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The use of Technologies in the Procurement Process: A Pedagogical Case Study

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TECHNOLOGY
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Departament of Information Science and Technology

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RESUMO

As tecnologias da informação têm vindo a causar um grande impacto na gestão da cadeia de abastecimento, aumentando a agilidade, a eficiência e a conectividade. A tecnologia pode acelerar procedimentos importantes, como a avaliação e a escolha de fornecedores. Esta tese desenvolve um caso pedagógico de estudo focado na CJR, Lda., uma empresa líder no setor da energia renovável. A pesquisa explora como as tecnologias da informação podem ser aplicadas para melhorar a gestão de compras, com foco específico no processo de seleção e avaliação de fornecedores. O quadro conceptual provém da literatura académica e a recolha de dados baseia-se em entrevistas semiestruturadas de pesquisa qualitativa com os principais chefes de departamento. Ao analisar as práticas da CJR e identificar oportunidades para melhoria tecnológica, este estudo fornece um exemplo prático que preenche uma lacuna na literatura e oferece aos alunos uma experiência prática de aprendizagem sobre o uso da tecnologia para melhorar a gestão da cadeia de abastecimento. O estudo destaca que a tecnologia permite escolher fornecedores de maneira mais eficiente, segura e com base em dados, centralizando informações, visualizando comparações e integrando ferramentas para monitorização de desempenho e riscos. Ele também mostra que a automatização melhora a qualidade da seleção de fornecedores ao padronizar a pré-qualificação, as verificações de conformidade, a monitorização de KPIs e os relatórios de feedback, permitindo uma tomada de decisão objetiva e consistente. No geral, esta tese ajuda os alunos a aprender em como as tecnologias da informação podem melhorar os procedimentos de compras.

Palavras-chave: Caso pedagógico; Gestão da cadeia de abastecimento; Seleção de fornecedores; Tecnologias de informação

Sistema de Classificação JEL:

M15 – IT Management

M11 – Production Management

ABSTRACT

Information technologies have been causing a significant impact on supply chain management, increasing agility, efficiency, and connectivity. Technology can accelerate important procedures, such as the evaluation and selection of suppliers. This thesis develops a pedagogical case study focused on CJR, Lda., a leading company in the renewable energy sector. The research explores how information technologies can be applied to improve procurement management, with a specific focus on the supplier selection and evaluation process. The conceptual framework comes from academic literature and data collection is based on a Qualitative research semi-structured interviews with key department heads. By analyzing CJR's practices and identifying opportunities for technological enhancement, this study provides a practical example that fills a gap in the literature and offers students a hands-on learning experience on the use of technology to enhance supply chain management. The study highlights that technology allows choosing suppliers in a more efficient, safe, and data-driven way by centralizing data, visualizing comparisons, and integrating tools for performance and risk monitoring. It also shows that automation enhances the quality of supplier selection by standardizing prequalification, compliance checks, KPI monitoring, and feedback reporting, allowing for objective and consistent decision-making. Overall, this thesis helps students to learn how information technologies can enhance procurement procedures.

Keywords: Information technologies; Pedagogical case; Supplier selection; Supply chain management

JEL Classification System:

M15 – IT Management

M11 – Production Management

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LIST OF ACRONYMS

AI – Artificial Intelligence

CPFR – Collaborative Planning, Forecasting, and Replenishment

CSCM – Contemporary Supply Chain Management

CSCMP – Council of Supply Chain Management Professionals

DEMATEL – Decision-Making Trial and Evaluation Laboratory

DSC – Digital Supply Chain(s)

EAI – Enterprise Application Integration

EDI – Electronic Data Interchange

ERP – Enterprise Resource Planning

ESG – Environmental, Social, and Governance

IaaS – Infrastructure as a Service

ICSC – Interconnected Supply Chain

INSC – Instrumented Supply Chain

IOS – Interorganizational Information Systems

IoT – Internet of Things

IT – Information Technology

ITSC – Intelligent Supply Chain

LR – Literature Review

MCDM – Multi-Criteria Decision Making

OUT – Order-Up-To

PaaS – Platform as a Service

PDS – Parallel and Distributed Simulation

RQ – Research Question(s)

RPA – Robotic Process Automation

SaaS – Software as a Service

SCM – Supply Chain Management

SI – Supplier Intelligence

SKU – Stock Keeping Unit

SSC – Smart Supply Chain

SSCM – Sustainable Supply Chain Management

VMI – Vendor Managed Inventory

1. INTRODUCTION

For sure, the company's development benefit from the existence of Information Technology (IT), since a strong IT infrastructure help organizations in all market processes, has the communication, expansion, processing, detection and fulfilling (Setiawati et al., 2022). CJR´s is an example of a company who may benefit with the use of IT on their processes, especially at the supplier management framework.

The rise of the internet and digital technologies has transformed supply chains, particularly in how materials and services are procured. Beyond simplifying purchasing, these tools allow companies to better control resource flows, leading to greater agility and transparency in supply operations (Kameshwaran et al., 2005). This is particularly relevant in the context of how the integration of technologies can optimize crucial stages such as supplier selection and evaluation.

While several studies describe specific features of Digital Supply Chains (DSC), there is still a lack of research that brings together the full range of DSC technologies in a comprehensive manner (Zhang et al., 2019). Ben-Daya et al. (2017) carried out a review of literature on the use of digital technologies in supply chain management, their study highlighted several gaps: the absence of clear guidance on how to adopt these technologies within supply chains, the lack of a roadmap for addressing supply chain challenges in a changing technological landscape, and various barriers that hinder implementation. Additionally, was identified a lack of case studies to help students training on these topics and an absence in procurement processes. It is possible to state that despite the growing importance of technologies in business processes, there is still a shortage of studies specifically focused on the application of these technologies to procurement processes.

This thesis aims to develop a pedagogical case study centered on the company CJR, Lda., a benchmark in the renewable energy sector. The research seeks to explore how information technologies can be applied to the company's procurement processes, with the goal of facilitating and enhancing the management of these processes. Rather than focusing on CJR's specific needs, since the company already adopts various technologies in other areas, the emphasis is on exploring how these tools can improve the procurement process, particularly in the supplier selection and evaluation phase. The lack of case studies focused on this topic, specifically within the supply chain context, makes this work especially relevant and necessary to fill a gap in the literature and provide students

with practical educational experience, filling a gap by providing a detailed analysis of how information technologies can be implemented in supplier sourcing and procurement processes.

This study aims to answer the following research questions (RQ):

RQ1: To what extent can technology be effectively applied in the supplier sourcing phase?

RQ2: How can automation contribute to improving the quality of supplier selection and enhance the evaluation process?

To achieve the objectives of this study, the adopted methodology consists of analyzing a real-life situation at the company CJR, Lda., through semi-structured interviews with the heads of key departments: Procurement, Construction, Finance, and Quality. These interviews will provide insights into how each department applies technology in its processes and how these tools have been leveraged to improve efficiency in procurement management. It is also important to note that it was used Artificial Intelligence (AI) tools to help building sentences in English.

This thesis is developed as a pedagogical case study, and is organized into the following chapters:

Chapter 1 – Literature Review: This chapter presents some information on the essential topics, explanations of concepts, and support tools for answering the case questions. The topics described in this chapter are: Supply Chain Management (SCM), Procurement and Supplier Management, Sustainable Supply Chain Management (SSCM), Contemporary Supply Chain Management (CSCM), Evaluation and Relationship with Suppliers, Digital Transformation, Information System and Digital Integration, Smart Supply Chain (SSC), Supplier Intelligence and Cloud Computing, and Enterprise Resource Planning (ERP) Systems in SCM.

Chapter 2 – Pedagogical Study Case: This chapter begins with a brief teaser describing the main problem addressed in the study. It then analyzes the company that is the subject of this thesis. At this stage, the focus is on identifying the supplier selection and evaluation process currently adopted by the company. At the end of this chapter, the case questions are presented.

Chapter 3 – Metodology: This short chapter presents the tools used to analyze and obtain the data for this case.

Chapter 4 – Pedagogical Note: In this final chapter of the thesis, the target audience and its educational objectives are defined, and a brief relationship between each question and objective is established. An animation plan precedes the answers to the questions proposed.

2. LITERATURE REVIEW

The Literature Review (LR) endeavors to provide a comprehensive exploration of existing knowledge on the foundational concepts of procurement, sourcing and supplier, within an urban context. By delving into the existing literature, this review aims to understand the main principles of supplier management, the strategies and importance of selecting and evaluating suppliers and how these are carried out, as well as delving into the importance of information systems in supplier management. The methodology employed in this LR began with a systematic selection process based on scientific articles on the digital libraries: ACM, Scopus and IEEE, with the search string 'procurement' AND 'supplier' AND 'technology'. From the articles initially found, additional relevant articles were identified through references and thematic similarity.

2.1.Supply Chain Management

Raw material acquisition, product transformation, and their delivery to the end customer is an integrated system that strategically optimizes the flow of goods, information, and finances, known as the supply chain, which includes all suppliers, production plants, storage, and distribution facilities (Adhtya & Srinivasan, 2010).

SCM started changing due to the complex needs of new market globalization (CSCMP, 2018). Since the supply chains are broad, their scope is frequently confused with the definition of logistics management, to aid in these misconceptions, the Council of Supply Chain Management Professionals (CSCMP) create different definitions to SCM and Logistics management. Morrison defined SCM as *"the integration of the strategic coordination of business functions and processes within a company and with the different companies of a supply chain."*, this definition encompasses the entire chain's alignment of the demand to the supply (CSCMP, 2018). SCM also integrates many business functions to form a seamless operational model, such as, manufacturing, marketing, sales, product development, finance, and IT, enhancing the connection between these business functions for enhanced cohesion and operational efficiency (CSCMP, 2018). On the other side of the continuum, is the logistics that is a defined subset of SCM that is responsible for the planning, execution, and control of forwarding and the storing of the goods, services, and related information from the point of origin to the point of consumption, with the emphasis on the operational activities like the transportation, warehousing, inventory control, the order fulfillment, and the management

of the logistics service providers, it becomes apparent the logistics encompasses supply chain activities (CSCMP, 2018) .

