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ABSTRACT

This thesis aimed to investigate the Role of Supply Chain Innovation in the Improving the Operational Performance. applied study in Ezz Steel Company. where Supply Chain Innovation was divided into five basic dimensions: (Agility, Quality, Service to the customer, Supply Chain Integration, Supply chain efficiency),

and Operational Performance has been divided into four basic dimensions: (Quality, Research & Development, Flexibility, Cost). The researcher relied on the descriptive method as it is the most widely used method in the social sciences. the researcher used the survey list to collect data on the research variables, then subjected the collected data to appropriate statistical analysis methods in order to achieve the research objectives and test the validity of the research hypotheses.

The study established that Supply Chain Innovation with its dimension (Agility, Quality, Service to the customer, Supply Chain Integration, Supply chain efficiency) has a positive and statistically statistically significant effect on the corporate Operational Performance with its dimension (Quality, Research & Development, Flexibility, Cost) in Ezz Steel Company.

Keywords: Supply Chain Innovation, Operational Performance, Agility, Quality, Service to the customer, Supply Chain Integration, Supply chain efficiency, Quality, Research & Development, Flexibility, Cost.

ملخص البحث :

هدفت هذه الدراسة إلى الكشف عن دور إبتكار سلسلة التوريد في تحسين الأداء التشغيلي، حيث تم تقسيم ابتكار سلسلة التوريد إلى خمسة أبعاد أساسية: (المرونة، الجودة، الخدمة المقدمة للعميل، تكامل سلسلة التوريد، كفاءة سلسلة التوريد)، وتم تقسيم الأداء التشغيلي إلى أربعة أبعاد أساسية: (الجودة، البحوث والتطوير، المرونة، التكلفة)، وتم تطبيق الدراسة على شركة حديد عز. اعتمد الباحثان على المنهج الوصفي باعتباره المنهج الأكثر استخداما في العلوم الاجتماعية. واستخدم الباحثان قائمة الاستطلاع لجمع البيانات حول متغيرات البحث، ثم تم إخضاع البيانات التي تم جمعها لأساليب التحليل الإحصائي المناسبة لتحقيق أهداف البحث واختبار صحة فرضيات البحث.

توصلت الدراسة إلى مجموعة من النتائج كان أهمها أن الابتكار في سلسلة التوريد بأبعاده (المرونة، الجودة، الخدمة للعملاء، تكامل سلسلة التوريد، كفاءة سلسلة التوريد) له تأثير إيجابي وذو دلالة إحصائية على الأداء التشغيلي بأبعاده (الجودة، البحوث والتطوير، المرونة، التكلفة) في شركة حديد عز.

الكلمات المفتاحية: ابتكار سلسلة التوريد، الأداء التشغيلي، المرونة، الجودة، الخدمة المقدمة للعملاء، تكامل سلسلة التوريد، كفاءة سلسلة التوريد، الجودة، البحوث والتطوير، المرونة، التكلفة.

1- Introduction:

Industrial and service organizations are currently dealing with environmental conditions characterized by dynamic and rapid change, and according to these changes, most institutions - especially those that occupy the center stage in their fields of work - tend to change their current strategic directions, and adopt new directions based on the use of the latest tools and methods in the field of management, including enabling it to keep pace with developments on the global scene; One of the most important trends of contemporary organizations in facing competition is their reliance on developing their own supply chains, as the supply chain represents the main artery for the efficient use of the organization's internal and external resources in an optimal manner.

In recent decades the globalized economy and increased international trade have expanded supply chains across the globe, which unavoidably has brought about new dependencies. These new dependencies come with both significant benefits and risks, creating unforeseen weaknesses.

The COVID-19 pandemic exposed those vulnerabilities in dramatic fashion, showing that organizations simply were not prepared to bounce back from such disruptions.

Digital transformation, which includes the likes of automation for example, is making it more possible to make a broad range of activities easier - including inventory control, order processing and logistics. As a result, workplace productivity is increased, alongside a much lower mistake rate.

Likewise, workers are becoming increasingly aware of the need to be trained on new technologies such as generative AI (Gen AI) in order to advance business development. With this in mind, we consider some of the current leading supply chain innovations around the world.

Performance is a concept that concerns all organizations in all areas; Because of its importance at both the working and organizational levels, organizations have always sought to upgrade their performance; In order to achieve the visions, objectives and core values that it delineates, especially operational performance that is widely concerned with processes and transformative and operational activities, from the efficiency of internal processes, the quality of the product, and the ability of organizations to provide a combination of new products, in addition to financial performance, operational performance is concerned with the interest of all parties concerned with the organization by achieving their different goals. (Junaidi, J. 2022)

The process of measuring performance is also a difficult, important and complex one, as it is an important means for departments to operate with vigour and vigour, forcing chiefs to continuously follow and observe the performance of their subordinates and driving subordinates to work actively and efficiently to show producers' appearance in front of their superiors; It is complicated by the

fact that some workers' performance is difficult to measure because of the nature of some intangible productive work, such as those based on mental and mental energy, such as administrative work, supervisors' work, etc., where the underlying reliance on performance measurement is based on the President's direct observation and personal opinion of some of the qualities of the worker. (Akhtar, S. 2016)

Basic performance measurement indicators are a means of measuring performance or progress towards the achievement of the Organization's or the Unit's scientific objectives, and when they are linked to a strategy and understandable factors: they help the Organization or any unity in it or even its external clients: (investors, suppliers and society) to understand the Organization's objectives and how well they are achieved, and performance measurement allows the Organization to determine a practical way; To describe what is considered appropriate performance, what is not, and by using this specific definition of success: managers can reward their staff, and learn from good practices applied in the business organization. (Akhtar, S. 2016)

According to the above; given the growing interest in operational performance in organizations in general, and iron production companies in particular, the current study focused on revealing the extent of Supply chain innovation in improving the operational performance of Ezz Steel Company, to produce some findings and recommendations that would improve the company's operational performance.

2- Theoretical Framework

2-1 Supply chain Innovation (SCI)

2-1-1 Supply chain Innovation Concept

Innovation is necessary for firms to respond to rapid changes in products and services as well as customer's demand and problems (Solaimani, S., & van der Veen, J, 2022). Generally, innovation occurs within processes, technologies, services, strategies and organizational structures (Isaksson et al, 2010). Specifically, SC innovation involves technology-improved processes and procedures in the outbound SC as well as changes in product, process or service that either enhances efficiency or improves final customer's satisfaction (Kwak et al, 2018). For instance, the competitiveness of logistics firms increasingly relies on their ability to adopt innovations that add value to the shippers' bottom line (Hahn, G. J, 2020).

SC innovation emphasizes the demands of the marketplace which can lead to an enhancement of value propositions for downstream customers (AL-Khatib, A. W, 2023). Panay ides and So (2005, pp. 192-193) noted that "as supply chain parties become more innovative in terms of adopting new processes, operational routines and investing in new technological systems, supply chain effectiveness in terms of ability to fulfil what was promised, meet standards and solve problems will improve".

SC innovation is a multi-dimensional construct, which can be categorised into technology innovation and process innovation (Ha Hall, J, 2006). The ability to manage technology and process innovation is becoming a critical capability for

both the logistics department of manufacturers and logistics intermediaries (Lee et al, 2011).

Technology innovation aims to enhance the integrated information system, real-time tracking technology and innovative logistics equipment across global SCs. Technology innovation helps firms to heighten labour and capital productivity and offer real-time visibility regarding the flow of cargoes, information and sales data so that they can enhance inventory management and enlarge their value proposition for final customers (Zijm et al, 2015). For this reason, researchers have anticipated that the application of contemporary technologies, such as GPS, RFID and ERP, can effectively support risk management of SC (Hazen et al., 2012; Li, B., & Li, Y, 2017). Technology innovation also plays an important role in exploiting economies of scale in purchasing, logistics and central distribution centres (Zijm et al, 2015), which can be a key means of differentiation in logistics services (Li & Li, 2017).

Although there are numerous technology innovations derived from technological advances, the greater efforts aimed at improving customer value result from process (service) innovation, such as developing more agile and responsive processes in the global SCs (Jangga et al., 2015; Shamout, M. D, 2019). (Karaman Kabadurmus, F. N. 2020) noted that "a process innovation is the implementation of new improved techniques, methods and procedures with the goal to continually improve the quality of a service or reduce the cost of providing a service". Process innovation is concerned with the effective re-design and re-engineering of the SC.

By understanding how the SC transfers innovation as well as knowledge, meaningful process innovations and ultimate value for better services can be stimulated (Shamout, M. D, 2019). It focuses on operational issues and processes that enhance management practices, networking, distribution, procurement and so on (Shamout, M. D, 2019).

Only limited academic attention has been paid to issues of defining and measuring SCIs (Jangga et al. 2015; Bello et al, 2004; and Abdelkafi, N., & Pero, M, 2018). However, the introduction of new products and services or entry into new markets is likely to be more successful if accompanied by innovative supply chain designs, innovative SCM practices, and enablement of technology. SCIs are thus a vital instrument for improving the performance of a supply chain (Jangga et al. 2015; Bello et al, 2004; and Abdelkafi, N., & Pero, M, 2018). Based on their systematic literature review on SCI, (Hopkins, J. L, 2021) put forward the following definition of SCI: "Supply chain innovation is a change (incremental or radical) within a supply chain network, supply chain technology, or supply chain process (or a combination of these) that can take place in a company function, within a company, in an industry or in a supply chain in order to enhance new value creation for the stakeholder."

This definition points to some vital characteristics of SCI. Firstly, SCI includes change and is considered dynamic in nature. Secondly, the novelty of SCI ranges from smaller or incremental changes to larger, more radical changes. Thirdly, SCI can have both intra- and interorganizational origins; accordingly, it can occur within a company (i.e., within a specific company function) or it can take place

across several organizations in a supply chain or across industries. Fourthly, SCI embraces more than the invention of something new since it includes the process and activities related to commercialization of a novel idea in a supply chain. Thus, an SCI must prove its commercial value which leads to the fifth and final characteristic. The innovation has to encompass new value creation to a partner, end customer, or stakeholder in the supply chain in terms of, for example, a new product, a new service, or a new market.

In a quest to operationalize the concept of SCI, (Hopkins, J. L, 2021) introduces three elements of SCI—supply chain business process, supply chain technology, and supply chain network structure. These elements constitute the content of SCI. The novelty of an SCI may range from incremental to radical (Luomaranta, T., & Martinsuo, M, 2020), but evaluation of novelty will be contingent on the eyes of the beholder. An important feature of the SCI model is its holistic and nuanced view of the content of SCI and what can be labeled as an SCI. Accordingly, an SCI can have its origin in any of the content elements of supply chain processes, supply chain technologies, and supply chain network structures, but an SCI may also build on a composition of two or all three of these content elements. Extant research has also clearly explicated that the three elements of SCI are interrelated—e.g. processes and technology (Cohen et al, 2000; Kronborg Jensen et al,2013), processes and structure (Bayanati et al. 2022; Caniato et al, 2013) and structure and technology (Luomaranta, T., & Martinsuo, M, 2020).

2-1-2 Dimensions of Supply chain Innovation

- Agility: There is increasing changing demand patterns and wide fluctuations in customer's behaviour in the SCM. Thus, SCM is required to be flexible and adaptable as well as resilient enough to absorb market and environmental shocks (Folke, 2006).
- Quality: The primary focus in SCM is the matter of quality is product availability on the shelf, product quality, product safety, process quality, and packaging quality all of which are considered in this research. The common goal of all stakeholders in the supply chain is to ensure the safety and quality of product flowing throughout the supply chain and will enhance the integrated performance of SCM.
- Service to the customer: Better customer service results in increased customer satisfaction. Customer satisfaction measured concerning on-time delivery, delivery speed and fast response to the customer can be an essential competitive priority (Gunasekaran et al., 2001).
- Supply Chain Integration: Coordination and collaboration among chain partners are regarded as an important feature of the SCM. Stakeholders must collaborate on important issues over the long term to ensure proper food quality, food safety, sustainable and agile supply chain.
- Supply chain efficiency: Supply chain efficiency is the proper utilisation of resources within the chain which can be measured concerning different cost and profit involved in the supply chain. There is a need for efficient supply chain management, especially for short lifetime products (Wu et al. 2022).

