

Economic Analysis to Measure Impact of Product Quality on the Competitiveness of Abo Ghraib Dairy Products Using (Smart Pls4) Program

D. A . Abdul Rahman  · S . H. Ali ,

* Department of Agricultural Economics, College of Agricultural Engineering Sciences, University of Baghdad, Iraq

ABSTRACT

The study was aimed to measure the impact of quality on the competitive advantage of dairy products - Abu Ghraib dairy factories - What is its impact on the competitiveness of other dairy products in the local market. And It was measured by structural equation modeling (SEM) analysis through the (smartPLS4) program Many organizations work to achieve high quality in order to remain in the competitive market Quality means (technical quality, image quality, and functional quality), that is, the quality of services provided to ensure the satisfaction of its customers It also works to reduce spoilage rates or conform the product to the specifications specified for it in a specific design, so organizations must look at quality as an opportunity to satisfy the customer. Modern procedures were relied upon to evaluate customer satisfaction through the path model (PLS). The study reached results that the quality element has the highest impact on the competitiveness of Abu Ghraib dairy factories' products, reaching (0.96). Abu Ghraib dairy factories are primarily concerned with the quality of manufactured products (cream, butter, all kinds of cheese, lard, yoghurt), as the weighted average reached (3.82) weight percentage (0.76) through the Cronbach's alpha test. The study recommended providing local factories with good quality liquid raw milk and its role in the high quality of products with the modern methods used in the dairy industry, as well as not using preservatives in the industry.

Keywords: Customer satisfaction, Path model, Product matching, Service quality, Structural equations



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INTRODUCTION

Many organizations work to achieve quality in performance in order to continue in the competitive market, as quality means (technical quality, image presence, and functional quality), that is, quality in providing services and customer satisfaction. It also works to reduce spoilage rates or conform the product to the specifications specified for it in a specific design. Therefore, organizations must look at quality as an opportunity to satisfy the customer. Therefore, the establishment must work to perform the best in production and marketing. This is also the way to solve problems or reduce costs (Shuker & Ibrahim. 2021). Therefore, this study measured

the impact of the quality of these products in terms of (technical quality, image quality, and functional quality), that is, the quality of the services provided on their competitive advantage, and that the criteria that are relied upon to evaluate the quality of the service provided are those determined by the beneficiary of that service, as it was Relying on modern procedures to measure competitiveness through the use of the smart PLS4 statistical program. Structural Equation Modeling (SEM) is considered one of the important topics that has gained great popularity recently through the interest of researchers and academics due to its ability to help in the analysis and interpretation of

complex models of economic and social phenomena. Structural Equation Modeling (SEM) is a statistical methodology that provides a set of procedures like other statistical methods and techniques such as (multiple regression, factor analysis, analysis of covariance) and other important statistical analyses. This method is used to test a theoretical model by applying a series of regression equations and using this analysis. It will provide a good possibility for analyzing explanatory models for economic, social and other phenomena that involve multiple and complex variables. In it, the explained variance of the internal latent variables is maximized by estimating partial model relationships according to an iterative sequence of the Ordinary Least Squares (OLS) method. (Sekaran, 2012, Agha & Thabit , 2019) Competitive advantage is the organization's ability to follow strategies that will provide high-quality service and exploit all available resources and excel over them . At the local level, we note that this sector suffers from many problems, including the decrease in the number of cows owned by Iraq, which led to a decrease in the local production of raw milk and the inability to meet the increasing demand for it, as well as the increase in the population annually and also the increase in cultural and health awareness of the importance of consuming dairy products. This leads to a gap between the demand for dairy products and local production.(Jeffrey, et al. 2017) Liquid raw milk is considered the most important basic input in the dairy products industry, as it is a major material in the dairy industry, and the quality of dairy products depends on the quality of the milk used in the industry. (Fahad, 2016) The dairy industry is one of the important branches of the food industry in Iraq, and it is also one of the most important food industries in the Arab world and the world, which works to improve the nutritional and health status of the population and gives rural people broad opportunities for work and thus works to reduce unemployment rates (ALKazrajy & Ahmed . 2020) Therefore, the dairy products industry is considered one of the basic pillars of the manufacturing

