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Potential for changing value uncaptured to value captured through circular economy practices

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Abstract. Value Captured (VC) is the benefit obtained by stakeholders (especially companies) from a manufacturing business. In principle, VC can be obtained from Value Uncaptured (VU) which often appears in the company's manufacturing practices. This VU can take the form of inefficiencies (waste and by-products that are not used) in the company's manufacturing process. The study of VU has provided guidance on VU in the manufacturing industry. VUs that have been identified need to be changed to VCs. Meanwhile, to convert VU to VC, the right method is needed. The concept of Circular Economy (CE) offers methods in an effort to convert VU to VC. Some alternative methods in the CE context include: maintenance, reuse, recycling, etc. CE can solve this problem, while also providing environmentally friendly solutions. This study provides an overview of the potential of turning VU into VC with several alternatives offered by the CE concept. This study also provides some examples of CE implementations that have successfully solved problems in offering company VCs.

Keywords: value captured, value uncaptured, value conversion, circular economy practices

1. Introduction

Manufacturing activity has a serious influence on the Profit People Planet - 3P [1]. Profit is often interpreted as a benefit obtained by stakeholders. The benefits obtained by the manufacturing industry are often known as Value Captured - VC. Besides generating benefits for stakeholders (especially producers and consumers), manufacturing activities also have negative impacts that cannot be avoided. The negative impact is known as Value Uncaptured – VU [2].

VU is often found in company manufacturing practices. Companies often are not aware of its existence or even ignore it because it is felt to have no significant effect on activities in the company. The existence of VU itself can be identified in the company's manufacturing practices. VU can be classified into four forms [3]:

- a. Surplus Value (VS): untapped resources.
- b. Value Absence (VA): lack of resources needed by the company.
- c. Value Missed (VM): by-products and co-products that are not utilized.
- d. Value Destroyed (VD): pollution that has a negative impact on stakeholders.



With the existence of the VU, it shows that the company's manufacturing practices are not yet efficient. While the VU has the potential to be changed and utilized so as to provide corporate benefits. This benefit is often known as VC.

Converting VU to VC can be done through various methods. Circular Economy (CE) offers several methods that are in line with the principle of converting VU to VC. These methods include: maintenance, reuse, recycling, and others [4]. By applying the methods offered in CE, companies can simultaneously apply the concept of sustainability in their manufacturing practices.

2. Literature review

2.1. Sustainability

At present, sustainability is an interesting issue in manufacturing practices. Some definitions of sustainability are presented in table 1.

Table 1. Definitions of sustainability.

#	Definitions	References
1	The intersection of social, environmental and economic performance of the organization's activities.	[5]
2	Organizational activities, to maintain the continuity of business operations that do not have a negative impact on social or ecological systems.	[6]
3	Sustainability is related to the ability to offer economic opportunities and provide competitive advantage.	[7]
4	Sustainability concerns responsibilities and opportunities.	[8]
5	Product creation that minimizes environmental damage, minimizes energy and natural resource consumption.	[9]

From these definitions (table 1), sustainability is an organizational activity that shows: performance (providing economic, social, and environmental benefits) and opportunities (providing competitiveness and competitive advantage).

2.2. Value captured (VC)

Views on value and value creation in business model innovations are often associated with business benefits and benefits obtained by stakeholders [10]. The resulting value is known as Value Captured (VC) which will be sent from the producer to other stakeholders (consumers / customers).

Research on VC has been widely carried out. Some examples of such studies are: Zero Carbon Buildings (ZCB) program to reduce carbon emissions [11], business model alliance practices to reduce risk, costs, etc. [12], Product Service System business models that produce servitization and dematerialization [13], [14]. Other studies are presented in table 2. Based on the results of these studies, it can be concluded that VC can be a competitive advantage for companies that offer this value to consumers.

Table 2. Sources of company value captured.

#	Value Captured (VC)	References
1	Application of e-healthcare program for hospital healthcare services in Taiwan.	[15]
2	Low Cost Airline (LCA) flight customer satisfaction shown by customer loyalty, a case study on flights in the UK.	[16]
3	The business model of solar electricity services in Germany offers advantages in terms of reducing the impact of climate change and dependence on fossil fuels.	[17]
4	Electricity business model with a battery storage system method that minimizes costs.	[18]

2.3. Value uncaptured (VU)

VU is defined as a potential value that can be captured, but has not been captured by a company [3]. According to [19], the existence of VU can be detected throughout the product life cycle (Beginning of life/BOL, Middle of Life/MOL, and End of Life/EOL). Research on VU can be seen in table 3. In company manufacturing practices, VUs can appear in the form of: waste heat (waste energy), more production, and lack of resources/inputs [3]. The existence of VUs in these forms shows that the company's manufacturing practices have not been carried out efficiently. Meanwhile, the VU still has the potential to be a source of value for the company (Value Opportunities/VO).

