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## The contribution of advanced manufacturing in enhancing marketing intelligence: A survey study of the opinions of a sample of workers in Badush Cement Factory in Nineveh Governorate

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### A B S T R A C T

The present study aims to examine the relationship between advanced manufacturing and marketing intelligence, focusing on both their influence and association. Specifically, the research investigates the extent to which the dimensions of the independent variable, advanced manufacturing—comprising computer-aided manufacturing, computer-aided design, flexible manufacturing systems, and material handling technologies—affect the dependent variable, marketing intelligence. The dimensions of marketing intelligence include product intelligence, customer intelligence, market understanding, and competitor intelligence. The study is conducted at Badoush Cement Factory in Nineveh Governorate, utilizing a questionnaire as the primary data collection tool. The collected data, based on a sample of 199 respondents representing employees of the organization under study, were analyzed using SPSS (Version 24) and AMOS (Version 24). The statistical methods applied include percentage analysis, arithmetic mean, standard deviation, coefficient of variation, and response intensity. The findings confirm a significant influence of advanced manufacturing on marketing intelligence at varying levels within the organization. Furthermore, the study presents several recommendations, the most notable of which is the need to enhance the adoption of advanced manufacturing approaches and develop a more expressive and data-driven marketing intelligence strategy to achieve the organization's objectives effectively.

**Keywords:** Advanced manufacturing, Marketing intelligence, Badush cement factory in Nineveh Governorate



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### **Introduction:**

Most business organizations strive to keep pace with technological advancements and progress in manufacturing systems and technologies, particularly those adopted in rapidly evolving manufacturing processes. One such approach is advanced manufacturing, which encompasses computer-aided design, computer-aided manufacturing, flexible manufacturing systems, and material handling technologies. This approach enhances the speed and flexibility of manufacturing operations within a smart and integrated digital system. The Badoush Cement Factory in Nineveh Governorate is among the organizations implementing this strategy to improve quality, increase flexibility, and reduce costs, thereby gaining a competitive advantage.

In addition to technological advancement, organizations recognize the importance of capturing and retaining the largest possible customer segment by securing a strong market share that ensures their survival and continuity in an increasingly competitive and saturated market. This is where marketing intelligence plays a crucial role. Marketing intelligence, represented by its key dimensions—product intelligence, market understanding, competitor intelligence, and customer intelligence—serves as a strategic marketing tool that enhances an organization's ability to navigate competitive market challenges. By leveraging marketing intelligence, organizations can develop and implement effective marketing policies, create market value, and achieve their marketing objectives. Furthermore, it enables informed decision-making, strategic planning, customer satisfaction, and overall business sustainability, ensuring long-term profitability and market presence.

The first section dealt with the research methodology, the second dealt with the theoretical aspect of the research, the third section covered the field aspect, and finally the fourth section came with the conclusions and proposals as follows:

## **Chapter One: Research Methodology**

### **1. Research problem:**

Business organizations face numerous challenges, including technological acceleration across various fields, particularly in marketing. This rapid advancement has made it increasingly difficult for organizations, including Badoush Cement Factory, to sustain traditional marketing strategies without adaptation and development. Consequently, there is an urgent need to adopt a modern marketing approach that enhances the organization's market position, ensures its survival and continuity, and secures a competitive advantage in an environment characterized by intense competition.

Based on this context, the research problem can be articulated through the following central question (Does advanced manufacturing contribute to enhancing marketing intelligence in Badoush Cement Factory?); Additionally, the study seeks to answer the following research questions:

- How does advanced manufacturing impact marketing intelligence within the organization under study?
- What is the nature of the relationship between advanced manufacturing and marketing intelligence at Badoush Cement Factory?

### **2. The importance of the research:**

The significance of this research lies in the role of the proposed variables in enhancing the organization's market position. Advanced manufacturing contributes by enabling the production of high-quality, competitive products, while marketing intelligence ensures these products are marketed effectively and innovatively, securing a strong market position and share. Additionally, the study holds practical importance for Badoush Cement Factory in Nineveh Governorate by assessing the extent to which it adopts these concepts and how they contribute to achieving a competitive advantage aligned with the organization's objectives. Furthermore, the study's findings can be generalized to other organizations, offering insights that may benefit similar industries.

### **3. Research objectives:**

- Diagnose the availability of marketing intelligence dimensions in the researched organization.
- Determine the level of adoption of advanced manufacturing dimensions in the researched organization.
- Reveal the nature of the contribution of advanced manufacturing in enhancing marketing intelligence.

### **4. Hypothetical research plan:**

The hypothetical research plan was based on its problem, importance and objectives to express the relationships of influence and correlation between the two variables and through their dimensions as shown in Figure (1) as follows:

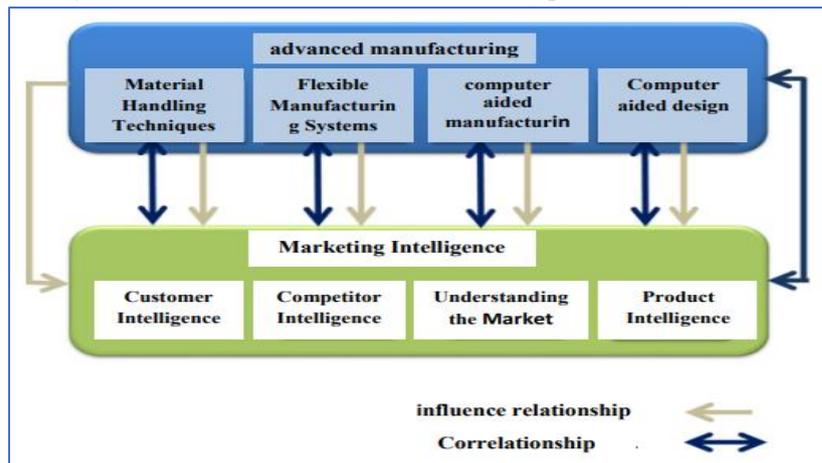


Figure prepared by the researchers (1) Hypothetical diagram

**5. Research hypotheses:**

The research hypotheses are derived from the proposed theoretical framework and are formulated as follows:

- Main Hypothesis: There is no statistically significant correlation between advanced manufacturing and marketing intelligence, both collectively and across individual dimensions, at a significance level of  $\alpha \leq 0.05$  in Badoush Cement Factory, Nineveh Governorate.
- Main Hypothesis: There is no statistically significant effect of advanced manufacturing on marketing intelligence, both collectively and across individual dimensions, at a significance level of  $\alpha \leq 0.05$  in Badoush Cement Factory, Nineveh Governorate.

**6. Research limits:**

- **Spatial boundaries:** The research was conducted in Badoush Cement Factory, Nineveh Governorate, Iraq.
- **Temporal boundaries:** 10/24/2024 to 1/19/2025
- **Human boundaries:** The human sample for the research was represented by Badoush Cement Factory workers from various administrative, technical and leadership levels.

**7. Statistical methods used:**

The study adopted a descriptive analytical approach, utilizing a questionnaire based on the five-point Likert scale as the primary data collection tool. The questionnaire was adapted to align with the objectives of the current study, focusing on describing and diagnosing the research variables through the analysis of responses from a sample of employees at Badoush Cement Factory in Nineveh Governorate. Out of 210 distributed questionnaires, 184 were deemed valid for statistical analysis, yielding a response rate of 88%. Data analysis was conducted using SPSS (Version 26) to determine percentages, arithmetic means, standard deviations, relative importance, reliability (stability measurement), common method bias, internal consistency, and hypothesis testing. Additionally, AMOS (Version 24) was employed for confirmatory factor analysis (CFA) and examining correlation and influence relationships.

