

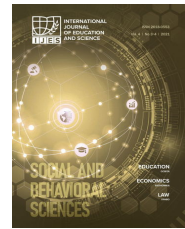


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## “Does Blockchain Technology Matter?”: Understanding Consumer Purchase Intention in a Blockchain Technology for Olive Oil Context

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**“Чи має значення технологія блокчейн?”: Розуміння намірів споживача щодо придбання оливкової олії з використання технології блокчейн**  
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**“Имеет ли значение технология блокчейн?”: Понимание намерений потребителя по приобретению оливкового масла с использованием технологии блокчейн**  
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### Abstract

**Background:** Blockchain, which was once primarily connected with financial services, is now affecting other businesses as well. Blockchain is gaining power as a tool to trace and monitor food as it moves through the supply chain, confirming its provenance. Consumers are becoming increasingly interested in learning where their purchases are created and how they are made. Consumers in the food business can use blockchain to verify the source of their purchases. Despite some blockchain studies on innovation uptake in finance settings, little is known about how consumers view blockchain in terms of food traceability and transparency, particularly olive oil products.

**Purpose:** To look why people would want to buy olive oil with blockchain code, using an adapted version of the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) that includes the perceived trust among other variables.

**Materials and Methods:** A survey methodology is used to collect responses from a sample of 115 olive oil consumers in France and analyzed via AMOS 23. Linear regression was used to assess the causal relationship between measured variables.

**Results:** The results indicate that the trust value generated by the blockchain technology has a strong effect on olive oil product's purchase intention. The unexpected result is that the other values, such as performance expectancy or effort expectancy, have no impact on that behavioural intention among French population.

**Conclusions:** For researchers, this study lunches a new call to discussion on the predictive effectiveness of the UTAUT2 model. In addition, it provides new insights to practitioners on how to increase the purchase intention towards olive oil brands that uses blockchain technology.

**Keywords:** Blockchain, food traceability, UTAUT2, purchase intention, consumer behaviour, olive oil brands.

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### Introduction

People nowadays are starting to realize the importance of eating healthier food and started to look for better choices when picking their fruits or vegetables (Marty et al., 2021). Yet, the challenges around food safety

and freshness are still persisting. These challenges rage from concerns around the origins and quality of products to the possibility of being shrinked or spoiled due to improper handling and storage (Shew et al., 2021). According to the U.S department of agriculture,

the uneaten produce from farmer goes to 33% which is about 161B \$ in waste. 22 safety alerts were issued by the U.D food and drug administration in 2019.

Currently, food fraud is one of the key factors that's standing between food companies' success (Weesepeol et al., 2021). Causing customers to lose trust and to perceive these companies as a threat to their health (Theolier et al., 2021). Fraud in the global food sector has been a severe issue for many years. The ability of blockchain technology to avoid fraud and boost security could help farmers fight fraud and improve food safety. Some of the world's major retailers and suppliers are using a blockchain-based electronic supply chain ledger to trace food from farm to shelf (Iansiti & Lakhani, 2017). Consumers might scan the code in the store and persuade themselves that they were purchasing exactly what they expected. Each step of an actual transaction is recorded in the digital ledger. The application may also be viewed and contains secure, up-to-date, and easily accessible information.

Customer value is influenced by blockchain technology because it allows customers access to products or services that were previously unavailable or could only be obtained by expending a significant amount of time or money. Nevertheless, because blockchain technology in the food business is still in its early stages, there is a chance that customers would underutilize the service, necessitating the need to address the problem. For example, in a blockchain-based electronic supply chain, a huge volume of data is transferred. This increases the transparency of information (Hughes et al., 2019).

Despite this valuable contribution, previous research studies did not consider perceived information transparency as a deciding aspect of blockchain adoption. They revealed that consumers' value perception could not be considered as a main driver for implementing a traceability system (Banterle & Stranieri, 2008; Garaus & Treiblmaier, 2021). Indeed, traceability is most often assessed on a product level, which creates a research gap when it comes to analyzing consumers perception and adoption of such new traceability system as well, as their willingness to pay premium prices for it.

