



The Impact of Supply Chain Performance on Cost Reduction Case Study: Nissan Motors Egypt

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Abstract

Cost reduction gains a great intention among manufacture companies nowadays. Accordingly, the current study aims to investigate the effect of supply chain performance on cost reduction in automotive industry through adopting Nissan Motors Egypt as a case study. Both qualitative and quantitative data are collected. The results of the qualitative analysis shows that supply chain, inbound logistics cost, inventory management and competitiveness are the four main themes that affect the cost reduction of the company, where each theme consists of number of codes. Moreover, the quantitative analysis shows there is a significant difference in cost reduction between the year-round, first quarter, second quarter, third quarter, and fourth quarter.

Keywords

Cost reduction, supply chain, inbound logistics cost, inventory management, competitiveness, annual production, automotive industry

1. Introduction

In today's growing market, where customer demands are changing continuously and competitiveness increases rapidly, the enterprises have to focus on cost reduction. As there are always a finite number of resources (raw materials, energies, people, machines, equipment, and other facilities), it is crucial for manufacturing organizations to manufacture products at a reasonable cost that are more effective and efficient in their use of resources (Kovács and Kot, 2017).

Cost reduction is a proactive, planned strategy for minimizing costs and increasing productivity. It can be seen in a variety of ways, including; a technique to reduce waste and maximize production (Egbide et al., 2019). Cost reduction is also described as a strategy that aims to lower costs from an established norm or standard while maintaining the quality or efficacy of the project or service (SK et al., 2022).

Therefore, the phrase "cost reduction" refers to actual or true savings in production, administration, selling, and sharing expenses as a result of the removal of unnecessary and inefficient parts from product design as well as from the methods and procedures used in conjunction with it. Cost reduction becomes necessary when the profit margin needs to be raised without an increase in sales turnover, meaning that costs must be brought down for the same level of sales (Akeem, 2017).

The reduction of costs could be done through different ways, accordingly prior studies started to link supply chain management performance with cost reduction, where it is indicated that the effective use of supply chain cost reduction strategies enables firms to respond to



the changing market and customer needs while still retaining flexibility (Dahooie et al., 2020).

Tiwari et al. (2020) indicated that enhancing the efficiency of supply chain performance helps in reducing the costs. For example; the investment made by consumers in a supplier's manufacturing process with the goal of lowering the supplier's production costs, represents one of the supply chain management processes that helps in reducing costs.

Once reducing cost represents a main aim that manufacturing companies aims to reach, it is important to investigate factors that affect this reduction. The current study aims to investigate the role of supply chain management performance on cost reduction in the automotive industry taking Nissan Motors Egypt as a case study.

Accordingly, this paper is divided into eight sections. The first section is the introduction, section two represents the literature review. Section three discusses the research methodology, while section four represents the results of the analysis. Section five is the research discussion and section six are research conclusion. Moreover, section seven represents the research recommendation, ending with section eight that represents the limitations and suggestions for future research.

2. Literature review

This section presents the previous literature related to the research variables.

2.1. Supply Chain

A supply chain, commonly spelt "supply-chain," is a complicated logistics system made up of facilities that turn raw materials into completed goods and then deliver them to final users or customers.

Supply chain management, meanwhile, takes the most effective approach to managing the movement of items along the supply chain. Used items may re-enter the supply chain at any stage where residual value is recyclable in complex supply chain systems. A value chain's supply chain is connected. Suppliers in a supply chain are frequently organized into "tiers," with first-tier suppliers delivering to the customer directly, second-tier suppliers providing to the first tier, and so on (Frederico et al., 2020).

Production and distribution phases make up the two sections of a typical supply chain. During the production phase, manufacturing canthers create components and semi-finished items. An assembly line is used to combine the components. The step of distribution involves shipping goods to final consumers via national and regional distribution centers. Academics contend that "supply chain processes should be organized in order to focus on end customer buying behaviors" and look for "customer responsiveness" as an indicator confirming that materials are capable of flowing "through an ordered set of supply chain processes in order to meet end customer buying behavior." At the end of the supply chain, materials and final goods only flow there because of the customer behaviors there (Remko, 2020).

Many of the interactions in the supply chain are between different businesses that want to increase their profits in their respective industries but may know little to nothing about or care little about the other participants. The term "chain" and the apparent linear structure it represents have come under fire as being "harder to relate... to the way supply networks really operate." More recently, the loosely coupled, self-organizing network of businesses that collaborate in providing product and service offerings has been referred to as the extended



enterprise. The supply and demand network that makes up a chain is intricate and dynamic (Lee et al., 2022).

A supply chain is said to have been interrupted when any link isn't operating at its best. There may be several problems. The cost structure of a corporation may be significantly impacted, for instance, by an increase in incoming material prices because one commodity is now more expensive than it was last year. Operational issues can also result from labor market mismatches, such as when shipping businesses cannot find enough drivers to fulfil orders. Supply chain vulnerabilities most frequently occur in five areas: planning and supplier networks, transportation and logistics systems, financial resilience, product complexity, and organizational maturity (Poules and Bahno, 2023).

At its most basic level, supply chain management (SCM) is the control of the movement of materials, information, and money associated with an item or service from the acquisition of raw materials through the delivery of the good at the ultimate location. Even though the supply chain and logistics are sometimes confused, logistics is actually only one part of the supply chain. Modern SCM systems are digitally based and incorporate material handling and software for all parties engaged in the development of goods and services, order fulfilment, and information tracking, including suppliers, manufacturers, wholesalers, carriers, and retailers (Craighead et al., 2020).

Every firm in the supply chain has the capacity to contribute to the optimization of the whole supply chain as opposed to sub-optimizing based on local optimization if all relevant information is available to

any relevant company. This will result in improved overall manufacturing and distribution planning, which may save costs and provide a more appealing end product, boosting sales and improving overall performance for the firms involved. Successfully integrating SCM results in a new type of rivalry on the global market, one that is supply-chain-versus-supply-chain-based rather than company-versus-company-based (Sodhi and Tang, 2021).

SCM's main goal is to satisfy consumer expectations by making the most effective use of available resources, such as labor, inventory, and distribution capacity. Theoretically, a supply chain aims to minimize inventory while balancing supply and demand. Working with suppliers to remove bottlenecks, strategic sourcing to balance lowest material cost and transportation, implementing just-in-time manufacturing techniques, maintaining the right mix and location of factories and warehouses to serve customer markets, and using location allocation, vehicle routing analysis, dynamic programming, and traditional logistics optimization are just a few of the aspects of improving the supply chain (Cek and Ercantan, 2023).

