

SYSTEM ANALYSIS FOR DECISION-MAKING IN E-COMMERCE PACKAGING LOGISTICS: CASE STUDY IN CHINA

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ABSTRACT

E-commerce is considered as a catalyst for the transition of trade and is transformative toolkit for the fulfilment of some SDGs (5b, 8.3, 9.3, 17.11, etc.). China, now as the world's largest and fastest growing B2C E-commerce market, upholds e-commerce development to steer inclusive wealth. The e-commerce logistics underpins the mobility of e-commerce supply chain and the packaging sector is significant for logistics performances. Despite sustainable attributes of the e-commerce model, the current packaging system of e-commerce logistics still features high eco-burden and lack of sustainability. A systematic approach would help explore the optimum amongst effective protection, minimum socio-environmental impacts and value creation.

This study adopted the concept of 'sustainable packaging logistics' (García-Arca et al., 2016) and applies it to the case study in China. Its general research objective was to capture the systematic features of e-commerce packaging logistics in China and provide decision-making support to improve its sustainability and competitiveness. A 'System Analysis Framework' has been devised as the methodological basis. Three domains (value domain, operation domain and impact domain) were dissected by three respective system analysis methods, which were stakeholder analysis, packaging logistics analysis and lifecycle impact analysis. In-between the methods, linkages were built and construed. This innovative analytical framework could leave legacies to future studies in similar fields.

As for the case study, three specific objectives aligned with the three domains were investigated: 1) to identify stakeholders, stakeholder needs/ value flows, and their perceptions on sustainable e-commerce packaging logistics; 2) to describe the interactions of packaging and logistics activities, identify occurring challenges and propose alternative scenarios; 3) to evaluate the compare impacts of e-commerce packaging logistics under different scenarios. For each objective, the study garnered both expected and unanticipated results. For objective one, 12 stakeholder groups were identified, with 6 groups as definitive stakeholders and 6 groups as expectant stakeholders. Value flows between all 12 stakeholders were mapped and modeled in a stakeholder value network, which further demonstrated the value loops between stakeholders. Both monetisable value loop and non-monetizable value loop were detected, specifically the market value loop and the policy value loop. It shed light on the value delivery mechanism between stakeholders and provided a communicative tool for decision-making. Stakeholder perceptions on sustainable e-commerce packaging logistics shared commonality yet presented prioritisation differences. For objective two, detailed mapping of e-commerce packaging logistics in ‘supplier + 3PL’ and ‘supplier + self-run logistics’ mode were conducted and compared, with which redundancies of logistics activities and packaging challenges were explored. In comparison, ‘supplier + self-run logistics’ generally surpassed ‘supplier + 3PL’ due to higher controllability of the supply chain. Four alternative scenarios were developed upon stakeholder perceptions and packaging logistics analysis, which were: 1) automation upgrade scenario; 2) material substitute scenario; 3) packaging rationalisation scenarios; 4) stakeholder integration scenario. This is a preparation for the objective three, which quantitatively evaluated the environmental impacts of the scenarios. For objective three, the LCA modeling results indicated that ‘self-run logistics’ performed better than ‘3PL’ in terms of impacts and damages to ecosystems, human health and resources. Comparison between a baseline scenario and four

alternative scenarios elucidated that the packaging rationalisation scenario and the stakeholder integration scenario demonstrated relatively higher performance. Discussions were made to certain packaging solutions and lifecycle activities and responded to the disputes observed earlier in the study.

Nevertheless, there are limitations of this research. It is constrained by the state-of-the-art e-commerce packaging logistics and choices of packaging solutions in the future could differ substantially. Furthermore, sensitivity analysis is missing in the impact analysis, and future studies are encouraged to attest its validity.

Key words: E-commerce, packaging logistics, decision-making