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SUSTAINABILITY OF UPCYCLING: STUDENT ACCEPTANCE IN UUM

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ABSTRACT

This paper identified factors of student acceptance in the sustainability of upcycling as well as analyzed student acceptance level in the sustainability of upcycling among students of a residential college in Universiti Utara Malaysia (INASIS Grantt). Using student survey-based method in a quantitative approach, this study distributed a set of questionnaires to gather primary data from targeted respondents. A total of 200 respondents were randomly distributed. Printed-out questionnaires were handed out, accompanied by an upcycled product that was built as a real-life product. Data were also collected through completed questionnaires through the use of the Internet. The items in the questionnaire were based on the sustainability of upcycling. The data were analyzed using Statistical Package for Social Science (SPSS) version 24. The results of the analysis showed a significant correlation between environmental, economic, and social with student acceptance. It was concluded that INASIS Grantt students accepted upcycling can be a new method on campus to create sustainable products that has the potential of reducing pollution while generating side income. An additional benefit includes reducing waste material at the landfill, when the student can use any recycled item to make some innovation that surely will give a lot of benefit and profit to those who want to make money.

Keywords: Sustainability, upcycling, student acceptance, entrepreneurship

INTRODUCTION

When it comes to social innovation, the notion of sustainability must be conceptualized in new ways to become meaningful. Sustainability is the concept of a contest without universal definition and tends to experience too narrow focus on economic-centered benefits (Banerjee, 2011). Here, Banerjee (2011) defined the three integrated sustainability dimensions: economic, social, and environmental. What makes upcycling different from other social innovations is the transformation of the transformation process. Upcycled products and processes are not only better than the original, but they too combine "aging" components to produce innovative "young" products, thus coining new age phrases like "spending with trash", "little attractive" and "start local, but thinking globally" (Earley, 2011).

As a result, upcycling is both about addressing the issues related to re-evaluating the past and paving the way for the future. In Malaysia, there are several companies that manage the disposal of tires into a new item. One of the companies is ZHA Alam Sekitar Sendirian Berhad, which recycles the tire into a high-value rubber powder. In the Borneo Post Press (2015), it was reported that the ZHA facility utilises the most viable amnion mechanical reduction technology that is proven to recycle used tires into rubber powder. The effort to cultivate recycling practices among Malaysians is still low. The proof is that, the recent findings of the Solid Waste Management and Public Cleansing Corporation (PPSPPA) found that the percentage of people in the country have the understanding and awareness of recycling is still at an unnoticeable level of only 17.5% (The Star Online, 2017). Based on this small percentage, it clearly illustrates that the level of understanding regarding recycling and upcycling practices among the people in the country is still a long way from the actual goal of the upcycling programme being introduced.

In this study, the focus was on upcycling waste tires, as opposed to other upcycled products, like fabric, plastic bottle, car parts, etc. An example used in this study was when the waste tire has been upgraded to become a chair. This product was built by using all waste materials, with the waste tire becoming the main material. The problem of wasted tires and used rubber is often associated with adverse effects on the environment. Nevertheless, waste tire and rubber tires are being used more and more, and this is becoming a global issue of great concern. Said Azemi Samsuri in Utusan Online (2003), in the United States alone, the total tire loss is 266 million annually and the European Union countries report almost 340 million or two million tonnes a year. According to him, the scenario in Malaysia based on Sin Siew Weng's report in 1990 found that about 14 million (70,000 tonnes) tires were wasted each year. Environmental adverse effects due to poor waste management are summed up by passage written by Kheiza (2013), saying that the residents of Taman Seremban, were upset by the presence of a number of lorry tires near a privately owned public square near their residence. Residents claimed that various problems had arisen since all the tires were placed in the area about three months ago by a local company.

Lack of consistency and true information about tire management waste is one of the obstacles to understanding the current situation and these issues are critical factors in the development of effective new policies. However, this scenario can be overcome through the upcycling of waste material into reusable products. The scope of this study was reduced to students staying at a residential college in Universiti Utara Malaysia (UUM), called INASIS Grantt (INASIS is a combination of two Malay words, namely "*inapan siswa*", which means student accommodation, and Grantt is taken from a corporate name, namely UMW Grantt

International Sendirian Berhad), so as to observe the attitude and worldview of potential contributors to the workforce. Therefore, the objectives of this study were:

1. to identify factors of student acceptance in sustainability of upcycling,
2. to analyse student acceptance in sustainability of upcycling among INASIS Grantt students, and
3. to recommend improvement initiatives for increasing upcycling awareness, among INASIS Grantt students.

