

# Identifying the Factors Affecting Consumer Perceptions on Product Safety and Model Presentation (Case Study: Home Appliances Consumers)

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## Abstract

Product safety affects the health of the citizens of a society and improve the quality of life. Improved product safety will increase the competitive power, reduce warranty costs, and prevent the claims of liability and return of goods, compensation. Accordingly, the current study presents a conceptual model for the perception of product safety home appliances consumers. The research method in this study is the Mixed Method. This research is involved three Cognitive, Design, Evaluation Phases. Statistical Population is home appliances consumers. Sampling in quality phase is Targeted Sampling and in quantity phase is systematic sampling. cognitive phase began with library research and exploratory interviews were conducted with 20 academic experts of sales, exclusive representation, repair, and warranty of home appliances. In the design phase, using a structured questionnaire compatible with the interpretive structural modeling technique. Finally, in the quantitative model evaluation phase, a researcher-made questionnaire, suitable for structural equations using partial minimum squares, was used. The questionnaire was distributed among 384 consumers of home appliances. The fit indicators confirmed the fit of the theoretical model with the data. On the other hand, the significance level was 0.0001. Therefore, the model of perception of safety for home appliance consumers is accepted with 95% reliability. Designing a conceptual model for perception product safety of home appliances based on a comprehensive set of the effective factors, developing the theoretical literature in the field of the factors affecting consumer s perceived product safety, and presenting valuable results for academicians, marketing managers, and producers.

**Keywords:** Product safety; perception of safety; consumer behavior; Home appliances

## 1. Introduction

As a public health goal, product safety is of great social importance (Lin *et al.*, 2019). Governments across the world pay special attention to product safety to improve the quality of life. For instance, according to the European Food Safety Authority (EFSA) and the European Center for Disease Prevention and Control (ECDC), there were 4783 and 5079 product quality and safety cases across 32 European countries in 2016 and 2017. Toxic eggs entered the markets of about 20 European countries such as Germany, Belgium, and the Netherlands in 2017. The food safety cases that occurred in Asian countries have caused concern in their consumers (*e.g.*, melamine found in infant formula in China). Such situations can be, therefore, significantly reduced through evaluating the quality and safety of products (Han *et al.*, 2019).. We are contacting a large number of products every day (*e.g.*, mobile phones, computers, and automobiles), and our lives and perception of welfare strongly depend on the performance and features of these products. Due to the lack of investment in product safety and liability by domestic automobile, food, and home appliance manufacturers, nearly all Iranian consumers believe in the absence of quality and safety of local products. The quality and safety of products are unfortunately sacrificed for quantity by manufacturers.

According to a survey, 61 percent of consumers believe foreign brands are using more up-to-date technology in their products. Consumers believe domestic brands are less preferable compared to the foreign ones in terms of design, the durability of the product, the quality of the parts used in the product, and the amount of energy consumption<sup>1</sup>. Lack of quality and safety can cause financial losses for consumers. These accidents in turn negatively affect the quality of life in long term imposing treatment and compensation costs on the community. Product safety cases may prevent social stability and economic development (Lin *et al.*, 2019) Safety is considered an integral part of product quality; therefore, the product quality features and indices can be generalized to product safety (Azimian *et al.*, 2016). According to Chen and Hu (2017), competition in the market and product liability are two incentives for encouraging manufacturers to invest in product safety to reduce product hazards and problems for consumers. improved product safety will increase the competitive power, reduce warranty costs, and prevent the claims of liability and return of goods, and partial and complete compensation (Rasand & Bauer 2008). Wang and Siu (2002) argued that customers are always ready to pay more for safer products. Hernandez *et al.* (2018) examined the harms

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that home appliance consumers face when using the product in the period between 2010 and 2016. They examined the statistics of home appliance consumers who were injured while using the refrigerator and visited 100 hospitals in the United States, through these years. Between January 1, 2010 and December 31, 2016, 6913 people were injured using the refrigerator and referred to hospitals. 3734 of the injured were men, with an average age of 38 years. The most common injury among these people was falling while using the refrigerator (31%). The second most common cause of injuries occurred when moving the refrigerator (25%). In adolescents, the most common injuries were bruises and fractures due to contact with these devices. Accordingly, home appliance manufacturers identify the harms that a consumer may encounter when using the product which can be used to design that product more safely. Consumers do not see the investment that manufacturers make in the safe design of the product, but they do see the damage that this product implies. This can affect a brand's reputation, as well as increase the cost of warranty, return, and compensation. When consumers feel that a product may pose a financial or human risk to them, it influences their purchasing decision. On the other hand, these events negatively affect the quality of life of society in the long run. They also impose costs on the community, including treatment and compensation. Therefore, to prevent these damages, home appliance manufacturers need to understand the consumer perception of product safety, to use its results in product design and marketing. Since in domestic and foreign studies, no comprehensive research is performed on consumer perception of product safety, the main purpose of the present study was to identify and design a comprehensive model of factors that affect a consumer's perception of the safety of home appliances.

