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Circular Economy: The Beauty of Circularity in Value Chain

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Abstract

Thought of Circular economy (CE) or circularity is widely accepted by corporations, academics and social & environmental concern individuals and organizations that create new opportunities & challenges to adapt and practicing in industry and customers. This model is sustainable in terms of a win-win situation from producers' and customers' ends; both are benefited from value proposition to consumption by ensuring economic, social and environmental well-being. The circular economy is all about circularity, and execution in the value chain. This research has been conducted by the qualitative method through mini literature review, studying business case, stakeholders' website, books, and journals. This paper aims to draw a framework of circularity in the value chain and to understand how circularity works in it and stimulates organizations to gain competitiveness and sustainability.

Keywords: Circular Economy, Circular Business Model, Circularity (10Rs), Circular Value Chain, Competitiveness.

1. Introduction

Take-make-dispose but what, how and where to take, make and dispose of? Extracting materials from nature for, by the human beings and ultimately for society through the artificial system of mining, manufacturing, distribution, consumption & use and lastly dispose in the environment and to create a carbon footprint for environmental degradation. The extractive industrial model makes the world as a garbage collector, but now the model of circular economy (CE) initiatives are to rethink decoupling economic activities to consume limited resources and designing waste out of the system. The CE based on three principles: design out waste & pollution, keep products & materials in use and regenerate natural systems (Ellenmacarthur Foundation, 2018).

The objectives of a circular economy are to systemic shift to build long-term resilience, create business and economic opportunities and deliver societal & environmental benefits through technical & biological cycles. The linear economy or traditional economy's growth has been accelerated since the 18th century by the invention of a steam engine that helps to ease human life, but all the industrial inputs are collected from natural resources, which are a limited and expensive mistake. Subsequently, industrial revolution 1.0 to 3.0 brought major invention in electricity distribution, both wireless & wired communication and lastly advances in computing power. *The Fourth Industrial Revolution can be described as the advent of "cyber-physical systems" involving entirely new capabilities for people and machines. While these capabilities are reliant on the technologies and infrastructure of the Third Industrial Revolution, the Fourth Industrial Revolution represents entirely new ways in which technology becomes embedded within societies and even our human bodies. Examples include genome editing, new forms of machine intelligence, breakthrough materials and approaches to governance that rely on cryptographic methods such as the block chain* (Davis, N 2016).

Through the industrial revolution 4.0; it is hoping to compensate linear system to new regenerative economic system getting the benefits of digital technology, which has the power to support the transition to the circular economy by radically increasing virtualization, de-materialization, transparency, and feedback-driven intelligence.

The enabler of circular business model (Geissdoerfer, M., Morioka, S.N., de Carvalho, M.M. and Evans, S., 2018): closing, narrowing, slowing, intensifying and dematerializing, and the resources looping depend on 10Rs principles (Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacturing, Repurpose, Recycle, Recover). In this literature, the 10Rs principles are considered as elements of circularity and implement in different stages in the value chain. The value chain in linear economy & circular economy are differentiated into the uses of Rs; in liner economy input and output are straightforward from taking to disposal, but in circular economy output is regenerative, and the 10Rs help looping materials over time and reduces using of primary raw materials, by converting used materials into secondary raw materials.

In previous literature, the Rs are considered in terms of uses of raw materials and products, but in this literature, the first 3Rs (R0-Refuse, R1-Rethink, R2-Reduce) are considered as a part of circular innovation practices besides product and raw materials uses in different stages of the value chain. The 3Rs together are to be called *Innovation Thinking* in every step to *rectify, enhance & modify* the circular value chain & circularity. In a linear economy, the value chain is a process and activities by which companies add value to an article including production, marketing, and after-sales service.

The value chain is adapted from Michael Porter's value chain model and trying to conceptualize a circular value chain.

Through the article, a complete view of circularity in the value chain is presented which helps to understand the circular economy & its elements, and a framework is created to show off. Through the literature reviews, it is observed that the concept of circular economy & presentation is scattered, and the major elements (Rs) of circularities are not well defined & positioned for that in this article, the perception of circularity and circular value chain are presented together as a holistic view.

The concept of sustainability is implemented and executed by practicing circular economy. The goals of the circular business model and sustainable business model are creating sustainable value, pro-active multiple stakeholder management, and long-term perspective. To gain organizational sustainability, and practicing circularity in the value chain is essential which creates competitive advantage, reduces import of raw materials and meets customer demand in an economical & sustainable way. Nowadays the demand for sustainable products is increasing due to consumer awareness, government initiatives, and environmental campaign.

2. Literature Review

Circular Economy (CE) and sustainability are related words. Each depends on others in different dimensions. The intentions (Homrich, A.S., Galvao, G., Abadia, L.G. and Carvalho, M.M., 2018) behind the Circular Economy are to practice the fortune in an ecological way to bring back, maintain our world clean and livable. In other words, Circular Economy is an approach to meet the bottleneck of resource scarcity & waste disposal, in a balancing way from economy to value perspective. Industrialization (Szirmai, A., 2012) works as an engine of economic growth. Through the industrial revolution, we made our life comfortable & connected, but it generates a lot of drawbacks to withstand our life on the green planet. CE has gained (Reike, D., Vermeulen, W.J., and Witjes, S., 2018) attention over the last decade in practicing sustainable society, "Tableau Economique" (1758). The Ellen MacArthur Foundation (ellenmacarthur foundation, 2018) describes that the circular economy is based on three principles: design out waste & pollution, keep products & materials in use and regenerate natural system. On the other hand, sustainability that the ability to be upheld at a certain rate or level. Sustainability concentrations on meeting the needs of the present without compromising the ability of future generations to meet their needs. In the sustainability concept, there are three pillars: economic, environmental and social (profits, planet, and people) [Investopedia]. Sustainable development (Bridger, J.C., and Luloff, A.E., 1999) is arisen as a popular solution in the 1980s to overcome the challenges of material needs by growing population while protecting the ecosystem.

