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The availability of global manufacturing success factors at Mass Iraq Iron and Steel Company
A survey study of the opinions of a sample of workers at Mas Iraq Iron and Steel in Sulaymaniyah

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مدى توافر عوامل نجاح التصنيع العالمي في شركة ماس العراق للحديد والصلب
دراسة استطلاعية لآراء عينة من العاملين في ماس العراق للحديد والصلب في السليمانية *

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Abstract **DOI: https://doi.org/10.71207/ijas.v22i88.5849**

This study aims to demonstrate the availability of critical success factor requirements for global manufacturing at the Mass Iron and Steel Plant. This objective gave rise to a set of sub-objectives that focused on evaluating the technical, organizational, and strategic aspects supporting the application of global manufacturing practices. The study problem is represented in the main question: To what extent are the factors for global manufacturing success available at Mass Iraq Iron and Steel Company? The study adopted the descriptive analytical method to reach accurate and reliable results. The study also used a questionnaire as the main tool for collecting field data. The study population consisted of all employees in the production, administrative, and engineering departments of the plant, with a population size of 4,000 workers. A suitable sample of 351 workers was selected for data analysis. The results of the study showed the availability of a suitable level of factors for global manufacturing success in the company, as both the main and sub-hypotheses were accepted, reflecting the plant's ability to effectively apply global manufacturing practices. Based on these results, the study recommends that the company's management continue to enhance and support the technical, organizational, and strategic factors, and take advantage of the strong institutional environment to expand the application of global manufacturing practices, which will contribute to achieving higher levels of efficiency and quality in its operations.

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المستخلص

تهدف الدراسة الحالية إلى التحقق من توافر متطلبات العوامل الحرجة لنجاح التصنيع العالمي في مصنع الحديد والصلب. ومن هذا الهدف الرئيسي، انبثقت مجموعة من الأهداف الفرعية التي تركز على تقييم الجوانب التقنية والتنظيمية والاستراتيجية الداعمة لتطبيق ممارسات التصنيع العالمي. تتجسد مشكلة الدراسة في السؤال الرئيسي التالي: إلى أي مدى تتوافر عوامل نجاح التصنيع العالمي في شركة ماس العراق للحديد والصلب؟ اعتمدت الدراسة المنهج الوصفي التحليلي لاستخلاص نتائج دقيقة وموثوقة، مع الاستعانة باستبيان كأداة أساسية لجمع البيانات الميدانية. امتد مجتمع الدراسة ليشمل جميع موظفي أقسام الإنتاج والإدارة والهندسة في المصنع (بإجمالي ٤٠٠٠ عامل)، وقد تم تحديد عينة مناسبة مكونة من ٣٥١ عاملاً لأغراض التحليل الإحصائي. أظهرت النتائج توافر مستوى ملائم من عوامل نجاح التصنيع العالمي داخل الشركة، مع قبول الفرضيات الرئيسية والفرعية على حد سواء، مما يعكس كفاءة المصنع في تبني هذه الممارسات. وعليه، يوصي البحث إدارة الشركة بتعزيز مستمر للعوامل التقنية والتنظيمية والاستراتيجية، مع استثمار البيئة المؤسسية القوية لتوسيع نطاق تطبيق هذه الممارسات، وذلك لتحقيق مستويات أعلى من الكفاءة التشغيلية والجودة الإنتاجية.

1. Introduction

The industrial sector is currently undergoing rapid transformations due to successive technological advancements, increasing competition among industrial companies globally, economic liberalization, and the growing demands of international markets for quality, efficiency, and innovation. This has led to the emergence of the concept of global manufacturing, a modern trend in industrial management. Global manufacturing focuses on the ability of industrial organizations to achieve advanced levels of production performance by adopting sophisticated industrial practices and technologies that comply with global standards in production, quality, and management.

In this evolving industrial environment, the success of industrial companies no longer depends solely on the availability of material resources or production capacity. Instead, it hinges on their possession and adoption of a set of global manufacturing success factors that enable them to compete in both domestic and international markets. These factors include a range of administrative and technical practices that contribute to improving the efficiency of production processes, enhancing quality, reducing costs, and increasing production flexibility, as well as developing human resources and adopting modern technologies in manufacturing and supply chain management.

The study of global manufacturing success factors is of paramount importance in heavy industries, particularly the iron and steel industry, given its pivotal role in supporting various economic sectors such as construction, infrastructure, and manufacturing. This industry also demands high levels of technical and managerial efficiency to ensure industrial sustainability and market competitiveness.

In this context, Mass Group Holding is a prominent industrial company in Iraq, owning a portfolio of large industrial projects in the energy, cement, and iron and steel sectors. Its iron and steel plant in the Bazian area is a significant industrial project that contributes to supporting the industrial sector and meeting a portion of the local market's needs for iron and steel products. Therefore, it is essential to examine the extent to which global manufacturing success factors are present in this company, as this will enhance its competitiveness and improve its production performance amidst the challenges facing heavy industries in Iraq. This Study aims to highlight the concept of global manufacturing success factors and their importance in enhancing industrial performance. It also analyzes the availability of these factors at Mass Iraq Iron and Steel Company, contributing to a diagnosis of the company's current manufacturing practices and identifying areas for development in line with global industrial standards. Furthermore, the Study hopes to provide a scientific framework that other industrial institutions in Iraq can utilize in their pursuit of adopting modern manufacturing practices and achieving industrial excellence and sustainable competitiveness.

2. Study methodology

2.1 Study Problem: The industrial sector is currently witnessing rapid developments as a result of technological progress, industrial digitalization, and increased competition in global markets. This has prompted industrial institutions to adopt modern concepts in management and manufacturing that focus on efficiency, quality, flexibility, and innovation. In this context, the concept of global manufacturing success factors has emerged, which represents a set of organizational and technical practices and capabilities that enable industrial companies to achieve production excellence and competitiveness in international markets.

The iron and steel industry is considered one of the strategic industries that contributes to supporting economic development and strengthening the infrastructure of countries. However, it faces many challenges related to high production costs, rapid development in industrial technologies, global quality requirements, as well as increasing competition from imported products. Therefore, the ability of companies operating in this sector to achieve success and sustainability depends largely on the availability of global manufacturing success factors in their production and administrative processes. In this context, Almas Company is a significant industrial company in Iraq, owning a large iron and steel plant. This plant contributes to meeting a portion of the local market's needs for iron products. Despite the importance of this industrial project, its success in a competitive industrial environment requires the availability of a range of global manufacturing factors that support production efficiency, improve product quality, and enhance competitiveness. Hence, the study's problem is embodied in the following main question: To what extent are global manufacturing success factors available at Almas Iraq Iron and Steel Company? This main question leads to several sub-questions, including:

1. What is the level of availability of modern technological factors within the company?
2. To what extent are organizational factors applied in production processes?
3. What is the level of availability of strategic factors within the company?

2.2 Study Objectives: The main objective of this study is to determine the extent to which the requirements for critical success factors of global manufacturing are available at the Almas Steel Plant. From this main objective, we define the following sub-objectives:

1. To identify the problems facing the success factors of global manufacturing and how to address them within both the theoretical and practical frameworks of the study.
2. To diagnose the level of availability of global manufacturing success factors at Almas Steel Company in Iraq.
3. To analyze the current manufacturing practices at the company and their conformity with international industry standards.
4. To present a set of proposals and recommendations that can contribute to enhancing the efficiency of manufacturing processes and improving the company's competitiveness.

2.3 Study Significance: The significance of this study stems from several scientific and applied aspects, which can be explained as follows:

1. The study contributes to enriching the scientific literature related to the topic of global manufacturing success factors in the industrial field.
2. It provides a theoretical framework that clarifies the most important concepts related to global manufacturing and the factors affecting its success.
3. It provides a scientific foundation that Studyers can utilize in conducting future studies in the field of industrial management and advanced manufacturing.
4. The study results help the management at Mass Group Holding diagnose the level of availability of manufacturing success factors in its iron and steel plant.