## Section Two: The Theoretical Aspect

### Firstly: advanced manufacturing

**1. Advanced Manufacturing Concept;**

The increasing global competition and the rapid advancement of advanced manufacturing technologies are two defining factors in today's business environment. These realities have collectively driven organizations to shift their strategic priorities toward quality enhancement, cost-effectiveness, and responsiveness to market dynamics (Gunawardana, 2006, 116). Advanced manufacturing is a broad term encompassing industries that continuously integrate high-tech advancements in information systems, machinery, materials, and modern management practices (Yin & Su, 2024, 28). It involves a diverse set of planning, design, and manufacturing techniques aimed at reducing costs, improving product quality, and enhancing overall performance in manufacturing organizations (Musebe, 2024,95). Furthermore, (Olugbade., 2025,248-249) defines advanced manufacturing as a

comprehensive system of innovative technologies, incorporating robotics, artificial intelligence, and cyber-physical systems within a unified manufacturing framework. This integration enhances operational efficiency and enables organizations to compete in the global market.

## **2. Dimensions of Advanced Manufacturing**

With the increasing integration of manufacturing, automation, sensors, the Internet of Things (IoT), and high-speed computing, the concept of advanced manufacturing has gained significant attention in the scientific community due to its immense potential across various industrial processes (Zhou & Bacanin, 2024, p. 383). Advanced manufacturing encompasses multiple dimensions, each contributing to the enhancement of efficiency, precision, and innovation in modern production systems.

- **Computer-aided manufacturing**

Computer-aided manufacturing (CAM) involves the use of advanced administrative information technologies to convert computer-designed models into high-quality, precision-engineered final products. Once a product is designed, it is transferred to a computer-integrated system that automates the manufacturing process, minimizing costs while ensuring accuracy and efficiency (Al-Najjar & Mohsen, 2012,178).CAM technologies are widely applied across various industries, including automotive, aerospace, and marine sectors, where they significantly enhance productivity for engineers and researchers while enabling higher levels of performance in research activities (Kyratsis et al., 2020, 1). The role of CAM is particularly critical in organizing and optimizing automated tool paths, ensuring the precise and efficient production of high-quality components (Feldhausen et al., 2022, 1). Furthermore, CAM streamlines manufacturing workflows, reducing production time and improving overall operational efficiency (Stamenković et al., 2021, 1-2).

- **Computer-aided design**

Computer-aided design (CAD) offers several key advantages in the design process, including providing detailed information about the designed shape, reducing time and effort, and improving overall efficiency. Historically, product development required several years to complete, whereas CAD has significantly shortened this timeline (Fujita, 2020, 8). Additionally, CAD plays a crucial role in reducing production costs by operating within an integrated system, specifically computer-integrated manufacturing (CIM), which enhances coordination between design and production processes (Larshin et al., 2021, 112). The primary goal of automating the analytical design stages is to ensure that components and assemblies meet performance requirements and comply with design standards. CAD software enables the creation of detailed computer models, facilitates virtual assembly, and simulates performance under various conditions. Expert evaluations are then conducted to determine whether modifications are necessary to optimize the design (Saini, 2023, 1874).

- **Flexible Manufacturing Systems**

Flexible manufacturing focuses on delivering the right products, in the right quantities, at the right time, and in the right location to optimize workflow, minimize waste, and provide adaptability. Key principles of flexible manufacturing include zero waiting time, zero inventory, attracting internal customers (rather than relying solely on external transactions), reduced batch sizes, and minimized processing times (Katarikar, 2020,1065). Several studies (Al-Ghannam, 2022,577; Katikar, 2020,1065; Mahmood et al., 2017, 425) highlight the following advantages of flexible manufacturing:

- Establishing and maintaining long-term relationships with suppliers through the sharing of cost and risk information.
    - Flexibility in producing a variety of products with different specifications, enabling rapid production without sacrificing efficiency, even for smaller quantities.
    - Continuous improvement by reducing waste, enhancing product quality, increasing productivity, and fostering information sharing across processes.
    - The pull system, where products are demand-driven (pulled from the customer side), rather than push-based (driven by the production line), ensuring production aligns with actual customer demand.

- **Material Handling Technologies**

Material handling in manufacturing presents a significant challenge for operators, which can be mitigated through the use of appropriate material handling technologies, such as forklifts and automated guided vehicles. These technologies not only reduce the physical effort and cognitive workload required for operations but also contribute to improving production efficiency and enhancing occupational safety within the factory environment (Soufi et al., 2021,123).Moreover, material handling technologies have a profound impact on the productivity, safety, and sustainability of the manufacturing process. However, if these technologies are not designed and implemented efficiently, they can lead to excessive spending. For instance, a large fleet of material handling equipment with low overall effectiveness can complicate internal logistics and increase operational costs (Soufi et al., 2023, 1; Soufi et al., 2024,3).

(Bianchi et al., 2024, pp. 1-2) highlighted the diverse applications of material handling technologies across multiple sectors, including biomedicine, manufacturing, and logistics. In manufacturing, these technologies are used to feed and position parts on assembly lines, significantly enhancing both production efficiency and accuracy. In logistics, material handling technologies facilitate tasks such as sorting, routing, and stacking packages, which improve the speed and accuracy of handling operations. In biomedicine, material handling is essential for handling microscopic and delicate items, such as biological samples, ensuring precise manipulation in critical processes.

## **Second: Marketing Intelligence**

### **1. The concept of marketing intelligence**

The information provided by marketing intelligence significantly enhances organizational insight, helping to achieve both the ultimate goals of the organization and the needs and desires of current and potential customers. It facilitates better communication with customers to understand their current and future needs, tendencies, desires, and market behavior, while also allowing organizations to evaluate changes in the business environment that impact the size and nature of the market. Additionally, marketing intelligence helps in monitoring competitor activities, providing early warnings that ensure the organization's survival and competitiveness (Kinoti, 2016, 2-3). Marketing intelligence can take the form of information gathered by managers regarding developments in the marketing environment, reflecting daily changes. This information is obtained through a series of procedures and sources that systematically provide data (Kotler & Keller, 2012, 71).

(Al-Murad et al., 2018, p. 261) define marketing intelligence as a set of organizational capabilities that derive input by systematically monitoring all events related to the organization's activities. This information is then used to influence the organization's future directions, which are communicated to relevant stakeholders, including strategic leaders and marketing managers while (Jaffar et al., 2024, 68) further describe it as the ability to understand, evaluate, and analyze both the internal and external environments in relation to competitors, customers, and markets, and to apply this understanding to long-term and short-term strategic planning.

### **2. Dimensions of marketing intelligence**

#### **• Product Intelligence**

The product plays a crucial role in shaping an organization's strategic decisions and activities, influencing the type of industry in which the organization operates, and determining the nature and scope of its target markets. Additionally, the product serves as the tool through which the organization meets the needs and desires of its customers. Decisions regarding the type of product, the introduction of new products, or the modification or discontinuation of existing products have a significant impact on the organization's strategic direction (Latifa, 2018, 157).

