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Acceptance of Genetically Modified Organism: A Study based on Consumption Values, Food Attitude, and Food Technology Neophobia

Faiqa Kiran * Faiza Sultan † Muhammad Asim Nawaz ‡

Abstract: *The study introduces the study model enacted from the consumption values to estimate the influential factors of consumer consumption willingness. It investigates the differences between consumption willingness based on the values and development of food attitudes in a comparative study. SmartPLS-based SEM technique was used to do the estimation based on the data collected through a questionnaire-based survey. The results indicate that Chinese consumers are more concerned about ecological values and perceived knowledge, which are premier aspects that can improve the situation. Moreover, food technology neophobia inversely moderates consumer willingness to consume. Further, the American data set reveals that the ordinary consumer holds a positive attitude towards GM consumption but is worried about the increasing involvement of food technologies. In contrast, fear of food technologies such as neophobia dampens the existing bond between the food attitude and consumption willingness of GM food.*

Keywords: Theory of consumption value (TCV), Price value, Nutritional value, Social approval, Ecological value, Perceived knowledge value, Food attitude, and Food technology Neophobia.

Introduction

After 26 years, genetically modified (GM) food is ready to hit the general consumer markets. Since 1992, GM food has experienced rapid growth in developed and developing countries. E.g., GM food harvesting was just 1.7 million hectares in 1996 and and later it reached 179 million hectares in 2018, an almost ten folds increase. Besides this rapid growth, the consumer is concerned about technology indulgence in food (Adenle, Morris, & Murphy, 2017). Scientifically, GM food benefits the environment and health manifold and the risks associated with novel food technologies. GM controversies originated within the scientific community addressing the possible benefits and risks. Eventually, these controversies resulted in consumer reluctance to GM food and technology.

A recent survey highlights the widespread consumer concerns towards GM food worldwide. Especially in Chinese and American consumer markets. China is one of the biggest

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importers and consumers of GM-based products some of them based on maize, soybeans, canola, and cotton (Deng et al., 2017). Cui & Shoemaker, (2018) found that only 11.9% of grocery consumers showed positive affiliation towards the GM food in the Chinese market. The USA is largest manufacturer of GM food with 40% contribution around globe, growing approximately 73.1 million hectares a year (Nawaz, Asif, Asmi, & Nawaz, 2019). 51% of users consider GM food a safe option, a drop from the 60% acceptance rate. Both national governments support the concept in their territories, but consumer response differs. A considerable difference exists between both economies and the consumer response to GM food. Risks associated with GM food technology are perceived as higher than the GM technology application in the medical domain. Growing consumer concerns about technology involvement in food development have resulted in the implementation of expensive safety measures and labeling processes. This situation highlights the need to know the reasons behind the public perception of GM food. This study will help to understand the psychological models while using consumption values, food attitude, and the consumer consumption willingness of GM food. Further, the study is comparative in nature, with comparison of USA and China GM food markets.

Consumer willingness to use any such product that is technologically sophisticated brings a lot of questions to consumers' minds and influences allied consumption behavior (Ajzen, 1991). Attitude toward development influences the consumer's desire to consume a product (Bonne, Vermeir, Bergeaud-Blackler, & Verbeke, 2007). Food attitude determines the final decision in consumers' consumption intentions. Attitude is the consumer's psychological tendency to dislike a product. Consumer attitude towards a product is influenced by consumption values such as functional characteristics, social acceptance, ecological concern, or consumer knowledge. Ample evidence exists that functional factors such as price and nutritional determinants affect consumer food attitudes. Similarly, positive social recognition of a food product enhances consumption willingness (Zhang & Kim, 2013), and product social standing influences consumer attitude. Moreover, food consumers don't mind to pay better for the sustainable consumption choices, and this concern shapes food attitudes. Literature establishes the incremental role of knowledge in shaping consumer consumption willingness (Aertsens, Mondelaers, Verbeke, Buysse, & Van Huylenbroeck, 2011). The literature exhibits that a negative consumer attitude is more influential than a positive or neutral attitude toward a product. Consumer willingness to consume correlates to actual behavioral response and consumers with a more positive attitude toward consumption were more likely to purchase or consume.