2.2.Procurement and Supplier Management

Mak (2014) defines procurement as a business function that involves planning and the subsequent purchase, as well as the arbitrary execution of planned purchases, including the external management and the planned purchase of additional organized resources as required for planned objectives, management, and the purchase of resources. However, Kidd (2013) states that reckless procurement and planned surplus spending needs over several months, as well as over several months of usage, must go through a rigorous planning phase before they can be put to use. Purchasing involves the transaction of the obfused goods for payments, whereas procurement involves the systematic planning and negotiation of the purchase (Mak, 2014).

According with Carvalho et al. (2017), the procurement process typically consists of two major activities: Sourcing associated with strategic procurement and Acquisition pertaining to operational procurement. Sourcing includes processes such as preparing and formally defining the specifications, identifying and evaluating the most appropriate suppliers, and ultimately, negotiating and concluding contractual agreements, while, the Acquisition phase, on the other hand, consists of activities pertaining to order placement, supply process control, and supplier performance evaluation (Carvalho et al., 2017).

In supplier management, it is common to adopt a two-step selection process that begins with qualification and is followed by selection (Jin et al., 2013). The qualification stage aims to minimize risks of non-compliance, whereas the selection phase is designed to secure more favorable conditions in terms of price and delivery, focusing on assessing whether suppliers can meet the minimum quality standards required, while the selection stage takes place once suppliers have been approved and are invited to compete on other criteria, often through reverse auctions (Jin et al., 2013). As Jin et al. (2013) point out, the challenge lies in striking the right balance: when qualification criteria are too strict – for example on price, quality, or lead times – the pool of eligible suppliers shrinks, which reduces competition and can limit cost advantages, in this sense, ensuring rational trade-offs between quality assurance and competitiveness is essential. At the same time, Rabieh et al. (2016) reminded that qualification alone is not enough, as supplier management must also address efficiency and flexibility to keep overall costs under control. Jin et al.

(2013) complement this by warning that if qualification processes become excessively narrow, the resulting loss of competition undermines these broader objectives.

Supplier selection, however, goes beyond quality and cost control, as it also carries significant strategic weight, as emphasized by Rabieh et al. (2016), the final costs depend heavily on raw materials and component prices, which makes effective supply and inventory management critical for reducing expenses, improving efficiency, and safeguarding operational flexibility. While price remains a decisive factor, their study shows that other considerations, such as technological capabilities, production capacity, environmental sustainability (particularly the role of "green" suppliers), resilience, and exposure to market risks, are increasingly central to supplier evaluation. Decisions on sourcing strategies also reflect this complexity: single sourcing may be chosen when one supplier meets all requirements, but multiple sourcing is often necessary when no supplier can do so alone, requiring careful evaluation of costs, deadlines, transport issues, and risk diversification (Rabieh et al., 2016).

They further note that negotiated prices and conditions have a direct effect on cost structures, production planning, profit margins, and the overall value delivered to customers. Building on this, Rabieh et al. (2016) highlights that adaptability in negotiation also strengthens resilience and risk management, making it a vital element of procurement strategy. Ferreira and Silva (2023) argue that the ability to adjust delivery schedules, contract conditions, and pricing structures opens the door to concessions on discounts, payment terms, and added benefits, which are key to maintaining competitiveness.

2.3. Contemporary and sustainable supply chain management

CSCM operates in a complex and unstable global environment, facing frequent disruptions such as material shortages, geopolitical conflicts, and the prolonged effects of the COVID-19 pandemic (Onwuchekwa, 2023). These challenges have increased production costs and compelled businesses to rethink critical strategies in sourcing, inventory control, and demand forecasting (Onwuchekwa, 2023). Demand forecasting has gained strategic importance as a tool to anticipate customer needs and optimize production, inventory, and resource planning, while technologies like AI and machine learning allow companies to analyze large datasets to identify consumption patterns and trends, improving forecasting accuracy and supporting more agile supply chain decisions

(Onwuchekwa, 2023). At the same time, SSCM emphasizes the strategic role of sourcing and procurement in ensuring long-term organizational success, even though its theoretical foundations are still considered underdeveloped (Gupte et al., 2025).

SCM also faces challenges arising from globalization, rapid technological advances, sustainability requirements, risk mitigation, and supplier relationship management (Onwuchekwa, 2023). In parallel, SSCM aims to reduce environmental impacts through resource efficiency, green logistics, sustainable packaging, and adherence to the 3Rs, while pursuing economic sustainability by balancing profitability with social and environmental responsibilities (Gupte et al., 2025).

At the same time, integrating decision-support tools such as Multi-Criteria Decision Making (MCDM) with marketing strategies aligned with SSCM can enhance customer loyalty and strengthen brand reputation, while governance mechanisms – both relational and formal – help mitigate risks, control costs, and foster green innovation (Gupte et al., 2025).

2.4.Evaluation and relationship with suppliers

The Decision-Making Trial and Evaluation Laboratory (DEMATEL) method, created by Fontela and Gabus in the 1970s, is an analytical technique intended to comprehend and depict complex systems with numerous interdependent elements, to identify and organize the influence relationships between these elements by differentiating between those that serve as causes and those that serve as effects, according to Bai et al. (2021). Also, following a series of steps that include identifying pertinent factors, building and normalizing the direct relation matrix, calculating the total relation matrix, and creating the causal diagram, which ultimately classifies factors by their systemic influence and structural role in the dynamics of the problem analyzed, gathering assessments from a group of decision-makers who perform pairwise comparisons of the identified factors, from which matrices and directed graphs (digraphs) are constructed to quantitatively and visually represent the interactions within the system (Bai et al., 2021). As demonstrated by Bai et al. (2021), an improved radar chart incorporates DEMATEL to accurately assess sustainable buyer-supplier relationship capacity, identify areas for future development, and incorporate varying perspectives from buyers and suppliers, reflecting both relative weights and interdependencies.

Ribas et al. (2021) state that supplier evaluation should consider risks like supply disruptions, price fluctuations, inventory levels, coordination, and technology access in addition to costs and capabilities. In addition, suppliers' financial stability is essential for maintaining business operations and investment potential, necessitating the monitoring of metrics like liquidity, debt, and profitability as well as the comprehension of potential weaknesses like significant technological expenditures (Jeeva, 2008).

Relationship models vary depending on the complexity of the product and the cost of switching; they range from market-based relationships (many suppliers, low switching costs) to intense partnerships for strategic items (risk, profit sharing, and joint development) to maintain a healthy buyer-supplier relationship (Jeeva, 2008). Since decreased customer loyalty raises the risk of market loss, purchasing professionals should keep an eye on trends that impact competitiveness, such as customer expectations, product life cycles, technological advancements, and the entry of new suppliers (Jeeva, 2008). By combining the DEMATEL method with sophisticated radar charts – reffered by Shaojie et al. (2017) as an invention of Georg von Mayr and also knowned as a spider, star, or web chart, as a visual aid for comparing objects with multivariate data – Bai et al. (2021) presented a novel way to assist decision-making when assessing the potential of a sustainable buyer-supplier relationship, by determining the causal relationships between several factors and grouping them into cause-and-effect categories, the DEMATEL, is used to analyze complex systems. The values of each factor can be plotted along the axes in this type of graphic representation because they are evenly spaced and have the same scale, connecting the data points across axes, which creates a polygon, where each geometric figure represents one different object (Bai et al., 2021).

Bai et al. also stated that radar charts have historically been used as a visual tool for identifying and comparing strengths and weaknesses across multivariate factors, but, despite their usefulness, radar charts have significant drawbacks, such as the impact of factor order on the area and perimeter of the polygon, which can impair the interpretation of results, and the radial arrangement of axes and angles between them, which typically does not convey meaningful information. Radar charts effectively highlight strengths and weaknesses for a small to moderate number of variables, and when combined with the DEMATEL method - which assigns weights and captures relationships among factors - they provide a more comprehensive visualization that supports performance comparison, identifies strategic and operational improvements, and guides balanced investment

decisions, though they remain limited in representing factor weights and interactions in more complex scenarios (Bai et al., 2021).

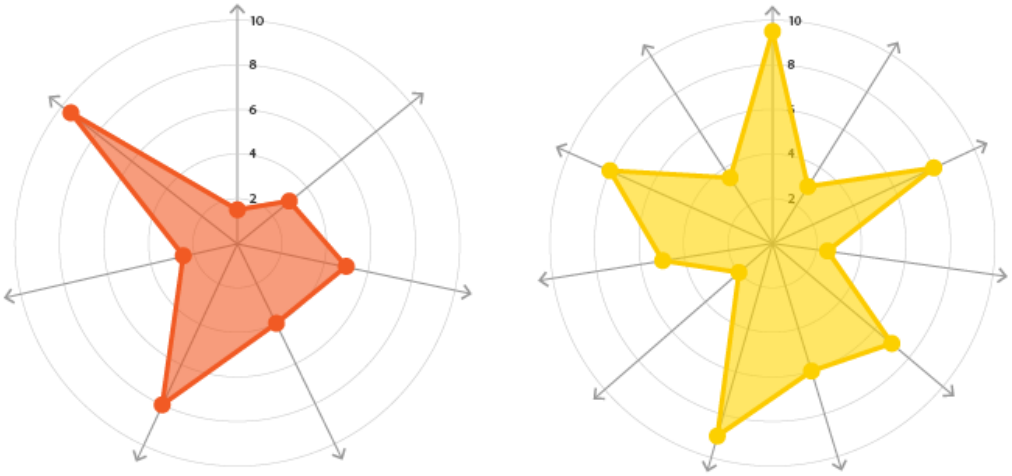

Figure 1 - Radar Charts

2.5. Digital Transformation

Supply chains have undergone significant changes with the advent of the internet and digital technologies, particularly in procurement of materials and services, as Kameshwaran et al. (2005) point out, these advancements not only make purchasing easier but also allow companies to manage resource flows more effectively, increasing transparency and agility throughout supply operations. Building on this, Rizzo et al. (2023) emphasize the role of e-procurement platforms in simplifying the work of purchasing professionals by centralizing acquisition channels and reducing information overload. By integrating data and processes, these platforms help decision-makers focus on relevant information, streamline procedures, improve the speed and quality of decisions, and ensure compliance with internal policies, while also lowering costs and enhancing operational efficiency (Rizzo et al., 2023).

