

Article

Predicting Textile Recycling through the Lens of the Theory of Planned Behaviour

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Abstract: Management of textile waste is a growing challenge for many countries. In order to tackle this issue, countries are turning to recycle, which is treated as an efficient way to manage textile waste. This empirical research is the first study on the scale of Lithuanian households aimed to ascertain the predictors of textile recycling behaviour. The study involved a sampling research method in order to understand factors affecting textile recycling behaviours and attitudes of residents in Lithuania. Data from a sample of 391 households were analysed using structural equation modelling. The research indicated key factors stimulating textile recycling behaviour based on standard and extended versions of the theory of planned behaviour. Results have shown the usefulness of applying the traditional model of planned behaviour instead of the extended one in predicting intention to recycle textile waste. The outcome of this research contributes to the formulation of recommendations regarding the promotion of sustainable textile waste management.

Keywords: textile; recycling; behaviour; intention; attitude; planning



Citation: Vilkaite-Vaitone, N.; Jeseviciute-Ufartiene, L. Predicting Textile Recycling through the Lens of the Theory of Planned Behaviour. *Sustainability* **2021**, *13*, 11559. <https://doi.org/10.3390/su132011559>

Academic Editor: Carol Monticelli

Received: 24 August 2021
Accepted: 18 October 2021
Published: 19 October 2021

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1. Introduction

Globally textile waste management is becoming more complex as a result of rapid urbanization, population growth, rising living standard, and changes in consumption patterns [1]. A considerable amount of textile waste is sent to municipal solid waste or even burnt. More than 70% of textile products end up as a landfill [2]. Such choices lead to the pollution of the environment and the loss of raw materials.

Considering the global amount of textile waste at 92 tons per year [3], to perceive this valuable resource as waste may be catastrophic. Society should know that the culture of throwing away is a thing of the past and more clarification of the recyclable materials and schemes have to be designed in order to enhance the initiatives of global circular economy [4,5]. Recycling nowadays is concerned as a sustainable and environmentally friendly option for waste management [6,7]. While benefits and opportunities of textile recycling are appealing, challenges for institutions, researchers and practitioners in stimulating society to choose recycling alternatives still exist.

Textile waste (clothes, shoes, bedding, curtains and other waste of textile products) cover approximately 8% of the whole communal waste flow in Lithuania [8] compared to 9% in the EU [9]. According to the most recent available data, the recycled waste of textile in Lithuania decreased from 1.7 kg per household in 2018 to 1.5 kg per household in 2020, while in the EU this number increased from 7.2 kg per household in 2018 to 7.4 kg per household in 2020 [10]. The generated waste of textile in Lithuania increased from 9.8 kg per household in 2018 to 10.6 kg per household in 2020, while generated waste of textile in the EU is relatively stable 10.2 kg per household in 2018 and 2020 [10]. Lithuania like any other member of the European Union has an obligation to collect textile household waste separately by 2025. To remedy the negative impact of textile waste accumulation a huge variety of measures have been introduced. For example, setting of special textile containers near supermarkets or in the places where another kind of waste is collected, initiatives

of charity organizations in collecting no more needed textile items, promotions of textile producers (for example, H&M) intended to collect unwanted garments in exchange for a discount, or incentives that encourage customers to purchase sustainable textile garments, etc. [11–15]. These measures cover only a small share of generated textile waste and thus do not generate relevant results. In order to establish a consumer-friendly textile recycling system, more understanding of consumer behaviour for textile products is needed.

