

Midocean University



College of Management

Department of Project Management

**Measuring supply chain obstacles and challenges in private projects in biological
and chemical food analysis**

Prepared by:

Nadeen Alqahtani - ID:222000696

Hotoon Alnafea - ID: 222000614

Sultan Alnahdi – ID: 222001499

Supervised by:

PhD. Waleed Sulaiman

PhD. Alfaisal Abdelhameed

Year:2023

**Measuring supply chain obstacles and challenges in private
projects in biological and chemical food analysis**

Table of Contents

1. List of Tables	4
2. List of Figures.....	5
3. Abstract.....	6
4. Introduction	7
5. Research aim	8
6. Study problems.....	9
7. Research questions.....	10
8. Research objectives	11
9. Delimitations of the study.....	12
10. Literature review	12
11. Research methodology.....	28
12. Results and discussion.....	31
13. Summary and Conclusion.....	44
14. References.....	46
15. Appendix.....	54

List of tables	Pages
Table (1) Socio-demographic data of the study participants	34
Table (2) Work Experiences and strategic implementations	36
Table (3) working experience	36
Table (4) supply chain and strategic alliance	37
Table (5) performance measurement system	37
Table (6) the most important to measure	38
Table (7) factors prevent(s) the whole supply chain from implementing performance measurement system	38
Table (6) insufficient training and competency levels impact maintain existing supply chain operations	38
Table (9) support implementation of new technologies and increase efficiency in the organization	39
Table (10) adequate technologies of an integrated logistics System to support infrastructure requirements and inter-channel commitment	39
Table (11) implementation is often hindered by technology overshadowing the human resource and change management aspect	39
Table (12) lack of trust, communication and information sharing	40
Table (13) Challenges based on organization experiences	40

List of figures	Pages
Figure (1) Age categories	35
Figure (2) Positions	35
Figure (3) Residency	36
Figure (4) work department	36

Abstract:

Biological and chemical food analysis is one of the many industries where supply chain management is vital to maintaining product quality and safety. The goal of this study is to examine and measure the difficulties and roadblocks that private projects in the supply chain of these analyses encounter. The goal of the study was to identify potential roadblocks that could appear at various supply chain phases, such as raw material acquisition, shipping, storage, and testing procedures. By looking at these issues, we hope to shed light on the crucial areas that require enhancement and optimization in order to guarantee effective and dependable supply chain management in commercial projects involving chemical and biological food analysis. We deployed a specially created questionnaire to obtain data for this study from important parties engaged in private initiatives, such as suppliers, shipping companies, lab staff, and government agencies. Furthermore, statistical analytic methods were applied to evaluate the acquired data and derive significant findings. The findings showed that a variety of barriers, ranging from communications and business infrastructure to logistics and transportation as well as product storage and maintenance plans, directly impact the supply chain in that industry. With this knowledge, methods and solutions to get through these obstacles will be easier to come up with, improving the supply chain's overall performance in these kinds of projects in terms of effectiveness and efficiency. The results of this study also helped to strengthen food safety laws and guidelines, which eventually benefited consumers and guaranteed the accuracy of food analysis conducted in private initiatives.

Keywords

Supply chain management, obstacles, challenges, private projects, biological food analyses, chemical food analyses

Introduction

Academics and industry professionals have given sustainable supply chains a lot of attention in recent years. Globalization made it possible for procedures to be distributed globally, connecting all participants in the supply chain from suppliers to final consumers through the exchange of information and the movement of goods and cash (1). As a result, businesses have been forced to reevaluate how to balance environmental, social, and economic issues in their supply chains and implement sustainable supply chain management techniques by pressure from stakeholders like regulatory bodies, non-governmental organizations, community organizations, suppliers, customers, and worldwide competition (2). The management of material, information, and capital flows as well as collaboration among businesses along the supply chain, all while taking into account objectives from the economic, environmental, and social dimensions of sustainable development that are derived from stakeholder and customer requirements, is known as supply chain coordination and management, or SSCM for short (1).

Like any other company activity, SSC strives to meet precise performance objectives. The complexity of supply chains, whose separate participants frequently have competing objectives and, as a result, use various performance metrics, makes this an arduous undertaking. Because the actions of one company may have negative effects on other supply chain participants, different metrics are not always viewed as beneficial to the chain's overall performance. Therefore, the supply chain must be viewed as a whole, existing beyond the confines of the business level, in order for the chain's overall performance to be enhanced (3).

The performance of the supply chain's sustainability is frequently improved by SSC practices like environmentally friendly shopping and sustainable packaging. Numerous contextual elements have the potential to either facilitate or impede the establishment of SSC practices

(4). Distinct industries have distinct enabling or limiting elements depending on their location, size, culture, and supply chain partners. SSC has been the subject of extensive research in a number of industries, including manufacturing, the automotive sector, energy, oil and gas, and the food business. One of the most prominent industries with major environmental, economic, social, and political challenges is the food industry. This is because food safety, production methods, environmental problems like deforestation, climate change, and energy use, as well as social issues like equitable salaries and population expansion, have received a lot of public attention. Furthermore, because "changes at one stage in a supply chain will have knock-on effects on other stages in the chain," concerns about the sustainability of food supply chains have been raised concurrently by globalization, technological advancements, the use of agricultural chemicals, and improved transportation (5).

Measurement of supply chain impacts, supply chain networking and collaboration, stakeholder participation, and sustainable development goals are other important problems. The aforementioned problems validate the distinctiveness of food supply chains, which are characterized by unpredictability and risk factors arising from product-specific attributes such as perishability, production seasonality, transit, and storage conditions. Concerns about product provenance, food safety, quality, and sustainable production including environmental pressure and animal welfare—have also been brought up by consumers and businesses (5).

Effective and efficient supply chains are essential to maintaining the smooth flow of products, information, and resources in the dynamic field of biological and chemical food analysis. Private initiatives in this field encounter numerous difficulties and roadblocks that require careful research. The goal of this research proposal is to measure and analyze the supply chain barriers and difficulties that arise in private initiatives that focus on chemical and biological food analysis (6).

Rational of the study

The significant function that these programs play in protecting the public's health by accurately and promptly analyzing food products highlights the importance of this study. There is a growing strain on private food analysis projects, both chemical and biological, to provide accurate and efficient results as consumers place a higher priority on food safety and quality. As the foundation of many initiatives, the supply chain assumes a crucial role in determining not only the operational aspects but also the overall dependability and integrity of the analysis results (7).

Study problems

When it comes to measuring supply chain obstacles and challenges in private projects, especially in the context of biological and chemical food analysis studies, there are several key factors to consider.

Potential obstacles and challenges that we may encounter:

- **Regulatory Compliance:** Private projects in biological and chemical food analysis studies must comply with various regulations and standards imposed by regulatory bodies. These regulations may differ across countries and regions, and ensuring compliance can be a significant challenge.
- **Supplier Qualification:** Identifying and qualifying reliable suppliers for biological and chemical analysis equipment, reagents, and consumables can be challenging. Ensuring that suppliers meet quality standards, have proper certifications, and can consistently deliver the required materials is crucial.
- **Sample Collection and Transportation:** Proper sample collection, preservation, and transportation are critical in biological and chemical food analysis studies. Challenges

can arise in terms of sample integrity, logistics, and maintaining proper temperature conditions during transportation.

- **Laboratory Testing:** Conducting accurate and reliable laboratory testing requires skilled personnel, state-of-the-art equipment, and adherence to stringent protocols. Challenges may arise in ensuring the availability of qualified staff, maintaining equipment calibration, and managing high throughput testing demands.
- **Data Management and Analysis:** Managing and analyzing large volumes of data generated from biological and chemical food analysis studies can be complex. Challenges may include data integration, standardization, data security, and implementing appropriate data analysis techniques.
- **Supply Chain Traceability:** Ensuring traceability throughout the supply chain is crucial for maintaining product integrity and safety. Challenges may arise in tracking and documenting the movement of samples, reagents, and consumables, especially when multiple stakeholders are involved.
- **Time Constraints:** Private projects in biological and chemical food analysis studies often operate under time constraints. Meeting tight deadlines for sample analysis, reporting, and decision-making can be challenging, particularly when unexpected delays occur.

Research questions

1. What are the challenges to efficient communication and collaboration among stakeholders in the supply chain of private initiatives involving biological and chemical food analysis?
2. How do information flow and communication processes occur within this context?

3. Which key performance indicators (KPIs) are utilized in private initiatives involving chemical and biological food analysis to gauge how well the supply chain is working, and how well do these indicators match industry norms?
4. In what ways do supply chain obstacles impact the overall timeliness and reliability of delivering analytical results in private projects specializing in biological and chemical food analysis?