2-2 Operational Performance

2-2-1 Operational Performance Concept

The concept of operational performance includes a set of standards and metrics used by organizations, through demand and supply, or the market share of products or services of these organizations, and these standards are also considered as the process of integration between the goals and objectives of the strategic organization with its operational goals and objectives, and operational performance is a description of the stages and functions of the strategic plan of organizations and the mechanisms of success and harmony between it and the strategic plan of the organization, due to the fact that the strategic plan is an integrated plan, which explains the resources It also works to determine the production schedules and quantities and determine the necessary budget for this.

Operational performance is broadly concerned with operations, transformation and operational activities, and is measured by indicators, such as: the efficiency of internal processes, the extent of product quality, the extent to which organizations are able to provide a combination of new products, and also includes financial performance, so operational performance is concerned with the interest of all parties involved in the organization by achieving their various goals.

The concept of operational performance witnessed several definitions, and the researcher presented the different researchers' views of the

concept of operational performance in the following table (1), according to its chronological order from oldest to newest, as follows:

Table No. (1) The concept of operational performance from the point of view of researchers

Researchers	concept
(Valdez, 2017)	It expresses the internal activities and operations carried out by the organization; to achieve financial goals, customer requirements, through the development and development of new services in the light of market determinants, diagnosing the nature of the market, customer needs, as well as the operational cycle focused on providing services to customers; in order to raise the degree of customer satisfaction and service .
(Santos Bento & Tontini, 2018)	Operational performance is seen as a measure of operational efficiency and effectiveness within organizations, because it reflects two important dimensions of supply chain performance: efficiency and customer service.
(Deng, Q., & Noorliza, K, 2023)	The ability of the organization to bring about rapid change in product design in a way that surpasses competitors, as well as to offer this product at lower prices than competitors and deliver it to customers as quickly as possible, as well as reaching a zero defect rate of manufacturing processes.
(Al-Hakimi et al, 2023)	The ability to provide products with the lowest costs and the highest quality, timely delivery and high operational flexibility, by responding to changing demands in the markets so as to obtain customer satisfaction.

Source: Prepared by the researcher based on the mentioned references.

Based on the above definitions, the researcher believes that operational performance is a set of competitive dimensions of the organization represented by quality, flexibility, speed of product delivery, design, and low cost, which enable organizations to achieve the results they want and increase their ability to set and set goals as well as implement them.

The researcher also believes that operational performance is the main indicator that reflects the ability of organizations and the extent of success they are working to achieve in investing their technical, human, informational and material resources available to them.

2-2-2 Dimensions of operational performance:

Researchers differ among themselves in determining the dimensions that express the operational performance of organizations,there are those who considered it a one-dimensional variable as mentioned by (Rahman and Bullock, 2010), and there are those who see it as a multidimensional variable, such as (Liu, et.al., 2013), and they defined the dimensions of operational performance in six dimensions, represented by: (cost, service, quality, time span, production flexibility, and reliability). As for (Vickery, 1997), "delivery, flexibility, innovation, quality, cost" identified dimensions of operational performance, while there are those who looked at operational performance through three dimensions, namely: (product, profitability, efficiency), (al-Tawil et al., 2009) while (Machusa, et al., 2011) they see that the dimensions that express the level of operational performance in the organization are: "quality, flexibility, delivery, cost", while each from (De Leeuw & van den Berg, 2011) that the dimensions of the operational performance of the organization are: "reducing errors in production processes, high inventory turnover rates, increasing production levels". (Al-Jawazneh, 2012) believes that the dimensions that express the operational performance in an organization are: "quality, reliability, cost, and speed of product delivery to the customer". While both (Jacobsa, etal.,2012: 679) (Matthias Hallgren, 2007) to

operational performance through four dimensions which are included in: "delivery, quality, cost, flexibility".

The researcher believes that this difference between researchers in determining the dimensions that express the levels of operational performance of organizations is due to the multiplicity of dimensions expressing aspects of operational performance on the one hand, and on the other hand: due to the difference in the intellectual interests of researchers, which leads to a difference in their orientations in the dimensions that express the level of operational performance of organizations.

When measuring operational performance, the researcher relied on the use of a set of dimensions, namely: quality, cost, flexibility, speed of delivery, research and development, " and the following is an explanation of these dimensions:

2-2-2-1 Quality:

In our ordinary life, quality means the degree to which the product meets the needs and desires of a certain segment of consumers, or industrial buyers, for example: the Mercedes car is considered the best quality for moving within cities from the point of view of some, but it is not the preferred car in terms of the degree of quality in the case of movement in Specific, chemical composition of materials, degree of tolerance, tensile strength, or final finish, so it is necessary to distinguish between two dimensions of quality, namely: (Buer et al. 2021)

- **Design quality:** focusing operations efforts on achieving design quality, which means the company's ability to find a high-performance design for each of its products or services to obtain features and characteristics of high and superior performance, safety and security in use, greater rigidity, being economical in use, lightness in use and

also ease of access to services, customers here do not look at the prices of products or services but are looking for distinctive quality and the best quality.

- **Quality conformity:** the company's ability to achieve quality conformity for each of the products or services it provides, as the company's activities and operations are keen so that customers can obtain services and products that meet the specifications and characteristics that have been developed for them, and that meet their ambition, desires and expectations .

Quality improvement is one of the objectives of the modern manufacturing strategy, because quality is one of the elements of competitive advantage that contributes to strengthening the competitive position of the organization, and quality improvement is viewed from two aspects :(Tarigan et al. 2021)

- **The first aspect:** it is associated with the reduction of high costs for poor quality.
- **The second aspect:** it is related to highlighting the treatment of quality problems that cause high cost in order to improve quality.

Achieving these two aspects requires continuous adherence to strict quality standards in three stages, namely: (the quality building stage when designing the product, the quality control stage during production or manufacturing processes, and the quality assurance stage at the supplier). (Tarigan et al. 2021)

2-2-2-2 Flexibility:

In light of modern manufacturing systems, one of the most basic components of modern manufacturing strategies is product flexibility, where flexibility is defined as "the ability of organizations to form a combination of products, the speed of changing

their configuration, in addition to working on reducing production time, the need to link production flexibility and the speed of the organization's response to changing customer needs, and the flexibility of the product in the organization depends on the product engineering activities to a high degree. (Kebede Adem, M. and Virdi, S.S. 2021)

The flexibility of production is one of the important characteristics that the organization exploits; to excel in modern manufacturing environments that enjoy a high degree of competition, and guarantees these organizations to maintain their customers by responding quickly to their changing requests, and achieving flexibility of the product depends on some important factors that organizations must take into account, such as: the organization's ability to innovate, creativity and innovation in its products, reducing the delivery cycle period to its minimum, and taking into account aspects of production engineering, and we can even say on an organization: it has achieved production flexibility for its products: It is necessary to look at some of the metrics by which an organization gains a competitive advantage in the markets in which it operates, and these metrics are: Santos Bento & Tontini, 2018)

- **Reduce the period of product delivery time:**

the period of the product delivery cycle is the period that passes between the receipt of order orders from customers, until the shipment of the finished product to them, and the more organizations work to reduce this period, the organization has the flexibility to meet the needs of customers. Also, customer delivery of a product or service with a high degree of quality and speed is one of the main pillars in his assessment of organizations, in light of the modern manufacturing environment. The presence of the competitive dimension of the time period of the delivery cycle achieves a cost

advantage, due to the redesign of activities, processes that achieve speed in responding to customer requests, and work to reduce their waiting time, which will lead to lower cost, and obtaining this competitive advantage requires organizations to move quickly and adapt, through the adoption of three main factors, namely (rapid learning, delivery of the product on time, and speed of response to developments in the market through continuous development).

- **Attention to the engineering aspects of products:**

The speed of organizations in making adjustments in production characteristics makes them able to achieve flexibility in production, and this is considered a function of the engineering aspects of the product, which relate to the level and components of materials that enter into production, and the possibility of the organization to make changes at various production stages.

2-2-2-3 Research and development:

development activities in service and production organizations, and "research" is defined as the study of a methodology oriented towards scientific knowledge, or understanding For the subject being studied, "development" means the systematic use of knowledge and understanding gained from research directed towards the production of materials, devices, systems, or useful methods, including the design and development of models and processes.the term research also includes activities involving the training of personnel in research techniques; these activities are used at the same facilities, as other research and development activities. (Tortorella et al. 2021)

As for the Frascati manual (Frascati) views research and development as "the ability to conduct a unique type of research and use the knowledge created; for product

development and technological development, so pure research and innovative activities with rational use of costs, product optimization are abbreviated as a research and development project. . (Tortorella et al. 2021)

The organization for Economic Cooperation and development (OCED) also defined research and development as "creative work carried out on a systematic basis; for the purpose of increasing the stock of knowledge, including the knowledge of Man, culture, society, and using this stock of knowledge; to find new applications. (Acquah et al. 2022)

He also believes that research and development " is an institutional scientific and technological activity based on directing a scheme of investment spending according to the criteria of technical and economic feasibility; in order to enhance scientific knowledge in its various chemical, physical, biological, engineering and production specialties ... To ensure the development of new or improved products, or in order to raise production efficiency. (Domenek et al. 2022)

Abu Khashba believes that research and development means the ability of an organization to provide new products that help its competitiveness by increasing its market share, as competition in markets requires the continuity of organizations in innovation and innovation, and therefore new products must be developed and produced in order to replace those old-fashioned products, on the one hand, and on the other hand: product development entails the development of new processes; in order to make products more effective, and in order to improve the process of continuous improvement of these processes must be linked to the objectives of Within this framework, it is possible to set specific goals for various actions; in order to provide

incentives for improvement in the areas that are most important. (Agyei-Owusu et al. 2022)

2-2-2-4 cost:

The main goal of any organization is to maximize profits to the maximum, and reaching the required level of profit maximization, and maximizing the return on investment for organizations requires work to reduce the cost to the minimum possible, and the cost is reduced by taking into account the following: (Ganbold et al. 2021)

- Reducing inventory to a minimum, or canceling it, which leads to dispensing with control procedures related to inventory.
- Work to reduce losses and damage, or cancel it by receiving materials that are purchased directly when they are needed, and in the quantity required for production, which will lead to dispensing with activities that do not add value to the product, thereby reducing its costs.
- Reducing dealing with a large number of suppliers and only dealing with a limited number of suppliers, which leads to reducing the procedures of purchase, inspection and receipt.

Cost optimization is the end result of organizations ' efforts to improve both quality and responsiveness, and as organizations continue to expand priorities, cost efficiency becomes more sustainable.

3- Problem Statement:

based on the exploratory Study plus a set of previous studies, the researcher can formulate the study's problem in the following questions:

- How far is the concept of Supply chain innovation applied in Ezz Steel Company?

- What is the current level of operational performance in Ezz Steel Company?
- What is the relationship between Supply chain innovation and operational performance in Ezz Steel Company?
- Can the dimensions of Supply chain innovation improve the dimensions of in Ezz Steel Company operational performance?

4- Study Objectives:

The study seeks to achieve the following objectives:

- Recognize the reality of applying Supply chain innovation in Ezz Steel Company.
- Identify the selection bases of the suppliers in Ezz Steel Company.
- Study the relationship between Supply chain innovation and operational performance in Ezz Steel Company.
- Reaching some results and making some recommendations and proposals could contribute to maximizing Supply chain innovation in improving in Ezz Steel Company operational performance.