The interest of scholars in textile recycling increases consistently with the rising attention given to the concept of the circular economy. Previous research has investigated recycling of textile as a whole or some textile products and fibres such as wool, polyester, cotton in the United States of America [16], Finland [17], Sweden [18], Spain [19], Austria [20], Turkey [21], Australia [22], China [23] and in other countries. Some studies [24–27] focused on the advantages of textile recycling, namely on environmental, socio-economic impact. Another category of researches dealt with the issues related to textile recycling looking from manufacturers' perspective [2,5,28,29]. Although these studies have been valuable in clarifying some problems in recycling systems, situations related to consumers' recycling behaviour can be different in nowadays sustainability era. Therefore, a new investigation of the current situation is necessary. This study intends to research households' perceptions and practices on textile recycling behaviour in Lithuania. In order to perform this task, the paper utilized the theory of planned behaviour. This theory as a promising framework has been widely used in previous researches investigating recycling behaviour [1,30,31], however, the lack of studies that utilized the theory of planned behaviour in textile recycling is obvious. This research is the first that applied the theory of planned behaviour to investigate textile recycling intention among households in Lithuania. Furthermore, the present research expands the theory of planned behaviour with additional variables, i.e., information provision. Therefore, the article addresses the following questions: (1) does the theory of planned behaviour predict recycling intention among households in Lithuania? (2) What is the role of information provision in conjunction with components of the theory of planned behaviour in predicting textile recycling intention? The answers to these questions are essential to finding as knowledge of the variables that affect textile recycling behaviour could benefit in guiding the government and industries to the efficient solutions of textile recycling.

The rest of this paper is structured as follows. After highlighting the importance of the theory of planned behaviour in explaining the textile recycling phenomenon, the importance of the informational provision as an additional variable is presented in the literature review. Section 2 describes the chosen methodological approach, including the research design, participants, study measures and data analysis techniques. Section 3 presents the results of the research. Finally, Section 4 summarizes the main findings and opens up future perspectives for institutions, researchers and practitioners towards the improvement of textile recycling. The paper ends up with the conclusions.

2. Literature Review

Effective efforts in the promotion of recycling behaviour change should be based on behavioural theories. Previous researches [1,30–33] confirm that theory of planned behaviour is expedient in explaining determinants of recycling. This theory is one of the most supported by empirical evidence and is widely used for the explanation of recycling behaviour. Therefore, this theory is the focus of this research.

The theory of planned behaviour was first proposed by Ajzen [34]. Its conceptual assumption is that humans behaviour usually features a sensible manner [35]. The theory of planned behaviour identifies behavioural intention as the strongest predictor of behaviour (Figure 1). The theory is based on three constructs: attitude toward behaviour, subjective norm and perceived behavioural control. All these constructs predict behavioural intention [32,36]. Predictors of behavioural intention are the results of behavioural beliefs (consequences of the alternatives that are available), normative beliefs (the normative expectations of important people) and control beliefs (available resources and obstacles) [1].

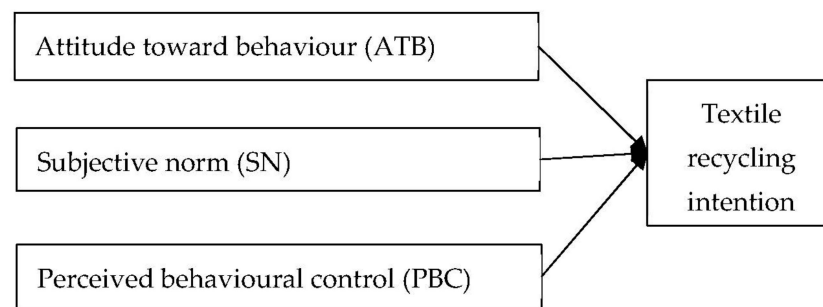


Figure 1. Model 1 (standard predictors of theory of planned behaviour).

Over the years varied results in the field of predictors of recycling behaviour were published. For example, Oztekin et al. [32] has found that attitude toward behaviour, subjective norm and perceived behavioural control were significantly and positively related to recycling intentions. The study demonstrated the significant positive impact of past behaviour as well. Oztekin et al. [32] indicated that perceived behavioural control has the largest contribution in explaining intention to recycle. The other study of determinants of recycling behaviour in the UK [33] has also confirmed the soundness of the theory of planned behaviour empirically, but the results of the research proved the component of attitude to be the major contributor to recycling behaviour. In another study, Jain et al. [37] investigated construction and demolition waste recycling and found attitude and perceived behavioural control having a significant positive effect upon behavioural intention. The study, however, failed to prove the significant effect of subjective norms on behavioural intention.