In 2021, it was highlighted that product intelligence can significantly enhance product development, improve customer experiences, and increase profitability. Notable companies like Amazon, Apple, and Google have leveraged product intelligence to drive innovation and growth (Forbes, 2021). Product intelligence refers to the use of data mining techniques to extract valuable insights about products, aimed at enhancing customer satisfaction and identifying potential business opportunities (Jaffar, 2024, 68) and (Abdou., 2024, 66) were explained that product intelligence involves collecting and analyzing data about an organization's products and its competitors' expectations. This process equips the organization's management with essential insights to inform product development and innovation activities.

#### **• The market is catching up**

Marketing intelligence plays a critical role in continuously monitoring the market and providing the organization's management with real-time, accurate information. Social media and the Internet are among the most important sources for gathering data on current market trends, customer needs, desires, ideas, and complaints (Armstrong et al., 2017, 131). A deep understanding of the market allows the organization to develop appropriate strategies to face challenges posed by competitors, as it reduces uncertainty and risk. With this understanding, the organization can better determine effective methods of operation in its specific market environment. When entering new markets, organizations must address various uncertain factors, such as the optimal product mix, market share, customer profiles, and effective methods of reaching these customers (Ben Sheikh & Shamakh, 2019, 36).

According to (Qader., 2019, 115; Massoudi., 2018, 6; Jaffar., 2024, 68), market research provides several key benefits, including:

- ❖ The ability to identify customer requirements, characteristics, and interests.
- ❖ The identification of market changes that competitors may overlook.
- ❖ The capacity to assess demand for a specific product.
- ❖ The discovery of new market segments

#### **• Competitor Intelligence**

Competitive intelligence is a powerful strategic tool that involves the monitoring, collection, and analysis of publicly available information regarding consumers, competitors' behavior, and market developments. The primary goal of this process is to enhance strategic decision-making by gaining a deep understanding of the consumer environment, evaluating competitors' strengths and weaknesses, and providing early warnings of potential opportunities and threats. Techniques used in competitive intelligence include direct consumer monitoring, employee testing, benchmarking competitors' products, online research, and social media monitoring.

Effective marketing information derived from competitive intelligence helps organizations understand how consumers behave, interact with, and discuss their brand. This understanding is crucial for achieving a sustainable competitive advantage (Kotler et al., 2017, 127). Competitive intelligence is vital for organizations as it enables them to track and analyze competitors' actions and movements in the market. With the increasing number of agile competitors, the ability to monitor, analyze, and respond to their activities is essential. Competitive intelligence helps collect, analyze, and disseminate information about the competitive and ever-changing business environment (Prasetyo, 2024, 832).

• **Customer Intelligence**

It is surprising that many executive managers of organizations complain that their It is surprising that many executive managers of organizations express dissatisfaction with their marketing strategies, noting that despite significant investments, their organizations see minimal profit and success. One of the main reasons for this is the reliance on outdated marketing practices, which often equate marketing with mere selling. Fortunately, traditional marketing approaches are gradually being replaced by modern, more strategic methods. Smart marketing organizations have begun to focus on developing customer knowledge, engaging customers more effectively, understanding customer economics, and gaining deeper insights into customer desires (Manis & Mughith, 2022,21). According to (Davis.,2022,37), customer intelligence involves analyzing data to improve business processes, enhance the customer experience, and increase profitability. Marketing intelligence has enabled marketers to closely monitor customers, better understand their interests, and analyze customer conversations about their favorite products. This shift requires organizations to employ skilled employees who are trained to understand consumer purchasing behavior, helping to shape the desired characteristics of products, build long-term customer relationships, and track customers' responses to the products they use. Subsequently, these insights can be analyzed and interpreted to refine future marketing strategies (Al-Hassi, 2023, 234) , also (Abdou., 2024,66) emphasizes that market research plays a crucial role in gathering data on customers' purchasing behavior, preferences, motivations, fears, and perceptions. This research helps create a comprehensive consumer profile, which is essential for developing targeted marketing strategies.

**Section Three: The Practical Side**

**A. Correlation Analysis**

First Hypothesis: The first main hypothesis posits that there is no significant correlation between advanced manufacturing and marketing intelligence at a statistical significance level of  $(0.05 \geq \alpha)$  from the perspective of a sample of managers working at Badush Cement Factory in Nineveh Governorate. The results presented in Table 1 and Figure 2 indicate a positive correlation between advanced manufacturing and marketing intelligence. The correlation coefficient was found to be 0.84, suggesting a strong relationship. Additionally, the significance of this relationship is supported by the P-value of 0.012, which is below the 0.05 threshold. This result confirms statistical significance. Furthermore, the similarity of the lower and upper limits within the 95% Confidence Interval further reinforces the strength of the relationship at the (0.05) significance level. Based on these findings, we reject the null hypothesis and accept the alternative hypothesis, concluding that a positive and significant correlation exists between advanced manufacturing and marketing intelligence, with a significance level of  $(0.05 \geq \alpha)$ .

Table (1) The relationship between advanced manufacturing and marketing intelligence

The first variable	Relationship direction	The second variable	Link value	95% Confidence Interval		Probability value P-value
				Lower	Upper	
advanced manufacturing	<-->	Marketing Intelligence	0.84	0.757	0.901	0.012

Source: Prepared by the researchers based on the results of the statistical analysis using AMOS V24 software n=184

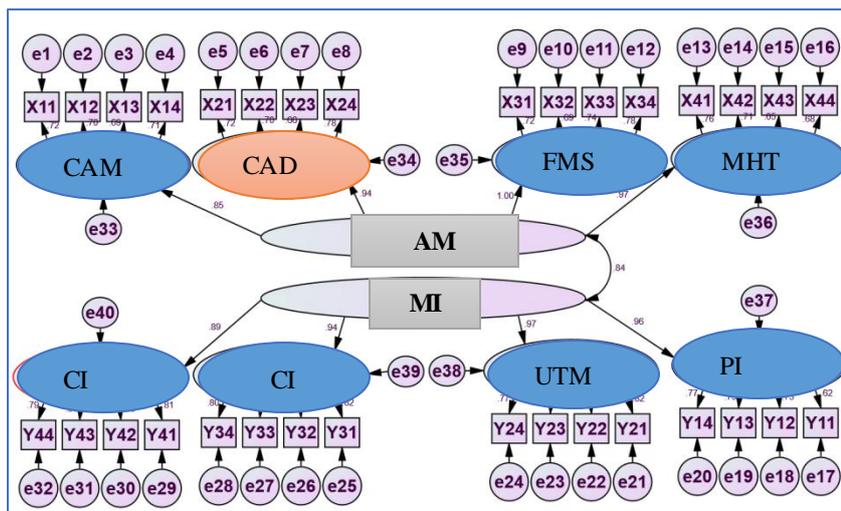


Figure (2) The relationship between advanced manufacturing and marketing intelligence

**The first sub-hypotheses arising from the first main hypothesis:**

The hypothesis states that there is no significant correlation between the dimensions of advanced manufacturing and marketing intelligence. This is at a statistical significance level of  $(0.05 \geq \alpha)$  from the perspective of a sample of managers at Badush Cement Factory in Nineveh Governorate.