The term "logistics" refers to operations involving the distribution of products within a single business or organization, whereas "supply chain" also includes manufacturing and procurement and, as a result, has a much broader focus since it entails multiple businesses (such as suppliers, manufacturers, and retailers) cooperating to satisfy a customer's need for a good or service. Beginning in the 1990s, a number of businesses decided to engage with a third-party logistics provider (3PL) in order to outsource the logistical component of supply-chain management. Contract manufacturers are also used by businesses to outsource production. To fulfil the need for assistance in managing



these intricate systems, technology businesses have emerged. Due to their influence on the optimization of time, resources, and inventory visibility, cloud-based SCM solutions are at the forefront of next-generation supply chains (Ivanov et al., 2022).

2.2. Supply Chain for Automotive Industry

Parts are used to assemble cars. Parts are created from components, and materials are used to build components. Suddenly, the production, shipping, and procurement processes for the tens of thousands of parts—between fifteen and twenty-five thousand—in a single car may take a very long time. The supply chain is what moves these components from one stage to the next. While this statement may have been true in the past, with one supplier feeding into another and another and so on, today's markets depend on several suppliers, each of whom feeds into various phases of manufacturing, resulting in a supply web as opposed to a supply chain. However, the chain is made up of several links, and if one of them breaks, the chain as a whole becomes weak and may break. Therefore, the automotive supply chain is essential for ensuring that automakers have the correct parts at the appropriate time to deliver their vehicles to customers (Delic and Eyers, 2020).

In recent years, supply chain problems have affected a wide range of product categories, and the automobile sector has undoubtedly experienced these troubles. It's crucial to comprehend the automobile industry's supply chain and how problems arise before talking about the challenges it confronts. On a fundamental level, the supply chain for the automobile sector consists of four primary steps: Suppliers of parts, manufacturers, dealers, and customers (Siems et al., 2021).

Automotive supply chain problems can be difficult to isolate to a single issue since there are many places where a minor interruption can have a significant impact on the entire operation. For instance, a problem with one of the supplier layers might halt the production of cars in its tracks (or on the road, to avoid mixing metaphors), given the enormous number of components that go into each individual vehicle. That may indicate a shortage of raw materials, a possible shortage of semiconductors, a problem in the nation or region of the supplier, or anything else (Kamble et al., 2021).

The automobile business, like all other industries, is dependent on the efficiency and accessibility of transportation. Components must be sent to the carmaker's plant once they are ready for the manufacturer. Naturally, when those finished automobiles leave the manufacturing line, they must also go to the showrooms and ultimately the buyers. To prevent producing more automobiles than the market needs, automakers often use just-in-time production. However, rising demand and other supply chain problems might result in significant shortages and lost income (Al-Doori, 2019).

Depending on what they give to the market and how they interact with the automobile industry, suppliers may be divided into three categories. Suppliers in the third tier work with raw materials like metals, polymers, and minerals. Tier 2 suppliers provide the necessary parts, but they also supply to other sectors in addition to the auto industry. Suppliers of semiconductors, who provide to electronics manufacturers and others who need the technology, would fall under this category. Last but not least, tier one suppliers frequently have direct connections to manufacturers and construct and provide finished components to automakers ready for vehicle assembly. The development of automotive



systems, panel suppliers, and battery gigafactories are a few examples of this (Pirttilä et al., 2020).

Carmakers are unable to fully manage the automotive supply chain, which is a crucial component of the sector. Although digitalization is making it easier to track supplies and components, external factors can still cause disruptions even if manufacturers controlled all the businesses that supplied their plants. One such is the Suez Canal blockade in 2021, which resulted in supplies being delayed as ships were redirected. However, automakers may collaborate with nearby suppliers to shorten supply chains, which not only increases dependability but also lessens the process' carbon footprint—an important consideration in today's environmentally concerned society (Novak et al., 2022).

2.3. Inbound Logistics

Logistics organizes the transportation and storage of resources including inventories, equipment, and merchandise. Logistics for manufacturers begins with the incoming raw material supply and continues through to the delivery of completed goods to clients. A logistics department may, for instance, collect supplies, provide components to a production line, transport finished goods to a distribution center, monitor inventories, and distribute goods to customers. The flawless operation of each of these processes, including purchasing, receiving incoming delivery, storing, packaging, managing inventory, shipping, outgoing transportation, and delivery, is the responsibility of the logistics teams. When production increases and there are several items to oversee, choreographing these operations

becomes challenging. Businesses with several distribution channels and locations for their operations must deal with additional complexity (Muñoz-Villamizar et al., 2021).

The success of a firm depends on the logistics department, which is the backbone of the supply chain. A brand's reputation may be improved by well-organized logistics, which can also assist satisfy client needs and save time and money. Managing the supply chain, the intricate web of businesses, people, activities, and resources needed to offer a service or something, effectively depends on logistics. Outbound logistics deals with sending goods and products out to clients, and inbound logistics deals with bringing supplies or resources into a firm. Both put a lot of emphasis on moving commodities. However, outbound is all about giving, and inbound is all about receiving (Kalaiarasan et al., 2022).

Materials and other commodities are carried into a firm through inbound logistics. The actions to order, receive, store, transport, and handle incoming goods are all included in this process. The supply side of the supply-demand equation is the main focus of inbound logistics. Inbound logistics activities represent as follows:

- Choosing and assessing possible suppliers, getting price estimates, haggling with and managing suppliers are all parts of **sourcing and procurement**.
- **Ordering/purchasing:** Acquiring the supplies and products the business needs to ensure the proper amount and timing of delivery.
- Choosing whether to **transport** products by truck, aircraft, rail, or any other means. Working with suppliers to determine pricing and route is another aspect of this task, as well as choosing the delivery

pace for incoming goods.

- **Receiving** include managing the delivery of fresh supplies, unloading vehicles, and making sure everything is in order.
- **Material handling** is the short-distance movement and staging of incoming products for subsequent use.
- **Putaway:** Transferring products from storage to the receiving pier. The staff stores everything in the designated places.
- Before the materials are used for production or customer fulfilment, they are managed in **storage and warehousing**. This division is in charge of ensuring that the appropriate storage conditions are met and that things are positioned in logical places for fulfilment.
- **Inventory** management involves choosing the kind, quantity, and location of the raw materials and other things you should keep on hand. For further information, consult the inventory management handbook.

- **Expediting:** Controlling the flow of materials and their timetable as they arrive at your plant.
- **Distribution** is the process of getting materials to the right places inside a company.
- **Tracking:** Monitoring information about incoming orders, including its location and supporting records like receipts.
- **Logistics** in reverse: The process of returning products to consumers for reasons including refunds, faults, delivery issues, repair, and refurbishing. Additionally, companies who recycle and recover discarded materials get their supply through reverse logistics (Smith and Srinivas, 2019).

High expenses, hazy delivery dates, and erratic lead times are the main difficulties in incoming logistics. These make it challenging for companies to keep appropriate inventory levels and boost warehouse productivity and efficiency. Some businesses spend an excessive amount of money on shipping. You must bargain preferential rates with fewer carriers and combine incoming cargo to form complete truckloads in order to save expenses. Vendor inbound compliance standards (VICS) for pricing and service can also be established. Analytics may assist you in finding any time or money waste (Hotrawaisaya et al., 2020).

