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Management Conference



# **Rediscovering local roots and interactions in management**

*Conference Proceedings*

*Long Papers*

*Bari (Italy)*

**29-30 June 2023**

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# **Rediscovering local roots and interactions in management**

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Long Papers

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To the reader,

this volume contains the long papers of the Sinergie-SIMA 2023 Management Conference, hosted by the LUM University and University of Bari at Mercure Villa Romanazzi Carducci (Bari) on June 29<sup>th</sup> and 30<sup>th</sup> 2023.

Theory and practice in the field of management have been challenged by the emergence of deep transitions such as those driven by globalization, the rise of social and environmental issues, and the diffusion of digital technologies. Events such as the ensuing geopolitical crises and the pandemic further contribute to spur management scholars to feel the call to produce impactful research with theoretical and managerial implications on the relationship between location and strategy (Bathelt and Li, 2022).

As a consequence, scholars and practitioners have been asked to design new business models and rethink value chains in a twofold direction (Mazutis et al., 2021). First, the relevance of local roots sheds light on the way people create and shape places, as much as places shape people and their organizations, suggesting a need to rethink how all lives ‘take place’ in places, as well as how all business happens in places (Sternad et al., 2017). Second, a need for new interactions emerges, suggesting that businesses are deeply connected to their roots, that are their homes, from which they draw inspiration, identity, and sources of competitive advantage (Soderstrom and Weber, 2020).

Rediscovering local roots and specific assets, as well as developing new ways of interaction among the economic actors and their stakeholders, can help firms to design effective and innovative strategies to create and share values (Mair et al., 2016), with positive economic, social, and environmental impacts (Attig and Brockman, 2017).

Several research questions stimulate an interdisciplinary debate in the field of management. These questions relate to the ability of firms and managers to move, among the others, between global and local relations, near/physical and far/digital interactions, reshoring and offshoring activities, omnichannel competition and retail interactions, market transactions and system operating structures, traditional and innovative approaches, social/local benefits and financial/global performances, business ethics and ethics in business.

In the same way, different theories, methodological approaches, and units of analysis are required to generate scientific research that has an impact not only in terms of theoretical contribution but also on the real business world.

The Sinergie-SIMA 2023 Management Conference was a great occasion to discuss about the research efforts of our research community on thematic tracks related to the Conference theme (the function of territorial or cultural roots and of operational interactions in management) and the SIMA thematic groups (Entrepreneurship, Innovation & technology management, International business, Marketing, Retailing & Service management, Small & family business, Strategic communication, Strategy & Governance, Supply chain management, logistics & operations, Sustainability, and Tourism and culture management).

The Conference call for papers gave the opportunity to submit either short or long papers. Overall, the editorial staff received 215 short papers and 63 long papers.

For the *short and long papers*, the evaluation followed the peer review process, with a double-blind review performed by two referees - university lecturers, expert about the topic - selected among SIMA and the community of Sinergie members.

In detail, the referees applied the following criteria to evaluate the submissions:

- clarity of the research aims,
- accuracy of the methodological approach,
- contribution in terms of originality/innovativeness,

- theoretical and practical contribution,
- clarity of communication,
- significance of the bibliographical basis.

The *peer review* process resulted in full acceptance or rejection of the submissions. In the case of disagreement among reviewers' evaluations, the decision was taken by the Chairs of the SIMA thematic groups or conference track. Each work was then sent back to the Authors together with the referees' reports. The suggestions received by the referees were used by the Authors during the presentation of their research works at the Conference.

The evaluation process ended with the acceptance of 215 short papers and 62 long papers, which were published in two distinct volumes.

All the long papers published in this volume were presented and discussed during the Conference and published online on the web portal of Sinergie-SIMA Management Conference (<https://www.sijmsima.it/>).

While thanking all the Authors, Chairs and participants, we hope that this volume will contribute to advance knowledge about the rediscovering local roots and interactions in management.

The Conference Chairs

*Angelantonio Russo, Savino Santovito, Arabella Mocciaro Li Destri and Marta Ugolini*

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# Are consumers' food purchase intentions impacted by blockchain technology?

ELISA MARTINELLI\* FRANCESCA DE CANIO\*

## Abstract

**Framing of the research.** Consumers are increasingly concerned with food products' authenticity and traceability. Blockchain technology (BCT) enables end-to-end traceability to the food supply chain, accessible to consumers through their mobiles.

**Purpose of the paper.** The study aims at understanding consumers' knowledge and factors affecting the intention to adopt the BCT when shopping for food. A model based on an integrated version of the TAM is verified.

**Methodology.** A survey based on a structured questionnaire was digitally shared among consumers. 392 responses were collected; PLS-SEM was used to verify the proposed model on the sample of knowledgeable consumers (N: 120).

**Results.** The level of knowledge of the BCT is very low (31% of the sample). Perceived usefulness (PU) and perceived ease of use (PE) influence the attitude-intention to adopt path. The technology principles knowledge impacts PU, PE, and blockchain guarantee, while the latter positively impacts on attitude. Indirect effects are all verified.

