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CONSUMERS ATTITUDE RELATED TO CLOTHING RECYCLING IN ROMANIA

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Abstract: Concerns about pollution of the textile industry are obvious. This study aims to raise awareness of sustainable fashion by promoting clothing recycling. Through an examination of strengths, weaknesses, opportunities and threats, we seek to accelerate the recycling of used clothing. The study used survey questionnaires to gather data from 107 individuals from Romania. The findings indicated strong backing for clothing recycling. The data have been analyzed using factor and frequencies analysis, correlation analysis, and t-tests as the chosen statistical methods.

Keywords: clothing recycling, consumer behavior, social recycling, sustainable development, environment concern

1 INTRODUCTION

The textile industry's pollution is indeed a pressing environmental issue that has gained increasing attention in recent years. This industry is known for its significant contributions to pollution across various stages of production, from raw material extraction to manufacturing, dyeing, and finishing processes.

One major concern is the extensive use of chemicals and water in textile production, which leads to contamination of water sources and soil, impacting ecosystems and human health. Additionally, the energy-intensive nature of textile manufacturing contributes to greenhouse gas emissions, exacerbating climate change.

Understanding public perspectives on the importance of clothing recycling is crucial for developing effective strategies to promote sustainable practices and mitigate environmental impact. (Öztürk & Şahin, 2023)

Moreover, the disposal of textile waste, including non-biodegradable synthetic fibers, further exacerbates environmental degradation. (Acquaye et all., 2023) Landfills become overwhelmed with textile waste, while incineration releases harmful pollutants into the air.

Efforts to address these issues include the adoption of sustainable practices such as using eco-friendly materials, reducing water and energy consumption, implementing efficient waste management systems, and promoting circular economy principles like recycling and upcycling. (Jalil & Shaharuddin, 2019) However, concerted global action is needed to mitigate the environmental impact of the textile industry and promote a more sustainable approach to fashion and textile production. (Weber et all, 2017)

In recent years, companies that produce and distribute clothing have addressed sustainability and ethical practices by taking measures to reduce their negative impact on the environment, using sustainable materials and the implementation of recycling programs. (Park, 2020) Major retail companies operating in Romania have implemented various initiatives for collecting and managing textile waste, aiming to minimize the environmental impact of discarded clothing. (Nistor, 2022) Some of the ways these companies collect and store textile waste include: collection in stores, collaboration with recycling partners, donations and charitable partnerships, circular fashion initiatives, and sustainable supply chains. (Rotimi et all., 2023)

The purpose of this study is to offer a practical perspective on textile recycling management. The goal outlined in this paper is to gather a substantial number of individuals' perspectives on textile recycling and conduct a thorough analysis of these viewpoints. It is crucial to maintain equilibrium among quality, time, performance, and costs, which are four essential dimensions to consider throughout the material preparation process.

2 METHODOLOGY

It has been determined that using a questionnaire would likely yield the most comprehensive data from diverse perspectives.

An online survey of a quantitative nature was carried out to gather data from participants, aiming to evaluate the predefined hypotheses in the study. Initially, survey questionnaires were pilot tested to ensure the reliability, clarity, and consistency of the inquiries. Subsequently, the refined questions were encoded into Google Forms and disseminated among respondents to gauge their attitudes, intentions regarding consumption, and behaviors related to the clothing recycling in Romania.

Participants willingly took part in the survey, with emphasis placed on ensuring the confidentiality and anonymity of their responses. The Google Form link was disseminated within Romania for a one-week duration (april 2023). Respondents typically spend around 5 minutes to complete the online survey. A total of 107 responses were gathered during this timeframe. These results were then analyzed to answer the set hypotheses of the study.

The data obtained from the questionnaire applied to the 107 respondents has been analyzed descriptively and inferentially according to the statistics generated by Statistical Product and Service Solutions (SPSS) (Jaba & Grama, 2004).

2.1 The respondents

Frequencies are used in the SPSS program to obtain information about the data distribution in a variable. A frequency analysis was conducted, obtaining information about the number of observations N, about the sample size. (Cătoiu & all, 2009) In the studied case, the Percent and Valid Percent columns are identical because all subjects have scores for this variable.

Using the standard deviation as a unit of measurement allows quantifying how far individual values are from the overall sample mean. The larger the standard deviation, the more spread out the values in the dataset are around the mean.107 participants aged between 18 and 80 were involved in the current

study. The majority of the responses were from individuals aged 46-55 (29.9% of total responses), followed by the 18-25 age group (20.6% of total responses) and the 36-45 age group (18.7% of total responses). This diversity in age groups is significant as it provides a broader spectrum of perspectives on the importance of recycling clothing items.