In the current study, we will focus on the blockchain-based traceability system adoption in one specific sector which is olive oil. This later is possibly the most widely used and traded product in the world. Even within a single country, the olive oil market is extremely complex: production is scattered throughout developed and developing countries, and it is realized through widely various production systems (Anania, 2001). Olive oil is produced regionally but traded globally. Crushing is dispersed, while bottling is becoming increasingly consolidated, with a strong presence of international businesses. Nonetheless, branding by small bottlers with efficient marketing techniques is proving successful (similar to what has been observed in the wine sector). Olive oil consumption is expanding, although consumption patterns vary greatly in terms of quantity and quality; market segmentation is the standard; quality of

products have become increasingly significant in some nations and for some consumers (the better off and more educated) (Chrysochou et al., 2021). The European Union (EU), the world's largest producer and consumer of olive oil, fiercely defends its domestic market, despite preferential access it grants to a number of Mediterranean countries. The olive oil production, use, and commerce have attracted greater attention in recent years than in the past (Dehghani, et al., 2021; Donat-Vargas et al., 2021; Vita et al., 2021). All around the world, olive oil is one of the most essential ingredients used in kitchens, it is known by its benefits on the human body. However, many companies decided to take another path in producing their olive oil to decrease their expenses and increase revenues by adulterating their oil with other cheap vegetable oils.

Customer awareness about shifting to a healthier lifestyle started to increase lately, which made it harder for companies to sell such products to customers who lack trust towards any brand that could be harmful to his health (Ilak Peršurić & Težak Damijanić, 2021). To solve this issue, companies started to look for solutions in order to provide clarity and transparency concerning their products' quality.

The reasons behind customers distrust are olive oil mislabeling, illegal counterfeit olive oil operations and the confusion derived from how the oils were blended. Even with the products with less confusion, customers demand more credibility, transparency and authenticity. A recent study elaborated by IBM institute for Business value found that 73% of customers are ready to pay a premium for a product that provides full transparency. Using Blockchain technology allows the company to create verifiable record that shows where every bottle of olive oil was produced, and what methods were used in the production process (Mirabelli & Solina, 2020). This way, permissioned members of the supply chain such as distributors and retailers can obtain this shared information in near real time.

Embedding our study in the field of adoption of blockchain adoption in the food industry, we heed the call for research into a deeper understanding of consumers' preferences, perception and purchase intention to facilitate the adoption and the promotion of such new technology. In this field, so much work can be done and specialists can propose effective way out to technological challenges, particularly those related to increasing consumer's acceptance and use of blockchain technology particularly in food industry. However, there is still limited exploration of the impact of blockchain integration on consumer's attitudes and behaviors (Mirabelli & Solina, 2020). In fact, while the operational benefits as well as the technical challenges of a blockchain-based food traceability system have already been discussed in extant literature (Creydt & Fischer, 2019; Pearson et al., 2019), no empirical research has explored consumers' preferences for a blockchain-based traceability system thus far. This creates an important research gap since the costs associated with employing a new traceability system requires the identification of consumers' preferences

and perceptions regarding new traceability systems (Jin et al., 2017).

*The aim of the study.* To provide blockchain technology adopters with practical guidance for deploying and building blockchain applications in the food industry.

As a result, the main objective of this work is to look at the aspects that may influence olive oil consumer's buying intent of brands using the blockchain technology for traceability purposes. Particularly, considering the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) as a theoretical framework, we propose the following hypotheses:

H1: Performance expectancy (PE) using blockchain technology for food traceability has a positive impact on olive oil purchase intention (PI).

H2: Effort expectancy (EE) using blockchain technology for food traceability has a positive impact on olive oil purchase intention (PI).

H3: Social influence (SI) concerning using blockchain technology for food traceability has a positive impact on olive oil purchase intention (PI).

H4: Facilitating conditions (FC) perceived by consumers in using blockchain technology for food traceability has a positive impact on olive oil purchase intention (PI).

