. However, the concerned workers did not receive any training to help them achieve an optimal use of its different options.
- ✓ A large number of workers declare that they have a poor competency in using GATIOR because of lack of training programmes.
- ✓ Section three reveals important facts about the usefulness of IT applications in the different stages of procurement;
- ✓ IT applications highlight the needs of the various business units in the company. It helps map the relevant vendor to every requirement without duplicating efforts and resources.
- ✓ Thanks to IT applications such as GATIOR, executives easily identify a set of suppliers, evaluate them, and finally select the most competent supplier for the requirements. GATIOR helps creating a list of preferred suppliers that can cater to the requirements. Then, suppliers are evaluated based on critical criteria like pricing, quality, after-sale service, industrial recognition, risks, etc. GATIOR detects the supplier that provides the maximum value at the lowest possible cost.
- ✓ IT applications promotes the negotiation of the pricing and quality, terms and conditions, scope of work, etc. Effective contracting ensure all obligations are complied with, and the maximum value is extracted from the relationship built with the suppliers.

- ✓ Using an IT application such as GATIOR helps creating better relationships, enhances, and streamlines communications with suppliers.
- ✓ IT provides a standardized process that can help make sure invoices are always paid on time, which can prevent late fees and build good relationships with suppliers.
- ✓ Because IT applications such as GATIOR and STK are always managing the inventory levels, one will know what stock he has on hand, and what needs to be ordered to complete a job. It helps avoid production interruptions by eliminating surprise material shortages and replenish based on actual on-the-job demand or for inventory. However, participants whom are workers in the warehouse management section are still obliged to print the different purchase requisitions and hand them to the purchasing department. In addition, GATIOR does not alert the purchasing department when the stock reaches a certain critical level, notifying that stock needs to be reordered.
- ✓ IT is of great importance in detecting risks like operational risk, financial risk, data security risks, etc. GATIOR, for instance, helps to identify risks with business impact and mitigate them by enforcing compliance amongst all the stakeholders.
- ✓ IT applications make relevant procurement information available to everyone. They help sharing real-time data between all the involved parts.
- ✓ IT applications offer the possibility to track the products easily. Some notifications will appear automatically when the order has been sent and received.
- ✓ In this IT system, there is an automatic notification for invoices from vendors that the company has not paid. These notifications can help increase procurement efficiency in business so that there are no obstacles.
- ✓ Procurement activities become more controlled with budgeting management and cost centres per department or project. These benefits will prevent the misuse of data and provide better financial planning.
- ✓ IT applications help streamline and automate many of the purchasing tasks and processes which leads to saving time and increasing productivity.
- ✓ Procurement staff welcome the new IT applications such as SAP and insist on the importance of training to reach an optimal use of information technology software.

As far as the results of our study are concerned, our hypothesis can be confirmed. The participants positive attitudes towards the usefulness of IT reflects the essential role it plays in the accomplishment of the daily activities. However, they still rely on paper-based procurement to save the different documents related to bids and purchase orders.

Conclusion

The present dissertation has investigated the importance of information technology in enhancing the procurement process of the Petrochemical Complex of Skikda. The main objective of this research was to investigate the usefulness of IT software in accomplishing the different procurement tasks and to identify the challenges that workers may encounter while using IT applications. We suppose that if IT is used effectively, it will improve the overall performance of procurement in CP2/K.

To achieve the above stated aims, it was deemed necessary to explore the concepts of procurement and information technology, the subject matter of the present dissertation. The first chapter is devoted to theoretical framework related to this research. The examined literature has revealed some important facts about how IT is transforming the way that business is conducted. Previous researches claim that procurement department has been radically changed by the development of the Information Technology.

The second chapter is an attempt to analyse and interpret the data collected from the questionnaire. Participants' responses illustrated that thanks to IT software adopted by the procurement department of CP2/K, information exchange has become significantly faster and broader, simplifying several steps with regards to purchasing, and also enhancing fast decision making. In addition, the quality has improved, costs have been reduced, and speed has increased. However, the analysis of responses has revealed some challenges that employees face such as lack of training and dependence on paper-based procurement.