**Research limitations.** Due to the novelty of the phenomenon, the sample is small as the study focused only on knowledgeable consumers, limiting the generalizability of results. Cross-cultural studies may improve our knowledge.

**Managerial implications.** Our results are useful to supply chain members and especially to managers of manufacturing and retail companies willing to provide solutions to guarantee authenticity and traceability to consumers, but also to institutions aimed at protecting their citizens.

**Originality of the paper.** The BCT studies are mainly focused on the firm side, while little data or insights on the consumer side are available.

**Key words:** blockchain technology; consumers' purchase intentions; blockchain guarantee; technology principles knowledge; technology acceptance model; structural equation modeling

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## 1. Introduction

Consumers are increasingly concerned with food products' authenticity, traceability, and safety. Therefore, tracing and verifying food products' origin and production phases have become critical activities for all the companies involved in the supply chain in order to guarantee consumers. To cope with traceability issues and to safeguard transparency, the blockchain technology (BTC) stands as particularly useful for its capacity to store food data in chronological order making impossible their manipulation afterward (Galvez et al., 2018).

Blockchains allow end-to-end traceability to the food chain as *“information is tied digitally to each individual product, creating a digital record to prove provenance, compliance, authenticity, and quality. This information follows the product throughout the supply chain and is accessible to every stakeholder”* (Bumblauskas et al., 2020, p. 1). In this way, even consumers are enabled to access the story of foods through their mobiles. This has led some authors to far-sighted considered the blockchain as *“the tech most likely to change the next decade of business”* (Tapscott and Tapscott, 2016, p. 2). Previous food scandals have made consumers more sensible and aware of what they buy and eat (Liu et al., 2019) and lots of them use technology to find out information about food items and/or the retailer or brands that sell them. This is impacting on the food industry, leading retailers, and manufacturers to introduce better schemes to reduce information asymmetry, in particular labelling and traceability systems. In Europe, for example, heavy antibiotics usage as well as gene feeding and poor information about farming conditions have generated criticisms among the public opinion. Thus, providing consumers with a technology as the Blockchain able to give them empowerment to get information about the product's origin and feeding methods easily, allows consumers to feel more secure when purchasing food (Sander et al., 2018). The market information asymmetry can sometimes let suppliers or retailers to undertake in opportunistic behaviors, making consumers paying the consequences - economic but also sanitary and in terms of health - for that; this is why, a Blockchain-traceability system has the potential to be welcome by consumers (Lin et al., 2021). Even though labelling schemes already provide consumers with useful information, the implementation of a food traceability system could really enhance the transparency of the food industry, since the entire supply chain stages can be monitored, offering a reliable continuous flow of information to consumers (Fuzesi et al., 2020).

However, to effectively implement the BCT, it is important to develop consumers' awareness about the existence and benefits they can get from the use of this technology and map the determinants that influence its acceptance by end-users. Though, the literature on BCT - even flourishing - is strongly addressed to the “firm” side, with particular attention posed on analyzing benefits and impacts on the supply chain (Gurtu and Johny, 2019) or any specific players of it - such as, retailers (Saxena and Sarkar, 2023). The paucity of research studies focusing on consumer intentions to adopt BCT when purchasing food is at the root of this study. As a matter of fact, *“individual actions toward such advanced technology are imperative to be observed to evaluate its scalability”* (Kumar and Upreti, 2022, p. 2). Within this framework, considering that few studies or insights on the consumers side of the phenomenon are currently available, the objective of this study is to understand the level of consumer awareness of the Blockchain and specifically determining consumers' perception of it when shopping for food. To achieve these objectives, an integrated version of the Technology Acceptance Model (TAM) has been used, testing a model in which the role of technology principles knowledge (TPK) is key in order to indirectly stimulate consumer intentions to adopt the BCT when shopping for food. In addition, this is performed exploring the mediation effect of blockchain guarantee (BG).

To verify the proposed model, a survey based on a structured questionnaire was performed, digitally sharing it among consumers; data were subsequently processed through structural equation modelling techniques. To our knowledge, no studies have been conducted on Italian consumers until now to this regard, despite their highly recognized level of concern about the provenance and quality of the food they eat/buy (Menozzi, 2015). As a matter of fact, the acceptance of emerging

food technology varies depending on the technology and across countries (Ashraf et al., 2014), requiring a focus on a specific cultural context.

The paper contributes to the literature on technology management and consumer behavior, evidencing the importance of integrating the TAM model with constructs supporting the principles of the technology and service attributes, such as BG. The results obtained may also be useful to managers of manufacturing and retailing companies operating in Italy and willing to anticipate consumers' needs and provide solutions on this regard, soundly aware of the factors which may lead to BCT adoption.

Our research questions are as follows: Do Italian consumers know the Blockchain? Do they intend to use it when purchasing for food? What is the role of TPK and BG in affecting consumer adoption of Blockchain in a TAM perspective?

The paper is structured as follows. After a brief description of the evolution of the literature on blockchain, the theoretical framework and hypotheses supporting the proposed model are described, followed by the methodology used to fulfil the study. The research design, measurements and model validity sub-paragraphs are provided before presenting the results obtained and discuss them in the light of the related theoretical and managerial implications. Limitations and further research avenues end the paper.