Since there were no fully relevant literature in this area, we answer the following questions in two steps using a hybrid approach:

1. What are the factors affecting the perception of Mashhad consumers about the safety of home appliances?
2. How is the conceptual model of the factors affecting the home appliance consumers' perception of product safety using interpretive structural modeling based on expert reviews?
3. Is the model designed using interpretive structural modeling based on consumer perspective?

## 2. Literature Review

According to Cai and Seligsohn (2019), the customers' perception of product safety is independent of objective risk assessments. The customers' perceptions of safety are influenced by personal experiences, information obtained from governmental regulations and standards, personal characteristics, and design parameters related to product convenience, beauty, and performance. Lee and Yon (2020) found different safety behaviors of consumers of household

chemical products, such as detergents depending on the efficiency beliefs. Specifically, two groups having a low safety behavior level were those with low education and income levels. Bearth and Siegrist (2019) investigated the consumers' risk perception of household cleaning products to find the relationship between risk perception and consumer behavior. Consumers have a relatively accurate estimation of risk. Despite the tendency towards eco-friendly cleaning products, consumers have a lower risk perception of non-eco-friendly cleaning products. Hernandez *et al.* (2018) discussed damage patterns, mechanisms, and those parts of the body probably damaged when using refrigerators and freezers. According to information collected from emergency centers, falling was the most prevalent damage faced by consumers when using refrigerators and freezers. Among different age groups, adolescents were the most affected group in this regard. They also suggested some measures to reduce the risk of falling among older age groups. Niven *et al.* (2019) studied child-related product safety recalls in the Australian and US markets. The four main groups of products damaging children were toys and computer games, home appliances, and sports clothes and equipment. The analysis of data on the recalled product showed the need for a change in the child-related product regulations in Australia. Chen and Hua (2017) investigated the relationship of competition and product liability, and they found that more investment in product safety by manufacturers and a higher level of product liability increase the manufacturer's reputation, thereby the consumer needs to be less careful when using such a product. Partial product liability causes an increase in the manufacturers' concern on reputation, encouraging them to invest in product safety. Increased competition caused by reduced product differentiation leads to an increase in product liability. There is a non-uniform relationship between the desirable product liability level and the number of competitors. The exact relationship between competition and product liability is generally dependent on the competition assessment. Bernard *et al.* (2019) investigated the effect of information on food labels on the customers' perceptions and willingness to pay (WTP). Labels containing limited information significantly increased the consumers' perception of. The willingness to pay for such products also increased. Labels play a key role in customers' perceptions and willingness to pay. According to Kocatepe *et al.* (2019), participants less than 30 years of age were unaware of product safety, but those aged over 30 years were aware of product safety. Participants aged over 45 years believed in the health of fried oysters, but those between 30 and 44 years believed in the unhealthiness of fried oysters. In general, participants had different viewpoints regarding the consumption of marine products, sales markets, health conditions, and product safety. Gaffari *et al.* (2019) studied the relationship of home appliance setting sound on the sense of reliability and the

perceived quality of products. The home appliance setting sound significantly affects the sense of reliability in some cases despite the role of sound in the product settings. A cohesive set of features influencing the design and manufacture of a product should be taken into account to achieve a sense of quality and reliability among consumers. Shaaban *et al.* (2019) investigated the effect of a brand recall on other brands of the same country of origin, and they found that the recall of a brand negatively affects other brands indirectly. Velcovska (2019) determined and compared the Y-generation consumers in Czech, Slovakia, and Poland in terms of the perception of the country of origin and labels containing safety and quality information. The country of origin was crucial for Poles in comparison with Slovaks and Czechs. Poles strongly prefer their domestic products and believe in the higher quality and safety of domestic products than foreign ones. Efforts were made by Nardi *et al.* (2020) to provide a more comprehensive image of risk perception of food safety. According to their results, trust, knowledge, and mental and social features forming risk perception of food safety influence consumers' willingness to purchase. Gök *et al.* (2020) investigated the effect of manual quality on the customer satisfaction and perception of product quality. A significant relationship was found between the manual quality and the perceived product quality. Accordingly, a consumer perceives the manual quality as part of product quality assessment. Liu *et al.* (2021) investigated the effect of HACCP certification on firm profitability, manufacturing productivity, and asset turnover. The results indicate that HACCP certification has both short- and long-term impacts on firm profitability, manufacturing productivity, and asset turnover. Additionally, this study reveals that the implementation of HACCP leads to rapid market growth in the short run. Baumann & Friehe (2021) describe a firm's incentives for safety investments and harm mitigation as a function of the level of the firm's liability. The result shows that whereas post-sale mitigation incentives are scaled up by liability, pre-sale product safety is a U-shaped function of liability, making the two harm reduction instruments substitutes at low levels of liability and complements at high levels. To induce efficient harm mitigation, liability must be less than full. Further reducing the level of liability improves product safety at the cost of the firm's profits. E. Nganje *et al.* (2021) shows that cost-effectiveness is defined as the optimal point at which additional expenditures to reduce pathogen prevalence will have minimal food-risk reduction effects. They aim to assess the various risk-reduction strategies implemented at the retail meat facilities and to determine the cost-effective strategy to be implemented at the retail level to reduce pathogen levels in meat and poultry products. They showed that the stochastic-optimization analysis quality loss and risk-reduction values increased with the probability of contamination. Risk was reduced as tolerance levels were

tightened. However, very low tolerance levels could also induce higher implementation costs, making a particular strategy cost-ineffective. The results further illustrated that the optimal intervention strategies varied by meat type and pathogen. Verdu *et al.* (2021) investigated about the relationship between the consumer sociodemographic profile and perception about Food Safety. The Result shows that The youngest participants were more demanding about food safety-related aspects, while the middle-aged group was more critical of prices. This was especially true of females, who demanded better quality:price ratios. They showed that Knowing these preferences could facilitate the development of more effective marketing strategies, helping make street markets more competitive.

