World Academy of Science, Engineering and Technology
International Journal of Humanities and Social Sciences
Vol:13, No:7, 2019

# Consumer Perception of 3D Body Scanning While Online Shopping for Clothing

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***Abstract*—**Technological development and the globalization in production and sales of clothing in the last decade have significantly influenced the changes in consumer relationship with the industrial-fashioned apparel and in the way of clothing purchasing. The Internet sale of clothing is in a constant and significant increase in the global market, but the possibilities offered by modern computing technologies in the customization segment are not yet fully involved, especially according to the individual customer requirements and body sizes. Considering the growing trend of online shopping, the main goal of this paper is to investigate the differences in customer perceptions towards online apparel shopping and particularly to discover the main differences in perceptions between customers regarding three different body sizes. In order to complete the research goal, the quantitative study on the sample of 85 Croatian consumers was conducted in 2017 in Zagreb, Croatia. Respondents were asked to indicate their level of agreement according to a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). To analyze attitudes of respondents, simple and descriptive statistics were used. The main findings highlight the differences in respondent perception of 3D body scanning, using 3D body scanning in Internet shopping, online apparel shopping habits regarding their body sizes.

***Keywords*—**Consumer behavior, online shopping, 3D body scanning.

## I. Introduction

MODERN 21st century technologies enable the advancement of production processes in all areas, as well as in manufacturing and purchasing of clothing on a global level. Parallel to the production modernization, the business strategy of the manufacturers is increasingly shifted to the customer's center of interest, with the aim of increasing the company's competitiveness on the market and gaining and retaining loyal customers. Thereby, the way of clothing production and sales is increasingly adapted to the customer's needs, in terms of design and garment characteristics customization (mass customization) as well as the adjustment of the garment size according to the individual anthropomeric characteristics of the customers (made to measure) [1]-[3].

Clothing manufacturers around the world distribute their collections to end-customers through various channels and various types of co-operation with other market participants. However, in the last decade there has been an expansion of Internet sales, so, nowadays, almost every middle or larger garment manufacturer offers its collections of clothes to customers online. However, in most cases the models of clothing are shown in the photographs recorded on slim fit body figures, which makes it often difficult for customers to assess whether a particular garment will suit their body, especially if there are deviations from the normal proportions of the body. The research results presented in this paper are based on the questionnaire analysis to obtain information about the Croatian population preferences of online shopping, with special reference to 3D body scanning capabilities and the use of 3D body models for the virtual garments "testing" during online clothing purchase.

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## II. Theoretical Framework

### A. The Problems of Clothing Sizes in Online Shopping

International Organization for Standardization – ISO presented the beginning for the unique size designation system of garments and footwear worldwide. ISO 3635, ISO 8559 and ISO 9407 standards present the unique definition of human body measurements for the needs of the clothing and shoe making industry [4]. Due to the differences in the average anthropometric measures of the population in different parts of the world, on the national level countries are developing their clothing size systems based on systematically implemented anthropometric measurements of the populations [5], [6]. In the last 15 years, national projects of population measurements for the purpose of creating or improving the clothing size systems are increasingly being carried out using a 3D body scanner that enables the identification of all relevant body measures, as well as the analysis of posture and body shape [7]-[9]. The results of anthropometric measurements and defined clothing size systems can be used for computer modeling and creation of a 3D body models database within a 2D/3D CAD system for computer design and construction. In doing so, the parametric body models can be customized according to each garment size and further used for evaluation of clothing model fit on the body of a particular size [10], [11]. Such a high-tech approach to the development and testing of garment models on a global scale is still unfortunately applied by a smaller number of clothing manufacturers. Furthermore, garment sizes systems are still based on average body measures, which generally do not take into account deviations from normal body proportions. This often causes that in the market, buyers cannot find clothing that fits their body proportions and shape. In online shopping,

the purchase of clothing is further complicated for the buyers by the fact that they have to choose the clothing size according to the size system based on the average anthropometric measures of the different nation, where the differences in body proportions cause inadequate clothing fit [12]. Because of all mentioned above, customers are often dissatisfied because they can only try out the clothing item after delivery, which causes that the clothing size often does not match and the material from which the garment is made is often not the same as at the presented image.

