Circular Economy Needs the Resilient Systems in COVID-19 Pandemic
(Lingkaran Ekonomi Perlukan Sistem Daya Tahan dalam Pandemik COVID-19)

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ABSTRACT

This note reveals the gaps from circular economy (CE) and resilience in the literature during COVID-19 pandemic. The disruptive event affects the circularity in the supply chain due to numerous single-use-products in food, health, plastic industries. The unsustainable production and consumption is harmful for social, ecological, and economic systems. The industrial practices need a highly resilient network to have better visibility and agility to shift sourcing. Prior studies reveal the gap that CE needs the resilient systems. Still, there is a need to conceptualize and models resilience in CE studies using quantitative and qualitative approaches.

Keywords: COVID-19 pandemic; circular economy; resilience in the supply chains.

ABSTRAK

Nota ini mendedahkan jurang lingkaran ekonomi (LE) dan daya tahan dalam literatur semasa pandemik COVID-19. Kejadian yang mengganggu ini mempengaruhi lingkaran dalam rantaian bekalan kerana banyak sekali produk sekali guna dalam industri makanan, kesihatan dan plastik. Pengeluaran dan penggunaan yang tidak berkelanjutan adalah mendatangkan keburukan bagi sistem sosial, ekologi, dan ekonomi. Amalan perindustrian memerlukan rangkaian berdaya tahan tinggi untuk mempunyai darjah penglihatan dan ketangkasan yang lebih baik untuk peralihan sumber. Kajian terdahulu menunjukkan jurang bahawa lingkatan ekonomi memerlukan sistem daya taham. Namun, terdapat keperluan untuk mengkonseptualisasikan dan memodelkan daya tahan dalam kajian lingkatan ekonomi menggunakan pendekatan kuantitatif dan kualitatif.

Kata kunci: Pandemik COVID-19; lingkaran ekonomi; daya tahan dalam rantaian bekalan.

EDITORIAL NOTE

The rapid spread from the coronavirus disease 2019 (COVID-19) in the world has changed people's life style for both production and consumption. Prevention efforts like social distancing and lesser physical contact lead producers to make product packages for one-time usage. These efforts affect consumers to purchase disposable products in daily life and producers are requested to fulfill the demand on the basis of mitigating massive disposable products (Tseng et al. 2020a). The producer and consumer practices impacted by the COVID-19 has led to unsustainable production and consumption; as a result, the practices need a highly resilient network to have better visibility and agility to shift sourcing, manufacturing and distribution activities towards sustainability. Hence, in the pandemic period, the resilience in circular economy (CE) invokes by government and industrial sectors to acknowledge the social, ecological, and economic systems requiring proper management approaches in the complex situations (Tseng et al.

2020b). The government and industrial entities need to extract and unify the approaches for quantifying resilience for social, ecological, and economic systems in various industries and to provide insights into resilience in CE. Usually, these entities need to respond, monitor, anticipate and learning in the pandemic period to support the resilience assessment in analyzing and quantifying the unsustainable production and consumption and remedies by using data science and analytics in the basic concept of resilience (Tseng et al. 2018).

The CE promotes more sustainable production and consumption (Wu et al. 2017) and has been explored and leads to balancing social, ecological and economic systems, and is thought of as a long-term human activities requirement (Tseng et al. 2013). The government and industrial entities need to have a tactic in this pandemic period whilst resilience is a shorter-term tactic and needs for sustainable production and consumption to be more sustainable. Resilient systems can apply in focal firm in the supply chains and precision to address the sustainable consumption in using data science due to the increasing complexity of supply chain operations with a large quantity of information to heighten the useful massive data and information (Tseng 2017). Today's supply chains make it essential to involve the resilient system in facing the unexpected disruptive events, such as COVID-19 whose effects we are continuing to experience, and to investigate investment strategies for enhancing their resilience under the limited resources (Tseng 2017). The rebalancing of efficiency and resiliency is not an easy task since the increasing resilience involves more costs in the supply chain. We have to focus on the understanding complicated resilience and complex systems such as, supply chain resilience to strengthen the resilience of social, ecological, and economic systems (Wang et al. 2021; Tseng et al. 2020a). Specifically, the circularity is often expected to enhance sustainability and resilience. In lieu of this, this disruptive event needs resilience in involving CE.

Recently, balancing the social, ecological, and economic systems has utilized the data science by Industry 4.0 exploration, including big-data driven analysis, and the Internet of things, to support the circular economy practices and to address production and consumption patterns (Abdul-Hamid et al. 2020; Tseng et al. 2018). CE requires supports from government and industrial entities for policy formulations and needs behavioral changes (Tseng et al. 2016; Wang et al. 2021). CE is applied and studied in various fields in government and industrial sectors; however, these studies are lacking on how the CE is employed under disruptive pandemic events. CE in disruptive situation needs to integrate with the basic concept of resilience. For instance, this disruptive event has significant impacts on the plastic manufacturing, healthcare and food industries. The single-use-plastics consumption patterns including the personal protective equipment such as masks and gloves are rapidly increasing (Patrício Silva et al. 2021). Consumers' behavioral changes increase the amount of plastic wastes. Healthcare industries contribute to generating infectious medical wastes endangering the environment and waste handlers. The food system disruption is due to lockdowns, hindering the food transportation of food to consumers in single-use-package. The massive single-use-package brings impacts on the environment and balancing the social, ecological, and economic system remains as an unsolved problem for government and industrial entities. Instead of this, Industry 4.0 might enhance the missing link of this disruptive situation and the CE needs the resilient systems to quantify the plastic wastes, medical wastes, food wastes and so on.