### **3. Research Methodology**

The purpose of this research is developmental-applied, based on a descriptive-analytical method. The method of research conduction is composite, considering that there was no relevant research background. This research is of a composite type based on pluralism in data. This research has been performed in three phases and eight main stages. In the cognition phase, through a study on thematic literature, a deep understanding of the issue was attempted. In this phase, using the systematic review approach, important articles and resources in this field were identified and then, the initial and appropriate variables were extracted carefully. At the same time, in order to localize the model and pay attention to the conditions and requirements of the studied industry, meetings and in-depth interviews with experts were held in the field of research, effective factors and variables were identified using qualitative content analysis. In the design phase, in order to establish a relationship between the model elements and achieve a conceptual model, the interpretive structural modeling method was used. Finally, in the quantitative evaluation phase of the model (measurement and evaluation phase), the proposed model was evaluated through the structural equation method based on the partial least squares approach. Finally, in order to identify the enumerated factors of consumer perception with the product safety approach, we first examine the current status of the enumerated factors from the quantitative statistical population using one sample t-test. Data collection in the cognition phase was counted through review and study of related articles, dissertations and books. In the continuation of the cognition phase, in order to complete the information and enrich the theoretical foundations, as well as to pay attention to the local conditions of sales, through in-depth interview sessions with experts and thinkers. In this research, based on theoretical sampling method, experts with sufficient experience and knowledge in the field of product safety and marketing have been interviewed. In the design phase, experts' opinions were obtained using a structured questionnaire appropriate to the interpretive structural modeling technique. In the

quantitative evaluation phase of the model (model measurement phase), a researcher-made questionnaire suitable for structural equations was used using the partial least squares method. The qualitative statistical population includes 20 academic experts and exclusive representatives of home products repair and warranty with the necessary knowledge in the technical field of home products. The quantitative statistical population includes 384 home appliance consumers. Finally, in the model test phase, sampling was performed in a non-probabilistic manner and by convenience sampling. Validity was evaluated in the cognition phase, using the point of view of supervisors and consultants in all stages of the interview. In the design phase, content validity was used and in the model measurement phase, the validity of the themes (structures) was measured using partial least squares method. In order to calculate the reliability in the cognition phase, retest reliability (0.86) and intra-subject agreement percentage (0.6) were utilized. The reliability of the questionnaire related to the structural method was evaluated based on the obtained indicators such as factor loads, Cronbach's alpha coefficients and composite reliability. Convergent validity was determined from Average Variance Extracted (AVE), divergent validity was determined from Cronbach's alpha and composite reliability. In the present study, the factors affecting consumers' perception of product safety have been confirmed and tested using a structural model.

#### 4. Findings

##### 4.1 Determining variables

The first step was to determine effective variables and factors. In the identification phase, a total of 380 factors were identified through reviewing the literature and in-depth interviews with home appliance experts, and by combining these findings. The identified factors were then classified into 41 sub-categories. Based on the factors identified in the previous step, a questionnaire was designed using the interpretive structural modeling (ISM) technique and provided to the experts. Of 380 factors, the content validity of 297 factors was confirmed by the experts. The results are presented in Table 1.

Based on the literature review and expert opinions, 297 factors were identified and classified into 8 main categories and 41 sub-categories as follows:

Based on the expert opinions and according to McGrenere (2000) and Svensson and Varland (2006), features of a product can influence consumer perception of the safety of that product. Kotzegger and Schlegelmilch (2013) believe that in the influence of the reputation of a brand on the consumer perception of product safety. According to Laghery and Wogalter (2011), the size, color/contrast, signal word, graphics, and format are the most important factors in the design of product labels and instructions. Megilberg *et al.* (2015) found that color and font stimulate consumers to read warning signs and labels on products and their packages. Malcom Harbor (2014) pointed out the