## 2. Blockchain: a literature in evolution

Blockchain technology implementation can take place on several sectors, such as the financial one, or the services sector and so on. However, at its early stage of diffusion, the main implementations of this technology have been in the food supply chain sector, since it provides value for both retailers and producers, but also for the end consumers. The phenomenon, which immediately acquired a particular interest and application in cryptocurrencies and financial services and then in the information technology and B2B relationship literature (Alt, 2020), has subsequently been considered - among other technologies - for its disruptive impactful in several business models (Jain et al., 2021).

Actually, the BTC can be used in order to: store and share data relative to all the players involved in the supply chain; provide wide visibility to who is performing what activities, where, and when (Kshetri, 2018); to bypass intermediaries and auditors, enabling lower costs and increased efficiency (Kshetri, 2018; Tonnissen and Teuteberg, 2019); to prevent fraud.

The benefits of BCT do not stand only on food supply chain traceability: the increasing search for environmental sustainability calls for foods with a lower environmental impact and this is strictly connected to the introduction of effective traceability technologies ensuring the integrity of the information provided.

Focusing on the retail industry, a few studies have explored the facilitator role of the blockchain in the industry (e.g., Chakrabarti et al., 2017; Chen et al., 2020; Miraz et al., 2020), without, however, considering the primary role that the blockchain can play in managing the relationship between retailers and consumers. Nevertheless, the relevance of blockchain in consumer marketing is undoubtful (Jain et al., 2021). This is confirmed by the recent study of Kumar et al. (2022), shedding light on the relevance that blockchain technology may have in providing information about the product origin and track the product's history in the pre-purchase phase. However, the spread of blockchain in current consumption and purchasing processes is strongly limited by the poor knowledge on the existence and benefits of the technology possessed by consumers. Wang and Scrimgeour (2022) evidenced the current knowledge gap regarding consumer adoption of blockchain food traceability. They explored the influence of a number of factors on consumer adoption of blockchain food traceability in New Zealand, finding out that consumer adoption of blockchain food traceability was significantly influenced by two innovation-adoption features - perceived incentives and perceived complexity, as well as their expertise in food traceability. This is why our study proposes a model offering a framework in which consumers' knowledge of the

functioning of the blockchain technology and the guarantee benefit brought by adopting it constitute key antecedents to support adoption, as the next paragraph depicts.

### 3. Theoretical framework and hypotheses

The technology acceptance model (TAM) is widely used in asserting users' acceptance of an innovation in a given context. The framework was introduced by Fred Davis in 1985 in his doctoral thesis, as an evolution of the Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1975). Davis stated that the use of an information system (and in view, the acceptance of a technology) derives from the user's attitude towards that system - considered to be a major determinant - and that this, in turn, is determined by two constructs: Perceived Usefulness and Perceived Ease of Use.

According to Kulviwat (2007), Perceived Usefulness (PU) is the belief of the person regarding the perceived likelihood that the technology will benefit the person in performing a given task, increasing the likelihood of adopting it in the future. In our model, PU of the Blockchain when purchasing for food concerns all those aspects related to the traceability and provenance ascertainment. Indeed, for consumers, having easily access to a technology that allow them to determine the status and quality of a food item when shopping for food is assumed to be useful and desirable. Therefore, we can postulate the following hypothesis:

H1: Perceived Usefulness positively impact Attitude towards Blockchain adoption when purchasing for food.

Perceived Ease of use (PE) is defined as "*The degree to which an individual believes that using a particular system would be free of physical and mental effort*". It can also express the effort required by the individual to benefit from a given technology and in the literature it is recognized as the second most important variable for predicting the intention to adopt a certain kind of technology. It affects perceived usefulness and attitude directly, and through these variables it indirectly impacts intention to use. Indeed, if a given technology is perceived easier to use for achieving a certain goal, then it will also be perceived as more useful (Ursavaş, 2022). Perceived Ease of Use generally represents how much easy and enjoyable a new technology is perceived: the easier and more enjoyable a technology is, the more likely consumers may be prone to adopt it. Additionally, according to Davis (1985), the more consumers perceive an innovation to be easy to use, the more they will find benefits from using it and therefore, the innovation will be perceived as more useful as well. Two further hypotheses are then derived:

H2: Perceived Ease of Use positively affects Attitude towards Blockchain adoption when purchasing for food.

H3: Perceived Ease of Use positively affects Perceived Usefulness.

In this study, an integrated version of the TAM is used, in which the Technology Principles Knowledge construct activates a positive attitude towards the investigated technology - and, in so doing, the intention to shop for food using the blockchain technology - through the mediating effect of PU, PE and BG. Knauer and Mann (2019) introduced this construct in the TAM model, considering it as referred to the tendency that people display when looking for new information about an innovation, before actually using it. Translating this conceptualization in the specific context of the current study (the role of technology when purchasing for food), consumers who already heard about Blockchain and who already know its features and potential benefits, are likely to perceive the technology to be useful, easy and enjoyable. Indeed, knowing the benefits that arise from using a decentralized technology in a context - as shopping for food - where information asymmetries are always present, positively impacts users' perception of the Blockchain.