The present study's theoretical support is enacted from the theory of consumption values, also known as TCV. The theory is best known for its predictive nature of consumer behavior. The current study adopts the theory to study the consumer attitude developed from consumption values leading to consumer willingness. The theory states that the five consumer values influence consumer willingness—functional, emotional, social, epistemic, and conditional value. The functional value estimates the consumer perception towards GM food. The social value will measure peer, role in developing favorable behavior. Emotional value reads the emotional stance of the consumer (Butt, 2017). Conditional values observe consumer willingness in a certain condition. Whereas, epistemic

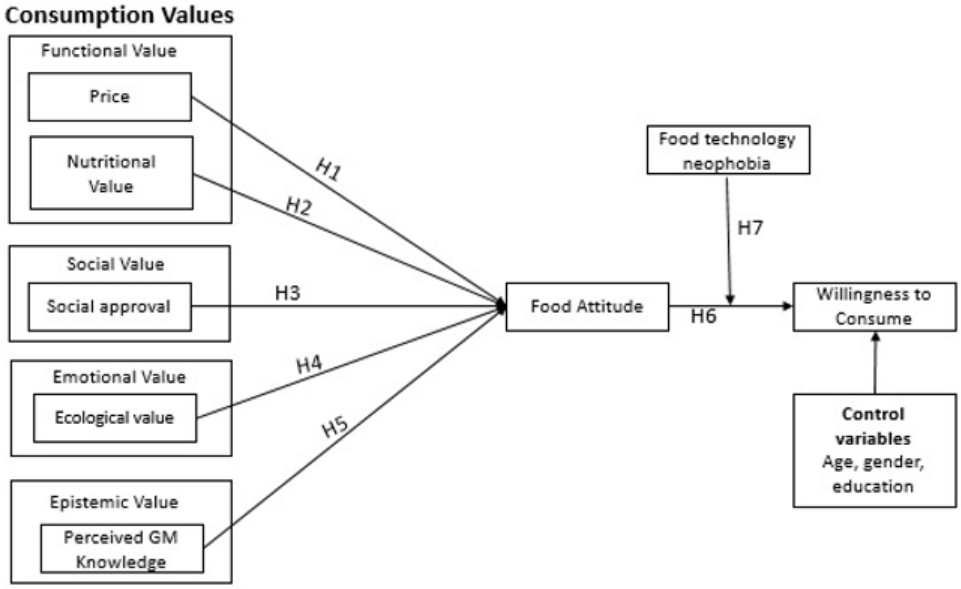
value describes the consumer's willingness to gain knowledge of the consumer products.

The TCV investigates and determines consumer consumption preferences. The theory increases understanding of consumption choices and will assist practitioners, policy-makers, and academicians while deciding which values motivate specific consumption choices. This study analyzes consumer behavior with the help of consumption values. It will extend the existing GM consumer understanding and help identify the critical factors of human consumption behavior. Moreover, the article provides a cross-cultural analysis of consumer behavior. Further, this article introduces the moderating role of technology-based food neophobia.

Research Framework and Hypothesis Development

The literature review of the TCV, food technology neophobia, and the literature on GM's willingness to consume. Later, it develops a hypothesis. Figure 1 presents the proposed research framework.

Figure 1
Conceptual Framework



Underpinning the Consumption Values

The theory of consumption values was proposed by Sheth, Newman, and Gross (1991) conceptualizes consumer behavioral response as a combination of five different values, functional value, emotional value, social value, epistemic value, and conditional value. The theory is based on three fundamental axiomatic propositions: 1) consumer behavior

is a function of various consumption values, 2) the consumption values have a different role in different purchase situations, and 3) the consumption values are independent. So, any purchase decision is influenced by one or all five values. Every value plays a fundamental role in specific purchase situations and contributes uniquely to behavioral choices (Khalid, Aslam, Irfan, & Zaman, 2022). This theory is used in multiple research articles with consistent positive predictions of consumer behavior. Sheth et al. (1991) applied the theory to study buying, product, and brand choice decisions. His results elaborate the dominating role of emotional values in consumer choice decisions, followed by the functional and social value. Long and Schiffman (2000) applied TCV to consumer segmentation to understand consumer motivation and behavior regarding relationship management with the service provider. Sweeney and Soutar (2001) considered three values and developed a perceived value to investigate consumer perception of the durable commodity at the brand level. Hur, Yoo, and Chung (2012) explore consumption theory's role in studying consumer intentions buy rubots for daily home task. They found that functional, epistemic, and emotional values are imperative determinants of consumer intentions. Gonçalves, Lourenço, and Silva (2016) adopted the TCV to examine green buying behavior and found that functional value is a better predictor than emotional value. The current study investigates consumer consumption values along with the GM food. The study will develop a general value measure regarding GM food.

Functional Value

The functional value presents the perceived utility of the market offering (Sheth et al., 1991). The perceived utility is based on price and quality. literature exhibits that consumers make price comparisons. A trade-off is made if perceived prices are higher than expected. Similarly, different studies highlight consumers' willingness to make premier prices of food choices. Vecchione, Feldman, and Wunderlich (2015) found that consumer is willing to pay 37% more for nutrient food items. Currently, literature provides evidence that consumer is not ready to pay premium or even normal prices for GM food based commercial offerings. The existing literature featured the effect of price and nutrition on consumer food attitude. Therefore, this study proposes:

H_1. Price Value will influence consumer attitude for GM food.
H_2. Nutritional Value will influence consumer attitude for GM food.