H5: Hedonic motivation (HM) of using blockchain technology for food traceability has a positive impact on olive oil purchase intention (PI).

H6: The Price value (PV) of using blockchain technology for food traceability has a positive impact on olive oil purchase intention (PI).

H7: The habit and experience (HE) of using blockchain technology for food traceability has a positive impact on purchase intention (PI).

H8: Perceived trust (PT) concerning the use of blockchain technology for food traceability has a positive impact on purchase intention (PI).

## Materials and Methods

A cross section study is designed to test the postulated effect of Performance expectancy (PE), Effort expectancy (EE), Social influence (SI), Facilitating conditions (FC), Hedonic motivation (HM), Price value (PV), habit and experience (HE) and the Perceived trust (PT) perceived from blockchain-based traceability system usage on the Purchase intention (PI) of a Tunisian brand that was using this technology and selling its products worldwide. The chosen company is the 1st company in Tunisia to use the IBM food trust technology that revolves around Blockchain, in order to provide traceability for its extra virgin olive oil across 8 quality assurance checkpoints including: the orchard that held the growth of olives, the mill where olives were crushed, the facilities in which the oil got filtered, bottled, distributed and more. Starting from the 14th of January 2020, every bottle of this brand included a QR code that can be scanned by customers allowing them to view a provenance record. This allows them to gain knowledge about the product's journey and will bring them peace of mind, make them trust the origins of the product and gives them more

insights into its quality checkpoints and even go through images that show where the olives were grown. The data collection was conducted in 2 weeks from September 5 to September 20, 2021. In total, 112 customers from France participated (The survey was written in French and conducted among those who are interested in adopting blockchain technology to trace food in France). We posted the survey in several French Facebook groups.

Prior research served to provide all of the measurement scales. Venkatesh et al. (2003) provided the scales for the UTAUT components (performance expectancy, effort expectancy, social influence, facilitating conditions, and behavioral intention). Habit scale was provided by Limayem and Hirt's (2003); the hedonic motivation scale by Kim and Hall (2019) and the price value scale by Dodds et al. (1991).

The scale used on which items were scored is a five-points Likert scale, with "strongly disagree" and "strongly agree" as the anchors. Age was measured in years given the following age intervals: Less than 18, 19-24, 25-34, 35-44, 45-54, 55-64, more than 64. Gender was scored as whether being a male, female or other. Professional status of participants was measured by whether it's: student, employee, independent, jobless, retired or other (55% female, 45% male).

As there was no aim for exploring the underlying factor structure within our data (because it's already known), PCA was carried in our study using SPSS.23 software. To test the PCA rightness, the KMO (Kaiser-Meyer-Olkin) index of sampling adequacy along with the Bartlett's test of sphericity were checked.

## Results

First, reliability of resulting measures was assessed using  $\alpha$  Cronbach. All of  $\alpha$  values were 0.7 which reflect a good sign of internal consistency within constructs (see Table 1).

After ensuring measurements reliability, testing model's assumptions could be established by using a linear regression technique. But before this, scores for our latent-component variables were calculated using the "Mean" statistical function on SPSS. So, new single item variables in the data set were created. Linear regression is a method of analysis for assessing the strength of the relationship between each of a set of explanatory or independent variables and another single explicative or dependent variable (Landau & Everitt, 2004). Otherwise answering "how well a set of variables is able to predict a particular outcome" (Pallant, 2007, p. 147).

The translation of our research hypotheses into a multiple linear model could be the following:

Purchase Intention =  $\beta_0 + \beta_1$  Performance Expectancy +  $\beta_2$  Effort Expectancy +  $\beta_3$  Social Influence +  $\beta_4$  Facilitating Conditions +  $\beta_5$  Hedonic Motivation +  $\beta_6$  Habit & Experience +  $\beta_7$  Price Value +  $\beta_8$  Perceived Trust + e. Before estimating the above listed model, an outlier analysis using Cook distances was carried in order to exclude outliers if exist, as linear regression is very sensitive to outliers (Pallant, 2007).