At the same time, emerging technologies are reshaping traditional procurement approaches, as cloud-based collaboration tools, robotic process automation (RPA), the Internet of Things (IoT), and AI enable more strategic and predictive sourcing, allowing organizations to proactively manage suppliers while automating routine tasks (Yang, 2022). These innovations not only reduce the risk of non-compliance but also improve efficiency and decrease operational costs tasks (Yang, 2022). Mohsen (2023) adds that

DSC significantly enhance visibility and responsiveness. Real-time data from IoT devices, combined with digital twins, allows for simulation of processes and products to support informed decision-making (Mohsen, 2023). Machine learning strengthens predictive analytics, and blockchain ensures secure, immutable tracking of transactions and assets, enhancing trust and traceability (Mohsen, 2023). Big data analytics processes vast amounts of information to support decisions across the supply chain, while cloud computing offers scalable and adaptable solutions that encourage innovation and reduce operating costs (Mohsen, 2023). According to Mohsen (2023), overall, digitization boosts efficiency, reduces risks and expenses, and enhances customer satisfaction by providing transparency, enabling data-driven decisions, automating workflows, and improving communication across the supply chain.

2.6. Interorganizational Information Systems and Digital Integration

Interorganizational information systems (IOS) are shared by two or more organizations and integrate business processes across organizational boundaries, with this, a large amount of operational and planning data, such as contracts, logistics, real-time deliveries, and billing information, must be shared with partners to use these systems. (Kameshwaran et al., 2005). These systems play a fundamental role in making business activities more effective and in fostering coordination among partners through the exchange of information now (Asamoah et al., 2019). IOS facilitates collaborative models where information flows continuously, and organizational boundaries are permeable when paired with SCM systems and Enterprise Application Integration (EAI) (Kameshwaran et al., 2005). IT infrastructure and information systems constitute essential organizational resources, capable of generating new capabilities and boosting the overall performance of the company (Asamoah et al., 2019). Similarly, IOS perform this function, but with the particularity of being applied between different companies, rather than just between departments or business units of the same organization (Asamoah et al., 2019).

Examples of SCM systems that enable real-time communication between businesses and their partners include Electronic Data Interchange (EDI) systems, Vendor Managed Inventory (VMI) systems, and Collaborative Planning, Forecasting, and Replenishment (CPFR) systems (Asamoah et al., 2019). IOS, like EDI and web-based platforms, help supply chains run more smoothly by enabling automated, two-way communication (Kameshwaran et al., 2005). This improves responsiveness, reduces mistakes, and makes

better use of resources, giving companies access to more suppliers and market information and increasing purchasing power, but there's a trade-off between having a wide network for leverage and deep integration for efficiency (Kameshwaran et al., 2005). How IOS are used often depends on the type of products and the market environment – standardized products benefit from close integration, while fast-changing markets value flexibility, however, today, IOS have grown into full-fledged systems that handle planning, inventory, and orders, helping companies cut costs, predict outcomes more reliably, and build supply chains that are efficient, resilient, and competitive (Kameshwaran et al., 2005).

The relationship between IOS use and performance is mediated by supply chain capabilities, since IOS use improves SCM for businesses in this way, which leads to improved outcomes, in short, IOS adoption helps to improve supply chain performance while also fostering the growth of these capabilities (Asamoah et al., 2019). The ability of an organization to recognize, utilize, and integrate information and resources—both internal and external—to support all chain operations is reflected in the supply chain's capabilities, i.e., the performance of the supply chain is thought to be determined by these capabilities, according to the relational view, the more advanced these capabilities are, the more capable the businesses are of working together with their partners, which promotes the creation of shared value and the attainment of superior performance (Agbenyo et al., 2018).

2.7.Smart Supply Chain

To facilitate SCM, businesses are implementing segmented structures that incorporate both digital and physical components, such as smart ports, warehouses, and containers, as supply chains become more complex – the SSC (Lee et al., 2023). The three main components of smart supply chain management (SSCM), according with Lee at al. (2023), are the Instrumented Supply Chain (INSC), which uses IoT, sensors, and GPS to provide real-time visibility and data to support AI-driven forecasting and optimization: the Interconnected Supply Chain (ICSC), which improves partner collaboration and information sharing and is frequently secured via blockchain to lower risk and fraud; and the Intelligent Supply Chain (ITSC), which uses AI, machine learning, and predictive analytics to support autonomous decision-making and boost supply chain agility. We can use smart contracts as an example of SSC use, which cut down on the amount of time

spent on paperwork and bureaucracy, while conventional SCM typically calls for a large amount of documentation (Turjo, 2021). Smart contracts are unchangeable since blockchain technology preserves the data as evidence and this paradigm has a significant impact on SCM transaction, immutability, and refund procedures (Turjo, 2021).

In modern factories and SSC, AI is used to analyze data and help make decisions in real time (Nozari et al., 2022). Even when companies rely on their suppliers to handle security issues, they still need to monitor and manage risks themselves, after all, while these digital tools make operations more efficient, they also expose the business to potential cyberattacks (Nozari et al., 2022). In such highly connected systems, trust isn't just about people – it becomes a part of the system itself, at the same time, since devices don't always perform perfectly in unexpected situations, hesitation to adopt AI and IoT can slow progress (Lee et al., 2023).

A solid technological setup is essential for modern supply chains, while digital services and cyber-physical systems make operations smoother and allow for remote supervision (Nozari et al., 2022). But technology alone isn't enough - companies need employees who understand the tools and the production processes, without trained staff, innovation can be slow and face internal resistance (Nozari et al., 2022). Meanwhile, the IoT collects information throughout the supply chain, giving managers a clear view of operations (Lee et al., 2023). IoT devices go a step further by automating decisions and monitoring processes as they happen (Lee et al., 2023). That's why investing in training in AI, IoT, big data, cybersecurity, and digital infrastructure is so important to keep up with the fast changes in supply chains (Lee et al., 2023).

When big data, cloud computing, and industrial IoT technologies are used together, supply chains become more accurate in tracking costs and improving traceability (Lee et al., 2023). Yet, according with Nozari et al. (2022) there are still hurdles, especially in inter-organizational and IT-focused supply chains. High implementation costs, security concerns, lack of skilled workers, challenges with older systems, and difficulty working with suppliers all remain problems (Nozari et al., 2022). Strong collaboration, ongoing workforce training, and smart investments are what make SSCM work perfectly (Nozari et al., 2022). When all these elements come together, smart technologies can help companies make better decisions about inventory and capacity (Lee et al., 2023).

2.8.Supplier Intelligence

Evaluating a supplier's financial stability is just as important, according to Jeeva (2008), companies need to look at corporate governance, accounting standards, debt levels, stock market performance, capital investments, and liquidity indicators such as accounts payable and receivable. These factors help determine whether a supplier can maintain stable operations over the long term, while also considering social responsibility and environmental sustainability (Jeeva, 2008).

Because Supplier Intelligence (SI) systems must offer thorough financial data, market insights, operational details, and production process specifics to make supplier selection and management easier, the collaboration between suppliers and SI systems is essential for supporting strategic and operational decisions over the long and short term (Jeeva, 2008).

Gaining a real competitive edge in supply chains today requires more than just fast delivery from suppliers – it depends on having information systems that provide a deep understanding of who your suppliers are and how they operate (Jeeva, 2008). This includes knowing not only their financial health, market position, and resilience but also the wider political, social, cultural, technological, economic, and legal environments in which they function (Darmawan et al., 2025).

Approaches to supplier selection and risk management in retail and consumer goods have evolved, as companies now evaluate suppliers not just on cost, but also on environmental, social and governance (ESG) performance and customer satisfaction (Mohammed, 2023). External factors like the pandemic, geopolitical tensions, and climate change have made supplier risk management increasingly critical, though implementation remains challenging due to cost and coverage limitations (Mohammed, 2023).

Understanding suppliers' strategic alliances with third parties is also crucial because the strength, longevity, and potential disruption of these alliances can have a big impact on the buyer-supplier relationship, for this reason, the SI system is a powerful tool for bolstering strategic ties and directing data-driven decisions regarding the proximity, intensity, and duration of partnerships (Jeeva, 2008). In line with Darmawan et al. (2005), disruptions upstream can trigger ripple effects throughout the supply chain, often called the "bullwhip effect", where small fluctuations in demand get amplified as they move upstream, impacting inventory efficiency and network performance. The size of these effects depends on the structure of the supply network and the ordering policies in place,

such as the Order-Up-To (OUT) system, and they become especially apparent during major events like Brexit or the COVID-19 pandemic (Jeeva, 2008). Interestingly, while the bullwhip effect can increase inventory costs during stable times, it can also make a supply chain more resilient in times of disruption by keeping larger inventory buffers that allow faster recovery (Darmawan et al., 2025).

Key performance indicators (KPIs) like timeliness, responsiveness, cost control, and order accuracy are tracked closely and connected to strategic goals using regularly updated performance scorecards, which makes SI systems essential for making informed decisions about fulfilling requirements, improving contract efficiency, and identifying opportunities for renegotiation (Jeeva, 2008). Beyond the usual metrics such as quality, lead time, cost, and reliability, it's important to pay attention to suppliers' planning skills and their willingness to engage in long-term partnerships (Jeeva, 2008).

Modern SI platforms can bring all this together by ensuring transparent data sharing, smooth communication, and careful evaluation of key factors like financial stability, technological innovation, production practices, planning and control systems, e-business maturity, and sourcing strategies (Jeeva, 2008).

AI can identify backup suppliers within existing networks, helping ensure continuity and reducing risks, and by combining SI systems with AI, organizations can build supply chains that are faster, more responsive, and driven by data (Jeeva, 2008).

AI is changing supplier management across its entire lifecycle, by processing large amounts of data, including performance metrics, market trends, and risk indicators, AI can dramatically speed up the process of finding suitable suppliers (Mohammed, 2023). It can also automate much of the evaluation and qualification work while keeping an eye on potential risks (Mohammed, 2023). Some companies go even further, using AI at the stocks keeping units (SKU) level to analyze purchase orders, invoices, and historical quotes, gaining detailed insights into supplier performance (Mohammed, 2023).

On top of that, supplier performance can be continuously tracked and optimized, allowing companies to stay ahead in a competitive market (Mohammed, 2023).

2.9. Cloud Computing and ERP Systems in Supply Chain Management

Cloud computing integration into supply chains has emerged as a key tactic for resolving important issues like accurate component delivery and customer retention, because more

assertive decision-making is supported by effective cloud-based data management, which makes it possible to identify potential clients and gain a better understanding of local demand (Krohn-Grimberghe et al., 2017). There are three main models that this technology uses to function: Platform as a Service (PaaS) offers development environments with partial infrastructure control, making it ideal for integrated models; Software as a Service (SaaS) offers ready-to-use applications without requiring infrastructure management; and Infrastructure as a Service (IaaS) offers servers, networks, and storage with extensive configuration freedom, making it appropriate for businesses that place a high priority on infrastructure (Teng, 2018).