Objectives of the study

This study is aiming to achieve the following objectives

- Quantify and examine supply chain barriers and difficulties that private initiatives involved in chemical and biological food analysis face. With a focus on providing a thorough understanding of the variables that obstruct the smooth flow of resources, information, and products within these projects, the study will carefully examine every stage of the supply chain, from the acquisition of raw materials to the delivery of analytical results. In the specific context of biological and chemical food analysis within the private sector.
- The research aims to pinpoint certain bottlenecks, inefficiencies, and obstacles that affect the overall efficacy and dependability of the supply chain through a thorough investigation.
- Provide insightful analysis and tactical suggestions to improve the robustness and effectiveness of supply chain operations, ultimately aiding in the optimization of private initiatives in this crucial area.
- Identifying and analyzing the key challenges faced in private projects involving biological and chemical food analysis.

- Assisting private organizations in comprehending the specific constraints they encounter during the project lifecycle.
- Analyzing the implications and potential risks associated with these challenges on project outcomes.
- Proposing strategies to mitigate and overcome the identified challenges.
- Evaluating the effectiveness of the proposed strategies through real-world case studies.

Delimitations of the study

- Within a particular geographic area, this study will mainly concentrate on private initiatives involved in food analysis, both chemical and biological. The conclusions and suggestions might not be relevant everywhere and might change depending on regional variations in supply chain infrastructures, market dynamics, and regulations.
- Both quantitative and qualitative methods will be appropriate for this study and will aid in obtaining more detailed information on the research issue.

Literature review

In order to comprehend supply chain difficulties in the context of biological and chemical food analysis, it is helpful to first grasp the general challenges faced in supply chain management, which are covered in this literature review. Several significant effects are identified by the review, including higher costs (1) Challenges and roadblocks in the supply chain may result in higher costs for private initiatives. This may be the result of things like

the requirement to utilize more costly or ineffective testing techniques, the requirement to retest items because of mistakes or delays, or the requirement to get rid of tainted products (1). Delays: Problems and impediments in the supply chain can also cause delays in private projects. This may be the result of things like waiting for test results, shipping or receiving product delays, or the challenge of getting testing supplies. Decreased quality: Difficulties and roadblocks in the supply chain might also result in worse quality in private initiatives. This may be the result of things like using tainted materials, using ineffective testing techniques, or having to expedite testing due to time restrictions (8)

The success of commercial initiatives in the field of chemical and biological food analysis is examined in this study of the literature with regard to supply chain management. It highlights a number of crucial elements, including as efficient inventory control, supplier management, and transportation management that support the accomplishment of these projects (9). The analysis highlights a number of significant obstacles, such as the intricate and disjointed structure of the food supply chain, the intricate and dispersed network of enterprises and organizations that makes up the food supply chain makes it challenging to plan and monitor the flow of food goods. This may make it more difficult to guarantee food goods' safety and traceability (10). The high price and difficulty of testing for food safety Due to the complexity and high cost of biological and chemical food analysis, private projects may find it difficult to secure funding and obtain the required testing services. The absence of consistency in food safety testing, the procedures and techniques used for testing food safety are not standardized. Because of this, comparing test findings and making sure food products adhere to all relevant safety regulations may be challenging. Personnel with the necessary training and expertise are needed for biological and chemical food analysis. On the other hand, this field lacks skilled personnel (11).

In order to incorporate sustainability into the supply chain, three streams of literature on sustainable supply chain management have been established. These include study on identifying the practices and performance of organizations and identifying the barriers that are already in their mature stage, at least in industrialized nations. A decade ago, proposed that more useful tools for using SSCM should be developed by researchers, and a large body of work has attempted to find sustainable ways to measure performance and decision making in various industries. Barbosa Póvoa and da Silva examined the way that operation research techniques are used to sustainable initiatives. 10 distinct external and internal drivers were listed by, who discovered 1559 drivers of SSCM. In order to improve practice, authors carried out a thorough systematic literature review with an emphasis on SSCM in global SCs. They did this by giving managers of target enterprises worldwide SC guidelines. Other authors examine the significance of network structural features in SC sustainability and discuss how a set of SSCM techniques helps businesses accomplish sustainability objectives throughout their SCs. 14 primary categories of crucial elements, including as cooperation, strategic orientation, culture, practices, and political environment, were identified by (12). These elements are necessary for the achievement of SSC innovation (13). Pimenta and Ball discovered the ways in which manufacturing companies' supplier development programs, either directly or indirectly, spread environmental and social sustainability practices throughout the supply chain tiers, as well as the elements that support these practices. The idea of SSCM practices has progressively grown in importance for companies all over the world, and research on their impact has earned a recognized place in the SSCM literature. These practices pertain to the instruments, remedies, techniques, tactics, and plans of action that assist a business in enhancing its sustainability performance through its SC. According to a Bloomberg analysis focusing on 600 organizations in Europe and the U.S., different companies have varied definitions of sustainability, and as a result, diverse methods may be

implemented. The effective use of sustainable practices is hampered by the lack of a systematic and thorough framework for identifying SSCM practices, despite the fact that various studies have examined sustainable practices for particular industries (14).

A key consideration for the best possible implementation of sustainable practices is the configuration of the SC. It is crucial to comprehend and lessen the complexity of the supply base by taking commercial disintermediation and rationalization into account. Effective facility planning, direct selling, intermodal freight transit, novel path configuration, vending machines, and local exchange communities can all reduce the number of intermediary tiers and suppliers in outbound SC. This causes development of sustainable projects to concentrate on a small number of complying providers. Creating a brief SC is sometimes a preferable course of action (15). This pertains to establishing a disinter mediated SC upstream and purchasing from suppliers who are nearby geographically. Two categories of sustainable practices apply to SC design: redefinition and ability to shift. In general, the first one speaks of rethinking the SC design in order to challenge exocentric viewpoints and business redefinition, such as collaborating with extra-economic groups. Second, in order to satisfy the demands of suppliers or customers, SCs should be built to adapt swiftly and efficiently to changing circumstances (16).

Innovation

The transition to sustainability is accelerated by creative solutions. Innovations pertaining to sustainability fall mostly into two categories: technology innovations and technique and approach innovations (17). The first one is the use of cutting-edge technologies like clean technology, nanotechnology, and contemporary information management techniques; it also refers to having strong technical aptitude and buying new machinery and equipment that uses less energy. The second aims to use the best methods now available to make the current state

of affairs more sustainable, such as innovative design for long-term durability and simple disassembly (18).

Inventory Management

Inventory control and warehousing are essential components of SCs. Two kinds of SSCM procedures have received a lot of discussion on this topic: (19) maintaining inventory control and (18) developing inventory management. To ascertain the appropriate order amount and reorder points, inventory control and the information systems should work together effectively. In particular, it works well to eliminate hazardous items and ensure appropriate storage by utilizing just-in-time technologies. Collaborative inventory management, the use of two-bin systems, store consolidation, the deployment of centralized replenishment systems, and the use of hybrid stockless systems in which high- and low-volume products are delivered directly to points of care and the central store, respectively are additional practices to implement sustainable and carbon-free methods (20)

Sustainable Distribution

Logistics systems inherently involve transportation. In this sense, the goal of sustainable/green distribution is to reduce the environmental effect of moving raw materials and finished goods along the supply chain. To get economies of scale in both inbound and outbound transportation, it should be put to use (21). The recommended practices can be divided into two categories: consolidation and collaboration actions, such as organizing lot sizes and collaborative warehousing, integrating demand, combining internal and external site systems, and working with vendors to reduce packaging size; and the use of alternative and renewable energy. the modernization, reorganization, and automation of networks for freight logistics; for instance, lowering weight and volume, utilizing full-load trucks and capacity, implementing environmentally friendly storage, lowering the weight of containers, enhancing refrigeration, and minimizing human involvement; monitoring emissions from the

distribution of products the creation of services (such as encouraging the use of shared-occupancy vehicles and public transportation to reduce or even eliminate travel, as in the case of videoconferencing, telehealth, and home healthcare in the healthcare sector); and the finding of shorter routes for the transportation of products in order to reduce associated costs and emissions (22).

Market Management

Achieving consumer pleasure is market management's primary objective. Certain strategies can help achieve sustainable market management, like: enhancing the image of a green brand, which provides a competitive edge in the global marketing arena and raises market share and profitability (23) In comparison to the company's main competitors, locating markets for recovered products and breaking into new markets; managing on-time delivery by improving supply flexibility and customer relationship management; addressing customer concerns by educating customers about sustainable movements and green initiatives; and designing eco-friendly products, distribution systems, and green and sustainable SCs to address the environmental concerns of customers (24).