5-The Importance of The Study

5-1 The Importance of The Study from A Scientific Perspective

Despite the multiplicity of previous foreign researches and studies and books that dealt with the study variables individually: Previous studies, especially in the Arab environment, lack what combines the variables together, as far as the researcher is aware, and this increases the importance of the current study, as the study variables are considered important topics in production management and processes, where it is concerned with one of the most important modern trends advocated by the world today in order to obtain the economic benefits of manufacturing by adhering to the

rules of environmental and social safety, where this study adopts the use of study variables to achieve economic, social and environmental benefits together in order to achieve manufacturing sustainability, where they were used to recover products for recycling operations, but they were not used through The researcher hopes that this study will provide a new scientific addition in terms of using the study variables in their comprehensive concept to achieve sustainable economic, social and environmental manufacturing practices. Therefore, the importance of the study from the scientific perspective is that the current study will be an extension of previous studies that have been done before in this field, and therefore it will enrich the Arab library in this fertile field.

5-2 The importance of the study from the applied perspective

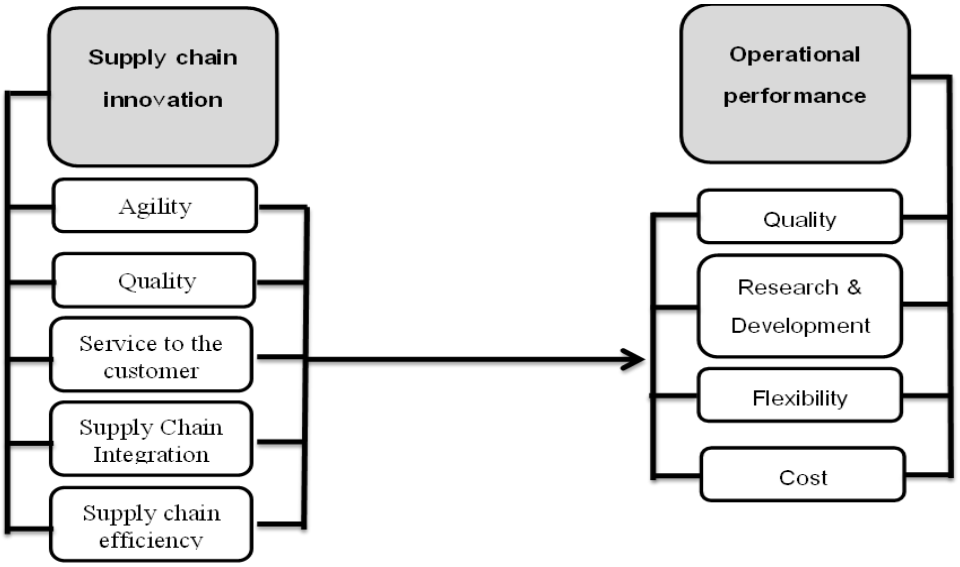
Interest in developing and improving efficiency in industrial organizations in general, and a giant company such as Ezz Steel in particular and studying ways to achieve its developmental role in the Egyptian economy are among the issues that receive great attention from the state at present, especially in light of the development challenges facing the Egyptian economy, and the need to confront them. With unconventional creative solutions that take into account life conditions and local, regional and international variables; Therefore, attention must be paid to the efficiency of the members of the supply chain, as well as the operational performance of Ezz Steel.

6- Study Variables:

- Independent Variable (Supply chain innovation): The researcher addressed it through the following dimensions: (Agility, Quality, Service to the customer, Supply Chain Integration, Supply chain efficiency).

- Dependent Variable (Operational Performance): The researcher addressed it through the following dimensions: (Quality, Research & Development, Flexibility, Cost).

Accordingly, the framework for the study's variables, which shows the extent to which the dimensions of Supply chain innovation play a role in improving operational performance, as shown in figure (1), is as follows



Prepared by the researcher based on previous studies

Figure (1) Research Variables Model

7- Hypotheses

The main Hypothesis:

"There is statistically significant effect of Supply chain innovation with its dimension (Agility, Quality, Service to the customer, Supply Chain Integration, Supply chain efficiency) to achieve the operational performance

with its dimension (Quality, Research & Development, Flexibility, Cost) in Ezz Steel Company. " From this hypothesis the following sub-hypotheses:

- There is statistically significant effect of Supply chain innovation with its dimension on the **Quality** which is one of the operational performance dimensions in Ezz Steel Company.
- There is statistically significant effect of Supply chain innovation with its dimension on the **Research & Development** which is one of the operational performance dimensions in Ezz Steel Company.
- There is statistically significant effect of Supply chain innovation with its dimension on the **Flexibility** which is one of the operational performance dimensions in Ezz Steel Company.
- There is statistically significant effect of Supply chain innovation with its dimension on the **Cost** which is one of the operational performance dimensions in Ezz Steel Company.

8- Methodology:

8-1 Research method and philosophy

The researcher relied on the descriptive method as it is the most widely used method in the social sciences. This method relies on collecting data from realistic conditions, complete clarity in the methods of collecting primary data, and lack of control over the research environment. This was done through an applied study, where the researcher used the survey list to collect data on the research variables, then subjected the collected data to appropriate statistical analysis methods in

order to achieve the research objectives and test the validity of the research hypotheses (Nassaji, 2015).

Regarding the philosophy of research, the researcher relied mainly on positivism, or what is also called deterministic philosophy, which focuses on constructed theories and their application in the field, whether with regard to the independent variable (Supply chain innovation), or regarding the dependent variable (Operational Performance). Positive philosophy is concerned with focusing on quantifiable observations that are analyzed statistically. (Awaad, 2019: 28)

There was also a reliance on the philosophy of phenomenology, embodied in monitoring some of the phenomena of the research variables when conducting the exploratory study, especially about the dependent variable (Operational Performance), but the researcher did not design research that covers the complete picture of these phenomena, as that was not one of the objectives of the research. It is not one of the objectives of the research to study the causes and consequences of Operational Performance in the research community, which is Ezz Steel Company.

8-2 Questionnaire design:

The survey list is divided into three main axes as follows:

1. **Demographic data:**

They include both:

A-type (two categories).

B-Age (4 categories).

C-Educational level (4 categories).

D- Career level (4 categories).

E-Years of Experience (4 categories).

2. Supply chain innovation:

Supply chain innovation was measured based on the scale developed by (Li et al. 2024) This scale consists of 24 statements, which are answered on a progressive Likert scale consisting of five points ranging from (1) completely disagree to (5) completely agree, and it measures five dimensions of Supply chain innovation:

A. **Agility:** consists of (5) statements (statements X1 to X5).

B. **Quality:** consists of (5) statements (statements X6 to X10).

C. **Service to the customer:** consists of (5) statements (statements X11 to X15).

D. **Supply Chain Integration:** consists of (5) statements (statements X16 to X20).

E. **Supply chain efficiency:** consists of (4) statements (statements X21 to X24).

Since the five dimensions Supply chain innovation have been agreed upon, as the researcher pointed out in many previous studies, the researcher performed Confirmatory Factor Analysis for the Supply chain innovation scale in its five dimensions, including 24 phrases, in order to identify phrases with significant standard regression coefficients that should be retained, and those phrases with non-significant standard regression coefficients that should be excluded. As the researcher will explain later in the special part Confirmatory Factor Analysis in this chapter.

3. Operational Performance:

Operational Performance was measured based on the scale developed by (Al-Dweiri et al. 2024), and this scale consists of 15 statements, which are answered on a gradual Likert scale consisting of five points ranging from (1) completely disagree to (5) completely agree. It measures four dimensions of Operational Performance:

A. **Quality:** consists of (4) statements (statements Y1 to Y4).

B. **Research & Development:** consists of (4) statements (statements Y5 to Y8).

C. **Flexibility:** consists of (4) statements (statements Y9 to Y12).

D. **Cost:** consists of (3) statements (statements Y13 to Y15).

Since the four dimensions Operational Performance have been agreed upon, as the researcher pointed out in many previous studies, the researcher performed Confirmatory Factor Analysis for the Operational Performance scale in its four dimensions, including 15 phrases, in order to identify phrases with significant standard regression coefficients that should be retained, and those phrases with non-significant standard regression coefficients that should be excluded. As the researcher will explain later in the special part Confirmatory Factor Analysis in this chapter.

8-3 The research population and sample:

- **Study population:**

The study population consists of all employees of Ezz Steel Company at the three administrative levels (senior management, middle management, and executive management), and this is evident in the following table:

Table No. (2) Study population - employees of Ezz Steel Company

Administrative level	number
Higher Management	6
Middle management	2250
Executive management	7744
Total	10000

Source: Prepared by the researcher based on the General Administration of Administrative Affairs, Ezz Steel Company, 2024.

- **Study sample**

- The research sample refers to the item to which the survey list is directed; To answer them, and then the sampling unit in this research is the employees of the upper and middle management and the supervisors of the operational management in Ezz Steel Company.
- In order for the research sample to be well representative of the research community, the most appropriate choice for the type of sampling was Stratified Random Sampling, commensurate with the size of the research community layers (the number of employees in the administrative levels: middle management, Executive management), and the sample size that will be conducted has been determined. field study on it; Based on the following equation: (Thompson, 2010: 59-60):

$$n = \frac{N \times P\,[1-P]}{\{\,[N-1 \times (d^2 / z^2)] + P(1-P)\,\}}$$

- N: the size of the Research population.
- Z: is the standard score at the permissible error and equals to 1.96 at a confidence factor of 95%, which is the most common in social research.
- P: is the probability that to the item will appear and is equal to 0.5.
- D: error rate equal to 0.05

So, sample size (n) = 385 individuals.

8-4 The statistical methods:

In analyzing the data and testing the validity of the hypotheses, the researcher relied on the Statistical Package for the Social Sciences (SPSS 26) program, where the following statistical methods were used:

First: Descriptive Methods

- Frequencies and percentages.

- Arithmetic Mean.

-Standard Deviation.

Second: Inferential Methods:

- **Distribution of the study sample** items included in the statistical analysis according to demographic variables (gender, age, educational level, career level, experience level) in terms of number or frequency and percentage, using the SPSS program.26
  - **Alpha coefficient:** The Cronbach's Alpha reliability coefficient (Alpha) was used for the study tool (survey list), in order to calculate the reliability and validity coefficients for the survey questions, and to determine the extent to which it can be relied upon in this research.

- **Confirmatory factor analysis**: for measures of phrases of the five dimensions of Supply chain innovation: (Agility, Quality, Service to the customer, Supply Chain Integration, Supply chain efficiency), and measures of phrases of dimensions of the four dependent variable Operational Performance: (Quality, Research & Development, Flexibility, Cost), in order to identify statements with non-significant standardized regression coefficients that should be excluded. In addition to clarifying the indicators for judging the quality of fit of the confirmatory factor analysis model for measures of Supply chain innovation and Operational Performance and calculating both the reliability coefficient and the validity coefficient using the AMOS program and the SPSS program.
- **Calculating descriptive statistics**: (arithmetic mean, standard deviation, and standard coefficient of variation) for each dimension of Supply chain innovation and Operational Performance, in addition to using a one-sample t-test, using the SPSS program.
- **Pearson correlation coefficient and its significance test:** for the purpose of measuring the degree of correlation between the research variables, testing the significance of that correlation, and knowing whether or not there is a moral relationship between the research variables. Using the SPSS program
- **Multiple regression analysis method:** to determine the type of influence between the independent variables and the dependent variable and to determine the dimensions that most influence the dependent variable. It was used to test the second hypothesis.

- **Building a structural or structural model:** for the paths of the study variables, which include the overall measure of Supply chain innovation and its impact on the five dimensions of Supply chain innovation, and the overall measure of Operational Performance and its impact on the four dimensions of Operational Performance, in addition to the impact of the overall measure of Supply chain innovation on the overall measure of Operational Performance, Using the AMOS program.

