Applications of drones in indoor manufacturing industries
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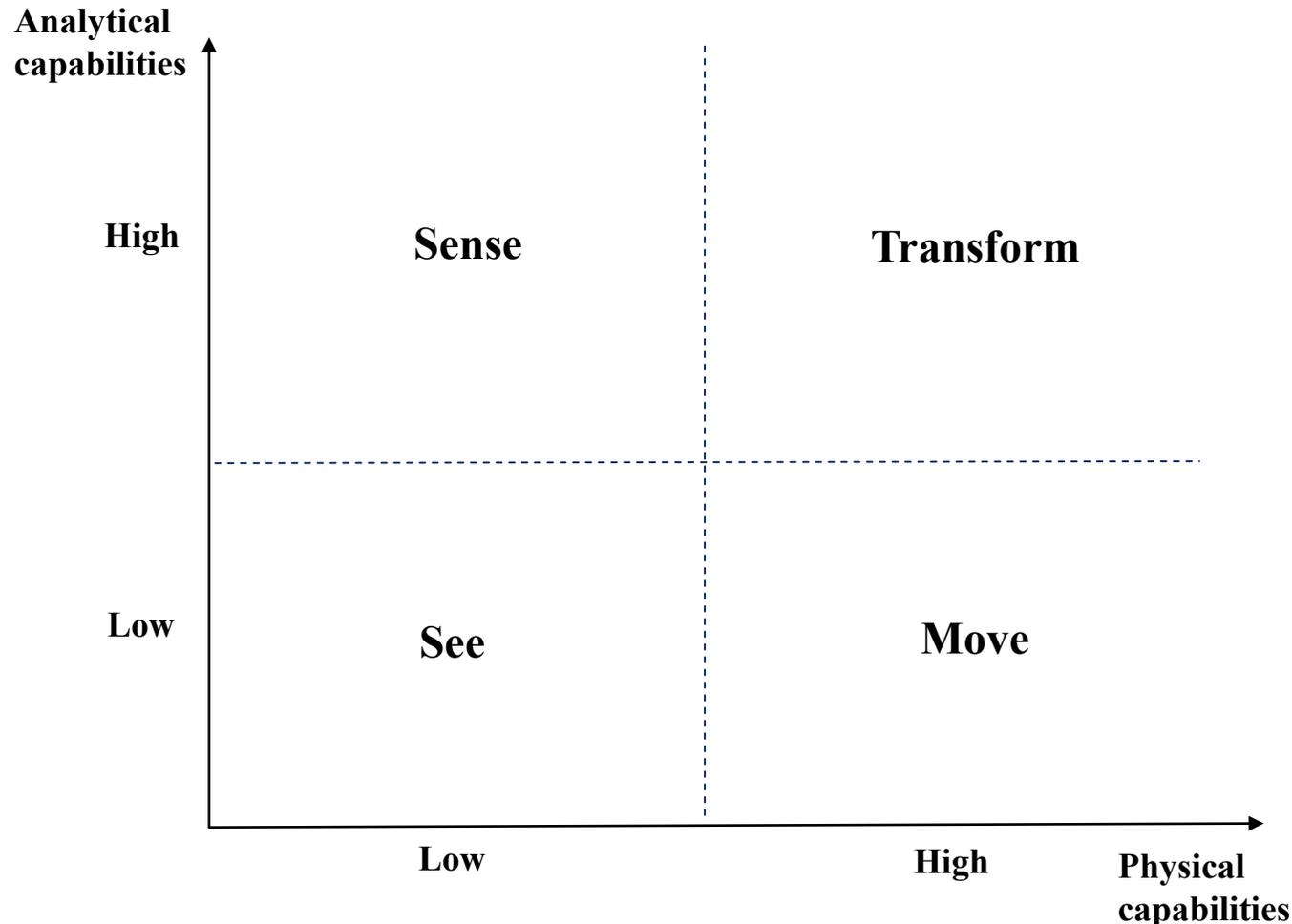
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Chair of Production and Operations Management (POM)

Swiss Federal Institute of Technology (ETH Zurich)

Background

Studying "**what**" (application areas), "**how**" (implementation), and "**so-what**" (effects) of drone technology in **real manufacturing** environments

What: Typology of Drone Applications in Manufacturing

Analytical capabilities (vertical axis)

