Attitudes towards Managing Post-Industrial Apparel Cuttings

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ABSTRACT

By its origin textile waste can be divided in two broad categories: post-consumer waste, and post-industrial waste generated during the manufacturing process. The division of the clothing supply chain between developed consumer markets and developing countries where apparel production capacities are outsourced implies that post-consumer waste is present in the former countries, whereas the later generate more post-industrial waste. The purpose of this exploratory study was to determine how the attitudes of top management towards managing apparel cuttings waste influence their willingness to introduce apparel waste sorting. The proclivity to sort apparel cuttings was strongly influenced by two key factors – the ease and costs of introducing sorting operations and impediments to sorting such as lack of workforce, technology or market. Combined these two factors lead towards negative attitudes to introducing apparel sorting. Perception of impediments in the process of sorting leads towards negative attitudes regarding the ease of introducing sorting operations, however it does not influence adversely the proclivity to sort.

Keywords: textile waste management, apparel cutting waste

INTRODUCTION

According to the 2011 FAO/ICAC survey issued by the United Nations, the world fiber consumption, and therefore the consumption of final product made of fibers, e.g. clothing, home textiles or industrial textiles, has grown nearly 30 times since the 1950s. The growing consumption of textile products is an indicator of the growing amount of textile waste generated in the world today. As textiles present a nonhazardous solid waste, their recycling is often sidelined, rendering land fields as the preferred manner of textile waste removal (Sakthivel, Ramachandran et al., 2012).

By its origin textile waste can be divided in two broad categories. On one hand, there is the post-consumer or household waste, while on the other the so called post-industrial waste generated during the manufacturing process. The division of the clothing supply chain between developed consumer markets and developing countries where apparel production capacities are outsourced, implies that household waste is present in the former countries, whereas the later generate more post-industrial waste. On the producer side of the supply chain, particularly amongst apparel producers, recycling post-industrial waste is not common (Tomovska and Zafirova, 2010, Kazakevičiūtė, Ramanauskien et al., 2008). Although numerous researchers have written on the subject of textile waste, academic research on the specific problem of apparel waste management is sparse. Most researchers have begun by categorizing the type of waste generated by a

local industry and reviewing the current recycling practices (Tomovska and Zafirova, 2010, Kazakevičiūtė, Ramanauskien et al., 2008, Larney and Aardt, 2010). Further on, some have researched the challenges posed to the introduction of recycling by apparel manufacturers (Larney and Aardt, 2010, Grasso, 1996). However, none of the studies has looked into internal barriers such as managerial attitudes towards recycling.

The primary contribution of apparel manufacturers in the recycling process lays in sorting, rather than disposing of unsorted apparel cutting waste, so that the waste would become re-usable. The first step is their willingness to prepare the apparel cutting waste in a suitable form for further treatment. Besides the actual sorting, the process also includes packing and transport of the waste. The purpose of this exploratory study was to determine how the attitudes of top management towards managing apparel cuttings waste influence their willingness to introduce apparel waste sorting.

MATERIALS AND METHODS

To measure the attitudinal variables a questionnaire was prepared and distributed to the top management 120 apparel manufacturers in Macedonia, during September 2012. From the distributed questionnaires, 78 fully completed questionnaires were used in the analysis. The questionnaire contained a total of 22 statements aimed to measure attitudinal variables. Attitudes towards the willingness to sort apparel cuttings, perceived ease of introducing sorting and perceived usefulness were measured as a binary variable (1-no/disagree, 2-yes/agree). Depending on the end use of the cuttings sorting by color, fiber composition or fabric type may be required. Therefore, attitudes regarding the ease and cost-effectiveness of sorting apparel cuttings by these methods were measured. Similarly, attitudes towards the ease and cost-effectiveness of three common packing methods (plastic bags, boxes and bales) were measured. The transport of waste, determined by the location and available transport options, also has an influence on the overall collecting efficiency and cost. Variables connected to transport were the ease and cost-effectiveness of organizing transport and the convenience of the factory location for picking up the waste. Profitability was measured through expected profits and expected market. In addition, availability of workforce and attitudes towards preserving the environment were introduced as variables which would influence all stages. All of the listed variables were measured on a four point scale ranging from 1-strongly disagree to 4-strongly agree. An even number of categories in the rating scale were used in order to force the respondents to formulate an opinion. A pilot test was conducted to ensure the clarity of the questionnaire, and respondents were notified of the end use of obtained data.

RESULTS AND DISCUSSION

A two-step process was used to analyses the results. Firstly, a principal component factor analysis was used to reduce the 22 statements related to recycling apparel cuttings into a smaller set of influencing variables. Afterwards, a cluster analysis was used to obtain the attitudinal differences among managers.