A considerable advantage of the theory of planned behaviour is its openness to incorporate additional variables [1,32,35,38–40]. Previous studies [1,35,40,41] have confirmed that the inclusion of additional variables has the potential to increase the predictability of the theory of planned behaviour. Additional variables are needed because the recycling decision is a complex one [33] and there exists a possibility that more factors should be taken into consideration in explaining recycling behaviour. The recent scholarship does not provide sufficient empirical evidence about the adequacy of the theory of planned behaviour in explaining textile recycling behaviour, so the authors of this paper decided to test not only the standard version of the theory of planned behaviour but the expanded version as well.

Previous literature has reported that sufficient knowledge is essential in the encouragement of recycling behaviour [30,42]. Knowledge in the field of textile recycling is a result of informational provision [43]. Soorani & Ahmadvand [35] confirmed that humans pay attention to the available information and choose their actions implicitly or explicitly based on the information provided. Information is relevant to performing the desired recycling behaviour. It is a prerequisite for the consistent and correct performance of such behaviour [44]. Mehner et al. [43] have highlighted the influence of user-adapted, instructive information on participation in a recycling scheme. Such information has a considerable impact on knowledge in the field of proper waste separation and the perception of information.

The theory of planned behaviour hypothesises that attitude, subjective norm and perceived behavioural control influence behavioural intentions. For the purpose of this study, an additional variable, i.e. informational provision, was included within the model (Figure 2). Accordingly, we will test two SEM models. Model 1 includes standard predictors of the theory of planned behaviour. In model 2 we test for the effects of standard predictors supplemented by the informational provision.

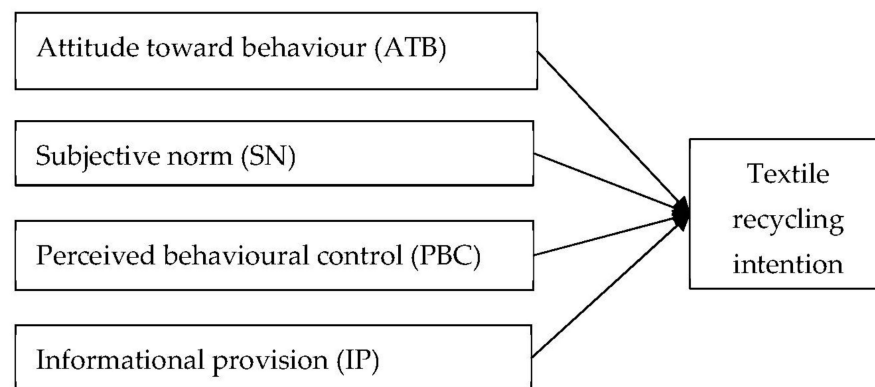


Figure 2. Model 2 (the extended theory of planned behaviour framework with the addition of informational provision).

3. Materials and Methods

3.1. Research Design

In order to understand peoples' perceptions on the influence of attitude, subjective norm, perceived behavioural control and informational provision on their textile recycling behaviour, a quantitative research approach was adopted. A survey utilized an exploratory research design to gain a deeper and greater understanding of the recycling phenomenon.

To investigate public perceptions and practices, a sampling research method was held and questionnaires were used to collect the data. The scientific merits of this method have been discussed in detail in the literature [30,45].

The first section of the questionnaire requested information about the respondents' demographic and socio-economic status, such as gender, age, place of residence, education level, social status and family status. The second section of the survey questionnaire consisted of several questions associated with constructs of the theory of planned behaviour and the additional element of informational provision. The survey questions used a five-point Likert scale for expressing an agreement or disagreement with statements. Every construct had multiple statement items following the recommendations by Rosenthal [46], Botetzagias et al. [47], Oztekin et al. [32], Park & Ha [48]. Pilot research was applied for validation and testing of the questionnaire.

3.2. Participants

The population of this research includes all households residing within Lithuania. Lithuania has a population of 2.78 million and approximately 1.28 million households [49]. The sample was calculated to be 385 households (with a standard 5 per cent margin of error and 95 per cent confidence level). Every household was represented by one family member who is mainly responsible for managing textile waste. The study applied a non-random and purposive sampling technique.

Snowball sampling procedure was used for the exploratory study. Members of households were invited to participate in web-based research via Facebook groups, emails, posts on social networks (pages of Vilnius Tech), personal messages. In total members of 391 households submitted the survey.