Reverse and Green Logistics

In order to determine the economic value of returned goods in the SC, product and material recovery is a crucial end-of-life procedure that is regularly discussed in the literature. It can be accomplished through applying techniques for green, reverse, and closed-loop SC logistics as well as by refurbishing, repairing, reusing, and remanufacturing (25). It involves a variety of diverse logistics operations, including recycling containers, energy-efficient automobiles, recyclable pallet systems, environmentally friendly investments, getting rid of extra packaging and shipping, hiring outside parties to recover products, and combining production and recovery (26).

Waste Management

Throughout the SC process, many waste types are emitted in the forms of solid, liquid, and gas. For example, CO₂ emissions contribute to the company's carbon footprint. In order to reduce pollution, businesses should work to prevent, regulate, or minimize waste. Various strategies are proposed, including the management of by-products and the creation of a waste product recycling system, the utilization of waste as a resource (27), requesting suppliers to commit to waste reduction targets, appropriate segregation, the use of alternatives to incineration, and landfilling. Adhering to specific protocols, like hazard analysis and important control points in the food business, can help lower the likelihood of contamination (28).

Resource Management

Owing to their limited availability, natural resources must to be utilized as efficiently as possible. To reduce resource use in the SC, resource management, conservation, and material substitution are therefore essential. Food SCM solutions include, but are not limited to, reducing meat intake, choosing organic and locally sourced foods, composting, and utilizing sustainable sources. The four pillars that support RM techniques are: (29) resource-based supplier management; water management; energy-saving management; and (30) hazardous management, which aims to prevent utilizing poisonous and damaging materials. Rainwater harvesting, waterless dyeing, leak prevention, installing flow restrictors and dual-flush toilets, using drought-resistant plants, recovering water from dialysis and sterilization services, odor control, using unconventional and alternative energy sources, automatic lighting timers and sensors, switching to LED lighting, taking into account nearby and local suppliers, and avoiding the use of chemical pesticides and fertilizers are some examples of workable solutions (29).

Purchasing

Green and sustainable procurement strategies necessitate a sustainable procurement process. First, go green by making sure that the products with the green badge you buy are recyclable and made with raw materials that are low in harm to the environment. Some examples of these products include certified organic coffee, meat produced without the use of hormones or antibiotics, packaging that is lighter and more environmentally friendly (31), and shopping bags. The second practice relates to socially conscious shopping, such taking into account how a product will affect human rights and choosing not to buy goods made by workers in non-standard conditions. The most crucial recommended practice is to base your supplier selection process on a code of conduct. This promotes procurement openness and strengthens procurement hubs and regional producers (32).

Supplier Management

The development of suppliers is essential to SCs' transition to sustainability. It is possible to divide the main practices into four categories: location, technology, certification issues, and training. Suppliers with environmental certificates are preferred by businesses, since this should facilitate the acquisition of genuine certifications (33). One technique that works well is to transfer technology to suppliers and share expertise with them to help them grow their skills. Selecting small, local suppliers is sometimes the best course of action because they can be trained and developed for the future, which can help with difficulties like intermediary concerns and local legal and regulatory needs (34-37).

Encoding

An explicit code of conduct serves as a road map for managing suppliers in an environmentally responsible manner. It helps create an ethical standard and enables businesses to select the best suppliers. It ought to be organized in accordance with national and international standards as well as legal requirements. In long-term partnerships, businesses should have the assurance that suppliers will adhere to the code of conduct (38).

Information Management

SCM makes extensive use of information and communication technology. Depending on data availability and provisions, a basic level of ICT entails obtaining and using information through websites, social media, public reporting, and advertisements. Information and knowledge sharing is a crucial ICT technique that connects all parties involved in the SC. One useful strategy is to exchange transactional information with many stakeholders and integrate IT systems (39). A crucial component is to communicate environmental laws, resource usage, and material flow management to suppliers. Furthermore, other research recommend more sophisticated approaches include digitizing SC activities, implementing blockchain technology and machine learning algorithms, and utilizing internet of things and interdepartmental IT connection systems (40-43).

Quality Performance

Various accountability and auditing procedures are created to facilitate the construction of corporate processes and apply sustainability concepts in SCs. While some businesses are attempting to create their own certifications, there are international standards that are tailored to specific industries. For example, there are various ISO certifications that aim to improve quality while taking an environmentally friendly approach; the most popular green building rating system, LEED; the EPD standard that provides information about the environmental impact of a given building material; GOTS that establishes internationally recognized standards for organic textiles; that is developed by the European Commission to help businesses and other organizations assess, report, and improve their environmental performance; (42) which contains ten universal sustainability principles to support UN goals; and ILO that lays out fundamental In particular, the Environmental Management System, or family, is a well-respected platform that offers data on the environmental performance and indices of businesses as well as resource consumption mapping and sophisticated

environmental data gathering tools. Regular supplier audits are crucial to ensuring that suppliers meet the highest social standards, are certified by OSH and, and offer a decent and fair work environment (45).

Evaluation and Assessment

The sustainability performance management systems of a business should be routinely reviewed in order to assess the state of affairs and determine what needs to be changed. As a result, official or informal assessment procedures must be carried out utilizing precise metrics, sustainability indicators, and standards for sustainable behaviors, such as CO₂ calculators and consumption mapping. SSCM assessment is significantly impacted by supplier evaluation. To ensure compliance, OEMs can, for instance, send questionnaires on environmental, safety, social responsibility, and ethical duty to their suppliers. One well-known solution is to use life cycle assessment methodologies to evaluate the environmental effects of a product's life from design to the point of recycling or death (46).

Health and Safety Management

Companies should set up and execute health and safety management systems to lower the chance of mishaps and guarantee environmental safety procedures. Implementing HSMSs reduces the likelihood of environmental disasters while also improving health and safety elements. Compliance surveys and standard programs serve as the instruments for managing and keeping an eye on the various SC participants, including suppliers. For example, moving goods through firm or trading partner facilities is one of the risks associated with generating activity in a business setting. In order to guarantee transportation safety, drivers' whereabouts and health should be inspected (47).

Hazard Assessment

In-depth discussions of handling and recognizing risk factors for the SC process are found in the literature. Industries transitioning to sustainability are known to share common strategies in risk perception and management. This entails being prepared for emergencies as well as identifying possible sources of competitive advantage. In this context, operational risk management and supplier risk reduction are important considerations (48).

Human Resources and Rights

More broadly, sustainability is a smart attempt to link humans and the environment to encourage conservation and innovation. Achieving these objectives requires effective human resource management, and human rights cannot be overlooked. Three components make up the axis of practice: 49 the hiring process; the working environment and welfare; and skill development. In the workplace, equity, diversity assurance, and rigorous adherence to rules against gender discrimination as well as meritocracy should be taken into account. Employers should use effective workplace management to give all workers a safe, positive, and healthy work environment. In terms of job responsibility, moral conduct, employment stability, flexible scheduling and minimizing the need for overtime, pay, money, awards, medical benefits, work-family balance, well-being systems, and employee empowerment and involvement across the SC, they should take these factors into account. Employees have a right to opportunities for capability development and ongoing education (50).

Activities Humanitarian

Humanitarian actions are among the social activities associated with SSCM that have drawn the most attention from the literature. Organizations need to push their SC partners to get involved in charitable endeavors. These altruistic endeavors encompass charitable contributions, involvement in nearby events and organizations, and creating jobs for marginalized individuals in order to advance sustainability. Companies should use low-

income businesses in SC operations; reduce the negative effects on the areas surrounding their operations, and support charitable and community welfare initiatives. The social SC strategy's (51) definition practice is the involvement of NGOs, the community, and charitable organizations in decision-making processes.

Conduct Patterns

Organizations must take into account the consequences of their actions, such as breaching the law and getting fined by the government. The company's reputation may suffer from this kind of performance. Behavioral changes are necessary for successful SSCM in order to ensure the sustainability of all SC levels. Additionally, businesses need to keep an eye on consumer actions like recycling and helping with return handling [52]. In order to comprehend and advance sustainability measures, businesses can foster critical thinking among their clientele .