This study was expected to provide all information obtained for use by the INASIS Grantt management or all Universiti Utara Malaysia personnel to improve or reduce the rate of solid waste disposal. This can be done by improving upcycling practices thus reducing pollution and greenhouse effects. In addition, this study could also be useful to the Student Affairs Department to be used as a guideline for providing more environmentally friendly areas through the use and adoption of upcycled products and related activities. The findings of this study were expected to have a positive impact on the acceptance and improvement of waste recycling practices for the future. In addition, the results of this study can also be referenced by the management of all INASIS, UUM Student Affairs Department, the community, tire dealers, or the Ministry of Environment to implement measures in implementing upcycling practices and reducing solid waste disposal, or any matter connected therewith. This helps indirectly to reduce environmental pollution. The next section reviews the past conceptual and empirical studies related to upcycling, which form the basis of the development of research framework and hypothesis in this study. This is followed by the discussion of research method and analysis technique. Finally, the paper further discusses and concludes the major findings derived from the analysis in this study.

LITERATURE REVIEW

Upcycle

Braungart and McDonough (2002, pp.109-110) stated that upcycling is “a technical essential nutrient of a product or material which is created to go back into the technical cycle and into the industrial metabolism from which it came from”. Pilz, who coined the phrase “upcycling” in 1994 (Kay, 1994), claimed that to consider anything as going through upcycling is maintaining its original form as much as possible and adding more value, while Braungart and McDonough (2002) perceived upcycling as the process that maintains or upgrades quality, value, and materials in their second life and beyond in a closed-loop industrial cycle. The goal of the upcycle is a delightfully diverse, safe, healthy, and just world by enjoyed with the clear power, air, water soil as well as safe and healthy (Braungart & McDonough, 2002).

Richardson (2011) expressed his concern about level of solid waste in households to be increasing in Australia and the design of industry’s complicity was creating this waste so much. This research claimed that “design-for-reuse” must to be considered as an integral part of industrial design practice to enable a reaction to developing product waste concerns. Customer acceptance in upcycling can be seen with the factors that affect the user themselves. If the upcycle is seen to the added quality of product, it will affect the user to accept the upcycle concept. Many of previous research had established that economic product is an important factor that influences user acceptance. However, the research about

understanding how that perception forms and changes over the time has rarely been done. Myers (2014) reviewed about how the female customer aged between 25 and 65 accept upcycled second-hand clothes. The finding showed that women accept the upcycling in fashion and fashion related products.

Sustainability of Upcycling

Elkington (1997) defined sustainability as the expansion of the corporate which considers environmental, social, and economic aspects. These three aspects are important to measure sustainability. Environmental sustainability is the ability to maintain as well as protects rates of pollution creation, renewable resource harvest, and minimises non-renewable resource that can be continued for a whole time. Upcycling, either as improved material recycling or product-level upcycling, generally provides an alternative to reduce environmental impact (Emgin 2012; Park & Kim, 2014; Santulli & Langella, 2013) or contribute to a higher value of environmental or performance of products (Ali, Khairuddin, & Zainal Abidin, 2013). Product-level upcycling also removes the demand for a new product (Szaky 2014), which means reducing the use of raw materials (material efficiency) and industrial energy for production, as well as reducing greenhouse gas emissions.

Recycling of waste tires is a business or production process which is sustainability. It is crucial that a balance between economic, environment, and social aspects. From an environmental perspective, the use of waste for its original purpose is the most special method. Also, upcycling can contribute toward economic sustainability, which helps in minimising cost in production or in material production. Gomez (2014) stated upcycling is suitable for student projects because it is easy and economical way to get the materials. The economic benefit is not limited to cost savings but also includes new profit opportunities by, for example, increasing the aesthetic values of existing products, giving uniqueness to the design, improving material quality or value (e.g. reinforcement), and providing other added value to materials or products (Ali et al., 2013; Santulli & Langella, 2013).

When upcycling the household, it can be as economically beneficial for consumers by fulfilling demands with spend the little cost and having a potential income opportunity. Lastly is about the social sustainability, Szaky (2014) suggested that converting waste and used objects into higher value or quality objects has existed as an individual behaviour for thousands of years. Szaky explained that reuse and upcycling were existed around the world before the Industrial Revolution, and currently this is the common thing, especially in developing countries because resources are limited. Bramston and Maycroft (2013) recommend that customer upcycling offers a chance to create natural comprehension of items, blend trains, societies and encounters, and make subjective and singular excellence while keeping the sentimental value of a used product.

Other social benefits also related to psychological wellbeing include experience benefits which is enjoyed the upcycling process and gain an experiences. Other than that, it helps to be more potential, capable and self-reliant. Based on the above discussions, this study was aimed at measuring the extent of students' acceptance of the new concept of upcycling.