Not knowing a shipment's precise location, when it will arrive, or how much it will cost is a common difficulty. Some businesses end up carrying excess inventory, making premature purchases, and experiencing production and customer delivery delays as a result of their ignorance. In order to ensure that proper data is obtained while importing supplies, a corporation can track and trace shipments and connect with suppliers using real-time information systems. Some businesses treat returns processing as an afterthought, which results in lost revenue when inventory is not swiftly replenished. Additional issues include inaccurate inventory counts and decreased client satisfaction. To address this, establish clear, effective return procedures and emphasize to workers the significance of returns management (Pitakaso and Sethanan, 2019).



Without enough preparation, firms may find themselves managing too many deliveries at once. As a result, their yards fill up with trucks, making it difficult for drivers to decide which pier to use. It is challenging to staff reception employees efficiently due to peaks and valleys in delivery volume. A shoddy receiving procedure results in mistakes and a material backlog. Scheduled arrivals, delivery to designated ports, and keeping a steady tempo throughout the day are some solutions. Logistics can benefit from warehouse management software (WMS). Cross-docking is another method, which involves the receiving department matching arriving merchandise to open orders. Workers never store the goods they unload; instead, they transport them straight to another pier to load them into a truck that is leaving (Kalaiarasan et al., 2022).

It can be challenging to ensure that there are adequate incoming supplies to satisfy consumer demand because of seasonality, competitive factors, economic situations, raw material price volatility, changes in selling cycles, and more. Data is the most effective tool to balance supply and demand. Software can assess your order stream and incoming inventories. Additionally, it can track the location and status of incoming supplies, forecast demand using past trends, look for possibilities to combine purchases, and do much more (Albadrani et al., 2020).

Making the operation quicker, leaner, more economical, and more agile is referred to as optimizing inbound logistics. Every procedure should be evaluated to determine its strengths and flaws before being improved. Better terms, shorter lead times, cost savings, and a sense of

confidence amid market swings can all result from solid supplier agreements. Setting this relationship as a priority can assist your supplier better understand your company. A supplier compliance strategy outlines your standards and fines for errors like late deliveries or disregarding route instructions. A program like this may save freight and warehousing expenses, boost efficiency and accuracy, and raise customer satisfaction (Costa et al., 2020).

Make use of a transportation management system (TMS) to automate, manage, and improve freight operations. A TMS plans the shipment, follows it through delivery, and analyses shipping prices and service levels amongst carriers. These specifics assist a business in lowering expenses, improving efficiency, and gaining complete visibility into its supply chain. Use a warehouse management system (WMS) to streamline receiving, putting away, inventory management, picking, and other warehouse processes. Combine deliveries because LTL packages have more expensive transportation and slower delivery periods. Consolidating shipments can occasionally be difficult because of various handling requirements (for example, some commodities require refrigeration). A third-party logistics provider (3PL) can combine a company's partial loads with those of other clients if it has trouble completing complete truckloads (Kalaiarasan et al., 2022).

2.4. Inbound Logistics for Automotive Industry

The car sector has a sophisticated inbound logistics system. There are hundreds of vendors in many nations, and each supplier specializes in producing certain auto components. Consequently, the transportation system is highly intricate. Inventory levels should be as low as feasible, which is another concern related to inbound logistics in the car sector.



Making sure that the incoming logistics work smoothly is one of the most crucial aspects of the company's supply side since the assembly line in an automotive manufacturing facility is constantly in operation (Baller et al., 2022).

For example, the study of inbound logistics is less frequent than the study of the distribution of finished goods. One may argue that one of the most important areas for improvement is incoming logistics: First off, inbound logistics is where the supply chain process begins, and if something goes wrong there, it will have an impact on all subsequent operations. The worst-case scenario if there are issues with the company's inbound logistics flow is that the assembly line must stop owing to a lack of supplies (i.e., components), which will be very expensive (Tuomola, 2014).

Inbound transfers through less than truckload (LTL), full truckload (FTL), and courier and express services (CES) are frequently handled in the automobile sector. Contracts are negotiated with transport service providers, and it is important to consider bundling and coordinating transportation to a facility. The return flow of empty load carriers to the suppliers must also be taken into account. Transport modes and process characteristics like delivery frequency and volume per delivery must be determined to minimize costs and CO₂ emissions when optimizing inbound logistics from first-tier suppliers up to the storage areas of an automobile manufacturer. Currently, the majority of solutions to this issue are manual labor-intensive or need only a few basic instruments (Falsafi et al., 2018).

2.5. Supply chain Cost Reduction in Automotive Industry

In the automotive industry, the supply chain is something to pay particular attention to. The optimization of supply chain costs in the automotive industry is one of the basic components to improve our company's financial performance. The success of a new product nowadays hinges on more than simply high-quality parts and efficient shipping. A supply chain cost analysis will show that, in order to save costs, we need give priority to locating knowledgeable partners with whom we can work. And there are other ways to achieve this, such using recycled transport packaging or low-cost and efficient component production processes like injection molding. While cutting costs in the supply chain is a great place to start, our company philosophy is also very important (Günther et al., 2015).

To lower production costs, just in time and just in sequence, the two primary logistical principles for ctor, should be used. Despite the fact that they are quite strict, they significantly affect how effectively manufacturing costs are reduced. When it is a product's turn, this is the precise moment for it to join the manufacturing line. The supplier is responsible for taking all required steps to guarantee that the materials will arrive on time. Transport may be highly unpredictable, yet operators are required to uphold the highest level of precision. Despite the fact that they are strict requirements, they provide for a lot of flexibility and a decrease in storage costs (Simchi-Levi et al., 2015).

It must be adaptable and responsive to market conditions in order to efficiently control spending. Companies must fully manage the supply chain in order to achieve this. Suppliers need to be dependable, cooperative, and on time. Even though their services are slightly more expensive than those of their rivals, it is still worthwhile to choose them since they will eventually provide results. It's crucial to keep in mind several less well-known cost-cutting strategies that are frequently eco-friendly. As

the costs of producing automobiles continue to rise as a result of fluctuating raw material costs and the need for manufacturers to keep up with technological and industrial advancements, many manufacturers are putting more of an emphasis on cost reduction in order to boost their competitiveness, sustainability, and overall profits (Brandes et al., 2013). In the upcoming years, the automobile industry may cut expenses and save money in three different ways:

- **Understands the impacts of employees:** Having a highly skilled and trained labor pool is essential for cost savings. Employees that commit errors disregard business expenditure guidelines. Additionally, workers who lack formal training in procedures and best practices can add significantly to a company's expenditures. Employees must receive thorough training and undergo regular evaluations to determine their abilities, appropriateness, and competence with reference to their everyday work activities, especially for jobs with a higher potential for hazard. Cost-saving measures, increased safety, and employee retention will be made possible by lowering employee errors, raising employee satisfaction for automotive vocations, and ensuring that the workforce is sufficiently qualified (Demirbas et al., 2018).
- **Coordination and cooperation:** To provide a product that satisfies customers' wants and preferences, producers should collaborate closely with suppliers and consumers. This partnership should begin as soon as feasible when creating a new vehicle or product so that consumer needs may be seen and taken into account throughout the rest of the design and supply chain processes. In addition to helping individuals make informed purchasing decisions, this will prevent businesses from wasting time and resources creating products that consumers would not find appealing (Gautam et al., 2018).