8-5 Limitations

The following are the limits for this research :

1. **Objective limits:**

These limits refer to the variables that will be studied, the dimensions that will be used, and how these variables and dimensions will be measured.

A. The Role of Supply chain innovation in operational performance will be examined directly without using any modifying variables.

B. The Role of Supply chain innovation in operational performance will be examined directly without using any intermediate variables.

C. The Role of Supply chain innovation in operational performance will be considered only as a dependent variable.

D. The Role of Supply chain innovation only as an independent variable in operational performance will be considered.

2. **Spatial Limits:** the field of application in the current research will be limited to Ezz Steel Company.

3. **Time limits:** This means the time period during which the research data will be collected, and the researcher will collect the data for this study in the period from January to March 2024.
4. **Human Limits:** All employees at the three administrative levels (senior management, middle management, and executive management) in the Ezz Steel Company.

9. The Applied Study:

9-1 Confirmatory Factor Analysis

Golob (2001) explains that confirmatory factor analysis is a form of structural modeling, which represents an input to analyzing data guided by a specific theory. It includes a variety of mathematical models that are capable of dealing with large numbers of independent variables and dependent variables, as well as dealing with observed variables (Awad, 2019).

The researcher also calculated the reliability coefficient and the validity coefficient for the dimensions of the study variables. The stability of the scale indicates the extent to which the statements of the survey list are stable and do not contradict themselves, meaning that the survey list will give approximately the same results with a probability equal to the value of the reliability coefficient if it is re-applied to another sample from the same population and of the same size.

To conduct a reliability test for the statements included in the survey list, Cronbach's Alpha coefficient was used, which is a coefficient that takes Quality ranging from zero to the correct one. If there is no stability at all, the value of this coefficient will be equal

to zero, while if there is complete stability, the value of this coefficient will be equal to the correct one.

Any increase in the value of Cronbach's Alpha coefficient to approach the correct one means an increase in the level of reliability, which reflects the results of the sample on the population under study. Note that the lowest value that can be accepted for this factor is 0.7, and more than 0.7 gives a strong indicator for judging the stability of the survey list (Awad, 2019). The validity of the scale means that the answers obtained from the survey list provide information that the statements were designed to measure. That is, the survey actually measures what it sets out to measure. The validity coefficient is calculated by taking the square root of the reliability coefficient. Hence, the researcher explains below the results of the confirmatory factor analysis and the reliability and validity coefficients for both Supply chain innovation and Operational Performance, as follows:

9-1-1 Confirmatory Factor Analysis for Supply chain innovation:

Confirmatory Factor Analysis was made for all Supply chain innovation and 24 phrases. The results of the initial Confirmatory Factor Analysis showed that there was no decrease in the quality indicators of model matching, due to the absence of a phrase with a low degree of saturation on the respective dimension. So no phrase will be excluded.

The following table shows the results of Confirmatory Factor Analysis tracks for Supply chain innovation dimensional scales phrases by illustrating Unstandaradized Coefficients (U.C), Standaradized Coefficients (S.C) ,Standard Error (S.E), T test (C.R), and P value.

Table (3): The results of Confirmatory Factor Analysis tracks for Supply chain innovation dimensional scale phrases

Statement number	Statement	Dimensions	(S.C)	(U.C)	(S.E.)	(C.R.)	Sig.
X1	The organization tracks resource utilization and minimizes waste. (resources optimization)	Agility	.780	1.000	–	–	–
X2	The Organization is able to quickly and easily adjust resources (after disruption and discontinuity).		.814	1.014	.061	16.725	***
X3	The organization's business processes are well defined, managed and measured.		.778	1.337	.085	15.817	***
X4	The Organization's processes standardized to enable plug and play connectivity (within the organization and with outside partners).		.839	1.174	.068	17.372	***
X5	The organization updates its business processes in relation with the business environment changes.		.732	.926	.063	14.677	***

Cont-Table (2): The results of Confirmatory Factor Analysis tracks for Supply chain innovation dimensional scale phrases

Statement	Statement	Dimensions	(S.C)	(U.C)	(S.E.)	(C.R.)	Sig.
X6	The company develops strategic partnership programs with key suppliers for the benefit of the supply chain.	Quality	.801	1.000	–	–	–
X7	The company engages key suppliers in the strategic planning process.		.792	1.141	.066	17.392	***
X8	The company engages key suppliers in the process of developing its products and services.		.804	.990	.056	17.746	***
X9	The company develops long-term partnership programs with suppliers for the benefit of the supply chain.		.779	.782	.046	17.006	***
X10	The company is working to involve suppliers in the research and development process in order to develop its services		.546	.654	.060	10.956	***
X11	Customers are actively involved in the process of developing new company products.	Service to the customer	.775	1.000	–	–	–
X12	Customers frequently share order information with the company.		.880	1.223	.065	18.705	***
X13	Our production plans are shared with customers.		.882	1.148	.061	18.775	***
X14	The company's main customers place orders in a timely manner.		.691	.884	.064	13.851	***
X15	The company makes joint decisions with key customers.		.788	1.015	.062	16.237	***

Cont-Table (2): The results of Confirmatory Factor Analysis tracks for Supply chain innovation dimensional scale phrases

Statement number	Statement	Dimensions	(S.C)	(U.C)	(S.E.)	(C.R.)	Sig.
X16	Formal meetings are routinely scheduled between various departments.	Supply Chain Integration	.536	1.000	–	–	–
X17	There is an integration between the internal functions of the company and the information technology available in the company.		.866	1.932	.177	10.904	***
X18	There is integration in the data that departments in the company share.		.838	1.697	.158	10.736	***
X19	The company can easily find information about suppliers ' products and their prices.		.758	1.604	.157	10.204	***
X20	The company's strategy is mainly based on building good relationships between itself and the members of the supply chain.		.415	.669	.099	6.789	***
X21	The company uses a multifunctional team to solve the problems it faces in the supply chain .	Supply chain efficiency	.792	1.000	–	–	–
X22	Internal management communicates frequently about the goals and priorities of the supply chain .		.766	.723	.044	16.293	***

Cont-Table (2): The results of Confirmatory Factor Analysis tracks for Supply chain innovation dimensional scale phrases

Statement number	Statement	Dimensions	(S.C)	(U.C)	(S.E.)	(C.R.)	Sig.
X23	There is an integration between the internal functions of the company and the information technology available in the company.	Supply chain efficiency	.628	.602	.047	12.716	***
X24	There is integration in the data that departments in the company share.		.775	.788	.048	16.523	***

** Indicates that the calculated value is statistically significant at a significant level of 1%

Source: Results of the statistical analysis of the AMOS program.

Figure (2) also shows the confirmatory factor analysis model for the phrases of the dimensions of Supply chain innovation:

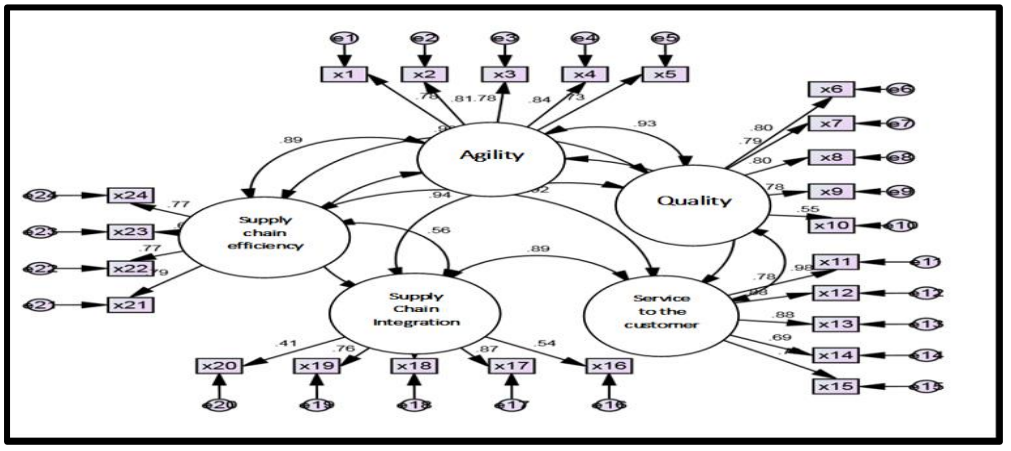


Figure No. (2) Confirmatory factor analysis model for phrases measuring the dimensions of Supply chain innovation

Source: Results of statistical analysis of the AMOOS program.

It is clear from the above that all the Quality of the standard regression coefficients were higher than 0.3 while keeping the rest of the significant expressions true. For further clarification, Table (4) Indicators for judging the quality of fit of the confirmatory factor analysis model for the Supply chain innovation scale:

Table no. (4) Indicators for judging the quality of fit of the confirmatory factor analysis model for the Supply chain innovation scale.

Index	Normative value	Indicator value
Normed Chi-square (CMIN/DF)	Less than or equal to 3	2.887
Root Mean Square Error of Approximation (RMSEA)	Less than 0.08	.023
Goodness of Fit Index (GFI)	The closer its value is to the correct one, the better the model matches the data of the research sample.	1.000
Comparative Fit Index (CFI)		1.000
Normed of Fit Index (NFI)		1.000
Tucker-Lewis Index (TLI)		1.000

Source: Results of statistical analysis of the AMOOS program.

It is clear from the previous table that all indicators of judging the quality of Tawfiq Confirmatory Factor Analysis model for the Supply chain innovation scale are statistically acceptable.

As shown in Table (5) Reliability and Validity for Supply chain innovation dimensional scales:

Table no. (5) Reliability and validity coefficients for measures of Supply chain innovation dimensions

Dimensions of Supply chain innovation	Number of statements	Transactions	
		Cronbach`s alpha coefficient	Self-honesty coefficient
Agility	5	0.912	0.955
Quality	5	0.871	0.933
Service to the customer	5	0.832	0.912
Supply Chain Integration	5	0.856	0.925
Supply chain efficiency	4	0.884	0.940
Total The Supply chain innovation	24	0.783	0.885

Source: The results of the statistical analysis of the SPSS program.

It is clear from the previous table that the Quality of the Cronbach`s alpha reliability coefficient range between 0.856 and 0.912 (that is, each of them is more than 0.7), which confirms the internal consistency of the statements of the Supply chain innovation dimensions scale. The validity coefficient Quality range between 0.925 and 0.955, which confirms that the statements measuring the dimensions of Supply chain innovation actually measure the dimension they were designed to measure.

9-1-2 Results of confirmatory factor analysis of Operational Performance:

Confirmatory factor analysis was conducted for all 15 statements or items of the Operational Performance scale. The results of the initial Confirmatory Factor Analysis showed that there was no decrease in the quality indicators of model matching, due to the absence of a phrase with a low degree of saturation on the respective dimension. So no phrase will be excluded.

The following table shows the results of Confirmatory Factor Analysis tracks for Operational Performance scales phrases by illustrating Unstandaradized Coefficients (U.C), Standaradized Coefficients (S.C) ,Standard Error (S.E), T test (C.R), and P value.

Table No. (6) Results of confirmatory factor analysis paths for phrases measuring dimensions of Operational Performance.

Statement number	Statement	Dimensions	(S.C)	(U.C)	(S.E.)	(C.R.)	Sig.
Y1	The quality of the product design corresponds to the standard specifications.	Quality	.467	1.000	-	-	-
Y2	The company relies on a strict quality control system.		.788	1.173	.138	8.493	***
Y3	The changes that occur are measured at the quality level.		.807	1.244	.145	8.558	***
Y4	The company implements a clear and targeted plan that adheres to quality.		.798	1.195	.140	8.528	***

Cont-Table No. (6) Results of confirmatory factor analysis paths for phrases measuring dimensions of Operational Performance.