Social Value

This value represents the social association of the social groups with the new consumption choices. A social entitlement to a product or service concerning society (Sheth et al., 1991). The social value highlights the importance of the social approval of GM food, which affects the consumer's intentions to adopt a particular product or service. GMOs receive controversial responses around the globe, possibly due to the media rumors and early scientist divide over the technology. Society resists the technological changes influencing society's core values. The construct of social approval presents the perceived social

pressure to adopt a behavior (Lucht, 2015). Social support refers to the external pressure from peers while pursuing the adoption willingness.

In contrast, social approval relates to the motives that set the social and moral consequences. In the food context, social feedback from the environment makes vital contribution to consumer perception of any commercial offering in market such as GM consumer products. So, study states that:

H_3. Social approval will influence consumer attitudes for GM food.

Emotional Value

This value represents the consumer's feelings and affection for the market offering (Sheth et al., 1991). (Akpoyomare, Adeosun, & Ganiyu, 2012) highlighted the importance of this blend and found that the market is based on a mix of rational and emotional characteristics. Emotions are vital in shaping consumption decisions. The existing study claims that 89.1% of consumers buy recyclable products out of emotional attachment to the environment concept. This emotional attachment with the environment influences consumer decision-making. The scientific evidence proves that GMOs are as dangerous to the environment in both the short and long-term manner as conventional food verities. Environmental consideration is a critical factor that can influence consumer attitude (Rahman, Park, & Chi, 2015). The prior literature observed that food attitude is sensitive to the ecological concerns of the consumers. GMOs among consumers enjoy an amalgam of emotions in the context of positivity, negativity, and neutral manner as consumer awareness of GMOs has been improving over the years. So, based on these findings, this study proposes that:

H_4: Ecological Value will influence consumer attitude for GM food.

Epistemic Value

The value represents product/service requiring the consumer to gain more knowledge, resulting of novelty and curiosity. Consumer knowledge of the product determines new product adoption (Vecchione et al., 2015). In a purchasing encounter, the consumer compares the new product with routine product categories with the information from label or prior knowledge of the products. A close match of buyer-perceived attributes and product characteristics is necessary to adopt a new product. The prior literature provides evidence for knowledgeability to influence the consumer food attitude. GM food products are declared safe and eco-friendly by governing bodies, and commercial organizations (Caplan, 2001). However, GMOs are a debatable concept for the general public.

Knowledge of consumers is critical due to negative public perception of novel consumption choices (Linnhoff, Volovich, Martin, & Smith, 2017). Knowledge helps the consumer to make a more rational decision when they have a better understanding of the health and environmental risks associated with consumption. Many studies have investigated the perceived knowledge's role in molding consumer attitudes. Thus, consumer

willingness to consume depends on perception and beliefs that are by-products of knowledge. Therefore, the study proposes yet another set of hypotheses:

H_5. Perceived GM Knowledge will influence consumer attitude for GM food.

Food Enacted Attitude

Ajzen (1991) renders consumer willingness the best predictor of behavioral response. Attitude is "the evaluative effect of positive or negative feelings of individuals in performing a particular behavior" (Fishbein & Ajzen, 1977), especially in context of food attitude of consumption willingness. Moreover, attitude is portrayed as a significant factor in food consumption willingness (Deng et al., 2017). So, the study states:

H_6: The food attitude significantly affects consumer willingness to consume GM food.

Food Technology Neophobia

The aversion to GM food derives from a non-scientific sense of risks associated with GM technologies that are perceived hazards to consumer health, environment, nutrition, and quality expectation of consumers (Giordano, Clodoveo, De Gennaro, & Corbo, 2018). This scientifically unjustified sense of phobia towards GM food is known as "food neophobia" or "food technology neophobia" that especially considers consumer aversiveness for novel food technologies. This phobia has several roots, such as consumers believing that technology adversely affects the food's naturalness and consequently opposes food novelties (Barrena & Sánchez, 2013). Inventing and promoting new food technologies like GM food is expensive. Neophobic consumers tend to respond negatively to new or unfamiliar food items. Siegrist, Hartmann, and Keller (2013) stated that neophobic consumers exhibit negative attitude and have lower expectations of food taste and quality. Usually, neophobic intentions are characterized as a personality trait that indicates consumer intentions to accept or reject innovative food. Similarly, literature has considered neophobia a behavioral response to a particular situation (Cooke, 2018). The present article estimates the moderating relation (food technology neophobia) in between food attitude and consumption willingness. Thus, the study introduces another hypothesis:

H_7: Food technology neophobia moderates in between the attitude and consumption willingness.