industries and provides a wide range of milk products and its derivatives.(AL-Khazrajy., 2020) The importance of the dairy industry is considered to have an important and high status in relation to the industry and to the rest of the foodstuffs on which people depend at the present time, as annual statistics indicate an increase in the quantities consumed of dairy products and their products with the increase in population numbers and the improvement of their standard of living. The General Company for Food Industries/Abu Ghraib Dairy Factories is considered one of the most important and largest factories for producing dairy products in Iraq. The company has worked to import modern machines from international origins and large production capacities in 2022, including machines for filling milk, cream, and thermally cooked cheese. It has worked to produce all types of Dairy products in large quantities and their products were competitive with imported products. (Fahad, 2016).

MATERIALS AND METHODS

This study is, by its nature, an applied study, and is also considered an explanatory study in terms of its purpose, as the causal relationship between the variables: cost, quality, flexibility, delivery, creativity (the independent variable), and competitive advantage (the dependent variable) was adopted, as this study aims To study measuring the impact of quality on competitive advantage, where the study population consisted of primary data obtained from factory management and workers in Abu Ghraib dairy factories (Al-Rafidain Factory, Degla Factory, Al-Furat Factory). A questionnaire form was prepared to collect data from a sample of (90) individuals that included the three factories of Abu Ghraib dairy factories (Al-Rafidain Factory, Dijlah Factory, Al-Furat Factory), represented by an assistant general manager, factory managers, production officials, department heads in factory management, marketing officials, and employees in the quality and quality control department and many employees working in factories.

RESULTS AND DISCUSSION

1.Validity and reliability of the study tool (questionnaire): The questionnaire was

presented in its initial form to a number of specialized professors and arbitrators at the College of Agricultural Engineering Sciences / University of Baghdad to ensure that it covers the basic aspects of the topic and their clarity, as well as in terms of the wording and clarity of its contents from the axes of the study.

Some phrases were deleted and some paragraphs were modified, added, and reformulated, to become more They are among the workers in the three factories. The internal consistency coefficient was calculated using Cronbach's alpha coefficients, as in Table. (1).

Table1. Reliability coefficient (Cronbach's alpha) for the variables and dimensions of the study

Variable	Dimensions	Reliability coefficient (Cronbach's alpha)
Competitive advantage	Cost	0.958
	The quality	0.956
	Flexibility	0.956
	Delivery	0.956
	Creativity	0.957
The tool as a whole		0.958

Source: Extracting the Cronbach's alpha coefficient from SPSS, ver. 26, based on questionnaires