**Table 1**

*Assumption Testing Using Multiple Linear Regressions ( $R^2=0.203$ )*

Hyp	Stand Coeff	Std. Error	t Statistics	p Values	Result
H1	-0.034	0.800	-0.281	0.779	Rejected
H2	0.217	0.086	1.510	0.134	Rejected
H3	0.092	0.046	0.985	0.327	Rejected
H4	0.014	0.054	0.117	0.907	Rejected
H5	0.146	0.052	1.377	0.172	Rejected
H6	-0.044	0.043	-0.409	-0.409	Rejected
H7	0.036	0.049	0.324	0.324	Rejected
H8	0.246	0.090	2.270	0.025	Accepted

This obtained result cannot be considered conclusive unless we are sure that our model didn't violate any main assumption of the linear regression such as the absence of multicollinearity, the error linearity, independence and homoscedasticity (Berry, 1993; Pallant, 2007).

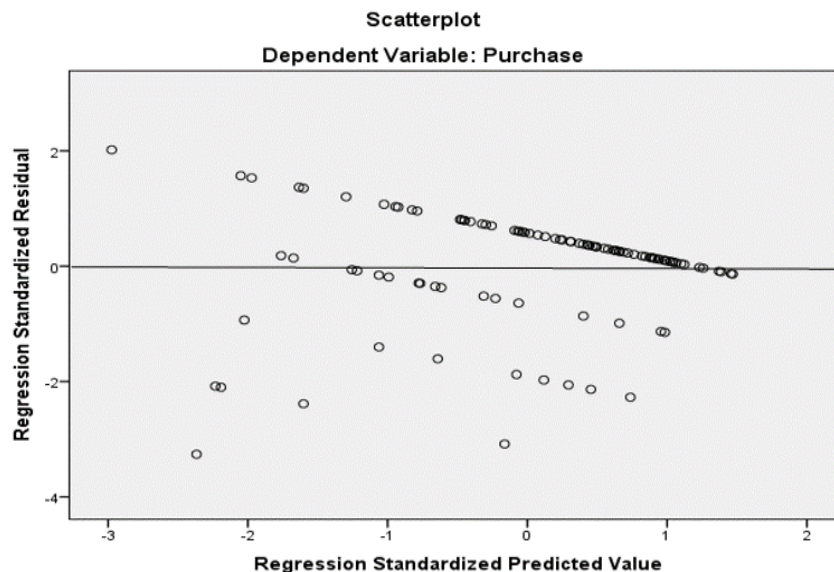
The following table show no high correlations ( $r>0.9$ ) between the independent variables in the model, so the first assumption of no multicollinearity is fulfilled (Tabachnick & Fidell, 2007).

The examination of residual scatterplots between the predicted dependent variable scores and errors of

prediction could provide a test of all normality, linearity and homoscedasticity. For this, Tabachnick and Fidell, (2007) said that the residuals have to have a straight-line relationship with the predicted dependent variable score (see Figure 1). In our case this shape was not perfectly received, but no severe deviations could be detected as well. For errors independence, we could check the Durbin-Watson statistics test, if this statistic is near to 2; this means no autocorrelation between errors. In our model, we got a Durbin-Watson=1.668, so no errors dependence can be found.

**Figure 1.**

*Scatterplot Dependent Variable: Purchase Intention*



## Discussion

The structural model was used to analyze the hypothesized relationships. This investigation generated a total of 8 hypotheses.

Only H8 was supported ( $P<0.05$ ), while the other hypotheses (H1, H2, H3, H4, H5, H6, and H7) were not ( $P>0.05$ ).