- There is no significant correlation for advanced manufacturing in product intelligence at a statistical significance level  $(0.05 \geq \alpha)$  from the point of view of a sample of workers in Badush Cement Factory in Nineveh Governorate.
- There is no significant correlation for advanced manufacturing in understanding the market at a statistical significance level  $(0.05 \geq \alpha)$  from the point of view of a sample of workers in Badush Cement Factory in Nineveh Governorate.
- There is no significant correlation between advanced manufacturing and competitor intelligence at a statistical significance level  $(0.05 \geq \alpha)$  from the point of view of a sample of workers in Badush Cement Factory in Nineveh Governorate.
- There is no significant correlation between advanced manufacturing and customer intelligence at a statistical significance level  $(0.05 \geq \alpha)$  from the point of view of a sample of workers in Badush Cement Factory in Nineveh Governorate.

**The results of Table (1) and Figure (2) indicate all of the following:**

- There is a direct correlation between computer-aided manufacturing and marketing intelligence, as indicated by the value of the correlation coefficient, which appeared equal to (0.66), and this relationship is significant based on the probability value (P-value), which appeared equal to (0.009), which is less than (0.05), in addition to the similarity of the signals of both the lower and upper limits of the confidence limits (95% Confidence Interval) at a significance level of (0.05).

This leads us to reject the null hypothesis and accept the alternative hypothesis that there is a correlation between computer-aided manufacturing and marketing intelligence, and this relationship is positive and significant at a significance level of  $(0.05 \geq \alpha)$ .

- There is a direct correlation between computer-aided design and marketing intelligence, as indicated by the value of the correlation coefficient, which appeared equal to (0.76), and this relationship is significant based on the probability value (P-value), which appeared equal to (0.006), which is less than (0.05), in addition to the similarity of the signals of both the lower and upper limits of the confidence limits.

This leads us to reject the null hypothesis and accept the alternative hypothesis that there is a correlation between computer-aided design and marketing intelligence, and this relationship is direct and significant at a significance level of  $(0.05 \geq \alpha)$ .

- There is a direct correlation between flexible manufacturing systems and marketing intelligence, as indicated by the value of the correlation coefficient, which appeared equal to (0.89), and this relationship is significant based on the probability value (P-value), which appeared equal to (0.008), which is less than (0.05), in addition to the similarity of the signals of both the lower and upper limits of the confidence limits at a significance level of (0.05).

It leads us to reject the null hypothesis and accept the alternative hypothesis that there is a correlation between flexible manufacturing systems and marketing intelligence, and this relationship is directly proportional and significant at a significance level of  $(0.05 \geq \alpha)$ .

- There is a direct correlation between material handling techniques and marketing intelligence, as indicated by the value of the correlation coefficient, which appeared equal to (0.86), and this relationship is significant based on the probability value (P-value), which appeared equal to (0.694), which is less than (0.05), in addition to the similarity of the signals of both the lower and upper limits of the confidence limits at a significance level of (0.05).

This leads us to reject the null hypothesis and accept the alternative hypothesis that there is a correlation between material handling techniques and marketing intelligence, and this relationship is positive and significant at a significance level of  $(0.05 \geq \alpha)$ .

Table (2) The relationship between the dimensions of advanced manufacturing and marketing intelligence

The first variable	Relationship direction	The second variable	Link value	95% Confidence Interval		probability value P-value
				Lower	Upper	
computer aided manufacturing	<-->	Marketing Intelligence	0.66	0.466	0.802	0.009
Computer aided design	<-->		0.76	0.537	0.861	0.015
Flexible Manufacturing Systems	<-->		0.89	0.807	0.974	0.008
Material Handling Techniques	<-->		0.86	0.694	0.957	0.019

Source: Prepared by the researchers based on the results of the statistical analysis using AMOS V24 software n=184

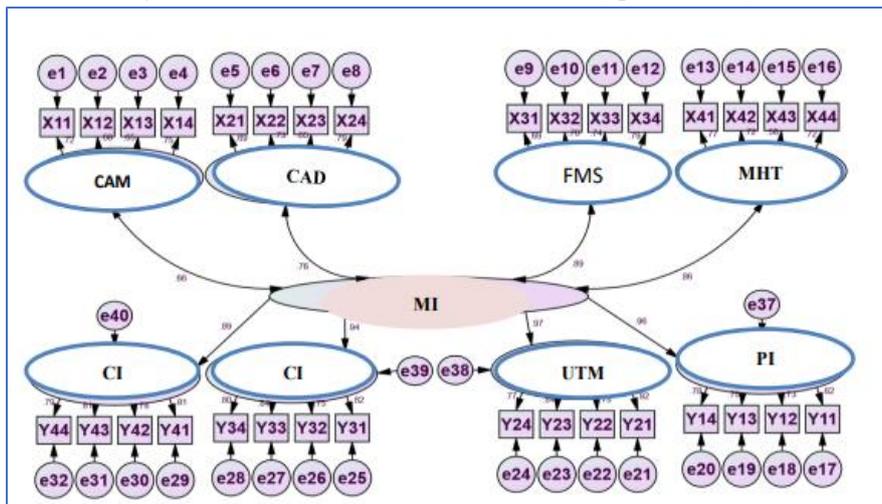


Figure (4) The relationship between advanced manufacturing and marketing intelligence dimensions  
**Source:** Prepared by the researchers based on the results of the statistical analysis using AMOS V24 software n=184

**2. Impact relationship analysis**

The content of this analysis reflects the test of the relationships of the influence of each of the independent variable(s) on the dependent variable as follows:

**The second main hypothesis:** There is no significant effect of advanced manufacturing on marketing intelligence at a statistical significance level ( $0.05 \geq \alpha$ ) from the point of view of a sample of managers working in Badush Cement Factory in Nineveh Governorate.

Table (3) and Figure (4) show each of the following:

- There is a direct effect of advanced manufacturing on marketing intelligence, as indicated by the value of the regression coefficient Estimate ( $\beta$ ) which reached (0.72), and this effect is significant as indicated by the probability value (P-value) which reached (0.005) which is less than (0.05), and the same result indicates the critical value (C.R.) which reached (5.90) which is greater than the tabular value (tab) which reached (1.96).

This leads us to reject the null hypothesis and accept the alternative hypothesis that there is an effect of advanced manufacturing on marketing intelligence, and this effect is positive and significant at the significance level ( $0.05 > \alpha$ ).

- The value of the coefficient of determination (R-Square) indicates that (70%) of the changes in (marketing intelligence) are due to (advanced manufacturing) and the remaining percentage of (30%) is attributed to other variables that were not included in the regression model (impact model). In other words, we can say that advanced manufacturing explains (70%) of the changes in marketing intelligence.

