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The impact of information and communication technology on the marketing mix.

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Abstract:

This study highlights the critical role of Information and Communication Technology (ICT) in enhancing the effectiveness of the marketing mix and strengthening organizational competitiveness. ICT contributes significantly to the development of the four elements of the marketing mix (product, price, place, and promotion), which form the foundation of marketing strategies, resource allocation, and sales target setting.

Based on a questionnaire conducted among employees of the Palm Mill in Chlef and analyzed using SPSS, the findings reveal a strong impact of ICT on most marketing mix components. The most significant effect was observed in pricing, followed by distribution and promotion, while its impact on the product itself remained minimal, with no noticeable changes in quality, accuracy, or speed.

Introduction: Organizations today face strong competition driven by ICT, which has transformed economic and social systems within the knowledge economy. ICT has shifted organizational operations from traditional to digital forms, improving communication, coordination, performance, and decision-making while enhancing control and data security (Kannan & Li, 2017; Wazis et al., 2016). ICT is widely recognized as a key enabler of digital transformation that strengthens organizational efficiency and strategic responsiveness in competitive markets (Kannan & Li, 2017).

In light of these developments, this study investigates the significance of the marketing mix in the context of ICT adoption as a necessary strategy for competing in the market and strengthening the position of Algerian economic entities. The study specifically seeks to answer the following question: What is the impact of ICT on optimizing the marketing mix within Algerian economic organizations?

Organizations today confront a form of competition unprecedented in scope, often described as a revolution driven by information and communication technologies (ICT), which have profoundly transformed economic, social, and cultural dynamics (Ivanov, 2019; Kannan & Li, 2017). These technologies have accelerated financial and economic globalization, making organizational information a critical strategic asset, comparable to military intelligence in wartime, it may not guarantee success independently but often plays a decisive role. This era, defined by ICT, is also recognized as the knowledge economy (Ivanov, 2019).

Organizations today face strong ICT-driven competition within the knowledge economy. ICT has transformed operations into digital systems, enhancing communication, coordination, performance, decision-making, and organizational control and security (Wazis et al., 2016; Kannan & Li, 2017). Studies confirm that ICT adoption significantly improves organizational performance through better data management, communication speed, and strategic responsiveness (Wazis et al., 2016).

Against this backdrop, the present study examines the role of the marketing mix within the framework of ICT adoption, viewed as an essential strategy for market competitiveness and the consolidation of Algerian economic entities' positions. The study addresses the following research question: How does ICT influence the optimization of the marketing mix in Algerian economic organizations?

Sub-Hypotheses:

1- ICT does not have a statistically significant effect on the product at The Palm Mill.

2- ICT does not have a statistically significant effect on pricing at The Palm Mill.

3- ICT does not have a statistically significant effect on distribution at The Palm Mill.

4- ICT does not have a statistically significant effect on promotion at The Palm Mill.

5- The Palm Mill organization emphasizes the use of ICT in constructing the marketing mix.

Research and studies have increasingly focused on information and communication technology (ICT) in general. However, there is a noticeable lack of studies specifically examining the impact of ICT on the marketing mix. This study aims to fill that gap by providing insights into how ICT influences the marketing mix within The Palm Mill. The findings are intended to enhance understanding of this relationship and contribute to the optimization and activation of the marketing mix within the organization (Khalayleh & Al-Hawary, 2022; Gutu et al., 2023; Zaini, 2024). Empirical evidence shows that digital marketing tools and ICT-enabled systems improve marketing performance, customer targeting, and operational efficiency (Khalayleh & Al-Hawary, 2022; Gutu et al., 2023). The study is grounded in several key considerations:

- The strategic role of marketing in influencing customer decisions and driving purchases.

- The importance of marketing in organizational success, as the achievement of goals is closely linked to marketing practices.

- The central role of ICT in the contemporary era, serving as a strategic resource that organizations rely on to market products and services.

- The evolution of ICT, its position within organizations, and its potential to enhance the efficiency and effectiveness of marketing activities.

The objectives of the study are outlined as follows:

1- To examine the role and presence of ICT within the entity under study.

2- To explore the relationship between ICT and the marketing mix in the organization.

3- To assess the contribution of ICT to improving problem-solving methods within the organization.

4- To identify challenges and limitations in the implementation of ICT that may affect the marketing mix at The Palm Mill.

5- To determine the extent to which ICT enhances the effectiveness of the marketing mix in the organization (Riccomini et al., 2024; Khalayleh & Al-Hawary, 2022).

Several studies have addressed the variables examined in this research.

Muanmeevit & Pankham (2025) examined how digital commerce strategies, including those built on information and communication technologies, ontribute to business growth, customer experience, and marketing mix effectiveness in online environments. Their findings highlight the evolving role of ICT in enhancing strategic elements of the marketing mix within digital commerce contexts. Abdillah et al. (2025) investigated the influence of the digital marketing mix and complaint handling on customer decision-making, satisfaction, and loyalty. This study employed PLS-SEM and emphasized that digital marketing mix components (including technology-enabled promotion and response speed) significantly shape consumer outcomes, illustrating how ICT-driven marketing strategies affect core marketing metric relationships in contemporary service settings (Khalayleh & Al-Hawary, 2022; Gutu et al., 2023). Empirical evidence confirms that ICT-enhanced marketing communication and content strategies significantly improve customer engagement and marketing performance outcomes (Khalayleh & Al-Hawary, 2022; Gutu et al., 2023).

Digital transformation studies further reinforce the role of ICT in reshaping marketing systems. For example, ICT-based cloud and digital technologies enable firms to enhance marketing efficiency, scalability, and responsiveness in dynamic environments (Ivanov, 2019; Wazis et al., 2016). Ivanov (2019) emphasizes that cloud technologies strengthen digital marketing operations, while Wazis et al. (2016) demonstrate that ICT adoption significantly improves communication efficiency and service marketing performance in telecommunications contexts.

Furthermore, ICT is increasingly linked with innovation and strategic marketing performance. Aljabari et al. (2024) show that digital marketing strategies supported by artificial intelligence significantly enhance innovation outcomes in SMEs, reinforcing the strategic importance of ICT in modern marketing systems.