The study addresses decision-makers in organisations who are affected in some way by IT solutions in procurement and aims to offer them orientation for the conception and further development of solutions. It spots the light on the reasons behind individuals' motives or resistance to IT. In addition, it should provide research and teaching faculties with up-to-date insight into the market.

Limitations of the Study

Some uncontrollable factors affect the quality of this research. One obvious obstacle was time; the nature of this study requires much more time than what was devoted because of the complexity of the procurement process and the multiplicity of its operations. In fact, we needed not less than six (06) months to test the validity of our hypothesis. In this case, we were obliged to limit our data collection tool to a single questionnaire. Another limitation is

that we could not conduct our research on a large sample because there were only twenty-five (25) employees in the department in which our practical research took place. It is worth mentioning that because of the sensitivity of the oil sector, a lot of information concerning the bids, the suppliers, and the financial transactions could not be shared. Hence, we were obliged to rely on employees' responses to answer the research questions.

Further recommendations

Since the procurement department of companies that belong to the oil sector is of crucial importance for the whole economy of the country, it is highly recommended that further studies are carried out to reach an optimal use of information technology in this sector. For instance, a comparative study between the effectiveness of the existing ERP and the SAP software is suggested.

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APPENDICES

Appendix A – Questionnaire

Ministry of Higher Education and Scientific Research

Higher National School of Management – Kolea

Questionnaire

The purpose of this research is to help identify the impact of **information technology (IT) on the procurement process in CP2/K**. This questionnaire therefore aims at gathering information about the employees' conception of IT, their attitude towards the use of IT, and the challenges they face.

Thank you very much for taking the time to share your experiences and ideas. Your input is very important and greatly appreciated and the information provided will be held in confidence and will be used for academic purposes only.

SECTION ONE : SOCIODEMPGRAPHICAL INFORMATION

1. Gender: Male ☐ Female ☐

2. Age: Less than 20 years ☐

20-30 years ☐

31-40 years ☐

41-50 years ☐

More than 50 years ☐

3. Work experience: Less than 2 years ☐

2-5 years ☐

6-10 years ☐

11-20 years ☐

More than 20 years ☐

4. Work experience in the procurement department:

Less than 2 years ☐

2-5 years ☐

6-10 years ☐

11-20 years ☐

More than 20 years ☐

5. Employment status: Full-time ☐ Part-time ☐

6. In which branch of the procurement department do you work?

Purchasing department: ☐ Warehouse management department ☐

SECTION TWO: CURRENT USE OF IT APPLICATIONS

7. What sort of information technology application(s) do you use for tasks completion?

……

……

8. Would you please mention other IT applications used in other departments of your company?

……

……

……

9. How often do you use IT applications for performing the different procurement activities?

Always ☐
Often ☐
Sometimes ☐
Occasionally ☐
Never ☐

10. How would you describe your **level of competency in using IT applications** utilized in your department? Excellent ☐
Good ☐
Fair ☐
Poor ☐
Very poor ☐

11. Did you receive any **training** for using IT applications adopted by your company?

Yes ☐ No ☐

12. How would you describe your **satisfaction with the current applications** used for the procurement processes?

Highly satisfied ☐
Satisfied ☐
Neutral ☐
Dissatisfied ☐
Highly dissatisfied ☐

SECTION THREE: IT APPLICATIONS IN PROCUREMENT PROCESS

13. To what extent do you think IT applications affect the **identification of business requirements**?

- Very important ☐
- Important ☐
- Moderately important ☐
- Slightly important ☐
- Unimportant ☐

14. To what extent do you think IT applications affect the **identification, selection and evaluation of suppliers**?

- Very important ☐
- Important ☐
- Moderately important ☐
- Slightly important ☐
- Unimportant ☐

15. To what extent do you think IT applications affect the **negotiation of contract with the selected suppliers**?

- Very important ☐
- Important ☐
- Moderately important ☐
- Slightly important ☐
- Unimportant ☐

16. To what extent do you think IT applications affect the **analysis of the risks related to various procurement tasks**?