### *B. 3D Body Scanning Technology for Fashion and Apparel Industry and Online Shopping*

3D body scanning technology enables very precise determination of all body measurements that are neccessary for clothing construction and customization of clothing according to individual measurements [13]-[16]. Furthermore, 3D body model can be implemented in CAD system for clothing design and used instead parametric body model for 3D simulation of clothing model prototype. This enables visualization of clothing model directly on customers' 3D body model, whereby the clothing design can be evaluated on a body of particular size, posture and shape [17], [18]. In that sense, potential customer can assess much better if the certain clothing model fits his body, before the purchase. Today still a small number of high-tech equipped clothing manufacturers in the world offer customers ordering garments according to individual measures online, where the customer follows the instructions of the application, takes its own measures and enters them into the computer. However, in the last decade, the intent of implementing high technology in the clothing development process and online clothing sales is present. In doing so, 3D body scanning is gradually replacing traditional body measurements methods, which are mostly carried out using a measuring tape and are often imprecise, mainly due to the position of taking the measurements and the body position in which the measurements are determined [9], [19].

The implementation of computer-based 3D body types within the CAD system for the simulation of garment patterns presents the development trend in this field. This way construction preparation process is up to 50% faster than in conventional manufacturing. It also reduces number of necessary prototypes of the real model because the control and corrections of the pattern are performed by the computer until the optimal garment fit has been achieved. In the real manufacturing process this saves material, power, labor and other cost Also, the garment developed using the innovative digital process will match quality competitive on demanding western markets [20].

## III. Research Methodology

### *A. Sample and Data Collection*

For the purpose of data collection, a questionnaire was developed and given to a group of people that was participating in a scientific project 3011 "*Application of mathematical modeling and intelligent algorithms in clothing construction*", supported by Croatian Science Foundation. One of the project activities was 3D body scanning of a sample of adults test subjects. 3D body scanning was performed at the University of Zagreb, Faculty of Textile Technology during 2017. Also, scanning was conducted according to standard ISO 20685:2010 [21], on a sample of 85 adult females and males aged 18 to 65 years and their body measures were taken. Sample of 85 questionnaires and connected data regarding their body sizes were collected.

Questionnaire was built with six groups of questions. First group consisted of closed questions used to determine demographical facts of the sample (Table I). Second and third group of questions were adapted from Park et al. [22] and used to determine attitude toward 3D body scanning (4 questions) and intention of using 3D body scanning in Internet shopping (3 questions) [22]. Fourth group was adapted for this research from Hansen and Jensen in order to analyze online clothing purchases [23].

TABLE I
Demographics of Sample (Total Sample = 85 Respondents)

| Item | | Percentage |
|---|---|---|
| Gender | Female | 56.5 |
| | Male | 43.5 |
| *Age* | 18-25 | 63.5 |
| | 26-35 | 24.7 |
| | 36-45 | 4.7 |
| | 46-55 | 5.9 |
| | 56-65 | 1.2 |
| *Occupation/ Employment status* | Employed | 34.1 |
| | Not employed | 50.9 |
| *Clothing size* | Group 1 (Female: 34, 36, 38 Male: 44,46,48) | 20 |
| | Group 2 (Female: 40, 42, 44 Male: 50, 52, 54) | 57.6 |
| | Group 3 (Female: > 46 Male: > 56) | 22.4 |

As all participants were 3D body scanned, their answers were connected with their body sizes and divided into three groups in order to determine main differences in their perception regarding three different body sizes. Research question was: "Is there any differences in perception of 3D body scanning, intention of using 3D body scanning in Internet shopping and online clothing purchases of potential customers with different body sizes?".

### *B. Data Processing*

For achieving the research goal of this research, three factors were measured. The first one, consumer attitude toward 3D body scanning was adapted from Park et al. [22] and respondents were asked to indicate on a five-point Likert scale their emotional evaluation of 3D body scanning ranging from "strongly disagree" (1) to "strongly agree" (5).