In addition, Goestjahjanti et al. (2024) highlight that digital transformation improves the effectiveness of the marketing mix in institutional and service-based contexts by integrating digital tools into product, price, place, and promotion strategies, thereby increasing organizational competitiveness.

Marketing mix effectiveness is also strongly influenced by service and consumer behavior dynamics. Lau (2016) confirms that extended marketing mix

elements (8Ps) significantly influence consumer selection behavior, while Lim et al. (2020) demonstrate that strategic marketing mix management improves brand positioning and institutional competitiveness in higher education contexts (Lau, 2016; Lim et al., 2020).

Ijomah (2023) further supports that integrated marketing strategies significantly enhance the adoption and success of IT-based products in both B2B and B2C markets, reinforcing the importance of ICT-enabled coordination across marketing functions. Riccomini et al. (2024) emphasize that innovation in marketing systems, especially in educational institutions, is driven by digital integration, improving engagement, adaptability, and strategic performance.

THE FIRST TOPIC: Generalities about ICT and marketing

In this section we will address the theoretical aspect of the study variables.

First requirement: Information and Communication Technology

Any organization, regardless of its activity, seeks to acquire modern technology to improve the quality of its products and thereby increase its market share, especially in light of the fierce competition witnessed globally.

First section: Concept of ICT: defines information and communication technology (ICT) as a computer-based, self-regulating system designed to assist organizations and their human resources in electronically collecting, storing, retrieving, processing, manipulating, and transmitting data in various forms, including text, audio, images, and video. (Laudon et Laudon 2020)

Information technology is generally understood as encompassing all advanced technologies utilized in the management of information, transforming data in its various forms into meaningful information that can be applied by users across multiple sectors. (Stair et Reynolds 2021)

In a similar context, emphasizes that modern technology refers to all tools and systems employed for the processing, transmission, and storage of information in electronic formats. This includes computer systems, communication devices, fax machines, and other equipment widely used to facilitate efficient communication. (Kirvan, Awati et Pratt 2025)

From the above, ICT can be defined as a set of hardware, software, ideas, cognitive capabilities and technologies that store, process and retrieve the data and information needed to facilitate the process of remote communication in addition to converting inputs into outputs at the appropriate time and form.

second section: Uses of ICT: Information and Communication Technology (ICT) can enhance an organization’s competitive advantage through several key mechanisms: (Laudon et Laudon 2020)

1- Maximizing customer value: ICT enables organizations to better understand and address customer needs and preferences, focusing on both quality and pricing to deliver superior value.

2- Business process re-engineering: By implementing innovative improvements, organizations can differentiate themselves from competitors and attract a larger customer base.

3- Enhancing business quality: ICT supports a customer-centric approach to quality, emphasizing performance, reliability, and responsiveness in products and services.

4- Creating an agile organization: Through rapid and continuous adaptation to global market demands, organizations can maintain high standards of quality and performance, ensuring flexibility in pricing and operations.

5- Building knowledge-driven and virtual organizations: Also referred to as learning organizations, these entities leverage technology to acquire, disseminate, and apply knowledge from diverse sources. By organizing and integrating this knowledge within processes and human resources, ICT positively impacts organizational performance.

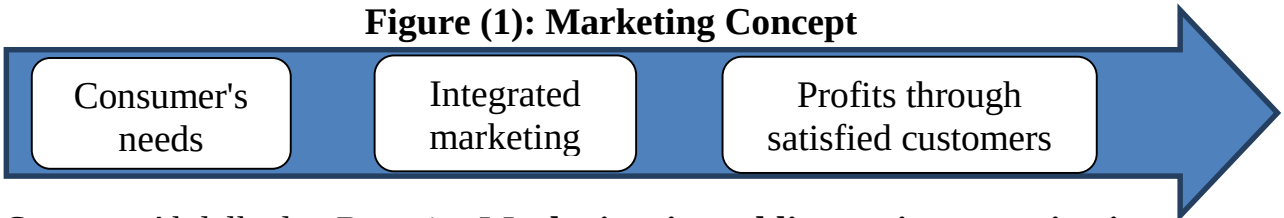
Organizations face ICT-driven competition in the knowledge economy, where digital transformation enhances communication, coordination, performance, decision-making, and organizational control and security.

Second requirement: Marketing and Marketing Activity

Organizations face ICT-driven competition in the knowledge economy, where digital transformation enhances communication, coordination, performance, decision-making, and control.

First section: The marketing concept: This concept focuses on producing what can be effectively marketed by identifying and satisfying target customers' needs and preferences. It requires organizations to first understand market demands, then design an appropriate marketing mix, supported by continuous market research to adapt to environmental changes. (Kotler, Armstrong et Opresnik 2024)

Figure (1): Marketing Concept



Source: Abdelkader Bryanis, **Marketing in public service organizations**, a study on the Algerian postal and telecommunications sector, PhD in economic sciences in Algeria, 2011, p 75.

The American Marketing Association (1960) defines marketing as the activities that direct the flow of goods and services from producers to consumers or users. Accordingly, marketing is a strategic process aimed at satisfying customer needs through goods, services, and ideas, while building long-term relationships and achieving organizational goals.

Second section: Elements of marketing activity

A review of marketing definitions shows that core concepts form the fundamental basis of all marketing activities and practices.

The core concepts of marketing are built upon a set of fundamental elements, including needs, wants, demand, products, exchange, transactions, and markets. These can be explained as follows: (TheMBAins; 2026)

- **Needs:** Needs are the foundation of marketing and include physiological, social, and personal needs. They are satisfied progressively from basic to higher levels and vary across societies depending on economic development, where higher-income societies meet more needs while lower-income societies adapt to limited resources.
- **Wants:** Wants represent a more specific expression of needs, referring to the means through which individuals seek satisfaction. They are shaped by cultural, social, and personal factors. In this context, marketers aim to identify and provide products and services that correspond to these wants while influencing consumer preferences.
- **Demand:** Demand emerges when wants are supported by purchasing power. Since individuals possess unlimited wants but limited financial resources, they must choose products that maximize their satisfaction within their budget constraints. Therefore, demand is determined by both the willingness to purchase and the ability to pay, and it is influenced by geographical scope (local, national, or international markets) as well as time.
- **Products:** Needs and wants generate demand, which is satisfied through products. Products include goods, services, ideas, or any offering that provides value, and are primarily defined by the benefits and utility they deliver to consumers.
- **Exchange:** Exchange is the core of marketing, where individuals obtain desired products by offering value in return. It requires at least two parties, mutual value, communication, delivery ability, and freedom to accept or reject the offer.
- **Transactions:** A transaction represents the basic unit of exchange and occurs when an agreement is reached between parties. It involves the transfer of value and is characterized by dimensions such as timing, location, and the consideration exchanged between the parties.