Cloud computing provides scalability and flexibility through a pay-per-use model that reduces the need for large physical infrastructure investments, allowing resources to be adjusted according to operational demands and lowering costs (Karvela & Kopanaki, 2021). It also enables outsourcing of tasks like maintenance and storage, which reduces expenses for IT staff and hardware, while facilitating real-time information sharing across departments and supporting geographically dispersed operations (Teng, 2018). Cloud solutions also simplify logistics and demand planning, provide real-time updates to stakeholders, improve procurement efficiency, and foster collaboration across the supply chain (Teng, 2018). These features improve inventory management and enhance resilience, particularly for SMEs, by enabling quicker responses to disruptions (Krohn-Grimberghe et al., 2017).

Security mechanisms such as automated backups and remote data wiping strengthen protection against data loss and unauthorized access, while compatibility with multiple systems allows uninterrupted updates and continuous availability (Karvela & Kopanaki, 2021). In addition, they allow organizations to monitor external factors in real time, supporting safer strategic decisions and more efficient operations (Rossetti, 2012).

Simulation and modeling capabilities further increase cloud benefits as can be seen by agent-based models who can analyze thousands of SKUs individually, providing detailed insights into supply chain behavior (Rossetti, 2012). Also, parallel and distributed simulations (PDS) offer superior performance and flexibility for complex network scenarios, even though their use is still limited (Krohn-Grimberghe et al., 2017). Furthermore, software compatibility, limited provider support, and evolving regulations can pose additional operational risks (Teng, 2018). These tools, combined with cloud infrastructure, enable companies to anticipate issues, test strategies with minimal risk,

and optimize operations before implementing changes in the real world (Karvela & Kopanaki, 2021).

Despite its advantages, cloud adoption comes with challenges and companies must ensure providers meet their specific requirements, whether using single or multicloud strategies (Karvela & Kopanaki, 2021). Integration with legacy systems demands time, money, and technical expertise, and transitioning may involve costly equipment replacement, also, a lack of standardization can hinder external collaboration and complicate service control, while shared environments increase vulnerability to security breaches (Karvela & Kopanaki, 2021).

Cloud-based and on-demand solutions are highlighted as strategic enablers, when compared with traditional on-premises systems, because they significantly lower installation, maintenance, and infrastructure costs (Polukhov, 2023).

Alongside cloud computing, ERP systems have evolved into integrated platforms that consolidate organizational processes into modular structures covering human resources, finance, sales, production, and logistics (Nazemi et al., 2012). The strategic value of ERPs lies not only in technology but also in operational support and business outcomes: centralized data analysis, process automation, and timely information distribution are essential to generating long-term benefits (Nazemi et al., 2012). ERPs support process standardization, internal information sharing, and improved coordination, while their architectures leverage advanced technologies such as three-tier client-server structures, cross-platform compatibility, and high processing power (Teng, 2018). These solutions support a more interconnected digital environment, allowing supply chains to operate efficiently across multiple participants and geographies (Teng, 2018).

Modern ERPs are increasingly collaborative, accessible, and intuitive, integrating suppliers, distributors, and customers into a connected ecosystem that complements cloud-enabled supply chain solutions (Karvela & Kopanaki, 2021).

Polukhov (2023) states that backend integration is a major challenge that is often hampered by the coexistence of multiple ERPs with incompatible architectures, but, suppliers face additional complexity due to the diversity of e-procurement platforms in the market, such as Ariba, i2, and Commerce One, each of which requires adaptation to different technical standards and data formats.

Among the well-known e-procurement systems Vu (2023) and Polukhov (2023) highlight the following:

- Oracle Procurement Cloud: This product, which is a component of the Oracle Cloud suite, offers SCM and procurement features (Polukhov, 2023);
- Jaggaer: Provides a full range of procurement services, such as supplier collaboration, contract management, spend analysis, and sourcing (Polukhov, 2023);
- SAP Ariba: a platform that manages the procurement cycle, enabling suppliers to strengthen customer relationships and buyers to optimize purchases sustainably. It provides spend analysis, integrates corporate resources into the source-to-pay process, and supports the expansion of a global supplier network. Its modules cover procurement, supplier management, invoice & payment management, and sourcing & contracts, offering features such as spot buying, supplier onboarding, automated integration, supply chain optimization, rapid Return On Investment, and strategies for both direct and indirect sourcing (Vu, 2023);
- Ivalua: renowned for its Source-to-Pay platform, which includes spend analysis, contract management, supplier management, procurement, and sourcing (Polukhov, 2023);
- GEP Smart: Offers procurement software that includes supplier collaboration, contract management, savings tracking, and sourcing. In order to enhance financial and procurement procedures, Basware provides solutions for invoicing, networked trade, and procurement (Polukhov, 2023);
- Procurify; Is an easy-to-use platform that focuses on spend tracking, approvals, and procurement automation (Polukhov, 2023);
- Coupa: Supports procurement, finance, SCM, and IT functions, providing financial management, spend analysis, purchasing activities, and supplier management. It integrates with a variety of ERP and non-ERP systems. The platform aims to optimize business modules, streamline operations, anticipate risks, and add significant value to a company's procurement functions. (Vu, 2023);
- Zycus: Offers complete procurement solutions, such as supplier management, contract management, e-sourcing, and spend analysis (Polukhov, 2023);
- Tradeshift: Provides an integrated platform for supplier management, payments, invoicing, and procurement (Polukhov, 2023);

- BravoSolution is renowned for its procurement platform, which encompasses supplier collaboration, procurement analytics, and strategic sourcing (Polukhov, 2023).

There are numerous other e-procurement systems with different features and functionalities – these are but a handful of examples, however, every system should be assessed according to the particular needs of the organization, including its size, industry, procurement procedures, integration capabilities, and financial constraints (Polukhov, 2023).

Polukhov (2023) asserts that integrated platforms encompass every stage of the procurement process, from catalog orders and invoicing to supplier and contract management.

3. METODOLOGY

This paper aims to develop a pedagogical case study, focusing on the company CJR, Lda., a leading organization in the renewable energy sector that has experienced steady growth since its foundation. The study concentrates on how information systems are applied to the company's purchasing processes, seeking to understand how these technological tools contribute to making the management of these processes more efficient.

According to Remenyi et al. (2002), case studies can be used in various contexts, including educational settings. The authors argue that this methodology supports deeper learning by encouraging the analysis and discussion of real-life business situations. They also claim that this type of case study is particularly effective in preparing students for the challenges of the job market, as it presents current topics and issues in the business world.

This case study aims to explore the role and importance of information systems in the company's purchasing process and is developed within an interpretive research paradigm. In this model, users examine a real situation and relate it to the theoretical knowledge they have acquired, answering a set of questions based on their own interpretation.

In summary, it is a critical and descriptive analysis of a real business scenario, where the final conclusions are drawn from the users' individual understanding, interpretation, and perspective.

3.1.Data Collection

The development of this case study was based on data collected through various methods: direct observation, semi-structured interviews with managers from the relevant departments (Procurement, Construction, Finance, and Quality) and analysis of primary data such as company's internal documentation.

The information gathered provided relevant content for the creation of the case study. In the initial phase, employees directly involved in the processes under analysis were identified, particularly those who could provide relevant information regarding supplier selection and evaluation procedures.

Next, a participant observation approach was adopted, which included on-site observation, and the conduction of interviews focused on the two processes mentioned.

The interviews were carried out with the heads of the Construction, Procurement, Finance, and Quality departments.

The interview questions focused on each department's role in the supplier selection process, their perspective on how the process operates, the changes brought about by the introduction of information technologies, and the benefits and challenges these technologies have brought (or may bring) to the organization. These 4 interviews, that were realized online on February of 2025, lasted in average 1 hour each and were recorded and transcribed afterwards.

Table 1 - Interview topics chart

	DEPARTMENT				
TOPICS		Quality	Finance	Construction	Procurement
	Financial criteria in supplier selection	X	X		
	Sustainability, ethics, and social responsibility		X		
	Data and information for decision-making			X	X
	Quality actions and criteria	X			
	Supplier selection and evaluation criteria	X	X	X	X
	Supplier performance and monitoring	X	X	X	X
	Commercial terms and negotiation	X	X	X	X
	Communication and problem-solving	X	X	X	X
	Interdepartmental integration and collaboration	X	X	X	X
	Use of information systems	X	X	X	X

3.2. Data Analysis

Researchers who choose interpretive approaches tend to analyze data primarily through qualitative methods (Stake, 2010). According to the same author, qualitative studies enhance the investigator's personal perception and understanding, which can lead to multiple interpretations.

The analysis and processing of data follow a qualitative methodology without any specific method, based on the collection, analysis and organization of the gathered information.

Initially, the main themes are broad in scope, but as the study progresses and the available information is interpreted, the areas of interest become more focused and specific.

4. PEDAGOGICAL STUDY CASE

4.1.Context

CJRs is a company focused on Engineering and Construction. It operates in the construction of infrastructures, urban planning, communication routes and provides integrated services for the renewable energy sector.

There has been a significant advancement in the technologies used by CJR's logistics department to select and evaluate suppliers.

A senior employee is skeptical about using technology in supplier evaluation, stressing the importance of human relationships. In contrast, newer staff see technology as a valuable complement, helping streamline processes, reduce routine work, and enhance management through automation, cloud tools, and AI.

To address skepticism, new team members stressed the strategic role of technology in supplier management. Tools like DICOM in Chile help assess financial risk by identifying indebted suppliers, supporting more objective decisions. Similarly, platforms analyzing complaint histories provide transparency and data-driven insights into long-term performance.

A key improvement was adopting SharePoint, which centralized supplier data and eliminated redundant evaluations. This gave all staff efficient access to information. Combined with SAP, the organization can now analyze pricing history, strengthening negotiation power and enabling more strategic supplier selection.

Despite skepticism from a senior employee, CJR maintains a rigorous supplier selection and evaluation system to ensure quality and compliance. The process includes proposal analysis, pre-qualification, certification checks, comparative mapping, tenders, and agreements. Evaluation covers performance, delivery, non-conformities, metrics, surveys, financial stability, and annual audits, ensuring only reliable suppliers remain on the list.

