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CHALLENGES FOR CIRCULAR ECONOMY ADOPTION IN SUSTAINABLE FOOD SUPPLY CHAINS

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ABSTRACT - This study seeks to identify challenging factors to the adoption of the circular economy in the food supply chain. A total of 17 challenging factors have been identified via a systematic literature review. The challenging factors were grouped into 6 categories: economic, social, institutional, technological and informational, supply chain, and organizational. To prioritize the challenging factors based on literature importance, a literature frequency analysis method was utilized. The possibility of misestimations in challenges ranking that result from frequency analysis is eliminated by employing an article-level research citation metric of Field-Weighted Citation Impact. The findings reveal that the three most critical challenges to adopting circular economy in the food supply chain are cost efficiency consideration, less enforcement of legislation and regulations, and lack of long-term shared vision among stakeholders. The findings will help managers, decision-makers, practitioners, and governments to formulate policies and strategies to effectively implement circular practices in the food industry.

Keywords: challenges; circular economy; food supply chain; systematic literature review; frequency analysis

1. INTRODUCTION

The contemporary trilemma of the food supply chain (FSC), which are global food security, environmental degradation due to over-exploitation of resources, and issues with food loss and waste, has attracted the world's attention. The food requirement will increase by 70% as the world's population is expected to reach 9.8 billion by 2050. Fulfillment of this necessity is predicted as impossible, and it will put greater pressure on natural resources. The food industry already contributes to one-third of global Greenhouse Gas (GHG) production and an 80% loss of biodiversity all over the world [1]. Additionally, one-third of food produced for human consumption is lost or wasted along the supply chain while there are 821 million undernourished people [2]. Therefore, the critical requirement of FSC reformulation has captured recent academic interest. The transition toward a Circular Economy (CE) is suggested as a potential, long-term solution to overcome this trilemma [1].

The CE is about restorative and regenerative design thinking that keeps resources in a closed loop. In contrast to the 'take-make-waste' concept in the linear economy, CE executes reduction, maintenance, repair, reuse, refurbish, remanufacture, and recycling that ensures zero or little waste generation. However, this CE transition in FSC takes a longer time than expected as it encounters numerous barriers. There are several studies focused on barriers to implementing CE in either various food industries or different processes in FSC [3]–[6]. Still, Farooque [3] states that there is a literature gap in a comprehensive list of challenges to adopting CE in FSC. In order to fill the knowledge gap, this study intends to identify challenging factors for the transition toward CE in FSC through a Systematic Literature Review (SLR). Further, this work aspires to rank the challenges based on their literature importance as it is not utilized in the similar field of research [3], [5]. Hence, this work will act as a handbook for CE implementation in FSC as this prioritizes the critical barriers that need initial attention.

2. MATERIALS AND METHODS

2.1. Systematic review and initial data analysis

This study employs the SLR approach to identify an exhaustive list of challenging factors for adopting CE in FSC. SLR differs from traditional reviews since it uses a transparent, and scientific process that reduces selection bias through a comprehensive literature search. This was carried out in three phases, following the content analysis-based literature review guidelines proposed by Seuring & Gold [7] as in Figure 1. Further, categorization of challenges is conducted based on previous literature framework suggested by Tura et al. [8] as it persuades industry practitioners to understand and reformulate practices in FSC that encourage CE adoption methodically.

