Logistics is a key enabler for growth of the retail commerce and product manufacturing industry, and is increasingly emerging as a differentiator in terms of customer service and satisfaction. The logistics sector specific to manufactured product retailing in India was valued at US $ 0.46 billion in 2016 and is projected to witness a CAGR of nearly 45-48 per cent in the upcoming five years to reach US $ 2.2 billion by 2020. (Source: Inc42 report, Mar 2017).

Reverse logistics has attained more and more pertinence during the recent years, as the economics and control over product returns is becoming far more crucial for industry, economy, and environment sustainability. Customers expect a seamless, economical and extended product usability, cost-efficient reuse thereof and safe disposal at its end-of-life. This focus leaves reverse logistics far more relevant in modern times.

Because of the fluctuation and uncertainty in both quantity and quality of the reverse product returns’ flow, design and planning of reverse logistics network is much more complicated compared to the forward supply chain. Huge potentials and implications for acute optimization and seamless integration with the forward supply chain has necessitated focus on optimization of different entities/components of the reverse logistics components. This could be accomplished by development of decision support tools for designing reverse logistics network in an economically efficient and environment friendly manner.

This research work, largely set up in Indian perspective, develops a conceptual framework of multi-criteria decisions involved in reverse logistics network configurations, identifies sector-specific network configuration preferences and validates it through multi-sector industry survey. A sensitivity analysis that determines cross-overs of prioritization in network preference is also validated.

Further, a generic mathematical formulation using Mixed Integer Linear Programming is adapted for a typical multi-stage, multi-facility reverse logistic network set up. The formulation is then optimized for actual inter-facility returns’ flow, distance, and pertinent costs data for an existing automobile tire manufacturing organization.

Lingo 14 optimization tool is used to obtain optimized returns quantities, total costs, and decision support on numbers and locations for the facilities at each stage. Sensitivity to rise in quantity of returns is also evaluated and optimized.