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Value Chain Analysis: The Insight of Aluminium Recycling

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ABSTRACT

Background: This paper proposes in implementing the model of value chain analysis made popular by porter 1985 to understand the process of value creation in the aluminium recycling industry. This is particularly important as aluminium is progressively replacing steel in many product from our household product until industry and construction. This paper discusses the past literatures on value chain analysis and recycling to find the research gap. Recycling rarely being identified as a profitable business but rather as an approach of saving the environment. Highlighting the value aspect into recycling will result in environmental awareness no longer seen as a good deed only but as a promising business that can't be ignored. The knowledge on the value creation from the recycling process value is expected can attract ventures and investment towards the recycling activity.

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INTRODUCTION

Since one century ago, aluminium has become the second most processed metal in the world after iron (Billy 2012). One of the primary aluminium production processes is the Bayer process based on the extraction of bauxite. Aluminium is then obtained from alumina through electrolysis, a highly energy intensive process (Schlesinger, 2013). Nevertheless, unique from other materials, aluminium presents the advantage to be recycled indefinitely without any loss of its physical properties. For this reason, it is estimated that 75 % of the total aluminium ever produced is still in use today, (Martchek 2006), and that the recycling of aluminium reduces emissions by over 90 % compared to primary production (Martchek 1997).

According to the report by UNEP (2010), the aluminium stock in the developed countries is in rise from the daily and industrial usage and in need to be recycled. This means for a developing country, it needs to prepare a good recycling approach to recycle aluminium. The issue of recycling had become a major issue in many developing countries in the world. It is facing greater challenges in order to keep all of the waste in proper management. Aluminium recycling is one of the major components of recycling. After years of the recycling campaign, a chain of recycle has developed.

Most of the recycling campaigns mainly deal with the environmental benefits of recycling regardless of the materials. Even in the recent research in recycling as by Bülent, (2013) which handles the issue of recycling by manufacturer, the emphasis is still on the environmental effects. There is nothing wrong with this good intention. But usually the value part of recycling in term of creation and monetary still lag. The creation of value and monetary perspective of recycling is important as we want to strive to the future and preserving the nature, often quoted as sustainability.

There are a few researches worth mentioning in either relation to recycling and value chain analysis or saving nature and value chain analysis like by Pan (2011), Claudine *et. al.* (2012) and Andrew *et. al.* (2012). The research by Pan (2011) tried to incorporate recycling into the value chain analysis of the manufacturing enterprise as a mean to increase the value of the manufactured product. It was not about the recycling value chain analysis itself. While Claudine *et. al.* (2012) and Andrew *et. al.* (2012) tried to highlight the importance of

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combining value chain analysis and some environment friendly features such as less gas emission, less used energy and a few others. According to them, it is important as a way to increase the competitive advantage and deliver higher value to the customer.

But then, these researchers deal with how to increase the value but not try to understand how the value is developed. Basically they either tried to incorporate recycling into the value chain analysis or highlighting the importance of saving the environment in the value chain analysis as a way to increase the value of the product. It is especially important to understand how recycling itself can increase value by saving the nature but to understand how the value of the recycled item such as aluminium being regarded as valuable after its disposal whether as a waste or scrap is crucial. How the final item after recycling achieves back its value and its creation throughout the recycling value chain itself?

Aluminium recycling has become one of the green technologies which help increase economy while at the same time save the environment. Aluminium recycling has never been standing as a single entity. It composed of many parties such as collectors, dismantler, metal merchants, shredders and many more (EAA, 2007). These components of aluminium recycling created a chain. This chain creates value for the final product which is the recycled aluminium. It has to be evaluated in order to understand the value that can be created from the recycling chain.

There are a few interrelated issue of value when it involves recycle item. The first one is, recycle item such as aluminium rarely exist as its pure form. According to Dahlström (2007), aluminium recycling value chain is quite different to be analysed since aluminium rarely exists as its pure form in commercial use. It has been added with other metal to improve its natural quality or known as aluminium alloys. Aluminium also can exist together with other material in a product such as in electric and electronic appliances. This means the aluminium has been added or mixed up with other materials such as plastic in home appliances, oil in vehicles and other alloying elements to boost certain quality of the aluminium. These directly affect the value of the aluminium itself.

The value from the recycling process is dynamic in nature (Brodin, & Anderson, 2008) but it is intentionally to increase the value of the recycled item. Due to the nature and the process of recycling itself the value can increase or decrease. This is especially depending on the material and process. Usually when an item is discarded, the value has reached its end which possesses none if not little value to the owner. The value can loss altogether or brought back via the recycling process. It is as if bringing back near dead or dead people to life. But what are the processes and dynamic that contributes the value which was once considered lost? Does it increase progressively along the recycling process and chain or just not understood yet to be valued?

Research on value usually deal with the industry where the product is assembled or additional features being added to increase the value such as the fish industry (living fish into canned fish) by Christensen *et al.* (2011) and cotton industry (cotton into cloth or fabric) Rieple & Singh (2010) known as manufacturing process that achieves increasing value throughout the process or chain until it reaches the final customer. But the case in the recycling industry is vice versa. Recycling begins once the final customer or the customers along the chain discarded the item such as aluminum. This has become a question whether recycling will create a change of value as it being disassembled and separated.