Sustainable consumer behavior (Peattie, K. and Belz, F., 2013) is consumers' behaviors that improve social and environmental performance as well as meet their needs. It relates reasons for consumer's response in sustainability into their consumption behavior and also studies consumer buying decision regarding sustainable products and afterward. Sustainable consumer behavior has a different viewpoint (Antonides, G., 2017) from the end of policy maker, marketing, consumer interest, and ethical focus. Consumer purchasing behavior is very multidimensional to evaluate and find a conclusion whatever it is sustainable or not. But some researcher did some works on sustainable consumer behavior whereas consumers perceive observation (Sohlberg, J., 2017) of threat on the environment has positively related to work on reducing environmental hazardous & positive effect of political party positions. Many authors have found specific correlations between socio-demographic features and pro-environmental behavior. Consumer awareness (Bonera, M., Corvi, E., Codini, A.P. and Ma, R., 2017) are also related to their background such education level, family status, educational level, and employee status and nationality as in important in describing eco-behavior.

Sustainable business model as a vital component to transfer organization from linear to circular approach. The circular business model is strongly linked to innovation adaptation and practices in value creation to value proposition (Charter, M., 2016). Enterprise's circular business model depends on the ability to innovate and new re-engineered. In a business model can be pointed out two main areas: new disruptive business model (new venture as circular) and hybrid business model (Tradition & circular) in another study to find the gaps on how firms conduct business relevant activities (Ritala, P., Huotari, P., Bocken, N., Albareda, L. and Puumalainen, K., 2018) that touch upon sustainable issues in a broad variety of societal & environmental domains, technological development, organizational practices, socially oriented activities and ending the conclusion that big companies have huge opportunity to find win-win situations but less evident for sustainability at first sight like cost savings, profitability and sufficiency for society & environment. And also noted that large business could be inspired and discuss with the innovative start-ups to pursue more radical innovation. In the conventional literature, the business model is a firm's strategy & practices that allows to examine: the value proposition, value creation, delivery and value capture.

In the literature on circular economy, the concept of circularity starts with "refuse" and ends with "recover energy" (Cramer, J., 2014) and then the 9Rs principles are oriented that are listed as follows:

- (1) Refuse: preventing the use of raw materials;
- (2) Reduce: reducing the use of raw materials;
- (3) Reuse: product reuse (second-hand, sharing of products);
- (4) Repair: maintenance and repair;
- (5) Refurbish: refurbishing a product;
- (6) Remanufacture: creating new products from (parts of) old products;
- (7) Repurpose: product reuse for a different purpose;
- (8) Recycle: processing and reuse of materials; and
- (9) Recover energy: incineration of residual flows.

Some literature work on 9Rs, and put the new dimension by presenting and defining as hierarchy and differentiate the linear economy & circular economy based on the circularity movement and allocated in three parts: useful application of materials, extended lifespan of products & parts, and lastly smart products use & manufacturing (Kirchherr, J., Reike, D. and Hekkert, M., 2017; Potting, J., Hekkert, M.P., Worrell, E. and Hanemaaijer, A., 2017).

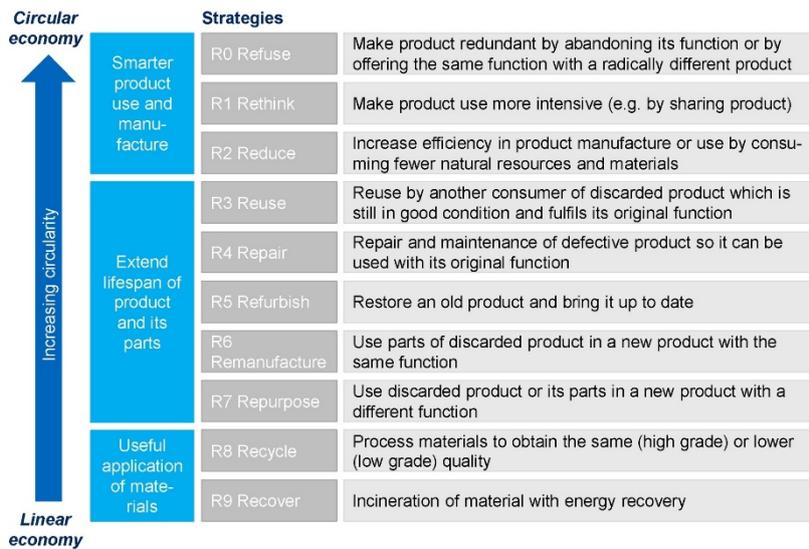


Fig-01 Source: Kirchherr, J., Reike, D., & Hekkert, M. 2017.