- Markets: A market is a group of potential buyers whose size depends on number, purchasing power, and willingness to spend, reflecting supply and demand interaction.

THE SECOND TOPIC: The impact of ICT on the marketing mix at The Palm Mill

ICT strategies enhance differentiation, sales performance, and long-term market share. The Palm Mill in Chlef was used to assess ICT's impact on market share in Algerian organizations.

First requirement: Statistical treatment and evaluation of alternatives

A questionnaire was distributed to employees of Al Nakheel Institution to examine the impact of ICT on the marketing mix across specific dimensions.

First Section: Analyzing the statements of the first axis ICT enablement: The questionnaire items were analyzed using response frequencies, arithmetic means, rankings, and scores to assess the results.

Table (1): The arithmetic means and standard deviations of the study sample's responses to the paragraphs of the (ICT Enablement)

N°	Paragraph	I strongly agree	Agree	Somewhat	I don't	Strongly	Average	Standard deviation	Rank	Degree
1	.The mill is available online	76	68	/	/	/	4.5278	0.50097	8	High
2	The mill has its own internal .network	81	63	/	/	/	4.5625	0.49781	7	High
3	The treadmill has various communication devices	104	40	/	/	/	4.7222	0.44947	4	High
4	The entity can use these networks .as needed to perform tasks	120	24	/	/	/	4.8333	0.37398	1	High
5	The entity enables workers to devices and networks work with	105	39	/	/	/	4.7292	0.44594	3	High
6	The entity provides specialists to maintain and develop communication tools and networks	118	26	/	/	/	4.8194	0.38599	2	High
7	Easy access to the information needed to do my job	101	43	/	/	/	4.7014	0.45925	5	High
8	The entity has a website and a social media page	89	55	/	/	/	4.6181	0.48756	6	High
General rate:							4.68923	0.450121		High

Source: Prepared by the researchers in light of the questionnaire based on the outputs of 30 SPSS V.

As shown in Table 1, the arithmetic means for this axis ranged from 4.52 to 4.83, with an overall mean of 4.68, indicating a high level of agreement. Item 4 achieved the highest mean of 4.83 (SD = 0.37), reflecting strong support for the entity allowing employees to use communication networks to perform their tasks. Item 6 ranked second with a mean of 4.81 (SD = 0.38), while item 5 came third with a mean of 4.72 (SD = 0.44), emphasizing the training and empowerment of employees with information and communication tools.

Item 2 ranked second lowest (M = 4.56, SD = 0.49), reflecting the availability of an internal communication and data exchange network. Item 1 recorded the lowest mean (M = 4.52, SD = 0.50), related to access to private and public internet networks for employees at Palm Mill.

The items measured performance based on the ICT index. Results show a high level of agreement, indicating that Palm Mill enables employees to effectively use ICT and enhance organizational performance. This reflects strong top management commitment to investing in ICT and ensuring its availability, suggesting a high level of ICT enablement among employees.

Second Section: Analyzing the statements of the second axis, the impact of ICT on the product: Questionnaire items were analyzed in two stages by computing means and standard deviations, then ranking the items according to their mean values.

Table (2): Means and standard deviations of responses on the impact of ICT on product.

N°	Paragraph	I strongly agree	Agree	Somewhat agree	don't I agree	Strongly disagree	Middle of the road	Standard deviation	Rank	Degree
9	Quality preparation and quality in the mill's products as planned	31	113	/	/	/	4.2153	0.41245	2	High
10	The mill designs its products through thoughtful modeling	26	118	/	/	/	4.1806	0.38599	3	High
11	We can bring differentiated products to the market	36	108	/	/	/	4.2500	0.43452	1	High
12	Consumer better understands the quality and provenance of Palm Mill products	26	118	/	/	/	4.1806	0.38599	3	High
General rate:							4.2066	0.4047375		High

Source: Prepared by the researchers in light of the questionnaire based on the output of 30V SPSS.

As shown in the table above, the arithmetic means for this axis ranged from 4.18 to 4.25, with an overall mean of 4.2066, indicating a high level of agreement. Item 11 obtained the highest mean of 4.25 (SD = 0.4352), reflecting that the Palm Mill is capable of providing a distinctive product. Item 9 ranked second with a mean of 4.21 (SD = 0.4047), while items 10 and 12 shared third place, each with a mean of 4.1866 (SD = 0.38). Item 10 specifically emphasized the design of products based on studied models.

These results suggest that the impact of ICT on product development is significant, although its overall mean is slightly lower than that of the first axis. Nevertheless, the effect is still considered high from the perspective of the study participants.

Section Three: Analyzing the phrases of the third axis, the impact of ICT on price: The results of the statements of this axis are attached in the following table.

Table (3): The arithmetic means and standard deviations of the responses of the study sample on the impact of ICT on price.

N°	Paragraph	I strongly agree	Agree	Somewhat agree	I don' agree	Strongly disagree	Middle of the road	Standard deviation	Rank	Degree
13	Study the price .before you set it	128	16	/	/	/	4.8889	0.31537	3	High
14	The total cost and demand for the product within the price.	123	21	/	/	/	4.8542	0.35417	4	High
15	The final price is competitive in the market	140	4	/	/	/	4.9722	0.16491	2	High
16	Continually review price and .cost	144	/	/	/	/	5.0000	0.0000	1	High
General rate:							4.9288	0.20861		High

Source: Prepared by the researchers in light of the questionnaire based on the outputs of 30 V SPSS.