- **Reduce material expenses:** One of the biggest cost factors in the automotive sector is the high cost of raw materials, which accounts for close to half of the overall cost of making a vehicle. Because of their reliance on certain raw materials—particularly steel—vehicle manufacturers are vulnerable to the adverse impacts of fluctuations in the price of those resources worldwide. Instead of only maintaining their current supplier connections,

companies should shop around for vendors who will provide them the greatest price to combat this. It will be even more crucial to lower the cost of materials as the industry switches to aluminum, which is twice as expensive as steel but significantly lighter. Automotive manufacturers should set their priorities, make purchasing decisions, and begin negotiations right away (Günther et al., 2015).

2.6. Effective Material Order Management

The order management process of manufacturing organizations is becoming more complex than ever because of the increasing number of variations per product and the rising customer demand for personalized items. The raising complexity of the order management process decreases the ability of companies to stay adaptable and profitable (Kunath and Winkler, 2018).

Materials management is the process of making decisions involving materials to guarantee that the proper number of materials, of the right quality, are available at the right time, place, and price to maximize the return on money spent on them. It is also defined as the managing flow of materials into, though, and out of the system (Vrat, 2014).

3. Research model and methods

As the current study aims to investigate the influence of supply chain performance on cost reduction in automotive industry, a mixed approach has been adopted. Nissan Motors Egypt is chosen as a case study. The qualitative data is collected through interviews done with managers of Nissan Motors Egypt, where 7 interviews are done with Logistics manager, Planning Manager, Material and ordering manager, Procurement and pricing manager, Warehouse Manager, Finance (Treasury Manager) and Supply chain manager. A thematic analysis is done to analyze the collected data through NVivo program.

On the other hand, quantitative data are collected from Nissan Egypt, as the annual production and the cost reduction per quarter are collected, in which data include the period from 2019 till 2025. A descriptive analysis and t-test is done to analyze the collected data through using SPSS program.

4. Findings

This part presents the results of the quantitative and qualitative data analysis of this research. First, qualitative data will be analyzed to find out the factors that help companies reduce costs, and then quantitative data will be analyzed. In the qualitative analysis, seven interviews were conducted with department managers in Nissan. The interviews will be analyzed using thematic analysis using NVivo software. Based on the results of the qualitative analysis, some secondary data will be collected from the secondary reports of the company and analyzed using a t-test using the SPSS program.

4.1. Qualitative Data Analysis

Qualitative research is the explanatory research that deals with symbolic material that needs many interpretations, as it usually answers questions and does not test hypotheses. Qualitative research answers the question of how and why things happen. So that it gives us a deeper understanding of the subject in question

and not just a passing glance. The research itself has many divisions and types, including divisions according to the field and other divisions according to the amount of data and much more, the researcher must know the general conditions in which he will conduct his study in order to know the type of this study (Yang et al., 2021).

Qualitative research is defined idiomatically as: a study in which the researcher demonstrates a research problem through the use of data collection methods and recognized scientific methodologies, and presents this data in an interrogative manner in order to deliver correct and direct information to the audience of readers, supported by analyzes and interpretations. It can also be said that qualitative research is: an integrated knowledge template in which the researcher performs the process of presenting data after collecting and analyzing them as answers to direct explanatory and analytical questions (Salah et al., 2020).

Qualitative research is concerned with causes and results. By reading the informational presentation of the data and sensing the method of interpretation, analysis and discussion, the researcher can judge the material as being of qualitative research. Qualitative research is not satisfied with the process of collecting data, analyzing it, and presenting it in a superficial manner, or as it is said (pencil tips). In qualitative research, the researcher often collects and analyzes data from the data only, without conducting any experiments, as he performs the process of interpretation and analysis, not proof and denial. Qualitative research is characterized by its suitability for fields that require a detailed account of data, such as (social research and educational research). The characteristic of qualitative research appears in the extent of the sample's interaction with the study tools, because qualitative research deals with the process of leaving room for essay answers to essay questions directly to the sample (Debbarma and Choi, 2022).

Thematic analysis is one of the methods that are used to analyze qualitative data, as the scientific researcher organizes and puts each of the data into topics or a number of specific categories. For the scientific researcher to explain it, especially interpreting it analytically, in order to find the exact answer to the question he raises in his scientific research. Where the scientific researcher performs the objective analysis by focusing on each of the common denominators between the data. Braun and Clarke (2012) explained the objective analysis approach according to six stages, as follows:

- 1- Self-ages each of the data has collected until they become familiar to it.
- 2- Write each of the phase initial symbols.
- 3- Search for each of the major topics/categories/headings.
- 4- Review each of the potential subject's stage.
- 5- The researcher identified the topics and named them.
- 6- Report production.

Based on the analysis of the interviews that were conducted with department managers at Nissan Egypt using thematic analysis, four themes were reached that explained the factors that help reduce costs within Nissan from the point of view of these managers, and these themes were represented in the following:

- [1] Theme of supply chain
- [2] Theme of inbound logistics cost
- [3] Theme of inventory management
- [4] Theme of competitiveness

4.1.1. Theme of Supply Chain

The automobile sector is the subject of the supply chain management technique known as automotive supply chain. This has to do with whole cycle chain management, which begins with the receipt of raw materials from suppliers and concludes with the shipment of goods to customers. Management of the supply

chain is essential in the auto sector. If a company's supply chain management and logistics processes are subpar, they risk falling behind on orders, incurring expensive delays, and upsetting their consumers. Business owners must use considerable caution when it comes to their automotive supply chain management systems in order to maintain a smooth production process.

This was confirmed by interviews, where Nissan managers explained that managing supply chains is one of the most important factors that help the company reduce costs. Therefore, from the interviews, the first theme is generated, which is the theme of supply chain, and from it several codes are generated, represented in the following: overseas suppliers and freight forwarders. Figure 1 shows these codes in context with the theme of supply chain.

