



“Gheorghe Asachi” Technical University of Iasi, Romania



CIRCULAR ECONOMY STRATEGIES FOR ELECTRIC AND ELECTRONIC EQUIPMENT: A FUZZY COGNITIVE MAP

**Maria Grazia Gnoni¹, Giorgio Mossa², Giovanni Mummolo²,
Fabiana Tornese^{1*}, Rossella Verriello²**

¹*Department of Innovation Engineering, University of Salento, Campus Ecotekene, Via per Monteroni, 73100 Lecce, Italy*

²*Department of Mechanics, Mathematics and Management, Polytechnic of Bari, Viale Japigia 182, 70126 Bari, Italy*

Abstract

A worldwide trend is leading the international community to explore the possible paths for the transition from a linear to a circular economic model. Recent studies identified the main enabling factors to facilitate this transition, among which closed loop logistics models and new service-based and function-oriented business models play a significant role. The diffusion of new business models relating to the use of a product rather than its ownership can indeed reduce material consumption and the related environmental impacts, while customer loyalty and company revenues are expected to increase. However, the overall impacts of such models on the environmental, economic and social perspectives are not clear, as several uncertainty factors arise with the implementation of non-ownership models. Therefore, the aim of this work is to evaluate impacts on sustainability dimensions due to the transition from an ownership-based to a product-as-a-service based model in direct and reverse supply chain of a large appliance product, i.e. washing machines. The analysis is carried out developing a fuzzy cognitive map model to quantify direct and indirect effects on the social, economic and environmental dimensions due to the adoption of a new business model. First, both the traditional and the leasing supply chain models are investigated. Then, the key drivers and their causal relationships affecting systems' performance are identified and discussed. Results stress out the great potential of such a change in the improving of the sustainable dimensions highlighting the enabling strategies viable by a policy maker to facilitate the transition to a product-as-a-service based model.

Key words: Circular Economy, closed-loop, fuzzy cognitive maps, product-service systems, sustainability

Received: February, 2017; Revised final: July, 2017; Accepted: August, 2017

* Author to whom all correspondence should be addressed: e-mail: fabiana.tornese@unisalento.it, Phone: +39 3298471817