2.4 Hypothetical Study Model: The current study adopts the following hypothetical model:

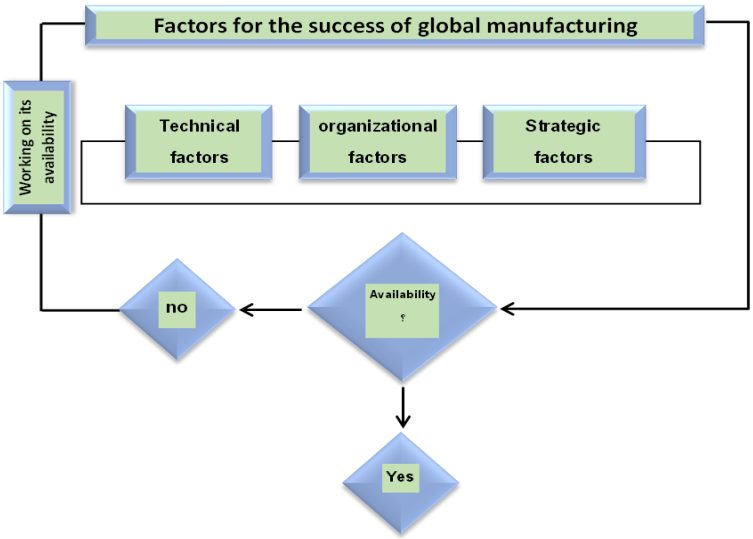


Figure (1) The hypothetical study model

Source: Prepared by Studyers.

To what extent are the technical, strategic, and organizational factors requisite for the success of global manufacturing present at Mass Iraq Iron and Steel Company?

2.5 Study Hypotheses: The study is based on the following main hypothesis:

Testing the Main Hypothesis (H1): A suitable level of success factors for global manufacturing is available in the company under study. This hypothesis branches into the following sub-hypotheses:

Testing the First Sub-Hypothesis (H1.1): A suitable level of technical factors supporting global manufacturing is available in the company under study.

Testing the Second Sub-Hypothesis (H1.2): A suitable level of organizational factors supporting the application of global manufacturing practices is available in the company under study.

Testing the Third Sub-Hypothesis (H1.3): A suitable level of strategic factors that enhance the success of global manufacturing is available in the company under study.

2.6 Study Methodology: This study adopted the descriptive-analytical approach, which is one of the most widely used methods in administrative and industrial studies that aims to describe, analyze, and interpret the relationships between their variables. This approach is used to collect and analyze data and information related to the study topic in order to identify the level of availability of global manufacturing success factors in the company under study, as well as to diagnose the strengths and weaknesses of its manufacturing practices.

2.7 Study Population and Sample: The study population consisted of all employees in the production, administrative, and engineering departments of Almas Steel Plant, totaling 4,000 workers. The sample size was determined using the equation (Krejcie & Morgan, 1970). Given the 4,000 workers in the company under study, and referring to Morgan's table or using his statistical equation, the appropriate sample size for the study was 351 individuals at a 95% confidence level and a 5% margin of error, as shown in the following equation:

$$S = \frac{x^2 * N * P\,(1-P)}{d^2(N-1) + x^2 * P\,(1-P)}$$

$$S = \frac{3.841 * 4000 * 0.5\ (0.5)}{0.05^2(4000-1) + 3.841 *\ 0.5\ (0.5)}$$

$$S = \frac{3.841 * 4000 * 0.25}{0.0025\ (3999) + 0.96025}$$

$$S = \frac{3841}{10.95775}$$

$$S = 351$$

2.8 Data Collection Tool: The study relied on a questionnaire as the primary tool for collecting field data, given its suitability to the nature of administrative and industrial studies. The questionnaire was designed based on literature and previous studies related to success factors in global manufacturing. It was designed using a five-point Likert scale (Strongly Agree 5, Agree 4, Neutral 3, Disagree 2, Strongly Disagree 1) with a hypothetical mean of 3.

2.9 Reliability Test: Table 1 shows the results of Cronbach's Alpha test, indicate that all dimensions of the questionnaire have high reliability, with alpha values exceeding 0.85. The overall score for all items reached 0.91, thus the reliability coefficient is considered acceptable as it exceeded 0.70. This reflects the questionnaire's internal consistency and its ability to reliably measure success factors in global manufacturing.

Table (1) Cronbach's alpha test results for questionnaire reliability

Dimension	Number of Items	Cronbach's Alpha	Reliability Assessment
Technical Factors	7	0.88	High
Organizational Factors	7	0.89	Very High
Strategic Factors	6	0.87	High
Overall Variable	20	0.91	Very High

Source: Prepared by researchers

2.10 Statistical Methods Used: The data were analyzed using SPSS software, employing a range of statistical methods appropriate to the nature of the study, including:

1. Frequencies and percentages to describe the characteristics of the study sample.
2. Arithmetic means and standard deviation to measure the availability of manufacturing success factors.
3. Cronbach's alpha test to measure the reliability of the questionnaire.
4. The t-test and F-test to test the study hypotheses.

2.11 Study Boundaries: The scope of the study was confined to the following:

1. Scientific Boundaries: These were reflected in the subject matter under investigation, and its model was based on the theoretical frameworks proposed by(Koren, 2010) (Han & Wang, 2025), as well as on the factors of global manufacturing success adopted in the current study.
2. Spatial Boundaries: The study's spatial boundaries were confined to the Mass Iraq Iron and Steel Factory in Sulaymaniyah.
3. Temporal Boundaries: The temporal boundaries extended from July 1, 2025, to November 1, 2025

3. The theoretical framework for the variables of the subject under

3.1 The concept of globalization

Globalization refers to the process of making something global or internationally widespread in its scope or application. It is also the process through which companies or factories—particularly commercial enterprises—primarily undertake globalization as an economic phenomenon, which is subsequently accompanied by political dimensions (Han & Wang, 2025). Following these are social and cultural aspects, and so forth. Moreover, making something international often implies rendering it suitable, comprehensible, or accessible to various countries around the world.

Globalization extends to being a process of control, dominance, and the establishment of rules and linkages, accompanied by the removal of barriers and borders between countries. (Prasanti et al., 2024)Capitalist countries that dominate the global economy have experienced significant growth, prompting them to seek new sources and markets, thereby expanding their economic boundaries to establish networks of relations with developing countries. Globalization is not limited solely to the financial and economic dimensions; it also encompasses a vital cultural dimension represented by the collection of traditions, beliefs, and values. Furthermore, globalization disregards the geographical borders of any nation, effectively transforming the world into a small village (Cengiz & Manga, 2024).

The concept of globalization is used to describe all processes through which social relations acquire a form of unification and the diminishing of distance, such that life operates as if the world is one place or a single small village. The British thinker Ronald Robertson defines globalization as a historical trend toward the contraction of the world and an increased awareness among individuals and societies of this contraction.

Studyers view globalization as encompassing all new developments and changes that intentionally or unintentionally strive to integrate the world's population into a single global society. (Pandian, 2024). Modern globalization is characterized by the integration and interconnection of global markets in the production of goods and consumer services.

3.2 The concept of global manufacturing

The term "world-class manufacturing" refers to the adoption and application of the highest global standards as benchmarks for comparison against competitors. This approach aims to achieve the utmost levels of manufacturing excellence and competitiveness in international markets, ensuring sustainability in a world that no longer tolerates weakness. It is accomplished by eliminating waste and material losses, avoiding any unnecessary depletion of resources regardless of how minimal, and through the implementation of total quality management practices, precise data accuracy, and rigorous performance measurement global manufacturing is a comprehensive term encompassing a set of concepts, principles, policies, and techniques for managing and operating a manufacturing company (Ikumapayi et al., 2020).This term also includes aspects such as productivity, quality improvement, and customer service.