Statement number	Statement	Dimensions	(S.C)	(U.C)	(S.E.)	(C.R.)	Sig.
Y5	The company was able to raise the level of technology used in operational processes.	Research & Development	.653	1.000	-	-	-
Y6	The efficiency of the company's operational processes is high compared to competitors.		.696	1.101	.136	8.105	***
Y7	Products are updated and developed depending on customer proposals.		.224	.418	.120	3.481	***
Y8	The company provides a high level of customer service.		.428	.913	.147	6.207	***
Y9	The company has a high flexibility in responding to changes in the needs and desires of customers.	Flexibility	.672	1.000	-	-	-
Y10	There is flexibility in changing the mix of products or services in the company.		.859	1.466	.105	14.009	***
Y11	There is flexibility in changing the production volume according to customer demand.		.728	1.269	.104	12.236	***
Y12	The current production capacity can be increased without any obstacles.		.737	1.040	.084	12.376	***

Cont-Table No. (6) Results of confirmatory factor analysis paths for phrases measuring dimensions of Operational Performance.

Statement number	Statement	Dimensions	(S.C)	(U.C)	(S.E.)	(C.R.)	Sig.
Y13	The company seeks to produce its services at the lowest cost to control its market share .	Cost	.472	1.000	-	-	-
Y14	The company uses control methods that optimize the use of resources .		.887	2.180	.238	9.163	***
Y15	The company is keen to offer its products at lower prices than the prices of competing products.		.840	2.131	.236	9.026	***

** Indicates that the calculated value is statistically significant at a significant level of 1%

Source: Results of the statistical analysis of the AMOS program.

Figure (3) also shows the confirmatory factor analysis model for the phrases of the dimensions of Operational Performance:

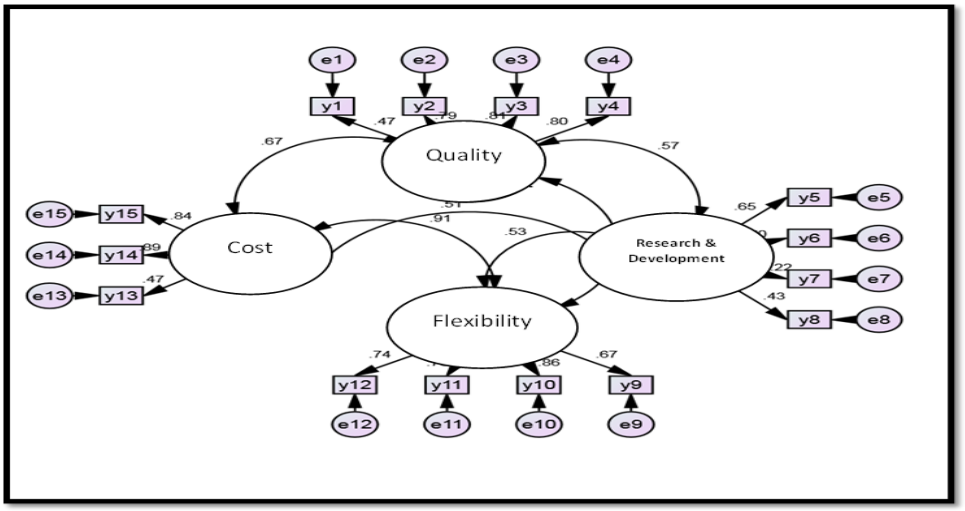


Figure No. (3) Confirmatory factor analysis model for phrases measuring the dimensions of operational performance

Source: Results of statistical analysis of the AMOOS program.

It is clear from the above that all the Quality of the standard regression coefficients were higher than 0.3 while keeping the rest of the significant expressions true. For further clarification, Table (7) Indicators for judging the quality of fit of the confirmatory factor analysis model for the Operational Performance scale:

Table no. (7) Indicators for judging the quality of fit of the confirmatory factor analysis model for the Operational Performance scale.

Index	Normative value	Indicator value
Normed Chi-square (CMIN/DF)	Less than or equal to 3	2.094
Root Mean Square Error of Approximation (RMSEA)	Less than 0.08	0.029
Goodness of Fit Index (GFI)	The closer its value is to the correct one, the better the model matches the data of the research sample	0.831
Comparative Fit Index (CFI)		0.854
Normed of Fit Index (NFI)		0.835
Tucker-Lewis Index (TLI)		0.813

Source: Results of statistical analysis of the AMOOS program.

It is clear from the previous table that all indicators of judging the quality of Tawfiq Confirmatory Factor Analysis model for the Operational Performance scale are statistically acceptable.

As shown in Table (8) Reliability and Validity for Operational Performance dimensional scales:

Table no. (8) Reliability and validity coefficients for measures of Operational Performance dimensions

Dimensions of Operational Performance	Number of statements	Transactions	
		Cronbach`s alpha coefficient	Self-honesty coefficient
Quality	4	0.806	0.898
Research & Development	4	0.784	0.885
Flexibility	4	0.860	0.927
Cost	3	0.814	0.902
Total The Operational Performance	15	0.851	0.922

Source: The results of the statistical analysis of the SPSS program.

It is clear from the previous table that the Quality of the Cronbach`s alpha reliability coefficient range between 0.784 and 0.860 (that is, each of them is more than 0.7), which confirms the internal consistency of the statements of the Operational Performance dimensions scale. The validity coefficient Quality range between 0.885 and 0.927, which confirms that the phrases measuring the dimensions of Operational Performance measure that dimension that they were designed to measure.

9-2 Measuring the attitudes of the respondents towards the extent to which the dimensions of the study's variables are available in the Ezz Steel Company subject of the study:

The researcher calculated the arithmetic means, standard deviations, and coefficients of variation for the statements that make up each variable in the study, and the results were as follows:

Table No. (9): Summary of descriptive statistics for the study variables

Dimensions	Arithmetic mean	Standard deviation	Coefficient of variation	Ranking
Supply chain innovation	3.7442	.75309	20.11	
Agility	3.8426	.93799	24.41	5
Quality	3.7990	.85249	22.44	2
Service to the customer	3.8999	.79590	20.41	1
Supply Chain Integration	3.7477	.87088	23.24	4
Supply chain efficiency	3.4319	.79143	23.06	3
The dependent variable (operational performance)	3.6685	.64169	17.49	
Quality	3.6742	.66182	18.01	3
Research & Development	3.6419	.65024	17.85	2
Flexibility	3.7481	.66563	17.76	1
Cost	3.6126	.87665	24.27	4

Source: Results of statistical analysis of SPSS.

It is clear from the previous table that:

- **Regarding the independent variable, Supply chain innovation:**

The overall level of the independent variable, the Supply chain innovation of Ezz Steel Company, under study, was characterized by a positive tendency, with a moderate degree of agreement, as the arithmetic mean value reached (3.7442), a standard deviation of (0.75309), and a coefficient of variation of (20.11). Which indicates that most of the respondents agreed on that.

- **Regarding the dimensions of the independent variable, Supply chain innovation:**

- It is noted from the previous table (9) that the **Agility** dimension is characterized by a degree that tends to agree, with an arithmetic mean of (3.8426), a standard deviation of (0.93799) and a coefficient of variation of (24.41). The **Agility** dimension is ranked fifth in terms of relative importance. Applying to Ezz Steel Company.
- It is noted also from the previous table that the **Quality** dimension is characterized by a degree that tends to agree, with an arithmetic mean of (3.7990), a standard deviation of (0.85249) and a coefficient of variation of (22.44). The **Quality** dimension is ranked second in terms of relative importance. Applying to Ezz Steel Company.
- It is noted also from the previous table that the **Service to the customer** dimension is characterized by a degree that tends to agree, with an arithmetic mean of (3.8999), a standard deviation of (0.79590) and a coefficient of variation of (20.41). The **Service to the customer** dimension is ranked first in terms of relative importance. Applying to Ezz Steel Company.
- It is noted also from the previous table that the **Supply Chain Integration** dimension is characterized by a degree that tends to agree, with an arithmetic mean of (3.7477), a standard deviation of (0.87088) and a coefficient of variation of (23.24). The **Supply Chain Integration** dimension is ranked fourth in terms of relative importance. Applying to Ezz Steel Company.

- It is noted also from the previous table that the **Supply chain efficiency** dimension is characterized by a degree that tends to agree, with an arithmetic mean of (3.4319), a standard deviation of (0.79143) and a coefficient of variation of (23.06). The **Supply chain efficiency** dimension is ranked third in terms of relative importance. Applying to Ezz Steel Company.

- **Regarding the dependent variable Operational performance:**

The overall level of the dependent variable, the Operational performance of Ezz Steel Company, under study, was characterized by a positive tendency, with a moderate degree of agreement, as the arithmetic mean value reached (3.6685), a standard deviation of (0.64169), and a coefficient of variation of (17.49). Which indicates that most of the respondents agreed on that.

- **Regarding the dimensions of the dependent variable, Operational performance:**

- It is noted from the previous table (9) that the **Quality** dimension is characterized by a degree that tends to agree, with an arithmetic mean of (3.6742), a standard deviation of (0.66182) and a coefficient of variation of (18.01). The **Quality** dimension is ranked third in terms of relative importance. Applying to Ezz Steel Company.
- It is noted also from the previous table that the **Research & Development** dimension is characterized by a degree that tends to agree, with an arithmetic mean of (3.6419), a standard deviation of (0.65024) and a coefficient of variation of (17.85). The **Research & Development** dimension is ranked second in terms of relative importance. Applying to Ezz Steel Company.

- It is noted from also the previous table that the **Flexibility** dimension is characterized by a degree that tends to agree, with an arithmetic mean of (3.7481), a standard deviation of (0.66563) and a coefficient of variation of (17.76). The **Flexibility** dimension is ranked first in terms of relative importance. Applying to Ezz Steel Company.
- It is noted from also the previous table that the **Cost** dimension is characterized by a degree that tends to agree, with an arithmetic mean of (3.6126), a standard deviation of (0.87665) and a coefficient of variation of (24.27). The **Cost** dimension is ranked fourth in terms of relative importance. Applying to Ezz Steel Company.

9-3 Testing Hypotheses

9-3-1 The Main Hypothesis

There is statistically significant effect of Supply chain innovation with its dimension (Agility, Quality, Service to the customer, Supply Chain Integration, Supply chain efficiency) to achieve the operational performance with its dimension (Quality, Research & Development, Flexibility, Cost) in Ezz Steel Company." From this hypothesis the following sub-hypotheses:

- There is statistically significant effect of Supply chain innovation with its dimension on the **Quality** which is one of the operational performance dimensions in Ezz Steel Company.

- There is statistically significant effect of Supply chain innovation with its dimension on the **Research & Development** which is one of the operational performance dimensions in Ezz Steel Company.
- There is statistically significant effect of Supply chain innovation with its dimension on the **Flexibility** which is one of the operational performance dimensions in Ezz Steel Company.
- There is statistically significant effect of Supply chain innovation with its dimension on the **Cost** which is one of the operational performance dimensions in Ezz Steel Company.

9-3-1 the main hypothesis test:

In light of the relationship of the correlation between Supply chain innovation in total on Operational performance, the impact of Supply chain innovation on Operational performance was measured using (Simple Regression Analysis) and the results came as shown in the following table (10):

Table (10) Simple linear regression model between Supply chain innovation on Operational Performance

Independent Variable	R	R Square	B	T-Test		F-Test	
				T	Sig.	F	Sig.
constant	.841[a]	.707	.987	10.592	.000***	862.576	.000***
Supply chain innovation			.716	29.370	.000***		

Source: The results of the statistical analysis of the SPSS program.

***** Statistically significant at the significance level (0.001) **Statistically significant at the significance level (0.01)**

Through Table (10), the following indicators are identified:

1. **Coefficient of determination (R2):**

According to the coefficient of determination R2, the independent variable explains (70.7%) of the total dependent variable (operational performance), and the rest of the percentage (29.3%) may be due to random error in the equation, or perhaps not including other independent variables that should have been included in the model. Or because the regression model differs from the linear model. Which means (as the researcher believes) that approximately 71% of Operational performance in Ezz Steel Company the result of Supply chain innovation.