Linear and Circular value chain

The book “Competitive Advantage” by Michael Porter (Porter, M.E., 2008) defines value chain as a collection of activities to create value for customers to gain competitive advantage (Porter, M.E., 1985) and ultimately gain economic success. The value chain analysis aims to control cost factors like Economies of Scale, Learning and Spillovers, Pattern of Capacity Utilization, Linkages, Interrelationships, Integration, Timing, Organization policies and Location.

The sustainable value chain consists of the product development and supply chain processes of an organization. It covers all stages of the lifecycle from idea/concept, raw material sourcing, production, and distribution, and end customers use to the point where the product goes back to a biological or technical cycle, thus closing the loop (D'heur, M., 2015).

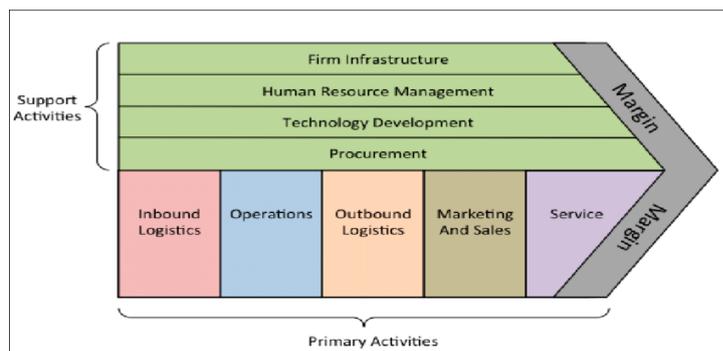


Fig-02 Source: Michael Porter’s value chain, businesssetfree.com

Michael Porter’s value chain is a linear economy based, and it focuses on cost minimization, differentiation and gains a competitive advantage that all are related to product & supply chain management, but in circular value chain the objects are to ensure organizational as well as social & environmental benefits. In primary activities of the conventional value chain related to inbound & outbound logistics that ignore reverse logistics and the supporting activities only involve in organizational value creation and mostly ignored social and environmental value & sustainability.

The circular value chain can be defined as “**A process and activities by which organizations retain and regenerate values to an article from secondary raw materials through reverse logistics and propose**

regenerative value by practicing sustainability in supporting activities: human resources, procurement, technology, and firm infrastructure."

In the proposed circular value chain, all functions & activities are considered that will help organizations to adapt circularity and gaining sustainability. In the circular value chain, the primary activities are involved in circular input (secondary raw materials), or partial inbound logistics (Primary raw materials) input, design innovation, outbound logistics, marketing and sales & service, consumer purchase & uses, reverse logistics and evaluation activities. Though consumers consumption & uses are not considered as a part in linear value chain the propose circular value chain likes to add due to its important functions in value transfer from purchase to reverse logistics. The beauty of circular value chain & circularity is consumers' contributions in reverse logistics and intensifying the loops could not be ignored. CE suggested keeping materials value and circulate over time that means value could not be zero and just transferring from producer to consumer that's why consumption & uses are considering as a part of the circular value chain. The supporting activities are mostly the same as the linear value chain, but sustainable procurement and practicing sustainability in supporting activities are added.

3. Research Method

Research is to see what everybody has seen and to think what nobody has thought (Albert Szent- Gyorgyi). Quantitative research pertinent knowledge from previous research and from everyday life is organized into theory - given what is known and one's best guess about reality - to build a cogent and best argument (Morse, J.M. and Field, P.A., 1995).

Qualitative research is characterized by its aims, which relate to understanding some aspect of social life, and its methods which (in general) generate words, rather than numbers, as data for analysis (McCusker, K., & Gunaydin, S. 2015).

The article is mostly based on qualitative research: mini literature review, journals, books, active organizations website and case study to gain knowledge on circularity & value chain, and finding the gap in latest work and concluding a framework.

3.1 Literature review

The literature search has been conducted in the Scopus database, Google Scholar, books and online website of practicing originations & stakeholders. The most publishing journals on the circular economy are Resources Conversion & Recycling, Journal of cleaner production, Procedia CIRP (Publisher-Science Direct), Journal of Industrial ecology (Publisher-Wiley Online Library), Sustainability Science (Publisher-Springer), Sustainability (Publisher-MDPI). Production Planning & Control (Publisher- Taylor & Francis). The active organizations are working on the Circular economy- Ellen MacArthur Foundation, European Commission, World Economic Forum, United Nations.

3.2 Framework

A framework is a basic conceptual idea (Merriam-webster) or Outline or skeleton of interlinked items which supports a particular approach to a specific objective and serves as a guide that can be modified as required by adding or deleting items (business dictionary). A conceptual framework as a visual or written product, one that "explains, either graphically or in narrative form, the main things to be studied—the key factors, concepts, or variables—and the presumed relationships among them (Miles, M.B., Huberman, A.M., Huberman, M.A., and Huberman, M., 1994).

From the definition of conceptual framework, it is also called comprehensible framework that is not finalized that could be changed over time as required, and the conceptual framework helps to presume relationships among key factors & concepts. In keeping the definition in mind, this conceptual framework is developed to connect the

concept of circularity and circular value chain. Here, the circularity opportunity in the value chain is defined and discussed.