Even in the research by Dahlström (2007) and Billy (2012) which partly dealt with the flow and monetary value of aluminium from the ore and stopped at the recycling as the end of life. Both of the researches tell how the value of aluminium increased from its production from the ore which is bauxite to the creation of the final product such as cans and car, and lastly on the recycling. In their researches, the manufacturing process started again without adequate explanation on the recycling processes which allows the aluminium enter the manufacturing cycle once again as input. Both did not explain what happen in the recycling processes and the value in it. All of these examples have the added features. But then, in the aluminium recycling, the product is disassembled which make it loses the additional features in order to turn it back to its pure form. What happen to the value of the aluminium in the recycling phase? The additions of the alloying elements make it harder to recycle. Will this situation increase the value or the other way around? There is yet a research addressing this issue. In the next section, the value chain analysis model will be explained together with the aluminium recycling process and the source of metal scrap for aluminium recycling.

Literature review:

Definition of value chain:

The idea of value chain originated from Michael Porter (1985) to depict how customer value accumulates along a chain of activities which produces an end product or service. Value chain can be defined as the internal processes or activities a company perform “to design, produce, market, deliver and support its product.” While according to Vermeulen *et al.*, (2008), “Value chain is the sequence of activities required to make a product or provide a service”. In a comprehensive manner, value chain can be defined as the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final

customers, and final disposal after use, Kaplinsky and Morris (2001). Therefore, it can be concluded that a value chain is the related value of input to output of a product or service to the final customer.

Definition Of Value Chain Analysis:

Value chain analysis examines the full range of activities required to bring a product or service from its conception to its end use, actors that perform those activities along the value chain and final consumers for the product or service, Vermeulen *et al.*, (2008). It describes the activities the organisation performs which links them with the activities around an organisation, and relates them to an analysis of the competitive strength of the organisation. Therefore, it analyses which value each particular activity adds to the organisations products or services. The fundamental idea was built upon the insight that an organisation is more than a combination of machinery, equipment, people and money. Only if these compilation are arranged into systems and systematic activates it will become possible to produce something for which customer value and willing to pay a price (Porter, 1985). Essentially, there are a few basic indicators involved in implementing a value chain analysis which is separated into two main groups which is the primary and supporting activities. These activities is where the value is predictably comes from depending on the product, service or different types of organisation.

Primary Activities In Value Chain Analysis:

Porter (1985) distinguishes between primary activities and support activities.

Primary activities are directly concerned with the creation or delivery of a product or service in the organisation. They can be grouped into five main areas: inbound logistics, operations, outbound logistics, marketing and sales, and service (Porter, 1985). Inbound logistics is the activities involving material handling and warehousing in the particular organisation (IMA, 1996). Operations are the processes of transforming inputs into the final product (IMA, 1996). Outbound logistics is the order processing and distribution of the finished product (IMA, 1996). While marketing and sales is communication, pricing and channel management (IMA, 1996). Lastly, service is the installation, repair and parts (IMA, 1996). Each of these primary activities is linked to support activities which help to improve their effectiveness or efficiency.

Support Activities In Value Chain Analysis:

Support activities are the activities that support the main activities in the creation of product which affect the value of the product. There are four main areas of support activities: procurement, technology development (including Research and Development), human resource management, and infrastructure (systems for planning, finance, quality and information management). Procurement is the purchasing of raw materials, supplies and other consumable items as well as assets (IMA, 1996). Technology development is know-how, procedures and technological inputs needed in every value chain activity (IMA, 1996). Human resource management is the selection, promotion and placement, appraisal; rewards, management development, and labour and employee relations (IMA, 1996). While firm infrastructure is the general management, planning, finance, accounting, legal, government affairs and quality management (IMA, 1996). The 2 main groups of activities in the value chain analysis are shown in Figure 1.

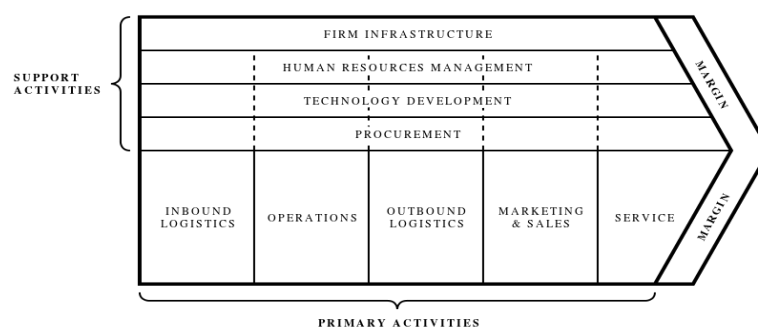


Fig. 1: Basic components of value chain analysis (porter 1985).

The term Margin implies that organisations realise a profit margin. It depends on their ability to manage the linkages between all activities in the value chain. In other words, the organisation is able to deliver a product or service for which the customer is willing to pay more than the sum of the costs of all activities in the value chain, Porter, (1985).