2. **Testing the significance of the independent variable:**

The T-test indicates that the independent variable (Supply chain innovation) is significant in the Simple linear regression model at a significance level less than (0.05).

3. **Testing the significance of the goodness of fit of the regression model:**

To test the significance of the model variables as a whole, the F-tset test was conducted, and the "F" value was (862.576), which is statistically significant at a significance level less than (0.05), which indicates that the Supply chain innovation variable as an independent variable has a

statistically significant positive effect on increasing Operational Performance as a dependent variable.

Based on the above, the regression equation can be formulated as follows:

Operational Performance= 0.987+ 0.716 Supply chain innovation

From the previous regression relationship model, it is possible to predict the degrees of total Operational performance by measuring Supply chain innovation by applying the previous regression equation, which means that every increase in the degree of Supply chain innovation by one correct lead to an increase in the Operational performance of "Ezz Steel Company (0.716).

This result indicates the great importance of Supply chain innovation in increasing the Operational performance of Ezz Steel Company, which gives an indication of the importance of Supply chain innovation in increasing Operational performance.

From the above, the main hypothesis of the study is correct, that is, "There is a significant effect of Supply chain innovation on Operational performance."

The researcher also tested the effect of Supply chain innovation separate dimensions on Operational performance dimensions in total. The researcher used Multiple Regression Analysis, which shows the relationship of the dimensions of the independent variable and the degree of their influence on of the dependent variable, and the results are shown in the following table:

Table (11) Multiple linear regression model to determine the dimensions of Supply chain innovation that most influence the dependent variable (operational performance) as a whole.

Dependent Variable	Independent Variables	R	R Square	B	T-Test		F-Test	
					t	Sig.	F	Sig.
Operational Performance	Constant	.874[a]	.764	.896	10.071	.000	228.686	.000b
	Agility			.010	.273	.785		
	Quality			.053	1.381	.168		
	Service to the customer			.145	2.771	.006***		
	Supply Chain Integration			.238	5.423	.000***		
	Supply chain efficiency			.314	10.005	.000***		

***** Statistically significant at the significance level (0.001) ** Statistically significant at the significance level (0.01) * Statistically significant at the significance level (0.05)**

Source: The results of the statistical analysis of the SPSS program.

Through Table (11), the following indicators are identified:

1. **Coefficient of determination (R2):**

According to the coefficient of determination R2, the independent variables explain (76.4%) of the total dependent variable (the dependent variable Operational performance as a whole), and the rest of the percentage (23.6%) may be due to random error in the equation or perhaps not including other

independent variables that should have been included. Within the model or because the regression model differs from the linear model.

2. **Testing the significance of each independent variable separately:**

The T-test indicates that the significant independent variables in the multiple linear models are three dimensions of Supply chain innovation (Service to the customer, Supply Chain Integration, Supply chain efficiency) at a significance level of less than (0.001), and they emerged from the dimensional model (Agility, Quality) because they are not significant.

3. **Testing the significance of the goodness of fit of the regression model:**

To test the significance of the variables of the model as a whole, the F-test was conducted, where the "F" value was (228.686), which is statistically significant at a significance level less than (0.001), which indicates that the variables related to the dimensions of Supply chain innovation have an impact on the dependent variable (operational performance) as a whole.

Based on the above, the regression equation can be formulated as follows:

Dependent variable (operational performance) as a whole = 0.896 + 0.145 Service to the customer + 0.238 Supply Chain Integration + 0.314 Supply chain efficiency

From the previous regression relationship model, it is possible to predict the scores of the dependent variable (operational performance) as a whole, by measuring the dimensions of Supply chain innovation, and by applying the previous regression equation, which means that:

- Every increase in the Service to the customer score of one correct lead to an increase in **the dependent variable (operational performance) as a whole** (0.145).
- Every increase in the Supply Chain Integration scores of one correct leads to an increase in **the dependent variable (operational performance) as a whole** (0.238).
- Every increase in the Supply chain efficiency scores of one correct leads to an increase in **the dependent variable (operational performance) as a whole** (0.314).

It also became clear from the estimated parameter values that the strongest dimensions of Supply chain innovation influencing the dependent variable (operational performance) as a whole were according to the following order: **(Supply chain efficiency - Supply Chain Integration - Service to the customer)**, and the previous result indicates the great importance of the dimensions of Supply chain innovation in increasing. The dependent variable (operational performance) as a whole.

9-3-1-1 The first sub-hypothesis of the main hypothesis: The impact of the dimensions of Supply chain innovation in Quality::

The researcher used Multiple Regression Analysis, which shows the relationship of the dimensions of the independent variable and the degree of their influence on of the dependent variable, and the results are shown in the following table:

Table (12) results of multiple regression analysis models for the effects of Supply chain innovation in Quality

Dependent Variable	Independent Variables	R	R Square	B	T-Test		F-Test	
					t	Sig.	F	Sig.
Quality	Constant	.834[a]	.695	.967	9.282	.000	161.617	.000[b]
	Agility			.003	.064	.949		
	Quality			.026	.569	.570		
	Service to the customer			.137	2.250	.025**		
	Supply Chain Integration			.197	3.837	.000***		
	Supply chain efficiency			.386	10.506	.000***		

***** Statistically significant at the significance level (0.001) ** Statistically significant at the significance level (0.01) * Statistically significant at the significance level (0.05)**

Source: The results of the statistical analysis of the SPSS program.

Through Table (12), the following indicators are identified:

1. **Coefficient of determination (R2):**

According to the coefficient of determination R2, the independent variables explain (69.5%) of the total dependent variable (Quality), and the rest of the percentage (30.5%) may be due to random error in the equation or perhaps not including other independent variables that should have been included in the model or because of a different model. Regression from the linear model.

2. Testing the significance of each independent variable separately:

The T-test indicates that the significant independent variables in the multiple linear models are three dimensions of Supply chain innovation (Service to the customer, Supply Chain Integration, Supply chain efficiency) at a significance level of less than (0.001), and they emerged from the dimensional model (Agility, Quality) because they are not significant.

3. Testing the significance of the goodness of fit of the regression model:

To test the significance of the variables of the model as a whole, the F-test was conducted, where the "F" value was (161.617), which is statistically significant at a significance level less than (0.001), which indicates that the variables related to the dimensions of Supply chain innovation have an impact on Quality.

Based on the above, the regression equation can be formulated as follows:

Quality = 0.967 + 0.137 Service to the customer + 0.197 Supply Chain Integration + 0.386 Supply chain efficiency

From the previous regression relationship model, it is possible to predict the degrees of Quality, by measuring the dimensions of Supply chain innovation, and by applying the previous regression equation, which means that:

- Every increase in the degree of Service to the customer by one correct leads to an increase in **Quality** (0.137).

- Every increase in the Supply Chain Integration score of one correct leads to an increase in **Quality** (0.197).
- Every increase in Supply chain efficiency score of one correct leads to an increase in **Quality** (0.386).

It was also clear from the values of the estimated parameters that the strongest dimensions of Supply chain innovation influencing Quality were in the following order: (Supply chain efficiency - Supply Chain Integration - Service to the customer), and the previous result indicates the great importance of the dimensions of Supply chain innovation in increasing Quality.

From the above, it is clear that the first sub-hypothesis has been partially proven, meaning that there is a significant effect of the dimensions of Supply chain innovation on Quality as one of the dimensions of Operational performance.

9-3-1-2 The second sub-hypothesis of the main hypothesis: The impact of the dimensions of Supply chain innovation in Research & Development:

The researcher used Multiple Regression Analysis, which shows the relationship of the dimensions of the independent variable and the degree of their influence on of the dependent variable, and the results are shown in the following table:

Table (13) results of multiple regression analysis models for the effects of Supply chain innovation in Research & Development

Dependent Variable	Independent Variables	R	R Square	B	T-Test		F-Test	
					t	Sig.	F	Sig.
Research & Development	Constant	.722[a]	.521	1.366	10.641	.000	76.968	.000[b]
	Agility			-.060-	-1.171-	.243		
	Quality			.012	.211	.833		
	Service to the customer			.155	2.058	.040**		
	Supply Chain Integration			.141	2.225	.027**		
	Supply chain efficiency			.388	8.570	.000***		

***** Statistically significant at the significance level (0.001) ** Statistically significant at the significance level (0.01) * Statistically significant at the significance level (0.05)**

Source: The results of the statistical analysis of the SPSS program.

Through Table (13), the following indicators are identified:

1. Coefficient of determination (R2):

According to the coefficient of determination R2, the independent variables explain (52.1%) of the total dependent variable (Research & Development), and the rest of the percentage (47.9%) may be due to random error in the equation or perhaps not including other independent variables that should have been included in the model or because of a different model. Regression from the linear model.

2. Testing the significance of each independent variable separately:

The T-test indicates that the significant independent variables in the multiple linear models are three dimensions of Supply chain innovation (Service to the customer, Supply Chain Integration, Supply chain efficiency) at a significance level of less than (0.001), and they emerged from the dimensional model (Agility, Quality) because they are not significant.

3. Testing the significance of the goodness of fit of the regression model:

To test the significance of the variables of the model as a whole, the F-test was conducted, where the "F" value was (76.968), which is statistically significant at a significance level less than (0.001), which indicates that the variables related to the dimensions of Supply chain innovation have an impact on Research & Development.

Based on the above, the regression equation can be formulated as follows:

Research & Development = 1.366 + 0.155 Service to the customer + 0.141 Supply Chain Integration + 0.388 Supply chain efficiency

From the previous regression relationship model, it is possible to predict the degrees of Research & Development, by measuring the dimensions of Supply chain innovation, and by applying the previous regression equation, which means that:

- Every increase in the degree of Service to the customer by one correct leads to an increase in **Research & Development** (0.155).
- Every increase in the degree of Supply Chain Integration by one correct leads to an increase in **Research & Development** (0.141).
- Every increase in Supply chain efficiency score of one correct leads to an increase in **Research & Development** (0.388).

It was also clear from the values of the estimated parameters that the strongest dimensions of Supply chain innovation influencing Research & Development were in the following order: (Supply chain efficiency - Service to the customer - Supply Chain Integration), and the previous result indicates the great importance of the dimensions of Supply chain innovation in increasing Research & Development.

From the above, it is clear that the second sub-hypothesis has been partially proven, meaning that there is a significant effect of the dimensions of Supply chain innovation on Research & Development as one of the dimensions of Operational performance.

9-3-1-3 The second sub-hypothesis of the main hypothesis: The impact of the dimensions of Supply chain innovation in Flexibility:

The researcher used Multiple Regression Analysis, which shows the relationship of the dimensions of the independent variable and the degree of their influence on of the dependent variable, and the results are shown in the following table:

Table (14) results of multiple regression analysis models for the effects of Supply chain innovation in Flexibility

Dependent Variable	Independent Variables	R	R Square	B	T-Test		F-Test	
					t	Sig.	F	Sig.
Flexibility	Constant	.745[a]	.555	1.327	10.482	.000	88.419	.000[b]
	Agility			-.057-	-1.123-	.262		
	Quality			.130	2.373	.018***		
	Service to the customer			.066	.895	.371		
	Supply Chain Integration			.290	4.644	.000***		
	Supply chain efficiency			.234	5.232	.000***		

*** Statistically significant at the significance level (0.001) ** Statistically significant at the significance level (0.01) * Statistically significant at the significance level (0.05)

Source: The results of the statistical analysis of the SPSS program.

Through Table (14), the following indicators are identified:

1. **Coefficient of determination (R2):**

According to the coefficient of determination R2, the independent variables explain (55.5%) of the total dependent variable (Flexibility), and the rest of the percentage (44.5%) may be due to random error in the equation or perhaps not including other independent variables that should have been included in the model or because of a different model. Regression from the linear model.