Having experienced the evolution of this process through its traditional approach over the years, CJR's most senior employee has developed the belief that the integration of technology may result in the depersonalization of relationships, potentially replacing personal interactions in negotiations. Additionally, this employee perceives the current proliferation of various tools as creating an informatic platforms overload, which could complicate supplier management processes. As a result, this employee raises the following questions: To what extent can technology be effectively applied in the supplier

sourcing phase? How can automation contribute to improving the quality of supplier selection and enhance the evaluation process?

4.2. The Company

4.2.1. Brief History

The CJR Group was established in 1970, in Portugal, by Cândido José Rodrigues and is now a multinational organization overseeing a varied portfolio across multiple industries and regions.

The CJR Group is a global provider of services in civil and electrical construction and installation. Its operations encompass the construction of wind farms, photovoltaic solar farms, installation of wind turbines, Power & Grid, as well as preventive and corrective maintenance for solar farms.

The company operates throughout the entire project value chain, from the early stages of detailed engineering and the execution of civil and electrical works to the final wind farms landscaping. The company maintains a rigorous Quality, Health, Safety and Environment policy, ensuring that its operations adhere to the highest global industry standards.

In the construction of solar plants, CJR Renewables offers comprehensive turnkey solutions for large-scale solar projects. Their services encompass design, engineering, procurement, construction, project management, as well as operations and maintenance.

In 2002, the CJR Group ventured into the wind energy sector by constructing its first wind farm in Portugal. By 2008, CJR Renewables emerged as a distinct entity, offering comprehensive turnkey solutions into the wind energy. In 2013, the company expanded internationally to Latin America, where it completed its inaugural project in Chile. Today, CJR operates in three countries in this region: Chile, Peru, and Colombia. In 2020, the firm further extended its reach to the United States and Sweden, marking a deliberate move to broaden its geographical footprint. Currently, CJR Renewables stands proudly as one of the top companies in the global renewable energy EPC industry, operating in over 25 countries.

CJR Renewables provides a comprehensive turnkey solution that includes services ranging from simple cabling installations and transformer and switchgear replacements to the design and construction of sub-stations. The company specialized in the mechanical

and electrical installation and maintenance of wind turbines, catering to wind turbine owners and developers.

Additionally, CJR Renewables supports the full lifecycle of solar parks by offering a broad spectrum of operation and maintenance services. These services are designed to ensure that solar systems achieve their optimal energy production goals throughout their lifespan.

Since expanding into Latin America in 2013, the company has established three subsidiaries and completed over 60 projects in the region. In Europe, where it was founded in 2002, CJR Renewables has successfully completed more than 400 renewable energy projects.

4.2.2. Supplier Selection Process

The purchasing process starts with a tender request, followed by an evaluation of supplier bids and the creation of a comparison map to identify the most suitable option. Before final approval, it must be verified whether the supplier is already qualified; if not, a pre-qualification process is initiated through the Quality Department. This involves a questionnaire covering financial and quality criteria, with the financial review serving as the first filter.

When choosing between suppliers, factors such as pricing, payment terms, delivery performance, product quality, and the history of the relationship are weighed carefully. For example, deciding whether to continue with a long-standing supplier who has raised prices or switch to a new, cheaper one requires assessing more than cost alone. Ultimately, the main challenge lies in balancing price, quality, and delivery time.

In construction, SAP is mainly used to review suppliers' price histories, supporting negotiations by comparing current and past quotes. However, delivery performance is not systematically tracked, with the Purchasing Department relying only on past experiences with each supplier—a gap that can create serious risks, as delays directly impact project schedules.

Special attention is given to "critical equipment," which involves longer lead times, contracts, advance payments, and guarantees. Because of the high risks and penalties tied to delays, only trusted suppliers are considered. For urgent projects, evaluations go beyond purchasing the item itself and include labor, installation, transport, and final commissioning activities.

It is also important to maintain an accurate and up-to-date supplier record at all times. These record include essential information such as payment terms (cash or credit), upcoming purchases, outstanding payments, delivery and billing locations and other relevant data. Keeping this information current is vital for ensuring an efficient purchasing process, minimizing communication errors, enabling transparent and timely transactions.

Supplier selection requires pre-qualification, regulatory compliance, and confirmation of production capacity. Key factors include financial stability, the ability to issue bank and performance guarantees, and, in cases like solar panels, long-term product durability. The pre-qualification process is applied only to awarded suppliers and is overseen by the Quality Department, which verifies certifications. Companies holding recognized quality, safety, or environmental certifications are exempt from completing those sections of the questionnaire, and the same applies to subcontractors and service providers.

All documentation is exchanged by email and filed systematically, ensuring easy access for future reference and preventing information loss in scattered correspondence.

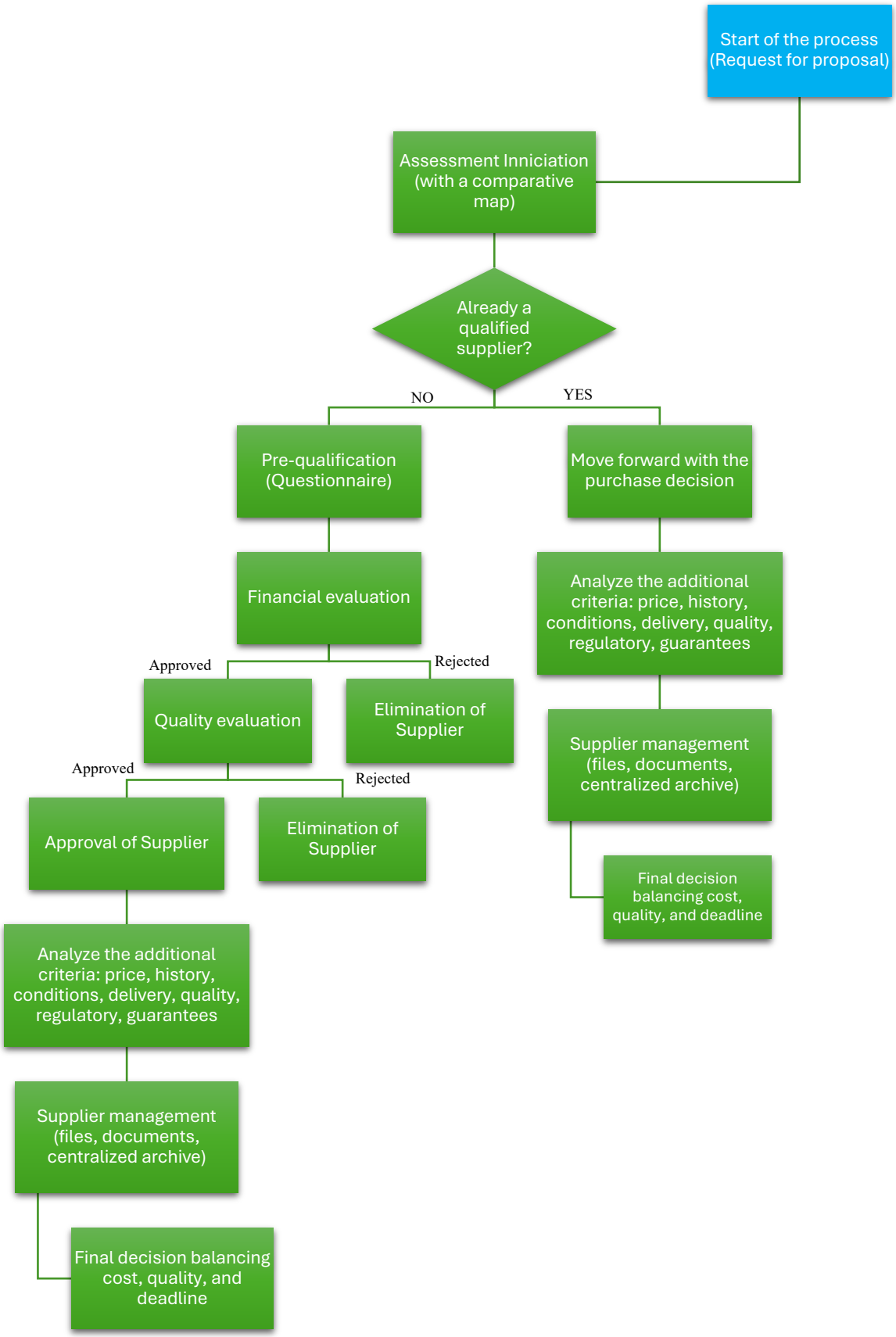

Figure 2 - CJR Supplier Selection Process

The current document exchange process has a weakness: suppliers can sometimes be approved without meeting all mandatory requirements, especially when site or production teams bypass Finance Department controls. Because the system lacks restrictions, large contracts, worth over €1 million, may end up split across multiple smaller invoices, creating inefficiency.

Supplier agreements begin with a standard draft that can be modified through negotiation, but once approved, it should be reused for future purchases with the same supplier. Currently, two to three suppliers have pre-negotiated annual contracts with fixed terms and payment conditions, which must be applied consistently without further changes during that period.

Supplier financial reliability is assessed through communication practices, the handling and exchange of documentation, and their flexibility in dealing with delays. Constructive engagement and empathy strengthen supplier relationships, while uncooperative behavior is viewed negatively. In some countries, CJR is responsible for subcontractors' payroll taxes, and failure by subcontractors to provide proof of payment results in immediate disqualification.

Consistent oversight of supplier deliveries enables the consolidation of materials into single shipments, improving cost efficiency. However, when responsibilities are split among different people, communication gaps often lead to missed opportunities for logistical optimization. At present, the company lacks an IT system to support this type of coordination.

Enhancing logistics and innovation requires a robust IT system capable of managing approvals, centralizing documentation, supporting digital archiving, and monitoring supplier delivery performance. The initial version relied on an Excel spreadsheet with folders for supporting files, but as usage grew, simultaneous access caused errors and data loss. To address these issues, the platform was migrated to SharePoint, which preserved the original structure while providing greater stability and accessibility. For many users, SharePoint continues to be the most effective solution.

4.2.3. Supplier Evaluation Process

After a supplier is pre-qualified and completes their service, the Quality Department initiates a performance evaluation. This assessment, usually carried out by the Project Manager or the Preparation and Planning technician, measures compliance with quality

standards, deadlines, and contractual requirements. Results determine whether the supplier remains on the approved list or is disqualified. A formal survey is used to record delivery quality, timeliness, and the condition of materials received.