As shown in Table 3, the arithmetic means for the axis measuring the impact of ICT on price ranged from 4.85 to 5.00, with an overall mean of 4.928, indicating a high level of agreement. Item 16 achieved the highest mean of 5.00, reflecting the entity's reliance on continuously and easily reviewing prices compared to previous methods. Item 15 ranked second with a mean of 4.97, emphasizing the competitiveness of prices in the market. Item 13 came in third with a mean of 4.88 (SD = 0.31), highlighting the study of prices before offering them. Item 14 ranked last with a mean of 4.85 (SD = 0.35), referring to

mechanisms for calculating the final price while considering changing external conditions.

These results indicate a strong ICT impact on pricing, as the entity effectively manages order distribution despite changes in points and volumes, through well-planned distribution programs that maintain retailer satisfaction.

Section Four: Analyzing the statements of the fourth axis of the impact of ICT on distribution: The sample members' answer was as follows

Table (4): The arithmetic means and standard deviations of the responses of the study sample on the axis of the impact of ICT on distribution

N°	Paragraph	I strongly agree	Agree	Somewhat agree	I do not agree	Strongly Disagree	Average	Standard deviation	Rank	Degree
17	The entity's customers receive services without .having to travel	/	13	131	/	/	3.0903	0.28758	2	average
18	Orders are fulfilled in real time	/	7	134	3	/	3.0278	0.26297	4	average
19	allows its The entity products to be distributed all the time	/	17	125	2	/	3.1042	0.34920	1	average
20	Distributes products via out -thought-a well scheme	/	6	138	/	/	3.0417	0.20052	3	average
Total:							**3.0660**	**0.2751**		**average**

Source: Prepared by the researchers in light of the questionnaire based on the outputs of 30V SPSS.

As shown in the previous table, the arithmetic means for the axis measuring the impact of ICT on distribution ranged from 3.02 to 3.10, with an overall mean of 3.066, indicating a medium level of agreement. Item 19 obtained the highest mean of 3.10 (SD = 0.349), highlighting that the Palm Mill is capable of providing its products around the clock to distributors. Item 17 ranked second with a mean of 3.09 (SD = 0.28), also emphasizing the 24-hour product availability to distributors. Item 20 had a mean of 3.04 (SD = 0.20), indicating that customers benefit from the entity's services without the need to travel to the physical location, and that distribution tasks and transport routes are organized according to studied models and schemes. Finally, item 18 obtained the lowest mean of 3.02 (SD = 0.26), still reflecting a medium level.

These results suggest that the impact of ICT on distribution is moderate, with an overall mean of 3.066 and a standard deviation of 0.27, as perceived by the study participants.

Section Five: Analysis of the statements of the fifth axis: The impact of information and communication technology on promotion: The respondents' answers were as follows:

Table (5): Means and standard deviations of responses on the impact of ICT on promotion.

N°	Paragraph	Strongly agree	agree	Somewhat agree	disagree	Strongly disagree	average	Standard deviation	rank	Degree
21	Promoting the Palm brand is easy and understandable for the consumer	/	/	110	29	5	2.7292	0.51845	4	average
22	There is a constant flow of information about the market	/	5	134	5	/	3.0000	0.26444	3	average
23	Customers have input on product quality and packaging	/	/	41	79	24	2.1181	0.66371	5	average
24	Minimize the number of channels between the entity and the consumer	/	21	115	8	/	3.0903	0.44112	2	average
25	Increase in the number of consumer customers for mill products	/	23	121	/	/	3.1597	0.36763	1	average
Total							**2.8195**	**0.4511**		**average**

Source: Prepared by the researchers in light of the questionnaire based on the outputs of 30V SPSS

As shown in Table 5, the arithmetic means for the axis measuring the impact of ICT on promotion ranged from 2.11 to 3.15, with an overall mean of 2.819 and a standard deviation of 0.45, indicating a medium level of agreement. Item 25 achieved the highest mean of 3.15 (SD = 0.36), reflecting that employees notice a noticeable increase in demand for the product. Item 24 ranked second with a mean of 3.09 (SD = 0.44), emphasizing that the entity benefits from its services. Item 22 had a mean of 3.00 (SD = 0.26), highlighting the provision of continuous information about the market for mill outputs in Algeria. Items 21 and 23 had lower means of 2.27 (SD = 0.51) and 2.11 (SD = 0.66), respectively, both evaluated at a medium level.

These results indicate that the impact of ICT on promotion is moderate, with the lowest overall mean among the axes studied, as perceived by the study participants. Notably, the standard deviation for all axes did not exceed 0.5, reflecting the consistency and stability of the items in measuring respondents' perceptions.

I.1.2- Testing the hypotheses of the impact of ICT on the marketing mix

A- Testing the main hypothesis and interpreting the results: To determine the conditions for applying parametric statistics, the study tests the hypotheses using simple linear regression for each hypothesis based on data analyzed in SPSS version 30.

- Model validity for testing the main hypothesis: The objective of this step is to verify the existence of a linear relationship between the independent and dependent variables. This is accomplished using the ANOVA table in SPSS V30.

The results obtained from the program provide evidence regarding the statistical significance and overall validity of the regression model, which allows us to proceed with testing the hypotheses. Table 6 shows the results of regression analysis of variance to confirm the validity of the model to test the main hypothesis.

Table (6): The arithmetic means and standard deviations of the responses of the study sample on the impact of ICT on distribution

Model	Correlation coefficient	Determination coefficient	miscalculation	F value	Morale level
1	0.692	0.478	0.15117	130.154	0.000[b]

Source: Prepared by the researchers based on the output of SPSS V30

Second Requirement: Testing the Hypotheses on the Impact of Information and Communication Technology on the Marketing Mix

To verify the validity of the hypotheses on which this study is based, the following tests were conducted:

First Section: Testing the Main Hypothesis and Interpreting the Results

The conditions for applying parametric statistics were first assessed by testing the hypotheses using simple linear regression for each hypothesis, based on the data analyzed with SPSS version 30.

- Model Validity for Testing the Main Hypothesis: The purpose of this step is to determine whether a linear relationship exists between the independent and dependent variables. This is done using the ANOVA table in SPSS V30. The program provided the following results, which allow for assessing the statistical significance and overall validity of the regression model for hypothesis testing.

