

Digital Twin Applications in Urban Logistics: An Overview

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“The research of Digital Twins in urban logistics is in pressing need of a fundamental bases upon which it can flourish.”

Motivation:

- Literature lacks a common characteristics of a DT – in urban logistics.
- Makes it difficult to build up on previous knowledge.

Urban Logistics Characterization^[2]:

- Stakeholders
- KPIs
- Resources
- Measures.

DT Definition:

- Virtual model that emulates a physical system.
- Updates itself in real-time using data collected from the physical system.
- Employs analytics to prescribe interference mechanisms.

DT Technical Anatomy:

- Physical World
- **Data & Model Management System**
- Storage System

^[1] Gutierrez-Franco, E., Mejia-Argueta, C., & Rabelo, L. (2021). Data-driven methodology to support long-lasting logistics and decision making for urban last-mile operations. *Sustainability*, 13(11), 6230.

^[2] Anand, N., Yang, M., van Duin, J. R., & Tavasszy, L. (2012). GenCLOn: An ontology for city logistics. *Expert Systems with Applications*, 39(15), 11944-11960.

DT Functionalities:

- Simulate & predict policy implications.
- Real-time monitoring, optimization & control.
- Learning from past operations and their KPIs.

DT Set-up:

- Overcome many challenges.
- Start simple and maintain data accuracy.
- 6-step deployment procedure in Gutierrez-Franco et al. (2021)^[1].

AI Framework:

- **Ontology**
- **Learning**
- **Optimization**

Future Research:

- Numerous opportunities & challenges.
- AI researchers can now observe how their models behave in a real-life environment.