A structured scoring system is used to evaluate suppliers objectively, converting performance on metrics such as quality, timelines, and service into a numerical score. Suppliers scoring below the minimum threshold are deemed unfit for future projects and suspended for two years, only becoming eligible again after a formal re-assessment. The evaluation focuses on compliance with delivery deadlines and the adequacy of materials, with criteria tailored to the type of partner, whether a supplier, subcontractor, or service provider.

The supplier evaluation process also takes financial stability into account, helping companies assess whether a supplier can consistently deliver services. In Portugal, past negotiations are reviewed to gauge the strength of the business relationship and trust level. Chile uses a platform called DICOM to identify suppliers with financial issues, flagging potential risks early. Similarly, Brazil relies on a system named DECOM for financial screening. These tools provide valuable insights into financial risks at both local and global levels, though differences in economic conditions and company size make it difficult to directly compare Portuguese and international suppliers.

The evaluation of the Purchasing Department's performance is carried out by the Site Manager. This assessment includes supplier performance and considers the commercial discounts offered by each supplier. An Excel sheet is used to track all orders placed, making it possible to identify each supplier and calculate the commercial effort involved in each deal. This helps quantify the supplier's overall contribution. There's also a phase known as "V0," which marks the initial proposal and the corresponding purchase order (PO). From the moment a supplier is hired, a continuous monitoring process is initiated. Any issues or non-conformities are reported to the client as part of the supplier quality control process.

Key criteria for selecting and evaluating suppliers include product or service cost, material quality, and adherence to delivery schedules. To improve oversight, the Quality Department now uses an internal platform to track all non-conformities, distinguishing between supplier and subcontractor issues. Previously, project teams worked independently without a shared system, making it difficult to assess supplier performance across the organization. This often led to disqualified suppliers being rehired on new projects, simply because other teams weren't aware of their history.

The introduction of a centralized platform has streamlined access to supplier performance data, enhancing oversight and helping prevent repeated issues, such as rehiring underperforming suppliers. When problems with suppliers or materials occur, they are initially addressed informally through dialogue. Only if these efforts fail is a formal non-conformity document issued.

In the past, supplier evaluations were managed separately by each project, often leading to disqualification based on isolated incidents, without a full picture of the supplier's overall performance. The absence of a centralized system made it difficult to track their complete history. Now, evaluations are recorded in SharePoint, a shared platform that organizes and filters performance data. Team members from quality, environmental, and safety areas input the evaluations, and the initiator is responsible for uploading the results. Regular updates from technicians across different sites ensure the database stays current. SharePoint also displays final evaluation outcomes, such as whether a supplier is approved or disqualified, and automatically generates up-to-date lists, simplifying access and verification for all team members.

While a centralized platform is now in place to manage supplier evaluations, the process of providing feedback to suppliers remains informal and unstandardized. Although feedback is sometimes given, there's no structured or documented approach, which can lead to inconsistencies in how suppliers are informed of their performance.

The current SharePoint system was created to address the limitations of the earlier Excel-based tool, which was initially used to manage supplier data. In that version, information was manually entered and supporting documents were stored separately. However, as more users began editing the spreadsheet at the same time, technical problems such as crashes, data loss, and overwritten entries became common. These issues highlighted the need for a more reliable, centralized, and collaborative solution, leading to the adoption of SharePoint, which now offers a more stable and organized way to store and share supplier performance records across teams.

To address previous challenges, a SharePoint list was created, keeping the basic setup of the Excel sheet but offering better performance and reliability for multiple users. SharePoint proved more effective for collaboration, making it a stronger platform for managing shared data. This new system centralized supplier pre-qualifications and assessments in one accessible place, no matter where the market consultation happened—even internationally. With everyone accessing the same information, duplicate pre-qualifications were eliminated, speeding up and simplifying the process.

Before SharePoint, each project managed supplier qualifications independently, storing documents locally. This caused suppliers to be repeatedly qualified for each project, leading to inefficiencies and delays. Now, all supplier data is stored in a single system, making evaluations faster and more efficient. Previously, a supplier might be disqualified based on issues in one project without considering their full history. The centralized SharePoint platform allows for a more complete and fair assessment of suppliers' overall performance.

In the construction industry, suppliers who exceed a certain number of non-conformities are disqualified. Non-conformities occur when deadlines are missed, products don't meet specifications, or delivery problems happen and these issues are documented in formal quality reports, which are sent to the supplier for explanation. The Purchasing Department starts this process by notifying the supplier and the Quality Department, who handles these issues, working to resolve them. If the problem is serious enough, the Purchasing Department follows up with a phone call to the supplier to address the situation and seek improvement, aiming to fix the issue while maintaining a good relationship. Suppliers who consistently perform well, delivering on time with no problems, receive positive feedback.

If a supplier has more than two non-conformities, no further purchases are made from them. To enforce this, performance evaluations are conducted after each supply, ensuring only reliable suppliers continue to receive contracts.

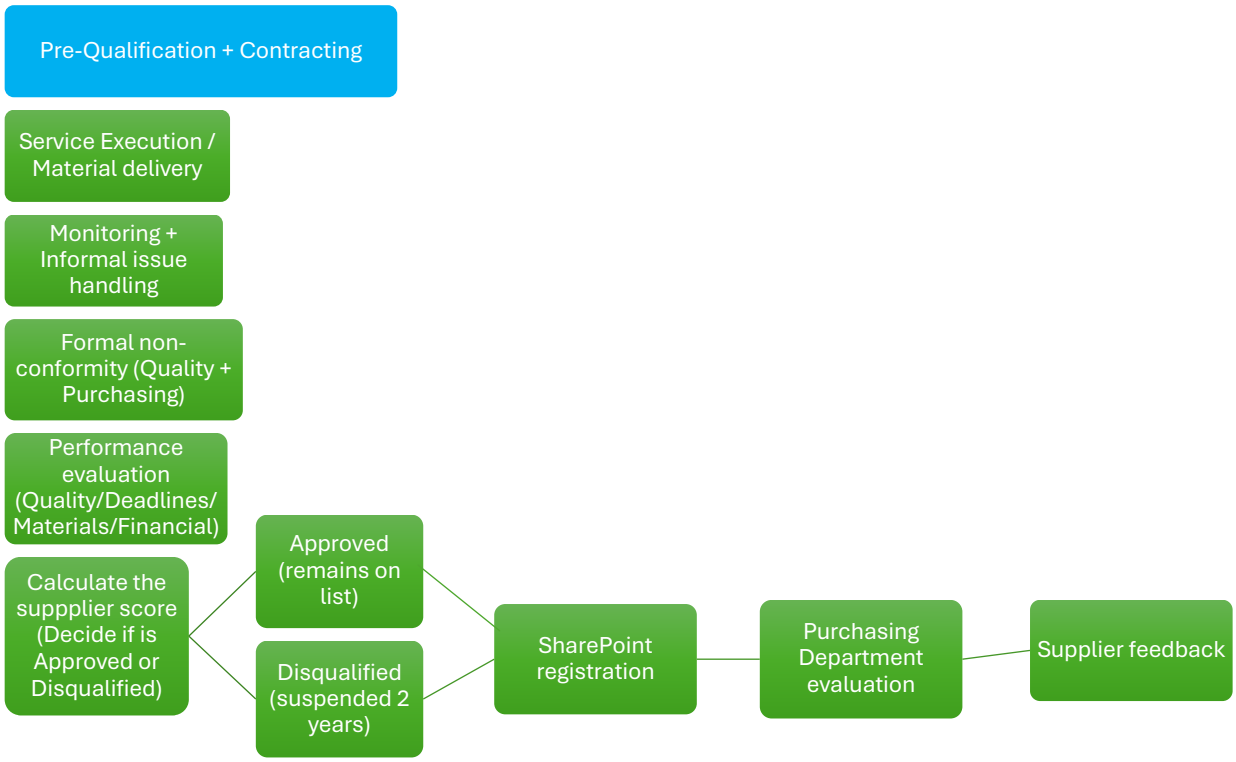

Figure 3 - CJR Supplier Evaluation Process

In the construction sector, suppliers are reviewed annually using a Word template, but there's no digital system to manage this process. During the yearly evaluation, one supplier is chosen for a second-party audit that examines their quality standards and internal processes to ensure they meet company requirements and the suppliers who don't meet the criteria are disqualified and informed by email, however, there's no formal system for ongoing feedback to help suppliers improve over time. Introducing automation could make the evaluation more consistent, efficient, and less predisposed to human error.

In conclusion, a major challenge in supplier monitoring is the fragmentation of information across multiple platforms. Without a centralized digital system, many employees struggle to find the relevant data they need. To resolve this, it's essential to implement a digital tool that consolidates all supplier information in one place, offering quick and organized access to key data like financial records, quality assessments, and compliance information.

Currently, supplier evaluations are scattered across different systems, one for compliance, another for management system evaluations, and others for various performance aspects. This fragmented approach is inefficient and difficult to manage. The

ideal solution would be a unified platform that integrates all this information, ensuring a smoother and more efficient workflow. Relying on emails to manage proposals and supplier data only leads to disorganization, with important information often lost or overlooked, making the procurement and evaluation process more complicated.

4.3. Questions

This strategic analysis questions are presented with the aim of helping students engage with the pedagogical objectives of this project through their resolution.

QUESTION 1: Produce the visualization of a map to compare suppliers. Identify which IT can be used to generate that map and how the map it generated.

QUESTION 2: Discuss the ERP systems main characteristics theoretically. Describe the adjustments needed in the company's ERP system so that it recognizes if a supplier complies with the pre-requirements for a specific purchase.

QUESTION 3: Which approach is more advantageous for CJR to use in supplier selection and evaluation processes: a best-of-breed IT solution or a single-vendor ERP system? Justify your answer.

QUESTION 4: How could a cloud-based Information System improve collaboration and feedback sharing with CJR's suppliers across multiple locations and what are the internal challenges that need to be overcome for such adoption?

QUESTION 5: Identify three initiatives to overcome the data security challenges experienced by the company. Justify your answer.