Table 3. Researches on Value Uncaptured (VU)

#	Value Uncaptured (VU)	References
1	VU identification in Chinese manufacturing companies, classification into Value Surplus (VS), Value Absence (VA), Value Missed (VM), and Value Destroyed (VD).	[3]
2	Identification of VUs in the entire product life cycle (Begin of Life – BOL-VU, Middle of Life – MOL-VU, and End of Life – EOL-VU) in 6 companies that apply the PSS business model in China, the United Kingdom, and America.	[19]

The existence of a VU needs to be identified, so steps can be taken to eliminate it. [3] identifies the existence of VU by classifying VU into Value Surplus (VS), Value Absence (VA), Value Missed (VM), and Value Destroyed (VD). While [19] identified VU into 26 categories which were spread in the activities of manufacturing companies. Based on this identification, besides removing it, it is possible to change the VU to VC. The resulting VC will become the company's added value and can be a source of competitive advantage.

2.4. Circular economy (CE)

Based on the concept of sustainability as an organizational opportunity to showcase its competitiveness, the change of VU to VC is one of the solutions. Various sustainability concepts offer a number of methods to do.

CE originates from a restorative understanding of industrial economics, which allows the flow of material, energy, labour, and information to run effectively [4]. In Chinese literature it is known as the Reduce Reuse Recycle - 3R concept with the closed loop principle [20]. By combining these concepts, CE is formulated as an economic system with Closed Material Loops - CML which allows material reuse [21]. While [21] offers several methods of [22] that can be done to carry out CE practices as presented in figure 1.

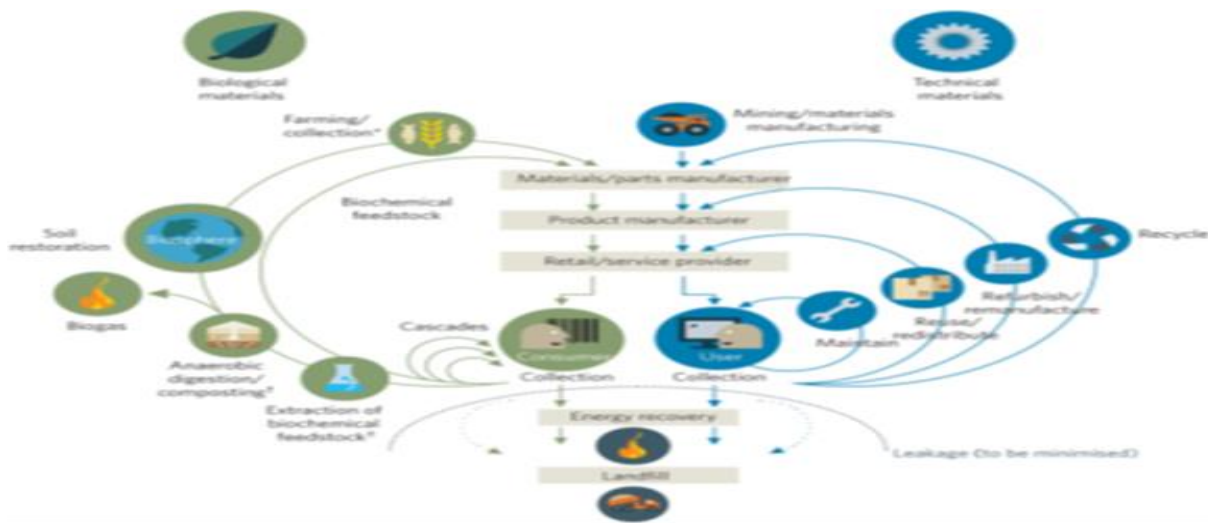


Figure 1. Butterfly diagram of circular economy.

Figure 1 shows some basic patterns of CML are maintain, reuse, remanufacture, recycling, and others [21]. Some research is needed as empirical evidence of the success story of the application of CE in turning VU into VC.

Study [23] uses the concept of reuse in the construction industry in reusing steel for reusable steel-framed walls. While [24] uses the concept of remanufacturing in the furniture industry with the refurbish method. Other studies are presented in table 4.

Table 4. Researches on value uncaptured (VU).

#	VU	CE Methods	VC	References
1	Waste of Fast Moving Consumer Goods (FMCG) products.	Reduce, reuse, recycling	Material reuse, packaging functions, etc.	[25]
2	Waste of electronic goods.	Reduce, reuse	Reuse of raw materials.	[26]
3	Waste Power Curve Upgrade Package (PCP).	Reduce, remanufacture	Used PCUP.	[27]
4	Electronic waste	Reduce, remanufacture	Used electronic products.	[28]

Based on table 4, CE (reduce, reuse, recycle, and remanufacture) practices are applied by companies that care about the concept of environmentally friendly manufacturing. Based on the literature referenced, the practice of reduce often appears in the applied CE method. This practice refers to the efficient use of resources (materials, components, etc.).