Table (7): Results of the Analysis of Variance (ANOVA) for Regression to Verify the Validity of the Model for Testing the Main Hypothesis

Model	Correlation coefficient	Determination coefficient	miscalculation	F value	Morale level
1	0.692	0.478	0.15117	130.154	0.000[b]

Source: Prepared by the researchers based on the output of SPSS V30.

Independent Variable: Information and Communication Technology (ICT)

Dependent Variable: Marketing Mix

As shown in the table above, the significance level is 0.000, which is less than the threshold of 0.05. This indicates that the regression model is valid for testing the hypothesis.

- Testing the Main Hypothesis:

- The null hypothesis (H_0) states that there is no statistically significant effect of ICT on the marketing mix at The Palm Mill.

This hypothesis was tested using the simple linear regression method. After analyzing the data with SPSS version 30, the results obtained are presented in the following table, which allows us to determine the strength and significance of the relationship between ICT and the marketing mix.

Table (8): Results of simple regression analysis to test the main hypothesis

Variable	standardized -Non transactions		Standardized coefficients	T	F	Sig
	A	Standard errors	Beta B			
Fixed	0.420	0.355	/	1.185	130.154	0.00
Knowledge management	0.862	0.076	0.692	11.409		0.00
correlation coefficient: 0.692 0.15117 :The standard error of the estimate					**Determination coefficient: 0.478**	

Source: Prepared by the researchers based on the output of SPSS V30.

From Table (7), the significance level is 0.000, which is below the threshold of 0.05. Therefore, we reject the null hypothesis, which states that there is no statistically significant effect of ICT on the marketing mix at the Palm Mill, and we accept the alternative hypothesis: there is a statistically significant effect of ICT on the marketing mix.

The Pearson correlation coefficient was calculated at 0.692, indicating a strong positive correlation of 69.2% between ICT and the marketing mix at the Palm Mill. This relationship is further explained by the coefficient of determination (R^2) of 0.478, which implies that 47.8% of the variation in the marketing mix can be attributed to ICT, while the remaining 52.2% is influenced by other factors not included in the model.

The standard error of the estimate was 0.15117, suggesting minimal

random error and a low dispersion of data points around the regression line. The slope parameter (β) is statistically significant with a significance value of 0.000 and a coefficient of 0.862. This positive coefficient indicates a direct relationship between ICT and the marketing mix, meaning that an increase of one unit in ICT corresponds to an increase of 0.862 units in the marketing mix. Additionally, the intercept parameter is significant and estimated at 0.420.

Based on these results, the regression equation can be expressed as follows:

Marketing Mix = 0.420 + 0.862 × ICT

Y=0.42+0.86X (1)

where: Y : Marketing mix

X : Information and Communication Technology.

If x increases by one unit, y will increase by 0.86 plus 0.42.

second section: Testing the sub-hypotheses and interpreting the results

- Testing the first sub-hypothesis: There is no statistically significant effect of ICT on product in the mill.

Table (9): Results of the simple regression analysis to test the first sub-hypothesis

Model	normative -Non factors		Standardized coefficients	T	F	Sig
	A	Beta B				
Fixed	4.176	/	9.113	9.113	40.389	0.000
Information technology	0.007	0.006	0.068	0.068		0.946
Correlation coefficient: 0.006 **Standard error of the estimate: 0.19530** **Dependent variable 01: Product**					**coefficient of determination: 0.000**	

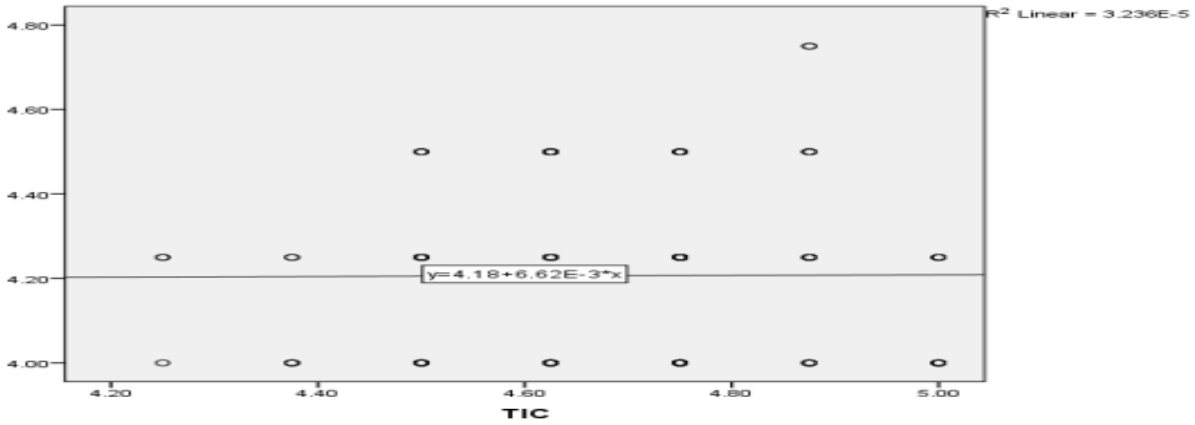
Source: Prepared by the researcher based on the outputs of SPSS V30

From the previous table, the significance level is 0.94, which is greater than 0.05. Therefore, we accept the null hypothesis, which states that ICT has no statistically significant effect on the product at the Palm Mill, and we reject the alternative hypothesis. This indicates that, although the Palm Mill utilizes ICT and engages in product development and improvement, ICT does not appear to directly influence this component of the marketing mix.

This finding may be explained by the fact that new product development or product enhancements are primarily driven by strategic decisions made by top management. The process is often assigned to specialized departments, limiting the involvement of ICT in these activities. Furthermore, while the correct application of ICT concepts and models could potentially support the production of higher-quality products, product innovation in such entities frequently relies on tacit knowledge, which is often retained by leading organizations in the sector.

Consequently, ICT's impact on the product component remains limited in this context

Figure (2): Representation of the regression line equation for the ICT product.



Source: From the output of SPSS V30

- Testing the second sub-hypothesis: There is no statistically significant effect of ICT on mill pricing.