The findings of this study made clear that Performance expectancy, Effort expectancy, Social influence, Facilitating conditions, Hedonic motivation, Price value and Experience and Habit didn't have positive impact on purchase intention which is contradictory to the model followed in the study (UTAUT2). In this case, according to this data we conclude that

blockchain technology for food and particularly olive oil traceability is still struggling to gain customers' acceptance. This misalignment between our results and the previous ones could be due to several reasons: Lack of understanding of blockchain technology for food traceability by customers. The technology is still experiencing its early phases in several countries, including France where the study was conducted. Another reason is that some of the persons who filled the survey didn't have any single interaction with this technology and haven't tested it yet, that's why some of their answers could be misleading. Finally, a potential brand effect may be considered as a cause for this disagreement. Future researcher should consider



brand image and brand trust as moderators in these proposed relationships.

However, we found that Perceived trust has a significant influence on purchase intention, which means that information transparency is an important factor to consider while creating a food traceability system. TR refers to an intentional circumstance in which a person feels that future behavior will be guided by reliable and competent activities (Grazioli & Jarvenpaa, 2000). Users are empowered to make decisions in the face of uncertain evidence of dependability, allowing them to buy food that is sustainable, healthful, truthful, and safe for their own purposes (Macready et al., 2020). Consumers want more openness and accountability in the food production chain, and they want information technology to help them understand the sources and procedures from farm to fork, resulting in increased food safety trust. Consumer trust may be lost due to a lack of reliable information on market transactions, such as dishonest and misleading acts, yet providing credible food information can greatly improve consumer trust (Lam, 2020). In our case, this could be derived from the fact that customers no longer have trust in what they consume. Several food brands lost their credibility while trying to increase their income using cheap and low-quality raw materials. This explains why in prior research; perceived trust was the top contributor to improve purchase intention using food traceability systems.

As demonstrated by the findings of this study and the growing literatures on blockchain, various factors influence blockchain technology adoption in several applications. One major theme emerged from this research is the importance of trust and transparency in blockchain technology for food traceability. As a factor that must be considered.

Consumers that want to engage in mobile commerce will find it valuable.

In technology environments, practitioners must take use of consumer's need to be assured about the transparency of information they're getting out of this technology. Blockchain technology allows for distributed public ledgers to store immutable data in a secure and encrypted manner, ensuring that transactions cannot be tampered with. In blockchain applications, ease of use, process speed and received value are matters to be considered and improved.

Our case study focuses on the olive oil blockchain technology, but the same approach may be applied to any industrial or agricultural product, as long as the process of implementing blockchain technology in this field provides value.

The rapid rise in non-organizational technology use has prompted consumer-focused research models such as the extended unified theory of acceptance and use of technology (UTAUT2) (Tamilmani, 2019). This work contributes to other theories by demonstrating that adding perceived trust into the present UTAUT2 model increases its predictive ability.

In the food industry and especially olive oil, food fraud is a huge concern. The trace module allows for efficient

control and food safety along the whole food supply chain. Customers, on the other hand, still have little or no understanding of blockchain technology. Customers' understanding of the benefits of blockchain applications should be improved by blockchain suppliers.

## Conclusions

This paper makes a significant attempt to comprehend the phenomenon of blockchain, however it is not flawless. For instance, when respondents lack sufficient knowledge with a certain technology, experts have advised prudence. Because the adoption of blockchain technology is relatively minimal, the majority of respondents had little or no experience with it.

The survey was also done with French customers. Future study will be able to replicate it in other nations and compare the results.

The outcomes of this study have significant consequences for businesses. Companies who employ a blockchain-based traceability system can actively promote the technology's use to build trust. Thanks to the favorable effect of a blockchain-based traceability system on trust among companies, retailer choice can be increased in this way among less known brands, such an approach may be particularly promising for unknown food brands. When it comes to the consequences of a blockchain-based traceability system's communication strategy, our findings clearly indicate providing information with high diagnostic levels. In other words, regardless of whether the merchant focuses on altruistic or safety appeals, the benefits of a blockchain-based traceability system must be properly explained.

Future research could include moderators in the food traceability integration model such as consumer location and age, and it will be required to use this to conduct follow-up studies to see whether there are variances between different consumer samples.

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## Conflicts of Interests

The authors declare that there is no conflict of interests.