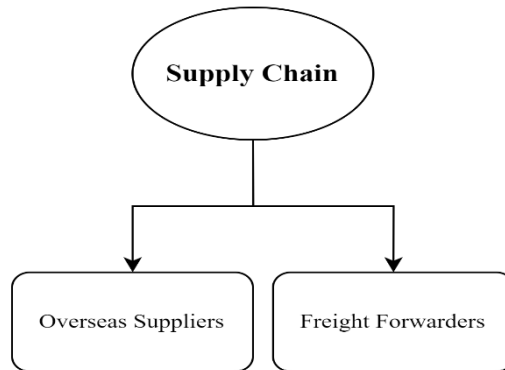


Figure 1: Mind Map of Theme of Supply Chain

Overseas Suppliers: Suppliers of Nissan may be found all around the world. Nissan outlined the quality assurance of each component and established international standards for supplier quality from the beginning. In respect to our suppliers, Nissan has likewise quickly enhanced our worldwide management system. This enables vendors with diverse cultures and customs to supply parts that exactly meet Nissan's high requirements for quality. Therefore, overseas suppliers were the first code in the theme of

supply chain that emerged from the interviews. Where this code appeared in some evidence in the first interview:

“Dealing is through NITCO, where we inventory what we need and send it to it, and it deals with overseas suppliers”

Further to that evidence that appeared in the third interview:

“There is dependence on overseas suppliers”

Moreover, it confirmed this in interview four, where the following evidence was found:

“The supplied parts are not received from the mother company; it is imported from overseas suppliers. NITCO is the main supplier of raw materials and we usually received our raw materials from NITCO Thailand”

And the sixth interview added the following evidence:

“We deal with overseas suppliers, which are represented in Nissan International Trading Company. Moreover, in FCL we received cooling modules of Nissan Sunny from El-TERIAK and Nissan Sunny Radiators from Egyptian company for import and export”

Freight Forwarders: Freight forwarding is the processing and planning of a shipment of commodities using one or more modes of transportation between the country of origin and the country of destination. Freight forwarding seeks to provide timely and cost-effective logistics planning and management for the transportation of products in the highest possible quality. Therefore, freight forwarders were the second code in the theme of supply chain that emerged from the interviews. Where this code appeared in some evidence in the second interview:

“We use to deal with NITCO, which is a group of freight forwards from Nissan Japan. Thus, we don't deal with Nissan Japan directly”

Further to that evidence that appeared in the third interview:

“There are freight forwarders who are responsible for following up with suppliers and checking the safety of shipments and materials”

4.1.2. Theme of Inbound Logistics Cost

Inbound logistics seeks to reduce overall costs by placing the appropriate items at the appropriate location at the appropriate time. Businesses have been advised to concentrate more on continuing inbound logistics management throughout history. Since inbound logistics is the first stage in the supply chain and if something goes wrong there, it would affect all following processes, one might say that it is one of the most crucial areas to develop. If there are problems with the organization's

inbound logistics flow, the worst-case situation is that the assembly line will have to stop because there aren't enough materials (i.e., components), which would be highly expensive.

One of the factors that help reduce costs is the management of logistic services, as well as the interest in managing supply chains. Therefore, from the interviews, the second theme is generated, which is the theme of inbound logistics cost, and from it several codes are generated, represented in the following: transportation cost, shipping type, ordering quantity and order lead time. Figure 2 shows these codes in context with the theme of inbound logistics cost.

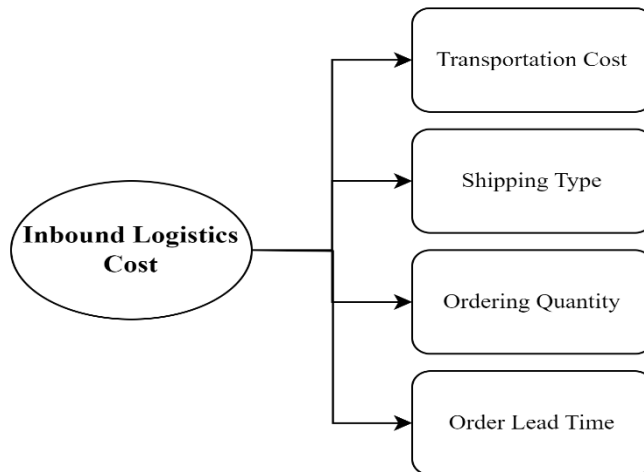


Figure 2: Mind Map of Theme of Inbound Logistics Cost

Transportation Cost: The term "inbound shipping costs" refers to the expenses incurred by a business for the incoming products, storage, and delivery of goods. It simply represents the cost of transporting commodities from the point of production to the consumer. Multiple initiatives have produced an inbound chain that is reasonably priced and successfully regulated. Therefore, transportation cost was the first code in the theme of inbound logistics cost that emerged from the interviews. Where this code appeared in some evidence in the first interview:

“Transportation costs, including Industrial Packaging duties and associated expenses such as tariffs, duties, taxes, intermediary fees, Inventory carrying costs, ordering expenses, and backorder costs, as well as transportation carrying costs (can be significant for slow transport) fees charged by other parties expense of monitoring and control, which is often greater when employing third-party services”

Further to that evidence that appeared in the second interview:

“Since the items we require are imported from the warehouse, there are additional costs, starting with the inventory. There are also costs for transportation, storage, and the size of the cargo.”

Moreover, it confirmed this in interview six, where the following evidence was found:

“The company uses frequently to pay for excess transportation costs while only receiving underutilized containers. The challenge becomes more serious because the prices of CIF of all imported parts are used to be updated every three months, according to that NITCO increases the prices and identifies the new prices of transportation depending on the maximum number of containers shipped and not on the real shipped quantity, which added more costs to the company”

And the seventh interview added the following evidence:

“We strive to improve product quality, lower costs, and rationalize manufacturing through actions like raising production volume per part, encouraging localization, and enhancing logistics in an effort to collaborate with suppliers to become cost leaders in today's competitive market conditions. To reduce all varying costs, including those related to specifications, materials, exchange rates, and logistics, we created the Total Delivered Cost (TDC) Challenge in fiscal year 2013”

Shipping Type: All of the crucial control aspects for a shipment, including the number range, whether it is an inbound or outgoing shipment, how leg determination is carried out, and which leg indication has been set for a shipment of this kind, are contained in the shipment type. Therefore, shipping type were the second code in the theme of inbound logistics cost that emerged from the interviews. Where this code appeared in some evidence in the first interview:

“I cannot give you a specific number, and this is because this depends on the type of shipment”

Further to that evidence that appeared in the second interview:

“We face many challenges related to logistics cost, the high costs represent a financial burden on the company, these costs are identified according to different dimensions, which are; costs of transportation, type of shipping type, and time required for the shipping process”

Moreover, it confirmed this in interview third, where the following evidence was found:

“The time depends on the type and size of the shipment”

And the fourth interview added the following evidence:

“The inbound logistics in our company depends on two types of container loads; FCL and LCL. Each type has its own challenges, FCL has a challenge related to the low utilization of containers, while LCL has a challenge related to the higher inbound costs that are more than FCL”