2. **Testing the significance of each independent variable separately:**

The T-test indicates that the significant independent variables in the multiple linear models are three dimensions of Supply chain innovation (Quality , Supply Chain Integration, Supply chain efficiency) at a significance level of less than (0.001), and they emerged from the dimensional model (Agility, Service to the customer) because they are not significant.

3. **Testing the significance of the goodness of fit of the regression model:**

To test the significance of the variables of the model as a whole, the F-test was conducted, where the "F" value was (88.419), which is statistically significant at a significance level less than (0.001), which indicates that the variables related to the dimensions of Supply chain innovation have an impact on Flexibility.

Based on the above, the regression equation can be formulated as follows:

Flexibility = 1.327 + 0.130 Quality + 0.290 Supply Chain Integration + 0.234 Supply chain efficiency

From the previous regression relationship model, it is possible to predict the degrees of Flexibility, by measuring the dimensions of Supply chain innovation, and by applying the previous regression equation, which means that:

- Every increase in the degree of Quality by one correct leads to an increase in **Flexibility** (0.130).
- Every increase in the degree of Supply Chain Integration by one correct leads to an increase in **Flexibility** (0.290).
- Every increase in the degree of Supply chain efficiency by one correct leads to an increase in **Flexibility** (0.234).

It was also clear from the values of the estimated parameters that the strongest dimensions of Supply chain innovation influencing Flexibility were in the following order: (Supply Chain Integration – Supply chain efficiency - Quality), and the previous result indicates the great importance of the dimensions of Supply chain innovation in increasing Flexibility.

From the above, it is clear that the third sub-hypothesis has been partially proven, meaning that there is a significant effect of the dimensions of Supply chain innovation on Flexibility as one of the dimensions of Operational performance.

9-3-1-4 The second sub-hypothesis of the main hypothesis: The impact of the dimensions of Supply chain innovation in Cost:

The researcher used Multiple Regression Analysis, which shows the relationship of the dimensions of the independent variable and the degree of their influence on of the dependent variable, and the results are shown in the following table:

Table (15) results of multiple regression analysis models for the effects of Supply chain innovation in Cost

Dependent Variable	Independent Variables	R	R Square	B	T-Test		F-Test	
					t	Sig.	F	Sig.
Cost	Constant	.862[a]	.743	-.110-	-.866-	.387	204.259	.000[b]
	Agility			.143	2.799	.005***		
	Quality			.047	.853	.394		
	Service to the customer			.212	2.856	.005***		
	Supply Chain Integration			.332	5.313	.000***		
	Supply chain efficiency			.269	6.011	.000***		

*** Statistically significant at the significance level (0.001) ** Statistically significant at the significance level (0.01) * Statistically significant at the significance level (0.05)

Source: The results of the statistical analysis of the SPSS program.

Through Table (15), the following indicators are identified:

4. **Coefficient of determination (R2):**

According to the coefficient of determination R2, the independent variables explain (74.3%) of the total dependent variable (Cost), and the rest of the percentage (25.7%) may be due to random error in the equation or perhaps not including other independent variables that should have been included in the model or because of a different model. Regression from the linear model.

5. **Testing the significance of each independent variable separately:**

The T-test indicates that the significant independent variables in the multiple linear models are four dimensions of Supply chain innovation (Agility, Service to the customer, Supply Chain Integration, Supply chain efficiency) at a significance level of less than (0.001), and it emerged from the dimensional model (Quality) because it is not significant.

6. **Testing the significance of the goodness of fit of the regression model:**

To test the significance of the variables of the model as a whole, the F-test was conducted, where the "F" value was (204.259), which is statistically significant at a significance level less than (0.001), which indicates that the variables related to the dimensions of Supply chain innovation have an impact on Cost.

Based on the above, the regression equation can be formulated as follows:

Cost = (-0.110) + 0.143 Agility + 0.212 Service to the customer + 0.332 Supply Chain Integration + 0.269 Supply chain efficiency

From the previous regression relationship model, it is possible to predict the degrees of Cost, by measuring the dimensions of Supply chain innovation, and by applying the previous regression equation, which means that:

- Every increase in the degree of Agility by one correct leads to an increase in **Cost** (0.143).
- Every increase in the degree of Service to the customer by one correct leads to an increase in **Cost** (0.212).
- Every increase in the degree of Supply Chain Integration by one correct leads to an increase in **Cost** (0.332).

- Every increase in the degree of Supply chain efficiency by one correct leads to an increase in **Cost** (0.269).

It was also clear from the values of the estimated parameters that the strongest dimensions of Supply chain innovation influencing Cost were in the following order: (Supply Chain Integration – Supply chain efficiency - Service to the customer - Agility), and the previous result indicates the great importance of the dimensions of Supply chain innovation in increasing Cost.

From the above, it is clear that the fourth sub-hypothesis has been partially proven, meaning that there is a significant effect of the dimensions of Supply chain innovation on Cost as one of the dimensions of Operational performance.

5-3-2 Developing the structural model of research variables:

The path analysis is one of the basic forms of structural modeling next to the confirmatory analysis, although the difference between them is that in the path analysis the overall-dimensional variables that were previously treated in the confirmatory factor analysis are treated as latent variables as observational variables (Birick & Kelloway, 2019). Path analysis is flexible, as it can include multiple independent variables and multiple dependent variables, and this is not available in the regression analysis model, which allows only one dependent variable (Awad, 2019: 172). The following figure shows the structural or structural model of the paths of the research variables:

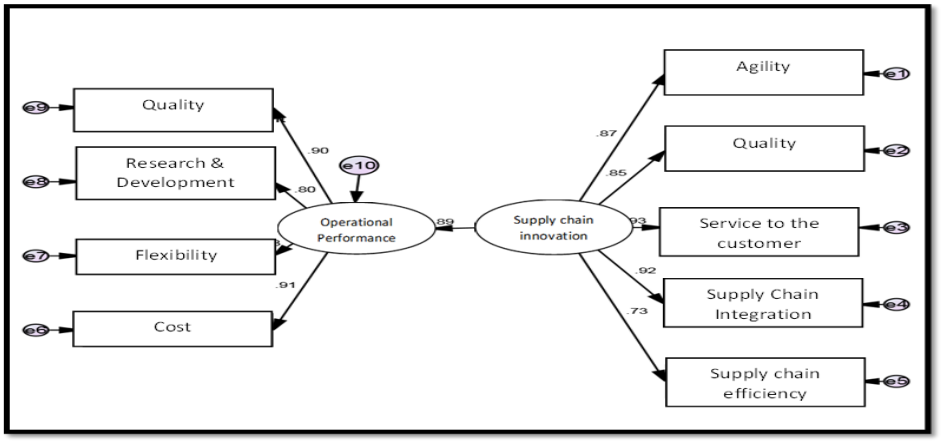


Figure (4) The structural model of the paths of the research variables

Source: Results of statistical analysis of the AMOOS program.

The following table shows the results of the Path analysis test for variables:

Table (16) The Path Analysis

The Path		(S.C)	(U.C)	(S.E.)	(C.R.)	Sig.
Independent Variables	**Dependent Variable**					
The overall measure of Supply chain innovation	Agility	.868	1.000	___	___	___
	Quality	.849	.889	.041	21.741	***
	Service to the customer	.932	.911	.035	26.365	***
	Supply Chain Integration	.916	.980	.039	25.374	***
	Supply chain efficiency	.729	.709	.042	16.777	***
	The overall measure of	.894	.818	.052	15.791	***

The Path		(S.C)	(U.C)	(S.E.)	(C.R.)	Sig.
Independent Variables	Dependent Variable					
	Operational Performance					
The overall measure of Operational Performance	Quality	.898	1.000	____	____	____
	Research & Development	.801	.749	.029	26.215	***
	Flexibility	.834	.656	.032	20.510	***
	Cost	.906	.699	.031	22.223	***

***** Indicates that the calculated value is significant at the 1% level of significance.**

Source: Results of AMOS statistical analysis.

It is clear from the previous table that all standard regression coefficients are significant at the 1% level of significance.

There is a significant, positive direct effect of the independent variable (Supply chain innovation) on the dependent variable, Operational performance, as the value of the path coefficient reached (0.89).

The following table shows the indicators for judging the goodness of fit of the structural model for the paths of the research variables:

Table No. (17) Indicators for judging the quality of fit of the structural model to the paths of the research variables.

Index	Normative value	Indicator value
Normed Chi-square (CMIN/DF)	Less than or equal to 3	2.646
Root Mean Square Error of Approximation (RMSEA)	Less than 0.08	.018
Goodness of Fit Index (GFI)	The closer its value is to the correct one, this indicates a better match of the model with the data of the research sample	0.922
Comparative Fit Index (CFI)		0.960
Normed of Fit Index (NFI)		0.954
Tucker-Lewis Index (TLI)		0.942

source: Results of AMOS statistical analysis.

It is clear from the previous table that all indicators for judging the goodness of fit of the structural model for the paths of the research variables are statistically acceptable.

10- Results and Recommendations

10/1 Results

10/1/1 General Results

1. Acceptance of the proposed study model for The Role of Supply Chain Innovation in the Improving the Operational Performance in the Ezz Steel Company under study, the model includes several basic concepts that include the dimensions of Supply Chain Innovation, which include: (Agility, Quality, Service to the customer, Supply Chain Integration, Supply chain efficiency), and the dimensions of Operational Performance which include: (Quality, Research & Development, Flexibility, Cost), applied to the Ezz Steel Company under study.

2. This study provided a real addition to all the research currently available in libraries, by highlighting both Supply Chain Innovation and Operational Performance as a modern entry point in management science that organizations and companies can rely on in the face of updates and keep abreast of environmental developments and changes, which supports strategic performance, thereby improving the level of acceptance among customers.
3. Understanding and applying supply chain innovation by organizations in the right way makes them able to improve the efficiency of their operational performance, whether by quickly delivering the product to customers on time, or by their ability to keep pace with changes occurring in the environment through their ability to continuously develop their products through customer feedback, and the ability of the organization to provide these products with high quality and at a lower cost leads it to be the leading organization in its industry, and pushes it to compete in the global market.
4. The benefits of the supply chain management are mostly involving the flow of information and materials that facilitate the supply chain process, and at the strategic level, the supply chain management is defined as a degree of flow management whether it is information flows, financial flows or material flow.
5. Factors at the organizational level lead to the implementation of supply chain innovation, namely the sharing of information, coordination of operations and strategic alliance with supply chain partners to achieve their planned results.

6. Common factors between supply chain members lead to the implementation of supply chain innovation practices, to achieve the desired supply chain management results.
7. Environmental factors force organizations to implement supply chain innovation, to overcome mistrust or find a way to deal with it.
8. Integration can be interpreted as coordination within and outside the organization's borders with suppliers and customers; however, in practice, the scope of integration may be limited to a nearby distributor, important suppliers, or at different levels or degree of the supply chain.
9. Supply chain innovation is considered a gateway to improve competitive performance through integrating the internal functions of the organization and linking them with the external operations of suppliers, customers and other members of the supply chain from modern trends in the field of management.competition pressures have contributed to the orientation of businesses towards establishing long-term closed relationships under the concept of supply chain as a system that includes the external environment including all members of the supply chain who work through the concepts of partnership and strategic alliance to achieve greater benefits for each member.
10. If a company does not have an appropriate level of internal integration capabilities, it is difficult for it to achieve any kind of integration with external parties to the supply chain.

11. Building Supply Chain Innovation requires clear strategies and effective control mechanisms that help chain parties evaluate integration processes in a specific, measurable way.
12. The desire to improve operational performance has made leading organizations more eager to follow supply chain instructions; the more transparent organizations are with their supply chain partners, the more positive results they can get; and the existence of a positive relationship between the dimensions of supply chain innovation and performance in general has become accepted theoretically as well as based on empirical evidence. Another opinion appeared opposite to this, where researchers questioned the practical application of the concept of supply chain innovation, which indicates that its aspects are much different from the theory.