Table 1. The age of the respondents

The age		Freq.	%	Valid %	Cumulative %
Valid					
	18-25	22	20.6	20.6	20.6
	26-35	9	8.4	8.4	29.0
	36-45	20	18.7	18.7	47.7
	46-55	32	29.9	29.9	77.6
	56-65	14	13.1	13.1	90.7
	over 65	10	9.3	9.3	100.0
	Total	107	100.0	100.0	

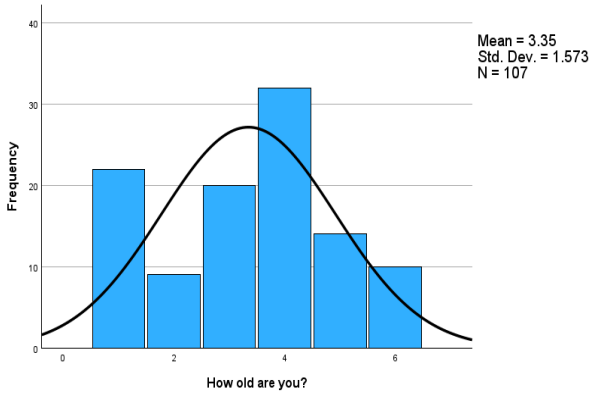

Figure 1. The age of the respondents

The sample shows a deviation from the mean M = 3.35 by 1.573 standard deviations below and above the mean.

Most of the answers received were given by women, i.e., 86.9% of the total answers as can be seen in table 2. It should be noted that statistically, worldwide, women purchase clothing products more often and in larger quantities. (Edirisinghe, D.et all, 2020)

Table 2. The gender of the participants

		Freq	%	Valid %	Cumulative %
Valid					
	1 Female	93	86.9	86.9	86.9
	2 Male	14	13.1	13.1	100.0
	Total	107	100	100.0	

There is a deviation from the sample mean M = 1.13 by S = 0.339 standard deviations below and above the mean. The individual values are very close to the overall sample mean, with a very small standard deviation.

Except for one individual who has completed only secondary school, all participants have attained at least a high school education, with the majority having pursued university studies (63.8% of total responses).

This observation is significant because one's level of education often influences their attitudes and actions towards various subjects, including clothing recycling. Higher education, particularly at the university level, can provide individuals with a broader understanding of the benefits of recycling, different recycling methods, and the environmental impact. Graduates are more likely to possess a deeper understanding of recycling principles and practices, leading to a greater appreciation for its importance.

However, it's important to note that educational background is not the only factor determining recycling behavior. Other factors such as awareness levels, the availability of recycling facilities, and individual motivations can also play significant roles.

Additionally, it was found that all participants live in urban areas, ensuring access to a wide range of fashion retailers' stores.

The current occupation of the subjects is highlighted in Table 3 and the graphic

representation of the frequency of scores is shown in figure 2.

Table 3. What is your current occupation?

		Freq	%	Valid %	Cumulative %
Valid	1 (Pupil)	2	1.9	1.9	1.9
	2 (Student)	14	13.1	13.1	15.0
	3 (Employed in the public sector)	43	40.2	40.2	55.1
	4 (Employed in the private sector)	25	23.4	23.4	78.5
	5 (Household)	1	0.9	0.9	79.4
	6 (Manager/ Patron)	1	0.9	0.9	80.4
	7 (Self employed)	4	3.7	3.7	84.1
	8 (Unemployed)	3	2.8	2.8	86.9
	9 (Retired)	14	13.1	13.1	100.0
	Sum	107	100.0	100.0	

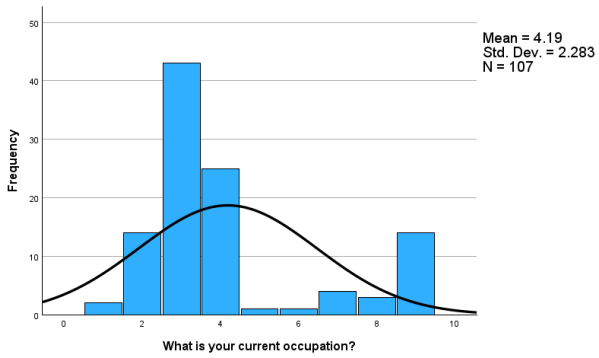

Figure 2. What is your current occupation?