3.3. Study Measures

Being a part of a larger web-based survey, some sections of the questionnaire were made up to evaluate the constructs of the theory of planned behaviour. 25 items were developed to measure determinants of textile recycling based on the expanded version of the theory of planned behaviour. The survey measured: attitude toward behaviour, subjective norm, perceived behavioural control, behavioural intentions and informational provision (Table 1).

Table 1. Specification of research variables.

Variables	Number of Items	Example	Cronbach Alpha
Attitude toward behaviour	9	Textile recycling is a good choice	0.895
Subjective norm	3	Most people who are important to me would approve of me recycling textile waste	0.839
Perceived behavioural control	8	During the previous half-year, it was easy for me to recycle textile	0.721
Textile recycling intention	3	I intend to perform textile recycling within the next half-year	0.872
Informational provision	2	I have enough information about how textile waste can be recycled	0.771

Nine items were used to examine attitude toward behaviour, such as “Textile recycling is a good choice”. A higher score meant a more positive attitude toward recycling. Cronbach alpha for attitude toward behaviour was 0.895. The items of this subscale were based on Botetzagias et al. [47], Oztekin et al. [32].

Subjective norm consisted of 3 items, such as “Most people who are important to me would approve of me recycling textile waste”. We modified the items of Botetzagias et al. [47], Oztekin et al. [32], Park & Ha [48] surveys to measure subjective norms in textile recycling settings. A higher score suggested that the perceptions of social pressure for textile recycling are greater. The Cronbach alpha for the internal consistency of the three items was 0.839.

Eight items were used to measure perceived behavioural control to recycle (Cronbach alpha = 0.721) including “During the previous half-year it was easy for me to recycle textile” [32,46–48]. Four items out of eight were reversed. A higher score reflected that respondents perceived better capability of textile recycling.

Three items measured textile recycling intention, including “I intend to perform textile recycling within the next half-year” [48]. The Cronbach alpha for the internal consistency of these items was 0.872.

Informational provision was examined with two items, such as “I have enough information about how textile waste can be recycled”. Cronbach alpha for informational provision was 0.771.

Response formats for all survey questions were 5-point Likert scales, ranging from strongly disagree (1) to strongly agree (5). The mean scores of each variable were calculated and used for the analysis. Higher scores of the variables indicated stronger attitudes to textile recycling, greater perceptions of social pressure for textile recycling, stronger perceived control over textile recycling and stronger intentions for recycling practice.

Two experts from Lithuania assessed the validity of the questionnaire. In order to improve the clarity of the statements’ authors carried out a pilot test of the questionnaire within a small group of students at Vilnius Gediminas Technical University.

3.4. Data Analysis

Results of the research were analysed by SPSS 23 and AMOS 23 software. SPSS 23 package was used for the calculations of Cronbach alpha (α), Pearson’s correlation coefficients (r), means (M), standard deviation (SD). In order to better understand the path relationship among the research variables, structural equation modelling (SEM) was employed. Two models were examined to answer the research questions. Model 1 proposed that elements of the theory of planned behaviour predict textile recycling intention among households in Lithuania. According to model 2 informational provision improves the predictive potential of elements of the theory of planned behaviour.

4. Results

Members of 391 households participated in the study. Socio-demographic variables of the research participants represent the greater female participation in the research (Table 2).

Table 2. Socio-demographic characteristics of participants.

Measures		Frequency	Percent
Gender	Male	94	24.04
	Female	294	75.19
	Other	3	0.77
Age in years	Under 20	118	30.18
	21–30	103	26.34
	31–40	90	23.02
	41–50	54	13.81
	51–60	18	4.60
	61–70	7	1.79
	71 or above	1	0.26
Place of residence	Town	305	78.01
	Small town	24	6.14
	Out of town	26	6.65
	Rural area	26	6.65
Education level	Primary education	13	3.32
	Secondary education	144	36.83
	Professional education	12	3.07
	University education	222	56.78
Social status	Pupil	1	0.26
	Student	185	47.31
	Employed	233	59.59
	Unemployed	36	9.21
	Pensioner	3	0.77
	Business owner	3	0.77
	Other	6	1.53
Family status	Single	137	35.04
	Single mother/father with a child(-s)	19	4.86
	A couple without children	132	33.76
	A couple with children	103	26.34

The socio-demographic composition of the sample shows that majority of respondents were women (75.19%). The mean age of the respondents was 30.85 years (SD = 12.05). The sample represented almost 80% of participants living in towns. The sample was highly educated since 56.78% of respondents completed higher education. Most participants were employed at the moment of the research.