The sustainable consumption nature suggests that influence of social norms can be a potential means to change behavior in the government regulation. The data driven computer aided generation is to track the consumer's consumption patterns such as techniques readily extended to incorporate relevant resilience in sustainable consumption issues; agent-based modeling is used to simulate or forecast the diffusion of consumer behavior changes through populations under different government policies. Real-time data product purchases provide timely feedback on consumption patterns for subsequent policy adjustment (Wang et al. 2021). The policy maker might use the qualitative, quantitative and social media data to justify their decisions before decision-making (Tseng et al. 2017). Data from social media indicate social norms along with personal norms, subjective norms, and perceived values of consumers. These norms present predictive powers to indicate consumer's behaviors in purchasing environmentally friendly products. As social media is a communication means with massive and rapid changes involving various consumers, policy makers need to take into account consumer's backgrounds in terms of education level, gender, and age. The segmentation of the background of consumer also determines their consumption towards the environmentally friendly products. In turn, the preferences on the environmentally friendly product facilitate the recycling process leading to the ease of reusing and reducing process.

Still, there are issues in the practices in terms of how to practice the resilience in the CE under disruption. Firms practice the resilience in the CE by enforcing industrial symbiosis for a longer period under disruptive events. The industrial symbiosis generates values from material and energetic wastes in the CE domain and allows essential cooperation amongst different areas. Firm starts to evaluate the industrial symbiosis relationships for vulnerability towards disruptions. The relationships are strengthened by promoting the emergence of small and medium-sized enterprises and the firms succeed to promote the CE through sustainable practices such as lean and green practices

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(Tseng & Bui 2017). This note asserts that moving to the resilient system in CE requires capabilities from firms. The resilient capabilities necessitate firms to have better human resources and financial resources contributing to the CE. The human resources have to be viewed as a driving capability due to its adaptability in knowledge and behaviors. The human resources also have roles to interconnect infrastructure systems and services (Tseng et al. 2019). In order to effectively gain the resilience in the CE, it is important to include the financial resources which are seen as a tool to initiate eco-innovative investment and affect business eco-innovations in terms of product, process and organizational. Firms are not only demanded to have the resilient capabilities to address the current disruption, but also required to comprise some preparations for the next disruptive events. Firms have to build an analytical model to assess the impacts of disruptive events influencing physical and monetary flows. Despite some disturbances in the recycle, reduce and reuse for CE, an interface management emergence is to reduce and assess the impacts of disruptive events. The interface management includes identifying, recording, monitoring, and tracking the recycle, reduce and reuse activities during the disruption.

A short note of bibliometric analyses in Scopus uses "Circular economy" and "Resilience" as search terms queries. The search results separately show that there are 7,314 publications on circular economy and even more than 100,000 publications have been done on resilience field. There are plenty of resources for potential research growth between these two concepts. However, the combined search results have revealed only 127 publications have been done; further, there are only 14 publications related to the CE. However, the nexus between the CE and resilience in term of disruption and crisis issues are lacking and this indicates the research field are now under developed and has a gap to be further explored. This note applied the Vosviewer to justify the keywords and pointed out the study trends. Several keywords are criticized as potential solutions in accordance to cover policy and governance, and sustainable development goals such as resource management and recovery, industry 4.0, internet of things, supply chain capabilities, industrial symbiosis, and consumer's behavior, social innovation, supply chain integration and coordination. For the macro scale, the development of green economy, waste management, smart and sustainable cities in term of a circular resilient system should also be emphasized.

In sum, during the pandemic period, consumer's behavior and social life style are changing. The manufacturing sector needs to reflect the changes from consumers due to the government regulation and policy is constrained for all activities. Hence, to capture the resilience and CE in the industries and the opportunities of further studies in enhancing the resilience of the CE under disruptive events, some specific themes are addressed as follows:
1. To understand how resilience in the CE has been comprehended by the academic community; and to understand the development made on quantitative methods/models to support the complex CE decisions when resilience is at stake.
2. To enhance the resilient systems in the CE that may also contribute to their resilience in supply chains by using any method band concept developed for assessing the risks and trade-offs between the resilience and CE.
3. The circularity in the supply chain has to be traced by the data science, including qualitative, quantitative and social media data and the material flow in the supply chain has to address in the symbiotic purpose in social, ecological, and economic concerns.
4. To conceptualized and model resilience in the CE studies along with practical applications or insight that need to be addressed by comparing pre-pandemic, in-pandemic or even post- pandemic as disruptive event.
5. To analyze this disruptive event using methods and tools developed such as life cycle assessment, computational modeling, quantitative analysis, consumer experimental analysis and comparative analysis.

This short note reveals that the CE needs the resilient systems in COVID-19 pandemic and leads to the sustainable consumption and production. Aforementioned, few studies tighten the CE and resilience in the disruptive events. In this pandemic, many complex situations and disruptions reveal the shortcomings of current literatures.

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