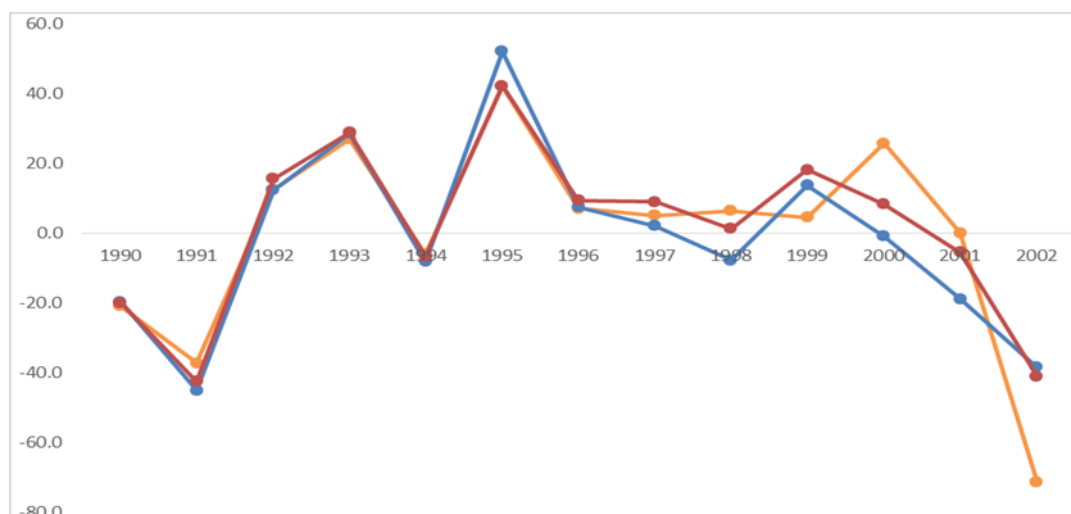
It is clear from Table (1) that the questionnaire as a whole enjoys reliability, as the alpha value reached (0.958), and the same applies to the alpha values for the dimensions of the study tool, which ranged between (0.956-0.958), as all of these values are greater than (0.70), which is the value approved as a criterion for acceptance. Tool stability.(Sekaran, 2012) Also, when we observe Table (2), the production of milk derivatives, including cheese and butter, is affected by milk production, even though imported dried milk powder was used for the year of study (2021), but we also find the fluctuation occurring in

the production of cheese and butter, and it reached the highest Cheese production was (217,347,322) tons in 2021, and the lowest production in 2013 was (216) tons, affected by milk production, which decreased in 2013 and 2014. This applies to butter production, which decreased in 2014 to record its lowest production, reaching 78 tons. As for the highest milk production, it reached (11,130) in 2001. Although milk production achieved positive growth during the study period, milk production was not sufficient to produce cheese and butter, which achieved a negative growth rate for each of them.(Bogeche, 2011).

Table 2. Quantities of milk produced (tons/year) in Iraq for the period 1990-2021

Years	Milk	Cheese	Butter	Total dairy production
1990	100403	31077	7958	139438
1991	79422	24948	6368	110738
1992	49762	13698	3657	67117
1993	55978	15386	4225	75589
1994	71064	19788	5444	96296
1995	66724	18150	5076	89850
1996	94796	27604	7219	12909
1997	101520	29648	7892	139060
1998	106596	30253	8599	145448
1999	113364	27889	8699	149952
2000	118440	31715	10277	160432
2001	148896	31410	11130	191436
2002	148896	25469	10519	184884
2003	42608	15659	6191	64458
2004	65897	14192	6591	86680
2005	65781	13273	5644	84698
2006	66665	13211	4956	84832
2007	57893	12298	4004	74195
2008	59166	12432	4084	75682
2009	74448	14165	4769	93382
2010	76648	14283	4862	95793
2011	78847	14210	4986	98043
2012	79490	14816	5121	99427
2013	37561	216	126	37903
2014	32392	290	78	32760
2015	154000	1500	304	155804
2016	139050	11265	630	150945
2017	112000	17400	3324	132724
2018	185684	44820	6425	236932
2019	0	0	0	0
2020	154	1650	83	1887
2021	0	347322	0	34722
Average	78307	26971	4825	97091
Lowest value	32392	216	78	1887
highest value	185684	347322	11130	236932
Annual growth rate (%)	-3.8%	-4.5%	-9.5%	-2.5%

Source: Ministry of Planning data / The average, lowest and highest value and annual growth rate were calculated using SPSS Ver26



Source: Prepared by the researcher Annual growth rate using the spss ,ver26

2. Data analysis and hypothesis testing: were calculated for the sample members' Arithmetic means and standard deviations answers, and the results were as.