10/1/2 Hypothesis Testing Results

The following table shows a summary of the results of hypothesis testing:

Table no. (18) summary of the hypotheses test

Hypotheses	Testing the validity of hypotheses	The result
The main Hypothesis	There is statistically significant effect of Supply chain innovation with its dimension (Agility, Quality, Service to the customer, Supply Chain Integration, Supply chain efficiency) to achieve the operational performance with its dimension (Quality, Research & Development, Flexibility, Cost) in Ezz Steel Company.	Acceptance
The first sub-hypothese	There is statistically significant effect of Supply chain innovation with its dimension on the Quality which is one of the operational performance dimensions in Ezz Steel Company.	has been partially proven
The second sub-hypothese	There is statistically significant effect of Supply chain innovation with its dimension on the Research & Development which is one of the operational performance dimensions in Ezz Steel Company.	has been partially proven
The The thirdsub-hypothese	There is statistically significant effect of Supply chain innovation with its dimension on the Flexibility which is one of the operational performance dimensions in Ezz Steel Company.	has been partially proven
The fourth sub-hypothese	There is statistically significant effect of Supply chain innovation with its dimension on the Cost which is one of the operational performance dimensions in Ezz Steel Company.	has been partially proven

Source: Researcher preparation

10/2 Recommendations

In light of the theoretical and practical part of the study, which dealt with The Relationship Between Organizational Culture and Job Rotation "An applied study, and in light of the results reached: The following recommendations can be made:

Table (19) Proposed recommendations for implementation

Proposed recommendations for implementation	Implementation responsibility	Required resources
Giving employees the freedom to make decisions related to their business tasks by choosing the way they perform their work, which reflects on their ability to create and innovate ideas that help companies develop their products in a way that keeps pace with the tremendous development in the environment around them, and meets the satisfaction and then customer loyalty for the product provided to them.	Planning department, research and Development Department	Financial resources and technological resources
Increase integration and interconnection between the company's departments through sharing information and joint planning between them in order to avoid any conflicts that may occur within the company.	Senior management	Human resources trained in proper planning
Facilitate the procedures for dealing with customers, starting from their request for the product, through their activities, and the processes and procedures of obtaining the product in order to satisfy their desires, and ending with the delivery of the final product to them.	Customer management	Human resources, Financial resources

Proposed recommendations for implementation	Implementation responsibility	Required resources
Continuously measuring the relationship between suppliers and the company, and working to develop it, which is reflected in improving the perceived value of customers.	Procurement management	Human resources, Financial resources
Create a flexible supply base, because any change may occur in it as a result of any dispute that may occur between the company and one of its suppliers, which forces the company to deal with another supplier, and if the company's supply base is not flexible enough, it will cost the company to waste time and money in order to deal with a new supplier, which affects the success of the company's production process.	Senior management, procurement management	Financial resources, human resources, knowledge resources
Relying on modern methods of production by continuously following modern developments to improve quality and introduce modern technological techniques in production.	Research & Development, Production Management	Financial resources, human resources, knowledge resources

Source: Researcher preparation

10-3 Recommendations for future studies:

1. Conducting more research on the role of supply chain innovation in improving operational performance on other industrial companies, other than Ezz Steel Company, and service companies.
2. Studying the impact of the application of supply chain innovation in its various dimensions in public and private organizations.
3. Retest the results of the current search on other sectors. - Linking supply chain innovation with supply chain flexibility.
4. Measuring the impact of supply chain innovation with reverse logistics.
5. Measuring the impact of energy management and production plans on the level of operational performance of organizations.

References:

Abdelkafi, N., & Pero, M. (2018). Supply chain innovation-driven business models: Exploratory analysis and implications for management. Business Process Management Journal, 24(2), 589-608.

Acquah, I.S.K., Quaicoe, J. and Arhin, M. (2022), "How to invest in total quality management practices for enhanced operational performance: findings from PLS-SEM and fsQCA", The TQM Journal, Vol. ahead-of-print No. ahead-of-print.

Agyei-Owusu, B., Asamoah, D., Nuertey, D. and Acquah, I.N. (2022), "Examining the relationship between dimensions of supply chain integration, operational performance and firm performance: evidence from Ghana", Management Research Review, Vol. 45 No. 12, pp. 1644-1669.

Akhtar, S. (2016). US Politics of Betrayal: The Urdu Press on Pakistan-US Relations Since the 1971 War (Doctoral dissertation, University of Central Lancashire).

Al-Hakimi, M. A., Goaill, M. M., Al-Hattami, H. M., Murshid, M. A., Saleh, M. H., & Moghalles, S. A. M. (2023). Improving operational performance of manufacturing SMEs: the interactive effect of technical and human lean practices. International Journal of Quality & Reliability Management, 40(4), 1092-1110.

AL-Khatib, A. W. (2023). The impact of big data analytics capabilities on green supply chain performance: is green supply chain innovation the missing link?. Business Process Management Journal, 29(1), 22-42.

Bayanati, M., Peivandizadeh, A., Heidari, M. R., Foroutan Mofrad, S., Sasouli, M. R., & Pourghader Chobar, A. (2022). Prioritize Strategies to Address the Sustainable Supply Chain Innovation Using Multicriteria Decision-Making Methods. Complexity, 2022.

Bello, D. C., Lohtia, R., & Sangtani, V. (2004). An institutional analysis of supply chain innovations in global marketing channels. Industrial Marketing Management, 33(1), 57-64.

Buer, S. V., Semini, M., Strandhagen, J. O., & Sgarbossa, F. (2021). The complementary effect of lean manufacturing and digitalisation on operational performance. International Journal of Production Research, 59(7), 1976-1992.

Caniato, F., Moretto, A., & Caridi, M. (2013). Dynamic capabilities for fashion-luxury supply chain innovation. International Journal of Retail & Distribution Management, 41(11/12), 940-960.

Cohen, M. A., Cull, C., Lee, H. L., & Willen, D. (2000). Saturn's supply-chain innovation: High value in after-sales service. MIT Sloan Management Review, 41(4), 93.

Deng, Q., & Noorliza, K. (2023). Integration, resilience, and innovation capability enhance LSPs' operational performance. Sustainability, 15(2), 1019.

Domenek, A.C., Moori, R.G. and Vitorino Filho, V.A. (2022), "The mediating effect of operational capabilities on operational performance", Revista de Gestão, Vol. 29 No. 4, pp. 350-366.

Folke, C. (2006). Resilience: The emergence of a perspective for social–ecological systems analyses. Global environmental change, 16(3), 253-267.

Ganbold, O., Matsui, Y. and Rotaru, K. (2021), "Effect of information technology-enabled supply chain integration on firm's operational performance", Journal of Enterprise Information Management, Vol. 34 No. 3, pp. 948-989.

Gunasekaran, A., Patel, C. and Tirtiroglu, E. (2001), "Performance measures and metrics in a supply chain environment", International Journal of Operations & Production Management, Vol. 21 No. 1/2, pp. 71-87.

Hahn, G. J. (2020). Industry 4.0: a supply chain innovation perspective. International Journal of Production Research, 58(5), 1425-1441.

Hall, J. (2006). Environmental supply chain innovation. In Greening the supply chain (pp. 233-249). London: Springer London.

Hazen, B. T., Overstreet, R. E., & Cegielski, C. G. (2012). Supply chain innovation diffusion: going beyond adoption. The international journal of logistics management, 23(1), 119-134.

Hopkins, J. L. (2021). An investigation into emerging industry 4.0 technologies as drivers of supply chain innovation in Australia. Computers in Industry, 125, 103323.

Isaksson, R., Johansson, P., & Fischer, K. (2010). Detecting supply chain innovation potential for sustainable development. Journal of business ethics, 97, 425-442.

Jangga, R., Ali, N. M., Ismail, M., & Sahari, N. (2015). Effect of environmental uncertainty and supply chain flexibility towards supply chain innovation: An exploratory study. Procedia Economics and Finance, 31, 262-268.

Junaidi, J. (2022). The Effect of Corporate Governance, Integrated Quality Management and Social Responsibility on Competitiveness and Operational Performance. Golden Ratio of Marketing and Applied Psychology of Business, 2(2), 73-91.

Karaman Kabadurmus, F. N. (2020). Antecedents to supply chain innovation. The International Journal of Logistics Management, 31(1), 145-171.

Kebede Adem, M. and Virdi, S.S. (2021), "The effect of TQM practices on operational performance: an empirical analysis of ISO 9001: 2008 certified manufacturing organizations in Ethiopia", The TQM Journal, Vol. 33 No. 2, pp. 407-440.

Kronborg Jensen, J., Balslev Munksgaard, K., & Stentoft Arlbjørn, J. (2013). Chasing value offerings through green supply chain innovation. European Business Review, 25(2), 124-146.

Kwak, D. W., Seo, Y. J., & Mason, R. (2018). Investigating the relationship between supply chain innovation, risk management capabilities and competitive advantage in global supply chains. International Journal of Operations & Production Management, 38(1), 2-21.

Lee, S. M., Lee, D., & Schniederjans, M. J. (2011). Supply chain innovation and organizational performance in the healthcare industry. International Journal of Operations & Production Management, 31(11), 1193-1214.

Li, B., & Li, Y. (2017). Internet of things drives supply chain innovation: A research framework. International Journal of Organizational Innovation, 9(3), 71-92.

Liu, H., Ke, W., Wei, K. K., & Hua, Z. (2013)"Effects of supply chain integration and market orientation on firm performance" International Journal of Operations & Production Management.

Luomaranta, T., & Martinsuo, M. (2020). Supply chain innovations for additive manufacturing. International Journal of Physical Distribution & Logistics Management, 50(1), 54-79.

Rahman, S.-U. and Bullock, P. (2010), "Soft TQM, hard TQM, and organisational performance relationships: an empirical investigation", Omega, Vol. 33 No. 1, pp. 73-83.

Santos Bento, G. D., & Tontini, G. (2018), "Developing an instrument to measure lean manufacturing maturity and its relationship with operational performance", Total Quality Management & Business Excellence, 29(9-10), 977-995.

Santos Bento, G. D., & Tontini, G. (2018), "Developing an instrument to measure lean manufacturing maturity and its relationship with operational performance", Total Quality Management & Business Excellence, 29(9-10), 977-995.

Shamout, M. D. (2019). Does supply chain analytics enhance supply chain innovation and robustness capability?. Organizacija, 52(2), 95-106.

Solaimani, S., & van der Veen, J. (2022). Open supply chain innovation: an extended view on supply chain collaboration. Supply Chain Management: An International Journal, 27(5), 597-610.

Tarigan, Z. J. H., & Siagian, H. (2021). The effects of strategic planning, purchasing strategy and strategic partnership on operational performance (Doctoral dissertation, Petra Christian University).

Tortorella, G., Miorando, R., Caiado, R., Nascimento, D., & Portioli Staudacher, A. (2021). The mediating effect of employees' involvement on the relationship between Industry 4.0 and operational performance improvement. Total Quality Management & Business Excellence, 32(1-2), 119-133.

Valdez, G. (2017), "INTERMEDIATE MANAGER EXPERIENCE: IMPLICATIONS FOR OPERATIONAL PERFORMANCE WITHIN VETERINARY CLINICAL INSTITUTIONS", (Doctoral dissertation, Argosy University).

Wu, H., Jiang, S., & Cao, J. (2022). High-efficiency Blockchain-based Supply Chain Traceability. arXiv preprint arXiv:2210.09202.

Zijm, H., Klumpp, M., Clausen, U., & Hompel, M. T. (2015). Logistics and supply chain innovation. Lecture Notes in Logistics. Springer, Cham.