- Very important ☐
- Important ☐
- Moderately important ☐
- Slightly important ☐
- Unimportant ☐

17. To what extent do you think IT applications affect the **facilitation of payment procedures to the suppliers**? Very important ☐

Important ☐

Moderately important ☐

Slightly important ☐

Unimportant ☐

18. To what extent do you think IT applications affect the **control of stocks level?**

Very important ☐

Important ☐

Moderately important ☐

Slightly important ☐

Unimportant ☐

19. In your opinion, does IT applications help in **increasing procured products traceability?** Totally agree ☐

Agree ☐

Undecided ☐

Disagree ☐

Totally disagree ☐

20. Do you think IT applications help in **increasing information transparency between all the involved parties in the procurement process?**

Totally agree ☐

Agree ☐

Undecided ☐

Disagree ☐

Totally disagree ☐

21. In your opinion, does IT applications help in **reducing costs** related to procurement activities?

- Totally agree ☐
- Agree ☐
- Undecided ☐
- Disagree ☐
- Totally disagree ☐

22. Do you think IT applications help in **reducing time allotted for different** procurement activities?

- Totally agree ☐
- Agree ☐
- Undecided ☐
- Disagree ☐
- Totally disagree ☐

23. Are there any **challenges** that you face while using IT applications?

Yes ☐ No ☐

- If yes, please specify: ……

……

……

SECTION FOUR: FUTURE PERSPECTIVES

24. Do you think a new IT application is needed for enhancing the procurement performance? Yes ☐ No ☐

25. If your answer to the previous question was "yes", please mention some suggestions:

……

……

Appendix B – Questionnaire

(French version)

Ministère de l'Enseignement Supérieure et de la Recherche Scientifique

Ecole Nationale Supérieure de Management - Koléa

Questionnaire

Le rôle principal de cette recherche est d'aider à **identifier l'impact des technologies de l'information (TI) sur le processus d'approvisionnement au CP2/K.** Les buts de ce questionnaire est d'obtenir des informations sur la conception des employés de IT, leurs attitudes envers son utilisation et les défis auxquels ils sont confrontés.

Merci beaucoup d'avoir pris le temps de partager vos expériences et vos idées. Votre contribution est très importante et grandement appréciée et les informations fournies seront tenues confidentielles et seront utilisées à des fins académiques uniquement.

PREMIÈRE SECTION : INFORMATIONS SOCIODÉMOGRAPHIQUES

1. Sexe: Homme ☐ Femme ☐

2. Age:
- Moins de 20 ans ☐
- 20-30 ans ☐
- 31-40 ans ☐
- 41-50 ans ☐
- Plus de 50 ans ☐

3. Expérience professionnelle :
- Moins de 2 ans ☐
- 2-5 ans ☐
- 6-10 ans ☐
- 11-20 ans ☐
- Plus de 20 ans ☐

4. Expérience professionnelle dans le département des approvisionnements :

Moins de 2 ans ☐

2-5 ans ☐

6-10 ans ☐

11-20 ans ☐

Plus de 20 ans ☐

5. Statut professionnel : Titularisé ☐ Contractuel ☐

6. Dans quel service du département des approvisionnements travaillez-vous ?

Service Achat ☐ Service de gestion des stocks ☐

SECTION DEUX : UTILISATION ACTUELLE DES APPLICATIONS DES TECHNOLOGIES DE L'INFORMATION

7. Quel **type d'application(s) de technologie de l'information (TI)** utilisez-vous pour l'exécution des tâches ? …….

……

8. Pourriez-vous mentionner **d'autres applications** de TI utilisées dans d'autres départements de votre entreprise ?

……

……

……

9. À quelle fréquence utilisez-vous des applications informatiques pour effectuer les différentes activités d'approvisionnement ?