The following hypotheses are developed:

H4: Technology Principles Knowledge positively affects Perceived Usefulness.

H5: Technology Principles Knowledge positively affects Perceived ease of Use.

Decentralization and the immutability features of the Blockchain are essential in giving assurance to consumers when it comes to purchase food items, since having all the information available of a food item and knowing its history in terms of origin and production stages without the risk that anyone in the supply chain can modify them can lead consumers to feel safer and guaranteed in performing the shopping task. Rainero and Modarelli (2021) performed an analysis assessing consumers' poor knowledge and perceptions on the BC and the scarce usage level, but evidence also that consumption habits could change through security and certainty antecedents, induced knowledge provided by external technological intervention. As the level of trust in a technology is determined by the quality of the technological infrastructure (Koenig-Lewis et al., 2010), we can postulate a positive impact of knowing the functioning of the blockchain technology in guaranteeing consumers, as posited by the next hypothesis:

H6: Technology Principles Knowledge positively affects Blockchain guarantee.

The role of technology as a tool able to act as a guarantee for consumers has been supported in the literature (Robertson et al., 2012). In the specific context of this study, the trust protocol of blockchain guarantees consumers (Rejeb et al., 2020) and act as a boundary condition (Behnke and Janssen, 2020). The higher the level of perceived guarantee played by a technology solution, the more positive is the attitude of a consumer in using a technology as the Blockchain - where all information about the given products are provided and immutable - when buying for food.

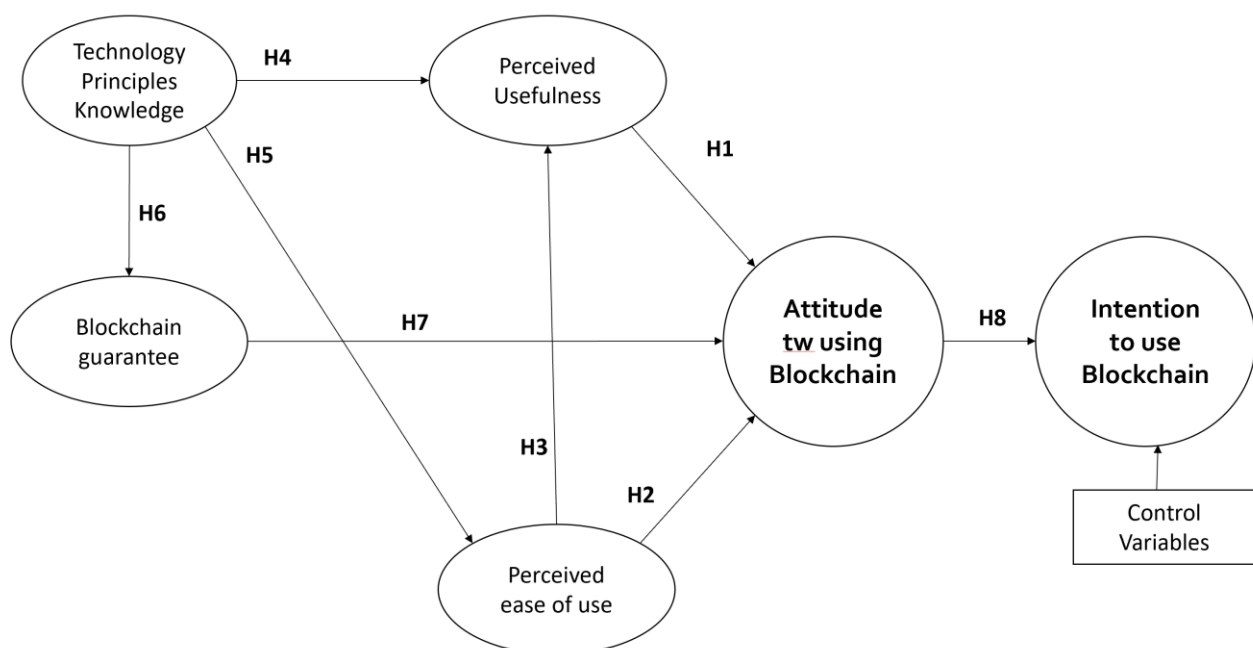
H7: Blockchain Guarantee positively impacts attitude towards using Blockchain.

Lastly, Attitude towards using the Blockchain is the main factor that influence consumers to adopt a given technology. Theoretically speaking, a positive attitude is positively related to intention to use a technology (Davis, 1985) and on other studies on different types of technologies, this relationship was found to be empirically significant. Therefore, we would like to verify the same path when the blockchain technology is employed:

H8: Attitude towards using Blockchain positively affects Intentions to use Blockchain technology when shopping for food.

Due to the novel topic, demographics may greatly improve the model performance. Accordingly, we included gender and age to the theoretical models to extend our results.