A principal component factor analysis, with varimax rotation, yielded six factors that contributed to 68.52% of the total variance, with eigenvalues greater than 1. To further test reliability Cronbach's alpha was calculated for the factors. Five of the six factors had reliability measures above 0.60. The first factor, labeled

Introducing sorting operations (eigenvalue 3.664, variance 16.65, α 0.854) related to the ease and cost of introduction of apparel waste sorting by color, fiber content and type of material. The second factor, Sorting facilitation (eigenvalue 3.008, variance 13.67, α 0.802), combined existing waste management practices that may be transferred when introducing sorting, such as the introduction and cost of packing apparel waste in plastic bags or boxes and waste disposal costs. In contrast the third factor, Recycling impediments (eigenvalue 2.856, variance 12.98, α 0.817), related to the ease and cost of introducing baling of apparel waste, the workforce availability and the market for apparel cuttings. The fourth factor, Auxiliary activities (eigenvalue 2.404, variance 10.92, α 0.613), included the ease of transport (waste disposal organization and factory location), as well as environmental concerns. The fifth factor, Proclivity to sort apparel cuttings (eigenvalue 1.731, variance 7.87, α 0.686) included the willingness to sort apparel cuttings and the perceived ease of sorting. The sixth factor, named Profit (eigenvalue 1.434, variance 6.52), linked the perceived usefulness of sorting to the profit expected from introducing this operation. This factor had a relatively low alpha score of 0.45 as compared to the other five factors.

Table 1 Results of the discriminant analysis

Discriminant function	Variance (%)	Canonical correlation	Wilks' Lambda	χ^2 (p)	Hit rate (%)
1	60.0	0.893	0.040	231.202(0.00)	93.6
2	28.8	0.809	0.199	116.187(0.00)	
3	11.2	0.652	0.576	39.777(0.00)	

A hierarchical cluster analysis was performed to reveal groups with distinct attitudes toward sorting apparel waste. By examining the cluster agglomeration a four cluster solution was obtained. To confirm the four clusters solution a discriminant analysis was used (Table 1), which obtained a hit-rate of 93.6%. The graphic representation of the four clusters based on the first two discriminant functions is given in Figure 1.

Cluster 1 contained 19.23% of the examined population (n=15), cluster 2 25.64% (n=25), cluster 3 7.69% (n=7) and cluster 4 47.44% (n=37). Cluster 1 consisted of managers with the highest proclivity to introduce apparel sorting operations, as 93.6% were willing to introduce apparel sorting, 86.7% considered it easy and all deemed sorting apparel cuttings as profitable. Members of this cluster exhibited positive attitudes towards sorting facilitation (average 2.73) and auxiliary activities (average 3.24) and did not view sorting impediments (average 2.57). However, they had concerns with the in situ sorting within their production facilities (average 1.78), particularly with sorting cuttings by fiber content. Although classifying fabric cuttings made of single fiber is straightforward, obtained fabrics come in mixed fiber content, often with diverse ratio of fibers, making classification a complex issue. The second cluster consisted of managers who were willing to introduce apparel sorting (85.0%) and considered it profitable (100%), yet only half of the members of this cluster considered apparel sorting to be easy. Although they had positive attitudes towards introducing sorting operations (average 2.53), sorting facilitation (average 3.05) and auxiliary activities (average 3.48), the impediments of apparel sorting, such as lack of workforce and market, as well as

introduction of baling technology for sorting, were strongly felt by members of this cluster (average 1.79). The third and smallest cluster consisted of managers with strong negative attitudes towards sorting apparel waste. All of them considered sorting apparel cuttings to be difficult and not profitable. Negative attitudes were seen towards practices that should be introduced, such as sorting operations (average 1.33) and impediments (average 1.28), in addition to ongoing practices such as sorting facilitation (average 1.63) and auxiliary activities (average 1.67). The fourth cluster also included managers unwilling to introduce sorting, even though 73% thought it might be profitable. Although members of this cluster had positive attitudes towards the current waste disposal practices (sorting facilitation, average 3.24, and auxiliary activities, average 2.48) they were strongly aware of existing impediments (average 1.86) and difficulties of introducing sorting (average 1.86).

A comparison of clusters 1 and 2, comprising of managers with positive attitudes towards recycling, to clusters 3 and 4, highlights the limiting factors to introducing apparel sorting. The later showed negative attitudes towards the introduction of sorting operations and were strongly aware of existing impediments. Combined these two factors have an adverse influence on the proclivity to sort apparel cuttings. Even though the perception of impediments in the process of sorting, seen in Cluster 2, lead towards negative attitudes regarding the ease of introducing sorting operations, it did not influence the overall proclivity to sort.

CONCLUSION

This study aimed to analyze managerial attitudes as an internal barrier posed to textile waste recycling. The proclivity to sort apparel cuttings was strongly influenced by two key factors – the ease and costs of introducing sorting operations and impediments to sorting such as lack of workforce, technology or market. Combined these two factors lead towards negative attitudes to introducing apparel sorting. Perception of impediments in the process of sorting leads towards negative attitudes regarding the ease of introducing sorting operations, however it does not influence adversely the proclivity to sort.

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