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DEVELOPMENT OF STAKEHOLDER ROLES IN SUPPORTING MATERIAL VALUE CONSERVATION OF PLASTIC PACKAGING USING BRAIN-WRITING AND INTERPRETIVE PROCESS

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ABSTRACT

According to the material-value-conservation paradigm, all material should not be considered to be marginal material, but rather to be valuable resource of which its value should be conserved. Degradation of material value may be prevented by designing for material value conservation that will support easier and faster processes for mechanical recycling; this will produce better quality of product and improve its financial viability. Therefore, it supports resource conservation schemes for plastic materials, reduces material waste, and also promotes a new method of environmental protection. A material value conservation implementation needs appropriate and strategic stakeholder roles in order to optimize the line of sight among stakeholders. Brain-writing and interpretive-process techniques of analysis were implemented in this research by interviewing competent resource persons representing every category of stakeholder (including government institutions, such as the regulator and law-enforcement agencies; plastic-packaging producers; plastic-packaging purchasers; plastic-waste collectors, and plastic recyclers), and then analyzing their responses to determine the appropriate strategic roles. Results of the two methods suggest a list of stakeholders with their strategic roles being to support the material-value-conservation aims in the context of quality and value of plastic-waste improvements, as well as increasing the quantity of waste accepted by plastic recyclers. Stakeholder roles provided valuable information and directions for implementing management of plastic materials and plastic packaging products, as well as its post-consumer materials as valuable waste. The new paradigm, which is supported by the appropriate roles of stakeholders will have a broader impact and provide more benefits through optimizing plastic-waste utilization, especially for regions with high density of people and high consumption rate of plastic packaging products.

Keywords: Brain-writing; Interpretive process; Material value conservation; Mechanical recycling; Plastic packaging; Stakeholder role

1. INTRODUCTION

Product packaging is the science, art, and technology of protecting products for the purposes of containment, protection, transportation, storage and information display (Lee & Lye, 2003). As a result of the extensive use of plastic by excessive-waste generation, especially plastic packaging, post-consumer plastic has caused serious environmental problems.

In 2010, China and Indonesia were most likely the top sources of plastic waste reaching the

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oceans with 8.8 and 3.2 million tons, respectively (Jambeck et al., 2015). Previous research on plastic recycling and its performance were more focused on decreasing the quantity of waste produced, and reducing its negative impact on environmental quality and community (Ross & Evans, 2003; Andrady, 2003; Grosse, 2010; Kristanto et al., 2015), and also encouraging public participation (Keramitsoglou&Tsagarakis, 2013). However, this research proposes a different paradigm: preventing generation of plastic waste by inhibiting material value degradation of plastic packaging after its end of life.

The problems caused by plastic waste were not only related to a single stakeholder but rather related to multiple stakeholders that affect various aspects (Groot et al., 2014), and this becomes worse as impact of plastic-packaging designs that only accommodate its functionalities, especially for information display, which reduces its value significantly as impact of coloring and printing. Plastic-packaging waste is suitable for mechanical recycling if it is not mixed with any other type of plastic and/or other material (Selke, 2006), is uncontaminated, (Goodship, 2007), and is dry (Manrich& Santos, 2006). Therefore, one of impacts of excessive use of color and ink was abundance of low-value plastic waste that was rejected by plastic recyclers. Nonetheless, implementation of material value conservation in plastic-packaging design will increase acceptance of plastic waste and it will gain more value through mechanical recycling.

This research adopts material-value-conservation paradigm, which is defined as an implementation of various approaches, design principles, processes or treatments of materials, and other efforts to minimize material value degradation, maximize its residual or salvage value, and therefore increase its utilization, lifecycle, and overall value (Gabriel, 2016). Design of plastic packaging to facilitate material value conservation in a mechanical-recycling context is just one of the implementations of the proposed paradigm; with the most important of material design criteria is purity of plastic material, which should not contain color pigment and printing ink and other contaminants. This is in opposition to the existing design paradigm, which is to design for functionality, especially for information display that uses excessive color and ink. Therefore, specific strategic roles of stakeholders need to be determined in order to conserve the value of plastic waste through implementation of the new paradigm. Identification of influential stakeholders and their strategic roles were analyzed and interpreted, using brain-writing method and an interpretive process. This research was conducted as a follow-up to the previous work on material value conservation (Gabriel, 2016), and supports the diversity of research because this theme has not been used as a main theme of research in Indonesia during the last five years (Surjandari, 2015).The objective of this research is to develop stakeholder roles to support plastic-packaging material value conservation in the context of mechanical recycling.

