



Indonesia



INNOVATIONS

ACADEMIC NOTE

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If necessity is the mother of invention, scarcity is the mother of sustainable innovation. Rapid economic development, high population growth, and intensifying urbanization have threatened the planet's natural resources –land, water, atmosphere, and biodiversity– as well as public health and safety. Sustainable innovation can reverse or slow down this rate of depletion and destruction. It can support or complement environmental regulation. Sustainable innovation strives to meet the triple objectives of profit (economic), people (social), and planet (environment) and minimize or avoid trade-offs among these goals.

Corporate innovation is rooted on maintaining sales growth and financial viability. It relies on investments in Research and Development and the creative use of technology to come up with a better, more competitive, more attractive products and services. In contrast, sustainable innovation is rooted on resource scarcity, corporate social responsibility, compliance to regulation, and social pressure.

It is based on resourcefulness and uses the 3R principles – reduce, reuse, recycle – to come out with greener products, services, processes, delivery systems, or business models that have less carbon footprint. Sustainable innovation can be used to generate more jobs, reduce poverty, create more value for producers like farmers, and improve the livelihood and health of the local community and the quality of its environment. Sustainable innovation can be applied to the entire value chain - input, process, and output.

INPUT INNOVATION

The first option in the innovation of inputs -raw materials or components– is the reduction of input quantity required to produce the end product. Volume or weight reduction will mean less energy consumption and carbon footprint from less processing and transport

requirements of lighter or less bulky materials and end products. Often, the end product or components have to be redesigned to maintain the same functionality using less amount of the same materials or parts. Instead of reducing current materials, they may also be replaced with those that are lighter or less bulky.

The second step is the replacement of current materials with more environmental friendly ones without changing the functionality and desirability of the end product. The key principles in input innovation by material substitution are:

- 1 Replacing inorganic, toxic, or non-biodegradable materials with organic, non-toxic, or biodegradable ones
- 2 Replacing non-renewable, scarce, or imported materials with renewable or more abundant, locally available materials
- 3 Replacing virgin materials with recycled or waste materials
- 4 Replacing current materials with those that are recoverable and recyclable at the end of the product life
- 5 Replacing current materials with those with longer lives
- 6 Replacing current materials with those that require less processes or processing.



Carbon footprint is further reduced if material substitution also results in volume or weight reduction. Changing the inputs may require changes in processing. Since the carbon footprint may decrease or increase due to this process change, it is important to ensure that the net environmental effect of input innovation is favorable.

PROCESS INNOVATION

The process may be innovated to reduce environmental impact without changing the input or output. The key process innovation principles for sustainability are:

- Process simplification with the reduction of the number of processes to reduce complexity and lead time
- Reduction of the length and intensity of processing
- Replacing the current process with that with less carbon footprint like greenhouse gas emissions
- Improving the yield and efficiency of the current process to cut material and energy usage
- Designing a closed-loop process in which material wastes, energy, heat, and water are returned to the system to be recycled or reused indefinitely
- Redesigning the process to use cleaner, alternative energy

Service processes or service delivery systems may be innovated similar to manufacturing processes. For instance, logistic processes - forward, backward, or reverse - may be simplified or re-engineered to cut unnecessary transport, hauling, storage, loading, and therefore the carbon footprint associated with these activities. For example, the collection process for recyclable materials and products can be innovated to improve efficiency and ease of collection. Supply chain processes may also be innovated by reducing or eliminating unnecessary channels or middlemen to create more value to producers and simplify logistic operations.

OUTPUT INNOVATION

The inputs and processes may be innovated without altering the outputs - end products or services - to improve sustainability. However, these outputs may be innovated for sustainability without changing their market appeal. By so doing, output innovation or redesign is the most effective innovation strategy since it may result in the reduction of both inputs and processing and their corresponding carbon footprints. Output innovation may also increase the lives of products thus reducing the volume going into the waste stream and the consumption of scarce materials and precious inputs. There are 4 key principles in output innovation for sustainability.

The **1st** or minimalist approach, is the simplification of the product design by removing unnecessary features without affecting product quality, safety, and market appeal. Product simplification will consequently simplify the process, inputs, and logistical requirements. By reducing these requirements to make and sell the product, the associated carbon footprints and resource consumption are also reduced.

To increase sales, companies are now coming out with more and more short-lived "throw away" products that are sealed and unserviceable by the user. The lives of these products are co-terminus with those of their components.

The 2nd product innovation strategy counters this trend. It is designing or re-designing the product for maintainability or parts replaceability. This second strategy will extend the lives of products and their components, thereby reducing the amount or volume of material going into the waste stream.

The 3rd strategy is designing or re-designing the product for reusability or recyclability. This strategy will make it possible, convenient, and economical to recover the reusable and recyclable parts and materials at the end of the life of the product. Products designed this way are easy to disassemble and their recyclable components or materials are marked or labeled for fast sorting, identification, and harvesting by recyclers.

The recovered materials can then be fed back into the original source designed as a closed loop production system. To make this process of reverse logistics efficient and economical, the product may also be designed for ease of collection from end-users at the end of product life or designed for ease of returnability.