Toujours ☐

Souvent ☐

Quelquefois ☐

Parfois ☐

Jamais ☐

10. Comment décririez-vous votre **niveau de compétence** dans l'utilisation des applications TI utilisées dans votre département ?

Excellent ☐

Bon ☐

Moyen ☐

Mal ☐

Très mal ☐

11. Avez-vous reçu **une formation** à l'utilisation des applications de TI adoptées par votre entreprise ? Oui ☐ Non ☐

12. Comment décririez-vous votre **satisfaction** à l'égard des applications actuelles utilisées pour le processus d'approvisionnement ?

Très satisfait ☐

Plutôt Satisfait ☐

Ni satisfait, ni insatisfait ☐

Plutôt insatisfait ☐

Très insatisfait ☐

SECTION TROIS : APPLICATIONS TI DANS LE PROCESSUS D'APPROVISIONNEMENT

13. Dans quelle mesure pensez-vous que les applications de TI affectent **l'identification des besoins de l'entreprise** ?

- Très important ☐
- Important ☐
- D'importance modérée ☐
- Peu important ☐
- Sans importance ☐

14. Dans quelle mesure pensez-vous que les applications de TI affectent **l'identification, la sélection et l'évaluation des fournisseurs** ?

- Très important ☐
- Important ☐
- D'importance modérée ☐
- Peu important ☐
- Sans importance ☐

15. Dans quelle mesure pensez-vous que les applications de TI affectent **la négociation du contrat avec les fournisseurs sélectionnés** ?

- Très important ☐
- Important ☐
- D'importance modérée ☐
- Peu important ☐
- Sans importance ☐

16. Dans quelle mesure pensez-vous que les applications de TI affectent **l'analyse des risques liés aux différentes activités d'approvisionnement** ?

Très important ☐
Important ☐
D'importance modérée ☐
Peu important ☐
Sans importance ☐

17. Dans quelle mesure pensez-vous que les applications de TI affectent **la facilitation des procédures de paiement aux fournisseurs ?**

Très important ☐
Important ☐
D'importance modérée ☐
Peu important ☐
Sans importance ☐

18. Dans quelle mesure pensez-vous que les applications de TI affectent **le contrôle du niveau des stocks** ?

Très important ☐
Important ☐
D'importance modérée ☐
Peu important ☐
Sans importance ☐

19. À votre avis, les applications de TI contribuent-elles à **accroître la traçabilité des produits achetés ?**

Tout à fait d'accord ☐
D'accord ☐
Ni d'accord, ni pas d'accord ☐
Pas d'accord ☐
Pas du tout d'accord ☐

20. Pensez-vous que les applications TI contribuent **à accroître la transparence des informations** entre toutes les parties impliquées dans le processus d'approvisionnement **?**

- Tout à fait d'accord ☐
- D'accord ☐
- Ni d'accord, ni pas d'accord ☐
- Pas d'accord ☐
- Pas du tout d'accord ☐

21. À votre avis, les applications de TI aident-elles **à réduire les coûts liés aux activités d'approvisionnement** ?

- Tout à fait d'accord ☐
- D'accord ☐
- Ni d'accord, ni pas d'accord ☐
- Pas d'accord ☐
- Pas du tout d'accord ☐

22. Pensez-vous que les applications de TI aident à **réduire le temps alloué** aux différentes activités d'approvisionnement ?

- Tout à fait d'accord ☐
- D'accord ☐
- Ni d'accord, ni pas d'accord ☐
- Pas d'accord ☐
- Pas du tout d'accord ☐

23. Y a-t-il **des défis** auxquels vous faites face lors de l'utilisation d'applications de TI ?

Oui ☐ Non ☐

- Si oui, veuillez préciser:

……

……

……

SECTION QUATRE : PERSPECTIVES D'AVENIR

24. Pensez-vous qu'une **nouvelle application de TI est nécessaire** pour améliorer la performance des approvisionnements ? Oui ☐ Non ☐

25. Si votre réponse à la question précédente était **"oui",** veuillez mentionner quelques **suggestions:**

……

……

……

Merci