Fig. 1: Theoretical model



Source: our elaboration

## 4. Methodology

### 4.1 Research Design

A deductive approach based on a quantitative method was designed to verify the proposed model and relative hypotheses. A survey based on a structured questionnaire was developed on a Google form and shared among potential users of the blockchain technology when shopping for food products in November 2022. The link to the online questionnaire was shared on a number of Facebook groups interested to discuss on food and grocery retailing. Consumers potentially involved in sharing their opinions about products, and showing a significant interest in retailers' innovation were invited to participate. To strengthen the diffusion of the questionnaire, fifteen consumers associations officially recognized by the Italian government ([mise.gov.it](http://mise.gov.it)) were contacted; among all of them, only the "Movimento Difesa del Cittadino", committed itself to spread the questionnaire to all its associates. To avoid potential biases, no reward was given to respondents.

The structured questionnaire is composed of two main parts: the first investigates the main demographic characteristics of respondents, while the second measures the constructs proposed in the theoretical section.

In one month, we collected 392 responses - demographics are reported in table 1.

*Tab. 1: Demographic characteristics of respondents*

<i>Measure</i>	<i>Items</i>	<i>N (392)</i>	<i>n (120)</i>
Blockchain knowledge (Do you know about the blockchain technology?)	Yes	120 (30.61%)	
	No	272 (69.39%)	
Gender	Male	109 (27.81%)	79 (65.83%)
	Female	283 (72.19%)	41 (34.17%)
Age	18-25 years old	99 (25.26%)	71 (59.17%)
	26-35 years old	60 (15.31%)	18 (15.00%)
	36-50 years old	135 (34.44%)	14 (11.67%)
	51-65 years old	89 (22.70%)	16 (13.33%)
	Over 65 years	9 (2.30%)	1 (0.83%)

Source: our elaboration

The first aim of our study is to understand the level of knowledge of the blockchain technology among consumers. Considering the overall sample, a first information emerging is that only one over three respondents know about the existence of the blockchain technology. Although the overall sample was mainly composed of female (72.19%) the reduced sample based on respondents knowledgeable about the blockchain is mainly based on male (65.83%) showing a wider awareness of the emerging phenomenon for men. Similarly, while the overall sample shows a heterogeneous distribution in age groups - only the eldest cluster is poorly represented - the representativeness of the age groups of those who know the blockchain technology decreases as age increases.

As the scope of the study is to investigate how the blockchain may influence the intention to shop for food by the support of the blockchain, the following empirical analysis is developed only on respondents who knows the blockchain. Thus, the empirical analysis has been conducted on 120 questionnaires.

### 4.2 Measurements

Table 2 presents the main measures derived from the consumer behavior literature. Questions were adapted to the context of our study. Items were translated in the Italian language to simplify

the response of survey's participants. Data were measures through a five-point close-ended Likert scale.

The scale of Technology Principles Knowledge (TPK), comprising of three items, was derived from the previous study of Knauer and Mann (2020) as well as the construct of Blockchain Guarantee (BG), composed of four items. Perceived Usefulness (PU) and Perceive Ease of Use (PE) were adapted from the original scale developed by Davis (1985) and the recent study of Kumar et al. (2022). Attitude towards the use of Blockchain (A) and the Intention to use to Blockchain while shopping for food (I) scales were derived and adapted from Albayati et al. (2020).

Tab. 2: Measures

<i>Construct</i>	<i>Items</i>	<i>Standardized factor loading</i>	<i>T-statistics</i>
Technology Principles Knowledge	TPK1: I know how the Blockchain technology works.	0.885***	22.487
	TPK2: I know the advantages of a decentralized technology as the Blockchain in comparison to a centralized one.	0.902***	39.156
	TPK3: I have already heard of Blockchain applications in food retailing.	0.789***	18.005
Blockchain Guarantee	BG1: I would be in favor of using the Blockchain technology to know the traceability of a food item after a food hazard.	0.853***	25.078
	BG2: I would be in favor of buying a new product if I could be assured that it does not contain virus or bacteria (e.g., Salmonella).	0.769***	12.871
	BG3: I think Blockchain technology ensures the integrity of the provided information about a food item.	0.867***	29.630
	BG4: The usage of the Blockchain in food retailing makes me feel safer when I purchase a food item.	0.797***	18.890
Perceived Usefulness	PU1: I think that using the Blockchain technology to track information about a food item is useful.	0.842***	25.256
	PU2: I think that the Blockchain technology can help me understand the real provenance of a food item.	0.850***	27.195
	PU3: I think that the usage of the Blockchain technology can help me understand the quality of a product compared to another.	0.837***	27.930
	PU4: I think that the usage of Blockchain can speed the process of choosing a product compared to another.	0.708***	14.038
	PU5: I think that the data immutability characteristics of the Blockchain is important in the food retailing sector.	0.848***	31.555
Perceived Ease of Use	PE1: I think that scanning a QR code Blockchain based with the smartphone to access real time information about a food item does not require much time.	0.723***	12.128
	PE2: I think that learning how to use the Blockchain technology in the food retailing sector through scanning a QR code is easy.	0.895***	40.694
	PE3: I think that the usage of the Blockchain through QR code is clear and intuitive.	0.909***	46.890
	PE4: I think it is easy for me to find the information I am looking for about a food item through the Blockchain traceability system.	0.811***	20.704
Attitude towards using blockchain	A1: I am in favor of using the Blockchain technology to track food items history.	0.934***	42.073
	A2: I think that the usage of a QR code Blockchain based to track information of food items is a good idea.	0.955***	78.588
	A3: It makes sense to use the Blockchain technology to track food items history.	0.951***	65.984
Intention to use blockchain for shopping	I1: I would be in favor of using the Blockchain technology when I go grocery shopping.	0.907***	45.539
	I2: If I had access to the Blockchain technology, I would use it.	0.937***	74.300
	I3: I will use the Blockchain technology in the future.	0.824***	18.012

Source: our elaboration

Note: \*\*\* p-value < 0.001

#### 4.3 Empirical model and measure validity

To validate the internal and external validity of the measures used for the empirical analysis, we performed a confirmatory factor analysis (CFA).