Table 3. Arithmetic means and standard deviation of the sample members' answers to the dimensions of the competitive advantage variable

Dimensions	SMA	standard deviation
Cost	3.37	1.04
the quality	3.82	0.97
Flexibility	3.78	1.001
Delivery	3.66	0.87
Creativity	3.54	0.99
After competitive advantage	3.63	0.97

Source: Calculated based on the questionnaire form using the spss, ver26 program

The results in Table (3) indicate the responses of the sample members to the statements related to the dimensions of the competitive advantage variables in the Abu Ghraib dairy factories (Al-Rafidain Factory, Degla Factory, Al-Furat Factory), where the arithmetic average for these dimensions reached, respectively, (3.37, 3.82, 3.78, 3.66, 3.54, 3.63) It indicates a high level of adoption of competitiveness (cost, quality, flexibility, delivery, creativity). The arithmetic means and standard deviations were also calculated for the sample members' answers on the quality dimension, as teste (3) .

Table 4. Arithmetic means and standard deviation of the sample members' answers regarding the quality dimension

Rank	Paragraphs	SMA	standard deviation
1	The company offers products that are of high quality in terms of their characteristics and qualities	3.89	0.98
2	The factory offers high quality products that are distinguished .At high prices	3.62	0.97
3	The facility ensures high performance of its products through quality control procedures	4.09	0.98
4	The factory is constantly working to improve the qualitative awareness of its workers to improve quality	3.60	0.97
5	The company uses appropriate means of transportation to maintain the quality of its products	3.91	0.96
	the quality	3.82	0.97

Source: Calculated based on the questionnaire form using the spss, ver26 program

The quality dimension reached an arithmetic mean (3.82) and a standard deviation (0.97), and the highest arithmetic mean (4.09) was an item that included the establishment's high performance of its products through quality control procedures and a standard deviation of (0.98), and the lowest arithmetic mean was

(3.60) and a standard deviation (0.97) in an item where the factory works. Continuously improving the qualitative awareness of its employees to improve quality Abu Ghraib factories are primarily concerned with quality, as the weighted mean was (3.82) and the percentage weight was (0.76).

Table 5. Quality analysis of the General Food Products Company / Abu Ghraib Dairy Factories

Question number	Strongly Disagree	Not matching	Neutral	Matching	Strong conformity	SMA	standard deviation	percentage	T	Sample orientation	Question rank
1	3	3	21	37	26	3.89	0.98	41.11	8.9	identical	5
2	3	3	39	26	19	3.62	0.97	43.33	6.2	Neutral	4
3	3	6	3	46	32	4.09	0.98	51.11	10.9	identical	2
4	3	9	22	43	13	3.60	0.97	47.77	6	identical	3
4	3	6	9	50	22	3.91	0.96	55.55	9.1	identical	1

Source: The researcher's work based on the questionnaire form and using the spss, ver26 program

The impact of the supply chain in achieving competitive advantage for Abu Ghraib dairy factories was measured in the context of partial least squares (PLS), Through the use of the statistical program smart PLS4, as the topic of structural equation modeling or (SEM) is considered one of the topics that has been greatly promoted recently and of interest among researchers and academics. The reason for this is due to its flexibility and ability to assist in the analysis and interpretation of complex models, as the analysis according to structural equation modeling passes through multiple steps, including good definition of the

model specifications, then collecting data, estimating the model, and then evaluating and modifying the estimated model. The competitiveness variable includes five variables. Latent (flexibility, quality, cost, creativity, delivery). Visible variables are represented by the expressions that make up these variable. This method is based on studying and analyzing the influential and interactive relationships between the dependent variable, represented by competitive advantage, and five independent variables that essentially make up the axis of the supply chain, as shown in Figure (1).