According to the analysis presented in Figure 2, the Gaussian curve shows us that out of a total of 107 respondents, 40.2% are employed in the public sector. There is a deviation from the sample mean M = 4.19 by S = 2.283 standard deviations below and above the mean. Upon examining the current occupation of the respondents, an interesting aspect can be observed: the vast majority, 40.2%, are employed in the public sector, followed by 23.4% in the private sector, with 13.1% being retirees.

2.2 Research tools

The research method that has been used is survey, and as a research instrument was the questionnaire, based on the purpose and objectives of the research. The questionnaire is identified as a flexible research tool, allowing the collection of primary data through questions. The questions are structured according to well-defined principles. (Turner & Simister, 2004).

The online questionnaire includes multiple-choice questions, open-ended questions, or a combination of both. Multiple-choice questions and rating scales were also introduced to obtain a comprehensive perspective on the subject.

The questionnaire comprises a total of 11 items, featuring short, clear, concise, and relevant questions. The questions are formulated in a neutral and balanced manner, without influencing or directing respondents' answers in a particular direction. Each item is unique, easy to understand, and provides valuable data for analysis and interpretation.

The current research is a descriptive, non-experimental, cross-sectional study aimed at examining the community's perception of the importance of recycling clothing items. It is a non-representative quantitative study, meaning that the results cannot be generalized to the entire population; therefore, they are limited to the specific sample under study (Ungureşan, 2022).

Data collection utilized a sampling method based on accessibility. The data obtained from administering the questionnaire to 107 respondents will be analyzed both descriptively and inferentially.

3 RESULTS AND DISCUSSIONS

3.1 Standardized score

Table 4. Statistics

	N	Min	Max	Mean	Std. Err.	Std. Dev.
Which of the following criteria are the basis for the choice of clothing items?	107	1	2	1.04	0.191	0.199
Valid N	107					

The responses to the question "Which of the following criteria are the basis for choosing clothing articles?" deviate from the sample mean M = 1.04 by S = 0.199 standard deviations below and above the mean. The majority of responses are: "the materials they are made of" and "the price".

The highest z-score of 4.35215 is obtained for subject 103, while the lowest score is -0.70959 for a significant portion of the subjects. The score of subject 103 is atypical, being very high, 4.2 times higher than the mean. Most of the z-scores seem to be relatively close to zero, indicating that those data points are around the dataset's mean. There are a few data points with significantly higher z-scores (for example, subject 103 with z = 4.35215 and subject 28 with z = 1.82128). These high values indicate that those observations are significantly distant from the dataset's mean. There are also observations with significantly negative z-scores, indicating that these data points are below the dataset's mean. The other subjects have a normal level, with results being one unit lower than the mean but within the range (-1, +1).

3.2 Pearson Correlations (r)

The Pearson correlation coefficient (r) measures the degree of linear association between two continuous variables. Its value can range from -1 to 1, where: 1 indicates a perfect positive correlation (if one variable increases, the other variable increases proportionally); 0 indicates no correlation (there is no linear association between the two variables), and -1 indicates a perfect negative correlation (if one variable increases, the other variable decreases proportionally). The closer the correlation approaches 0, the weaker the relationship between the variables. Positive values indicate a direct relationship between variables, while negative values indicate an inverse relationship.

The correlation "gender - purchasing new clothing items" is bivariate. There is a small negative correlation between the frequency of purchasing new clothing items and respondents' gender, as the Pearson correlation coefficient r = -0.119, as shown in Table 5. However, the high p-value (0.220) indicates that there is not enough evidence to support that this correlation is statistically significant. The degree of correlation is low, suggesting a small indirect relationship between the two variables. This analyzed correlation is not statistically significant. The correlation is very weak, indicating that this trend is not very pronounced.

The correlation "age - criteria for choosing clothing items" is bivariate. There is a small positive correlation between the two variables, as indicated by the Pearson correlation coefficient r = 0.028, as shown in Table 6. The degree of correlation is low. The correlation coefficient close to zero suggests that there is no significant association between age and criteria for choosing clothing items. The high p-value (0.777) indicates that there is not enough evidence to support that this correlation is statistically significant. This analyzed correlation is not statistically significant. Essentially, there is no significant linear association between them.

This means that changes in one variable are not linearly associated with changes in the other variable. These results indicate that the age of respondents is not significantly correlated with the criteria for choosing clothing items.