impact of production standards on product safety. Roman (2018) believed that manufacturers should raise their production standards beyond existing requirements. According to Rausand and Bauer (2008), the quality of a product affects its safety. Kotzegger and Schlegelmilch (2013), Lisej *et al.* (2015), and Miao (2014) assessed risk probability and severity to obtain a proper risk perception. Lisej and Lee (2014) pointed out self-preservation and depletion. According to Stoltman and Morgan (1995) studied the skill level required for the safe use of a product, as well as reduced physical abilities of consumers regarding product safety. Megilberg *et al.* (1997) investigated purchasing strategies adopted by parents. Viscusi and Cavallo (1994) addressed the effect of public training as a key factor influencing consumers' perceptions of product safety. Stoltman and Morgan (1995) argued that consumers' desire to gather information effectively enhanced their perceptions of safety. Viscusi and Cavallo (1994) examined the degree of accuracy. Petreh (1996) believes in the influence on self-confidence on consumers' perceptions of product safety. Biu Tse (1998) and Wang and Su (2002) examined consumers' mental image of the country-of-origin (COO) and the country of assembly (COA). Laghery and Wogalter (2011) and Balestos *et al.* (2018) found the effect of geographical location on consumers' perception of product safety. Hal *et al.* (2016) believed that previous experiences affect the proper usage of products. Similar to Kotzegger and Schlegelmilch (2013), Biu Tse (1998) and Wang and Su (2002) also highlighted the impact of mass media on consumers' perception of product safety. Megilberg *et al.* (1997) examined the impact of various aspects of consumer socialization (including family, media, and peers) on consumer willingness to use product labels. Kotzegger and Schlegelmilch (2013) argued that after-sales services affect consumer perception of product safety. Hal *et al.* (2016) put an emphasis on providing consumers with some links to obtain more information. Wang and Su (2002) showed the significant impact of source credibility on perceived product safety. According to Megilberg *et al.* (1997), instead of gender differences, socialization aspects have an impact on the use of product labels. Balestos *et al.* (2018) found the impact of age and educational level on the consumer perception of product safety. According to Biu Tse (1998) and Wang and Su (2002), product promoters, product testing, credit, and brand name can affect consumer perception of product safety. This is in line with the results of this study. Carnoeil *et al.* (2018) concluded that brand trust and brand beliefs can affect consumer perception of product safety. Lisej and Lee (2015), Malcom Harbor (2014), and Blacker *et al.* (2014) identified safe design as an important factor influencing consumer perception of product safety. Wang and Su (2002) and Biu Tse (1998) pointed out the major role of mass media in enhancing consumer perception of product safety. Kotzegger and Schlegelmilch (2013) also argued that appropriate public

relations may affect consumer perception of product safety. Su Jong Nam (2018) pointed out that higher prices are subconsciously believed to be associated with higher qualities. Stoltman and Morgan (1995) and Hal *et al.* (2016) mainly focused on the content and appearance of labels. Wang and Su (2002) also recognized price and discount as major determinants of perceived product safety. In this study, price and discount affected consumer perception of product safety. Laghery and Wogalter (2013) and Hal *et al.* (2016) identified the best fonts used for designing suitable product instructions. Their findings are consistent with those found in this study. They also concluded that consumers are more likely to study concise product manuals, and argued that proper design of instructions provides consumers with a better understanding of product safety. Some major issues mentioned by Stoltman and

Morgan (1995), Laghery and Wogalter (2011), and Hal *et al.* (2016) included highlighting main points, using clear tables and charts, using images and legible fonts, using video clips, and putting concise and useful information on labels. Su Jong Nam (2018) believed in the impact of reading warnings and labels on the consumer perception of product safety. Lisej *et al.* (2016) stressed the importance of using appropriate words to specify the severity of relevant risks. Blacker *et al.* (2016) examined fear of large volume of instructions, forgetfulness, reading technique, and multiplicity of product options. Kotzegger and Schlegelmilch (2013) and Richard Staelin (1978) found the impact of awareness on the consumer perception of product safety. Wang and Su (2002) and Biu Tse (1998) concluded the significant impact of the reputation of a store on the consumer perception of product safety.

Table 1  
Themes extracted from the literature

Main category	Sub-category	Theme
Factors affecting consumer perception of product safety	Product-related factors	Product features
		Packaging
		Product design
		Product quality
	Customer knowledge and awareness	Producer
		Risk
		Individual factors
		Personality traits
		The importance of production site
		Proper usage
		Experiences
		Training background
		Consumer attitude
		Social networks and cyberspace
	Demographic characteristics	Data collection
	Advertising and marketing	Demographic factors
		Advertising
		Customer management
		Word-of-mouth marketing
		Branding
		Risk management
	Sociocultural factors	Public relations
		Cultural
		Environmental
		Economic
	Instructions and labels	Sociocultural capital
		Willingness to buy domestic products
		Content of instructions
Design of instructions		
Label design		
Factors leading to poor attention to instructions and labels		
Quick guide design		
Proper label placement		
Seller-related factors	Proper study of instructions	
	Seller	
	Store	
	After-sales services	
	Installer	
Customer orientation and training	Competition of product and service providers	
	Consumer training	
	Customer orientation	

4.2. Model design

In this research, after reviewing the literature and conducting interviews, using content analysis, the dimensions and indicators of the product safety model are identified and then interpretive structural modeling is used to create and interpret the relationships between the dimensions. The steps of performing interpretive structural modeling are as follows, each of which is described below

4.2.1. Developing the Structural Self-Interaction Matrix (SSIM)

This matrix was completed by 20 active experts and academics using the contextual relationship of "leads to" and the following symbols:

1. V: The factor in row i leads to the factor in the column j.
2. A: The factor in the column j leads to the factor in row i.
3. X: Both factors in the row and column lead to each other (bilateral relationship).
4. O: There is no relationship between the row and column factors.