To ascertain the internal reliability of constructs both values of Composite Reliability (CR) and Cronbach’s alpha are required to be higher than the 0.7 threshold (Hair et al., 2016). As confirmed by data presented in Table 3, all constructs are internally reliable. This is confirmed by the values of standardized factor loadings (see table 2) that are higher than 0.6 and statistically significant. The convergent validity was assessed by the values of the Average Variance Extracted (AVE) that are greater than 0.5 (Hair et al., 2016).

Tab. 3: Constructs reliability and validity

	<i>Cronbach's alpha</i>	<i>Composite reliability (CR)</i>	<i>Average variance extracted (AVE)</i>
Attitude toward the block-chain	0.942	0.963	0.896
Intention to use block-chain	0.869	0.920	0.793
Perceived Ease of Use	0.855	0.903	0.702
Perceived Usefulness	0.877	0.910	0.670
Blockchain Guarantee	0.840	0.893	0.677
Technology Principles Knowledge	0.822	0.895	0.740

Source: our elaboration

Applying the Fornell and Larcker criteria (results proposed in table 4) we confirmed the discriminant validity of the measurement model. Correlations among constructs pair are lower than the square root of AVE, confirming the discriminant validity.

The discriminant validity of constructs included in the measurement model was also confirmed by the heterotrait-monotrait ratio (HTMT) being all values lower than 0.9 (Henseler et al., 2015).

Tab. 4: Discriminant Validity: Fornell-Larcker criterion and Heterotrait-Monotrait ratio

	Age	A	Gender	I	PE	PU	BD	TPK
Age	<b>1.000</b>	0.069	0.024	0.093	0.125	0.096	0.095	0.064
A	-0.068	<b>0.947</b>	0.051	0.685	0.731	0.787	0.768	0.374
Gender	0.024	0.050	<b>1.000</b>	0.065	0.068	0.128	0.120	0.071
I	-0.090	0.627	0.060	<b>0.891</b>	0.685	0.730	0.723	0.383
PE	-0.115	0.657	0.018	0.602	<b>0.838</b>	0.707	0.668	0.409
PU	-0.049	0.730	0.024	0.650	0.624	<b>0.819</b>	0.888	0.540
BG	-0.088	0.685	0.001	0.624	0.572	0.774	<b>0.823</b>	0.521
TPK	-0.029	0.332	-0.048	0.325	0.342	0.473	0.441	<b>0.860</b>

Source: our elaboration

Note: Values along the main diagonal (bold) are the square root of the AVEs. Off diagonal values are the correlations between constructs, and HTMT ratios are above the diagonal.

Finally, values of the variance inflation factor (VIF) for latent constructs lower than 3 indicate the measurement model does not present potential collinearity issues (Hair and Sarstedt, 2021). Values are reported in Table 5.

Tab. 5: Collinearity statistics for the inner model (VIF)

	<i>Age</i>	<i>A</i>	<i>Gender</i>	<i>I</i>	<i>PE</i>	<i>PU</i>	<i>BD</i>	<i>TPK</i>
Age				1.005				
A				1.007				
Gender				1.003				
I								
PE		1.693				1.132		
PU		2.842						
BG		2.577						
TPK					1.000	1.132	1.000	

Source: our elaboration

Note: Variance inflation factor (VIF)