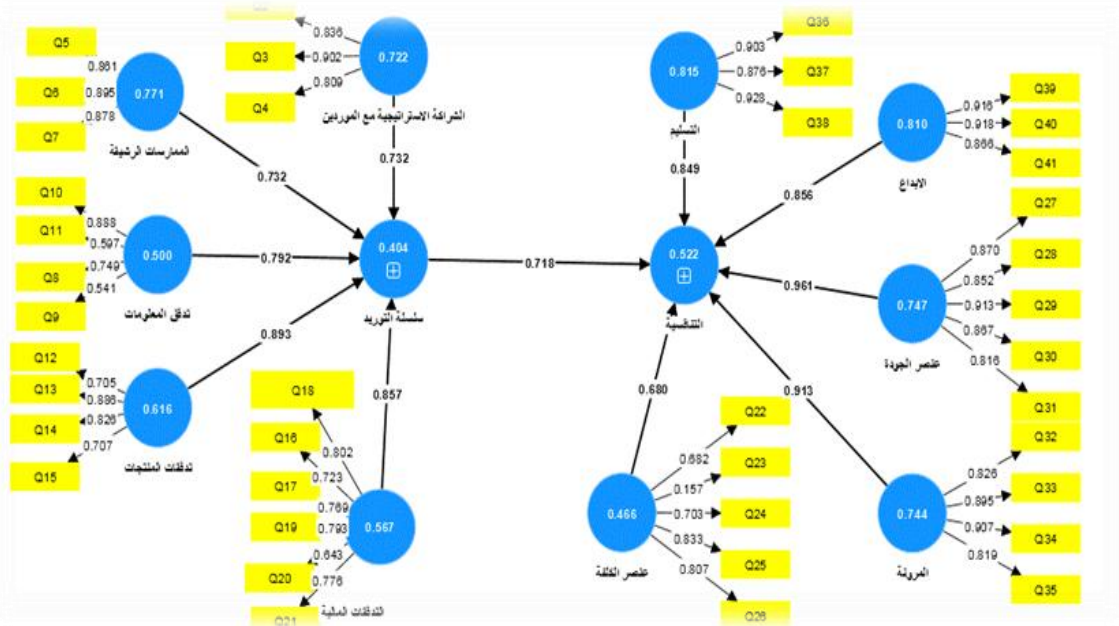


Figure 1. study model And analyze the influential and interactive relationships between the dependent variable, which is competitive advantage, and five independent variables that essentially make up the supply chain axis

Source: Prepared by the researcher using the smartPLS4 program

The model consists of a set of causal relationships that explain the nature of competitiveness. It is clear from the above figure that the quality element has the highest impact on the competitiveness of dairy products in Abu Ghraib dairy factories, with a value of (0.96). What Abu Ghraib dairy factories compete with in the market is the element of high quality. The competitive variable includes five latent variables: (flexibility, quality, cost, creativity, and delivery). Visible variables are represented by the expressions that make up these variables. By evaluating the model in standard terms, the results of evaluating the model were good through the coefficient of determination (R^2), which is a common measure upon which the structural model is evaluated, and that this factor represents the combined effects of all independent variables on the dependent variable, so on this basis, its value for this model Excellent (99%) That is, all the independent variables represented by the supply chain, which include a number of axes or factors, and each factor contains a number of items that make up the axis, have proven to

explain 99% of the dependent factor (competitiveness), and that only 1% is due to other factors. When evaluating the structural model, we must examine the level of collinearity in the structural model, and the coefficients of the independent variables may be biased due to the presence of a high level of collinearity between the expected latent variables.

$$Y = B_0 + B_1M + e_1 \quad (1)$$

$$M = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + e_1 \quad (2)$$

$$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + BM + e_3 \quad (3)$$

We need to examine this relationship according to the PLS-SEM method. The problem of collinearity arises when the tolerance values are 0.20 or less, and the VIF (variance inflation factor) values are 5 and higher, respectively (Hair, Hult, Ringle & Sarstedt, 2010). The model indicated that there were no problems with multi collinearity, as the tolerance values exceeded 0.2, while all VIF values were within the permissible limits. We also note that the structural model relationship was statistically significant, as shown in the relationship figure, where the regression coefficients were as follows:

Table 6. The overall impact of the supply chain on the competitiveness of Abu Ghraib dairy factories for the study sample for the year 2022