Considering that the ISM approach is consistent with nonparametric methods and operates based on modes and frequencies, common responses with the highest frequencies were selected. Finally, the following SSIM(Table2) was obtained.

Table 2  
The Structural Self-Interaction Matrix (SSIM)

i \ j	Customer orientation and training	Seller-related factors	Instructions and labels	Sociocultural factors	Advertising and marketing	Demographic characteristics	Customer knowledge and awareness	Product-related factors
Customer orientation and training	O	O	O	A	O	A	A	O
Seller-related factors			V	A	X	A	X	X
Instructions and labels				A	V	A	O	O
Sociocultural factors					X	X	X	X
Advertising and marketing						X	X	X
Demographic characteristics							O	X
Customer knowledge and awareness								X
Product-related factors								X

4.2.2. Initial reachability matrix

In the next step, the SSIM was converted into the initial reachability matrix (IRM) only consisting of zeros and ones. To this end, the symbols X and V were replaced by ones, and A and O were substituted by zeros.

1. If the entry (i, j) in the SSIM is V, then the entry (i, j) in the IRM becomes 1, and the entry (j, i) becomes 0.
2. If the entry (i, j) is A, then the entry (i, j) in the IRM becomes 0 and, the entry (j, i) becomes 1.

3. If the entry (i, j) is X, then the entry (i, j) in the IRM becomes 1, and the entry (j, i) also becomes 1.

4. If the entry (i, j) is O, then the entry (i, j) in the IRM becomes 0, and the entry (j, i) also becomes 0.

The internal consistency of the IRM was then assessed using mathematical rules, where the  $k + 1^{th}$  ( $k \geq 1$ ) power of the IRM was obtained based on the Boolean rules (i.e.,  $1 * 1 = 1$  and  $1 + 1 = 1$ ) (Azar et al., 2010). The final reachability matrix was obtained at the end of this step (see Table 3). It should be noted that the sign "\*" shows zeros converted into ones in the final reachability matrix.

Table 3  
The final reachability matrix

i \ J	Customer orientation and training	Seller-related factors	Instructions and labels	Sociocultural factors	Advertising and marketing	Demographic characteristics	Customer knowledge and awareness	Product-related factors
	Customer orientation and training		0	0	1	0	1	1
Seller-related factors	0		1	1	1	1	1	1
Instructions and labels	0	1		1	1	1	0	0
Sociocultural factors	1	1	1		1	1	1	1
Advertising and marketing	0	1	1	1		1	1	1
Demographic characteristics	1	1	1	1	1		0	1
Customer knowledge and awareness	1	1	0	1	1	0		1
Product-related factors	1	1	0	1	1	1	1	

4.2.3. Determining relationships and partitioning the identified variables into different levels

Each component of the model has a reachability set (R (si)) and an antecedent set (A (si)), which play key roles in the formation of the reachability matrix and the design of the final research model (Mandal *et al.*, 1994). The reachability set for a variable consists of those variables that can be reached through that variable. The antecedent set for a variable includes those variables through which that

variable can be reached using the reachability matrix. After determining the reachability and antecedent sets for each variable, the common elements in the reachability and antecedent sets are determined for that variable. Here, a variable with equal reachability and the intersection sets had the highest ISM level. These variables were removed to form the next table, in which the second level variables were identified. This process was used to partition the identified variables into several levels. The results are presented Table 4.

Table 4  
Determining relationships and partitioning the identified variables

Factors	Reachability Set (R(si))	Antecedent Set (A(si))	Intersection R(si) ∩ A(si)	Level
Customer orientation and training	3-6-7	3-6-7-8	3-6	1
Seller-related factors	3-4-5-6-7-8	3-4-5-6-7-8	3-4-5-6-7-8	1
Instructions and labels	2-4-5-6	2-4-5-6	2-4-5-6	1
Sociocultural factors	1-2-3-5-6-7-8	1-2-3-5-6-7-8	1-2-3-5-6-7-8	1
Advertising and marketing	2-3-4-6-7-8	2-3-4-6-7-8	2-3-4-6-7-8	1
Demographic characteristics	1-2-3-4-5-8	1-2-3-4-5-8	1-2-3-4-5-8	1
Customer knowledge and awareness	1-2-4-5-8	1-2-4-5-8	1-2-4-5-8	1
Product-related factors	1-2-4-5-6-7	1-2-4-5-6-7	1-2-4-5-6-7	1

4.2.4. Drawing the model diagram (factors affecting safety perception)

After determining the relationships and levels of variables, they can show as a model. For this purpose, first the variables are adjusted from top to bottom according to their level and using the performed leveling, a diagram is drawn as a model of factors affecting safety perception. In this step, the variables were ranked from top to bottom based on their

levels, and the diagram of "factors affecting consumer perception of product safety" was drawn. To this end, the first-level variable was placed in the first level of the diagram and other variables in the next levels. The conceptual model, as shown in Figure 1, was designed based on the above diagram and with regard to the findings of the content analysis. This model integrates latent variables (dimensions) into observed variables (codes).