2. METHODOLOGY

A material value conservation scheme is not only conducted by a single actor on a single process, but performed on interrelated process chains with different roles of stakeholders. Therefore, this scheme should be supported by related stakeholders with different roles. In this context, stakeholder involvement becomes the first and most strategic step in the implementation of material value conservation. Limited number of works were discussed about stakeholder involvement, with previous research implemented in wildlife management (Chase, 2000; Chase,2002), and health services (Delnoij et al., 2010; MacLennan et al., 2015; Pollock et al., 2017). Appropriate stakeholder involvement also needs good relationship and multi-stakeholders network (Roloff, 2008; Myllykangas et al., 2010) with a well-designed stakeholder role to ensure the success of material value conservation practices. Unfortunately, works on stakeholder role development are currently limited to health services and nursing (Mills & Morris, 1986; Honan, 1988; Jones, 2005; Nicolson, 2005).

The first alternative method used in stakeholder role development is expert judgment (Mumpower& Stewart, 1996; Cooke &Goossens, 2004; Aligica&Herritt, 2009), which mainly depends on experts' capabilities and experience, and is not free of limitations or strong critics. Brainstorming by some experts with knowledge related to the topic was proposed by researchers to reduce the disadvantages of the expert judgment (Wilson, 2006; Nishimoto et al., 2006), but this still has some pitfalls. Wilson (2006) proposed brain-writing to reduce the dominance of certain people during brainstorming, but due to the varied experience and expertise of participants, brain-writing method is still problematic in term of depth of analysis and contextual relevance. The interpretive process proposed by Crist and Tanner (2003) eliminates the last pitfalls in brain-writing. Therefore, this research combined the two selected methods.

In this research, two phase of process were implemented with different methods used in stakeholder role development: brain-writing and interpretive processes. The first method identified the stakeholders who are related to the material-value-conservation practices in plastic-packaging design, production, consumption, after-end-of-life utilization, and management, as well as their activities within the new paradigm. Results of the first method were verified using interpretive-process method, which was supported by an in-depth analysis, evaluation with logic consideration, and more complete arguments. The two-stage method eliminated the weaknesses of the first method, and made the second method into a more effective and efficient process. Researchers with appropriate experience and deep knowledge in plastic recycling and material value conservation were engaged as facilitators and validators in the analysis for both processes.

2.1. Brain-writing Process

According to Okubo, et al. (2012), brain-writing participants do not need to care about their conversation skills, or their position and status in the group during the process. This method eliminated the disadvantage of brainstorming and the other method used (oral knowledge and idea sharing), when one or few persons dominated the forum, especially as a result of their having better conversation skills, or a high rank or individual status.

Brain-writing process was carried out with the following stages:

1. Preparing a preliminary identification of the activities that support the implementation of designing plastic packaging to facilitate material-value-conservation, the criteria for the design, the related processes, and the activities related to mechanical recycling, all of which was used as input for brain-writing sheet development.
2. Preparing a preliminary identification of the stakeholders related to the implementation of designing plastic packaging to facilitate material value conservation. This identification was based on maps of the supply chain, consumption process, and after-end-of-product-life handling, treatment, and management.
3. Preparing for the brain-writing among the representative stakeholders, by providing the research participants with the necessary preliminary list of activities that support the implementation of design for material value conservation in a context of mechanical recycling. The print out of this list was referred to as a brain-writing sheet.
4. The brain-writing process itself, which developed more-detailed activities than the preliminary identification, and which was prepared and led by brain-writing facilitators who support the implementation in general and the overall point of view, as well as the broad spectrum of purpose. Firstly, every member of interest group that represented the plastic-packaging stakeholders wrote a new idea based on the brain-writing sheet that was prepared before and then distributed among all participants. The thinking and writing-process was repeated based on other participants' ideas and passed around the group in an iterative circle.