Average scores and standard deviations for the items of the study variables are provided in Table 3.

Table 3. Descriptive statistics for each item.

Variables	Items	Min	Max	M	SD
Attitude toward behaviour	ATB1	0	5	4.15	1.13
	ATB2	0	5	3.92	1.25
	ATB3	0	5	4.29	1.07
	ATB4	0	5	4.15	1.20
	ATB5	0	5	3.85	1.36
	ATB6	0	5	4.16	1.15
	ATB7	0	5	3.98	1.24
	ATB8	0	5	4.11	1.22
	ATB9	0	5	2.26	1.52
Subjective norm	SN1	0	5	2.86	1.57
	SN2	0	5	3.49	1.40
	SN3	0	5	2.65	1.51
Perceived behavioural control	PBC1	0	5	2.68	1.60
	PBC2	1	5	2.97	1.29
	PBC3	1	5	2.91	1.16
	PBC4	1	5	3.35	1.03
	PBC5	1	5	3.37	1.02
	PBC6	1	5	3.41	1.00
	PBC7	1	5	3.50	1.03
	PBC8	1	5	3.32	0.99
Behavioural intentions	BI1	1	5	3.36	1.08
	BI2	1	5	3.45	1.03
	BI3	1	5	3.26	1.19
Informational provision	IP1	1	5	2.61	1.21
	IP2	1	5	2.84	1.10

The correlations between variables are reported in Table 4. Pearson correlation coefficients for the variables ranged from 0.231 to 0.601. The highest coefficient was obtained for the correlation between perceived behavioural control and informational provision.

Table 4. Bivariate relationships between variables.

Variables	1	2	3	4	5
1. Attitude toward behaviour	1				
2. Subjective norm	0.459 **	1			
3. Perceived behavioural control	0.260 **	0.392 **	1		
4. Textile recycling intention	0.399 **	0.442 **	0.588 **	1	
5. Informational provision	0.231 **	0.358 **	0.601 **	0.459 **	1

**— $p < 0.01$.

The distributions of variables of attitude toward behaviour, subjective norm and behavioural intentions were negatively skewed. Skewness values of perceived behavioural control and informational provision were higher than 0. Kurtosis values were not equal to

0 as well, thus the bootstrapping method was applied to estimate the path model because this method is not dependent upon the normality assumption.

The theory of planned behaviour was tested using a structural equation model. We started by fitting Model 1. The path diagram illustrates the association between research variables with standardized path coefficients (Figure 3).

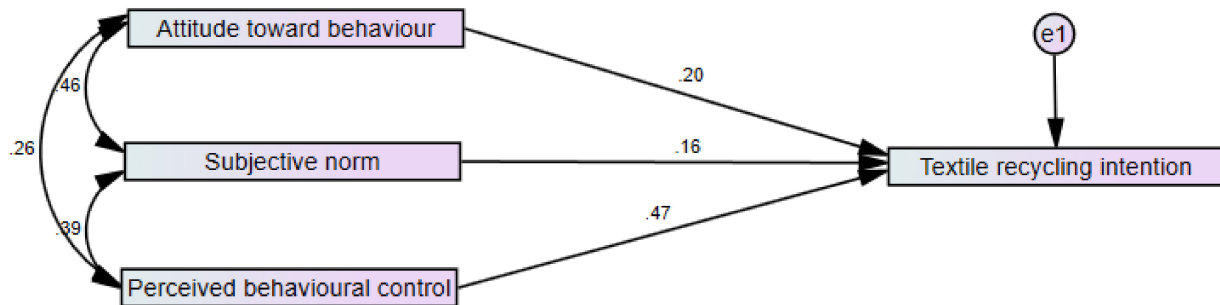


Figure 3. Results of the path analysis (Model 1).