The second one, intention of using 3D body scanning in Internet shopping was adapted but also modified from Park et al. [21] in order to measure customers' attitude towards their intention to use 3D body scanning while shopping online. Respondents were asked to indicate their degree of agreement

on a Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5) with statements regarding using their 3D body scan model while shopping online, willingness to pay higher price for such clothing and willingness to wait longer on a delivery for such products. And the last one, customer frequency of online clothing purchases and the amount of money spent on shopping online was adapted and modified from Hansen and Jensen [23] and Cowart and Goldsmith [24]. And for this factor, a five-point Likert scale was used to indicate respondent frequency of online clothing purchases and the amount of money they spent in 12 months period for online shopping.

For analyzing the data collected, simple and descriptive statistics methods were used.

## IV. Results

### A. Results on Customer Perceptions towards 3D Body Scanning Regarding Different Body Sizes

In the second group of questions, after demographical facts, respondents were given statements about their attitudes towards 3D body scanning (Table II). According to the results in Table II, respondents from Group 1 strongly agree that 3D body scanning is fun, interesting and futuristic (76.47%).

TABLE II (A)
ATTITUDE TOWARDS 3D BODY SCANNING

| Statements | % | | | | | Arithmetic mean |
|---|---|---|---|---|---|---|
| Gender | 1 | 2 | 3 | 4 | 5 | |
| 3-D body scanning is fun. | 0 | 1.18 | 20 | 32.90 | 54.12 | 2.79 |
| 3-D body scanning is interesting. | 0 | 0 | 20 | 29.41 | 50.59 | 4.24 |
| 3-D body scanning is pleasant. | 0 | 0 | 27.06 | 35.29 | 37.65 | 4.31 |
| 3-D body scanning is futuristic. | 2.35 | 1.18 | 24.71 | 25.88 | 54.12 | 4.11 |

TABLE II (B)
ATTITUDE TOWARDS 3D BODY SCANNING – GROUP 1

| Statements | % | | | | | Arithmetic mean |
|---|---|---|---|---|---|---|
| Gender | 1 | 2 | 3 | 4 | 5 | |
| 3-D body scanning is fun. | 0 | 0 | 5.88 | 17.65 | 76.47 | 4.71 |
| 3-D body scanning is interesting. | 0 | 0 | 11.76 | 11.76 | 76.47 | 4.65 |
| 3-D body scanning is pleasant. | 0 | 0 | 17.65 | 35.29 | 47.05 | 4.29 |
| 3-D body scanning is futuristic. | 0 | 0 | 11.76 | 11.76 | 76.47 | 4.65 |

TABLE II (C)
ATTITUDE TOWARDS 3D BODY SCANNING – GROUP 2

| Statements | % | | | | | Arithmetic mean |
|---|---|---|---|---|---|---|
| Gender | 1 | 2 | 3 | 4 | 5 | |
| 3-D body scanning is fun. | 0 | 2.08 | 20.83 | 39.58 | 37.50 | 4.13 |
| 3-D body scanning is interesting. | 0 | 0 | 18.75 | 35.42 | 45.83 | 4.27 |
| 3-D body scanning is pleasant. | 0 | 0 | 27.08 | 37.50 | 35.42 | 4.08 |
| 3-D body scanning is futuristic. | 2.08 | 2.08 | 22.92 | 31.25 | 41.67 | 4.08 |

TABLE II (D)
ATTITUDE TOWARDS 3D BODY SCANNING – GROUP 3

| Statements | % | | | | | Arithmetic mean |
|---|---|---|---|---|---|---|
| Gender | 1 | 2 | 3 | 4 | 5 | |
| 3-D body scanning is fun. | 0 | 0 | 31.58 | 31.58 | 36.84 | 4.05 |
| 3-D body scanning is interesting. | 0 | 0 | 31.58 | 31.58 | 36.84 | 4.05 |
| 3-D body scanning is pleasant. | 0 | 0 | 42.11 | 31.58 | 26.32 | 3.95 |
| 3-D body scanning is futuristic. | 5.26 | 0 | 42.11 | 26.32 | 26.32 | 3.68 |

Respondents from Group 2 strongly agree with 45% that 3D body scanning is interesting and with 42% that it is futuristic.