Path	B	Standard error SE	T- Value	P- Value	the decision
Strategic Partnership – Supply Chain	0.73	0.052	14.038	0.000	H0 reject
Agile Practices – Supply Chain	0.72	0.071	10.14	0.000	H0 reject
Information flow - supply chain	0.79	0.031	25.48	0.000	H0 reject
Product flow - supply chain	0.89	0.013	68.46	0.000	H0 reject
Financial flows - supply chain	0.86	0.035	24.57	0.000	H0 reject
Supply chain - competitiveness	0.72	0.033	21.81	0.000	H0 reject
Delivery – Competitiveness	0.84	0.022	38.18	0.000	H0 reject
Creativity - competitiveness	0.85	0.035	24.28	0.000	H0 reject
Quality - Competitiveness	0.96	0.026	36.92	0.000	H0 reject
Flexibility - competitiveness	0.91	0.038	23.94	0.000	H0 reject
Cost - competitiveness	0.68	0.054	12.59	0.000	H0 reject

Source: smartPLS4 output

We note from the above statistical analysis that the highest impact on competitive advantage was quality, as quality with competitiveness recorded the highest value (B) of 0.96 regression coefficient, as it has the highest impact on competitive advantage.

HYPOTHESIS TESTING: H0: There is no statistically significant effect of the flow of information on the supply chain at a level. We note that when the supply chain and competitive variables are well defined, the

importance of each variable in the research will emerge and facilitate the task of linking the relationships between them through logical thinking of the problem within a theoretical framework and its embodiment. According to an applied framework, and therefore, in the end, every hypothesis can be tested according to the hypothesis of the study and my agencies:

Looking at Table (6), the hypotheses are tested as follows:

H0: There is no statistically significant effect of the strategic partnership of suppliers on the supply chain at a significance level of $\alpha=0.5$

H0: There is no statistically significant effect of agile practices on the supply chain at a significance level of $\alpha=0.5$

Significant $\alpha = 0.5$

H0: There is no statistically significant effect of product flow on the supply chain at a significance level of $\alpha=0.5$

H0: There is no statistically significant effect of financial flows on the supply chain at a significance level of $\alpha=0.5$

H0: There is no statistically significant effect of the supply chain on competitiveness at a significance level of $\alpha=0.5$

H0: There is no statistically significant effect of delivery on competitiveness at a significance level of $\alpha=0.5$

H0: There is no statistically significant effect of creativity on competitiveness at a significance level of $\alpha=0.5$

H0: There is no statistically significant effect of quality on competitiveness at a significance level of $\alpha=0.5$

H0: There is no statistically significant effect of flexibility on competitiveness at a significance level of $\alpha = 0.5$

H0: There is no statistically significant effect of cost on competitiveness at a significance level of $\alpha=0.5$