Within the whole value system, there is only a certain value of profit margin available. This is the difference of the final price the customer pays and the sum of all costs incurred with the production and delivery of the product or service such as raw materials, energy, human resource and others. It depends on the structure

of the value system, how this margin spreads across the suppliers, producers, distributors, customers, and other elements of the value system. Each member of the system will use its market position and negotiating power to get a higher proportion of this margin. Nevertheless, members of a value system can cooperate to improve their efficiency and to reduce their costs in order to achieve a higher total margin to the benefit of all of them. As an example, a small tin of sardine, which being sold at RM 2.00 is the result of the value being created from the initially caught sardine fish from the sea until it reaches the final customer after going through the value chain.

Aluminium Recycling:

Aluminium recycling is the process by which aluminium waste or scrap can be reused in products after its initial production. The process partly involves re-melting the metal, which is far less expensive and energy intensive than creating new aluminium through the electrolysis of aluminium oxide, which must first be mined from bauxite ore and then refined, (Schlesinger, 2013). Aluminium recycling has a number of key environmental and economic benefits. Compared to other high volume materials, aluminium production has one of the largest energy differences between primary and secondary production: 186 MJ/kg for primary compared to 10-20 MJ/kg for secondary (Green, 2007). The International Aluminium Institute has come out with their ideal of well-developed aluminium recycling structure as shown in Figure 2 as follows:

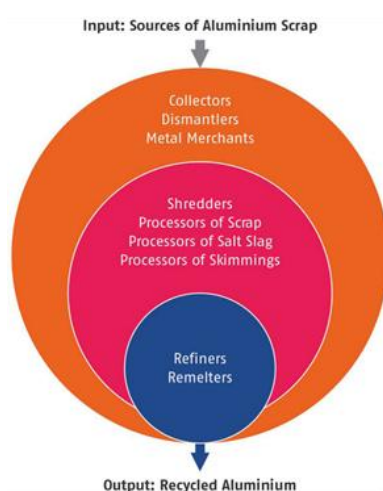


Fig. 2: Structure of a Well Developed Aluminium Recycling Industry (Source: International Aluminium Institute, 2009).

Based on Figure 2, it only shows the required processes and parties in the aluminium recycling but it does not include the whole party inside the chain of the aluminium recycling itself. As an example, after the last process of recycling, we do not know how finally the recycled aluminium reaches the manufacturer again to be processed as a product. Initially also, the aluminium product does not simply thrown away as a waste then someone collect it. The collecting phase might involves a few party especially if the aluminium is not a waste instead is a scrap in a manufacturing company such as a car factory or a construction site which uses aluminium as part of its input.

All of these is important as a way to understand the value being created through the aluminium recycling process. Due to many benefits of recycling, it is a worthy area to be explored and understand. The value of the aluminium recycling industry should never be underestimated. By utilising the value chain analysis, the value being created in this industry could be identified.

Sources Of Metal Scrap:

There are two main sources for secondary raw materials. The first source of secondary raw material is industrial waste and manufacturing scrap such as off-cuts and waste streams from smelters. The second source is end-of-life products sometimes referred to as urban mines. Process scrap and residues, and old scrap (from end-of-life products) enter the value chain at refining and processing stages, (European Commission, 2007).

Recycling of recovered aluminium, either during fabrication or from end-use scrap plays a key role in the value chain. This is because the metal, or a useful alloy, can usually be recovered from scrap in a form that is suitable for reprocessing, while the costs of recovery and secondary processing are considerably less than the costs of primary production. This difference is largest in the case of aluminium as the comparison of the energy costs of primary and secondary production (European Commission, 2007).

Conclusion:

This study is expected to give an insight of the system or processes in the aluminium recycling process. It is very important as we have to know all of the involved process and party in order to analyse the value being created throughout the whole process of recycling. After the identification, then the value being created from the recycling process could be understood. This is crucial as we want to spark the insight on the value part of the recycling process as we usually only being exposed to the environment friendly part of the recycling benefits which is not as attractive as the part which can generate profit yet equally important if not more.

Based on the literature, there is yet a research on the value chain analysis of the aluminium recycling industry. Hopefully this study will be useful in order to gain the knowledge on the value of the aluminium recycling. The description of the value chain will help to construct a framework for business formation in the recycling industry. This framework is useful as a reference not only in the body of knowledge but also to the stakeholders in the aluminium recycling industry.

This research will give a greater impact to certain party such as the investor who wants to invest in the aluminium recycling industry, green technology developer, government to strengthen and maybe fortify the current policy on aluminium recycling and as reference for future study in aluminium recycling. This study will also reveal the operation that contributes to the generation of value from the aluminium recycling as well as the part that requires improvement to generate more value in the near future.

The success of the recycling campaign especially the aluminium recycling not only depend on the campaign but then again the value that this most respected effort and action from the government which contributes to the nation as a whole. The value not only consists of the environmental impact but also the current economy and society to preserve what we have now for the future generations.

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