Methodology

The current study explores consumer willingness to use genetically modified foods and the moderating relation of food neophobia The article is quantitative and descriptive, as the study gap is derived from the existing literature. That's why this exploration has followed deductive reasoning. Further, the study has followed the cross-sectional approach

for data collection. To collect the data, the study used the questionnaire survey technique to gain respondent response by purposive sampling.

Data Collection Procedure

The survey's target population was the general consumers visiting the fruit and vegetable markets for daily groceries. This is why the study has developed a printed questionnaire to collect the data. The questionnaire was distributed among the respondents visiting supermarkets selling genetically modified food products. In this perspective, the authors have considered the purposive sampling technique as it allows the researchers to request the respondents to provide their feedback. The survey was conducted in large cities in both countries (China: Beijing, Hefei, Shanghai, Guangzhou, Nanjing, and Wuhan. USA: New York, California, Sacramento, Colorado, Denver, and Connecticut). The authors have received 303 and 318 responses from China and the USA, with an 87% response rate.

Measurements

The questionnaire was adapted from relevant studies as "price value" by Choe and Kim (2018) and "nutritional value" from the scale developed by Asif, Xuhui, Nasiri, and Ayyub (2018), and (Choe & Kim, 2018). "Social approval" was measured using the scale developed by Choe and Kim (2018). Ecological values were calculated based on a scale developed by Gug, (2014). "Perceived GM knowledge" was adapted from Chen (2008). "GM food attitude" was measured using the scale of Rodríguez-Entrena and Salazar-Ordóñez (2013). "Food Technology Neophobia," exploring the technological fear of food consumers, scale is adapted from the research article of Schnettler et al. (2017). Table 1 presents the detailed measurement scale.

Results

The SmartPLS based estimation is well known for its ability to process the complex structures. It has minimum limitation in term of measurement scales, population size, number of items, numbers of varibales and the residual values. This article adopts the PLS-SEM technique to process the survey data (J. Hair, Andreson, Tatham, & Black, 1998). The PLS-SEM technique can run multiple variables and can be sub-categorized into two stages model. First, measurement model-based estimations are established and in the second stage structural model is estimated.

Further, SEM technique studies multivariant data sets in which researchers measure observed variables (J. Hair et al., 1998). This article chooses the PLS-SEM technique as it can estimate the multiple latent variables simultaneously. In last, PLS-SEM technique is a two step approach. First step is measurement model and the second step is the estimation of structural model.

Table 1
Measurement scale

Factor		Item	Source
Nutritional Value	NV1	I think that GM food is hygienic.	(Asif et al., 2018; Choe & Kim, 2018)
	NV2	I think GM food makes me healthy.	
	NV3	I think that GM food is safe.	
	NV4	I think GM food provides me with good nutrition.	
Price Value	PR1	GM food is good value for money.	(Choe & Kim, 2018)
	PR2	I think that GM food is reasonably priced.	
Social Value	SV1	Eating GM food gives me a chance to show off my GM experience to others.	(Choe & Kim, 2018)
	SV2	I have higher social status when eating well-known GM food.	
	SV3	It is worth sharing my GM food experience with others.	
	SV4	Eating GM food gives me prestige.	
Ecological value	EV1	Mankind is severely abusing the environment	(Gug, 2014)
	EV2	Humans must live in harmony with nature to survive.	
	EV3	I am worried about the state of the world's environment and what it will mean for my future.	
Perceived GM Knowledge	PK1	I'm personally very knowledgeable about GM foods.	(Chen, 2008)
	PK2	The average person in China is very knowledgeable about GM foods.	
	PK3	The government is very knowledgeable about GM foods.	
Food Technology Neophobia	FN1	New foods are not healthier than traditional foods.	(Schnettler et al., 2017)
	FN2	The benefits of new food technologies are often grossly overstated.	
	FN3	New food technologies decrease the natural quality of food.	
	FN4	Society should not depend heavily on technology to solve its food problems.	
	FN5	There is no sense in trying out high-tech food products because the ones I eat are already good enough.	
	FN6	New food technologies may have long-term adverse environmental effects.	
Food Attitude	FA1	Production of GM food improves the current and future society's welfare.	(Rodríguez-Entrena & Salazar-Ordóñez, 2013); (Rojas-Méndez, Ahmed, Claro-Riethmüller, & Spiller, 2012)
	FA2	Production of GM food is a necessary activity for society.	
	FA3	Production of GM food has more benefits than risks for society.	
	FA4	Production of GM food provides a balanced and varied diet.	
Willingness to consume GM	WC1	I will buy GM food if it was of better quality than ordinary food	(Asif et al., 2018)
	WC2	I intend to consume GM food in the future.	
	WC3	I will buy GM food if it was cheaper than ordinary food.	

Demographic Analysis

The table-2 discusses the demographic outcome of the surveyed data. None of the control variables had any influence on the dependent variable. The control variables includes the gender, age, and the education.