In the proposed framework, the major two elements are looping circularity (R0 to R9) in the value chain and the circular value chain. In the analysis and discussion part, the circularity enabler techniques and appropriate positioning are presented. Here the important factor is considered that innovation practices in every stage in the value chain through refuse, rethink and reduce principles.

Refuse (obsolete or renounce), the traditional concept of value optimization and Rethink (reconsider, redefine) new CE approach and Reduce (consolidate, Restrict) the complexity in processing & implementation through the value chain. All together of the three circularities are called innovation practices or innovative design thinking.

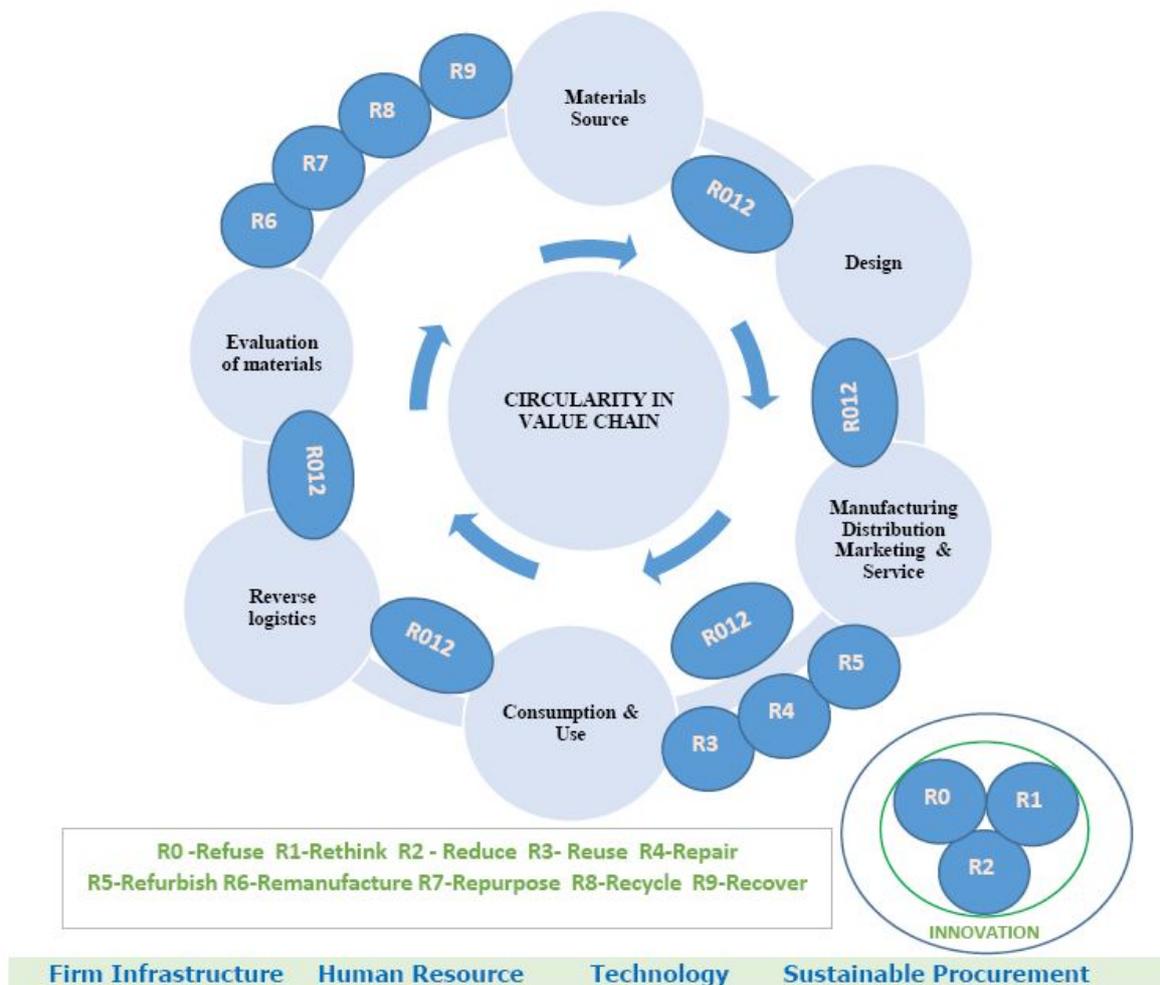


Fig-03 Source: Author

4. Limitations

The limitations of this literature that it is only based on the value chain, circularity, circular economy and sometimes sustainability. It follows qualitative research that only thought based and follow previously published literature and framework without mathematical evaluation and data analysis. CE has a vast area of analysis and evaluation parts for that presenting and conceptualizing CE in one article is not sufficient. It is written only based on core ideas without detailing the concept in clarity. Nevertheless, the analysis is in limited in organizational or economic concern, but social, environmental and consumer behavioral concept and practices are not mentioned.