Every participant of the brain-writing process worked separately, without any discussion or any interactive communication with other participants, and freely wrote their own ideas and suggestion using Tables 1 and 2 and the brain-writing sheet prepared by the facilitators.

Table 1 Brain-writing – List of stakeholders

Instruction	List of stakeholder	Consideration and explanation
Please write stakeholders that related to plastic packaging material value conservation.	1. 2. 3. Etc.	1. 2. 3. Etc.

Table 2 Brain-writing – Stakeholder list with roles

List of stakeholder	Stakeholder roles	Consideration and explanation
1.	1.1.	1.1.
	1.2.	1.2.
	1.3.	1.3.
	Etc.	Etc.
2.	2.1.	2.1.
	2.2.	2.2.
	2.3.	2.3.
	Etc.	Etc.
Etc.		

2.2. Interpretive Process

The second process was conducted based on the results of brain-writing and all of the stages lead by the research facilitators. If this process did not seem sufficient enough for a final interpretation, the brain-writing process was repeated based on the fulfillment of the research objectives. According to Crist and Tanner (2003), an interpretive process was carried out using the following five stages which provide further elaboration in the context of mechanical recycling of plastic waste.

1. ***Early focus and lines of inquiry for stakeholder roles***. Transcripts of the first narratives from brain-writing were discussed in the interpretive process lead by the research facilitators. The first phase include a critical evaluation of the brain-writing results. Any missing or unclear pieces were tagged and further exploration was conducted.
2. ***Central concerns, exemplars and paradigm cases for stakeholder roles***. This phase identified central concerns, and important themes or meanings of the stakeholder roles. Experience of the participants affecting their views and intentions, and shaping the current roles based on their experiences was considered to the interpretive process. Throughout the interpretive process, writing and rewriting developed the interpretation. The summaries provide a vehicle for assessment in the next step.
3. ***Shared meanings of stakeholder roles***. As participants' central concerns became clear, the observation of shared meanings could be completed. The written interpretive summary showed connections among the meanings found within and across stakeholder roles, or constitutive patterns among them. The development of the interpretation of the role focused on the summary.
4. ***Final interpretations of stakeholder roles***. Subsequent interpretive notes and summaries continued to provide lines of inquiry for the current narratives and future implementation.

In-depth interpretation of excerpts, summaries of central concerns, and interpretive summaries of stakeholder roles were developed.

5. ***Verification, validation and dissemination of the interpretation***. Interpretations of the manuscripts reporting were refined with input from the previous interpretive process. This phase of interpretation was an iterative process between the narratives, field notes, and interpretive-process input. The interpretation was developed simultaneously with participants' interviews, observations, and writing. Although interpretation is an unending process, the writers of the report should make a final interpretation. The interpretations of stakeholder roles were verified and validated by senior researchers for inclusion in the final documentation before being proposed as a strategic role of stakeholders in the implementation of design for material value conservation in a context of mechanical recycling.

2.3. Participants of Research

Five experts and professionals working in the field and related to plastic-packaging industry, waste management, and plastic recycling in Indonesia participated in this research as resource persons. They were consulted for the development of contextual roles and relationships among the stakeholder role using the aforementioned methodology. The experts were chosen based on their work, having professional experience of more than 10 years, as well as their willingness to participate in the research. All the experts were holding either top- or middle-management posts and were well versed in the subject of the research.

The experts and professionals who participated in this research were as follows:

1. An owner and chief executive officer (CEO) of a plastic-packaging producer working with virgin plastic as the raw material
2. An owner and CEO of a plastic packaging-producer with recycled plastic pellet the raw material
3. Head of a waste collector agency of a local government
4. An entrepreneur as a plastic-packaging purchaser and a household member
5. An owner and CEO of a plastic-waste recycler

Before conducting these processes, each participant had the method they would be using explained to them and this was facilitated by giving them a sheet on the topic that they were going to brain-write about, which was implemented anonymously in order to produce higher quality of ideas (Neupane et al., 2007).