Table 2
Demographic Description

Measures	Value	Frequency		(%) Approx.	
		China	USA	China	USA
	Male	153	149	51	48
Gender	Female	146	164	49	52
	18-24	68	41	22	13
	25-30	82	126	27	40
Age	31-40	115	90	38	29
	41-above	38	56	13	18
	High school graduates	45	113	15	36
	College graduates	120	90	40	29
Education	Bachelors	100	80	33	25
	Masters	29	30	9	10
	PhD	9	-	3	-

Study 1. Chinese Consumer Willingness to Consume GM Food

Measurement Model

The measurement model estimates the EFA to validate the internal reliability of constructs. To do so, the study measured the variance extracted of all factors and external discriminant validity. The table-3 contains the EFA estimations. To study the internal reliability, Cronbach α is calculated and the threshold value is 0.70 and all the values meets this criterion of Fornell and Larcker (1981). Next is the composite reliability or simply "CR" with minimum value of 0.70 and all the values are above it as described by Fornell and Larcker (1981). Average Variance extracted or AVE measures the difference in between the constructs. The minimum threshold value of 0.50 is acceptable and all values are above the standard value (J. F. Hair, Sarstedt, Ringle, & Mena, 2012).

The discriminant validity establishes the external validity of the constructs being observed in study framework. The process is completed by estimating the square root of each construct, abbreviated as AVE or average variance extracted. AVE must ve above the inter-construct correlation. Considering this perspective, the present study meets this criterion as given in table-4.

Structural model and hypothesis testing: To study the approximate fit indices, PLS offers the criterions such as the SRMR and NFI. The threshold values of SRMR are $<$0.08 and the current study is having SRMR values with in the given limits. NFI $>$0.90 is acceptable and the current study is having a value above the threshold value. A value of 0.12 for RMS_theta exhibits a well-fit model (Henseler et al., 2014). Our values are SRMR 0.073, NFI 0.92, RMS_theta 0.11, and VIF 1.051 to 3.290. This shows the study structure is valid for further exploration.

Table 3
Exploratory Factor Analysis and Reliability Analysis

Chinese Consumers					American consumers				
Construct	**Factor loadings**	**Cronbach's alpha**	**(CR.)**	**(AVE)**	**Construct**	**Factor loadings**	**Cronbach's alpha**	**(CR.)**	**(AVE)**
PR1	0.784	0.769	0.861	0.674	PR1	0.877	0.755	0.859	0.671
PR2	0.853				PR2	0.839			
PR3	0.825				PR3	0.766			
NV1	0.829	0.760	0.857	0.667	NV1	0.837	0.774	0.852	0.658
NV2	0.773				NV2	0.761			
NV3	0.846				NV3	0.86			
SV1	0.801	0.755	0.857	0.667	SV1	0.718	0.719	0.842	0.641
SV2	0.848				SV2	0.838			
SV3	0.800				SV3	0.848			
EV1	0.876	0.835	0.887	0.665	EV1	0.824	0.834	0.889	0.666
EV2	0.854				EV2	0.843			
EV3	0.837				EV3	0.831			
EV4	0.700				EV4	0.783			
PK1	0.921	0.892	0.933	0.822	PK1	0.891	0.829	0.897	0.743
PK2	0.899				PK2	0.865			
PK3	0.901				PK3	0.840			
FA1	0.847	0.841	0.894	0.679	FA1	0.783	0.808	0.874	0.635
FA2	0.713				FA2	0.777			
FA3	0.861				FA3	0.843			
FA4	0.866				FA4	0.800			
WC1	0.784	0.731	0.848	0.651	WC1	0.854	0.768	0.866	0.684
WC2	0.856				WC2	0.844			
WC3	0.777				WC3	0.792			

Table 4
Square of correlation between latent variables

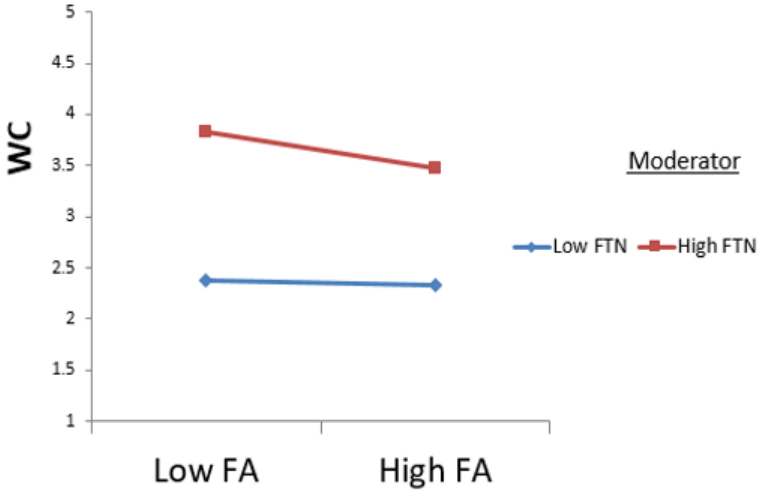
Sr.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Ecological Value	**0.815**							
2	Food Attitude	-0.178	**0.824**						
3	Food Technology Neophobia	0.703	0.067	**0.806**					
4	Nutritional Value	0.650	-0.143	0.757	**0.817**				
5	Perceived Knowledge	-0.096	0.822	-0.104	-0.102	**0.907**			
6	Price Value	0.660	-0.186	0.762	0.650	-0.177	**0.821**		
7	Social Approval	0.677	-0.153	0.686	0.656	-0.131	0.744	**0.817**	
8	Willingness to consume	0.603	-0.182	0.657	0.674	-0.166	0.573	0.639	**0.807**