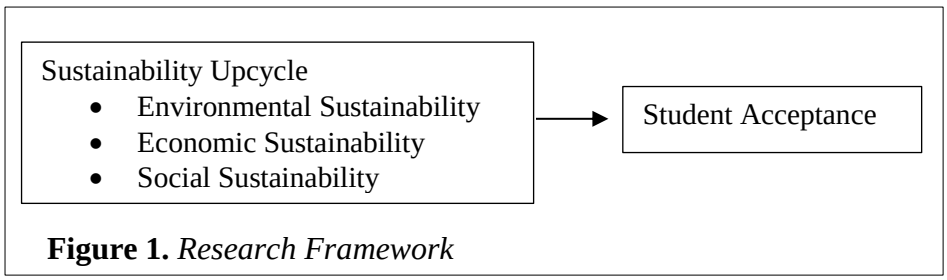

Figure 1. *Research Framework*

This assessment focused on the upcycling as a measuring tool in the study to determine the acceptance of the students, as displayed in Figure 1 and clearly stated in the following hypotheses. Deriving from the proposed research framework, the following hypotheses were developed:

H1 : Sustainability of upcycling has a positive and significant effect on student acceptance.
H1(a) : Environmental sustainability has a positive and significant effect on student acceptance.
H1(b) : Economic sustainability has a positive and significant effect on student acceptance.
H1(c) : Social sustainability has a positive and significant effect on student acceptance.

RESEARCH METHODOLOGY

Population and Sampling

The population of this study covered a population of 945 students in INASIS Grantt. The selected sample was 200 students only. Respondent selection was made randomly. A questionnaire distributed to all respondents consists of five main sections, sections A, B, C, D, and E. Part A contains questions that collects demographic data as well as basic information and sample study information, such as gender, race, qualification, semester and GPA. Part B includes questions related to student acceptance on sustainability of upcycling. Lastly, Part C, D, and E are questions related to the sustainability that consists of three factors, which are environmental, economic, and social dimensions.

Data Collection

For this study, primary data were collected from the targeted respondents who are INASIS Grantt students. This includes all information and feedback obtained regarding the sustainability upcycling based on the questions contained in the questionnaire form. The questionnaire was given manually to 100 students and they were shown the upcycling product that was built by the researcher. Meanwhile, the rest of questionnaires were distributed via online by showing them pictures of the upcycling product. The questionnaire was constructed based on previous studies and was tested with t-test. Therefore, previous studies that have been taken as a guide to construct questionnaires, which Sung, Cooper, Ramanathan, & Singh (2017), Sung, Cooper, & Kettley (2017), Nyaguthii (2003), Kathomi (2013), and Myers (2014).

The method used in measuring the scale was the Likert-like scale. In this study, a five-point scale was used to represent strongly disagree, disagree, not sure/neutral, agree, and strongly agree. The questionnaire was distributed randomly to 200 graduates INASIS Grantt students, consisting of various racial groups using the cluster method. In order to obtain stable data, data from different genders with different races have been captured.

Table 1.
INASIS Grantt Students

Race	Male	Female
Malay	115	484
Chinese	44	105
Indian	12	44
Others	70	71

Data Analysis Method

Data collected through the distribution of questionnaires were analysed using the IBM Statistical Package for Social Science version 24 software (SPSS 24). Descriptive analysis was done to accomplish the first research objective in this study relating to the factor of student acceptance in sustainability of upcycling. In order to test the proposed hypothesis, which is reflected the second objective, the Pearson correlation was adopted. To examine the causal relationship, this study used The Pearson correlation. The statistical type used in the study was frequency, percentage, mean, and standard deviation.

FINDING AND DISCUSSION

Descriptive Analysis

The number of respondents was 200 students who were taken randomly. Based on Table 2 below, the majority of the respondents were female, who were 103 (51.5%) of the total respondents, while males were only 97 (48.5%). For the race, the majority of respondents were Malay numbering 149 (74.5%) of the total respondents, the second highest was Chinese with 26 respondents (13%), the third highest was the Indian population of 17 (8.5%), and for other races were the lowest with 8 (4%) only. The finding showed that the highest number of qualification comes from STPM, which were 100 respondents (50%). The majority of respondents were from semester 7 which were 91 respondents (45.5%). The result also showed that the highest of GPA respondents were found in the range of 3.00-3.49, or 124 persons (62%) of the total respondents.

Table 2.

Respondent Demographic

Demographic	Type	Frequency	Percentage (%)
Gender	Male	97	48.5
	Female	103	51.5
Race	Malay	149	74.5
	Chinese	26	13
	Indian	17	8.5
	Others	8	4
Education	Matriculation	62	31
	STPM	100	50
	STAM	5	2.5
	Diploma	33	16.5
Semester	1	1	0.5
	2	5	2.5
	3	31	15.5
	4	14	7
	5	45	22.5
	6	13	6.5
	7	91	45.5
	8	0	0
GPA	2.00 – 2.49	2	1.0
	2.50 – 2.99	24	12
	3.00 – 3.49	124	62
	3.50 – 4.00	50	25

In order to answer objective 1, descriptive analysis was conducted. Based on Table 3 below, environmental was the highest factor of student acceptance in sustainability of upcycling, with mean 4.07. The standard deviation of 0.34 shows that student most likely to do upcycling to reduce environmental pollution.