The emergence of this concept was driven by the success achieved through the resurgence of Japanese manufacturing after World War II. It incorporates many ideas originally employed by the Japanese in industries such as automotive, electronics, and steel to gain a competitive advantage The global manufacturing network is defined as a geographically dispersed group of companies affiliated with a multinational corporation that assumes

responsibility and control over these entities. Its management is characterized as a coordinated aggregation of firms located in different sites. Two main issues are addressed in the decision-making process within a global manufacturing network: configuration and coordination. Numerous studies indicate that the coordination of activities within the network is dependent on its configuration The management of global manufacturing networks, as understood today, plays an increasingly important role in the competitive capability of manufacturing companies. Consequently, some authors interpret it as the global manufacturing organization of a company unit within the network. Other authors adopt a broader definition of the manufacturing network, encompassing suppliers and customers alongside the network's internal sites(Han & Wang , 2025:6-8). Some have defined global manufacturing networks as a matrix-connected network of factories, where each node (i.e., factory) influences other nodes across different countries worldwide. Consequently, these networks cannot be managed in isolation from one another.

Global manufacturing involves the division and distribution of the production process and the placement of various production units across different countries (Sawadogo et al., 2024). This dispersion requires the fulfillment of the following condition:

1-Significantly low production costs driven by local advantages such as low wages, quality infrastructure, or other regulatory benefits.

2-The costs of service links, transportation, and telecommunications, as well as the interconnection of the different production units, are not excessively high.

hereare several terms used to describe global manufacturing, including: international operations, international production, international manufacturing, global operations, global production, international operations network, international production network, global operations network, global manufacturing network, dispersed manufacturing, globally distributed manufacturing, international embedded network, and multi-embedded network .

3.3 Characteristics and benefits of global manufacturing

There are seven characteristics of industrial companies that have adopted global manufacturing. The following is a brief explanation of these characteristics:

1. Reducing Waiting Times

1. Time represents a critical competitive advantage for industrial companies within the contemporary business environment. This advantage is reflected in the speed of product completion, from the initial concept and manufacturing process to final delivery to the consumer.(Zia & Tabassam, 2025).Consequently, these companies have placed great importance on minimizing waiting times, particularly across three key stages: (Gangele & Kumar, 2025) (Alkharafi & Alsabah, 2025)
    a. Raw Material Procurement Stage:t he waiting time at this stage refers to the duration required to receive materials after placing an order with suppliers. This time can be reduced by establishing strong relationships with suppliers aimed at ensuring rapid delivery, guaranteeing material quality, and lowering procurement costs.
    b. production Stage:

At this stage, companies primarily focus on reducing the lead times involved in transferring materials from warehouses to production lines, as well as minimizing the processing times during production flow between different production lines until the product is fully manufactured. Additionally, efforts are made to shorten the setup times required when

switching production from one product to another. This process reflects the company's production flexibility, which enhances its ability to respond swiftly to consumer demands.

c. Delivery to the Consumer Stage:

This stage encompasses the time elapsed from the consumer's initiation of a product or service order until the delivery of the product or service to them. At this stage, companies typically strive to provide immediate delivery, fulfill orders according to the consumer's specific requests, or ensure delivery within competitive timeframes relative to other market competitors.

2. Reducing operating costs

cost management and control is considered one of the important competitive areas within an organization. Costs represent a primary determinant of profits; therefore, companies—both historically and currently—have attached great importance to cost reduction and control processes.

therefore, in a competitive environment, companies that possess a clear and straightforward cost structure alongside an effective control system also enjoy a distinct advantage in profitability and the ability to adjust prices to withstand competitive pressures when necessary, whether to maintain their current market share or to capture a new one (Tang, 2025). It is important to emphasize that the significance of cost reduction in an advanced industrial environment—where value is created—must be addressed across the entire value chain, including supply, manufacturing, and delivery to the consumer, rather than focusing solely on industrial operating costs.

3. Increase the clarity of the organization's performance.

Individuals play a crucial role in the development of the organization and the achievement of its objectives. In the global industrial environment, there has been a shift towards involving all employees in the organization's planning, operational, and administrative processes.

In this context, any plan aimed at advancing the organization towards global industry must include the following topics: (Kumar et al., 2024)

- Participation in the organization's vision
- Commitment from every individual within the organization
- Engaging individuals in genuine change through team quality and planned improvements .

Accordingly, all employees in the organization, starting from senior management down to the lower executive levels, should be well-informed about the organization's performance according to their respective levels. Senior management must be aware of the extent to which strategic objectives have been achieved, while executives need to be informed about the progress in attaining tactical objectives.

4. Reducing Time to Market

Time to Market (TTM) is defined as the duration required to transform the ideas of engineers and product innovators from mere concepts into marketable products (Pandian, 2024). given the significant role that consumers play in determining products, coupled with increasing competitive pressures due to the growing number of competitors, alongside advancements in technology, the evolution of information systems, and their rapid dissemination, the importance of continuous improvements or modifications to existing products has

heightened. Moreover, innovation in developing new products and swiftly bringing them to market has become increasingly critical.

5. Meeting or Satisfying Consumer Expectations

The consumer is one of the primary focal points in the contemporary business environment. Therefore, manufacturers operating in the global industrial context must establish strong relationships with consumers and continuously conduct market Study to understand their demands, needs, and desires. Furthermore, manufacturers should strive to offer innovative and novel products to outperform competitors (Han & Wang, 2025). accordingly, to become the preferred supplier for consumers, this can be achieved through competitive products, high quality, reasonable prices, timely delivery, and outstanding after-sales services.

6. Organizing or Simplifying Integration Processes.

Operating within an advanced industrial environment is no longer compatible with the vertical integration strategies that companies pursued in the past. A single company may not be able to bear the high costs associated with completing all manufacturing processes, (Ikumapayi et al., 2020) which involve diverse areas such as Study and development, restructuring operations, factory organization, and establishing new production lines. Therefore, companies—especially medium and small enterprises—have shifted toward integration approaches whereby the organization procures some of its needs from other companies while focusing internally on its competitive core areas.

7. Global Operations Management

Every organization today is connected in some form to international trade, whether through marketing and selling to consumers in other countries or simply by purchasing parts or manufactured materials from elsewhere. Globalization and cross-border trade have transformed traditional business behaviors and practices (Gunasekaran & Ngai, 2012). Therefore, companies must tailor their products and services to meet the needs of new potential consumers. They should effectively utilize the internet to establish a physical presence and use technology to cooperate with other companies for a better and faster response to consumer demands. The key requirement is collaboration—whether on a global or local scale—to achieve industrial integration and provide information that improves customer service.

This means that organizations must manage their global operations with an emphasis on adaptation, communication, and partnership. They need strategic coordination across borders to handle complex supply chains, respond rapidly to market shifts, and leverage technological tools to serve diverse markets efficiently (Gangele & Kumar, 2025). Effective global operations management fosters synergy between international partners, enhances responsiveness to customer requirements, and optimizes resource use to maintain competitive advantage in the global marketplace.

the benefits of adopting the concept of global manufacturing by many industrial companies lie in its ability to address numerous challenges within these companies. Globalization has created many new opportunities, and global manufacturing companies now enjoy multiple advantages, including:

- 1-Reducing manufacturing costs by utilizing countries with low labor costs.
- 2-Mitigating business risks and fluctuations in currency exchange rates.
- 3-Globalization as a source of corporate growth, achieved through access to new markets (Zia & Tabassam, 2025).

Globalization does not only mean that large companies have become international in terms of their sales and the locations of their production facilities worldwide, but also that they can offer innovative products tailored to the specific cultures and preferences of customers across different countries and regions. Furthermore, the global market, which includes a large number of competing suppliers, increases the purchasing power of the consumer. These potential consumers now exist all around the world (Tang, 2025).

3.4 Risks of Globalization for Industrial Companies and Its Negative Aspects.

Globalization imposes a new reality on industrial companies characterized by challenges and pressures arising from market liberalization, economic integration, and global supply chains. Despite its advantages, globalization presents extensive risks and numerous negative aspects that directly and indirectly affect the industry (Sawadogo et al., 2024). The pressures on companies are inevitable, and the benefits usually justify the endeavor. However, if a company does not plan carefully, the risks associated with entering the global arena can erode all these benefits.