Equity

A SSC ought to be impartial and fair to all parties involved. Redefining the SC strategy should take fairtrade practices into account. In a sustainable business climate, corporations strive for policies that combat corruption and promote fair trade. They are free to select their suppliers, turn down bribes from vendors, and sell goods and services to customers. Fair-trade solutions in an industry include sourcing from fair trade certified suppliers, offering a minimum price to suppliers, and predicting 60% ultimate reimbursement at the start of the trade to support business viability (52)

Financial Management

Even though most of the time using sustainable systems results in lower costs, we still need to know how to finish cost-cutting tasks. These are steps taken to save costs on a variety of fronts, such as manufacturing costs, distribution costs, and fixed or beginning costs. By

putting in place a suitable cost management system, implementing modern machinery and technology, controlling environmental expenses for green SCs, and cutting down on scrap and stoppage, they are achievable. Businesses can assist suppliers in value engineering to save component costs by reducing production expenses and making purchases based on total cost rather than pricing (53-57)

Systems of Incentive and Reward

Entities are motivated to participate in a sustainability route that creates a sustainable system by incentive management and perceptual rewards. Tax rebates, soft loans, or taking back and implementing access revenue models are other ways to reward businesses and consumers (58). In order to implement greener practices, staff measurement, reward, and compensation systems can be connected to the company's sustainability performance. Larger orders, long-term contracts, loans, or greater discount rates for suppliers with superior sustainability performance can all be extended to compliant suppliers through trade credit schemes. Puma and Alibaba Group, for instance, use an SSC finance system to assess suppliers' performance based on social and environmental standard (59).

Investing

To make the transition to sustainability, money and resources must be allocated expressly to the recovery process. Resources and technology should be the focus of the investment. In this sense, the studies offer several doable solutions to expand SSC improvement. These include turning surplus assets into income through the sale of idle assets, excess inventory, scrap or by-products, and excess capital equipment (60).

Organizational Management

Organizational structure and management has to be proactive in order to provide sustainability. Two factors determine the extent of sustainable organizational practices: organizational culture; and (61) reputation and image. SSCM can be positively impacted by

cultural initiatives such establishing social responsibility committees, sustainability departments, and chief sustainability officers, as well as team-based, adaptable, competitive, and market-oriented structures that are reinforced. Effectively presenting the company's past and enhancing its standing in comparison to rivals would advance sustainability (61).

Management of Stakeholders

When considering the performance of an SSC, it is important to remember that stakeholders like as investors, have a legal claim to a portion of the company's profits. These communities mostly relate to individuals or clients who are concerned about the environment or who are impacted by the sustainability initiatives of rival businesses; they are not always affiliated with the company or its partners. Effective management of these players is necessary to lessen the strain on the business. Determining sustainable procedures for managing stakeholders is crucial when taking into account the well-being of investors at trading partner locations (62).

Combining and Working Together

Efficient practices include jointly developed programs and integrated methodologies, sometimes known as integrating digital and physical systems. They assist the SC tracking system for prompt replies and aid in the reduction or elimination of material use and logistics expenses. They consist of things like collaborative forecasting and planning and cross-functional integration. Industry-wide collaborative efforts are being considered, such as integrated nursing workstations and shipment consolidation in the manufacturing and healthcare sectors, respectively (62).

Guidelines and Policies

Effective laws and rules are enacted by governments and social planners to help businesses lower their environmental pollution. Sustainability is achieved by adhering to the rules that are set forth and enforced by environmental legislation. Understanding the regional, national, and international regulatory systems is essential. These political policies are sustainable legal frameworks and institutions that are put into place by means of coercion, networks of support, or global environmental accords. One clear goal of (63) environmental policy is to address climate change, as stated in Article 191 of the Treaty on the Functioning of the European Union. Governments across the country have implemented safety-related environmental regulations, such as handling hazardous and toxic waste, which businesses are required to follow or face penalties. Additionally, businesses want to select outside vendors who adhere to environmental guidelines and norms.

Plans & Initiatives to Provide Assistance

To achieve sustainability goals, a strategy for sustainable development is essential. Reputable businesses routinely provide sustainability policy statements that are based on the triple bottom line methodology. This aids in addressing the institutional influences that may harm a business's standing. These initiatives can be written as corporate social responsibility initiatives to increase wealth creation, for example. The research suggests two more methods to accomplish the objectives: (64) financial help; commitment and support from high management. Effective plans require the support of middle managers and micro-budgets for sustainability projects in addition to a set annual budget and the commitment of senior management. Employees, customers, suppliers, and stockholders must be involved and supportive of the strategies.

Consciousness

In sustainable practice, awareness refers to the endeavors made to elevate the general consciousness of society. As a result, raising public knowledge of environmental issues helps

adoption methods. The social and economic benefits of environmental planning should be realized in society through including individuals in sustainability initiatives, which will improve sustainability literacy. Enhancing social consciousness outside of the job can be accomplished in a variety of ways. Environmental slogans that effectively convey a company's message and increase awareness, for example, might be displayed on their vehicles, products, websites, or even as an attention-grabbing emblem on their logos (63).

Methodology

Design of the study

- The research subjected quantitative-methods approach ensuring a comprehensive analysis of supply chain obstacles and challenges in private projects engaged in biological and chemical food analysis.

Population

- The participants in this research study will primarily consist of individuals and private projects operating within the domain of biological and chemical food analysis. A diverse range of stakeholders will be engaged to ensure a comprehensive understanding of supply chain obstacles and challenges in this sector.

Inclusion critters

- Private Project Managers: Project managers and directors of private projects specializing in biological and chemical food analysis will be key participants. Their insights will provide a high-level overview of supply chain management strategies, challenges, and performance indicators within their organizations.
- Supply Chain Managers: Supply chain managers responsible for overseeing the procurement, logistics, and distribution of resources and products within the private projects will be actively involved. They will offer detailed information on the day-to-day operations and challenges encountered in supply chain management.
- Industry Experts: Experienced professionals, consultants, or academics with expertise in supply chain management and the biological and chemical food analysis industry will participate in interviews. Their external perspective will provide valuable insights and potential best practices.

- **Regulatory Authorities:** Representatives from relevant regulatory bodies responsible for overseeing standards and compliance in biological and chemical food analysis will be consulted to understand the regulatory challenges faced by private projects.
- **Suppliers:** Selected suppliers providing raw materials, chemicals, or equipment to private projects will be engaged to obtain a supplier perspective on the challenges encountered in meeting the demands of private projects.
- **Clients/Stakeholders:** Some of the private projects' clients and stakeholders, such as food manufacturers, distributors, or government agencies, may be interviewed to capture their expectations and experiences related to supply chain efficiency and analytical results delivery.
- **Employees:** In some cases, employees at various levels within private projects may participate, offering insights from the operational frontlines, shedding light on day-to-day challenges and solutions.

Ethical considerations

- Participants will be selected based on their willingness to take part in the study and their relevance to the supply chain processes within private projects. Efforts will be made to ensure diversity in terms of project size, geographic location, and specialization areas to provide a well-rounded perspective on the topic of supply chain obstacles and challenges in biological and chemical food analysis. Informed consent will be obtained from all participants, and their identities will be kept confidential in the research report.

Data collections procedures

- **Quantitative Phase:** structured questionnaires distributed to a representative sample of private projects in the biological and chemical food analysis sector. In addition to

key stakeholders, including project managers, supply chain managers, and industry experts, will be conducted to gather detailed insights.

Data Collection Instruments:

- Quantitative: Standardized survey instruments designed to measure key supply chain variables, challenges, and performance metrics. To enhance the validity and reliability of the study, data triangulation was employed by comparing and contrasting findings from the quantitative and qualitative phases of the research.

Data analysis

- Findings were presented in a clear and organized manner, with visual aids such as charts, graphs, and tables used to illustrate quantitative data. The research report will include an executive summary, detailed analysis, conclusions, and actionable recommendations for private projects in the biological and chemical food analysis sector.

