Across all industries, from manufacturing to services, decision makers must deal day to day with the outcomes from past and current decisions that affect their business. Last mile is the term used in supply chain management to describe the movement of goods from a hub to final destinations. This research proposes a methodology that supports decision making for the execution of last mile delivery operations in a supply chain. This methodology proposes diverse, hybrid and complementary techniques (e.g., optimization, simulation, machine learning and geographic information systems) to understand last mile delivery operations through data driven decision-making. The hybrid modeling might create better warning systems and support the dynamic decision-making during the execution stage in a supply chain. The methodology proposes hybrid modeling and self-learning procedures to iteratively test and adjust the gaps between the expected and real performance. This methodology supports the process of making effective decisions in a timely manner, optimization and machine learning models are used to support execution processes and adjust plans according to changes in conditions, circumstances and key factors. The methodology architecture intends to leverage and synchronize technological trends, such as internet of things in supply chain networks by considering the use of complementary approaches. The methodology is applied for maritime and city logistics. The first case discusses the decision process to find the type of vessels and routes to deliver petroleum from ships to villages. Secondly, a network of stakeholders during the city distribution process is analyzed, showing the potential benefits of this methodology, especially in understudied metropolitan areas from emerging markets. Potential applications of this system will leverage growing technological trends (e.g., internet of things).