Therefore, a global company must prepare itself by thoroughly examining all aspects of its operations as it attempts to align with the global framework, and it must continuously monitor itself to ensure survival. (12) The following is a presentation of these aspects: (Friedli et al., 2021), (Sawadogo et al., 2024), (Rodrik, 2012).

1. Locating Factories Abroad: The control of manufacturing operations, especially in countries typically characterized by "low-cost labor" and developing economies, can involve unforeseen risks that do not emerge until after the investment has been made.

Sometimes, the labor rules and work ethics in these so-called "low-cost" labor forces differ significantly to the extent that they may offset much of the anticipated cost savings. in some cultures, for example, it is common for workers to take a day off if they feel they have earned enough money during the previous week. This can cause an entire assembly line to become idle even if only a few workers decide to forgo work. In other cultures, labor regulations strictly define the number of working hours. In such cases, increased demand cannot be met by offering additional pay for extra work.

Another significant issue relates to the infrastructure and communication systems at the foreign factory location. Most developing countries suffer from deficiencies in infrastructure related to transportation, communications, and electricity. These deficiencies currently represent the major obstacle to economic progress in countries such as India and China, as well as affecting the capacity and reliability of their power networks, despite their vigorous efforts to improve them.

Manufacturing abroad may not be a simple substitute for local production. The decision of factory location abroad has become one of the most critical strategic tools for industrial companies operating in the globalization environment, as it fundamentally influences costs, competitiveness, and the industrial future of the company.

However, alongside these benefits, complex challenges arise that require well-considered decisions integrating technological, economic, cultural awareness, and compliance with international regulations.

2.Global Market Interconnection: The widespread dispersion and interconnection of production, along with global communication, have led to the intertwining of national economies. An economic downturn in one country can rapidly impact the economic conditions of other countries. For instance, after the financial crisis that began in the United

States in September 2008 spread swiftly across the globe, the sudden decline in retail purchasing in the U.S. caused factories in China to shut down abruptly, resulting in the layoff and repatriation of their workers (Reinhart & Rogoff, 2009).

This example illustrates how global economic integration means that crises are no longer confined within national borders but propagate quickly through interconnected markets and international supply chains. The interconnection of global markets is a key factor in promoting economic integration within the phenomenon of globalization. Goods, services, capital, and technology move rapidly across borders, creating an interconnected international economic system. This interconnection enhances opportunities and economic development; however, it simultaneously increases the level of complexity and risks, necessitating strong international coordination and meticulous management of shared challenges (Pal, 2021).

3. Exchange Rates: exchange rate fluctuations can have unexpected and devastating effects on a company's profitability. Currency exchange rates can vary significantly within just a few months, and volatile exchange rates can disrupt complex global supply chains that take years to establish. Exchange rate considerations are often a predominant reason why manufacturers choose to forgo the inherent advantages of their home country and relocate operations to the country where their largest markets are located. This is one of the reasons behind Toyota's and Honda's decisions to open automobile manufacturing plants in the United States—to mitigate the risks associated with exchange rate volatility. (Sawadogo et al., 2024).

4. Changing Economic Rules: In the past, the U.S. government encouraged its citizens to shop in order to stimulate the economy (Ujam, 2025). This approach might have been successful in the old economy, when most products were manufactured within the United States.

However, in the economic reality of the twenty-first century, this strategy has had a very limited impact, as the money spent is often used to purchase products manufactured abroad. The local U.S. economy's only significant contribution is typically limited to retail sales, shipping, and handling. The majority of the purchase process enriches foreign manufacturers.

The new economy cannot be built on spending alone; it must be based on producing goods domestically.

5. Standards and Regulations for Imported Products: Similar to infrastructure, product reliability cannot be regarded as insignificant in the context of globalization, along with product quality and safety. The standards that are an integral part of the regulatory landscape in an advanced country may be very rare and difficult to ascertain when dealing with foreign suppliers. Writing quality specifications into an outsourced contract is no different from enforcing codes of conduct on the factory floor (Obiuto et al., 2024). For example, if the local workforce perceives different standards of cleanliness and purity, it will be difficult to avoid cross-contamination of the process. If the quality of aircraft parts and heavy equipment, or the purity of food and pharmaceuticals, is substandard, the consequences could be dire. Increased inspection, oversight, and control can impact the profitability of an outsourced contract as much as any other reason, with the added risk of liability (Sawadogo et al., 2024).

6. National Sovereignty: One of the most significant risks of globalization is that it challenges a state's sovereignty over its behavior and trade.

Globalization impacts state sovereignty by imposing international rules on the domestic commercial landscape. The emergence of institutions such as the World Trade Organization, the World Bank, the European Union, and the European Central Bank adds constraints that may have been overlooked in the past, but are now part of the majority of commercial transactions, especially in manufacturing. In addition, there is another risk of environmental problems. Production may be shifted to new countries, bringing with it local environmental problems, but these local problems quickly become global environmental problems. Global problems require global solutions and cannot be solved using the local mindset of local governments (Prasanti et al., 2024).

The negative aspects of globalization in manufacturing are many, including economic, technological and cultural aspects, as follows: (Sawadogo et al., 2024), (Pal, 2021), (Agu et al., 2016).

1. Market integration means that people in one country can consume goods from other countries. Through the internet and telephone, people are more aware of the lives of others in different countries than ever before. This implies that globalization impacts the daily lives of people worldwide, which in turn not only affects their economic status but also influences their cultural habits. Consequently, we are witnessing a broad and unprecedented transformation of human life. This transformation includes economic fluctuations, unemployment, social inequality, the decline of economic sovereignty, and environmental and social challenges. These issues necessitate deterrent policies and international regulations to enhance financial oversight, protect local markets, and promote sustainable and balanced development.

2. Job Losses and Industrial Decline: The relocation of factories to countries offering lower labor costs has resulted in the loss of millions of industrial jobs, particularly in developed nations, and a shift in employment towards low-wage service sectors with limited benefits.

3. Exploitation of Workers and Weak Labor Rights: Companies' efforts to reduce costs have sometimes led to the exploitation of labor in developing countries through low wages, poor working conditions, and inadequate trade union rights.

4. Globalization Undermining Government Taxation Powers: Globalization diminishes governments' ability to increase import taxes, thereby limiting their capacity to provide services to their citizens.

5. The vulnerability of global supply chains, due to the extreme complexity of global manufacturing chains, increases the risk of disruption (such as political crises, natural disasters, or epidemics), potentially leading to production shutdowns and significant losses.

6. The widespread diffusion of Western products and methods has led to the erosion of local cultures and traditions in favor of a uniform consumer culture, and the decline of traditional arts and crafts in the face of fast, replicable products. Globalization has transformed some cultural manifestations and traditions into commercial products, leading to the loss of their original meanings and the marginalization of the local communities that produced them. This has led to the decline of specific languages and traditions, and the spread of Western languages and methods has weakened local languages and dialects, threatening the diversity of cultures and traditions and the cohesion of societies.

Globalization is the integration and interconnection of global markets and resources in the production of consumer goods and services for manufacturing firms, which has created an integration of global markets and new conditions such as: (Fatehi & Choi, 2025).

- Intense global competition.
- Global supply of products significantly exceeds demand.
- Increased purchasing power of consumers.
- Rapid changes in consumers' needs and demands.
- Acceleration in the pace of product and process innovations that disseminate swiftly.
- International environmental awareness leading to stricter regulations imposed by governments (such as fuel efficiency standards and the collection of used products for recycling and dismantling).

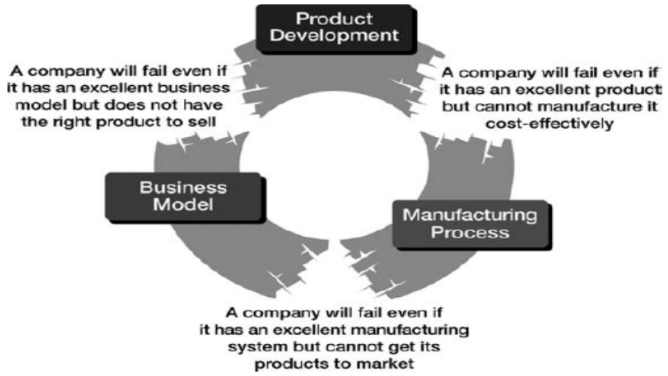
These conditions pose new challenges for global manufacturing companies such as: (Hitt et al., 2017)

- Sudden changes in product demand.
- Frequent product modifications and new government regulations.
- Short market windows of opportunity for new products.
- Increased product variety and transition towards a unified market.
- Precise coordination of global resources through multi-tier supply chains to produce products at the lowest cost and in close proximity to customers.