Respondents from Group 3 do not find 3D body scanning fun and interesting as respondents from Group 1. Dominant result was that they neither agree, neither disagree that is it pleasant (42%) and futuristic (42%).

### B. Results on Customer Perceptions towards Intention of Using 3D Body Scanning in Internet Shopping

Third group of questions presents respondents' attitude towards intention of using 3D body scanning in Internet shopping (Table III).

As it can be concluded from Table III, respondent strongly agree (48.24%) that they would like to use their 3D body scan model while they shop on the Internet and also they are willing to pay higher price for the apparel that is adapted to their body measures (68.26%) and wait longer for production of such clothing (28.24).

Respondents from Group 1 would like to use their 3D scanned model for online shopping (65%), and they agree with the statements that they would be willing to pay higher price for the apparel that is adapted to their body measures (47%) and they would be ready to wait longer for its delivery (41%).

50% of the respondents from Group 2 strongly agree that they would like to use their 3D scanned model for online shopping and they also agree with the statements that they would be willing to pay higher price for the apparel that is adapted to their body measures (38%) and they would be ready to wait longer for its delivery (40%), but with a slightly lower percentage than respondents from Group 1.

TABLE III (A)
ATTITUDE TOWARDS INTENTION OF USING 3D BODY SCANNING IN INTERNET SHOPPING

| Statements | % | | | | | Arithmetic mean |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| I would like to use my 3D body scan model while I shop on the Internet. | 1.18 | 4.71 | 18.82 | 27.06 | 48.24 | 4.12 |
| I would be willing to pay higher price for the apparel that is adapted to my body measures. | 5.88 | 8.24 | 17.65 | 36.47 | 68.24 | 4.16 |
| I would be willing to wait longer on the delivery of the product that is adapted to my body measures. | 3.53 | 11.76 | 16.47 | 40 | 28.24 | 3.79 |

TABLE III (B)
ATTITUDE TOWARDS INTENTION OF USING 3D BODY SCANNING IN INTERNET SHOPPING – GROUP 1

| Statements | % | | | | | Arithmetic mean |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| I would like to use my 3D body scan model while I shop on the Internet. | 0 | 0 | 5.88 | 29.41 | 64.71 | 4.59 |
| I would be willing to pay higher price for the apparel that is adapted to my body measures. | 11.76 | 0 | 11.76 | 47.05 | 29.41 | 3.82 |
| I would be willing to wait longer on the delivery of the product that is adapted to my body measures. | 11.76 | 0 | 17.65 | 41.18 | 29.41 | 3.76 |

TABLE III (C)
ATTITUDE TOWARDS INTENTION OF USING 3D BODY SCANNING IN INTERNET SHOPPING – GROUP 2

| Statements | % | | | | | Arithmetic mean |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| I would like to use my 3D body scan model while I shop on the Internet. | 2.08 | 8.33 | 14.58 | 25 | 50 | 4.13 |
| I would be willing to pay higher price for the apparel that is adapted to my body measures. | 6.25 | 8.33 | 12.50 | 37.50 | 35.42 | 3.88 |
| I would be willing to wait longer on the delivery of the product that is adapted to my body measures. | 2.08 | 14.58 | 12.50 | 39.58 | 31.25 | 3.83 |

TABLE III (D)
ATTITUDE TOWARDS INTENTION OF USING 3D BODY SCANNING IN INTERNET SHOPPING – GROUP 3

| Statements | % | | | | | Arithmetic mean |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| I would like to use my 3D body scan model while I shop on the Internet. | 0 | 0 | 36.84 | 31.58 | 31.58 | 3.95 |
| I would be willing to pay higher price for the apparel that is adapted to my body measures. | 0 | 15.79 | 36.84 | 26.32 | 21.05 | 3.53 |
| I would be willing to wait longer on the delivery of the product that is adapted to my body measures. | 0 | 15.79 | 26.32 | 36.84 | 21.05 | 3.63 |

Respondents from Group 3 are not interested as respondents from Group 1 and 2 for using their 3D body scanned model in online shopping. They also neither agree, neither disagree in a larger percentage than respondents from Group 1 and 2 (37%) with the statement that they would be willing to pay higher price for the apparel that is adapted to their body measures but they mostly agree (37%) that they would be ready to wait longer for its delivery (37%), but with a slightly lower percentage than respondents from Group 1 and 2.