The statistical findings provide valuable results. The first construct of TCV is the functional value with further sub-categorization of price and nutrition. They are statistically non-significant and do not influence the food attitude of Chinese consumers. Hence H1 and H2 are non-significant. The second construct is social approval (social value). Statistical results found the relationship non-significant; hence, H3 is also not approved. The Third construct is the ecological value (emotional value). Ecological value makes negative contribution to the food attitude (β = 0.-0.129, $p < 0.05$). H4 has approved shows that Chinese consumer is emotionally attached to environmental sustainability. The consumer GM perceived knowledge contributes significantly to the positive attitude development toward GM food. The relation between GM's perceived knowledge and food attitude makes significant and positive contribution (β = 0.218, $p < 0.01$). So, H5 is supported. Moreover, the relationship between the food attitude and consumer willingness is inversely significant (β = -0.103, $p < 0.01$). The results show that Chinese consumer has

negative attitude for the GM food.

The food technology neophobia is also inversely significant (β = -0.081, p $<$ 0.05). Technology fear further enhances the antagonistic relation between the food attitude and willingness of Chinese consumers towards GM food. The graphical representation is presented in Figure-2. According to behavioral research standards, a value of R2 above 0.2 is considered relatively high and acceptable. In this study, the R2 value for food attitude is 0.682, and the willingness is 0.444.

Figure 2
Exhibiting the moderation relationship



Further, the blindfolding procedure helps to estimate the relevance of exogenous variables along with the overall performance of the study structure. Blindfolding combines function fitting and cross-validation by evaluating each construct's predictive relevance by calculating changes in the criterion estimates (Q^2). $Q^2 > 0$ indicates the relevance of the model. Our results of Q^2 indicate that consumer's food attitude towards GM (Q^2 = 0.429) and willingness to consume GM (Q^2 = 0.273). The outcome depicts the predictive relevance of study as observed measures have satisfactory values.

Study 2. American Consumer Willingness to Consume GM Food

Measurement Model

Exploratory factor analysis is used to study the contruct internal reliability. The procedure includes the tests such as the factor loading, compositive reliability, Cronbach alpha and average variance extracted. The table-2 contain study EFA output. The outcome of 'Cronbach α' and 'Composite Reliability' must have a minimum value of 0.70 (Fornell & Larcker, 1981). Similarly AVE or average variance extracted value must not be less than

0.50. The current study outcome meets all these criterions and provides positive signal for further exploration.

The discriminant validity is vital to estimate the external validity of the criteria under investigation in the current model. In the present study, discriminant validity is measured by calculating the square root of the AVE values that remains beyond the correlation between the items. So, the study meets the discriminant validity indicators. Table-5 contains the discriminant validity outcome.

Table 5
Square of correlation between latent variables

Sr.		1	2	3	4	5	6	7	8
1	Ecological Value	**0.816**							
2	Food Attitude	0.692	**0.797**						
3	Food Technology Neophobia	0.782	0.664	**0.732**					
4	Nutritional Value	0.593	0.628	0.641	**0.811**				
5	Perceived Knowledge	0.648	0.630	0.661	0.602	**0.862**			
6	Price Value	0.747	0.767	0.714	0.612	0.660	**0.819**		
7	Social Approval	0.707	0.726	0.720	0.671	0.667	0.812	**0.800**	
8	Willingness to consume	0.708	0.752	0.667	0.640	0.685	0.809	0.709	**0.827**

Structural model and hypothesis testing: To study the approximate fit indices, PLS offers the criterions such as the SRMR and NFI. The threshold values of SRMR are <0.08 and the current study is having SRMR values with in the given limits. NFI >0.90 is acceptable and the current study is having a value above the threshold value. A value of 0.12 for RMS_theta exhibits a well-fit model (Henseler et al., 2014). Our values are SRMR 0.07, NFI 0.91, RMS_theta 0.11, and VIF 1.041 to 3.490.