### 5. Empirical model results

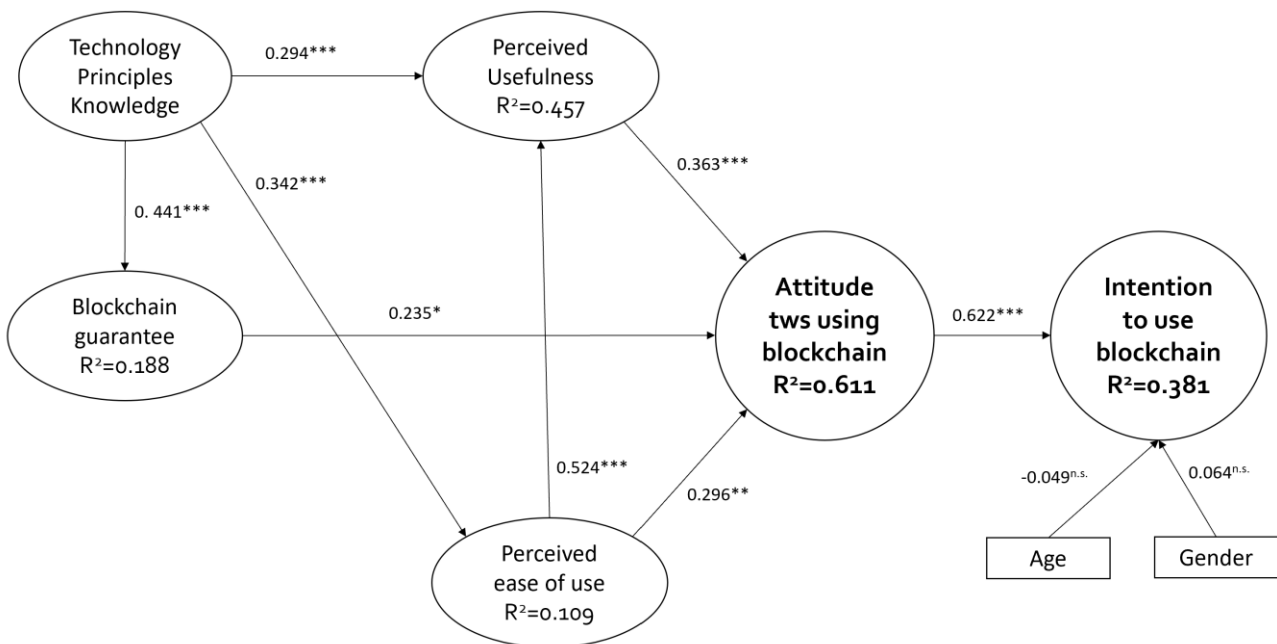
Due to the small sample size, the Partial Least Square Structural Equation Model technique (PLS-SEM) was implemented, as it is considered more reliable with reduced sample sizes and complex models (Hair et al., 2018). A bootstrap routine with 5,000 iterations was implemented to provide standard errors and t-statistics of the relationship among constructs and achieve stability in results (Henseler et al., 2009). The software SmartPLS 4.0 was used to develop the structural model and assess paths among constructs (Ringle et al., 2022). The results are presented in Figure 2. The calculated model presents a good predictive ability being the amount of variance explained by dependent variables modest for the perceived ease of use ( $R^2=0.109$ ) and the blockchain Guarantee ( $R^2=0.188$ ), moderate for the intention to use blockchain during food shopping ( $R^2=0.381$ ) and perceived usefulness ( $R^2=0.457$ ) and strong for the attitude toward the blockchain ( $R^2=0.611$ ).

#### 5.1 Structural model results

Results of the structural equation model confirm all the postulated hypotheses. The perceived usefulness and the perceived ease of use directly influence the attitude toward the use of blockchain ( $\beta_{PU \rightarrow A}=0.363$ , t-value=2.976;  $\beta_{PE \rightarrow A}=0.296$ , t-value=2.912), assessing the first two hypotheses. Further, perceived ease of use shows a direct and positive effect on perceived usefulness, in line with H3 ( $\beta_{PE \rightarrow PU}=0.524$ , t-value=7.759). The technology principles knowledge exerts a positive impact on perceived usefulness ( $\beta_{TPK \rightarrow PU}=0.294$ , t-value=3.779), perceived ease of use ( $\beta_{TPK \rightarrow PE}=0.342$ , t-value=3.511), and blockchain guarantee ( $\beta_{TPK \rightarrow BD}=0.441$ , t-value=6.543). Hypotheses 4, 5, and 6 are confirmed. Direct and positive is also the impact of blockchain guarantee on the attitude toward using the blockchain, as postulated in H6 that is confirmed ( $\beta_{BD \rightarrow A}=0.235$ , t-value=2.176). Finally, we confirm also H8 as the attitude toward the blockchain positively influence the intention to use the blockchain during food shopping ( $\beta_{A \rightarrow I}=0.622$ , t-value=7.263).

Although the sample discussion showed that young males were more knowledgeable about the blockchain phenomenon, none of the control variables present a significant impact on the intention to use the blockchain for shopping ( $\beta_{Age \rightarrow I}=-0.049$ , t-value=0.702;  $\beta_{Gender \rightarrow I}=0.064$ , t-value=0.404).

Fig. 2: Structural model results



Source: our elaboration

Note: \*\*\* p-value < 0.001; \*\* p-value < 0.01; \* p-value < 0.05; n.s. = not significant effect.



## 5.2 Indirect effects

Table 6 presents the results of the analysis estimating indirect effects. The perceived usefulness shows a strong and significant indirect impact on the intention to use the blockchain during shopping. The perceived ease of use exerts both a direct and indirect impact on the attitude toward the blockchain by the means of perceived usefulness. Further, the construct evidences a positive and indirect impact on the intention to use the blockchain, mediated by the attitude.

The technology principles knowledge by acting on the perceived ease of use indirectly influence both perceived usefulness and attitude toward the blockchain. The indirect relationship between technology principles knowledge and attitude is also mediated by blockchain guarantee.