Fourth group of questions describes respondents' attitude towards online clothing purchases (Table IV).

### *C. Results about Customer Online Apparel Shopping Habits Regarding Different Body Sizes*

Results in Table IV show that respondents do not buy clothing online (65.88% strongly agree and 12.94% agree). Only 10% of respondents buy clothes online one to two times a month. 13% of respondents spent less than 13 Eur on the clothing bought online in the last 12 month. 21% spent between 13 and 67 Eur and 19% of respondents spent between 67 and 133 Eur.

77% of the respondents from Group 1 and 34% from Group 2 do not buy clothes online, and only 6% from Group 1 and 34% from Group 2 buy clothes on line. 54% of the respondents from Group 3 do not buy and 47% of them buy clothes on line. All the respondents buy clothes online rarely, 26% of the respondents from Group 1 in the last 12 month spent less than 13 Eur on the clothing bought online.

TABLE IV (A)
ATTITUDE TOWARDS ONLINE CLOTHING PURCHASES

| Statements | % | | | | | Arithmetic mean |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| I do not buy clothes online. | 22.35 | 10.59 | 20 | 12.94 | 65.88 | 3.26 |
| I buy clothes online one to two times a month. | 63.53 | 12.94 | 14.12 | 5.88 | 3.53 | 1.73 |
| I buy clothes online three to four times a month. | 75.29 | 11.76 | 8.24 | 4.71 | 0 | 1.42 |
| I buy clothes online five to six times a month. | 77.65 | 12.94 | 9.41 | 0 | 0 | 1.32 |
| I buy clothes online seven to eight times a month. | 80 | 11.76 | 8.24 | 0 | 0 | 1.28 |
| I buy clothes online nine to ten times a month. | 80 | 11.76 | 7.06 | 1.18 | 0 | 1.29 |
| I spent 1-2 hours per week buying clothes online. | 80 | 11.76 | 7.06 | 1.18 | 0 | 1.29 |
| I spent 3-4 hours per week buying clothes online. | 83.53 | 8.24 | 9.41 | 0 | 0 | 1.27 |
| I spent 5-6 hours per week buying clothes online. | 84.7 | 8.24 | 7.06 | 0 | 0 | 1.22 |
| I spent 7-8 hours per week buying clothes online. | 85.53 | 9.41 | 7.06 | 0 | 0 | 1.24 |
| In the last 12 month I spent less than 13 Eur* on the clothing bought online. | 55.29 | 7.06 | 9.41 | 10.59 | 17.65 | 2.29 |
| In the last 12 month I spent 13-67 Eur** on the clothing bought online. | 64.71 | 8.24 | 5.88 | 7.06 | 14.12 | 1,98 |
| In the last 12 month I spent 67-133 Eur*** on the clothing bought online. | 69.41 | 7.06 | 4.71 | 8.24 | 10.59 | 1.84 |
| In the last 12 month I spent more than 133 Eur on the clothing bought online. | 77.65 | 7.06 | 8.24 | 0 | 7.06 | 1.52 |