Table (4) Results of the impact of advanced manufacturing on marketing intelligence

independent variable	Direction of influence	Dependent variable	regression coefficient Estimate( $\beta$ )	Standard error of regression coefficients ( $\beta$ )	coefficient of determination	Critical value C.R.	P-value
					R-square		
التكنولوجيا المتقدمة	↑	Marketing Intelligence	0.72	0.122	0.70	5.90	0.005

Table value (1.96=tTab)

**Source:** Prepared by the researchers based on the results of the statistical analysis using AMOS V24 software n=184

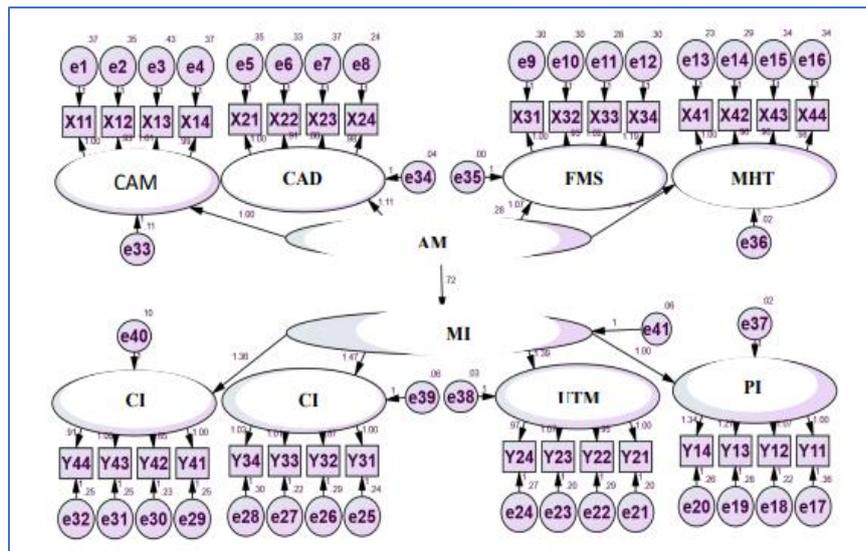


Figure (5)

The impact of advanced manufacturing on marketing intelligence

Source: Prepared by the researchers in light of the results of the statistical analysis using AMOS V24 software n=184

**The first sub-hypotheses arising from the second main hypothesis:**

- There is no significant effect of computer-aided manufacturing on marketing intelligence at a statistical significance level ( $0.05 \geq \alpha$ ) from the point of view of a sample of workers in Badush Cement Factory in Nineveh Governorate.
- There is no significant effect of computer-aided design on marketing intelligence at a statistical significance level ( $0.05 \geq \alpha$ ) from the point of view of a sample of workers in Badush Cement Factory in Nineveh Governorate.
- There is no significant effect of flexible manufacturing systems on marketing intelligence at a statistical significance level ( $0.05 \geq \alpha$ ) from the point of view of a sample of workers in Badush Cement Factory in Nineveh Governorate.
- There is no significant effect of material handling technology on marketing intelligence at a statistical significance level ( $0.05 \geq \alpha$ ) from the point of view of a sample of workers in Badush Cement Factory in Nineveh Governorate.

**The results of Table (4) and Figure (5) indicate all of the following:**

- There is a direct effect of computer-aided manufacturing on marketing intelligence, as indicated by the value of the regression coefficient Estimate ( $\beta$ ) which reached (0.48), and this effect is significant as indicated by the probability value which reached (0.003) which is less than (0.05), and the same result indicates the critical value (C.R.) which reached (3.96) which is greater than the table value (tTab) which reached (1.96). This leads us to reject the null hypothesis and accept the alternative hypothesis that there is an effect of computer-aided manufacturing on marketing intelligence, and this effect is positive and significant at the significance level ( $0.05 > \alpha$ ).
- There is a direct effect of computer-aided design on marketing intelligence, as indicated by the value of the regression coefficient Estimate ( $\beta$ ) which reached (0.58), and this effect is significant as indicated by the probability value which reached (0.006) which is less than (0.05), and the same result indicates the critical value (C.R.) which reached (5.32) which is greater than the table value (tTab) which reached (1.96). This leads us to reject the null hypothesis and accept the alternative hypothesis that there is an effect of computer-aided design on marketing intelligence, and this effect is positive and significant at a significance level of ( $0.05 \geq \alpha$ ).
- There is a direct effect of material handling techniques on marketing intelligence, as indicated by the value of the regression coefficient Estimate ( $\beta$ ) which is less than (0.05), and the same result indicates the critical value (C.R.) which reached (6.49) which is greater than the table value (tTab) which is (1.96). This leads us to reject the null hypothesis and accept the alternative hypothesis that there is an effect of flexible manufacturing systems on marketing intelligence and this effect is direct and significant at the significance level ( $0.05 > \alpha$ ).

- There is a direct effect of material handling techniques on marketing intelligence, which reached (0.68), and this effect is significant in terms of the probability value, which reached (0.005), which is less than (0.05). The same result indicates the critical value (C.R.), which reached (5.71), which is greater than the table value (tTab), which reached (1.96).

This leads us to reject the null hypothesis and accept the alternative hypothesis, which states that there is an effect of material handling techniques on marketing intelligence, and this effect is direct and significant at a significance level of  $(0.05 \geq \alpha)$ .

- The dimensions of advanced manufacturing vary in terms of the strength of influence on marketing intelligence from the point of view of a sample of workers in Badush Cement Factory in Nineveh Governorate. It was found that, through the value of the standard regression coefficient (SRW), the dimension (flexible manufacturing systems) came in first place in terms of the ranking of the strength of influence, as indicated by the value of the standard regression coefficient (SRW), which amounted to (0.890), followed in the strength of influence by the dimension (material handling techniques) with a value of the standard regression coefficient of (0.859), while the third place was for the dimension (design by computer) with a value of the standard regression coefficient of (0.759), and in the fourth and last place came the dimension (manufacturing by computer) with a value of the standard regression coefficient of (0.663).
- It is clear to us, through the value of the coefficient of determination (R-Square), that (88%) of the changes in (marketing intelligence) are due to the dimensions of (advanced manufacturing), and the remaining percentage of (12%) is attributed to other variables that were not included in the regression model. In other words, we can say that the dimensions of advanced manufacturing explain (88%) of the changes in marketing intelligence.

independent variable	Direction of influence	Dependent variable	regression coefficient Estimate( $\beta$ )	Standard value of regression coefficient SRW	Standard error of regression coefficient $Se.(\beta)$	coefficient of determination	critical value C.R.	P-value	Arrangement
						R-square			
computer aided manufacturing	→	Marketing Intelligence	0.48	0.663	0.121	0.88	3.96	0.003	4
Computer aided design	→		0.58	0.759	0.109		5.32	0.006	3
Flexible Manufacturing Systems	→		0.74	0.890	0.114		6.49	0.005	1
Material Handling Techniques	→		0.68	0.859	0.119		5.71	0.005	2

Tabular value (1.96=tTab)

Source: Prepared by the researchers based on the results of the statistical analysis using AMOS V24 software n=184

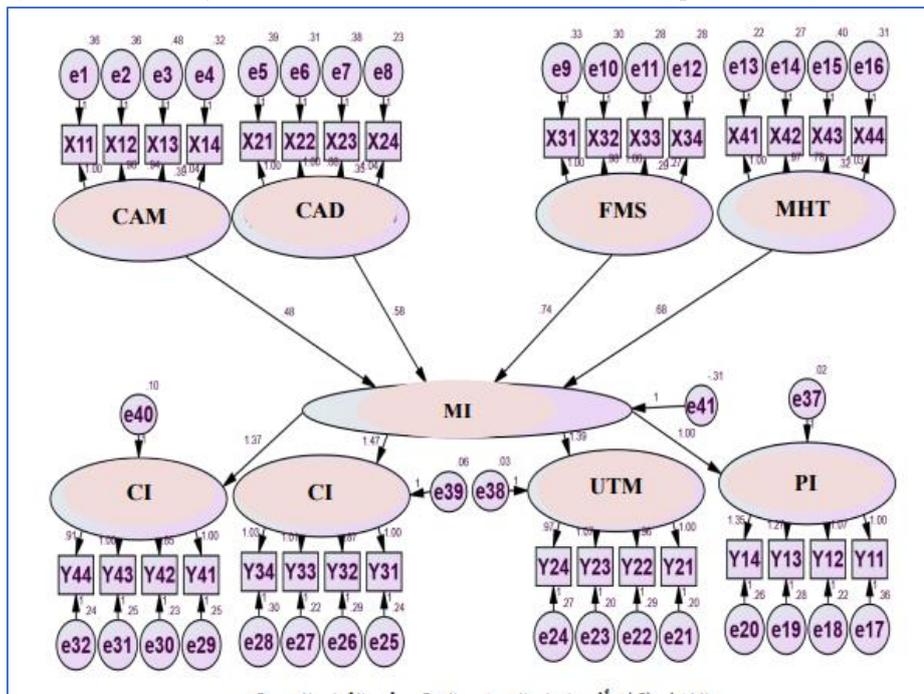


Figure (6) The impact of advanced manufacturing dimensions on marketing intelligence  
 Source: Prepared by the researchers in light of the results of the statistical analysis using AMOS V24 software n=184

