

Consumers Perceived Prospects and Benefits Regarding the Nanotechnology Practices in the Fashion Industry

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Abstract

Nanotechnology appeared as an interdisciplinary science that was meant to revolutionize the process of realizing clothes, supplying innovative chemical, organic, and psychical features that were not attainable previously.

The present paper proposes to investigate the consumers' awareness, risks, and benefits beliefs about the nanotechnology procedures employed in the fashion industry production. In this regard, we administrated a survey on Romanian consumers; aged 18-30 years. To the collected data, we applied an exploratory analysis, followed by confirmatory factor analysis. The results indicated two factors and good psychometric properties of the designed scale, while the fit indices recorded excellent scores. Also, the performed analysis revealed that consumers are willing to buy garments realized with nanotechnologies, followed by house cleansing products, while cosmetics and food realized with nanotechnology procedures are at the end of their shopping list.

Key words: Nanotechnology; Nanomaterials; Fashion Industry; Risks; Consumer Behavior.

J.E.L. classification: C38; D12; L67; O31.

1. Introduction

The spread of nanotechnology practices, in the generation of innovative techniques or technologies to promote the conservation of resources in the production processes or to enhance people's lifestyles, came with a series of doubts from consumers regarding their potential harmful health and environmental impact due to their unique and their unpredictable properties.

Nanotechnology appoints a fast-growing science that manifests a great impact on the actual abilities of creation and production by giving properties and benefits that were not available until now. Nanotechnology brings new perspectives of the chemical, environmental, biological, and information technology industries supplying properties that we considered impossible in the past.

When it comes to the fashion industry, nanotechnology phenomena can ease the production of clothing items through the efficient use of existing resources. Due to the preservation of the physical and thermal properties offered by those commodities and due to the durability of the materials used, clothing items designed with nanomaterials could stand as an alternative to traditionally made textiles.

The actual research proposes to figure out consumers' awareness regarding nanotechnology practice in the creation of fashion items, to measure their perceived risks and benefits about those procedures, and to test the consumer's intention to adopt those products in the future. In this regard, we implemented an exploratory analysis. We collected data using a survey applied to Romanian customers aged 18-30 years. Secondly, we performed a confirmatory factor analysis.

The paper we structured as follows. In the first part, we realized a short review of the existing studies in the area, the research method, and the presentation of findings. In the last part, we present conclusions, limitations, and directions for future research.

2. Theoretical background

Consumers' knowledge and beliefs stand as essential aspects of the general understanding of science. The scientific literature revealed that consumers display trust and more willing to admit novel technologies when specialists consider their ambiguity and their misunderstanding of science (Roco, 2003).

This perspective affects the nanotechnology spread, practitioners considering that this new phenomenon will become an essential vector in science and economics in the new world order.

Several studies showed that in our days, most people manifest a low level of awareness about the nanotechnology domain. In this respect, earlier research (Waldron et al., 2006) revealed that 60.00% of study participants do not show knowledge of nanotechnology, while another study (Macoubrie, 2006) revealed that 95.00% of participants do not heard of nanotechnology before being part of the study.

Earlier studies related to the consumers' attitude on the nanotechnology revealed that people focus on the benefits provided by the nanotechnologies rather than the risks (Burri and Bellucci, 2008). Also, consumers manifested a positive attitude toward nanotechnology, considering that it could offer important opportunities in the future (Cobb, 2005; Macoubrier, 2006).

Studies conducted in Europe revealed that consumers manifest indifference and ambiguousness toward nanotechnologies (Gaskell et al., 2005). In contrast, consumers from the United States perceived the benefits of nanotechnologies as being higher than the risks (Cobb and Macoubrier, 2004).

Earlier research revealed that negative effects on health and environmental concerns are some of the principal motives that figure out consumers to manifest a reluctance attitude toward nanotechnologies. Also, consumers doubt about the long-term effects of nanotechnologies (Burri and Bellucci, 2008) due to their potential to disregard privacy.

To benefit of the opportunities provided by nanotechnologies, it is essential to educate people about nanotechnology, to transfer the know-how through education to the coming generation to develop the needed knowledge, abilities, or competencies.