Results and Discussion

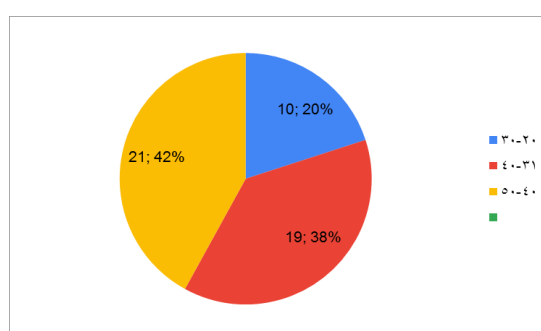
Socio-demographic information

Table (1) Socio-demographic data of the study participants

factors	Categories	Responses	Percentage
Age	20-30	10	20
	31-40	19	38
	40-50	21	42
	Total	50	100
Position	Private Project Managers	12	24
	Supply Chain Managers	8	16
	Industry Experts	3	6
	Regulatory Authorities	1	2
	Suppliers	9	18
	Clients/Stakeholders	3	6
	Employees	12	24
	others	2	4
	total	50	100
Residency	A city	49	98
	Rural area	1	2
	total	50	100
Department	Production	10	20
	Quality Control	4	8
	Technical Support	1	2

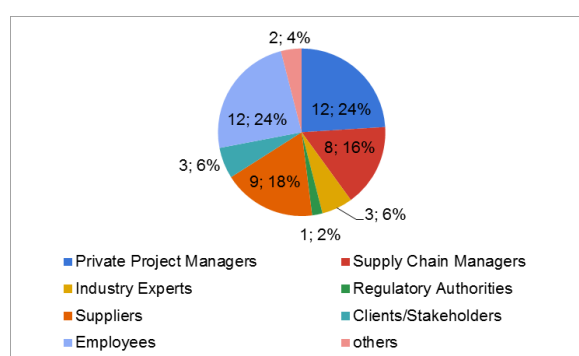
	Logistics	13	26
	HR	7	14
	Finance	5	10
	others	10	20
	Total	50	100

Figure (1) Age categories



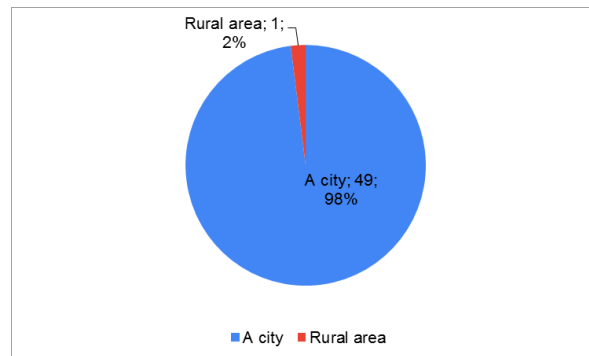
The age range of the participant refer to that almost of them might has good experiences that will reflect on their repaves of the questionnaire where the categories are comparable the from 31 to 50years old were reprinted by 80% .

Figure (2) Positions



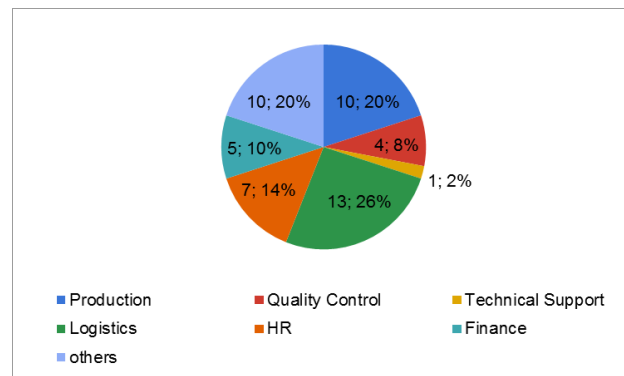
The positions of the participants were representative for all sectors that would add more reliability for the study position variations

Figure (3) Residency



The residency type refer to that the majority of the persons were from cuties (98%)

Figure (4) work department



Also for the work department we see that the variation among departments was clearly depicted in our results and the percentages were so close from each other.

Table (2) Work Experiences and strategic implementations

Your company's role in Supply Chain				
Category	Responses	Rate	P. value	Significance
Supplier	17	34	0.072	Sig.
Transporter	5	10	0.000	
Manufacturer	2	4	0.12	
Distributor	18	36	0.91	
Wholesaler	2	4	0.003	
Retailer	6	12	0.00	
Customer	0	0	0	

In the first experiences trend we found that the majority of the firms were having a role for the strategic implementation and the analysis refer to the significance of the ample.

Table (3) working experience

Your working experience in this position is?				
Category	Responses	Rate	P. value	Significance
Less than 5 years	22	44	0.072	Sig
More than 5 years	28	56	0.000	

The majority of the participants had a good experience's 28 (56%) representing the more than 5 years experiences with significant relationship

Table (4) supply chain and strategic alliance

Does the whole supply chain have any strategic alliance?				
Category	Responses	Rate	P. value	Significance
Yes	47	94	0.012	Sig
No	3	6	0.000	

The majority of the firms were having strategic alliances (94%) while others has relatively no alliances (4%) with significance

Table (5) performance measurement system

Have you implemented any kinds of performance measurement system(s) in the whole supply chain?				
Category	Responses	Rate	P. value	Significance
Yes	31	62	0.000	Sig
No	19	38	0.23	

There were 31 participants who implemented any kind of measurement system and the others were not (38%).

Table (6) the most important to measure

Which aspect of the whole supply chain is the most important to measure?				
Category	Responses	Rate	P. value	Significance
Time	10	20	0.000	Sig
Flexibility	15	30	0.000	
Reliability	3	6	0.12	
Cost	22	44	0.91	

Cost of the supply chain is the most important to measure 44% and the Flexibility was 30% while the time and the reliability came by 20 and 6 respectively

Table (7) factors prevent(s) the whole supply chain from implementing performance measurement system

What is (are) the main reason(s) which prevent(s) the whole supply chain from implementing performance measurement system(s)?				
Category	Responses	Rate	P. value	Significance
Cost	11	22	0.000	Sig
Manpower	2	4	0.000	
Time	14	28	0.038	
Lack of data	5	10	0.00	
Lack of interest	2	4	0.0078	
Others	16	32	0.000	

The main reason(s) which prevent(s) the whole supply chain from implementing performance measurement system(s) were time by 28% and the cost by 22 % and the other factors were less than 6% while three were 32% as different causes.

Table (8) insufficient training and competency levels impact maintain existing supply chain operations

How insufficient training and competency levels impact maintain existing supply chain operations				
Category	Responses	Rate	P. value	Significance
Strong impact	34	68	0.00	Sig
Moderate impact	10	20	0.72	
Weak impact	1	2	0.02	

No impact	5	10	0.000	
-----------	---	----	-------	--

Insufficient training and competency levels impact maintain existing supply chain operations as shown in the results where 68% were supported this statement while 5 persons saw that there are no impact of this factor.

Table (9) support implementation of new technologies and increase efficiency in the organization

How support implementation of new technologies and increase efficiency in the organization				
Category	Responses	Rate	P. value	Significance
Weak support	8	16	0.000	Sig
Moderate	12	24	0.000	
Not enough	18	36	0.00	
No support	12	24	0.00	
Are there trade barriers between countries and government policies				
Category	Responses	Rate	P. value	Significance
Yes	42	84	0.000	Sig
No	8	16	0.000	

Support of implementation of new technologies and increase efficiency in the organization was weak by 16% and moderate by 24% and not enough by 36% while not supported was the answer of 24%.

Table (10) adequate technologies of an integrated logistics System to support infrastructure requirements and inter-channel commitment

Are there adequate technologies of an integrated logistics System to support infrastructure requirements and inter-channel commitment?				
Category	Responses	Rate	P. value	Significance
Yes	17	34	0.0832	Not sig
No	33	66	0.43	

Adequate technologies of an integrated logistics System to support infrastructure requirements and inter-channel commitment, this was the replies of 34% of the participants while 66 of them were not supporting this statement and the analysis was not significant

Table (11) implementation is often hindered by technology overshadowing the human resource and change management aspect

Is the supply chain process implementation is often hindered by technology overshadowing the human resource and change management aspect?				
Category	Responses	Rate	P. value	Significance
Yes	41	82	0.092	Not sig.
No	9	18	0.436	

The supply chain process implementation is often hindered by technology overshadowing the human resource and change management aspect, this was the response of 82% while 18 were not supporting this results

Table (12) lack of trust, communication and information sharing

How lack of trust, communication and information sharing becomes secretive?				
Category	Responses	Rate	P. value	Significance
Strong	41	82	0.000	Sig
Moderate	3	6	0.000	

Weak	6	12	0.00	
------	---	----	------	--

Lack of trust, communication and information sharing becomes secretive recommended by 82% as strong answer while 12% were referring that it was weak.