5. PEDAGOGICAL NOTE

5.1. Target Audience of the Case

The case presented is primarily designed for students pursuing Bachelor in Industrial Management and Master's degrees in Business Management and Computer Science, Management and Industrial Management. For this audience, the case study serves as a practical tool for reinforcing the knowledge gained in the logistics and SCM courses included in their academic programs. The analysis of this case allows students to apply theoretical concepts to a practical scenario, encouraging reflection on the role of information systems in supplier management. Additionally, it highlights the significance of these systems, offering a parallel to the current or future business environments of the target audience. To maximize the value of this case study, students should have a basic understanding of the subject matter.

Additionally, it serves as an analogy for the current or future business context that the target audience may encounter.

5.2. Pedagogical Objectives

The overall objective of the pedagogical case presented is to answer the following questions: To what extent can technology be effectively applied in the supplier sourcing phase? How can automation contribute to improving the quality of supplier selection and enhance the evaluation process?

To this end, the target audience is expected to develop the ability to interconnect and apply the knowledge acquired about information systems to be applied to the management of purchasing processes and how to implement and apply them.

After completing the pedagogical case study, learners should be able to:

1. Analyze the role of Information Technologies in the Procurement Process
2. Develop Data Visualization and Analysis Skills - Propose ways of visualizing data (such as comparative maps of suppliers), exploring technological tools for its construction and strategic interpretation.
3. Propose Strategies for Data Security Risk Mitigation - Identify practical initiatives that contribute to overcoming challenges related to data security in the context of the use of technologies in procurement.

4. Compare and contrast complex business scenario, propose technology-based solutions, and make evidence-based decisions.
5. Identify the most suitable technologies for process improvement, namely the procurement process.
6. Identify the main characteristics of cloud systems, namely ERP, and how these characteristics can support supplier management.
7. Identify internal challenges for the adoption of IT systems, namely cloud-based information systems.

5.3. Correspondence between the case questions and the pedagogical objectives

The table 2 shows the correspondence between the case questions and the learning objectives of this case study.

Table 2 - Correspondence Matrix Between Case Questions and Learning Objectives

	Q1	Q2	Q3	Q4	Q5
O1	X	X	X	X	X
O2	X				
O3					X
O4	X		X	X	X
O5			X		
O6		X			
O7				X	

5.4. Animation Plan

This facilitation plan serves simply as a proposal for how the Pedagogical Case Study might be utilized. In this scenario, it is suggested as a group-based activity, forming part of the continuous assessment strategy for a Course Unit (CU).

Before the activity implementation, the instructor should provide students with the necessary theoretical background or a set of resources that provide the knowledge that this case needs to approach and resolve the case effectively. During the initial session, the Case will be introduced, and it is advised that students be organized into five groups.

Each group should review the case beforehand and prepare responses to the assigned questions, applying the concepts and tools discussed in class. This preparation requires students to collaborate in advance, address any uncertainties, thoroughly examine the situation, and propose well-reasoned solutions.

In the session focused on question resolution, each group is expected to appoint a different spokesperson for each question. A discussion will then follow each question answer, allowing for input from the teacher and the students.

Table 3 - Animation Plan Proposal

Session	**Objectives**	**Tasks**
1	Presentation of the pedagogical case study: Division of the class into groups	Sharing the case study with students: Reading of the case, clarifying any doubts that may arise; and establishing the project groups
2	Reading and examining the case, suggesting possible solutions, self-study of the topics addressed in the case	Students read the case individually; sharing of ideas within the group regarding possible answers; discuss questions and uncertainties with other groups and the instructor; and prepare a document presenting the proposed solutions, supporting the answers to the questions with theoretical foundations
3	Sharing and debating the suggested resolutions for the pedagogical case study.	Every groups presents their suggested answers to the case questions, followed by a discussion of the proposed solutions among the groups and the instructor

5.5. Animation Questions

In this study case we have already presented the case questions, which are focused on the analysed reality specific aspects, however, these questions are different from the following animation questions that guide the investigation in a theoretical and broad way.

1. What are the key advantages of implementing IT solutions for the improvement of CJR's supplier management processes?
2. What needs to be considered for a successful implementation?

5.6. Answers to the case questions

This chapter presents only proposed solutions for the questions raised. The solutions provided are only a working basis for the case resolution.

5.6.1. Propose resolution for the question 1

Produce the visualization of a map to compare suppliers. Identify which IT can be used to generate that map and how the map it generated.

Radar charts (also called spider or web charts) can be used in combination with the Decision-Making Trial and Evaluation Laboratory (DEMATEL) method to create a map visualization for supplier comparison. Decision-makers can determine the causal links between several interdependent factors, including price, quality, compliance, delivery performance, and financial stability, by using DEMATEL. Building a direct relation matrix from expert assessments, normalizing it, and then producing a total relation matrix that emphasizes cause-and-effect influences among evaluation criteria are the steps in the process.

These values can be plotted in a radar chart after systemic influence weights have been determined. One supplier evaluation criteria is represented by each axis of the chart, and the polygon created by joining the plotted values graphically depicts the supplier's performance profile. This makes it possible to quickly compare several suppliers, pointing out their advantages and disadvantages. An improved radar chart with DEMATEL offers a more accurate foundation for supplier selection by integrating the interdependencies among factors in addition to comparing scores.

By centralizing supplier data (financial information, quality certifications, delivery history), cloud-based ERP and procurement systems improve this process even more and guarantee that records are correct and current.

This visualization helps decision-makers to analyze the differences between cost, quality, and delivery, ensuring that operational and strategic risks are taken into account when evaluating and choosing suppliers.

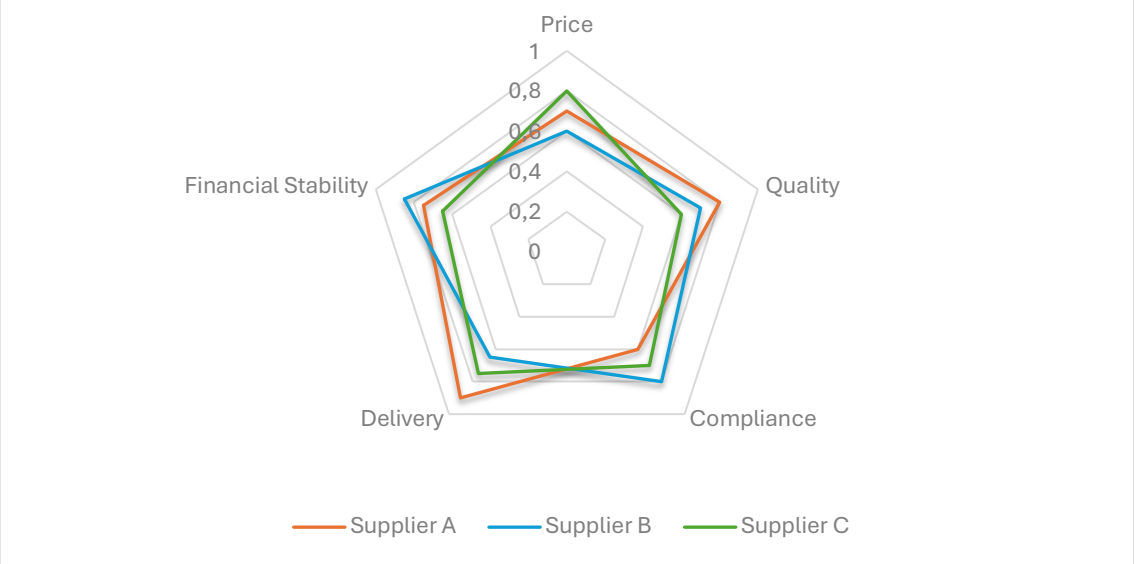

Figure 4 - Comparative map of suppliers (Radar Chart + DEMATEL) generated in Excel

5.6.2. Propose resolution for the question 2

Discuss the ERP systems main characteristics theoretically. Describe the adjustments needed in the company's ERP system so that it recognizes if a supplier complies with the pre-requirements for a specific purchase.

An organization's processes in a variety of areas, including finance, human resources, procurement, logistics, and production, can be consolidated and coordinated with the help of ERP systems. Data standardization (using common data definitions, ERPs ensure consistency, transparency, and accuracy of information across the enterprise), process integration (centralizing data, enabling real-time information sharing across departments, and reducing duplications and errors), automation and efficiency (workflows like purchase approvals, contract management, and financial postings are automated, reducing administrative effort and cycle time), and collaborative capabilities (ERPs extend beyond

internal integration, connecting suppliers, distributors, and customers to support end-to-end supply chain collaboration). These are some of their primary features.

For the CJR's purchasing process, the ERP system must transform from a transactional tool to a decision-support platform, guaranteeing that suppliers meet pre-requisites prior to contract award. To do this it is necessary to make some changes.

To record financial stability, production capacity, regulatory compliance, and certifications (quality, safety, and environmental), a supplier pre-qualification module should be integrated first. To guarantee that suppliers without the required paperwork are identified or blocked until compliance is verified, the Quality Department's questionnaire workflows must be automated and connected directly to the supplier's ERP profile.

Automated compliance controls must be put in place by implementing system limitations that stop unqualified suppliers from being chosen or evading Finance Department inspections. Additionally, thresholds for contract values (such as €1 million) must be set up to guarantee that big contracts cannot be divided into smaller invoices without higher-level approval.

An ERP-integrated system that securely stores contracts, guarantees, and certificates and makes them searchable and available to all pertinent departments, along with digital archiving and version control to prevent information loss, should take the place of email-based correspondence in centralized documentation and archiving.

Smart supply chain integration should be pursued by utilizing blockchain-enabled smart contracts for crucial equipment purchases to guarantee that contract terms are unchangeable and automatically enforced, as well as by utilizing IoT and AI-enabled analytics to track supplier capacity and predict risks like delays or financial instability.

Finnaly, to implement improved negotiation and decision support, price history analytics, which are currently done manually in SAP, must be integrated into dashboards that compare quotes, historical costs, and delivery performance. Additionally, multi-criteria decision models that balance cost, quality, delivery, and risk must be embedded, supporting data-driven supplier selection.

5.6.3. Propose resolution for the question 3

Which approach is more advantageous for CJR to use in supplier selection and evaluation processes: a best-of-breed IT solution or a single-vendor ERP system? Justify your answer.

The purchasing, quality, finance, and project management departments are involved in CJR's supplier selection and evaluation procedures, while pre-qualification of suppliers, bid evaluations, contract negotiations, delivery tracking, and post-performance evaluations are among the specialized responsibilities of each department. Now, external financial risk platforms (DICOM in Chile, DECOM in Brazil) and tools like SAP, SharePoint, and Excel are utilized concurrently. Although SharePoint is good at centralizing data, it still relies heavily on manual input, has little automation, and uses non-standardized feedback workflows, on the other hand, SAP offers price history tracking and negotiation but lacks delivery performance monitoring. Risks and inefficiencies are increased by this disjointed approach; for example, suppliers may circumvent finance checks or divide large contracts into smaller invoices to evade higher-level approval.