Nanotechnology and the use of nanomaterials in the production of textiles appoints a relatively novel domain of science and technology. In this regard, the consumers' possible benefits of those types of applications could balance against its potential adverse effects.

Potential benefits include aspects relates to higher durability, better use of the resources, environmental protection. On the other side, consumers try to minimize the potential negative effects of nanotechnologies, like the integration of nanoparticles in the human body or through actions that could cause health problems through their spread in the natural environment or their integration in food.

Existing research (Starr, 1969) revealed that people are inclined to assume risks as time as those are associated with potential benefits provided by that technology. In this respect, we considered that it is essential to investigate the public beliefs about nanotechnologies in general and particularly through their usage in fashion production. When people are well informed, their reluctance to change will reduce because the potential risks are known and it is known how to avoid them, allowing the realization of technological advances and facilitation of people's life.

3. Research methodology

As a tool to collect data, we applied an own designed questionnaire meant to measure consumer's awareness and their perceived risks and benefits toward the usage of nanotechnologies in the production of fashion items. We ranked the items on a ninth Likert Scale, where one corresponds to a total disagreement response, while nine corresponds to a total agreement response.

We collected 207 responses from consumers aged 18-20 years. Concerning the gender distribution in the collected sample, there were 161 women (77.90%) and 46 men (22.10%), while regarding the residence, 156 (65.40%) respondents are from the urban area and 71 (34.60%) are from the rural area. We present descriptive statistics in the following (Table 1).

Table no. 1 Descriptive Statistics

Item	Classification	N = 207	
		No.	
Gender	Women	161	77.9%
	Men	46	22.1 %
Residence	Urban	156	65.4 %
	Rural	71	34.6 %

Source: Author’s calculation

To the collected data, we applied several statistical methods. We verified the existing correlations among variables, followed by the exploratory analysis and confirmatory factor analysis. We performed all procedures using the R statistical and programming software (R Core Team, 2020).

4. Findings

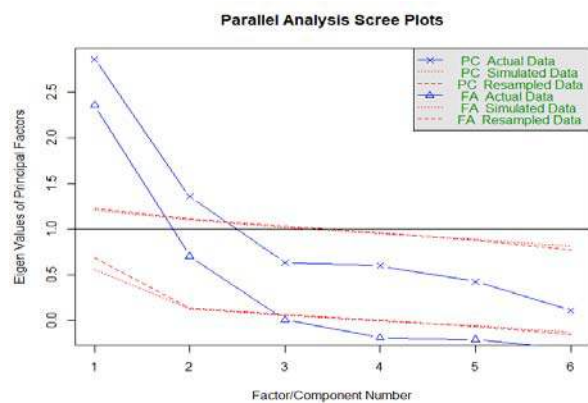
The first step in factor analysis will consist of a visual representation of the existing associations among variables. We see that some variables present exceptionally low correlations (Figure no.1), so we considered it proper to exclude them from the analysis.

Figure no. 1. Variables Correlations



Source: Author’s calculation

Figure no. 2. Parallel Analysis



Source: Author’s calculation

Secondly, we applied the Kaiser-Mayer-Olkin-Statistics of sampling adequacy to check the appropriateness size of the sample to run an exploratory analysis. The scientific literature (Kaiser, 1974) considers the obtained result of 0.70 as being a “middling” score. Further, we employed the *parallel* analysis scree plots (Figure no.2) to figure out the ideal number of factors and the software suggests the existence of two factors.

The exploratory analysis revealed that the first factor explained 33.7% of the variance, while the second factor explained 24.1%. In terms of reliability, the Cronbach Alpha registered scores of 0.83 in the case of the first identified dimension, named nanotechnology awareness, respectively, 0.71 in the case of the second dimension, named perceived risks and benefits of nanotechnology.