Fig. 1. Conceptual research model

#### 4.3. Verification and testing of the conceptual model based on consumer perspective

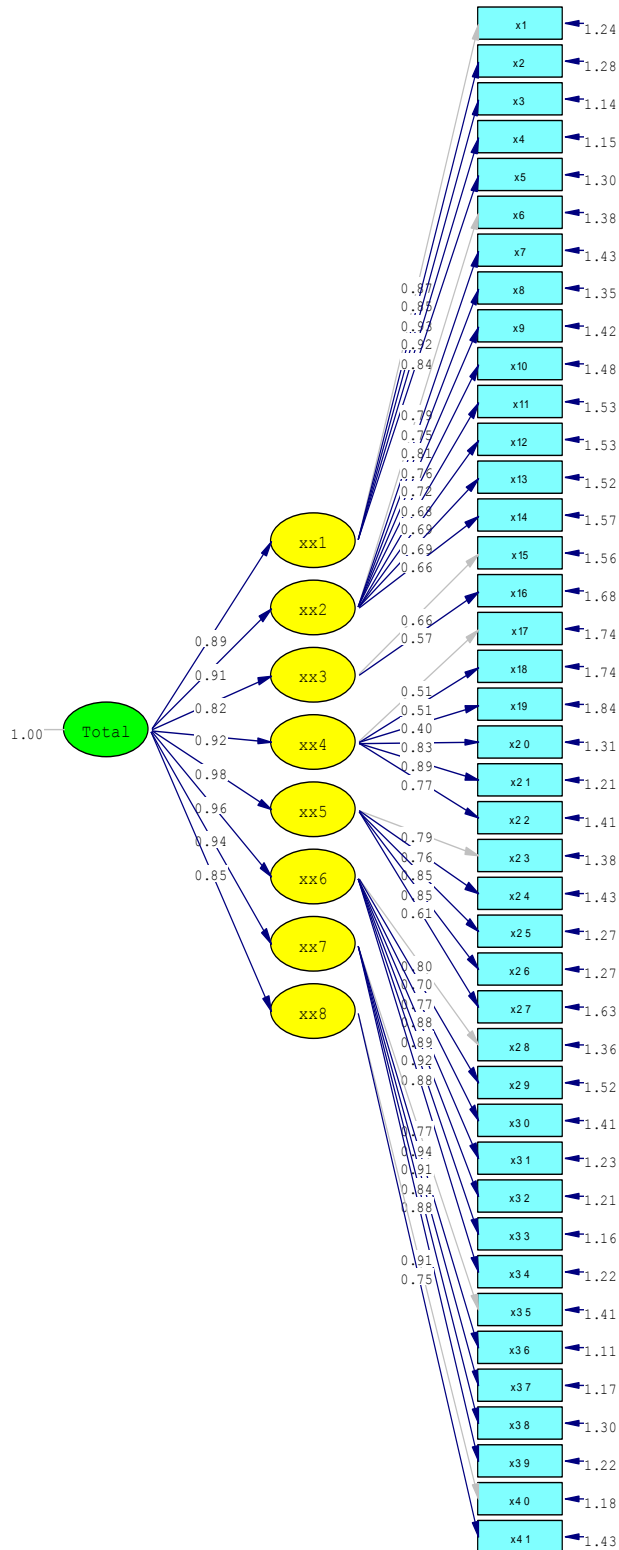
Considering that in the previous stage of the research, the conceptual model design of factors affecting consumers' perception of product safety and drawing relationships between dimensions using interpretive structural modeling method based on experts' views has been reported, therefore in this section, we will approve the model based on consumers' views. Based on the categories obtained in the model (Figure 1), eight hypotheses were set:

1. Customer orientation and training affect safety perceptions of home appliance consumers ( $t = 6.46$ ).
2. Seller-related factors affect safety perceptions of home appliance consumers ( $t = 5.9$ ).
3. Instructions and labels affect safety perceptions of home appliance consumers ( $t = 4.18$ ).

4. Sociocultural factors affect safety perceptions of home appliance consumers ( $t = 3.65$ ).
5. Advertising and marketing affect safety perceptions of home appliance consumers ( $t = 6.21$ ).
6. Demographic characteristics affect safety perceptions of home appliance consumers ( $t = 6.24$ ).
7. Customer knowledge and awareness affect safety perceptions of home appliance consumers ( $t = 5.86$ ).
8. Product-related factors affect safety perceptions of home appliance consumers ( $t = 6.22$ ).

At this stage, a questionnaire was prepared and distributed among 384 consumers and the obtained data were processed by structural equation method based on partial least squares in LISREL software. In the following, we review the statistical analysis results of the collected information. The diagrams of standard model coefficients and the Student's  $t$  values are shown in Figures 2 and 3.