3. Research methodology

This research uses the literature study method. The object of this study is the manufacturing industry.

The study links the concepts of sustainability, values (VU and VC), and CE practices to produce VC. The research methodology and framework can be seen in figure 2.

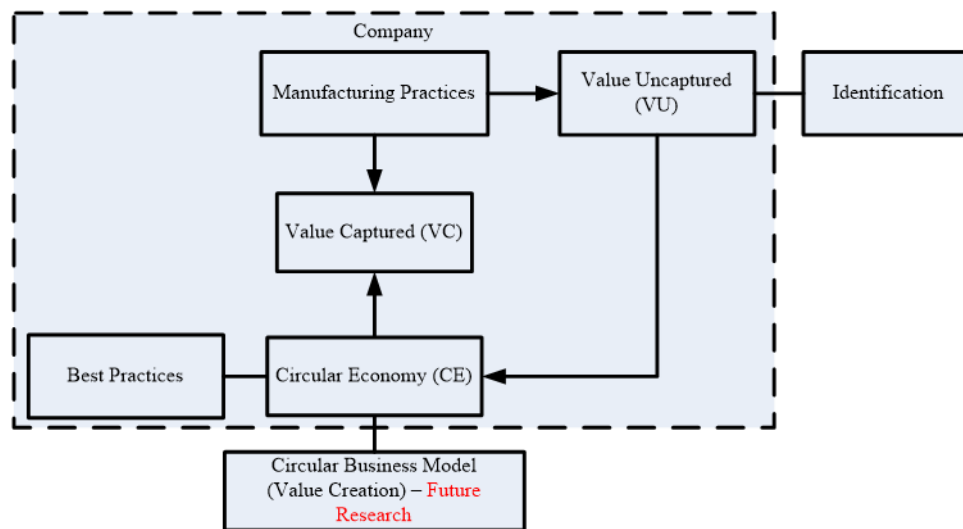


Figure 2. Research methodology and framework.

The first step is to identify manufacturing practices that produce Value Uncaptured (VU). Previous studies are used as a reference: [2], [3].

The next step is to identify Circular Economy (CE) practices which include: reduce, reuse, recycle, remanufacture, and others. The butterfly diagram proposed by [21] is used as a reference.

The study also shows the best practice about the concept of CE that has been done by several companies. The best practices used in this study are: LoWaste Market, SQUARE027, and Ecopneus [29]. LoWaste is a project to control urban waste with a CE model with the principle: reuse and recycle waste. One of the results of this project is the processing of textile waste. The waste is recycled to produce gadgets for exhibitions, cases and bags, furniture (chairs and pillows). SQUARE027 is an innovative luxury fashion brand, in accordance with ethical principles, designing and producing environmentally friendly shoes. To produce environmentally friendly shoes, SQUARE027 uses biodegradable gum and synthetic leather. The result of using biodegradable gum is a 50% reduction in emissions. While the use of synthetic leather can reduce CO₂ emissions by 35%. While Ecopneus is a non-profit limited company for the search, collection, maintenance and recovery of End of Life Tires (ELT). Ecopneus was founded by a leading tire manufacturer operating in Italy. In Italy, ELT production is 350,000 tons per year (equivalent to 38 million tires). The results of the application of CE carried out by Ecopneus: 20% for material recovery and 50% for energy recovery [29]. These three case studies illustrate that CE practices do provide benefits for turning VU into VC in a company's manufacturing practices.

4. Analysis and results

Based on literature studies, the concept of Value Uncaptured (VU) began to emerge in 2014. The concept reappeared in 2017. Both concepts present how to identify VU in manufacturing practices. This method of identification is a reference for this research. It is possible in manufacturing practice to produce several VUs: VU₁, VU₂, ..., VU_n. A method is needed to convert VU to Value Captured (VC).

Circular Economy (CE) practices have the potential to convert VU to VC through a business model (Circular Business Model - CBM). Best practice from the literature study shows the forms of CE methods that can be done include: reduce, reuse, recycle, and remanufacture.

5. Conclusions

This research is a literature study that produces a framework of the relationship between VU and CE practices. CE (reduce, reuse, recycle, remanufacture) practices themselves are very relevant to changing VU to VC.

This research is related to value creation in the business model. Circular Business Model (CBM) is shown as a solution to the value creation process that is in accordance with the CE principles. The limitation in this research is that it has not yet discussed how CBM works.

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