Table (10): Results of simple regression analysis to test the second sub-hypothesis

Model	normative -Non factors		Standardized coefficients	T	F	Sig
	A	Standard errors	Beta B			
Fixed	0.553-	0.307	/	1.801-	40.389	0.740
Information technology	0.945	0.065	0.771	14.443		0.000
Correlation coefficient: 0.771 Standard error of the estimate: 0.13091 Dependent variable 02: Pricing					**coefficient of :determination0.595**	

Source: Based on the outputs of SPSS V30

From the analysis, it is observed that the significance level is 0.000, which is less than 0.05. Therefore, we reject the null hypothesis that ICT has no statistically significant effect on pricing at the Palm Mill and accept the alternative hypothesis, confirming that ICT does have a significant impact on pricing.

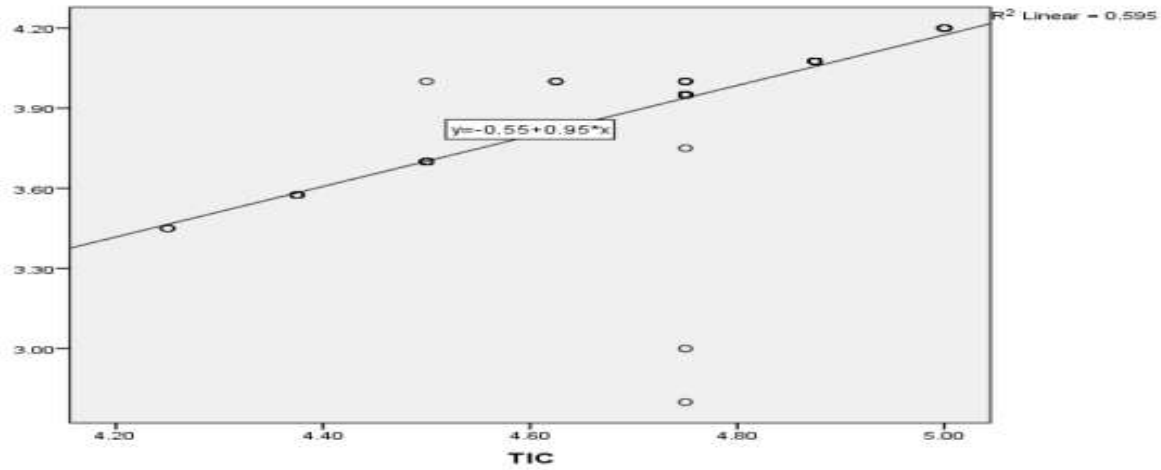
The standardized coefficient (Beta) was estimated at 0.771, indicating a positive effect of ICT on pricing. The Pearson correlation coefficient was also 0.771, reflecting a strong positive relationship between ICT and pricing. The coefficient of determination (R^2) was estimated at 0.595, meaning that 59.5% of the variation in pricing can be explained by ICT, while the remaining 40.5% is attributed to other factors outside the model.

These results indicate that ICT supports pricing decisions at Palm Mill by enabling informed management decisions, addressing urgent pricing issues, and adapting to market needs. However, its use is mainly limited to specialized staff responsible for costing, pricing, and market analysis rather than being applied across all employees. Y= - 0.553+0.945X (2)

where: Y: pricing X : ICT

If x increases by one unit, y will increase by 0.954 plus - 0.553.

Figure (3): Regression line equation for ICT pricing.



From the output of SPSS :**Source**V30

hypothesis: There is no statistically significant effect of -Testing the sub -.Mill ICT on distribution at Palm

Table (11): -Results of simple regression analysis to test the third sub hypothesis

Model	normative -Non factors		Standardized coefficients	T	F	Sig
	A	Standard errors	Beta B			
Fixed	0.607-	0.750	/	0.810-	40.389	0.420
Information technology	1.016	0.160	0.471	6.355		0.000
Correlation coefficient: 0.471 Standard error of the estimate: 0.31972 Dependent variable 03: Distribution					**coefficient of determination: 0.221**	

Prepared by the researchers based on the outputs of SPSS :**Source** V30

From the analysis, the significance level is 0.000, which is less than 0.05. Therefore, we reject the null hypothesis that ICT has no statistically significant effect on distribution at the Palm Mill and accept the alternative hypothesis, confirming that ICT does have a significant impact on distribution.

The standardized coefficient (Beta) was estimated at 0.471, indicating a positive effect of ICT on distribution. The coefficient of determination (R^2) was

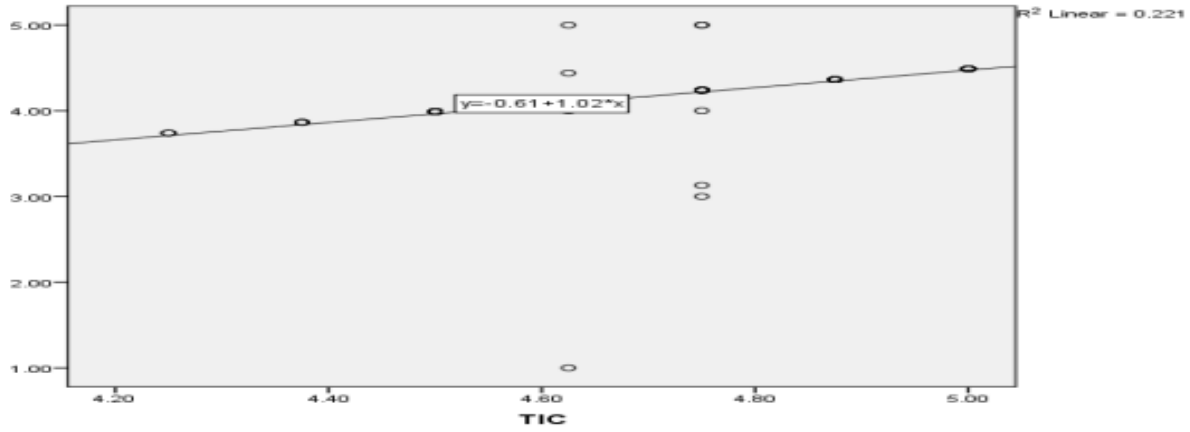
0.221, meaning that 22.1% of the variation in distribution can be explained by ICT, while the remaining 77.9% is due to other factors outside the model.