Chi-Square=1338.28, df=771, P-value=0.00000, RMSEA=0.059

Fig. 2. The structural research model with estimated standardized coefficients

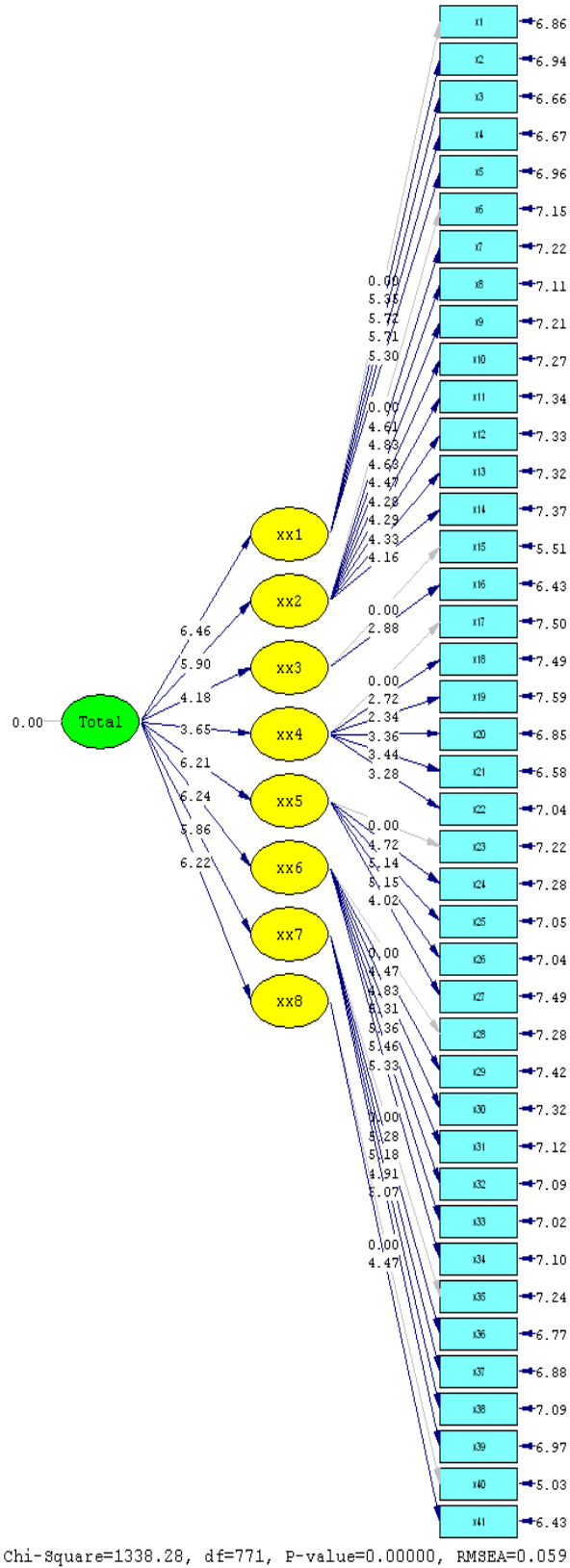


Fig. 3. The structural research model with estimated t-values

Table 5

Goodness of fit indices for the structural model (factors affecting consumer perception of product safety)

$\chi^2/df$	P	RMR	GFI	AGFI	RMSEA
1.74	0.0001	0.015	0.91	0.92	0.59

The lower the  $\chi^2/df$  fit index the better, not being more than 3. According to Figures 2 and 3 and Table 5, this value is 1.74 which is less than 3 and shows that the theoretical model fits with the data and is confirmed and has the necessary reliability. Also, the value of path coefficient is positive. AGFI (Adjusted Goodness of Fit Index) higher than 0.9 is reported as a fitted model. An NFI (Normed Fit Index) above 0.9 indicates a good fit for the model. RMSEA (Root Mean Square Error of Approximation) is equal to 0.059, which is less than 0.08 indicating the goodness of fit of the model. On the other hand, P-value (significance level) is 0.0001, which is less than 0.05, so the safety perception model of home appliance users in the city of Mashhad is accepted with 95% goodness of fit.

### 5. Discussion and Conclusion

As mentioned earlier, product safety affects the health of citizens and the society indeed, and increases the quality of life. On the other hand, it increases the competitiveness of manufacturers and reduces warranty costs, prevents product returns and claims. The purpose of this study was to develop a conceptual model for consumers' perception of product safety based on interviews with experts and study of the existing literature in this field. The results showed that product-related factors, knowledge and awareness, demographic characteristics, advertising and marketing, cultural and social factors, instructions and labels, vendor-related factors, customer orientation and education affect consumers' perception of product safety. According to the results of the present study, designing a product simply using modern technology and multiplicity of features so that the product is very easy to use, has a positive effect on consumers' perception of product safety. Research by McGreenor (2000), Asonson and Warland (2006) also showed that product features and options affect consumers' perceptions of product safety. The inclusion of features as signs on the product packaging can positively affect consumers' perception of product safety. The origin of the technology used to make a product, the quality of the parts, the origin and manufacturer of parts affect the consumer's perception of the safety of the product. Wang and Su (2002) also acknowledged the production origin of a product as a factor affecting the perception of product safety. In the research by Wang and Su (2002) and Katzger and Schelgmilch (2013), branding a product affects the perception of product safety. In the present study, it was found that consumers of home appliances consider more famous foreign brands safer than similar foreign and Iranian products. According to the research results, labels on the