TABLE IV (B)
ATTITUDE TOWARDS ONLINE CLOTHING PURCHASES – GROUP 1

| Statements | % | | | | | Arithmetic mean |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| I do not buy clothes online. | 5.88 | 0 | 17.65 | 23.53 | 52.94 | 4.12 |
| I buy clothes online one to two times a month. | 70.59 | 11.76 | 11.76 | 5.88 | 0 | 1.53 |
| I buy clothes online three to four times a month. | 82.35 | 11.76 | 5.88 | 0 | 0 | 1.24 |
| I buy clothes online five to six times a month. | 88.24 | 5.88 | 5.88 | 0 | 0 | 1.18 |
| I buy clothes online seven to eight times a month. | 88.24 | 5.88 | 5.88 | 0 | 0 | 1.18 |
| I buy clothes online nine to ten times a month. | 88.24 | 5.88 | 5.88 | 0 | 0 | 1.24 |
| I spent 1-2 hours per week buying clothes online. | 88.24 | 5.88 | 5.88 | 0 | 0 | 1.18 |
| I spent 3-4 hours per week buying clothes online. | 94.12 | 0 | 5.88 | 0 | 0 | 1.12 |
| I spent 5-6 hours per week buying clothes online. | 94.12 | 0 | 5.88 | 0 | 0 | 1.12 |
| I spent 7-8 hours per week buying clothes online. | 94.12 | 0 | 5.88 | 0 | 0 | 1.12 |
| In the last 12 month I spent less than 13 Eur* on the clothing bought online. | 58.82 | 0 | 0 | 0 | 23.53 | 2.29 |
| In the last 12 month I spent 13-67 Eur** on the clothing bought online. | 88.24 | 5.88 | 0 | 5.88 | 0 | 1.24 |
| In the last 12 month I spent 67-133 Eur*** on the clothing bought online. | 94.12 | 0 | 0 | 5.88 | 0 | 1.18 |
| In the last 12 month I spent more than 133 Eur on the clothing bought online. | 100 | 0 | 0 | 0 | 0 | 1 |

TABLE IV (C)
ATTITUDE TOWARDS ONLINE CLOTHING PURCHASES – GROUP 2

| Statements | % | | | | | Arithmetic mean |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| I do not buy clothes online. | 18.75 | 14.58 | 27.08 | 10.42 | 29.17 | 3.17 |
| I buy clothes online one to two times a month. | 60.42 | 12.50 | 14.58 | 8.33 | 4.17 | 1.88 |
| I buy clothes online three to four times a month. | 77.08 | 12.50 | 6.25 | 4.17 | 0 | 1.38 |
| I buy clothes online five to six times a month. | 77.08 | 14.58 | 8.33 | 0 | 0 | 1.31 |
| I buy clothes online seven to eight times a month. | 81.25 | 12.50 | 6.25 | 0 | 0 | 1.25 |
| I buy clothes online nine to ten times a month. | 81.25 | 12.50 | 6.25 | 0 | 0 | 1.25 |
| I spent 1-2 hours per week buying clothes online. | 77.08 | 16.67 | 6.25 | 0 | 0 | 1.29 |
| I spent 3-4 hours per week buying clothes online. | 79.17 | 12.50 | 8.33 | 0 | 0 | 1.29 |
| I spent 5-6 hours per week buying clothes online. | 81.25 | 12.50 | 6.25 | 0 | 0 | 1.25 |
| I spent 7-8 hours per week buying clothes online. | 81.25 | 12.50 | 6.25 | 0 | 0 | 1.25 |
| In the last 12 month I spent less than 13 Eur* on the clothing bought online. | 54.17 | 8.33 | 10.42 | 8.33 | 18.75 | 2.29 |
| In the last 12 month I spent 13-67 Eur** on the clothing bought online. | 5.33 | 8.33 | 4.17 | 10.42 | 10.42 | 2.23 |
| In the last 12 month I spent 67-133 Eur*** on the clothing bought online. | 68.75 | 10.42 | 4.17 | 6.25 | 6.25 | 1.79 |
| In the last 12 month I spent more than 133 Eur on the clothing bought online. | 81.25 | 8.33 | 4.17 | 0 | | 1.42 |