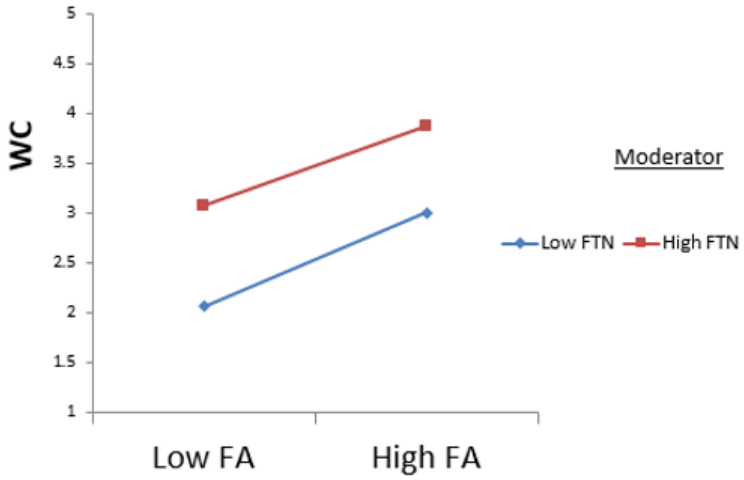
Table 6
Hypothesized Direct Effects

Hyp.		Chinese Data		Result	American Data		Result
		Est.	Sign.		Est.	Sign.	
H1	PV → FA	0.030	0.544	Non-significant	0.364	0.001	Significant
H2	NV → FA	-0.042	0.529	Non-significant	0.158	0.010	Significant
H3	SV → FA	0.055	0.404	Non-significant	0.105	0.302	Non-significant
H4	EV → FA	-0.129	0.050	Significant	0.184	0.001	Significant
H5	PK → FA	0.218	0.001	Significant	0.105	0.050	Significant
H6	FA → WC	-0.103	0.010	Significant	0.436	0.001	Significant
H7	FA → FTN → WC	-0.081	0.050	Significant	-0.041	0.050	Significant

The statistical findings provide valuable results. The first construct of the TCV is that the functional value in the context of price and nutrition are statistically significant. The outcome states that price along with nutrition influence the food attitude of USA consumers. So, H1 (β = 0.364, p < 0.001) and H2 (β = 0.158, p < 0.01) are supported. The second construct is social approval (social value). Statistical results are non-significant; hence, H3 (β = 0.105, t < 1.96) is not approved. The third construct of the theory is the ecological value (emotional value) that contributes significantly to forming a positive food attitude. The relationship is significant at (β = 0.184, p < 0.001). This result establishes that consumer think technologically developed food items contribute positively towards ecological stability. Further, the bond of knowledge and food attitude holds positively

significant. Hence H5 (β = 0.105, p $<$ 0.05) is approved. Moreover, the relation between the food attitude and willingness is also significant (β = 0.436, p $<$ 0.05).

Figure 3
Exhibiting the moderation relationship



The moderating variable is also inversely significant (β = 0.-0.041, p $<$ 0.05). Technology interference with the natural process is gaining consumer intention. The "food technology neophobia" dampens the positive association of food attitude and willingness. The graphical representation is presented in figure-3. According to behavioral research standards, a value of R^2 above 0.2 is considered relatively high and acceptable. In this study, the R2 value for food attitude is 0.648, and the willingness is 0.696. Further, the blindfolding procedure helps to estimate the relevance of exogenous variables along with the overall performance of the study structure. Blindfolding combines function fitting and cross-validation by evaluating each construct's predictive relevance by calculating changes in the criterion estimates (Q^2). $Q^2 > 0$ indicates the relevance of the model. Our results of Q^2 indicate that consumer's food attitude towards GM (Q^2 = 0.386) and willingness to consume GM (Q^2 = 0.448) have satisfactory predictive relevance as the values are above the cutoff level.

Discussion

The study focused on exploring the factors that influence consumer perception, leading to a consequent willingness to consume GM food. The study offers the moderating role of technology interference with the natural procedure term food technology neophobia. Secondly, the study is comparative in nature. As in the case of China, the food attitude was overwhelmingly found to be negative, and predicting negative consumer food attitudes towards the consumer willingness and their interaction terms were found significant. Such results are indirectly supported by the previous literature (Zhang & Kim, 2013),

which established that Chinese consumer is highly concerned about ecological stability and ecological value inversely affect the consumer food attitude in the context of willingness to consume stuff that may adversely affect the ecological stability. Price value, nutritional value, and social support were having a non-significant relationship with the consumer willingness to consume. These findings contradict previous results. These findings support the argument that when it comes to technology involvement in general consumer products, the consumer is willing to pay more, sacrifice the scientifically claimed nutritional value, and highly values the social pressure of society (Jones, McFarlane, Park, & Tranter, 2017). Perceived knowledge was found to influence consumer food attitude positively, which supports some of the previous findings, and presents contradictory results in some others. This finding may be due to the recent intense media campaign by the Chinese government to influence consumer perception regarding GM food. Based on the statistical contribution from the consumption values, consumer food attitude towards the consumption willingness of consumers was found to be predominantly negative. These findings were supported by Zhu, Yao, Ma, and Wang (2018), and found that food attitude is the dominant factor in shaping desired willingness for GM food.