product are based on standards in the field of manual design and product labels specified by the standard organization and does not have the necessary efficiency to affect consumers' perception of product safety. Logheri, Volgalter (2011) pointed to important design factors of labels and instructions including size, color / contrast, signal word, graphics and format. The results of the present study, similar to Wang and Su (2002) and Biotetz (1998), showed that the reputation of the store from which the consumer buys affects his perception of the safety of the product. Providing more information and awareness about a product by manufacturers and encouraging consumers and sellers to read and encouraging consumers to share their experiences on using a product can have a positive impact on consumers' perception of product safety. Creating videos of installation descriptions by consumers, taking notes of important points explained by the installer on the use of the product during installation, preparing training CDs by manufacturers, encouraging people to read instructions, paying attention to the given information, the need to provide information during installation and the need to change attitudes were among the factors affecting the perception of product safety, which were identified by participants. Hall et al. (2016) also referred to design factors in the manual, font size and color. Fear of lengthy and forgetful instructions, reading manner and the multiplicity of product options are some of the factors that Blocker et al. (2016) examined. In designing recipes and labels, information should be presented concisely and usefully, and proper words should be used to easily convey the meaning to the consumer and to easily find the needed information. Bulk manuals prevent consumers from reading. Therefore, based on the results of the present study, it was determined that the volume of the manual should be reduced and designed in such a way that the consumer can quickly find the information he needs. Also, very clear explanations should be used so that the consumer can easily understand and use the product correctly. Also, use of figures to explain the product usage leads to the correct use of the product and thus has a positive effect on the perception of product safety. By investing in product safety and information, as well as providing useful information to consumers about the features and how to use the product properly, companies can gain credit in the market. The consumer is not aware of the manufacturer's investment on the product safety, but hears the harm that the product implies from other consumers, and this can negatively affect his perception of the safety of that product. Manufacturers, with the advent of modern technology and research and development activities,

are lead to the development of the home appliance industry, and on the other hand, by investing in product safety, they can change the mindset that foreign goods are of higher quality. Manufacturers can influence consumers' perceptions of product safety by providing complete information to sellers and installers and encouraging them to provide this information to consumers, providing quality and long-term guarantees, and providing desirable after-sales service. Malcolm Harbor (2014) also pointed to the impact of standards on product production as a factor in perceiving product safety. Roman (2018) believed that manufacturers should seek to raise their production standards and design their products to exceed existing standards. , Based on the results , the useful life of a product, quality of the produced product, as well as quality control that is performed on the products are among the factors that affect consumers' perception of product safety. Rasand, Bayer (2008) referred to the discussion of quality as an effective factor in product safety. Financial risk was one of the factors identified in the present study as an effective factor in shaping consumers' perception of product safety. Injuries caused while using home appliances, non-observance of safety signals while consuming and lower risk of foreign brands were identified as factors that affect consumers' perception of product safety. Lisch; Rayo; Choi (2015) and Lisch; Lee (2015) believed that the feeling of danger is one of the factors that affect perception of product safety. This subject was also confirmed in the present study. Miao (2014) has identified the degree of vulnerability perceived by the consumer as a factor affecting the perception of product safety, which was also confirmed in the present study. Lisch and Lee (2014) considered the level of skills required for safe use and reduction of consumers 'physical abilities as one of the variables that affect consumers' perception of product safety. Also, reviewing product functions in the store and understanding the product features affect the consumer's perception of product safety. Designing a comprehensive model of consumer perception of home appliance safety has developed theoretical literature in the field of consumer perception of product safety and has provided useful results for product managers, manufacturers, as well as researchers in this field. The present model on consumer perception was examined and tested using structural equations based on partial least squares in LISREL software. The test results of the model confirmed the view of experts. The eight dimensions of the conceptual model of factors affecting consumers 'perception of product safety were approved by consumers according to the experts' view shown in Figure 1. Therefore, according to the view of experts and consumers, customer orientation and education, factors related to vendors, instructions and labels, cultural and social factors, advertising and marketing, demographic characteristics, knowledge and customer awareness of factors related to the product are

effective on consumers' perception of the safety of home appliances in the city of Mashhad.

Instructions and label design standards need to be reviewed and revised. Manuals, instructions and labels should be designed to provide consumers with the information they need in a concise and useful way. Also, the packaging of home appliance products needs to be reviewed and re-examined by home appliance manufacturers. Manufacturers of home appliances need to reposition their brand based on quality and after-sales service. Preparing short videos and publishing them on virtual networks in order for consumers to use the products properly has a positive effect on consumers' perception of product safety by providing additional information about products on social media.

This is the first study to identify factors affecting product safety perceptions of home appliance users in Iran; therefore, the market experts were unfamiliar with the research concept. Furthermore, it was very difficult for researchers to access these experts (due to their busy work schedule), and to enroll a large number of manufacturers and importers of home appliances in the study.

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