

Coordinating inventory redeployment between independent manufacturers in distributed networks

Siqing Wu¹ Valeria Borodin¹ Alexandre Dolgui¹
Kannan Govindan²

¹ IMT Atlantique, LS2N-CNRS Nantes, France

{siqin.wu, valeria.borodin, alexandre.dolgui}@imt-atlantique.fr

² University of Adelaide, Adelaide Business School, Adelaide SA 5005, Australia

kannan.govindan@adelaide.edu.au

Keywords: *Manufacturing as a Service, Inventory management, Distributed networks*

1 Introduction

Manufacturing operations frequently face inventory imbalances caused by demand fluctuations, rescheduling, or changes in engineering requirements, issues that are particularly pronounced in the electronics industry. This sector exhibits fast product life cycles and high variability, which cause excess stock to depreciate rapidly in value [3].

Manufacturing as a Service (MaaS) is emerging as a distributed production paradigm in which manufacturing resources are shared through networked providers [2]. While MaaS is mainly applied in the context of providing flexible, scalable, and on-demand access to manufacturing capabilities across distributed providers, its underlying principles can also be extended to material sharing and excess-inventory exchange. Within such ecosystems, firms are no longer limited to their internal inventories. Instead, they can request, offer, or exchange excess stock across the network, thereby reducing the risks of shortages, improving material availability, and limiting waste. This logic is exemplified by platforms such as GREENCHIPS¹ or Resourcly², an AI-enabled shared-inventory service that matches idle, certified parts with real-time industrial needs, contributing simultaneously to operational continuity, sustainability, and circular material flows [1].

In this paper, we investigate decision-support mechanisms that enable independent companies to offer and use excess or non-critical parts and expiring materials (e.g., chemicals) to ecosystem partners.

2 Problem under study

We investigate an inventory-sharing mechanism between two independent manufacturers, allowing excess stock held by one company (i.e., the donor) to be loaned temporarily or transferred permanently to another (i.e., the receiver) facing a shortage. The scheme is illustrated in Figure 1.

Any transfer must respect a key operational principle: The production plan of the donor must not be penalized. To ensure this, the system evaluates forecasted demand, minimum stock thresholds, safety requirements, and future production commitments before authorizing a transfer.

The proposed service enables two independent companies to collaborate by sharing surplus or non-critical inventory in a controlled, mutually beneficial manner. When one company holds

¹<https://greenchips.com>

²<https://www.resourcly.earth/>

excess materials that are not immediately needed for its own production, these items can be made temporarily or permanently available to another company experiencing a shortage. The key principle is that any exchange must not compromise or disrupt the production plan of the company providing the material.

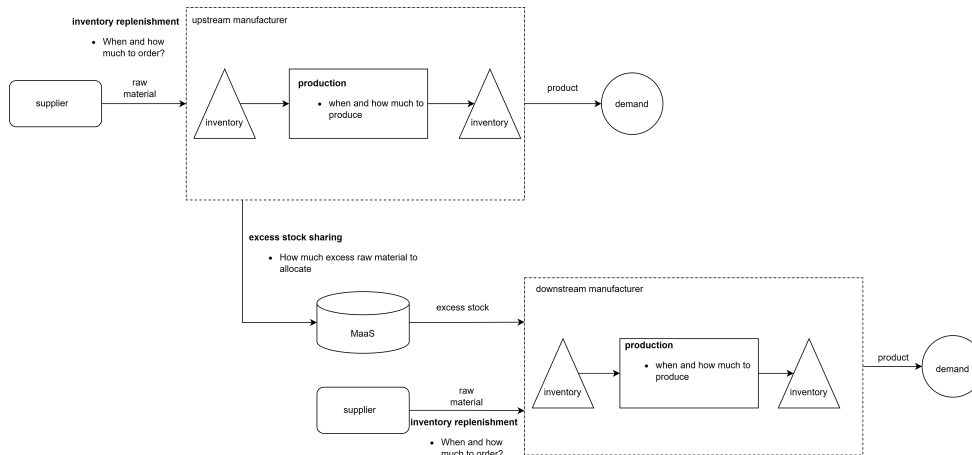


FIG. 1: Inventory sharing scheme

The decision problem therefore consists of determining when and how much inventory can be shared while ensuring that both companies maintain the ability to meet their planned production requirements. The service continuously monitors stock levels, upcoming demand, and the constraints of each partner, and recommends or authorizes transfers only when the donor company's operations remain fully protected. By coordinating these exchanges, the service reduces waste (especially for materials that risk obsolescence or expiration) and decreases the number of production delays caused by shortages. Both companies benefit from improved plan adherence, better on-time delivery performance, and stronger resilience across the network.

3 Acknowledgment

This project has received co-funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No. 101126644. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

References

- [1] Manufacturing as a Service for the EU's twin transition until 2040 (MASTT2040) project (under grant agreement no 101138342). <https://www.mastt2040.eu/2024/09/09/d1-1-casebook-current-state-of-maas-approaches-and-best-practices-to-advance-the-ce/>. Access: 16 November 2025.
- [2] Manufacturing as a service: Technologies for customised, flexible, and decentralised production on demand. <https://www.horizon-europe.gouv.fr/manufacturing-service-technologies-customised-flexible-and-decentralised-production-demand-made#:text=Manufacturing>. Access: 18 November 2025.
- [3] Andre P Calmon and Stephen C Graves. Inventory management in a consumer electronics closed-loop supply chain. *Manufacturing & Service Operations Management*, 19(4):568–585, 2017.