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#### Анотація

**Вступ:** Блокчейн, який колись здебільшого був пов'язаний із фінансовими послугами, тепер впливає і на інші види бізнесу. Блокчейн набирає чинності як інструмент відстеження та моніторингу продуктів харчування в міру їх переміщення по ланцюжку поставок, підтверджуючи їхнє походження. Споживачі дедалі більше цікавляться тим, де і як створюються їхні покупки. Споживачі у харчовому бізнесі можуть використати блокчейн для перевірки джерела своїх покупок. Незважаючи на деякі дослідження використання блокчейна інновацій у фінансовій сфері, мало що відомо про те, як споживачі ставляться до блокчейн з точки зору відстеження та прозорості харчових продуктів, особливо продуктів з оливкової олії.

**Мета:** З'ясувати, чому люди захочуть купувати оливкову олію з кодом блокчейн, використовуючи адаптовану версію Єдиної теорії прийняття та використання технологій 2 (UTAUT2), яка включає довіру, що сприймається, серед інших змінних.

**Матеріали і Методи:** Методологія опитування використовується для збору відповідей вибірки з 115 споживачів оливкової олії у Франції та аналізу за допомогою AMOS 23. Для оцінки причинно-наслідкового зв'язку між вимірюваними змінними використовувалася лінійна регресія.

**Результати:** Результати показують, що цінність довіри, створювана технологією блокчейн, дуже впливає на намір купити продукт з оливкової олії. Несподіваний результат у тому, що такі значення, як очікувана продуктивність чи очікувані зусилля, не впливають поведінковий намір серед французького населення.

**Висновки:** Для дослідників ця робота відкриває нові перспективи вивчення прогностичної ефективності моделі UTAUT2. Крім того, це дослідження дає практикуючим спеціалістам нові ідеї про те, як збільшити купівельний намір щодо брендів оливкової олії, які використовують технологію блокчейн.

**Ключові слова:** блокчейн, простежуваність харчової продукції, UTAUT2, купівельний намір, поведінка споживачів, бренди оливкової олії.

#### Аннотация

**Введение:** Блокчейн, который когда-то в основном был связан с финансовыми услугами, теперь влияет и на другие виды бизнеса. Блокчейн набирает силу как инструмент отслеживания и мониторинга продуктов питания по мере их перемещения по цепочке поставок, подтверждая их происхождение. Потребители все больше интересуются тем, где и как создаются их покупки. Потребители в пищевом бизнесе могут использовать блокчейн для проверки источника своих покупок. Несмотря на некоторые исследования использования блокчейн инноваций в финансовой сфере, мало что известно о том, как потребители

относятся к блокчейн с точки зрения отслеживаемости и прозрачности пищевых продуктов, особенно продуктов из оливкового масла.

**Цель:** Выяснить, почему люди захотят покупать оливковое масло с кодом блокчейн, используя адаптированную версию Единой теории принятия и использования технологий 2 (UTAUT2), которая включает воспринимаемое доверие среди других переменных.

**Материалы и Методы:** Методология опроса используется для сбора ответов выборки из 115 потребителей оливкового масла во Франции и анализа с помощью AMOS 23. Для оценки причинно-следственной связи между измеряемыми переменными использовалась линейная регрессия.

**Результаты:** Результаты показывают, что ценность доверия, создаваемая технологией блокчейн, оказывает сильное влияние на намерение купить продукт из оливкового масла. Неожиданный результат заключается в том, что такие значения, как ожидаемая производительность или ожидаемые усилия, не влияют на поведенческое намерение среди французского населения.

**Выводы:** Для исследователей эта работа открывает новые перспективы изучения прогностической эффективности модели UTAUT2. Кроме того, это исследование дает практикующим специалистам новые идеи о том, как увеличить покупательское намерение в отношении брендов оливкового масла, использующих технологию блокчейн.

**Ключевые слова:** блокчейн, прослеживаемость пищевой продукции, UTAUT2, покупательское намерение, поведение потребителей, бренды оливкового масла.

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