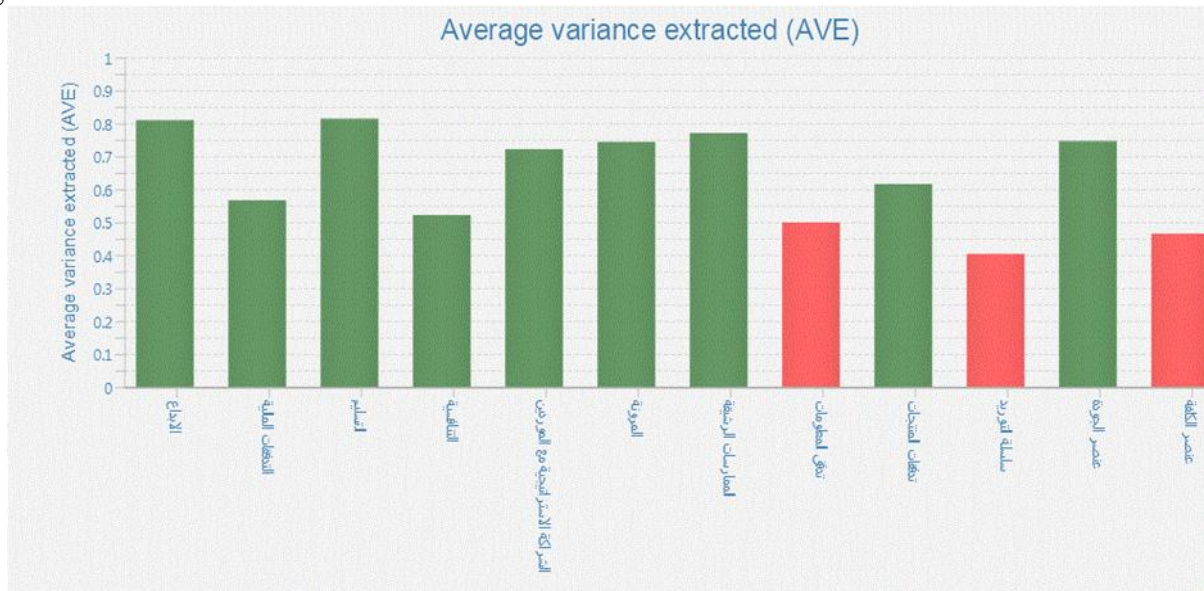


Figure 2. Average variance extracted (AVE)

Source: smartPLS4 output

that there were no multicollinearity problems, as the tolerance values exceeded 0.2 while all VIF values were within the permissible limits. The VIF (variance inflation factor) values are from 5 and higher, respectively (Hair, Hult, Ringle & Sarstedt, 2010). The model indicated **F² EFFECT SIZE THE SUPPLY CHAIN ON COMETITIVENESS**: It is an indicator that shows us the magnitude of the impact of the supply chain on competitiveness, as its results showed a good value for all axes of the supply chain, while the magnitude of the impact of all axes of the supply chain combined showed a weak impact. We can say that we are confident from a statistical

standpoint that the effect differs from zero (there is an effect of the mediating variable), which is the supply chain, and through the tables and previous drawing We conclude that all supply chain paths (strategic partnership with suppliers, financial flows, product flows, information flow, agile practices) fulfilled the first condition, which is the presence of a statistically significant effect at a significance level of $\alpha = 0.5$. Through the second condition, we note that the confidence interval does not include zero. We can say that there is an effect of the mediator variable (supply chain) for all paths and axes of the supply chain.

Table 7. f2 effect size

Independent variables	The size of the effect of f2 on the dependent variable/competitiveness	Conclusion
Financial flows - supply chain	89.74	High
Strategic partnership with suppliers – supply chain	32.11	High
Agile practices - supply chain	32.63	High
Information flow - supply chain	37.84	High
Product flow - supply chain	45.89	High
Supply chain – competitive	0.01	Low

Source: smartPLS4 output

We note that the size of the effect of all the supply chain axes combined showed a weak effect (0.01), but we are statistically confident that the effect differs from zero, (there is an effect of the mediating variable, which is the supply chain, on competitiveness, through the first condition and the second condition for all paths and axes of the Supply chain .That is, all the independent variables represented by the supply chain, which include a number of axes or factors, and each factor contains a number of items that make up the axis, have proven to have a significant, statistically significant effect at a significance level of 0.5. From all of this, we can say that in the year 2022, the capacity of production lines increased, they were developed, new lines were created, the quality of the material improved, and new materials were introduced, including the introduction of raw milk in all products. This gives quality and taste to dairy products, which competes with local and imported products, and products with a new look, distinctive taste, and manufacturing. This is all patriotic through contracting with the Iraqi investor who achieved financial support for the company and worked to introduce modern means in the management method and production methods. This is what was shown by the results of the economic analysis to measure the impact of product quality on the competitiveness of Abu Ghraib dairy products. The survey that was taken through a questionnaire confirmed The questionnaire revealed the existence of an effect of consumer satisfaction on Abu Ghraib dairy products through increasing demand for it in the local markets, and this effect appeared as a mediator, as a partial mediation was found

between product quality and competitive advantage, and the researcher was able to prove that the application of supply chain management leads to solving some supply problems from By increasing coordination between the organization's departments and working as a single unit to prevent conflict and inconsistency, the main goal that was achieved in this research is to implement an efficient supply chain, which works to achieve customer satisfaction by providing customer requests at the right time and in the right quantity at the lowest cost, highest quality, and best value. For customers.