5. Results & Discussions

5.1 Circularity in Primary Activities

5.1.1 Evaluation to Materials Sources

(R6, R7, R8, R9)

In the value chain, materials are sourced in two ways: primary and secondary sources (European Commission, 2018). Primary sources that fully depends on natural resources and secondary sources or secondary raw materials (Schweitzer Jean-Pierre, Eliaerts, Sylvie, Gionfra Susanna, Jones Harvey, Nanni, Sylvia and Solovieva, Anna, 2017) from existing used goods or urban mining (Di Maria, F., Micale, C., Sordi, A., Cirulli, G. and Marionni, M., 2013). In circular value chain Remanufacture (R6), Repurpose (R7), Recycle (R8) and lastly Recover (R9) are processed through which secondary raw materials are converted into finish goods. Remanufacturing – Uses parts of the discarded product in a new product with the same function whereas Repurpose-Use discarded the product or it's parted in a new product with a different function and Recycle-Process materials to obtain the same (high grade) or lower (low grade) quality and Recovery-Incineration of material with energy recovery. Here, through the Rs' materials are converted into value-added and create resale value that works as input in value creation by optimizing the value in it. The beauty of circularity is value created and delivered without touching or mining natural resources, and a new concept of materials sources is established.

After reverse logistics in the circular supply chain the used materials fully or partially belongs to the collector, and that is sent to manufacturing company or expertize company (Terra Cycle, 2018) to restore value or used as raw materials for next phase and lastly it sales again in the market as a value-added product.

The main objective of the Circular economy is to minimize the uses of natural resources due to resources scarcity and environmental degradation (ellenmacarthur foundation, 2018). The natural resources are limited and costly in terms of social, environmental and economic perspective, whereas CE emphasis on secondary and renewable sources of materials. As raw materials input from natural sources still continue and always have some sort of requirements of fresh raw materials and to enhance secondary raw materials, the experts are suggested to sustainable or green procurement (Appolloni, A., Sun, H., Jia, F. and Li, X., 2014) where goods & services are procured with the same primary function considering lower environmental footprint, narrowing the loops (Bocken, N.M., de Pauw, I., Bakker, C. and van der Grinten, B., 2016) of material input, integrated end-to-end supply chain model (SCOR) to increase efficiency, reduce the input of resources, and accelerate supply chain process (D'heur, M., 2015; Supply Chain Council. 2006).

In addition to industrial symbiosis (Chertow, M.R., 2000; Chertow, M.R., 2007) is to ensure maximum utilization of wastage and by-product to share and input for other industry or intra industry. Lifecycle Assessment (LCA) (Guinée, J.B., 2002), diversity and cross-sector linkages to ensure industry standards into transparency, financial & risk management tools, infrastructure development & education. Government regulations, tax credits, and subsidies to facilitate the factor of production (business dictionary) (Land, labor, capital & enterprise) to ensure the uses of secondary raw materials, technology, renewable raw materials and ease of circular supply chain practices.

Secondary raw materials reduce the risk of resources scarcity and leverage the import of raw materials that certainly helps to reduce costs in supply chain management and finally input cost of raw materials. Optimization of secondary raw materials and renewable sources could be the best for community development and social harmony through the sharing economy for supplier to consumer end and at the end helps decoupling economic growth from natural resources consumption (Kjaer, L.L., Pigosso, D.C., Niero, M., Bech, N.M. and McAlloone, T.C., 2018).

5.1.2 Materials sources to design innovation

(R0, R1, R2)

The materials are collected from the sources (mostly from secondary raw materials) as stated above, and now the value will create in different ways of implementations and objectives. As CE objective is to maximize the value

and minimize uses of natural resource or increasing the uses of secondary raw materials from urban mining (Mining, U., 2015). The goals are set up in this stage, how to design the smart product or services that create greater values by ensuring economic, social and environmental benefits in return the organization to gain sustainability. In this stage R's are used to Refuse, Rethink and Reduce or innovation in product design. CE Product design requires to refuse, rethink and reduce in existing value creation system, complexity in design, distributions, functions and reverse logistics. In other words, it can be defined as innovation in design as a continuous process to ensure CE goals and objectives at the same time to meet customer demand and organizational sustainability. Circular economy's success mostly depends on the design of the products that help to ensure circularity over time as secondary raw materials considering value proposition, value co-creation & value co-delivery system as well as value capture (Biloslavo, R., Bagnoli, C. and Edgar, D., 2018; Bocken, N.M., Short, S.W., Rana, P. and Evans, S., 2014). Practicing innovation (R0, R1,R2) design in enabler driver (slowing, intensifying, narrowing loops and dematerializing) between circular supply chain (CSC) and circular business model (CBM) can accelerate the growth of circularity to gain sustainability by meeting the conditions (Economical, Environmental, Socials goal, Proactive stakeholder management and long-term perspective). Presently scholars are suggested and already in practices some technologies and infrastructure that are designed to facilitate circularity in the value chain. Regenerative design or Bio mimicry: *Regenerative design is a concept based on process-oriented systems theory. The word "regenerate" means "to create again." A regenerative system makes no waste; its output is equal to or greater than its input, and part or all of this output goes toward creating further output — in other words, it uses as input what in other systems would become waste.* (Lyle, J.T., 1996; regenerative, 2018), Bio mimicry (biomimicry.org, 2018) *is an approach to innovation that seeks sustainable solutions to human challenges by emulating nature's time-tested patterns and strategies. The goal is to create products, processes, and policies—new ways of living—that are well-adapted to life on earth over the long haul.* Cradle to cradle is based on three principles: everything is resources for something else, biological nutrients that designed to degradable & mixed with soil, technical nutrients that (McDonough, W. and Braungart, M., 2010, Allen, J., 2007; Kumar, S. and Putnam, V., 2008; mcdonough.com, 2018) for new products without natural degradation that is mostly accepted design thinking, which helps circularity and extended life of products and services. Product-service system (PSS) is an integrated system of interconnected elements which provides an agreed-upon functionality for customers (Belkadi, F., Boli, N., Usatorre, L., Maleki, E., Alexopoulos, K., Bernard, A. and Mourtzis, D., 2018). This idea is suggested product stewardship instead of ownership (Kjaer, L.L., Pigosso, D.C., Niero, M., Bech, N.M. and McAlloone, T.C., 2018).