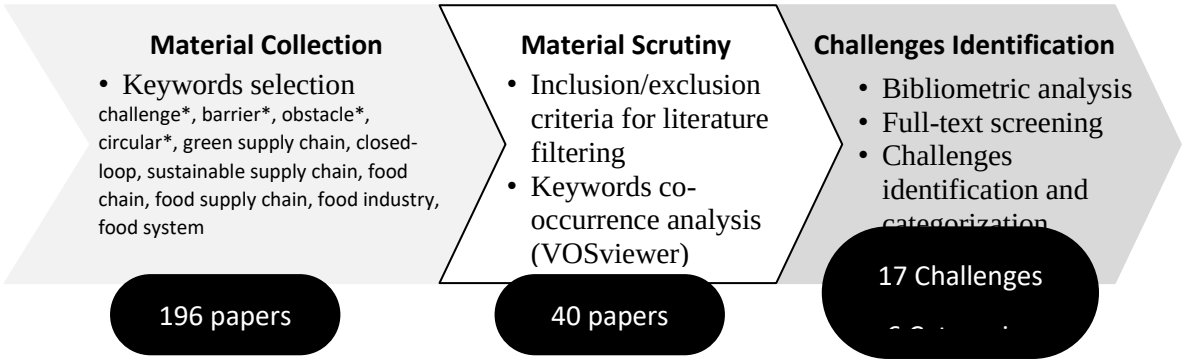

Figure 11. Methodology of systematic literature review

2.2. Challenges Prioritization

Factor ranking and prioritization based on the literature frequency is a widely used methodology. However, the sole consideration of the frequency of literature occurrence can lead to misestimations of factor ranking [9]. To eliminate this possible misestimation, Purkayastha et al. [10] recommended incorporating an article research citation metric of Field-Weighted Citation Impact (FWCI) combined with the literature frequency. The rate of FWCI collates the actual citations obtained by the paper with the anticipated number of citations for a paper published of the same type [10]. Hence, this study derived the weights of challenges by employing a formula that considered the barrier appearance in the articles of review sample and their FWCI.

3. RESULTS AND DISCUSSION

The identified 17 challenging factors, the six challenge categories, the derived weights of challenges, and their final frequency rankings are as follows (Table 1):

Table 6. Results of systematic literature review and challenges prioritization

Category	Challenging Factors		Weights	Ranking
Economic	C1	Cost efficiency considerations	2.96	1
	C2	Issues in investments - scalability and replicability	0.82	12
Social	C3	No trade and social pressure	0.64	15
	C4	Lack of societal acceptance and demand	1.69	6
Institutional	C5	Less enforcement of legislation and regulations	2.29	2
	C6	Insufficient subsidies and uncertainty of incentives	1.37	8
Technological & Informational	C7	Lack of information on processes; less transparency	1.91	4
	C8	A lack of awareness and expertise	1.67	7
	C9	Technological difficulties and R&D deficiency	1.74	5

	C10	Problems in innovations	0.43	17
Supply chain	C11	Geographical challenges	0.99	11
	C12	No long-term shared vision among stakeholders	1.94	3
	C13	Competition from existing linear businesses	1.17	10
	C14	Lack of support from the logistics network	0.78	13
Organizationa l	C15	Lack of infrastructure and methodologies	1.29	9
	C16	Top management reluctancy	0.69	14
	C17	Employee connectedness and company culture	0.44	16

The results ranked cost efficiency considerations as the most critical barrier indicating the requirement of prior attention to the economic sustainability of circular practices in FSC and the necessity of CE funding. Likewise, the ranking of the challenges stipulates their relative importance and the demand for methodical addressing of the critical challenges in order to implement a circular food chain efficiently.

4. CONCLUSION

This study identifies 17 challenging factors for adopting CE in FSC as an initial contribution to CE implantation. An extensive list of challenging factors is derived through an SLR as per the first research objective. The prioritization of challenging factors is performed based on frequency analysis combined with a research citation metric of FWCI. The results identified cost efficiency considerations as the most critical challenge while listing less enforcement of legislation and regulations and the lack of long-term shared vision among stakeholders as second and third prominent challenges, respectively. The prioritization of challenges guides the FSC practitioners to formulate strategies to eliminate the barriers and accentuates the fields that require the utmost attention to implement CE. This highlights diverse opportunities that can be gained from CE transition and the benefits in the long run. Further, the identified challenging factors can be universally applied to any FSC as it was derived using an SLR. Moreover, this work can be extended to prioritize the identified challenges based on empirical importance using responses from industry experts and compare the rankings of importance and pragmatic importance of challenging factors.

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