3.5 The components of global manufacturing and its success factors

For global companies to succeed, it is essential to reconsider the three core components of a project: product development, manufacturing system, and business model. These three components are always in a state of dynamic disequilibrium, particularly when responding to unforeseen market events. Enhancing responsiveness to changing market conditions is crucial for industrial firms to thrive in the global marketplace and maintain sustainable growth (Friedli et al., 2021).Therefore, product development, manufacturing systems, and business models must be designed to rapidly adapt to unexpected changes. These plans are formulated through a global strategy that addresses several key issues such as which products should be developed, in which regions around the world factories can be located, and how to integrate global supply chains (koren, 2010:16). Manufacturing companies must develop tools across all three components of manufacturing to achieve competitiveness within the emerging global manufacturing model:

- Products designed for regional customization across different market sectors, tailored to meet the needs of distinctive local customers.
- Manufacturing system (process) designs that enable reconfiguration to produce products in the volumes required by the market.
- Business models that respond effectively to volatile markets and customer demands.
- These issues constitute the core of the global manufacturing revolution. Figure (2) illustrates these components.



Source: Koren, Y. (2010). *The global manufacturing revolution: Product-process-business integration and reconfigurable systems*. John Wiley & Sons.

Figure (2) Components of global manufacturing

Some have stated that the global industrial revolution must be based on four foundations to succeed, which are: (Koren & Shpitalni, 2010)

1. Innovative Products for Global Markets and Customization for Local Markets: To capitalize on new products as a primary source of revenue while producing them at low manufacturing costs, global companies should pay attention to the following points:

- New Products: There is an urgent need to develop company strategies focused on product innovation, especially new products, with global markets in mind. Accordingly, these products will serve as the primary source of growth and revenue.
- Shortening Lead Times through Supplier Capability Development: New products must be developed concurrently with the advancement of global supply chains and the enhancement of supplier capabilities. This will also ensure low-cost, high-quality products that drive growth in new product sales and new markets.
- Product Architecture Required for Competition in the Global Manufacturing Model: Developing a product architecture that allows the construction of modular products, each designed to suit a specific region or culture, is essential for competitiveness.

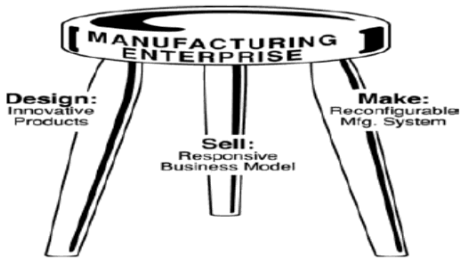
2. Remanufacturing of Manufacturing Systems: This strategy enables the design of products that can be customized and regionally tailored to suit specific sectors and cultures, while still being produced at low cost. It allows manufacturers to use the same underlying product architecture to produce customized products at an affordable cost for local markets.

- Regional Product Suitability: Beyond culture and market considerations, the regional structuring must also take into account additional factors and constraints such as purchasing power, climate, and legal regulations (including safety standards, environmental restrictions, and driving on the left side of the road). Market Study that collects and analyzes information on the habits and needs of customers in the target country is essential for product success. This Study ensures that the product fits the diverse regional context and enhances the likelihood of market acceptance.(Fawcett, 1993)
- Product Personalization: Products manufactured to meet the precise needs of individual buyers are likely to become a new source of revenue, particularly in developed countries. Personalization responds to the increasing demand for

customized and individualized experiences, representing a competitive advantage in advanced markets (Obiuto et al., 2024).

3. Global Business Strategies with Rapid Response to Customers and Markets: The timing of new product launches is always critical, and this importance is amplified due to the limited market windows available for new products as a result of global competition. Therefore, manufacturers who can utilize existing manufacturing systems that are quickly reconfigurable to produce new products gain a competitive advantage. To achieve this, it is essential to impose constraints on the design of new products so that they can be accommodated by the current manufacturing systems which are already producing other products. These requirements exceed those typically applied in conventional product design (Ipaki & Hosseini, 2025).

4. Integration of Product, Process (i.e., Manufacturing System), and Business: The three components have become more interconnected than ever before, as illustrated in Figure (3), making their integration essential for the success of a global company. For instance, if the company manufactures products with a modular architecture, the manufacturing system must be designed to produce a complete range of products based on those modules. Furthermore, the business model should support personalized product orders that utilize the modular product architecture.



Source: Koren, Y. (2010). *The global manufacturing revolution: Product-process-business integration and reconfigurable systems*. John Wiley & Sons.

Figure (3) A manufacturing company is like a three-legged stool - to be stable, it needs three equally strong legs.

For success in global manufacturing requires a comprehensive set of strategic, organizational, and technological factors. According to Koren's model, the most prominent of these factors are as follows:

3.5.1 Technical factors include:

1. Innovation and Technological Advancement: Investing in innovation and adopting modern technologies (such as artificial intelligence, automation, and digital transformation) serves as a tool to enhance competitiveness and keep pace with rapid market changes, enabling continuous product development and process improvement. Indeed, advanced technology is evident in the integration of product-system-business; thus, a global manufacturing company must apply a systems approach that integrates product design with the manufacturing system that will produce it and the business plan it follows. (Agu et al., 2016). This progress in manufacturing technologies—using robots, artificial intelligence, and machine

learning—all supports improving product quality and productivity, in addition to adapting to the demands of modern global production (Sawadogo et al., 2024).

2. Raw Materials and Energy Sources: Manufacturing heavily relies on the availability of necessary raw materials for production, in addition to various energy sources that power factories. This includes plant-based, animal-based, and mineral materials, as well as traditional energy sources like coal and petroleum, and clean energies such as hydroelectric and nuclear power.
3. Standardization and Quality: This is achieved through unifying processes and standards.
4. Flexibility and Rapid Response: The key to global success lies in the rapid response to customer needs and market changes, incorporated into their business strategies as well as their manufacturing systems.
5. Infrastructure and Logistics: The presence of advanced infrastructure (roads, ports, communications) facilitates the efficient transportation of raw materials and finished products.
6. Reconfigurable Manufacturing Systems: A global manufacturing company must possess reconfigurable manufacturing systems that can easily change capacity to adapt to market demand, and whose functions can be effectively and cost-efficiently adapted to introduce new products within short timeframes (Ujam, 2025).

3.5.2 Strategic factors:

1. Sustainability and Environmental Responsibility: This is embodied in adherence to environmental standards and green manufacturing, reducing emissions and waste. It also involves developing eco-friendly products, which enhances the company's position in global markets.
2. Competitiveness and Market Responsiveness: This is achieved by understanding customer requirements and their changes, and offering products that meet their evolving needs. It includes adapting to global competition through efficiency improvements and cost reductions without compromising quality.
3. International Partnerships and Collaboration: This is accomplished through partnerships with international companies and institutions to exchange knowledge and technologies, and to expand markets.
4. Global Strategy: A manufacturing company must develop a global strategy that addresses issues such as the products to be developed, the regions worldwide, the locations of factories, the integration of global supply chains, and how to increase productivity with the same global resources (Fatehi & Choi, 2025). The company should also develop business strategies for emerging markets, such as Brazil, Russia, India, and China.
5. Critical Components and Final Assembly: An effective, cost-efficient manufacturing strategy that also protects intellectual property involves building assembly plants in the target market country while retaining production of critical components in the home country. (Ipaki & Hosseini, 2025).