Refuse, rethink and reduce are a continuous process in generating innovative idea and implementation. Innovations are classified into two categories: Evolutionary, incremental advantage in process & technology and Revolutionary, disruptive or new innovation (business dictionary). Both categories innovation are needed to articulate the design thinking and meeting the challenge customer demand and guarantee circularity. In a 1959 essay by Isaac Asimov, On Creativity, he concluded, one way of investigating the problem is to consider the great ideas of the past and see just how they were generated. Innovative ideas often come from happy coincidences and combining popular ideas or products from different disciplines (i-phone), considering a problem people have even if they don't recognize it (Magic whiteboard) and drawing connections between different ideas (Collins, B 2018).

5.1.3 Manufacturing, distribution and marketing & services (MDMS) to Consumption & Use (CU) (R0, R1, R2) + (R3, R4, R5)

In this stage, design thinking is implemented through value creation and generating the desired product and services that meet the goals of circularity and will retain as secondary raw materials after first life. The circular supply chain has three parts: inbound logistics (mostly ignored or renewable sources), outbound logistics and reverse logistics, that plays a vital role for materials collection. This stage is divided into manufacturing smart products, outbound logistics, and consumer's uses. Innovative thinking (R0, R1, and R2) in manufacturing (energy efficiency, material productivity & adaptable manufacturing), outbound logistics, creating consumer awareness, reduce product knowledge gap and operate innovative products. Here the R3, R4 & R5 are used to increase circularity in consumptions & uses that helps to extend products life or intensifying the loops.

In the manufacturing process, efficiency in energy and productivity could reduce the price of the final product and helps to maximum utilization of raw materials or reduce the input of raw materials; in circular value chain, the

secondary raw materials processing is required to use innovative, efficient technology and human resources. The economic value of a product is created on the input secondary raw materials and processing cost. Reuse or sharing -R3 of industrial wastage and byproducts in intra-industry would help to minimize the cost, knowledge sharing on zero-wastage (Lombardi, D.R., and Laybourn, P., 2012) for that it is needed to ensure the practice of industrial symbiosis and industrial sourcing platform by the blessing of industrial revolution 4.0 (Davis, N 2016).

After getting product and energy efficiency with lower cost competitive advantage, now it turns to get marketing and distribution and implementation of Rs (R3-Reuse, R4-Repair & R5-Refurbish) from consumer to distribution level. To ensure circularity in this level, a new set of distribution, marketing & communication strategy should be developed.

The concept of green marketing is very appropriate for circular economy practices which defined as *Green or Environmental Marketing consist of all the activities designed to generate an facilitate any exchanges intended to satisfy human needs or wants such that the satisfaction of these needs and wants occurs, with the minimal detrimental impact on natural environment* (Jay Polonsky, M., 2008). Packaging materials help the company in value presentation and getting customer attention, but it brings vast negative impact on environment problem. Packaging materials' after use throw away and impact prevention is a very challenging task. Nowadays, government and scientists are trying to solve the problem of packaging materials discard in the environment by implementing laws and enhancing innovation. For example plastic adulteration in the environment are controlled by enforcing laws as well as encouraging reuse, invention of degradable plastic and bio-plastic (Pavel, S. and Supinit, V., 2017; Hejase, H.J., Hejase, A.J., Tabsh, H., Chalak, H.C., Wamitu, S.N. and Pavel, S., 2018; Ravenstijn, J., 2010) for packing as replacement of plastic that takes 100 of years to mix with soil.

In a circular economy, customer relationship management is an important factor of success and attractiveness. CE always focus on the maximum utilization of products and expansion of life, even after life management through reserve logistic. Extension of product life means to hold a long-run relationship with customers, and the even relationship depends on organization's value proposition and communication skills. Product quality or smart product, green marketing, green packaging, smart communication (Product labeling, Eco-labelling (Van Amstel, M., Driessen, P. and Glasbergen, P., 2008; zicla, 2018; Lewandowski, M., 2016) are very crucial to reduce communication gap and to build sustainable relationships and taking the opportunity of reselling and strong bonding with customers.

CE always stresses to participate in community development to value sharing & socially responsible consumption (Webb, D.J., Mohr, L.A., and Harris, K.E., 2008) organizations' corporate sustainable social responsibility (CSRS) practice instead of corporate social responsibility (CRS) and extended producer responsibility. Furthermore, products as a service or product service system (PSS) (Jensen, J.P., and Remmen, A., 2017) which has three categories: product oriented, use-oriented, result oriented that conceptualize product stewardship (dictionary.cambridge.org) instead of product ownership from the customer end. Through IOT, products and services virtualization will boost increasing circularity.