**The second sub-hypotheses arising from the second main hypothesis.**

- There is no significant effect of advanced manufacturing on product intelligence at a statistical significance level ( $0.05 \geq \alpha$ ) from the point of view of a sample of workers in Badush Cement Factory in Nineveh Governorate.
- There is no significant effect of advanced manufacturing on market understanding at a statistical significance level ( $0.05 \geq \alpha$ ) from the point of view of a sample of workers in Badush Cement Factory in Nineveh Governorate.
- There is no significant effect of advanced manufacturing on competitor intelligence at a statistical significance level ( $0.05 \geq \alpha$ ) from the point of view of a sample of workers in Badush Cement Factory in Nineveh Governorate.
- There is no significant effect of advanced manufacturing on customer intelligence at a statistical significance level ( $0.05 \geq \alpha$ ) from the point of view of a sample of workers in Badush Cement Factory in Nineveh Governorate.

1. The results of Table (5) and Figure (6) indicate the presence of a direct effect of advanced manufacturing on product intelligence, as indicated by the value of the regression coefficient Estimate ( $\beta$ ) which reached (0.81) and this effect is significant as indicated by the probability value which reached (0.003) which is less than (0.05), and the same result indicates the critical value (C.R.) which reached (6.98) which is greater than the table value (tTab) which is (1.96), as for the value of the coefficient of determination, it indicates that (73%) of the changes in product intelligence are due to advanced manufacturing and the remaining percentage of (27%) is due to other variables that were not included in the model.

This leads us to reject the null hypothesis and accept the alternative hypothesis that there is an effect of advanced manufacturing on product intelligence and this effect is direct and significant at the significance level ( $0.05 \geq \alpha$ ).

Table (6) Results of the impact of advanced manufacturing on product intelligence

independent variable	Direction of influence	Dependent variable	regression coefficient estimate( $\beta$ )	Standard error of regression coefficients. ( $\beta$ )	coefficient of determination	critical value C.R.	P-value
					R-square		
advanced manufacturing	→	Product Integence	0.81	0.116	0.73	6.98	0.003

Tabular value (1.96=tTab)

Source: Prepared by the researchers based on the results of the statistical analysis using AMOS V24 software n=184

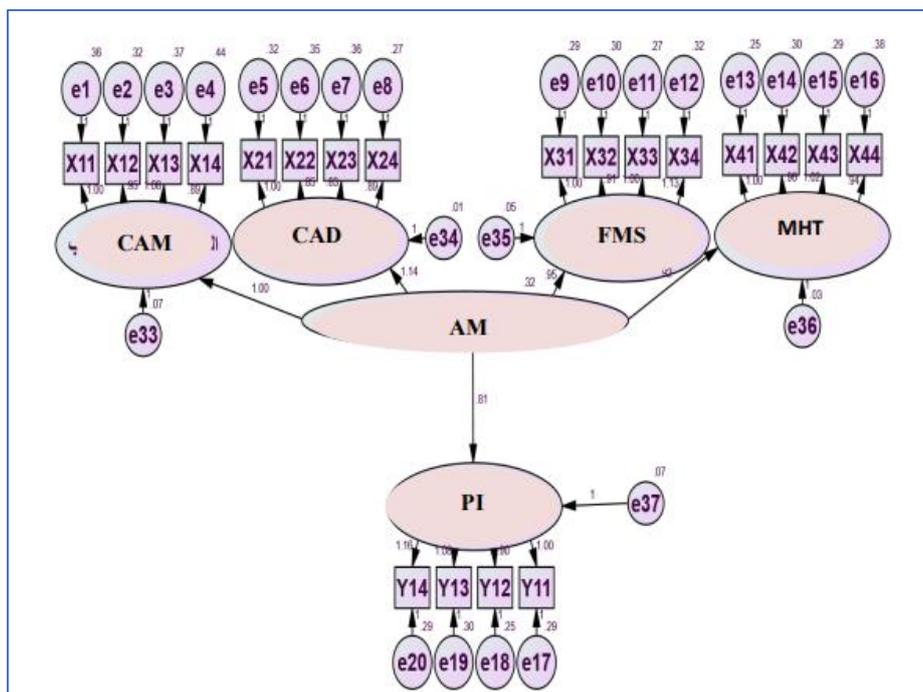


Figure (7) The impact of advanced manufacturing on product intelligence

Source: Prepared by the researchers in light of the results of the statistical analysis using AMOS V24 software n=184

- The results of Table (6) and Figure (7) indicate the presence of a direct effect of advanced manufacturing on market understanding, as indicated by the value of the regression coefficient Estimate ( $\beta$ ) which reached (0.94) and this effect is significant in terms of the probability value which reached (0.011) which is less than (0.05), and the same result indicates the critical value (C.R.) which reached (10.68) which is greater than the table value (tTab) which is (1.96), as for the value of the coefficient of determination, it indicates that (66%) of the changes in market understanding are due to advanced manufacturing and the remaining percentage of (34%) is due to other variables that were not included in the model. This leads us to reject the null hypothesis and accept the alternative hypothesis which states that there is an effect of advanced manufacturing on market understanding and this effect is direct and significant at a significance level ( $0.05 \geq \alpha$ ).

Table (7) Results of the impact of advanced manufacturing on market understanding

independent variable	Direction of influence	Dependent variable	regression coefficient Estimate ( $\beta$ )	Standard error of regression coefficient Se. ( $\beta$ )	coefficient of determination	critical value C.R.	P-value
					R-square		
advanced manufacturing	→	Understanding the Market	0.94	0.088	0.66	10.68	0.011

Tabular value (1.96=tTab)

Source: Prepared by the researchers based on the results of the statistical analysis using AMOS V24 software n=184