Model 1 depicts the standard model of the theory of planned behaviour. This model explains 43.0% of the variance of textile recycling intention. Every predictor was found to be significant in explaining textile recycling intention ($p < 0.01$).

Model 2 (Figure 4) tests the extended theory of planned behaviour framework with the addition of informational provision. All of the direct paths are statistically significant ($p < 0.01$) except the direct path from informational provision to textile recycling intention ($p = 0.019$). Results of the research demonstrate that informational provision could be treated as significant for the explanation of textile recycling intention if the critical significance level was 0.05.

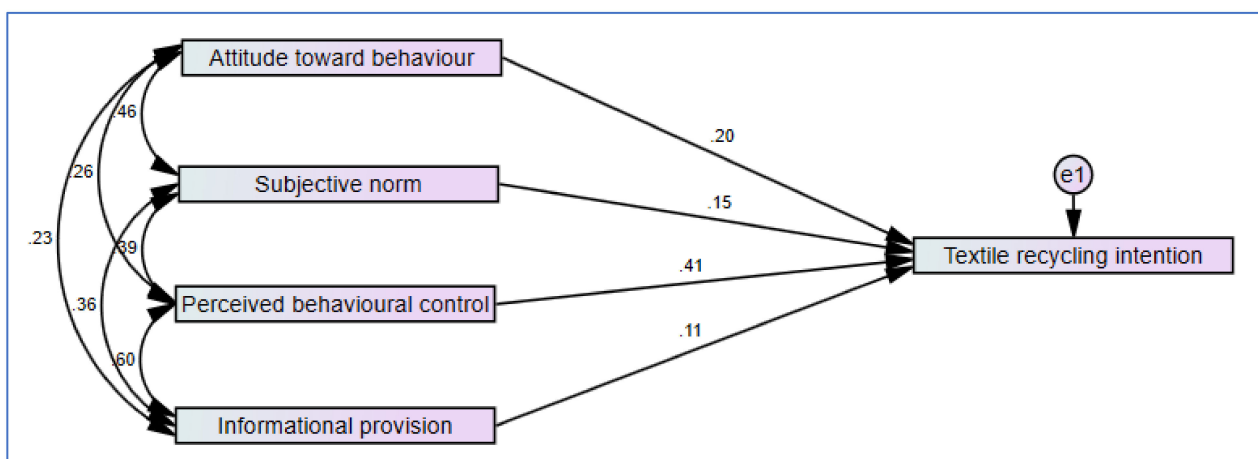


Figure 4. Results of the path analysis (Model 2).

Predictors in the model explained 43.82% of the variance in textile recycling intention. Even though Model 2 explained a slightly larger share of variance (compared to 43.0% in the case of Model 1), the effect of the informational provision was not significant. Therefore, the inclusion of information provision as a separate construct into the theory of planned behaviour in the case of textile recycling had to be rejected (at 0.01 as the critical significance level).

5. Discussion

Theory of planned behaviour is a helpful instrument to understand the determinants of consumers' food-management behaviour [35], green purchase behaviour [50],

farmers' intentions to use pesticides [38], sustainable usage of bike-sharing [41], recycling behaviour [32,40,47,51] or other pro-environmental behaviour [39,52]. This study tested the standard and expanded versions of the theory of planned behaviour. The theory of planned behaviour was proved to be a sound theoretical framework to explain the determinants of textile recycling in Lithuanian households. Overall, the majority of components of the model had a large effect on textile recycling intention. The independent variables explained 43% of the variance in textile recycling intention.

It was found out that all the standard variables used in the research predict textile recycling intention. Attitude toward behaviour, subjective norm and perceived behavioural control significantly predict textile recycling intention. These findings support previous findings of recycling behaviour at university campuses [32,53]. Textile recycling promoters should apply the findings of the study when promoting textile recycling in Lithuanian households.

Perceived behavioural control was the strongest predictor of textile recycling behaviour. Other variables demonstrated a significant, yet smaller impact. Such a finding is in line with the results of the research on recycling behaviour at university campuses in Turkey [32]. Regarding this finding, promoters should emphasize the easiness of textile recycling.