5.1.4 CU to Reverse Logistic to Evaluation (R0, R1& R2)

After the product consumption & uses and maximum utilization of products' value through sharing, reusing, repairing, refurbishing or intensifying the product lifetime; the wastages are collected through reverse logistics and after evaluation or sorting, it is prepared for input as secondary raw materials. In this process, technological and biological process are decided through evaluation and taken action as it. This stage ensures closing loops and prevents the wastage to adulterate environment.

The European Working group on Reverse logistic, REVLOG (1998) puts forward the following definition "The process of planning, implementing and controlling backward flows of raw materials, in-process inventory, finished goods, and related information from the point of origin for the purpose of recapturing value or proper disposal" (Dekker, R., Fleischmann, M., Inderfurth, K. and Van Wassenhove, L.N., 2005).

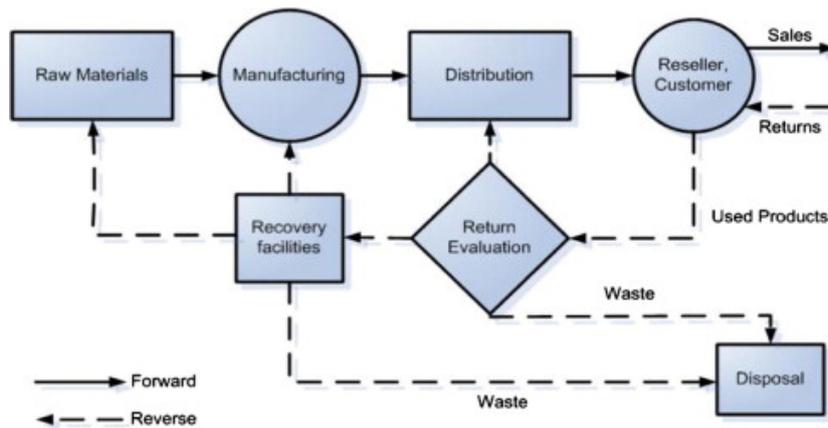


Fig-05 A generic form of forwarding/reverse logistics (Tonanont et al., 2008).

From the definition and figure 05; the objective of reverse logistics is to retain value or proper disposal through evaluation and recovery and lastly send as raw materials or directly for manufacturing. Many countries implemented law and regulation for practicing reverse logistic, but now it is taken as a business opportunity (Govindan, K. and Soleimani, H., 2017).

5.2 Supporting Activities for Circularity

5.2.1 Sustainable procurement

Procurement plays a key role in materials sourcing for input in operation that depends on the organizational purchasing policy and execution. To gain competitive advantage and cost efficiency, the organization could adopt reverse logistic in organizational value chain or long-term partnership with out-sourced organizations. If the organization directly adapt reverse logistics to collect and manage secondary raw materials or from the outsourced company then pressure on purchasing virgin materials will reduce gradually. CE suggested whenever the purchase is needed, always purchase secondary or renewable materials that could be intra-industry through sustainable or green or green public procurement. To understand a recycling outsourced company's business model, here TerraCycle's business model canvas is presented that will help to understand the nature of business and activities which facilitating reserve logistics in a sustainable way.

Business Model Canvas of TerraCycle

Business Types	Innovative Recycling Company
Customer Segment	Industrial organization & general people, Social Workers
Value Propositions	Free Recycling platform and solution for the community, free shipping labels, Investment opportunity (USD700 to USD100K) for all, Zero waste box platform, Earning a reward for waste, Large-scale recycling, Educational program.
Channels	Free Shipping, Social Worker, website- https://www.terracycle.com/en-US
Customer Relationships	The website, social awareness, charity works, customer support, long-term partnership with industrial organizations, customersupport@terracycle.com, digital press kit for instant up-to-date.
Revenue Streams	Funded by conscientious companies, brands, manufacturers, and retailers around the world and selling recycled to manufacturer.
Key Activities	Collecting waste to recycle, reuse including cigarette butts and chewing gum and selling services & products. Donate money per pieces of the collection to the collector's favorite charity and school.
Key Resources	Circularity, Innovative, Technology, Scope oriented, Management Team
Key Partners	Municipalities, companies want to close the loop on their products.
Cost Structure	Strategic brand partners cover the operating costs.

Sustainable procurement can be defined as the pursuit of sustainable development objectives through the purchasing and supply process. Sustainable procurement 'is consistent with the principles of sustainable development, such as ensuring a strong, healthy and just society, living within environmental limits, and promoting good governance' (Walker, H. and Brammer, S., 2009).

The concept of green procurement and green public procurement are the extensions of sustainable procurement both have the same objectives to meet economic, social and environmental benefits. The green procurement is benefited: organizational brand value, Customer satisfaction, Reduce the risk of law and policy, cost reduction and maximize shareholder value. The latest and wider concept of sustainable procurement is Green public procurement (GPP) that is *defined by the EU as "a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured" (COM (2008) pg. 400 "Public procurement for a better environment" (European Commission, 2017).*

GPP is a wider practice of procurement from the government to private organization to ensure benefits and to justify triple bottom (Slaper, T.F., and Hall, T.J., 2011) line approach (economic, social & environment) (business dictionary). Green public procurement works as a holistic platform among supplier, purchaser, and government which ease and ensure purchasing green materials. Overall the objective to help to narrow the loop as much as possible to purchase virgin materials.