Table no. 2 Fit Indices Confirmatory Factor Analysis

	Items	Factor Loading	Cronbach Alpha
Nanotechnology Awareness	I have knowledge about nanotechnologies in general.	0.887	0.83
	I have knowledge about nanotechnologies used in the production of clothes.	0.994	
	I have knowledge about the fact that nanotechnology could be harmful to my health.	0.486	
Perceived Risks and Benefits of Nanotechnology	I think that I will wear clothes realized with nanomaterials.	0.673	0.71
	I believe that there are more benefits than risks in clothes realized with nanotechnologies.	0.796	
	I believe that scientists are interested in lowering the potential risks caused by nanotechnologies.	0.583	

Source: Author's calculation

Further, we implemented a confirmatory factor analysis to the obtained factors to check the performance of the obtained factors. To diagnose the model, we estimated the fit indices showed in the following table (Table 3). In the case of the Goodness of fit, Normed Fit Index, Tucker Lewis Index we aspire to values greater than 0.95. In the case of the Adjusted Goodness of Fit and Comparative Fit Index, values greater than 0.90 are considered goods scores. In this case, we obtained values of 0.990, respectively 0.994. Regarding the root mean square error of approximation and standardized root mean square residual, it is desirable to obtain values lower than 0.08. In the case of all fit indices were obtained incredibly good scores.

Table no. 3 Fit Indices Confirmatory Factor Analysis

Measure	Name	Value	Cut-off
χ^2	Model Chi-Square	11.257/ P-value = 0.188	p-value > 0.05
GFI	Goodness of fit	0.997	GFI \geq 0.95
AGFI	Adjusted Goodness of Fit	0.990	AGFI \geq 0.90
NFI	Normed Fit Index	0.979	NFI \geq 0.95
TLI	Tucker Lewis Index	0.989	TLI \geq 0.95
CFI	Comparative Fit Index	0.994	CFI \geq 0.90
RMSEA	Root Mean Square Error of Approximation	0.044	RMSEA < 0.08
SRMR	(Standardized) Root Mean Square Residual	0.033	SRMR < 0.08

Source: Author's calculation

In the latest part of the analysis, we questioned respondents about the most significant risks and benefits that they distinguish in the use of nanotechnologies in the clothing creation process.

Regarding the risks, most respondents said that they do not have so much information's about the domain. The rest of the respondents said allergies, irritations, potential damages to health, a high level of toxicity, and pollution.

Concerning the potential benefits, most of the respondents found durability, ecological impact, lower price, high quality, and efficient use of the resources.

In the end, we questioned respondents about their intention to buy forthcoming products realized with nanomaterials. 51.30% of the respondents said that they would buy clothes realized with nanomaterials, 35.70% of respondents said that they would spend in the future in the acquisition of home cleansing products realized with nanotechnologies, 9.00% will buy makeups realized with nanotechnology procedures. Only 4.00% of the respondents are confident about the acquisition of food realized with nanotechnology procedures.

5. Conclusions

The present study proposes to investigate the consumers' awareness, risks, and benefits beliefs about the nanotechnology procedures employed in the fashion industry production. In this respect, we developed a scale through exploratory factor analysis and validated through confirmatory factor analysis.

The reliability analysis revealed good psychometric properties of the developed scale, while the fit indices of the confirmatory factor analysis registered excellent scores.

Also, our study revealed that consumers' awareness of nanotechnologies is low, and they perceived those new technologies as a potentially harmful factor for their health status and lifestyle.

We believe that the knowledge and understanding of nanotechnologies play an essential role in reducing the consumers' resistance to those innovations. The belief that nanotechnologies encompass more risks than benefits may reduce by leading consumers to trust in nanotechnology applications.

The empirical results of this study could help understand consumers' forthcoming attitudes about nanotechnology applications in the fashion industry and to contribute to future research in this domain. However, there are some weaknesses in this study that we should consider when generalizing the findings.

Our first limitation is related to the sample that we collected; it is an unbalanced sample. We hold in our sample more women than men, and this aspect could affect the obtained result.

The second limitation comes from the fact that we investigated people's awareness, their perceived risks, and benefits related to the usage of nanomaterials in the fashion industry. Future studies propose to further investigate public attitudes toward more specific nanotechnology applications in the fashion industry.

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