CONCLUSION

The General Company for Food Products / Abu Ghraib Dairy Factories is distinguished by quality and is the highest variable of competitive advantage, followed by delivery and creativity, as the quality variable is the highest in value and influence on the competitive advantage of dairy products of Abu Ghraib dairy factories, as it reached a value of (0.96). This is what was shown by the results of the path model regression analysis using the SmartPLS4 statistical program. Abu Ghraib factories have implemented continuous quality improvement programs on an ongoing basis, by using fresh milk in the manufacture of dairy products, and also do not use preservatives for dairy products (cream, butter, all kinds of cheese, free fat, and yoghurt), and are concerned with reducing time wasted in internal lean practices, including The facility provides high performance for its products by conducting quality control and using appropriate means of transportation to maintain quality. The company provides products that are distinguished by high quality in terms of characteristics and

characteristics. From our study, it can also be concluded that the PLS-SEM method, with the SmartPLS4 application, is a powerful tool for mediation analysis for researchers in business administration studies as well as in the field of marketing.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

DECLARATION OF FUND

The authors declare that they have not received a fund.

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تحليل اقتصادي لقياس تأثير جودة المنتج على التنافسية لمنتجات ألبان أبو غريب باستعمال برنامج (SmartPLS4)

دينا عبد الفتاح عبد الرحمن ، سعاد حسين علي

قسم الاقتصاد الزراعي – كلية علوم الهندسة الزراعية - جامعة بغداد

المستخلص

هدف البحث لقياس تأثير الجودة في الميزة التنافسية لمنتجات الالبان- مصانع البان أبو غريب ، وما هو اثرها في تنافسية منتجات الالبان الاخرى الموجودة في السوق المحلي ، وقد تم قياسها عن طريق تحليل النمذجة بالمعادلات البنائية (SEM) من خلال برنامج . (smartPLS4) حيث تعمل العديد من المنظمات على تحقيق الجودة العالية لكي تبقى في سوق المنافسة . وأن الجودة تعني الجودة الفنية وجودة الصورة والجودة الوظيفية ، أي جودة الخدمات المقدمة لضمان أرضاء زبائنهم . وكذلك تعمل على تقليل معدلات التلف او مطابقة المنتج مع المواصفات المحددة لها في تصميم معين ، لذا يتوجب على المنظمات ان تنظر الى الجودة على انها فرصة لارضاء الزبون . حيث تم الاعتماد على الاجراءات الحديثة في تقييم رضى الزبون من خلال نموذج المسار (PLS.) وتوصلت الدراسة الى عدة نتائج أهمها أن عنصر الجودة هو الاعلى تأثيرا في تنافسية منتجات مصانع البان ابو غريب حيث بلغت (0.96) . أذ تهتم مصانع البان أبو غريب بالدرجة الاولى بجودة المنتجات المصنعة (القيمر ، الزبد ، الجبن بكافة انواعه ، دهن الحر ، اللبن) اذ بلغ المتوسط المرجح (3.82) وزن مؤوي (0.76) من خلال اختبار الفا كرونباخ. وأوصت الدراسة بتوفير الحليب الخام السائل ذو النوعية الجيدة المحلية للمصانع وما له من دور في جودة المنتجات العالية مع الوسائل الحديثة المستخدمة في صناعة الالبان ، وكذلك عدم استخدامها للمواد الحافظة في الصناعة.

الكلمات المفتاحية : رضا الزبون، نموذج المسار، مطابقة المنتج، جودة الخدمات، المعادلات البنائية.