Table (13) Challenges based on organization experiences

Question	Rank	SD	P value
Inability to maintain safety and quality	4	.05	0.000
Inadequate communication between the parties	5	0.01	0.002
Poor communication between supply chain members, especially primary members	4	0.2	0.415
Poor physical infrastructure	3	0.05	0.002
Raising supply chain cost	3	0.1	0.019
Technology based issue	4	0.12	0.198
Financial problem	3	0.1	0.128
Storage, Transportation and Sample Collection	2	1.03	0.125
Data Management and Analysis	2	1.0	0.24
Lack of internal cost efficiency and speed of delivery in the following areas: ordering, inventory, marketing, and logistics	4	0.2	0.12
Inadequate distribution channel design and structure ie., balance of power in contractual relations	4	0.23	0.000
Lack of a strong organizational culture committed to SCMI	4	0.1	0.000

supply chain channel members view themselves as a collection of individual companies, not as a holistic system	3	0.2	0.23
The supply chain decision makers are usually not near the action ie. The sales arena. Decisions are based on inaccurate information	4	0.7	0.20
supply chain channel members do not share the same business values	2	1.5	0.01
Company's suppliers serve their competitors and secret information could be revealed to the wrong party	3	1.02	0.21
The flow of data between businesses is often insufficient or recorded on incompatible databases	3	1.1	0.000
It is hard to have total control over the third party service provider's actions	3	0.92	0.000
Poor internal communication of company's objectives cause communication breakdown: lack of effectiveness	3	0.12	0.000
Supply chain channel members fail to realize their contribution to customer satisfaction	2	1.2	0.18

Discussion

From the analysis of the rating responses we can conclude that, inability to maintain safety and quality, inadequate communication between the parties, Poor communication between supply chain members, especially primary members, Technology based issue, The supply chain decision makers are usually not near the action,. The sales arena Decisions are based on, Lack of a strong organizational culture committed to SCMI and Lack of internal cost

efficiency and speed of delivery in the following areas: ordering, inventory, marketing, and logistics where all effective factors that clearly impact the Supply chain with rank of 4 and 5 degrees. While other obstacles were Supply chain channel members fail to realize their contribution to customer satisfaction, Poor internal communication of company's objectives cause communication breakdown: lack of effectiveness, It is hard to have total control over the third party service provider's actions, The flow of data between businesses is often insufficient or recorded on incompatible databases, supply chain channel members do not share the same business values, Storage, Transportation and Sample Collection and Data Management and Analysis were all impacted the supply chain in moderate scale. The relationship shows that the statistical analysis there a significance values for the sample based on the population of the study.

In the literature we found a lot of supporting results as follow, Important areas for possible waste reduction and process improvement are supplier lead times and performance. The distribution network can also be out of date as one obstacle client or store setups, and other subjects were also added to the factors (13). It might have been constructed at a time when the emphasis was on warehouse inventory storage rather than the current emphasis on inventory velocity. The product is often not worth touching in order to store it; doing so simply wastes time. Time and inventory can be saved by avoiding warehouses with cross docking or other port transfer capabilities (25).

Technology used in supply chain execution can provide visibility from the purchase order to the delivery order. It can offer a means of allocating goods while they are in transit. Time and inventory waste are reduced when this is integrated into the new process. Due to the distance involved, global supply chain management involves a substantial built-in lead time (33). This is in opposition to local supply chains. In consequence, the prolonged period may lead to uncertainty and the requirement for many businesses to construct and maintain extra

inventory. However, there are two waste areas that lean can improve: time and inventory. Therefore, the intrinsic scope of lean international logistics and its impact throughout the supply chain, particularly within the firm, present an extra difficulty. Finding non-value-added activities is crucial for global supply chain management in particular. The effectiveness of the supply chain can be hampered by any activity that increases the time, inventory, or cost of the already complicated activities (17).

A technique for observing and locating waste, both internal and external, is value stream mapping. Plans for streamlining the supply chain might be based on an observation of the waste and ongoing operations. This process is particularly important for high-volume, high-margin products since it has a big effect on the bottom line of the business (29). Truly eliminating waste throughout the whole supply chain requires cooperation and coordination between trading partners as well as within the company's organizational structure. Increased inventory velocity, quicker cycle times, and lower costs for high-volume, high-margin products can all have an impact on return on investment and demonstrate the benefits of lean (61).

A valuable technique for comprehending the current supply chain and creating a new one is value stream mapping the company's mission and vision should be closely aligned with supply chain management. SCM is the path to profitability, competitive advantage, and client growth and retention. Successful supply chains have the endorsement and cooperation of upper management (4). A value stream map represents a process or something that is used as a process. Ineffective processes might result in wasteful or low-value activities. Waste in the global supply chain manifests as unnecessary cycle time, inventory, and expense. The transportation and warehousing processes are where cost waste frequently manifests itself.

It is simple to assign blame to other parties without knowing what your business does to set them off. Look for instances when the process is being pushed to suit your business or another organization, which leads to a major waste. The new process's design calls for in-depth research and creative thinking beyond conventional logistics. If not, a defective process may take the place of another problematic process (6).

Conclusion

The success and efficiency of private projects can be greatly impacted by supply chain barriers and difficulties, particularly in the area of chemical and biological food analysis. Accurate measurement and resolution of these barriers are essential for companies in this field. The following is a list of the main roadblocks and difficulties encountered in the supply chain of commercial initiatives involving chemical and biological food analysis:

- **Sourcing Raw Materials:** Obtaining a steady and dependable supply of superior raw materials for analysis is one of the main obstacles. This entails locating reliable suppliers and setting up strong procurement procedures to preserve the materials' traceability and integrity.
- **Quality Control:** To guarantee accurate and trustworthy analysis results, stringent quality control procedures must be followed throughout the supply chain. This entails following legal criteria, calibrating instruments, and putting into practice standardized testing procedures.
- **Storage and Transportation:** To preserve the integrity of the materials, samples and reagents must be stored and transported properly. Temperature control, contamination hazards, and logistical planning to guarantee prompt delivery to testing facilities might provide difficulties.
- **Regulatory Compliance:** A variety of regulatory frameworks and requirements apply to private enterprises involving chemical and biological food analysis. It can be quite difficult to follow these rules, get the required permits, and make sure that compliance is maintained, particularly when working in multiple jurisdictions.
- **Data Management:** Traceability and supply chain optimization depend on efficient data management. Maintaining data security and privacy, integrating data from many

sources, and putting in place reliable methods for data analysis and reporting can all present difficulties.

- **Technological Advancements:** New techniques and technologies are always being introduced into the field of biological and chemical food analysis. It can be difficult to stay on top of these developments and incorporate them into the supply chain; it calls for constant investment, learning, and adjustment.
- **Capacity Building:** It's critical to create and preserve a team with the expertise to manage intricate analysis procedures. Recruiting and training competent staff, encouraging information sharing and making sure essential talent is retained are possible obstacles.
- **Sustainability and Ethics:** The food business is placing a growing emphasis on sustainability and ethical issues. Ensuring ethical sourcing procedures, reducing environmental effect, and resolving social and ethical issues along the supply chain could provide difficulties.

Summary

In conclusion, a variety of barriers and difficulties arise in the supply chains for private initiatives including chemical and biological food analysis. A comprehensive strategy that takes into account sourcing, quality assurance, storage, transportation, regulatory compliance, data management, technology improvements, capacity growth, and sustainability is needed to address these issues. Organizations can improve this domain's efficiency, dependability, and overall success by recognizing and proactively addressing these difficulties.

References

1. Gurtu, A., & Johnny, J. (2021). Supply chain risk management: Literature review. *Risks*, 9(1), 16.
2. Lehyani, F., Zouari, A., Ghorbel, A., & Tollenaere, M. (2021). Defining and measuring supply chain performance: a systematic literature review. *Engineering management journal*, 33(4), 283-313.
3. Cureau, F. V., Bloch, K. V., Henz, A., Schaan, C. W., Klein, C. H., Oliveira, C. L. D., & Schaan, B. D. (2017). Challenges for conducting blood collection and biochemical analysis in a large multicenter school-based study with adolescents: lessons from ERICA in Brazil. *Cadernos de saude publica*, 33.
4. McGorin, R. J. (2009). One hundred years of progress in food analysis. *Journal of Agricultural and Food Chemistry*, 57(18), 8076-8088.
5. Damian, D., Izquierdo, L., Singer, J., & Kwan, I. (2017, August). Awareness in the wild: Why communication breakdowns occur. In *International Conference on Global Software Engineering (ICGSE 2007)* (pp. 81-90). IEEE.
6. Carter, C.R.; Jennings, M.M. Logistics social responsibility: An integrative framework. *J. Bus. Logist.* 2002, 23, 145–180.
7. Lis, A.; Sudolska, A.; Tomanek, M. Mapping research on sustainable supply-chain management. *Sustainability* 2020, 12, 3987.
8. Sánchez-Flores, R.B.; Cruz-Sotelo, S.E.; Ojeda-Benitez, S.; Ramírez-Barreto, M.E. Sustainable supply chain management—A literature review on emerging economies. *Sustainability* 2020, 12, 6972.
9. Sarkis, J. Manufacturing's role in corporate environmental sustainability-Concerns for the new millennium. *Int. J. Oper. Prod. Manag.* 2001, 21, 666–686.