This difficulty is exacerbated by the supplier evaluation procedure, while structured surveys and scoring systems are used for performance reviews, and disqualifications are applied when minimum requirements are not fulfilled. Despite SharePoint's advancements, there are still irregularities in the way feedback is given, and supplier history isn't always considered. Positive performance feedback is not systematically documented, and non-conformities are documented but resolved through informal communication, this leaves gaps that may result in recurring problems, the rehiring of subpar suppliers, and missed chances for optimization and learning.

For CJR, a best-of-breed IT solution is a better option than a single-vendor ERP system considering these factors. Despite providing a unified environment, a single ERP would need to be heavily customized at great expense to capture CJR's intricate procedures, including structured scoring, certification verification, financial pre-qualification, and region-specific financial risk screening. Its inflexibility may also make it more difficult to innovate and adjust to new technologies, such as blockchain, AI, and the Internet of Things, which are essential for contemporary supply chains.

On the other hand, a best-of-breed approach allows CJR to integrate specialized solutions for each critical function, such as using Supplier Intelligence (SI) modules to

consolidate data on ESG certification compliance and financial stability, leveraging smart supply chain capabilities like IoT-enabled tracking and blockchain-based AI risk prediction for essential equipment, adopting cloud-based platforms to ensure scalability, centralized documentation, and real-time collaboration across locations at lower costs than on-premises ERP, and implementing performance monitoring systems that automate KPI tracking, including responsiveness, timeliness, cost efficiency, and quality, while linking any non-conformities directly to supplier profiles. By integrating cutting-edge supplier management tools with current systems (SAP, SharePoint, DICOM, and DECOM), this architecture would enable CJR to establish a smooth and cooperative digital ecosystem, additionally, it guarantees that real-time data on delivery performance, compliance, financial resilience, and ESG performance are used to support supplier selection rather than relying only on price or prior experience.

Also, CJR's unique construction industry requirements, such as rigorous management of critical equipment contracts, region-specific compliance, and disqualification rules for repeated non-conformities, can be accommodated by tailored supplier evaluation frameworks using best-of-breed solutions.

The best-of-breed IT strategy is the better option due to CJR's operational complexity, cross-departmental workflows, and reliance on multi-dimensional supplier intelligence, even though ERPs offer integration and consistency.

5.6.4. Propose resolution for question 4

How could a cloud-based Information System improve collaboration and feedback sharing with CJR’s suppliers across multiple locations and what are the internal challenges that need to be overcome for such adoption?

By centralizing and standardizing communication, assessments, and performance records across all locations, a cloud-based information system could improve cooperation and feedback exchange between CJR and its suppliers. Although SharePoint is an improvement over the previous Excel-based system, it still lacks formal mechanisms for structured feedback to suppliers. Nowadays, SharePoint is used to manage supplier evaluations and data, however, several benefits would result from switching this procedure to a supplier management and procurement platform that is entirely cloud-based:

- Teams in Portugal, Chile, Brazil, and other locations could access supplier records, pre-qualifications, and performance reviews in real time through a single system, which would eliminate the need for multiple pre-qualifications and guarantee that all projects use the same data, reducing the possibility of rehiring suppliers who have already been disqualified;
- The creation and distribution of performance reports can be automated by cloud platforms, guaranteeing that suppliers continuously receive organized feedback on timeliness, quality, and compliance. By standardizing feedback procedures, the current unstructured and irregular method would be replaced;
- By allowing suppliers to access their contracts, evaluations, and requests for corrective action directly through the system, it promoted openness and cooperative problem-solving. Additionally, cloud-based platforms facilitate multilingual and multi-location collaboration, guaranteeing that suppliers across the globe adhere to the same standards;
- CJR would be able to better balance cost, delivery performance, and long-term relationship value with the help of centralized data analytics, which would facilitate more informed supplier selection.

Despite these advantages, adopting a cloud-based solution requires dealing with some internal obstacles:

- CJR right now uses SharePoint for assessments and SAP for price history analysis. So, to migrate or integrate these with a new cloud platform it would take technical know-how, time, and money;
- Teams from different countries are used to working with SharePoint, spreadsheets, or email to manage supplier records. To guarantee consistent use, a new system transition requires training, defined protocols, and cultural adjustment;
- Each country has its own pre-qualification, monitoring, and feedback procedures for suppliers, so to prevent fragmented data entry and guarantee consistent evaluation criteria, adopting a cloud platform would necessitate standardized these processes;
- Because supplier data contains contractual and financial information, CJR would have to make sure that local laws (such as the GDPR in Europe and the

local data laws in Brazil and Chile) are followed and that the risks of unauthorized access in a shared cloud environment are reduced;

- To achieve full adoption, it will be essential to guarantee accessibility and offer assistance, because, nowadays, many suppliers, particularly smaller subcontractors, might not have the technical know-how or resources necessary to adjust to new platforms.

By facilitating real-time collaboration, structured feedback, and integrated performance monitoring across several locations, a cloud-based information system has the potential to transform CJR's supplier management. However, achieving these advantages requires solving internal issues with data security, training, process harmonization, and system integration.

5.6.5. Propose resolution for question 5

Identify three initiatives to overcome the data security challenges experienced by the company. Justify your answer.

To overcome the organizations data security challenges, it can be implemented the following strategies: The first is the adoption of a secure cloud-based platform for supplier and procurement management, as the company's current reliance on shared folders and emails exposes it to data loss, dispersed communications, and unauthorized access, as was the case with Excel in the past, also, consolidating sensitive financial and contractual data into a cloud solution with role-based permissions, encrypted storage, and automated backups would safeguard it against breaches and guarantee regulatory compliance in all operating regions. Given that high-value construction contracts, which frequently exceed €1 million, are vulnerable to fragmentation and financial control circumvention, the next strategy is to implement blockchain-enabled smart contracts for key suppliers, since eontractual terms embedded in blockchain-based smart contracts offer a transparent, secure method of managing agreements, delivery dates, and payments, lowering fraud risks and guaranteeing suppliers fulfill their quality and delivery commitments..

The last strategy is strengthening cybersecurity governance and offering ongoing staff training that handles human-related vulnerabilities that technology cannot resolve on its own, like approving suppliers without fulfilling requirements; this is because clear governance policies, along with regular training on secure data handling, phishing attempt

awareness, and proper system use, help employees become more competent in areas like cloud security, IoT, and AI, so, this strategy fosters a culture where compliance and data protection were established in supplier management and procurement procedures.

6. CONCLUSION

After a detailed analysis of the pedagogical case study and taking into account the initially structured research objectives and questions, it is possible to present some concrete conclusions regarding the significant impacts of IT on the efficiency, transparency, and security of the supplier management process.

This study aimed to explore how information technologies can be applied to CJR's procurement process, facilitating and improving the management of these processes, particularly in the supplier selection and evaluation phase.

Regarding the question “To what extent can technology be effectively applied in the supplier sourcing phase?”, it can be concluded that technology can be widely and effectively used in the supplier selection process through the analysis and comparison of suppliers. This is possible with advanced methods, such as DEMATEL, combined with radar charts, which allow the identification of cause-and-effect relationships between criteria (price, quality, delivery, compliance, financial stability) and create visualizations that facilitate comparison between suppliers. Additionally, ERP and integrated systems can centralize financial, production, compliance, and certification data, automating pre-qualification and controlling high-value contracts, ensuring that only qualified suppliers are selected. Cloud-based and best-of-breed solutions enable real-time collaboration, global access to data, structured feedback, and integration with modern technologies (IoT, blockchain, AI) to monitor supplier capacity, risks, and performance. In addition, the use of blockchain for contracts and secure cloud platforms protects sensitive data, ensures compliance, and prevents fraud or violations, providing greater security and regulatory compliance.

Regarding the question “How can automation contribute to improving the quality of supplier selection and enhance the evaluation process?”, it is concluded that automation plays a crucial role in improving the quality of supplier selection and evaluation. This is achieved by automating pre-qualification and compliance processes, allowing suppliers without certifications or compliance to be blocked, avoiding inappropriate choices and minimizing human error. Additionally, automating feedback and reporting on cloud platforms enables the automatic creation of performance reports, ensuring that suppliers receive structured and consistent feedback. The use of dashboards and analysis of price history, delivery performance, and other KPIs enable more informed decisions and the integration of automated multi-criteria decision models that balance cost, quality,

delivery, and risk, improving objectivity and standardization in evaluation. Finally, continuous monitoring through automated systems allows for constant tracking of KPIs and alerts on non-compliance or risks, preventing problems before they affect operations.

Among the most relevant results, we highlight, first, the combined use of Radar Charts and the DEMATEL method for comparative visualization of suppliers. This approach proved to be highly effective in multi-criteria evaluation, allowing us to consider not only the individual performance of suppliers in terms of price, quality, and delivery, but also the causal interdependencies between the different criteria. This evidence confirms that the application of advanced analytical tools in the context of supplier management provides a more solid basis for strategic decision-making, reducing operational and financial risks.

Second, the study highlighted the importance of integrated cloud-based platforms and best-of-breed solutions for data centralization, compliance process automation, and real-time collaboration with geographically distributed suppliers. The adoption of these solutions allows for the harmonization of processes, ensures regulatory compliance, and increases transparency, contributing to the creation of an efficient and secure digital ecosystem. This evidence reinforces the role of IT not only as operational tools, but as strategic elements of innovation in supply chain management.

For future work, it is recommended to further investigate the integration of emerging technologies, such as artificial intelligence, IoT, and blockchain, into supplier management, quantitatively assessing the impact of these technologies on risk mitigation, cost reduction, and improvement of supply chain sustainability. In addition, longitudinal studies on the adoption of cloud systems and best-of-breed solutions in multinational companies could provide additional evidence on the effects of process standardization and interdepartmental collaboration on organizational efficiency.

In summary, the results obtained confirm that the strategic implementation of IT solutions in supplier management represents a significant competitive advantage for CJR, promoting more informed decisions, greater transparency, and greater data security, while establishing a solid foundation for future research and innovation in the field of supply chain management.

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