3.5.3 The organizational factors are as follows:

1. Supply Chain and Sourcing Management: This involves securing raw materials and energy sources sustainably and efficiently, in addition to

developing flexible supply chains capable of facing global crises and disruptions.

2. Sustainable Capital and Investment: This is achieved by providing sufficient funding for establishing and developing factories, along with continuous investment in new equipment and technologies.
3. Human Resources and Skills: This entails having a skilled and trained workforce, with investments in developing technical and managerial skills.
4. Leadership and Organizational Support: This requires strategic leadership that supports innovation and effectively manages risks (Cengiz & Manga, 2024:16).

3.6 The problems that manufacturing companies face when designing their business models for global operations (Chopra & Meindl, 2001) (Prempeh, 2024)

- everaging Globalization: Will it provide a source of growth, or a short-term competitive advantage based on low-cost manufacturing or any other such factor?
- Potential Markets: Which countries are likely to be large markets for the company's products? Which countries are not potential markets at all?
- Product Customization and Regional Adaptation: Should the product be customized to meet local cultural needs in each country, or should the company sell standardized products? Can a low-cost differentiation strategy be applied to the product?
- Global Sales: What is the strategic approach to increasing sales in each target country? What are the estimated expenses? Where should service centers be located? What distribution systems are necessary?
- Manufacturing Plants: How should manufacturing facilities be distributed?
- Final Assembly Plants: Should they be located in low-cost countries or in the countries where products are sold? How can manufacturing plants be designed to facilitate production transfer operations from one country to another?
- &D Centers Location: Where should Study and development centers be located? Should they be distributed across multiple countries or concentrated in one location?
- Strategic Alliances: Which companies and countries might provide strategic alliances?

A comprehensive analysis of these issues will provide companies with the cornerstone for developing an integrated global business model, which consists of the following: (Ikumapayi et al., 2020) (Vuk, 2025)

1. Prioritizing long-term strategies over immediate performance.
2. Targeting countries with significant marketing potential for its new products.
3. Aligning product customization and regional adaptation in countries and markets.
4. Seamlessly integrating global supply chains.
5. Locating finishing facilities in major target markets.
6. Globalizing distribution systems.
7. Developing global strategic alliances.
8. Distributing Study and development across targeted product markets wherever possible for global support.
9. Product development, as well as accessing the world's best talents.

4. The field framework

Brief Overview of the Study Sample: The Mass Iraq Iron and Steel Plant is one of the largest and most important iron and steel plants in Iraq, and among the largest in the Middle East. Located in the Bazian area of Sulaymaniyah Governorate in the Kurdistan Region, approximately 38 kilometers west of Sulaymaniyah, the plant has a production capacity of about 1.25 million tons of iron annually. Construction began in 2011, and production commenced in 2015 to meet the growing demand for iron used in the reconstruction of Iraqi cities. The plant produces various types of iron and industrial iron products, such as reinforcing bars, square steel, angles, and steel bars, in accordance with international standards (BS, ASTM, and ISO). The plant has also been ISO 9001:2015 certified since 2016, enhancing its credibility and making it a reliable partner for major Iraqi companies in the oil, energy, and construction sectors.

4.1 Describing and diagnosing the factors contributing to the success of global manufacturing at the factory under study.

Table (2) data regarding paragraphs (x6, x5, x4, x3, x2, x1) respectively, which represent strategic factors, showed that (91.7%) of the respondents agreed that their company has a clear strategic plan focused on achieving global manufacturing, with an arithmetic mean of (4.49) and a standard deviation of (0.65). This served as a starting point for paying attention to implementing modern manufacturing systems in alignment with its manufacturing strategies and the requirements of global markets, as indicated by the responses of (85%) of the respondents, with an arithmetic mean of (4.07) and a standard deviation of (0.606). Additionally, (66%) of the respondents agreed that their company has plans to improve its production processes and expand its manufacturing capacities, with an arithmetic mean of (3.83) and a standard deviation of (0.71). meanwhile, the responses of (86.6%) of the respondents acknowledged that their company focuses on innovation and new product development when formulating its plans, with an arithmetic mean of (4.10) and a standard deviation of (0.60). This indicates the company's reliance on studying and analyzing the market and competitors to periodically and continuously update its strategies, as agreed upon by the responses of (78.7%) of the respondents, with an arithmetic mean of (3.92) and a standard deviation of (0.607). Furthermore, the company seeks to integrate environmental sustainability into its manufacturing strategies by using eco-friendly practices, managing waste, and reducing the consumption of natural resources, as indicated by the responses of (56.7%) of the respondents, with an arithmetic mean of (3.77) and a standard deviation of (0.76).

Regarding the organizational factors represented by paragraphs (x13, x12, x11, x10, x9, x8, x7) respectively, they were framed through the respondents' confirmation that the management structure in their company plays a role in supporting the implementation of manufacturing strategies, with an agreement rate of (76.6%) from the respondents' answers, an arithmetic mean of (4.04), and a standard deviation of (0.723). In addition, there is effective coordination between the company's different departments to ensure efficient and successful production processes, as confirmed by the answers of (75.0%) of the respondents, with an arithmetic mean of (4.01) and a standard deviation of (0.71). Meanwhile, (66.7%) of the respondents agreed that the company provides modern and continuous training programs to develop employees' skills in the field of manufacturing, with an arithmetic mean of (3.98) and a standard deviation of (0.81). this is supported by the company's adoption of

a policy of material and moral incentives to encourage and improve employee performance, as acknowledged by the answers of (85.1%) of the respondents, with an arithmetic mean of (4.28) and a standard deviation of (0.71). Additionally, the company enjoys a work environment that keeps pace with change and adapts to the requirements of global manufacturing, as evidenced by the answers of (80.6%) of the respondents, with an arithmetic mean of (4.17) and a standard deviation of (0.74). Furthermore, the company has adopted mechanisms and performance measurement indicators for making continuous improvement decisions, as indicated by the answers of (75.1%) of the respondents, with an arithmetic mean of (4.23) and a standard deviation of (0.845). Meanwhile, the company maintains strong relationships with suppliers to ensure the quality of raw materials used, while seeking to develop its international relationships and partnerships, as agreed upon by (77.4%) of the respondents, with an arithmetic mean of (4.05) and a standard deviation of (0.832).regarding the technological factors represented by paragraphs (x20, x19, x18, x17, x16, x15, x14) respectively, the company uses modern and advanced manufacturing technologies such as concurrent engineering and additive manufacturing, as acknowledged by the answers of (85.3%) of the respondents, with an arithmetic mean of (4.13) and a standard deviation of (0.64). Additionally, the company enjoys good readiness in terms of technological and infrastructural capabilities, as confirmed by the answers of (71.7%) of the respondents, with an arithmetic mean of (4.02) and a standard deviation of (0.77). Furthermore, the answers of (77.2%) of the respondents indicated that the company relies on an advanced information system and digital systems to support production processes and integrate operations, with an arithmetic mean of (4.18) and a standard deviation of (0.79). additionally, the company applies international standards to ensure the quality of its products across all production stages, as agreed upon by the answers of (73.4%), with an arithmetic mean of (4.00) and a standard deviation of (0.736). Meanwhile, (68.4%) of the respondents agreed on the availability of modern and advanced technologies for maintaining the company's equipment, with an arithmetic mean of (3.93) and a standard deviation of (0.756). Furthermore, the company provides cybersecurity and protection for its data and manufacturing operations, as acknowledged by the answers of (78.4%) of the respondents, with an arithmetic mean of (4.18) and a standard deviation of (0.76). The company also continuously measures and monitors key performance indicators to improve its technological processes and monitor production quality, as unanimously agreed upon by the answers of (78.3%) of the respondents, with an arithmetic mean of (4.21) and a standard deviation of (0.77). This reflects the organization's efforts to raise the living standards of individual workers through consideration of corporate social responsibility.

Table (2) Frequencies, percentages, arithmetic means, and standard deviations of global manufacturing success factors.