10. Morali, O.; Searcy, C. A review of sustainable supply chain management practices in Canada. *J. Bus. Ethics* 2013, 117, 635–658.
11. Ahi, P.; Searcy, C. An analysis of metrics used to measure performance in green and sustainable supply chains. *J. Clean. Prod.* 2015, 86, 360–377.
12. Taticchi, P.; Garengo, P.; Nudurupati, S.S.; Tonelli, F.; Pasqualino, R. A review of decision-support tools and performance measurement and sustainable supply chain management. *Int. J. Prod. Res.* 2015, 53, 6473–6494.
13. Moreno-Camacho, C.A.; Montoya-Torres, J.R.; Jaegler, A.; Gondran, N. Sustainability metrics for real case applications of the supply chain network design problem: A systematic literature review. *J. Clean. Prod.* 2019, 231, 600–618.
14. Paul, A.; Shukla, N.; Paul, S.; Trianni, A. Sustainable supply chain management and multi-criteria decision-making methods: A systematic review. *Sustainability* 2021, 13, 7104.
15. Barbosa-Póvoa, A.P.; da Silva, C.; Carvalho, A. Opportunities and challenges in sustainable supply chain: An operations research perspective. *Eur. J. Oper. Res.* 2018, 268, 399–431.
16. Saeed, M.A.; Kersten, W. Drivers of sustainable supply chain management: Identification and classification. *Sustainability* 2019, 11, 1137.
17. Koberg, E.; Longoni, A. A systematic review of sustainable supply chain management in global supply chains. *J. Clean. Prod.* 2019, 207, 1084–1098.
18. Alinaghian, L.; Qiu, J.; Razmdoost, K. The role of network structural properties in supply chain sustainability: A systematic literature review and agenda for future research. *Supply Chain Manag. Int. J.* 2020, 26, 192–211.
19. Nilsson, F.; Göransson, M. Critical factors for the realization of sustainable supply chain innovations-model development based on a systematic literature review. *J. Clean. Prod.* 2021, 296, 126471.

20. Pimenta, H.C.D.; Ball, P.; Salonitis, K. Supply chain environmental and social sustainability practice diffusion: Bibliometrics, content analysis and conceptual framework. *Corp. Soc. Responsib. Environ. Manag.* 2021, 28, 1870–1890.
21. Thamsatitdej, P.; Boon-Itt, S.; Samaranayake, P.; Wannakarn, M.; Laosirihongthong, T. Eco-design practices towards sustainable supply chain management: Interpretive structural modelling (ISM) approach. *Int. J. Sustain. Eng.* 2017, 10, 326–337.
22. Bureau of National Affairs. The Sustainability Imperative: Business and Investor Outlook; 2018 Bloomberg Sustainable Business & Finance Survey; Nuveen and BNP Paribas: Paris, France, 2018.
23. Shekarian, E. A review of factors affecting closed-loop supply chain models. *J. Clean. Prod.* 2020, 253, 119823.
24. Shekarian, E.; Flapper, S.D. Analyzing the structure of closed-loop supply chains: A game theory perspective. *Sustainability* 2021, 13, 1397.
25. Tranfield, D.; Denyer, D.; Smart, P. Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *Br. J. Manag.* 2003, 14, 207–222.
26. Shekarian, E.; Kazemi, N.; Abdul-Rashid, S.H.; Olugu, E.U. Fuzzy inventory models: A comprehensive review. *Appl. Soft Comput.* 2017, 55, 588–621.
27. Pagell, M.; Wu, Z. Building a more complete theory of sustainable supply chain management using case studies of 10 exemplars. *J. Supply Chain Manag.* 2009, 45, 37–56.
28. Schober, A.; Kittel, C.; Baumgartner, R.J.; Füllsack, M. Identifying dominant topics appearing in the Journal of Cleaner Production. *J. Clean. Prod.* 2018, 190, 160–168.
29. Raut, R.D.; Narkhede, B.; Gardas, B.B. To identify the critical success factors of sustainable supply chain management practices in the context of oil and gas industries: ISM approach. *Renew. Sustain. Energy Rev.* 2017, 68, 33–47.

30. Li, J.; Fang, H.; Song, W. Sustainable supplier selection based on SSCM practices: A rough cloud TOPSIS approach. *J. Clean. Prod.* 2019, 222, 606–621.
31. Das, K. Integrating lean systems in the design of a sustainable supply chain model. *Int. J. Prod. Econ.* 2018, 198, 177–190.
32. Islam, M.M.; Perry, P.; Gill, S. Mapping environmentally sustainable practices in textiles, apparel and fashion industries: A systematic literature review. *J. Fash. Mark. Manag. Int. J.* 2020, 25, 331–353.
33. Choudhary, S.; Kumar, A.; Luthra, S.; Garza-Reyes, J.A.; Nadeem, S.P. The adoption of environmentally sustainable supply chain management: Measuring the relative effectiveness of hard dimensions. *Bus. Strategy Environ.* 2020, 29, 3104–3122.
34. Qorri, A.; Gashi, S.; Kraslawski, A. Performance outcomes of supply chain practices for sustainable development: A meta-analysis of moderators. *Sustain. Dev.* 2021, 29, 194–216.
35. Yadav, G.; Luthra, S.; Jakhar, S.K.; Mangla, S.K.; Rai, D.P. A framework to overcome sustainable supply chain challenges through solution measures of industry 4.0 and circular economy: An automotive case. *J. Clean. Prod.* 2020, 254, 120112.
36. Mejías, A.M.; Paz, E.; Pardo, J.E. Efficiency and sustainability through the best practices in the logistics social responsibility framework. *Int. J. Oper. Prod. Manag.* 2016, 36, 164–199.
37. Ciccullo, F.; Pero, M.; Gosling, J.; Caridi, M.; Purvis, L. When sustainability becomes an order winner: Linking supply uncertainty and sustainable supply chain strategies. *Sustainability* 2020, 12, 6009.
38. Luthra, S.; Mangla, S.K. When strategies matter: Adoption of sustainable supply chain management practices in an emerging economy's context. *Resour. Conserv. Recycl.* 2018, 138, 194–206.

39. Golini, R.; Moretto, A.; Caniato, F.; Caridi, M.; Kalchschmidt, M. Developing sustainability in the Italian meat supply chain: An empirical investigation. *Int. J. Prod. Res.* 2017, 55, 1183–1209.
40. León-Bravo, V.; Caniato, F.; Caridi, M. Sustainability in multiple stages of the food supply chain in Italy: Practices, performance and reputation. *Oper. Manag. Res.* 2019, 12, 40–61.
41. Vargas, J.R.C.; Mantilla, C.E.M.; de Sousa Jabbour, A.B.L. Enablers of sustainable supply chain management and its effect on competitive advantage in the Colombian context. *Resour. Conserv. Recycl.* 2018, 139, 237–250.
42. Heidary Dahooie, J.; Zamani Babgohari, A.; Meidutė-Kavaliauskienė, I.; Govindan, K. Prioritising sustainable supply chain management practices by their impact on multiple interacting barriers. *Int. J. Sustain. Dev. World Ecol.* 2020, 28, 267–290.
43. Wang, J.; Dai, J. Sustainable supply chain management practices and performance. *Ind. Manag. Data Syst.* 2018, 118, 2–21.
44. Wan Ahmad, W.N.K.; Rezaei, J.; Tavasszy, L.A.; de Brito, M.P. Commitment to and preparedness for sustainable supply chain management in the oil and gas industry. *J. Environ. Manag.* 2016, 180, 202–213.
45. de Sousa Jabbour, A.B.L.; de Oliveira Frascareli, F.C.; Jabbour, C.J.C. Green supply chain management and firms' performance: Understanding potential relationships and the role of green sourcing and some other green practices. *Resour. Conserv. Recycl.* 2015, 104, 366–374.
46. Marshall, D.; McCarthy, L.; McGrath, P.; Claudy, M.C. Going above and beyond: How sustainability culture and entrepreneurial orientation drive social sustainability supply chain practice adoption. *Supply Chain Manag. Int. J.* 2015, 20, 434–454.