Ordering Quantity: The definition of the Minimum Order Quantity, its standardization, and the advantages of each will be discussed because they both have an impact on cost-cutting. Following this, cost-cutting measures will be discussed, including how they affect an organization's bottom line and any associated risks. Therefore, ordering quantity were the third code in the theme of inbound logistics cost that emerged from the interviews. Where this code appeared in some evidence in the first interview:

“Sometimes in this period we do not need the quantity for which we are making an order, and from my point of view I see that it is a waste for time and increases the cost”

Further to that evidences that appeared in the second interview:

“These orders are based on our company's monthly production needs, which results in a specific quantity to be directed that is typically less (LCL), which is more expensive and takes longer than (FCL), which causes a lack of coordination with other sources and a high inbound logistics cost”

“It highly depends on the quantity of the shipment and there is no certain time”

Moreover, it confirmed this in interview six, where the following evidence was found:

“From this challenge another one could be noted, which is related to the order quantity. Most of the time, the required quantities are not that huge freight, which leads to the problem of low containers utilization”

And the seventh interview added the following evidence:

“It is essential to check that the quantity of items and the timing of new orders are accurate while replenishing your stock”

Order Lead Time: The time between when a company places an order for the production inputs it needs and when those items actually arrive at the manufacturing plant is known as the total lead time. Simply explained, the LT is the anticipated time it takes to receive an order once it has been placed. Order lead times depend on a range of factors, including the kind of goods or materials being ordered, and vary from firm to company and industry to industry. Therefore, order lead time were the fourth code in the theme of inbound logistics cost that emerged from the interviews. Where this code appeared in some evidence in the first interview:

“The company faces some problems with the order lead time, and this is because sometimes there is a certain time that requires

us to count the materials and make a report with the required materials”

“These warehouses store inventory of auto parts to greatly reduce the lead-time of logistics, as if overseas parts were purchased locally.”

Further to that evidences that appeared in the fourth interview:

“As we talked about the challenges, I have to mention that LCL requires more order lead time than FCL”

And the seventh interview added the following evidence:

“The model specifications, the delivery location, and of course the assistance from our international manufacturing facilities and suppliers, all influence the wait time”

4.1.3. Theme of Inventory Management

Automotive inventory management involves monitoring and organizing items from suppliers, through the production process, and into customers' hands. It goes beyond just knowing how much inventory you have on hand. The significance and variety of its inventory are traits that define the automobile sector. At several points in the production process (raw materials, works-in-progress, and final goods), inventories are created. They come with advantages and dangers. Any product's inventory is primarily created to account for any potential supply and demand imbalances. Stocks, however, might result in greater additional expenses for organizations if they are not properly handled.

Based on that and the interviews, it could be concluded that it is essential for a vehicle manufacturer to manage this asset well in order to minimize the potential financial loss brought on by overstock or stock out. Therefore, from the interviews, the third theme is generated, which is the theme of inventory management, and from it several codes are generated, represented in the

following: inventory amount and inventory cost. Figure 3 shows these codes in context with the theme of inventory management.

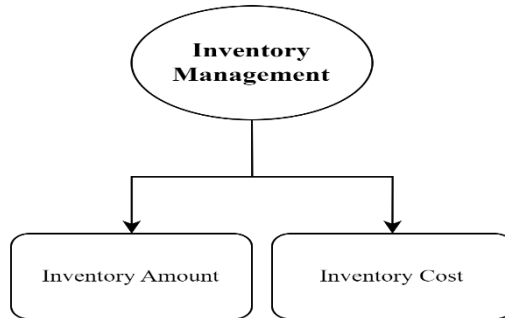


Figure 3: Mind Map of Theme of Inventory Management

Inventory Amount: A company's inventory consists of all the goods it can identify by conducting an inventory in its own method from the products it uses for business. The technique of calculating inventory helps to determine if the firm has a surplus or deficit in inventory. Consequently, it decides how to respond in such situation. Therefore, inventory amount was the first code in the theme of inventory management that emerged from the interviews. Where this code appeared in some evidence in the first interview:

“By using their production control system and expertise in how to supply the vehicle manufacturing facilities with the least amount of inventory, our branches and affiliated businesses, which are spread out throughout the world, have solutions to accommodate customers' various needs, including emergency orders”

Further to that evidences that appeared in the fourth interview:

"The cost of inventory changes according to the amount of the inventory. Moreover, there are other factors that affect the costs, which are; storage costs and hold inventory"

Moreover, it confirmed this in interview five, where the following evidence was found:

“Receiving an order from the supplier is the first stage in the inventory management process. Checking that the amount, product code, and serial code are all accurate is crucial.”

And the seventh interview added the following evidence:

“Employees may schedule production depending on availability thanks to inventory management, which also improves the productivity of the production cycle”

Inventory Cost: The costs related to acquiring, holding, and maintaining inventory along the whole supply chain are referred to as inventory costs. In addition to the initial purchase, the cost of inventory also includes storage fees and expenditures associated with keeping finished items that have not yet been sold. Therefore, inventory cost was the second code in the theme of inventory management that emerged from the interviews. Where this code appeared in some evidence in the first interview:

“This process takes place fairly every month, in which an inventory of all the raw materials needed in manufacturing is made, and from it a list of missing materials is reached, based on which the inventory cost is determined from the cost of ordering and the cost of shipping and carrying”

Further to that evidences that appeared in the second interview:

“Our main aim of supply chain is to decrease the costs of inventory holding, decrease the time required to transmit inventory, and sell the products faster”

“There are many costs related to inventory; cost to order, storage costs, holding unsold finished goods costs and admin costs”

Moreover, it confirmed this in interview three, where the following evidence was found:

“It is modified in a way that reduces the cost of inventory, it is highly efficient, and this is because the company's strategy regarding inventory is somewhat costly”

And the sixth interview added the following evidence:

"Handling and transportation costs represent the costliest factors of inventory"

4.1.4. Theme of Competitiveness

The automobile sector has a fair amount of competition. Although rules and regulations are in place to ensure fair competition between firms, there is sometimes a great deal of rivalry. When there are many rivals that are comparable in size and power, this is one of the main reasons that escalates rivalry in the marketplace. There is continuous discussion have the ability to significantly alter the economics of the sector. The fixed costs are just too expensive, which adds to the competitive environment's fierce competitiveness. Suppliers may attempt to keep control in negotiations by raising prices or lowering the quality of their offerings in order to be more cost-effective. Over time, material costs have increased, and one of the biggest challenges is finding a balance between management and customers.

When suppliers are dominated by a small number of businesses, this is one of the elements that gives them negotiating strength. They now have more clout when haggling over prices and costs as a result. When they have established switching costs, which are essentially fixed prices that purchasers incur when switching suppliers, they also have an edge when negotiating. Therefore, from the interviews, the fourth theme is generated, which is the theme of competitiveness, and from it several codes are generated, represented in the following: cost reduction,

performance and time reduction. Figure 4 shows these codes in context with the theme of competitiveness.