Dimensions	Paragraphs	I strongly agree		I agree		neutral		I disagree		I strongly disagree		Arithmetic mean,	standard deviation
		N	%	N	%	N	%	N	%	N	%		
Strategic	x1	21	35.0	34	56.7	5	8.3	---	---	---	---	4.49	0.652

	x2	13	22.7	38	63.3	9	15.0	---	---	---	---	4.07	0.606
	X3	11	19.3	28	46.7	21	35.0	---	---	---	---	3.83	0.717
	X4	14	23.3	38	63.3	8	13.3	---	---	---	---	4.10	0.602
	X5	9	15.4	38	63.3	13	21.7	---	---	---	----	3.92	0.607
	X6	12	20.0	22	36.7	26	43.3	---	---	---	---	3.77	0.767
Regulatory factors	X7	29	48.3	17	28.3	14	23.3	---	---	---	---	4.04	0.723
	X8	15	25.0	30	50.0	15	25.0	---	---	---	---	4.01	0.713
	X9	21	35.0	19	31.7	20	33.3	---	---	---	---	3.98	0.813
	X10	26	43.3	25	41.8	9	15.0	---	---	---	---	4.28	0.715
	X11	26	43.4	22	36.7	12	20.0	---	---	---	---	4.17	0.740
	X12	28	46.7	17	28.1	15	25.0	---	---	---	---	4.23	0.825
	X13	19	31.7	22	36.7	19	31.7	---	---	---	---	4.05	0.832
Technical factors	X14	16	26.7	35	58.6	9	15.0	---	---	---	---	4.13	0.640
	X15	25	41.7	18	30.0	17	28.3	---	---	---	---	4.02	0.770
	X16	25	41.9	21	35.3	14	23.3	---	---	---	---	4.18	0.792
	X17	28	46.7	16	26.7	16	26.7	---	---	---	---	4.00	0.736
	X18	15	25.1	26	43.3	19	31.7	---	---	---	---	3.93	0.756
	X19	24	40.1	23	38.3	13	21.7	---	---	---	---	4.18	0.763
	X20	22	36.6	25	41.7	13	21.7	---	---	---	---	4.21	0.778

The table was prepared by the Studyers based on SPSS results.

to illustrate the dimensionality of the study's variables—namely (strategic factors, organizational factors, technological factors)—factor analysis was employed. Note that supporting this dimensionality requires high loadings on the factors and low loadings on other factors, with the eigenvalues of the latent roots equaling or exceeding one for each factor. Upon examining Table (3), the factor analysis, using the rotation method, yielded seven factors: the first with a value of (3.091), the second with (2.607), the third with (1.964), the fourth with (1.872), the fifth with (1.433), the sixth with (1.281), and the seventh with (1.173).

Table (3) presents the results of factor analysis for the study variables.

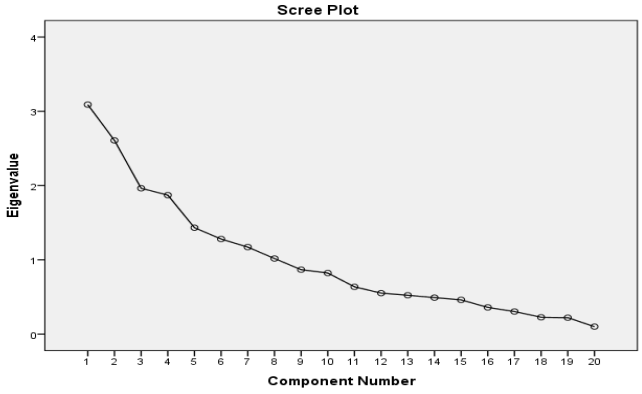
Self-values				Extracted sum of squares of loadings	
elements	**The whole**	**percentage variance**	**Aggregate percentage**	**The whole**	**percentage variance**
the first	3.091	15.452	15.452	3.091	15.452
the second	2.607	13.037	28.488	2.607	13.037
the third	1.964	9.816	38.305	1.962	9.816
Fourth	1.872	9.356	47.662	1.872	9.356
Fifth	1.433	7.163	54.824	1.431	7.163
Sixth	1.281	6.402	61.225	1.280	6.402
Seventh	1.173	5.857	67.084	1.173	5.857

The table was prepared by the Studyers based on SPSS results.

Table (3) data embody the total variance explanation, which reveals that the extracted loading squares groups were determined into seven factors. The cumulative loading square total for these factors, in descending order starting from the first factor with the highest cumulative loading square total down to the seventh factor with the lowest cumulative loading square total, is as indicated in Table (3). The cumulative percentage for the first factor reached (15.451), while its lowest was for the seventh factor (5.858), reflecting the descending order in the values of these factors. This explains that the variables belonging to the first factor, represented by (x3, x5, x6, x7, x8, x9, x15, x17, x18), are the variables on which the study sample Studyers most agreed.

Figure (3) reflects the distribution of eigenvalues across the study variables. It was revealed that the seven factors have values greater than one; hence, the focus was placed on these factors.

Figure (3) Distribution of (self-identity) values on the variables under study



Source: Prepared by researchers

Results of the Global Manufacturing Factors Index: The results in Table (4) indicate that the overall mean score was (4.09), meaning there is general agreement among the sample members on the availability of these dimensions. This reflects a generally good level of performance. The relatively low standard deviation values (0.73) also indicate convergence and homogeneity in the opinions of the respondents, which enhances the reliability of the results and reflects a high degree of agreement among them. At the dimension level, they

were ranked according to the results as follows: The organizational dimension came in first place with a mean score of (4.16), the highest among the dimensions, indicating that organizational aspects (such as laws, procedures, and regulations) receive greater attention and are applied more clearly compared to the other dimensions. The technical dimension came in second place with a mean score of (4.09), indicating the availability of a good level of support and technological applications. However, it is still lower than the organizational dimension, which may reflect a slight gap in the adoption or development of technological aspects. Finally, the strategic dimension came in last place with a mean score of (4.03). Although it remains at a high level, this indicates that aspects related to strategic planning and vision are not addressed. The future needs more reinforcement compared to other dimensions.

Table (4) Results of the Global Manufacturing Factors Index

Dimensions	S. agree	Agree	Neutral	Disagree	S. disagree	mean	S. dev
strategic dimension	22.62	55.00	22.78	0.00	0.00	4.03	0.66
regulatory dimension	39.06	36.19	24.29	0.00	0.00	4.16	0.77
technical dimension	36.97	39.14	23.81	0.00	0.00	4.09	0.75
Overall average	32.88	43.44	23.63	0.00	0.00	4.09	0.73
Total	76.32		23.63	0.000			

Source: Prepared by researchers

4.2 Hypothesis Testing

4.2.1 Main Hypothesis Test (H1): The results in Table (5) show that the arithmetic mean of the overall variable for global manufacturing success factors reached (4.07) with a standard deviation of (0.73), which is higher than the hypothetical mean of (3). The relative weight reached (81.4%), indicating a high level of availability of global manufacturing success factors in the company under study. The results of the t-test showed that the calculated value reached (27.44) at a significance level of (0.000), which is less than (0.05), indicating a significant difference between the arithmetic mean and the hypothetical mean. Therefore, the main hypothesis (H1) is accepted, which states, "There is an appropriate level of global manufacturing success factors in the company under study."

4.2.2 First Sub-Hypothesis Test (H1.1): The results in the table indicate that the arithmetic mean of the technical factors reached (4.09) with a standard deviation of (0.75), which is higher than the hypothetical mean of (3). The relative weight reached (81.8%), reflecting a high level of awareness among the sample regarding the availability of technological factors within the company. The calculated t-value (27.25) at a significance level of (0.000), which is less than (0.05), indicates a significant difference between the arithmetic mean and the hypothetical mean. Therefore, the first sub-hypothesis (H1.1), "A suitable level of technological factors supporting global manufacturing is available in the company under study," is accepted.

4.2.3 Testing the second sub-hypothesis (H1.2): The analysis results show that the arithmetic mean of the organizational factors reached (4.10) with a standard deviation of (0.77), which is higher than the hypothetical mean adopted in the study (3). The relative weight was (82.0%), reflecting a positive perception among the sample members

regarding the availability of organizational factors in the company. The results of the t-test showed a calculated value of (26.83) at a significance level of (0.000), which is less than (0.05), indicating a significant difference between the arithmetic mean and the hypothetical mean. Therefore, the second sub-hypothesis (H1.2) is accepted: "An appropriate level of organizational factors supporting the application of global manufacturing practices is available in the company under study."