Verification and validation work were carried out by senior researchers, not by the experts and professionals who contributed their insights and recommendations. Two experts, who each has more than 20 years' experience in research, consulting and teaching participated as facilitators and analysts who refined and validated the final results.

3. RESULTS AND DISCUSSION

The two-stage method generated two results: (1) a list of stakeholders in the implementation of design for material value conservation, and (2) stakeholders' strategic roles in conserving the value of material in plastic packaging, especially the value after the end of product's life.

3.1. List of Stakeholders

Brain-writing and interpretive process generated list of stakeholders in the following formation:

1. Legislator institutions
2. Government institutions, acting as a regulator or promoting agencies
3. Law-enforcement institutions
4. Plastic-packaging producers

5. Plastic-packaging purchasers
6. Waste-collector agencies
7. Households
8. Plastic recyclers
9. Civil-society institutions and non-governmental organizations
10. Business and community, as well as environmentalists

3.2. Strategic Roles of Stakeholders

Strategic roles of stakeholders vary depending on their own functions and interests related to the existence of materials and products, from virgin plastic and its lifecycles as plastic packaging to after the end of product's life. Functions and interests as regulators, law-enforcement institutions, plastic-packaging purchasers, plastic-packaging producers, interest groups, households, waste-collector agencies, government institutions, plastic recyclers as well as business, community, and environmentalists, which have both active and passive roles as recipients of benefits, were included in the description of stakeholder roles. Table 3 describe the list of stakeholders and their strategic roles.

3.3. Benefit of Implementing the Brain-writing Method

The list of stakeholders and their roles was not easy for the experts and researchers to identify or interpret because of many problems and obstacles that occurred in the process of analysis. The following discussion uncovered the problems and obstacles as well as the benefits of the two-stage of method implemented in this research.

In the brain-writing process, a free flow of ideas was an important aspect for creating a good result from the research. The flow of ideas needed to be accommodated in order to find out the most relevant ideas within the context of research's purpose, and all useless or impossible ideas had to be eliminated in this process. The remaining ideas were counted as feasible ideas. Flexibility of ideas resulted in a wide range of ideas and perspective from the participants' cognition; these were then were graded in this process through careful observation to find out the appropriate ideas. This approach also accommodated the original ideas generation without resistant conversation, which potentially emerged in face-to-face process.

3.4. Benefit of Implementing the InterpretiveProcessMethod

Within the traditional empirical or quantitative science domain, description serves as the crudest form of inquiry, and even its rules are dominated by the same fundamental assumptions. Therefore, a high-quality description would typically be decontextualized to the point that it is almost devoid of human subjectivity, which not always satisfy the requirements of a holistic, interpretive, and relational practice discipline. However, qualitative researchers were understandably reluctant to align themselves with the descriptive tradition of quantitative scientific methods. They believe that the most effective way to distance themselves from this tradition is to locate their science within the legitimized philosophical and methodological perspectives of other disciplines. Both limitations found in the brain-writing process were reduced by using the interpretive-process approach that was conducted after the end of brain-writing process.

Usually, people respond to external stimuli in a deterministic way, but from an interpretive perspective, people's actions are the results of how they make sense of a situation. The participant of this research, who are part of organizations or firms related to plastic-packaging material value conservation, think and act in the best interests of their own institution; but, in the interpretive approach, people were not only depending on their institutions, because their institution exists among many other institutions.