In this study attitude toward behaviour was the second most important predictor of textile recycling in Lithuanian households. In Oztekin et al. [32], Kumar [40], Poškus [53] researches attitudes have also significantly predicted waste recycling intention, but to a lower degree if compared to this study.

Although attitude toward behaviour, subjective norm and perceived behavioural control were significant predictors, informational provision was not. This finding was surprising as the relevance of information is supported by previous researches [35,43,44]. It is possible that general norms of recycling do not adequately persist in textile recycling. One more explanation of the insignificant impact of information provision on textile recycling behaviour (at 0.01 as the critical significance level) is related to the interaction between information and other factors. For example, information might form the attitude toward behaviour. Apart from this, there exists a possibility that socio-demographic characteristics might explain the irrelevance of informational provision. Future researches could be concentrated on these insights.

Although the conducted research is comprehensive, limitations do exist. Firstly, we have chosen a convenience sample of household representatives to invite to participate in the research. It is a relevant limitation because such a choice of a sample tempers generalizations from the findings of this research. Secondly, it is worth mentioning that the textile waste collection service in Lithuania does not cover the entire area. Therefore, it is possible that some households that were included in the research lack a convenient reach of the place where they could dispose of textile waste. Presumably, such a lack could have a considerable impact on intentions to recycle or not to recycle. In order to overcome this limitation a more detailed analysis based on external textile waste conditions would be expedient in the future. The span of current research has not covered specific issues of textile recycling, their efficiency, and has not analyzed which segments of the textile industry perform well in the field of textile recycling. Such studies undoubtedly would be useful in the future seeking to stimulate the share of recycled textiles.

Finally, the analysis of the results of the research has not considered possible variations due to socio-demographic profiles of respondents, while previous researches [32,40,47] have highlighted the differences in recycling behaviour among populations of different socio-demographic characteristics. The collected data demonstrate a potential for such kinds of measurements. Therefore, the explanation of textile recycling behaviour based on socio-demographic characteristics becomes an important direction for the follow-up analysis.

Results of the research are useful for the preparation of a marketing communication campaign intended to stimulate textile recycling behaviour. Such a campaign should focus on perceived behavioural control which was identified as the strongest predictor of

textile recycling behaviour. The authors of this paper presume that an efficient marketing communication campaign has the potential to reduce the negative environmental impact occurring from the production of new textiles.

6. Conclusions

In this research textile recycling behaviour was discussed and presented. Using findings from the literature and research participants' views it was argued that the theory of planned behaviour is a reasonable concept that explains the phenomenon of textile recycling.

The study is a start filling the research gap while applying the theory of planned behaviour on textile recycling intention among households in Lithuania. According to this study, the major driver for textile recycling in Lithuanian households perceived behavioural control. The findings of the study confirm that the minor driver for textile recycling in Lithuania is a subjective norm.

The empirical results revealed that the role of informational provision should not be overemphasized. Thus, such kind of provision is a prerequisite for ensuring the obligation for EU member states to collect textile household waste separately by 2025. With the relevance to the significance of perceived behavioural control in explaining textile recycling behaviour, it is expected that textile waste management policy in Lithuania shall align towards the development of textile recycling schemes based on a thorough understanding of householders' positions regarding textile waste recycling intentions.

Author Contributions: Conceptualization, N.V.-V. and L.J.-U.; methodology, N.V.-V. and L.J.-U.; software, N.V.-V.; validation, N.V.-V.; formal analysis, N.V.-V.; investigation, L.J.-U.; resources, N.V.-V. and L.J.-U.; data curation, L.J.-U.; writing—original draft preparation, N.V.-V.; writing—review and editing, L.J.-U.; visualization, N.V.-V. and L.J.-U.; supervision, L.J.-U.; project administration, L.J.-U.; funding acquisition, N.V.-V. and L.J.-U. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Acknowledgments: The authors express their sincere gratitude to the residents of Lithuania who were involved in the research for their cooperation. The authors thank anonymous referees for their insightful comments.

Conflicts of Interest: The authors declare no conflict of interest.

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