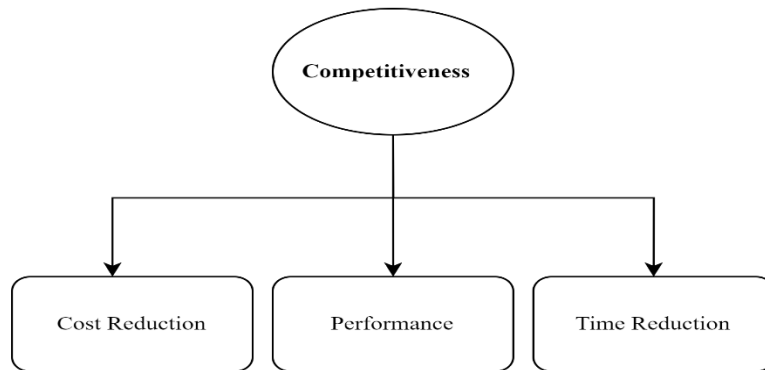


Figure 4: Mind Map of Theme of Competitiveness

Cost Reduction: The automobile market is very competitive and changing quickly. The sector has become uncomfortably volatile as a result of recent supply chain disruptions and the changing regulatory environment. As a result, many manufacturers are looking for cost-cutting opportunities, using more effective and economical materials, automating some aspects of the production process, and applying lean manufacturing principles. It's also crucial to create and put into effect a complete cost-reduction strategy that includes all parties involved, defined goals and objectives, and an action plan. Therefore, cost reduction was the first code in the theme of competitiveness that emerged from the interviews. Where this code appeared in some evidence in the first interview:

“This is to reach the largest quest for storage and supply at the lowest cost”

And the fourth interview added the following evidence:

"The development of policies related to inventory management will make the process more organized and effective, which will reduce the costs related to importing and inventory"

Performance: the KPIs that are most frequently utilized in the automobile repair sector. Although there are many ways for each service department to assess success, the sector as a whole use five primary KPIs. These metrics include effective labor rate, gross profit, customer satisfaction & retention, hours sold per repair order, and fixed coverage. Therefore, performance was the second code in the theme of competitiveness that emerged from the interviews. Where this code appeared in some evidence in the second interview:

"The well management of inventory ensures the competitiveness of the company, as it enhances all the production process as well as increases the performance of the company"

Time Reduction: The effective management of supply chains and warehouse management has an impact on the company's performance, especially in reducing time. Therefore, time reduction was the third code in the theme of competitiveness that emerged from the interviews. Where this code appeared in some evidence in the first interview:

"The inventory must be well planned and stored in a way that prevents any damage, as well as paying attention to developing a logistical strategy that manages the time of demand"

Further to that evidences that appeared in the sixth interview:

"Development of policies as well as the enhancement of the supply chain management will help in reducing the wasted time and costs and by that enhance the competitiveness compared to other companies"

4.2. Quantitative Data Analysis

In this subsection, the quantitative data collected from the potential budgets of Nissan will be analyzed, where the potential annual production of the company will be collected starting from 2019 to 2025, and the level of increase or decrease in production in the company will be calculated after the cost reduction process. Using SPSS, a descriptive analysis of the research variables will be done, and then Means will be compared using T-Testing to find out if there is a difference in the production performance in the company before and after cost reduction.

4.2.1.Descriptive Analysis for the Research Variables

Descriptive statistics is a strategy that presents a clear understanding of the characteristics of a certain data collection by summarizing samples and the procedures used to measure the data. Table 1 illustrates the descriptive analysis for the research variables.

Table 1: Descriptive Analysis for the Research Variables

	N	Min.	Max.	Mean	Std. Deviation
Over the Year	14	5.33	30000.00	11745.52	12610.06
Quarter One	14	3300.0	31980.0	14866.46	11127.21
Quarter Two	14	3630.00	35178.00	16353.10	12239.93
Quarter Three	14	5610	54366	25272.98	18916.25
Quarter Four	14	3960.00	38376.00	17839.75	13352.65

4.2.2.Comparing Means using T-Testing

Table 2 shows the T-test for the difference in firm production performance before and after cost reduction. It shows that there is a significant difference of Over the Year, Quarter One, Quarter Two, Quarter Three and Quarter Four, as the corresponding P-values are less than 0.05. Moreover, the mean rank of Over the Year for the “Before” responses (Mean = 23485.71) is more than

other “After” responses (Mean = 5.33). Meanwhile, the mean rank of Quarter One for the “After” responses (Mean = 25035.77) is more than other “Before” responses (Mean = 4697.14). In addition, the mean rank of Quarter Two for the “After” responses (Mean = 27539.35) is more than other “Before” responses (Mean = 5166.86). Furthermore, the mean rank of Quarter Three for the “After” responses (Mean = 42560.81) is more than other “Before” responses (Mean = 7985.14). Finally, the mean rank of Quarter Four for the “After” responses (Mean = 30042.93) is more than other “Before” responses (Mean = 5636.57).

Table 2. T-Test for Process of Cost Reduction

	Cost Reduction	N	Mean	P-value
Over the Year	Before	7	23485.71	0.000
	After	7	5.33	
Quarter One	Before	7	4697.14	0.000
	After	7	25035.77	
Quarter Two	Before	7	5166.86	0.000
	After	7	27539.35	
Quarter Three	Before	7	7985.14	0.000
	After	7	42560.81	
Quarter Four	Before	7	5636.57	0.000
	After	7	30042.93	

4.3. Discussion

The current study applied qualitative and quantitative analysis in order to identify factors that affect the cost reduction. The qualitative analysis is done through making interview with manager of Nissan Motor Egypt and the analysis is done using NVivo program. From the analysis four themes are extracted, where each theme consists of codes.

First theme is supply chain, the well management of supply chain is presented as a significant factor that helps in cost reduction. This theme has two codes, which are; overseas suppliers and freight forwards. Second theme is inbound logistics cost. The placing of the appropriate items at the appropriate location and time in the inbound logistics helps in reducing the costs of the company. This point has been assured in the interviews through inbound logistics cost theme, where four codes are included in this theme, which are; transportation cost, shipping type, ordering quantity and order lead time.

Third theme is inventory management, the management of inventory and the organization of the production process from its beginning till it reach the customer represents an important factor that leads to cost reduction. This theme consists of two codes that have extracted from the interviews, which are; inventory amount and inventory cost. The fourth theme is competitiveness, according to interviews, the competitiveness that faces the automotive companies could represent a factor that encourages the companies to improve their performance and by that reduce their costs. This theme is consisted of three codes, which are; cost reduction, performance and time reduction.