Table 5. The correlation "gender - purchasing new clothing items"

		How often do you purchase new clothing items?	Gender
How often do you purchase new clothing items?	Pearson Correlation	1	-0.119
	Sig. (2-tailed)		0.220
	N	107	107
Gender	Pearson Correlation	-0.119	1
	Sig. (2-tailed)	0.220	
	N	107	107

Table 6. The correlation "age - criteria for choosing clothing items"

		Which of the following criteria are the basis for choosing clothing items?	What is your age?
Which of the following criteria are the basis for choosing clothing items?	Pearson Correlation	1	0.028
	Sig. (2-tailed)		0.777
	N	107	107
What is your age?	Pearson Correlation	0.028	1
	Sig. (2-tailed)	0.777	
	N	107	107

3.3 The importance of clothing recycling

Participants in the questionnaire were queried regarding their perceived level of knowledge regarding the significance of recycling clothing items. Responses varied significantly, with only 9.5% of participants indicating that they felt highly informed on this subject.

Nearly half of the participants, accounting for 44.8% of all respondents, expressed a lack of confidence in their knowledge of this topic, despite expressing a willingness to gain further understanding. Numerous individuals cited insufficient promotion of textile recycling campaigns as a barrier to broader awareness and highlighted the absence of known collection points for used clothing items in certain areas.

Table 7. The correlation "educational level of study participant - importance of recycling clothing items"

		To what extent do you consider clothing recycling to be important?	Your educational level - what is the highest level of education you have completed?
To what extent do you consider clothing recycling to be important?	Pearson Correlation	1	-0.041
	Sig. (2-tailed)		0.676
	N	107	107
Your educational level - what is the highest level of education you have completed?	Pearson Correlation	-0.041	1
	Sig. (2-tailed)	0.676	
	N	107	107

The correlation "educational level of study participant - importance of recycling clothing items" is bivariate. There is a small negative correlation between the two variables, as indicated by the Pearson correlation coefficient r = -0.041, as shown in Table 7. The degree of correlation is low, suggesting a small indirect relationship between the two variables. This analyzed correlation is not statistically significant.

Out of a total of 107 respondents, some companies have special programs for collecting used clothing items, with a deviation from the sample mean M = 1.59 by S = 0.494 standard deviations below and above the mean and an average standard error of 0.048 (Table 8). The average value of responses for the analyzed variable (associated with the degree of agreement or disagreement with the statement: "Did you know that some companies have special programs for collecting used clothing items?") is 1.59.

Table 8. Statistics for a single sample

	N	Mean	Std. Deviation	Std. Error Mean
Did you know that some companies have special programs for collecting used clothing items?	107	1.59	0.494	0.048

Deviation from the mean:

- Below the mean: There is a deviation from the mean by 0.494 standard deviation units below the mean. This indicates that there is a segment of respondents who have responded below the overall sample mean.
- Above the mean: Additionally, there is a deviation from the mean by a certain value above the mean, suggesting that there are also respondents who have responded above the overall mean.

The average standard error is 0.048, indicating the average variability of the data within the sample around the sample mean. The smaller the standard error, the more consistent the data around the mean.

Due to the values of deviation from the mean below and above the mean, it can be suggested that there is variability in respondents' responses regarding special programs for collecting used clothing items. The small standard error indicates a relatively consistent data around the mean.

The significance level chosen is p = 0.05. The confidence interval is 95%.

For the situation presented in Table 9, the scores within the confidence interval span zero because they range from -0.1 to +0.09. Therefore, our sample mean is not statistically different from the mean of the comparison sample (Riaz, 2015). The observed test statistic is t = -0.025. The specified test value is 1.59. If the observed value (t) were greater than this, it would fall into the rejection region of the test. Considering the large p-values (0.490 and 0.980), there is not enough evidence to reject the null hypothesis. Furthermore, the confidence interval for the difference includes zero, supporting the absence of a significant difference.

The significance level chosen is p = 0.05. The confidence interval is 95%.

For the situation presented in Table 9, the scores within the confidence interval span zero because they range from -0.1 to +0.09. Therefore, our sample mean is not statistical.

It follows that respondents have the same preferences, meaning that companies tend to collect used clothing items.

61.7% of respondents consider clothing recycling to be very important, 28.6% to a great extent, but also 2.9% of the study participants

Table 9. T Test

	Test Value = 1.59						
			Significance			95% Confidence Interval of the Difference	
	T	df	One-Sided p	Two-Sided p	Mean Diff.	Lower	Upper
Did you know that some companies have special programs for collecting used clothing items?	-0.025	106	0.49	0.98	-0.001	-0.1	0.09

declared themselves completely indifferent, considering it not to be an urgent environmental issue. The results of this study show that women are more involved in recycling worn-out clothes than men.

While it's good that most people are somehow concerned about the environment, the existence of indifferent individuals will continue to pose a danger to the surrounding environment, continuing to pollute it without restraint.