TABLE IV (D)
ATTITUDE TOWARDS ONLINE CLOTHING PURCHASES – GROUP 3

| Statements | % | | | | | Arithmetic mean |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| I do not buy clothes online. | 42.11 | 5.26 | 10.53 | 10.53 | 31.58 | 2.84 |
| buy clothes online one to two times a month. | 63.16 | 15.79 | 21.05 | 0 | 0 | 1.58 |
| I buy clothes online three to four times a month. | 63.16 | 10.53 | 15.79 | 10.53 | 0 | 1.74 |
| buy clothes online five to six times a month. | 68.42 | 15.79 | 15.79 | 0 | 0 | 1.47 |
| I buy clothes online seven to eight times a month. | 68.42 | 15.79 | 15.79 | 0 | 0 | 1.47 |
| buy clothes online nine to ten times a month. | 78.95 | 10.53 | 5.26 | 5.26 | 0 | 1.47 |
| I spent 1-2 hours per week buying clothes online. | 78.95 | 5.26 | 10.53 | 5.26 | 0 | 1.42 |
| I spent 3-4 hours per week buying clothes online. | 78.95 | 5.26 | 15.79 | 0 | 0 | 1.37 |
| I spent 5-6 hours per week buying clothes online. | 84.21 | 5.26 | 10.53 | 0 | 0 | 1.26 |
| I spent 7-8 hours per week buying clothes online. | 78.95 | 10.53 | 10.53 | 0 | 0 | 1.32 |
| In the last 12 month I spent less than 13 Eur* on the clothing bought online. | 52.63 | 5.26 | 15.79 | 10.53 | 15.79 | 2.37 |
| In the last 12 month I spent 13-67 Eur** on the clothing bought online. | 63.16 | 5.26 | 15.79 | 0 | 15.79 | 2.05 |
| In the last 12 month I spent 67-133 Eur*** on the clothing bought online. | 36.84 | 5.26 | 10.53 | 15.79 | 21.05 | 2.58 |
| In the last 12 month I spent more than 133 Eur on the clothing bought online. | 47.37 | 10.53 | 26.32 | 0 | 15.79 | 2.26 |

1 kn=7.5 Eur, in the questionnaire was 100 kn* (cca 13.3 Eur), 500 kn** (66.6 Eur), 1000 kn*** (133.3 Eur)

19% of respondents from Group 2 spent in the last 12 month less than 13 Eur on the clothing bought online and 19% spent 13-67 Eur and 10% spent 67-133 Eur. 27% of the respondents from Group 3 in the last 12 months spent less than 13 Eur on the clothing bought online, 16% spent 13-67 Eur but 37% spent 67-133 Eur which is significantly more than respondents from Group 1 and 2.

## V. CONCLUSION

This paper may have implications for both academics and managers. From the academic aspect, it can be explained as a pilot research in body sizes and customer preferences regarding online apparel shopping in Croatia as an example of Eastern European country. Although there is a lack of such researches and despite the fact that also this research showed low percentage of customers that buy clothing online, there is a huge possibility in increasing online shopping habits of Croats.

The main findings of this research highlight the differences in online shopping for a consumer with different body types. In previous research from Park et al. [22], there were differences by body type regarding attitudes toward internet shopping, in this research differences regarding body sizes were found. While majority of respondents in Group totally agree that 3D body scanning is fun, interesting and futuristic, respondents form Group 2 and 3, do not agree in such a huge percentage. Respondents form Group 1 would like to use their 3D scanned model for online shopping, they would be willing to pay higher price for the apparel that is adapted to their body measures and they would be ready to wait longer for its delivery. The respondents from group 2 also agree with statements but with a slightly lower percentage than respondents from Group 1. Respondents from Group 3 are not interested as respondents from Group 1 and 2 for using their 3D body scanned model in online shopping.

It can be concluded that different marketing approach is needed for consumers with a different body sizes. For a Group 1 that is willing and more open to use 3D body scanning, different approach is needed than for a Group 3 that is not so interested for using it. Also, a different approach in motivating them for trying and educating them about all advantages of 3D body scan in everyday shopping is needed.

Further research will expand the sample and conceptual model will be built in order to measure impact of shopping orientation, attitude towards 3D body scan, intention of using 3D body scan in online shopping at online clothing purchases and finding the differences regarding different body sizes.

So, at the end, it can be said that the 21st century defines new era of industrial manufactured clothing customization for a wide range of customers. In the context of 3D body scanning application in the fashion and clothing industry and online purchase of cloths, there is an interest shown for the use of 3D scanner as well as for purchasing clothes that are designed and customized according to customer individual size and demands.

## ACKNOWLEDGMENT

This work has been fully supported by Croatian Science Foundation under the project number 3011 *Application of mathematical modeling and intelligent algorithms in clothing construction.*

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