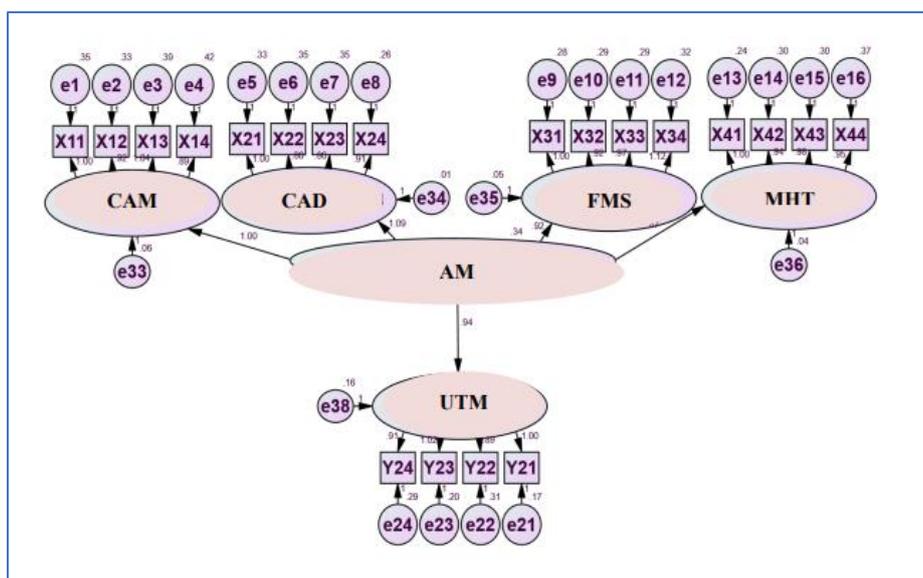


Figure (8) The impact of advanced manufacturing on market understanding

Source: Prepared by the researchers in light of the results of the statistical analysis using AMOS V24 software n=184

- The results of Table (7) and Figure (8) indicate the presence of a direct effect of advanced manufacturing on the competitor's intelligence, as indicated by the value of the regression coefficient Estimate ( $\beta$ ) which reached (0.93) and this effect is significant in terms of the probability value which reached (0.009) which is less than (0.05), and the same result indicates the critical value (C.R.) which reached (10.94) which is greater than the table value (tTab) which is (1.96), as for the value of the coefficient of determination, it indicates that (65%) of the changes in the competitor's intelligence are due to advanced manufacturing and the remaining percentage of (35%) is due to other variables that were not included in the model.

This leads us to reject the null hypothesis and accept the alternative hypothesis that there is an effect of advanced manufacturing on the competitor's intelligence and this effect is direct and significant at the significance level ( $0.05 \geq \alpha$ ).

Table (8) Results of the impact of advanced manufacturing on competitor intelligence

independent variable	Direction of influence	Dependent variable	regression coefficient Estimate ( $\beta$ )	Standard error of regression coefficient Se. ( $\beta$ )	coefficient of determination	critical value C.R.	P-value
advanced manufacturing	→	Understanding the Market	0.94	0.088	0.66	10.68	0.011

					R-square		
advanced manufacturing	→	Competitor Intelligence	0.93	0.085	0.65	10.94	0.009

Tabular value (1.96=tTab)

Source: Prepared by the researchers based on the results of the statistical analysis using AMOS V24 software n=184

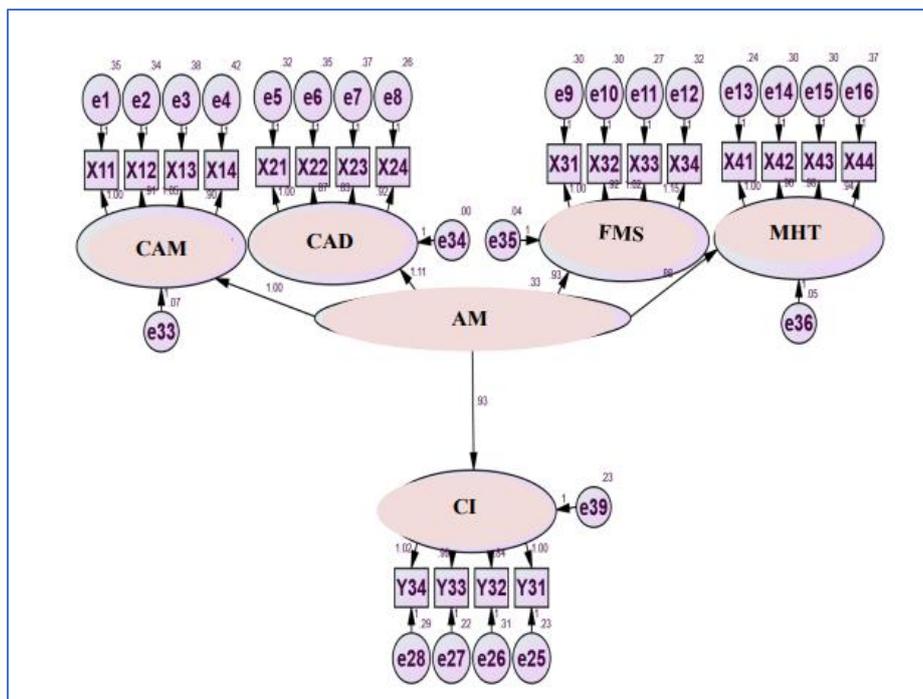


Figure (9)

The impact of advanced manufacturing on competitor intelligence

Source: Prepared by the researchers in light of the results of the statistical analysis using AMOS V24 software n=184

- The results of Table (8) and Figure (9) indicate the presence of a direct effect of advanced manufacturing on customer intelligence, as indicated by the value of the regression coefficient Estimate ( $\beta$ ) which reached (0.86) and this effect is significant in terms of the probability value which reached (0.012) which is less than (0.05), and the same result indicates the critical value (C.R.) which reached (9.77) which is greater than the table value (tTab) which is (1.96), as for the value of the coefficient of determination, it indicates that (51%) of the changes in customer intelligence are due to advanced manufacturing and the remaining percentage of (49%) is due to other variables that were not included in the model. This leads us to reject the null hypothesis and accept the alternative hypothesis which states that there is an effect of advanced manufacturing on customer intelligence and this effect is direct and significant at a significance level ( $0.05 \geq \alpha$ ).

Table (9) Results of the impact of advanced manufacturing on customer intelligence

independent variable	Direction of influence	Dependent variable	regression coefficient Estimate ( $\beta$ )	Standard error of regression coefficient Se. ( $\beta$ )	coefficient of determination	critical value C.R.	P-value
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					R-square		
advanced manufacturing	→	Customer Intelligence	0.86	0.088	0.51	9.77	0.012

Tabular value (1.96=tTab)

Source: Prepared by the researchers based on the results of the statistical analysis using AMOS V24 software n=184

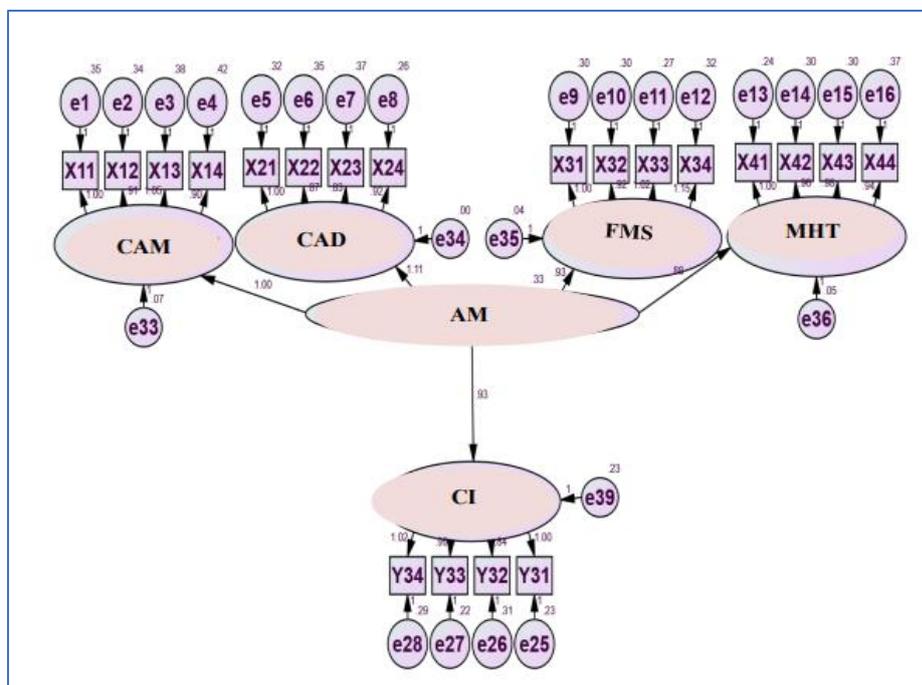


Figure (10) The impact of advanced manufacturing on customer intelligence Source: Prepared by the researchers in light of the results of the statistical analysis using AMOS V24 software n=184

**The third main hypothesis:** Advanced manufacturing is not available at the aggregate level and in terms of its dimensions in the Badush Cement Factory in Nineveh Governorate.