4 CONCLUSIONS

The results have been processed and analyzed using SPSS.

Frequency analysis is essential for understanding the distribution of data and for identifying patterns or characteristics of variables. Essentially, the data representing the age of the subjects, gender, level of education, and their current occupation exhibit considerable dispersion around the mean, with some values lower and others higher than the mean. Individual values are relatively distant from the sample mean, indicating a heterogeneous dataset.

The majority of z-scores appear to be relatively close to zero, indicating that those data points are around the mean of the dataset for the question: "Which of the following criteria are the basis for choosing clothing items?"

The Pearson correlations "gender - purchasing new clothing items", "age - criteria for choosing clothing items", "educational level of study participant - importance of recycling clothing items" are very weak, indicating that these trends are not very pronounced.

The application of the T-test for: "Did you know that some companies have special programs for collecting used clothing items?" indicates that companies tend to collect used clothing items.

The study show that women are more involved in recycling the used clothes than men.

This study is subject to specific limitations, which are deemed significant in establishing a research framework for future studies. A limitation of the study was the inability to directly interact with the subjects under investigation, potentially compromising the sincerity of their responses. Additionally, the inability to address potential questions from the subjects further exacerbated this issue. Furthermore, a random sampling methodology was not employed, limiting the generalizability of the results to the broader population, and thus the findings are only representative of the specific sample under investigation or possibly at the level of Cluj County.

Textile recycling encourages innovation and diversification of products.

Public perception regarding the importance of clothing recycling is multifaceted, reflecting varying levels of awareness, knowledge, and

engagement. Efforts to promote clothing recycling must address existing challenges, including limited access to information and recycling infrastructure, while also tapping into the growing desire among individuals to contribute to environmental sustainability. By understanding and addressing public perspectives, stakeholders can work towards a more sustainable future for the fashion industry and the planet as a whole.

BIBLIOGRAPHY

Acquaye, R., Seidu, R.K., Eghan, B., Fobiri, G. K. (2023). Consumer attitude and disposal behaviour to second-hand clothing in Ghana, *Scientific African*, e01887.

Cătoiu, I. et all. (2009). *Cercetări de Marketing*, Editura Uranus.

Edirisinghe, D., Nazarian, A., Foroudi, P., & Lindridge, A. (2020). Establishing psychological relationship between female customers and retailers: A study of the small-to medium-scale clothing retail industry. *Qualitative Market Research: An International Journal*, *23*(3), 471-501.

Jaba, E., Grama, A. (2004*). Analiza statistică cu SPSS sub Windows*, Editura Polirom.

Jalil, M. H., & Shaharuddin, S. S. (2019). Consumer purchase behavior of eco-fashion clothes as a trend to reduce clothing waste. *International Journal of Innovative Technology and Exploring Engineering*, 8(12), 4224-4233.

Nistor, L., & Bálint, G. (2022). Attitudes towards Sustainable Fashion in Romania. *Acta Universitatis Sapientiae,* Social Analysis, 12(1), 28-52.

Öztürk, E., & Şahin, A. (2023). Encouraging sustainable clothing disposal: consumers' social recycling motivations in Turkey. *Journal of Material Cycles and Waste Management*, 25(5), 3021-3032.

Park, Y. (2020). Perception related to recycling clothing and analysis of the actual conditions for the unused clothing. *Journal of Fashion Business*, 24(5), 1-20.

Riaz, H. A. (2015). Impact of brand image on consumer buying behavior in clothing sector: A comparative study between males and females of Central Punjab (Lahore) and Southern Punjab (Multan). *Kuwait Chapter of the Arabian Journal of Business and Management Review*, 4(9), 24.

Rotimi, E. O. O., Johnson, L. W., Kalantari Daronkola, H., Topple, C., & Hopkins, J. (2023). Predictors of consumers' behaviour to recycle end-of-life garments in Australia. *Journal of Fashion Marketing and Management: An International Journal*, 27(2), 262-286.

Turner, J.R. & Simister, J. S. (2004). Manual Gover de Management de Proiect, Editura Codecs, Bucureşti, p. 59.

Ungureşan, M. P. (2022). Development of a Cultural Project: The "Enchantment of Music" Tour by the JUNIOR VIP Children's Choir from Cluj-Napoca, Romania, Bachelor's Thesis, Babeş-Bolyai University, Faculty of Economics and Business Administration.

Weber, S., Lynes, J., & Young, S. B. (2017). Fashion interest as a driver for consumer textile waste management: reuse, recycle or disposal. *International Journal of Consumer Studies*, 41(2), 207-215.