The 4th output innovation strategy is frugal innovation which involves the development of affordable products or services that minimize the use of resources or materials. Frugal innovation is achieved by:

- Efficiently using scarce, expensive resources
- Using readily available, inexpensive, or abundant resources and technologies
- Using materials that otherwise would be discarded like production wastes, by-products, excess materials, and other outputs of production systems that do not become part of finished products
- Using recycled materials and parts recovered from products disposed at the end of their lives

OUTPUT INNOVATION

After you have innovated the input, process, or output, any two, or all three, be sure to measure the overall impact of your actions with Life Cycle Analysis or LCA. LCA is a means of quantifying the different social and environmental impacts of a product or service at every stage from the starting activity, like sourcing, to the end of its life or disposal.

For example, if inputs, say materials, are innovated, be sure that the benefits from this improvement will be complemented and not offset by the impact in the resulting changes in process and/or outputs.

SUSTAINABLE INNOVATION SKILLS

Just like other innovation processes, sustainable innovation involves creative or lateral thinking, thinking outside-the-box, counter-intuition, and right brain approach to problems and opportunities. Sustainable innovation is also similar to the survival innovation practiced by survivalist who live off on scarce resources away from civilization like remote jungles, islands, or mountains.

In order to survive, these people learn how to find, use, and creatively convert available resources from nature into food, water, medicine, shelter, weapons for defense or hunting, and communication devices. Natives of remote tribes as well as special military units placed in adverse environments to accomplish their mission all have these survival skills. They can cope imaginatively and resourcefully with extreme and rapidly changing conditions.

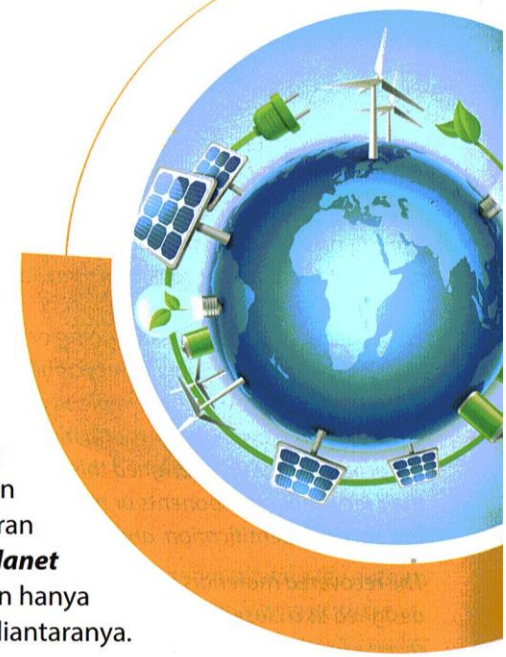


PRINSIP-PRINSIP INOVASI YANG BERKELANJUTAN

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Kalau kebutuhan adalah “ibu” dari invensi, maka kelangkaan adalah ibu dari inovasi yang berkelanjutan (*sustainable innovation*). Perkembangan ekonomi dan pertumbuhan penduduk yang demikian cepat, ditambah dengan maraknya urbanisasi telah menjadi ancaman bagi sumber daya bumi kita – tanah, air, udara, dan keaneka-ragaman hayati – demikian juga kesehatan dan keamanan masyarakat.

Inovasi yang berkelanjutan bisa membalikkan kecenderungan ini, atau setidaknya mengerem laju kerusakan dan pemiskinan bumi kita, melengkapi berbagai upaya dan kebijakan pelestarian lingkungan. Inovasi yang berkelanjutan adalah perjuangan untuk mencapai “**Triple P**” sasaran pembangunan: **Profit** (pembangunan ekonomi), **People** (pembangunan sosial), dan **Planet** (kelestarian lingkungan) sekaligus, dan menghindari kecenderungan untuk mendahulukan hanya salah satu diantaranya.



Seharusnya istilah “inovasi yang berkelanjutan” (*sustainable innovation*) tidak perlu, karena semua upaya inovasi harus berorientasi pada keberlanjutan (*sustainability*). Dengan kata lain, gagasan inovasi yang tidak *sustainable* tidak layak disebut inovasi.

Inovasi di dunia bisnis seringkali terpancang pada sasaran ekonomi saja, yaitu untuk mencapai pertumbuhan dan keuntungan bisnis semata. Inovasi seringkali hanya mengandalkan pada investasi dan kreativitas untuk memanfaatkan teknologi untuk menghasilkan produk atau layanan yang lebih unggul, lebih menarik, dan lebih berdaya saing.

Sebaliknya, inovasi yang berkelanjutan harus didasarkan pada kesadaran akan kelangkaan sumber daya, tanggung jawab sosial, kepatuhan pada peraturan, dan pemenuhan pada tuntutan masyarakat.

Inovasi yang berkelanjutan mesti dilandasi oleh kecerdasan manusiawi dan penerapan prinsip 3R: *reduce* (mengurangi), *reuse* (pakai lagi), dan *recycle* (daur ulang); akan menghasilkan produk, proses, dan layanan yang lebih “hijau”, atau cara menjalankan bisnis yang meninggalkan jejak karbon (*carbon footprint*) yang minimal.

Dengan demikian, inovasi yang berkelanjutan haruslah mampu menciptakan lapangan kerja lebih banyak, mengurangi kemiskinan, menciptakan nilai lebih banyak bagi produsen, meningkatkan kehidupan dan kesehatan masyarakat, dan menjaga kelestarian lingkungan sekaligus. Inovasi yang berkelanjutan dapat diterapkan di sepanjang rantai nilai – input, proses, dan output.



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