Table 3 Stakeholders and their strategicroles in materialvalueconservation

No.	Stakeholder	Strategic Roles
1	Legislators and government institutions acting as regulator	• Regulating design for material value conservation and its follow-up in the production and use of plastic packaging, and related activities after the end of packaging's life and its waste utilization.
2	Law-enforcement institutions	• Enforcing the law related to design of plastic-packaging to facilitated material value conservation and its implementation, as well as enforcing plastic waste utilization and management.
3	Plastic-packaging purchasers	• Accepting and using plastic packaging that has been designed to fulfill material value conservation specification. • Purchasing plastic packaging that has been designed to fulfill material value conservation specification and fulfill the related law.
4	Plastic-packaging producers	• Accepting and producing plastic packaging procurement that has been designed to fulfill material-value-conservation specification. • Labeling the plastic packaging with containment of information related to the purpose of material value conservation.
5	Civil-society institutions and non-governmental organizations	• Initiating, facilitating, and motivating households and communities on plastic-packaging waste collection and selling, with respect to the efforts related to material value conservation.
6	Households	• Having a willingness to protect plastic-packaging waste from further contamination. • Having a willingness to sort plastic-packaging waste, by types, from other waste before collection.
7	Waste-collector agencies	• Collecting all plastic waste in their service coverage area for all households and other areas targeted. • Using separate or different container, based on type of waste, particularly for plastic waste.
8	Government institutions acting as promoting agencies	• Supporting and accommodating research and development, and other activities for plastic material value conservation, as well as endorsing corporate social responsibility (CSR) programs in this purpose. • Endorsing and giving rewards to firms, institutions, and whoever has performed activities and achieved outcomes that support material value conservation significantly, as well as endorsing CSR programs in this purpose.
9	Plastic recyclers	• Improving production capacity and quality in line with the quantity of valuable plastic waste collected as result of the material value conservation practices.
10	Business, community and environmentalists	• Receiving more and better quality of recycled plastic products, which has a multiplier effect, and also reducing plastic waste and creating a better environment by material value conservation.

In other words, the success of multi-institutional goal, such as the implementation of material value conservation, should consider the needs of other institutions, as well as social and economic interests, and environmental restrictions. In the interpretive approach, the point of view of the participants are regarded as important for understanding social and economic affairs, as well as environmental restrictions. Therefore, this research needed an interpretive process to understand the material-value-conservation practices. The only method of brain-writing can become a barrier to the spread of material-value-conservation practices since this method allows the participants, who represented companies, policy-makers, and other actors, to narrow down their perceptions of the possible or appropriate activities to their own specific interest. The representatives who did not feel comfortable with a particular material-value-conservation practice may then choose not to engage in those practices if the practices do not make sense to them.

An interpretive view of the material value conservation implementation will allow a broader scope of activities for people in many related institutions. This point of view motivates them to adapt the material value conservation implementation to the specific needs and strategies of the institution in which they work, and makes them eager to make use of materials by following the appropriate principles. This applies not only to plastic-packaging producers and users, but also to other stakeholders such as legislators, the government, law-enforcement agencies, civil-society institutions, households, and non-governmental agencies.

4. CONCLUSION

This research has revealed the stakeholders related to the material-value-conservation practices for plastic packaging, and their roles in supporting the implementation of these practices in a context of mechanical recycling. These results suggest a new way of understanding who supports material-value-conservation practice, and how they support those practices, particularly in the design and implementation processes for plastic packaging. A brain-writing activity was conducted followed by a shift towards an interpretive understanding, which proposed a new set of activities that are recommended for the promotion of material value conservation in various institutions and in households, and in an inter-organizational context. With this plan of action, material-value-conservation practices will evolve beyond the present paradigms, which generates more and more plastic waste because they only supports the functionality of plastic packaging, especially its function to display information and to promote the purpose of its contents.

Stakeholders aiming to endorse material-value-conservation practices should thus consider alternatives to simply offering more refined tools and drafting more sector-wide recommendations on how to carry out material-value-conservation work. They might find that an exhibition of the various uses and practices for material value conservation may be a more efficient means of encouraging material-value-conservation research and its practices, not only for plastic packaging but also other uses of plastic materials, as well as for various other non-renewable materials, and even renewable materials such as paper, wood, cotton, and other crops and forestry products. The list of stakeholders and their roles generated from the brain-writing and interpretive-process seems sufficient and appropriate, but is not yet structured by this research. In order to optimize its implementation, it is recommended that the relationships among stakeholder roles are structured using interpretive structural modelling. Each stakeholder role's position in the structure among the other stakeholder roles, along with the direction of the inter-stakeholder relationships, will be very helpful for implementing material-value-conservation practices.

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