Table 3.

Mean and Standard Deviation

	Environment	Economic	Social
	4.29	3.91	3.87
	4.24	4.24	3.92
	3.48	4.08	3.93
	4.27	3.84	4.08
	4.05	3.74	4.21
Number {N} =	5	5	5
Mean =	4.07	3.96	4.00
Standard Deviation=	0.34	0.20	0.14

Reliability Test

Cronbach Alpha test has been done in this study to verify the reliability of the steps. This test was conducted to ensure the suitability of respondents' answers to all items in size. According to Sekaran (2003), when the Cronbach Alpha value is less than 0.6 and approaches 0, the questionnaire is considered invalid and the reliability of the constructed item is low. On the other hand, if Cronbach Alpha score exceeds 0.6 and approaches 1.0, it can be considered the highest score and the items contained in the questionnaire is reliable. Based on Table 4 below shows the Cronbach Alpha value obtained for each variable in the questionnaire. All parts recorded values greater than 0.6. Therefore, the questionnaire is considered to be good and acceptable and can be used to obtain real data.

Table 4.

Cronbach Alpha

	Number of Item	Cronbach's Alpha
Student Acceptance	5	0.82
Environmental	5	0.68
Economic	5	0.75
Social	5	0.87

Pearson Correlation Analysis

Referring to Table 5, it shows that there is a significant positive relationship between sustainability of upcycling and student acceptance. A correlation values r = 0.706 it has medium strength relationship. Hence, the hypothesis H1 was accepted. In conclusion, this positive relationship between sustainability of upcycling and student acceptance can be first steps to bring upcycle to INASIS Grantt students.

Table 5.

Correlations result

		Upcycling	Student Acceptance
Upcycling	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	200	
Student Acceptance	Pearson Correlation	.706**	1
	Sig. (2-tailed)	.000	
	N	200	200

**. Correlation is significant at the 0.01 level (2-tailed).

Responding to the second objective of this study, correlation analysis was conducted to analyze student acceptance in sustainability of upcycling. The result is presented in Table 6. Based on this result, it shows that there has a significant impact in sustainability of upcycling. This is because each factor of sustainability of upcycling has positive. For the highest correlation goes to the environmental factor (r = 0.702). Followed by economic factor (r = 0.647) and social factor (r = 0.573). Since the correlation values (r) are 0.702 0.647 and 0.573, all factor have medium strength relationship, with environmental is stronger than others factor.

Table 6

Correlations Result

		Student Acceptance	Environmental	Economic	Social
Student Acceptance	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	200			
Environmental	Pearson Correlation	.702**	1		
	Sig. (2-tailed)	.000			
	N	200	200		
Economic	Pearson Correlation	.647**	.680**	1	
	Sig. (2-tailed)	.000	.000		
	N	200	200	200	
Social	Pearson Correlation	.573**	.675**	.791**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	200	200	200	200

**. Correlation is significant at the 0.01 level (2-tailed).

CONCLUSION AND RECOMMENDATION

In conclusion, sustainability of upcycling can be accepted by students in INASIS Grantt. The results of this study are directly able to provide answers to the questions studied. The relationship between dependent variables and independent variables which is expected can bring the new method to reduce environmental pollution, increase economic and social well-being. From the correlation analysis performed to test the hypothesis of the study to see the relationship between the sustainability of upcycling with student acceptance. The results showed a significant correlation between independents variable and dependent variable. Therefore, the findings this study identify the environmental aspect is the highest factor that influences student acceptance. Based on the finding, INASIS Grantt students accept upcycle as a new method on campus to create a sustainable product that can reduce pollution while generating side income. Furthermore, many students in INASIS Grantt accepted and were satisfied that the chair from waste tire that have been showed to them as an upcycling product. Upcycling should be done by everyone because it takes more than just one person in order to succeed. Besides that, upcycling gives an advantage to every person because it is a pollutant free and save as well.

INASIS Grantt students can be the first INASIS that implement upcycling in UUM. In order to make this happen, UUM should give support in many ways and collaborate with INASIS. Next, UUM should make a campaign to expand the idea to the public. UUM also should be educated by a person who is knowledgeable about the upcycle process and influence students to make upcycling as a routine in their life. This means that everyone can build upcycling products, and thus generate new and innovative ways of upcycling. In addition, the student can use any recycled item to make some innovation that surely will give a lot of benefit and profit to those who want to make money.

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