4.2.4. Testing the third sub-hypothesis (H1.3): The analysis results indicate that the arithmetic mean of the strategic factors reached (4.03) with a standard deviation of (0.66), which is higher than the hypothetical mean of (3). The relative weight reached (80.6%), indicating the presence of a good level of strategic factors supporting the success of global manufacturing in the company. The calculated t-value reached (29.19) at a significance level of (0.000), which is less than (0.05), indicating a significant difference between the arithmetic mean and the hypothetical mean. Therefore, the third sub-hypothesis (H1.3) is accepted: "A suitable level of strategic factors that enhance the success of global manufacturing is available in the company under study."

Table (5) Results of testing the study hypotheses using the one-sample t-test

Dimension	Number of Items	Mean	S. Dev	Relative Weight %	T Value	Sig
Technical Factors	7	4.09	0.75	81.8 %	27.25	0.000
Organizational Factors	7	4.10	0.77	82.0 %	26.83	0.000
Strategic Factors	6	4.03	0.66	80.6 %	29.19	0.000
Overall Variable	20	4.07	0.73	81.4 %	27.44	0.000

Source: Prepared by researchers

The results in table 6 of the ANOVA analysis also showed statistically significant differences between the three dimensions of global manufacturing success factors, with an F-value of 6.43 at a significance level of 0.002, which is less than 0.05. This indicates that all technical, organizational, and strategic factors contribute independently and effectively to the availability of success factors. Therefore, both the main and sub-hypotheses are accepted, confirming the availability of an appropriate level of global manufacturing success factors within the company.

Table (6) Results of the ANOVA Analysis between the Dimensions of Global Manufacturing Success Factors

Source of Variation	Sum of Squares	D F	Mean Square	F Value	(Sig)
Between Dimensions	4.81	2	2.405	6.43	0.002
Within Dimensions	130.32	348	0.374		
Total	135.13	350			

Source: Prepared by researchers

5. Conclusions and recommendations

5.1 Conclusions

1. The diagnostic descriptive results at the overall level of global manufacturing dimensions revealed positive trends indicating the availability of these dimensions within Mass Iraq Iron and Steel Company at a satisfactory level, thereby confirming

the feasibility of adopting and effectively implementing global manufacturing practices.

2. Sustainable manufacturing within the framework of Mass Iraq Iron and Steel Company necessitates achieving a relative balance between social, economic, and environmental objectives, supported by appropriate policies and practices that enhance the critical success factors of global manufacturing.

3. Global manufacturing contributes to poverty alleviation in society by creating industrial job opportunities at Mass Iraq Iron and Steel Company or through the long-term utilization of its products, reflecting one of its key social success factors.

4. Investing in renewable energies as a clean alternative to traditional sources represents a strategic objective for most nations worldwide, including support for Mass Iraq Iron and Steel Company, to realize sustainable manufacturing while ensuring the welfare of the current society and preserving the rights of future generations as an integral component of global manufacturing success factors.

5. Global manufacturing at Mass Iraq Iron and Steel Company contributes to environmental preservation by minimizing harmful industrial activities and preventing the depletion of non-renewable natural resources, thereby strengthening its environmental success factors.

6. A confluence of external market forces, emerging technologies, and new competitors is compelling manufacturing firms, including Mass Iraq Iron and Steel Company, to transform their business operations. Successful and sustainable transformation demands strategic reevaluation and planning, a strong emphasis on value creation through services, and a commitment to technology-driven innovation that transcends conventional approaches—constituting essential elements of global manufacturing success factors.

7. Manufacturing flexibility plays a pivotal role in securing a competitive advantage in the international market for Mass Iraq Iron and Steel Company, enabling rapid responses to evolving market dynamics, enhancing responsiveness, reducing costs, and improving customer satisfaction. The findings of this study underscore the critical importance of adaptable manufacturing systems in attaining operational excellence and strategic responsiveness as primary success factors.

5.2 Recommendations

Based on the foregoing conclusions, the study put forward a number of recommendations:

1. The study recommends that governmental entities support Mass Iraq Iron and Steel Company to bolster its competitive position in the markets, thereby reinforcing the critical success factors of global manufacturing within the company.

2. It is essential to eradicate pollution instances detrimental to the environment by achieving equilibrium between the activities of Mass Iraq Iron and Steel Company and its surrounding environment, as a fundamental element in enhancing the environmental success factors of global manufacturing.

3. Efforts should be directed toward orienting individuals within organizations toward research and development, while fostering a culture of innovation through the establishment of continuous training programs, to underpin the technical and organizational success factors in Mass Iraq Iron and Steel Company.

4. Consideration must be given to elevating the living standards of employees and providing job opportunities for the unemployed, as part of the social objectives supporting the success factors of global manufacturing at Mass Iraq Iron and Steel Company.

5. Mass Iraq Iron and Steel Company must operate according to the principle of profit maximization to ensure economic sustainability as a primary factor in the success of global manufacturing practices.

In addition to the previous recommendations, it is proposed for **Mass Iraq Iron and Steel Company** a simple, practical mechanism that includes a quick assessment of the current situation (strengths and weaknesses), a step-by-step plan with a clear timeline and budget, local partnerships with the government and companies for training and support, and a small internal team for continuous improvement and adaptation to market changes.

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Use of generative artificial intelligence and AI-supported tools in the writing process: The authors did not rely on artificial-intelligence programs in carrying out this Study.
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M/ Questionnaire form

Warm Greetings...

The questionnaire form in your hands represents a part of the Study project titled *(The Extent of Availability of Global Manufacturing Dimensions in Business Organizations: A Survey Study of Opinions from a Sample of Employees at Mas Iron and Steel Company)*. This form serves as a measurement tool relied upon for scientific Study purposes. We hope you will answer the questions included in it.

Thank you for your cooperation

Dimensions	Sequence	phrase	I strongly agree	I agree	neutral	I disagree
Strategic factors	1.	Our company has a clear strategic plan focused on achieving global manufacturing within it.				
	2.	Our company's manufacturing strategies are aligned with the requirements of global markets.				
	3.	Our company has plans to improve its production processes and expand its manufacturing capabilities.				
	4.	Our company focuses on innovation and developing new products when setting its plans.				
	5.	Our company relies on studying and analyzing the market and competitors to update its strategies periodically and continuously.				
	6.	Our company integrates environmental sustainability into its manufacturing strategies, employing environmentally friendly practices and focusing on waste management and reducing the consumption of natural resources.				
Regularity Factors	7.	Our company's management structure plays a role in supporting the implementation of manufacturing strategies.				
	8.	There is effective coordination between the various departments of the company to ensure that production runs efficiently and successfully.				
	9.	Our company offers modern and ongoing training programs to develop the skills of workers in the manufacturing field.				
	10.	Our company adopts a policy of material and moral incentives to encourage and improve employee performance.				
	11.	Our company has a work environment that keeps pace with change and adapts to the requirements of global manufacturing.				
	12.	Our company has approved mechanisms and performance measurement indicators for making continuous improvement decisions.				
	13.	Our company builds strong relationships with suppliers to ensure the quality of raw materials used, and also seeks to develop its international relationships and partnerships.				
Technical Factors	14.	Our company uses modern and advanced manufacturing technologies such as concurrent engineering and additive manufacturing.				
	15.	Our company has a good technical and technological infrastructure.				

	16.	Our company relies on an advanced information system and digital systems to support production processes and link operations within them.				
	17.	Our company applies international standards to ensure the quality of its products at all stages of production.				
	18.	Our company has modern and advanced technologies for maintaining its equipment.				
	19.	Our company provides cybersecurity protection for its data and manufacturing operations.				
	20.	Our company continuously measures and monitors key performance indicators to improve its technical processes and monitor production quality.				