Tab. 6: Indirect effects

<i>Indirect effects</i>	<i>Standardized factor loading</i>	<i>T-statistics</i>	<i>P values</i>
PU → A → I	0.226***	3.205	0.001
PE → PU → A	0.190**	2.686	0.007
PE → A → I	0.184*	2.431	0.015
TPK → PE → PU	0.179**	2.814	0.005
TPK → PE → A	0.101*	2.288	0.022
TPK → BG → A	0.104*	2.010	0.044

Source: our elaboration

Note: \*\*\* p-value < 0.001; \*\* p-value < 0.01; \* p-value < 0.05.

## 6. Discussion and implications

The study proposes an innovative perspective on the emerging blockchain phenomenon. The blockchain, a wide database maintaining and continuously updating data about search, orders, behaviours, and any potential record available about a subject, is a technology of undoubted potential in consumer marketing (Jain et al., 2021). The BCT can be very useful for consumers as a tool able to provide information about the product origin (Kumar et al., 2022), tracing the product's path along the agri-food supply chain and giving assurance and guarantee especially when consumers shop for food products, traditionally considered as experience or credence goods (Caswell and Mojdzuska, 1996). Within this context, the results of the present study contribute to the literature by presenting the perspective of consumers in adopting the blockchain in their shopping process. Our findings support the view of blockchain technology as “*an evolutionary breakthrough that empowers a consumer-centric mentality*” (Rabby et al, 2022, p. 266).

A first result emerging from the data collection highlights that the blockchain technology is known only by the 30% of the population. Thus, although increasingly diffused in practice, several consumers do not know about its existence and the potential usage of it. Conversely, those who know the blockchain technology, consider it as a useful and ease of use tool to facilitate their shopping process for food. From a theoretical perspective, results confirm that, among knowledgeable consumers, the blockchain acceptance and practical usage is well anchored in the technology acceptance model (Davis, 1985). In line with previous results within the technology acceptance and usage literature, the direct and indirect positive relationships between perceived usefulness, perceived ease of use, attitude and usage intentions are confirmed by our survey.

Further, results corroborate previous findings of Knauer and Mann (2019), showing that people's tendency to look for new information about an innovation, before using it - the so-called Technology Principles Knowledge - acts positively on perceived usefulness, perceived ease of use, and on blockchain defense. The latter is a novel variable; the authors included it in the Technology Acceptance Model, to test the consumers' opinion about the ability of the blockchain to serve as a guarantee of consumers in food traceability. Results show that when the blockchain technology is perceived as a guarantee for the consumer, ensuring the integrity of food information, it leads to a wider intention to use the blockchain for food shopping. Finally, the strong positive relationship

between attitude and intention confirms consumer interest for blockchain, as resulted in the recent study of Kumar et al. (2022).

The study's findings show that the blockchain technology may represent a useful informational tool for food customers that, thanks to their wearable devices, may quickly and easily access to food information. Customers show an overall predisposition to use new technologies to access information. Today, in fact, access to a digitized world of information, by scanning the QR codes, has become common and widely accepted by consumers. This allows both retailers and food product manufacturers to have new forms of communication and creation of knowledge to the benefit of their customers. The latter can find guarantee and safeguard in the BCT, satisfying their needs for authenticity and safety. But not only. In fact, the BCT spread and adoption is key to support farmers, manufactures and retailers' policies aimed at lowering the environmental impact of their activities: the BCT can be the essential technological infrastructure to ensure the integrity of the information provided.

To support and spread the use of the technology, manufacturers and especially retailers should provide information to consumers on the principles of functioning of the technology and develop dedicated communication messages aimed at enhancing the role of guarantee developed by BCT. To this aim, virtual and physical shops can be very effective platforms to spread technical information on the technology in an easy and straightforward way, studying, for instance, integrating displays, bands, and tapes able to support the trial, and interacting with mobile phones. As a consequence, the findings of the study provide practical suggestions for retailers implementing the blockchain technology in their web and mobile selling interfaces, as well as for policymakers increasingly called to protect people from an unconscious and dangerous use of blockchain.

Similarly, governments are called to afford the blockchain technology spread to guarantee citizens from an untrustworthy diffusion of personal data. As results show, two over three respondents do not know about the blockchain. Indeed, the direct access via personal devices could lead to an unconscious risk of sharing files and personal information. Thus, data sharing and blockchain guarantee, become high-interest topics for institutions aimed at protecting their citizens.

## 7. Limitations and further research

Although the manuscript offers a first empirical study on consumers' acceptance and adoption of the blockchain technology in their shopping intentions for food, future studies are required to extend these explorative results. First, due to the lack of literature exploring the consumers' blockchain adoption, we cannot corroborate the study's findings with previous results available in the literature. For this reason, one limitation of the present study concerns the generalizability of results.

Further, the sample is composed of respondents of a single country - Italy - while further studies should validate results in countries with a higher technology adoption rate, as well as in countries with a lower technology adoption rate. Moreover, extant literature analyses the differences present in UE and Asian traceability systems and rules (Quian et al., 2020), evidencing the importance of cross-cultural studies. Moreover, due to the novelty of the phenomenon among consumers, the sample is small as the study focused only on knowledgeable consumers. Future studies should investigate potential barriers and the perspectives of those who do not know the technology.

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