47. Geyi, D.A.G.; Yusuf, Y.; Menhat, M.S.; Abubakar, T.; Ogbuke, N.J. Agile capabilities as necessary conditions for maximising sustainable supply chain performance: An empirical investigation. *Int. J. Prod. Econ.* 2020, 222, 107501.
48. Lu, C.-S.; Lai, P.-L.; Chiang, Y.-P. Container terminal employees' perceptions of the effects of sustainable supply chain management on sustainability performance. *Marit. Policy Manag.* 2016, 43, 597–613.
49. Gopal, P.; Thakkar, J. Analysing critical success factors to implement sustainable supply chain practices in Indian automobile industry: A case study. *Prod. Plan. Control.* 2016, 27, 1005–1018.
50. Stiller, S.; Gold, S. socially sustainable supply chain management practices in the Indian seed sector: A case study. In *Supply Chain Forum: An International Journal*; Taylor & Francis: Oxfordshire, UK, 2014.
51. Sabuj, S.U.; Ali, S.M.; Hasan, K.W.; Paul, S.K. Contextual relationships among key factors related to environmental sustainability: Evidence from an emerging economy. *Sustain. Prod. Consum.* 2021, 27, 86–99.
52. Kumar, A.; Moktadir, A.; Khan, S.A.R.; Garza-Reyes, J.A.; Tyagi, M.; Kazançoğlu, Y. Behavioral factors on the adoption of sustainable supply chain practices. *Resour. Conserv. Recycl.* 2020, 158, 104818.
53. Hong, J.; Guo, P.; Chen, M.; Li, Y. The adoption of sustainable supply chain management and the role of organisational culture: A Chinese perspective. *Int. J. Logist. Res. Appl.* 2020, 25, 52–76.
54. Kausar, K.; Garg, D.; Luthra, S. Key enablers to implement sustainable supply chain management practices: An Indian insight. *Uncertain Supply Chain Manag.* 2017, 5, 89–104.

55. Wu, J.-Z.; Santoso, C.H.; Roan, J. Key factors for truly sustainable supply chain management: An investigation of the coal industry in Indonesia. *Int. J. Logist. Manag.* 2017, 28, 1196–1217.
56. Silvestre, B.S.; Silva, M.E.; Cormack, A.; Thomé, A.M.T. Supply chain sustainability trajectories: Learning through sustainability initiatives. *Int. J. Oper. Prod. Manag.* 2020, 40, 1301–1337. Das, D. Development and validation of a scale for measuring sustainable supply chain management practices and performance. *J. Clean. Prod.* 2017, 164, 1344–1362.
57. Duque-Urbe, V.; Sarache, W.; Gutiérrez, E.V. Sustainable supply chain management practices and sustainable performance in hospitals: A systematic review and integrative framework. *Sustainability* 2019, 11, 5949.
58. Zimon, D.; Tyan, J.; Sroufe, R. Drivers of sustainable supply chain management: Practices to alignment with un sustainable development goals. *Int. J. Qual. Res.* 2020, 14, 219–236.
59. Mitra, S.; Datta, P.P. Adoption of green supply chain management practices and their impact on performance: An exploratory study of Indian manufacturing firms. *Int. J. Prod. Res.* 2014, 52, 2085–2107.
60. Das, D. Sustainable supply chain management in Indian organisations: An empirical investigation. *Int. J. Prod. Res.* 2018, 56, 5776–5794.
61. Esfahbodi, A.; Zhang, Y.; Watson, G.; Zhang, T. Governance pressures and performance outcomes of sustainable supply chain management—An empirical analysis of UK manufacturing industry. *J. Clean. Prod.* 2017, 155, 66–78.
62. Esfahbodi, A.; Zhang, Y.; Watson, G. Sustainable supply chain management in emerging economies: Trade-offs between environmental and cost performance. *Int. J. Prod. Econ.* 2016, 181, 350–366.

63. Luthra, S.; Garg, D.; Haleem, A. Critical success factors of green supply chain management for achieving sustainability in Indian automobile industry. *Prod. Plan. Control.* 2015, 26, 339–362.
64. Delai, I.; Takahashi, S. Corporate sustainability in emerging markets: Insights from the practices reported by the Brazilian retailers. *J. Clean. Prod.* 2013, 47, 211–221.
65. Wang, J.; Zhang, Y.; Goh, M. Moderating the role of firm size in sustainable performance improvement through sustainable supply chain management. *Sustainability* 2018, 10, 1654.
66. Mathivathanan, D.; Kannan, D.; Haq, A.N. Sustainable supply chain management practices in Indian automotive industry: A multi-stakeholder view. *Resour. Conserv. Recycl.* 2018, 128, 284–305. Kusi-Sarpong, S.; Sarkis, J.; Wang, X. Green supply chain practices and performance in Ghana's mining industry: A comparative evaluation based on DEMATEL and AHP. *Int. J. Bus. Perform. Supply Chain Model.* 2016, 8, 320–347.

Appendix

Questionnaire

Measuring supply chain obstacles and challenges in private projects in biological and chemical food analysis

Part 1: Demographic Information

What is your Age?

What is your position?

- Private Project Managers:
- Supply Chain Managers:
- Industry Experts:
- Regulatory Authorities:
- Suppliers
- Clients/Stakeholders
- Employees
- others

Where is your firm located?

- A city
- Rural area

Your department is?

- Production
- Quality Control
- Technical Support

- Logistics
- HR
- Finance
- others

Your company's role in supply chain

- Supplier
- Transporter
- Manufacturer
- Distributor
- Wholesaler
- Retailer
- Customer
- Others

Your working experience in this position is?

- Less than 5 years
- More than 5 years

Does the whole supply chain have any strategic alliance?

- Yes No

Have you implemented any kinds of performance measurement system(s) in the whole supply chain?

- Yes No

Which aspect of the whole supply chain is the most important to measure?

- Time
- Flexibility
- Reliability
- Cost
- Other

What is (are) the main reason(s) which prevent(s) the whole supply chain from implementing performance measurement system(s)?

- Cost
- Manpower
- Time
- Lack of data
- Lack of interest
- Others

How insufficient training and competency levels impact maintain existing supply chain operations

- Strong impact
- Moderate impact
- Weak impact
- No impact

How support implementation of new technologies and increase efficiency in the organization

- Weak support
- Moderate

- Not enough
- No support

Are there trade barriers between countries and government policies

- Yes
- No

Are there adequate technologies of an integrated logistics System to support infrastructure requirements and inter-channel commitment?

- Yes
- No

Is the supply chain process implementation is often hindered by technology overshadowing the human resource and change management aspect?

- Yes
- No

How lack of trust, communication and information sharing becomes secretive?

- Strong
- Moderate
- Weak

Rate the following challenges based on your organization experiences (from 1 to 6 scales) as following:

Strong impact = 1, High impact = 2, Moderate = 3, Fair impact = 4, Low impact = 5, Weak impact = 6

1. Inability to maintain safety and quality ()

2. Inadequate communication between the parties ()
3. Poor communication between supply chain members, especially primary members ()
4. Poor physical infrastructure ()
5. Raising supply chain cost ()
6. Technology based issue ()
7. Financial problem ()
8. Storage, Transportation and Sample Collection ()
9. Data Management and Analysis ()
10. Lack of internal cost efficiency and speed of delivery in the following areas:
ordering, inventory, marketing, and logistics ()
11. Inadequate distribution channel design and structure ie., balance of power in
contractual relations ()
12. Lack of a strong organizational culture committed to SCMI ()
13. supply chain channel members view themselves as a collection of individual
companies, not as a holistic system ()
14. The supply chain decision makers are usually not near the action ie. The sales arena.
Decisions are based on inaccurate information ()
15. supply chain channel members do not share the same business values ()
16. Company's suppliers serve their competitors and secret information could be
revealed to the wrong party ()
17. The flow of data between businesses is often insufficient or recorded on
incompatible databases ()
18. It is hard to have total control over the third party service provider's actions ()

19. Poor internal communication of company's objectives cause communication

breakdown: lack of effectiveness ()

20. Supply chain channel members fail to realize their contribution to customer satisfaction (

)

21.

جامعة ميدأوشن

كلية الإدارة

قسم / تخصص: إدارة مشاريع



العنوان باللغة العربية

قياس معوقات وتحديات سلسلة التوريد في المشاريع الخاصة في تحاليل الاغذية الحيوية والكيميائية

إعداد الطالب/

نادين القحطاني

هتون النافع

سلطان النهدي

إشراف/

د.وليد عبدالجواد سليمان صديق

د.الفيصل عبدالحميد محمد حسن

العام الدراسي:

2023