These results highlight that ICT plays an important role in enhancing distribution mechanisms by enabling real-time communication and coordination between management, distributors, and customers. This synchronization ensures efficient planning and execution of distribution operations, which in turn improves overall operational performance and the timely delivery of products to consumers . X1.016+0.607-Y= (3)

Y: Distribution :where X: ICT

If x increases by one unit, y will increase by 0.016 plus 0.607

Regression line equation representation of the distribution for ICT :)4(Figure



Source: From the output of SPSS V30

- Sub-hypothesis testing: To test the impact of IT on promotion, simple linear regression was used to assess the extent to which IT explains variations in promotional activities at Palm Mill and to determine the strength and significance of their relationship.

Table (12): Results of the simple regression analysis to test the fourth sub-hypothesis

Model	normative factors-Non		Standardized coefficients	T	F	Sig
	A	Standard errors	Beta B			
Stationary	0.223-	0.413	/	0.517-	40.389	0.606
Information technology	0.942	0.092	0.652	10.244		0.000
Correlation coefficient: 0.652 Standard error of the estimate: 0.18384 Dependent variable 04: Promotion					Standard error of the estimate: 0.18384	

Source: Prepared by the researchers based on the output of SPSS V30

From the previous table, it is evident that the significance level is 0.000, which is less than 0.05. Therefore, we reject the null hypothesis that ICT has no statistically significant effect on the promotion activities of the Palm Mill and

accept the alternative hypothesis. There is a statistically significant effect of ICT on promotion at the Palm Mill. The standardized coefficient (Beta) was estimated at 0.652, indicating a positive impact of ICT on the mill's promotional activities. The coefficient of determination (R^2) was 0.425, meaning that 42.5% of the variations in promotion can be attributed to ICT.

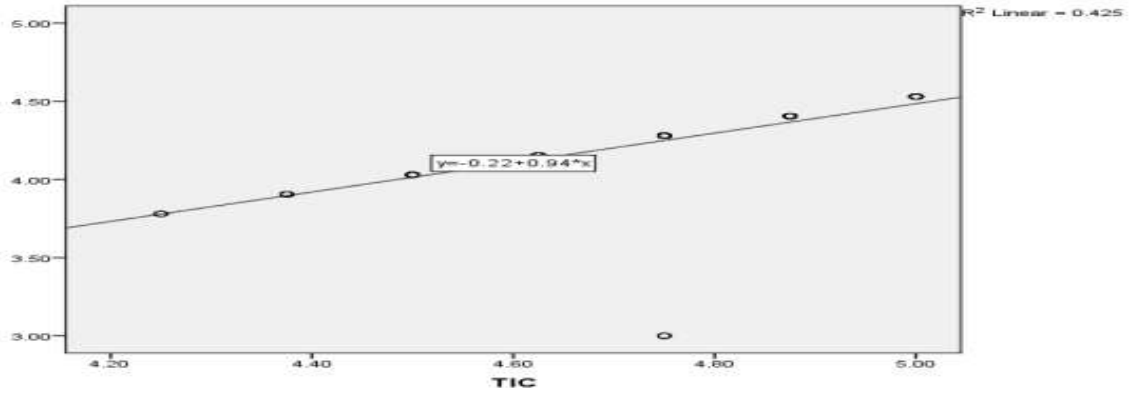
These results indicate that ICT significantly enhances promotion by providing information on customers, competitors, and market conditions. This enables Palm Mill to develop promotional strategies, enter new markets, and adapt to consumer needs, leading to improvements in packaging, branding, product design, and advertising timing and content.

$Y=0.223+0.94X$ (4)

Where: X : Independent variable Y : Dependent variable.

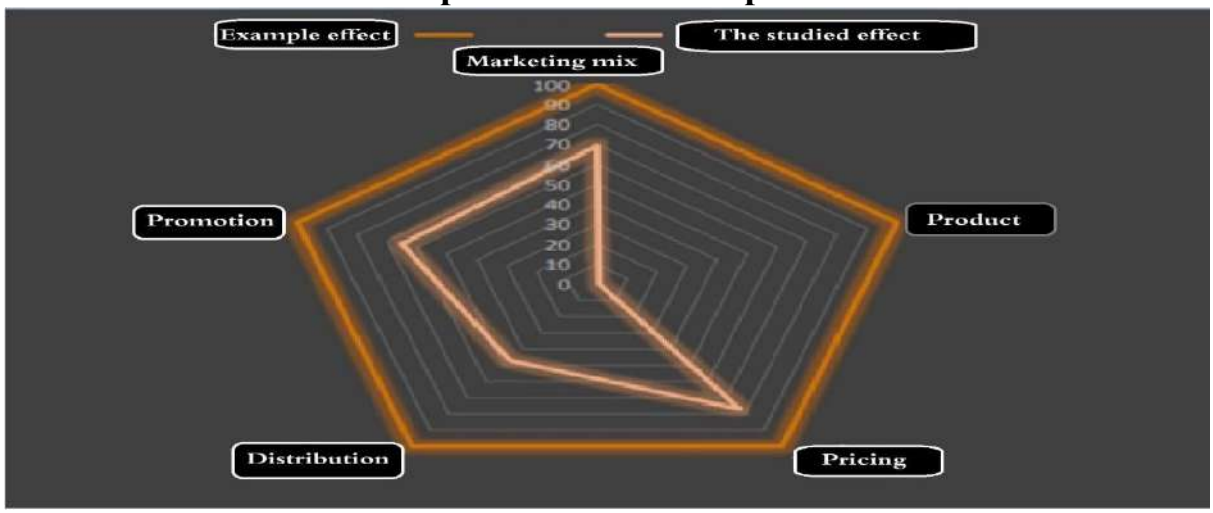
If x increases by one unit, y will increase by 0.94 plus 0.223.

Figure (5): Regression line equation representation of promotion for ICT



Source: From the output of SPSS V30

Figure (6): The impact of IT on the studied marketing mix compared to the expected idealized impact



Source: From the output of SPSS V30

Section Three: Method and Tools: In this study, we adopted both the descriptive and analytical methods. The descriptive method was used to collect and categorize information and data related to the topic, while the analytical method was applied to examine and interpret this information and data (Kannan & Li, 2017; Ivanov, 2019). These approaches are consistent with digital marketing research frameworks that emphasize structured data interpretation and technology-driven analysis in marketing environments.