Moreover, in the American consumer market, the consumer behaves differently regarding GM food. The American consumer considers price a positive contributor to the food attitude. Further, nutritional value also contributes positively towards developing a favorable consumer attitude in shaping cheerful willingness for GM food. The nutritional value findings align with the previous results, claiming that the nutritional value of eatables is the top perspective of American consumer markets. Whereas, Social appraisal has a non-significant impact on consumer food attitude. The possible reason behind it is the recent public movements against the non-labeling of GM food products as an ingredient. The results further illustrate that ecological value contributes to developing a positive consumer food attitude. These findings differ from those of Murphy, Levidow, and Carr (2006). The possible reason might be that the American consumer stand higher in technology adoption indexes (Kennedy & Funk, 2016). The findings regarding the GM perceived knowledge significantly contribute to developing positive consumer attitude towards GM food. These findings align with the previous results of Vecchione et al. (2015). The statistical contribution from the consumption values consumer food attitude towards the consumption willingness of consumers is positive.

The study further discusses the moderating role of neophobia between attitude and willingness. The output exhibit that food technology neophobia contributes to both data sets. In the Chinese context, food technology phobia further strengthens the negative consumer attitude towards GM food willingness to consume. The valid reason for these findings can trust the deficits in China's food consumer markets due to the food scandals (Ayyub, Wang, Asif, & Ayyub, 2018). Similarly, in the American case, food technology neophobia dampens the positive relation between the consumer food attitude and consumer willingness to consume GM food. These findings regarding food technology neophobia might be due to increased marketing and regulatory push from the non-GM food sectors.

Conclusion

The existing body of literature exhibits many pieces of evidence that discuss GMO consumption intention. GMOs are advanced versions of innovative food technologies that are considered the future of the food market and the only solution to meet the ever-increasing food demand. This highlights the importance of gaining deep insight into consumer consumption willingness of such technological innovations as the market does resist such technologies at the first stage. However minimum research is found that investigates the link between such innovations and consumer willingness. This study examines how different consumer values add to the consumer food attitude towards such innovative food technologies and their ability to influence consumption willingness. The study is a comparative analysis of two world's largest GM food markets. The SmartPLS-based SEM technique is used to estimate the relationships between different variables being considered in the study. The study findings indicate that food innovation with the help of technology is having positive acceptance in the USA market in comparison to the Chinese market. The study implications show that the Chinese market needs to focus much on technology diffusion in the context of food technologies. Whereas, USA based market needs to further enhance the production and market share of GM food items. Further, food technology neophobia exists in the market and consumers must be provided with understandable scientific knowledge to reduce the impact of technology involvement.

Implications

The current study contributes theoretically by establishing the moderating role of food technology neophobia in consumer willingness to consume GM food. The study also compares motivational factors in light of consumption values adopted from the theory of consumption values across two major economic players of the world. Secondly, the study also provides vital insight to the practitioners to develop an efficient marketing and communication strategy in both countries based on the motivators of GM food consumption. The study suggests that an aggressive marketing and communication campaign may be initiated to make consumers more aware of GM's economic and nutritional benefits. Moreover, such a campaign can help to neutralize the negative impact of GM food technology fear. In addition, this study also guides the policymakers of these countries to shift consumer concerns about ecological safety, as scientific evidence exists that GM food is as safe as conventional food items. Such marketing initiatives might facilitate the consumer attitude shift that will ultimately influence the consumer's willingness to consume GM food. The world needs to work on scientific literacy to make the masses aware of technological advancement and its ability to improve human lives (Rodríguez-Entrena & Salazar-Ordóñez, 2013).

Limitations and Future Directions

The current study has certain limitations that need to be declared. This study's findings and implications are restricted to certain American and Chinese cities, primarily food

markets and grocery stores were focused to collect data and this may limit the generalizability of this study. The studies with cross-sectional nature bound the authors from making generalized claims of causality. The findings of this study can be verified with similar studies conducted with support from industrial players or public companies operating in American and Chinese environments or across the world. Moreover, the study sample size can be increased with the latest survey techniques available for data gathering to expand the trustworthiness of findings. Nevertheless, the limitations of this study are the future directions for further research to gain better insight into consumer behavior.

Besides, the current study comprised the most comprehensive view of consumer willingness to consume. However, future studies can incorporate more personal values to expand the theory of consumption values further in GM's willingness to consume.

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