The nonparametric statistical test (One-Sample Wilcoxon Signed Rank Test) will be used to test the above hypothesis, as this test is based on comparing the value of the observed median (calculated from the sample) and the value of the hypothetical median, which is equal to (3) according to the five-point Likert scale used in our study, noting that the reason for our use of the above test is that the variables and dimensions of the study did not have a normal probability distribution, which was indicated in the previous Table (9).

**The results of Table (9) and Figure (10) indicate all of the following:**

1. Advanced manufacturing is available at the overall level in Badush Cement Factory in Nineveh Governorate, as indicated by the value of the observed median, which amounted to (4), which is greater than the value of the hypothetical median, which is equal to (3). This difference is significant, as indicated by the probability value (P-value) accompanying the (One-Sample Wilcoxon Signed Rank Test), which amounted to (0.000), which is less than (0.05). Therefore, based on the above result, the null hypothesis will be rejected and the alternative hypothesis will be accepted, which states that advanced manufacturing is available in Badush Cement Factory in Nineveh Governorate.
2. The dimensions of advanced manufacturing, represented by [computer-aided manufacturing, computer-aided design, flexible manufacturing systems, material handling technologies] are available in Badush Cement Factory in Nineveh Governorate, as indicated by the value of the observed median, which reached (4) for each dimension of advanced manufacturing, respectively, which is greater than the value of the hypothetical median, which is equal to (3). This difference is significant, as indicated by the probability value (P-value) accompanying the (One-Sample Wilcoxon Signed Rank Test), which reached (0.000), which is less than (0.05). Therefore, based on the above result, the null hypothesis will be rejected and the alternative hypothesis will be accepted, which states that the dimensions of advanced manufacturing are available in Badush Cement Factory in Nineveh Governorate.

Table (10) Results of the test of the availability of advanced manufacturing at the aggregate level and in terms of its dimensions in the Badush Cement Factory in Mosul

Variables	Value of the mediator	Hypothetical median value	Test type	P-value	decision
advanced manufacturing	4	3	One-Sample Wilcoxon Signed Rank Test	0.000	Reject the null hypothesis
computer aided manufacturing	4	3		0.000	Reject the null hypothesis
Computer aided design	4	3		0.000	Reject the null hypothesis
Flexible Manufacturing Systems	4	3		0.000	Reject the null hypothesis
Material Handling Techniques	4	3		0.000	Reject the null hypothesis

Source: Prepared by the researchers based on the outputs of the (SPSS V.26) program n=184

**The fourth main hypothesis:** Badoush Cement Factory in Nineveh Governorate does not adopt marketing intelligence at the macro level and in terms of its dimensions.

To test this hypothesis, the nonparametric statistical test (One-Sample Wilcoxon Signed Rank Test) will also be used, as the results of Table (10) and Figure (10) indicate all of the following:

- Badoush Cement Factory in Nineveh Governorate adopts marketing intelligence, as indicated by the value of the observed median, which reached (3.84), which is greater than the value of the hypothetical median, which is equal to (3). This difference is significant, as indicated by the probability value (P-value) accompanying the (One-Sample Wilcoxon Signed Rank Test), which reached (0.000), which is less than (0.05). Therefore, based on the above result, the null hypothesis will be rejected and the alternative hypothesis will be accepted, which states that Badoush Cement Factory in Nineveh Governorate is working to adopt the principle of marketing intelligence at the overall level.
- Badoush Cement Factory in Nineveh Governorate is working on adopting the dimensions of marketing intelligence, which are [product intelligence, market understanding, competitor intelligence, customer intelligence], in terms of the value of the observed median, which reached [(4.00), (3.80), (3.80), (3.83)] respectively, which is greater than the value of the hypothetical median, which is equal to (3). This difference is significant, in terms of the probability value (P-value) accompanying the (One-Sample Wilcoxon Signed Rank Test), which reached (0.000), which is less than (0.05). Therefore, based on the above result, the null hypothesis will be rejected and the alternative hypothesis will be accepted, which states that the dimensions of marketing intelligence are adopted in Badoush Cement Factory in Nineveh Governorate.

Table (11) Results of the test of the adoption of marketing intelligence by Badoush Cement Factory in Mosul at the aggregate level and in terms of its dimensions

Variables	Value of the mediator	Hypothetical median value	Test type	P-value	decision
Marketing Intelligence	3.84	3	One-Sample Wilcoxon Signed Rank Test	0.000	Reject the null hypothesis
Product Intelligence	4	3		0.000	Reject the null hypothesis
Understanding the Market	3.80	3		0.000	Reject the null hypothesis
Competitor Intelligence	3.80	3		0.000	Reject the null hypothesis
Customer Intelligence	3.83	3		0.000	Reject the null hypothesis

Source: Prepared by the researchers based on the outputs of the (SPSS V.26) program n=184

### Section Four: Conclusions and Suggestions

#### ❖ Conclusions

The availability of advanced manufacturing dimensions among employees in the organization under study varied.

1. The results of the practical research on each of its variables revealed that the general rate of awareness of the researched individuals was good and positive, which confirms that they pay attention to the dimensions of advanced manufacturing in order to enhance marketing intelligence.
2. There is a significant influence relationship between the dimensions of advanced manufacturing and at varying rates in enhancing marketing intelligence in the researched organization, which indicates the possibility of the combined dimensions of advanced manufacturing in enhancing marketing intelligence in the researched organization.
3. The dimension of material handling techniques achieved first place compared to other dimensions, which indicates that the factory management seeks to adopt material handling techniques that contribute to simplifying the workflow, which provides safety and security in the workplace through advanced automation.
4. The dimension of computer-aided manufacturing achieved second place compared to other dimensions, which indicates cost savings through manufacturing processes.
5. Flexible manufacturing systems achieved third place compared to other dimensions, which leads to reducing the production cycle time and on-time delivery through manufacturing flexibility.
6. Computer-aided design ranked fourth compared to other dimensions, which indicates that the laboratory management has advanced design programs and devices that work smoothly and reliably.

#### ❖ Suggestions

1. We recommend the necessity of using advanced manufacturing technologies in industrial organizations due to their clear impact on the speed and accuracy of manufacturing products.
2. The necessity of directing scientific research to develop advanced manufacturing processes and product development.
3. Advise government officials and investors to acquire these advanced manufacturing technologies and benefit from them in the fields of manufacturing.
4. The necessity of paying more attention to the advanced manufacturing approach and marketing intelligence to achieve the objectives of the organization under study.

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