Finally, the following figure shows the mind map representing a summary of all the points that arise from the interview's responses.

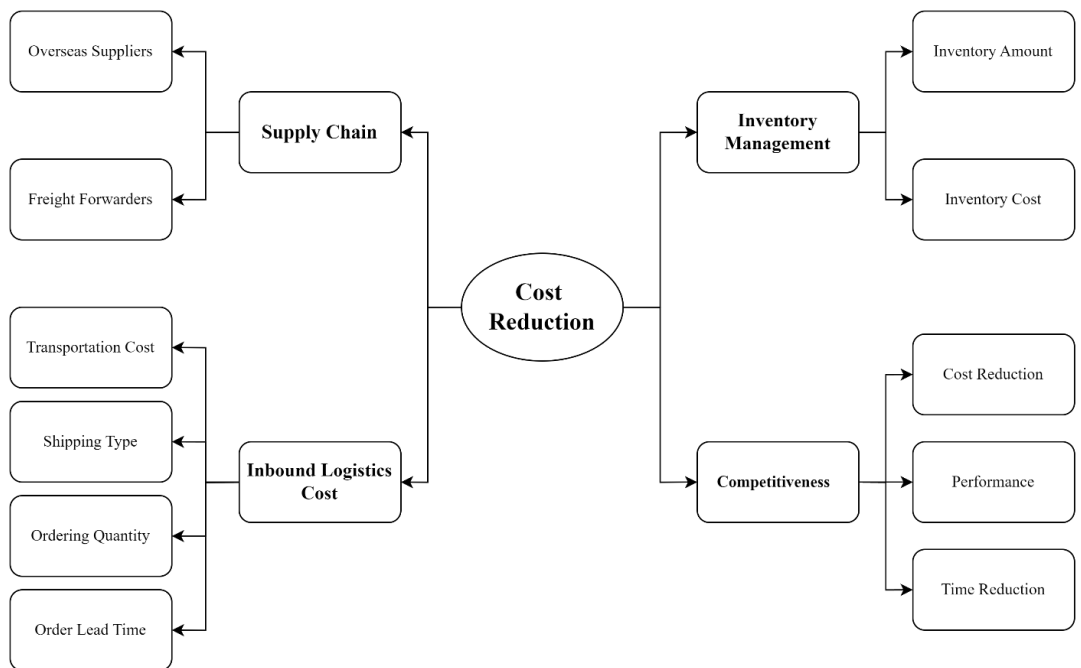


Figure 5: Mind Map

After completing the qualitative analysis and extracting the factors that help reduce the cost, a quantitative analysis was conducted to find out the effect of cost reduction on the company's production performance. First, a descriptive analysis of variables was used. A descriptive analysis was provided for each of the study variables. Secondly, the result of production volume analysis before and after cost reduction is discussed. And from the results, it was confirmed that there is a significant difference between the year-round, first quarter, second quarter, third quarter, and fourth quarter, as the corresponding P values are less than 0.05.

5. Conclusions

The current study aims to identify factors that affect the reduction of costs inside the automotive industry. Therefore, a mixed approach has been adopted in order to collect the data using different methods. Interviews are done to collect the qualitative data and 7 managers at Nissan Egypt are the respondents of the interviews. The qualitative analysis shows that supply chain, inbound logistics cost, inventory management and competitiveness are the most important factors that affect cost reduction according to the respondents. Looking for the quantitative analysis, a significant relationship between annual production and the cost reduction per quarter is proved. Another important point concluded by applying T-test before and after cost reduction is that there is a significant difference between the year-round, first quarter, second quarter, third quarter, and fourth quarter, as the corresponding P values are less than 0.05.

6. Research Recommendations

After analyzing the cost reduction and factors that could affect this variable inside Nissan Motors Egypt, some recommendations are provided through this section to decision makers of Nissan Motors Egypt as well as to the automotive industry sector.

First recommendation is regarding the inventory management, it is recommended to always work on improving the inventory management, as it represents an important factor that leads to enhancing the productivity of the production cycle.

Second recommendation is related to the time, it is recommended that decision makers should develop logistics strategies that help in reducing the demand time as well as work on developing these strategies every now and then. In addition to that develop policies related to inventory management, and supply chain management that helps in controlling the wasted time and costs and by that enhances the performance and increase the competitiveness.

Third recommendation is related to the challenges that face LCL and FCL, first it is recommended to make monthly count of the actual stocks in the warehouses in order to identify the exact missing raw materials and determine the units needed to be ordered.

It is also recommended to develop the material requirements planning and to train the employees on minimize the order cost. Moreover, it is suggested to raise all the containers filling ratio to 80% and make the material requirements planning and logistics department to review all the container's units before order to make sure that the percentage is covered.

Other recommendations are related to NITCO (Nissan International Trading Company) which is a group of freight forwarders which are accredited from the mother company (Nissan Japan), Nissan Egypt should always review freight rates with NITCO to make sure that it suits its KPI. Nissan Egypt should also negotiate with NITCO to minimize the minimum order quantity in some parts that has not met the actual demand.

After presenting recommendations for discussion makers, some recommendations are provided to current and future research. As for the recommendation for current researches is to focus on more factors that will help in reducing costs than supply chain and inbound logistics and try to identify which factor could affect the cost reduction than the other.

The second recommendation is regarding the population of the study, as this study targeted Nissan Motors Egypt as a case study. Thus, the researcher suggests making this research on other automotive companies as well as applying it in other manufacturing industries in order to reach generalization.

Another recommendation is to focus on companies in different countries than Egypt as well as making comparison between companies in different countries (whether developed or developing) in order to identify the points of differences and similarities.

7. LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

The researcher presents some points of limitations that came across during the study and then illustrate some opportunities and ideas for future research that have surfaced along the way. The study had a timing limitation because the data used for the study only covered a short period of time. As a result, the study suggests that future studies include data from a longer time frame.

Second limitation is related to the research variables. The researcher had put her focus on supply chain performance as a main factor that affects cost reduction. Thus, the researcher suggests for the future researches to include more variables that may affect the cost reduction in automotive industry.

Another limitation is regarding the population and the sample of the study, as this study targeted Nissan Motors Egypt. Thus,

the researcher suggests making this research on other automotive companies as well as applying it in other manufacturing industries in order to reach generalization. On the other hand, the researcher suggests making more studies in other developing countries in order to see if there is variation will happen in the results. Finally, the researcher suggests making a comparative study between Egypt as a developing country and other developed countries or between the developing and developed countries in order to see if the results could be generalized.

Disclosure statement

No potential conflict of interest is reported by the authors.

Data availability statement

Due to the nature of this research, participants of this study did not agree for their data to be shared publicly, so supporting data are not available.

Ethics approval

Approval received from Arab Academy for Science, Technology and Maritime Transport (AASTMT), Alexandria, Egypt.

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