5.3 Technology

Circular value chain analysis not only depends on internal analysis but also external analysis. In different stages from materials sourcing to reverse logistics all activities should be connected in a way that data analysis on secondary materials sourcing, product demand & supply, consumer interface, target customer or cluster analysis are prompted. Adapting technology in organizational level to assist radical virtualization, dematerialization, and greater transparency on product use and materials flow to solve battle of agency problem (Allen, J., 2007).

The most innovative technologies are mentioned below:

Asset Tagging (camcode, 2018) for getting information on condition and availability on product, components, and materials.

Geospatial information (cgsatellite, 2018) for visibility on the flow of materials, components, products, and people as well as visualize traffic and population information base on maps.

Big Data Management (attunity, 2018) *is the organization, administration, and governance of large volumes of both structured and unstructured data and organization employ bid data management strategies to help them contend with fast-growing pools of data.*

Connectivity through mobile technology or telecommunication to facilitate leasing and sharing platform, reverse logistics, take-back system, distribution and remanufacturing.

Google operates some innovative technologies to help circular economy – Project sunroof (google, 2018), Nest learning thermostat (nest, 2018), Waze (Waze, 2018), Flow (flow, 2018), Project air view (sustainability.google, 2018), Maps (maps.google, 2018), Leanpath (lean path, 2018), Leafy green machine (freight firms, 2018).

The companies are practicing and facilitating the technology –Rubicon Global (Cloud, Big data) (rubiconglobal, 2018), NCC (Mobile) (ncc,2018), Hello Tractor (machine to machine communication) (hellotractor, 2018), Apple (robotics), gCycle (bio-based materials).

Several tools and methods from Biomimicry, Cradle to Cradle (C2C) and industrial economy - Design Spiral (biomimicry.org, 2018), Life's Principles (biomimicry 3.8, 2018), AskNature (asknature.org, 2018), ABC X

categorization (EPEA Internationale Umweltforschung GmbH, 2018), C2C Certification (c2ccertified.org, 2018), Life Cycle Assessment (LCA) (Iyyanki V. Muralikrishna, Valli Manickam, 2017).

To ensure competitive advantage with cost and differentiate strategies, technological improvement and implementation in primary and supporting activities are essential. There are many ways of deploying technologies in the organization, but out-sourcing operations and long-term partnership with the high-tech organization could be cost-effective as adopting new technology is costly and needed skilled manpower to manage.

5.4 Human resource management

Human resource management has four basic functions- staffing, training and development, motivation and maintenance. Organizational shifting from linear economy model to circular economy model requires skilled and motivated employees who will hold the objective of sustainability, and workers need to develop a long-term and interdisciplinary thinking in order to perform their jobs in a sustainable and environmental way. CE model helps to generate competitive advantage by leveraging on technology and innovation practices.

5.5 Firm infrastructure

Firm infrastructure denotes to an organization's structure and its management, planning, accounting, finance, and quality- control mechanisms. Organization's every activity in the circular economy has to follow rule and regulation in concern to environmental practice and taking advantages of tax holiday and subsidiaries. To gain a competitive advantage in a sustainable way, organizations requires planning to deploy technology, facilitate human resources, financing activities and connected accounting system as well as highly motivated management.

6. Conclusion

Circular economy to decouple economic growth from natural resources and finding the innovative path to maximum utilization of existing resources looping circularity in the value chain and at the same time inspiring renewable sources of virgin materials.

Value chain for the linear economy and the circular economy is different in implementation, but it has similarity in supporting activities though it is needed to ensure practicing sustainability among supporting activities.

Through the literature, a fusion of two thoughts (Circularity & Value Chain) are observed and the beauty of this combination that it strengthens organizations competitiveness through cost and differentiation strategy by getting the support of circularity, technology, and innovation. On the other hand, the practice and adaptation of circular business model in the organization can achieve the goal of organizational sustainability and government & customer preference of green environment. The circular value chain analysis helps an organization to gain competitive advantages in an ecological way. Successful implementation of circularity in the value chain helps to overcome pressure from internal and external stakeholder to ensure harmless operations and gaining high sustainability index leadership (Searcy, C. and Elkhawas, D., 2012).

The paper mostly focuses on materials circularity in the value chain and its implementation but avoid biological circularity for more visibility of materials circularity and to avoid diagram complexity and in consideration of less impact on the environment.

The enablers of circularity are shown every step that is changeable over time and here the presentation of circularity (9Rs) is based on the optimistic outcome.

The circular business model creates a scope of new business in the supply chain, communication, procurement, connectivity, reverse logistics, branding and labelling, and certification.

Organizations, community, and government have to extend the hand of cooperation to save the earth keeping garbage overtime and making a happy future.

Consumer awareness and education on responsibility for the environment should be enforced through the initiative on community development towards sustainability and practicing & thinking green. Industrial revolution 4.0, IOT, robotics and overall innovative technology are an accelerator of the circular economy that will assist to minimize the communication gap and to create a platform for customer, supplier, industry, and government.

The proposed circular value chain will support enterprises to gain knowledge on the circular business model, value creation activities as well as state of the art techniques to influence in the decision-making process. The further study on the model could be extended by implementing in industrial level to test the viability of the model and how it works to gain competitive advantage. As this model is a fundamental and holistic view that will enrich over time by the invention and practicing.

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