For the case study, we distributed questionnaires to employees of the entity under study, focusing on areas related to ICT and marketing. To answer the study questions, both descriptive and analytical statistical methods were employed using the SPSS statistical package (Gutu et al., 2023; Wazis et al., 2016). Incomplete and non-returned questionnaires, totaling six, were excluded from the analysis.

Frequencies were extracted to identify the characteristics of the study population and sample, including variables such as age, educational qualifications, and other personal data that enrich the study. Percentages were calculated to show the proportion of each category relative to the total. Arithmetic means were used to determine the average responses for each item, while standard deviations were employed to measure the dispersion of responses around the arithmetic mean. This provided insight into the degree of consensus or variability in the responses of the study sample members. These statistical approaches align with empirical studies on marketing mix performance evaluation in ICT-driven environments (Khalayleh & Al-Hawary, 2022; Zaini, 2024).

Section Four: Testing the results of the hypotheses:

- **Main Hypothesis:** There is an impact of ICT on the marketing mix. This hypothesis is supported, as ICT clearly influences the entity by improving most of its activities and operations. This effect is a result of the optimal and effective utilization of advanced technology. With the shift towards the digital economy, ICT has become a fundamental requirement for organizations, enabling them to overcome challenges of time and space, while providing a suitable environment to facilitate communication and information exchange through the applications offered by this technology (Goestjahjanti et al., 2024; Kannan & Li, 2017).
- **First Hypothesis:** The impact of ICT on the product in the entity. This hypothesis is not supported, as ICT tools have not demonstrated a clear and effective influence on the production line in terms of speed, accuracy, or quality. Observations from the site visit and the questionnaire analysis show limited activation of ICT tools, with employees relying heavily on prior experience. This highlights a lack of management focus on training and developing employees' skills, instead relying on traditional motivation methods (Ijomah, 2023; Riccomini et al., 2024).

- Second Hypothesis: The impact of ICT on pricing. This hypothesis is supported, as the Palm Mill effectively uses internal and external communication tools to maintain updated information about its products and competitors, enabling rapid and informed pricing decisions. The entity provides employees with the necessary tools, training, and planning support to optimize pricing strategies, thereby enhancing profitability and market reach (Zaini, 2024; Gutu et al., 2023).

- Third Hypothesis: The impact of ICT on distribution. This hypothesis is supported, as effective communication strengthens employee engagement, satisfaction, and a sense of belonging, which in turn enhances performance. Observations indicate that employees who receive accurate and timely information are better able to perform their tasks efficiently and overcome challenges, improving the distribution process overall. These findings are consistent with studies highlighting ICT's role in operational efficiency and service delivery systems (Wazis et al, 2016; Ivanov, 2019).

- Fourth Hypothesis: The impact of ICT on promotion. This hypothesis is supported, as ICT provides valuable knowledge about customers, competitors, and the market. This information enables the entity to create targeted promotional offers, enter new markets, and adapt product packaging, design, and advertising schedules according to consumer needs (Aljabari et al., 2024; Khalayleh & Al-Hawary, 2022).

- Fifth Hypothesis: The Palm Mill focuses on applying ICT to develop the marketing mix. This is supported by the results of the previous hypotheses. The entity's marketing strategy emphasizes price development, continuous monitoring of products at various points of sale, and updating information about competitors. This strategy aims to maximize profits by balancing pricing with market conditions, demonstrating that ICT plays a central role in shaping the overall marketing mix (Lim et al., 2020; Lau, 2016).

Conclusion: ICT occupies a crucial role in most organizations, whether public or private, due to its numerous advantages. Its primary benefits include reducing human intervention in repetitive processes, improving organizational performance, and accelerating information exchange through networks. The application of ICT in internal communication channels brings fundamental changes to management, particularly by enabling fast and accurate decision-making based on factual data. Additionally, ICT facilitates gradual transformation in the marketing mix. Its application within marketing obliges organizations to adopt appropriate tools and techniques for effective communication across all sectors, which can only be achieved through the provision of advanced ICT infrastructure and accessible, cost-effective applications that support large-scale operations.

The study reached several conclusions at both theoretical and practical levels:

- The marketing mix at Palm Mill, despite its novelty, enhanced organizational efficiency, improved customer engagement mechanisms, and ultimately increased employee effectiveness, although this impact varied across organizational levels.
- The effect of employees on the organization's strategic plans was positively correlated with the type and extent of ICT usage.
- The effectiveness of the marketing mix requires the use of advanced ICT tools, though in our study, this was partially reflected, as profits remained relatively stable while some marketing mix elements were influenced by ICT.
- Specialized training for employees in ICT tools led to more consistent performance across workers, regardless of their competencies or educational levels.
- Optimizing parts of Palm Mill's marketing mix strategy enhanced coordination between promotional and distribution teams.
- Continuous monitoring of the network's protection and security fostered trust and comfort among administrative staff in using ICT.
- Digital transformation improved workflow and influenced employee behavior, allowing better oversight, reducing fraud, and enhancing productivity and discipline.
- Employees reported higher stability and comfort compared to traditional management methods, as information networks enabled growth, sustainability, fast access to information, cost reduction, and energy savings.

Recommendations

Based on the study's findings, the following recommendations are proposed for Palm Mill:

- Prioritize the training and qualification of all employees in ICT, both theoretically and practically, to acquire new knowledge and skills.
- Actively support the adoption of various ICT tools that enhance communication within the organization.
- Raise awareness among department heads and employees regarding the benefits of ICT, clarifying proper methods and tools for its use.
- Top management should acquire new technologies to reduce competitive gaps and enhance profitability relative to other entities in Algeria's food industry.
- Ensure that ICT-generated revenue exceeds associated implementation and maintenance costs.
- Utilize external experts to transfer competencies and contextualize ICT effectively within the organization.
- Focus on the production line as a source of innovation rather than a routine process, leveraging careful planning, advanced technology, and employee experience to maximize efficiency.
- Recognize that differences in ICT adoption and development globally directly influence competitive advantages and market share for economic entities.

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