- **High**
  - **Sense**
  - **Transform**
- **Low**
  - **See**
  - **Move**

Physical capabilities (horizontal axis): **Low** — **High**

Drones in manufacturing: exploring opportunities for research and practice

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Abstract

Purpose – Although the industrial application of drones is increasing quickly, there is a scarcity of applications in manufacturing. The purpose of this paper is to explore current and potential applications of drones in manufacturing, examine the opportunities and challenges involved and propose a research agenda.
Design/methodology/approach – The paper reports the result of an extensive qualitative investigation into an emerging phenomenon. The authors build on the literature on advanced manufacturing technologies. Data collected through in-depth interviews with 66 drone experts from 56 drone vendors and related services are analyzed using an inductive research design.
Findings – Drones represent a promising AMT that is expected to be used in several applications in manufacturing in the next few years. This paper proposes a typology of drone applications in manufacturing, explains opportunities and challenges involved and develops a research agenda. The typology categorizes four types of applications based on the drones' capabilities to "see," "sense," "move" and "transform."
Research limitations/implications – The proposed research agenda offers a guide for future research on drones in manufacturing. There are many research opportunities in the domains of industrial engineering, technology development and behavioral operations.
Practical implications – Guidance on current and promising potentials of drones in manufacturing is provided to practitioners. Particularly interesting applications are those that help manufacturers "see" and "sense" data in their factories. Applications that "move" or "transform" objects are scarcer, and they make sense only in special cases in very large manufacturing facilities.
**Originality/value** – The application of drones in manufacturing is in its infancy, but is foreseen to grow rapidly over the next decade. This paper presents the first academically rigorous analysis of potential applications of drones in manufacturing. An original and theory-informed typology for drone applications is a timely contribution to the nascent literature. The research agenda presented assists the establishment of a new stream of literature on drones in manufacturing.
Keywords Technological innovation, Advanced manufacturing technology, Manufacturing operations
Paper type Research paper

Link to the open access published paper

How: Experimenting with drones in real manufacturing settings
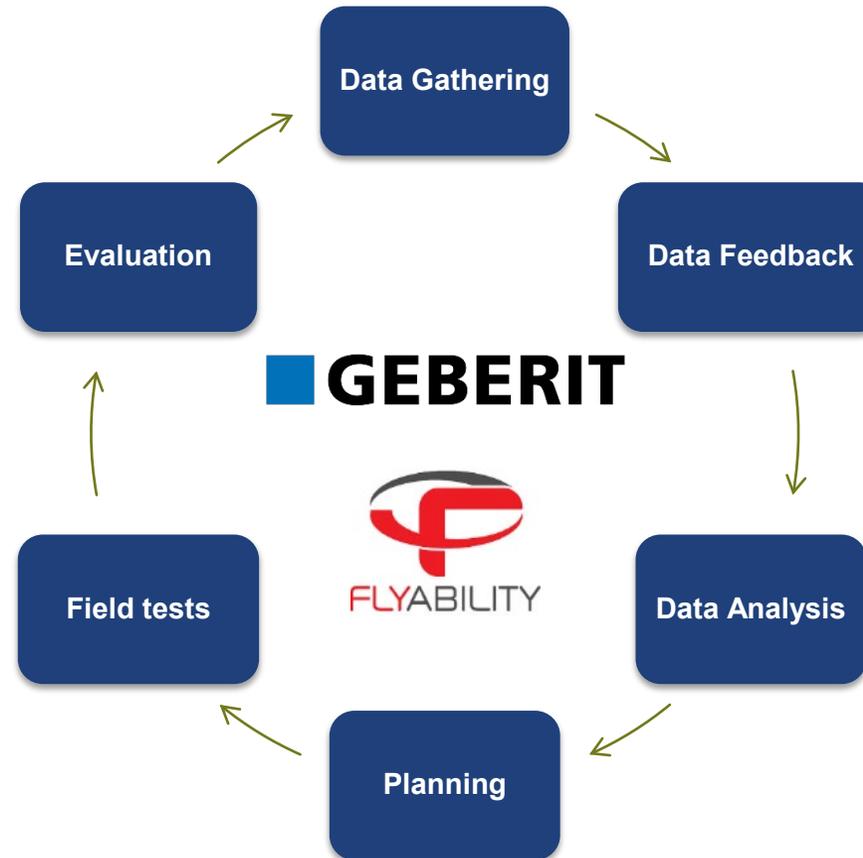
Link to the summary video is available at YouTube

So-what: Benefits and challenges of drones

Benefits

1. Cost savings;
2. Task speed;
3. Safety improvements;
4. Efficient data collection
5. Public relations (PR) and marketing

Challenges

1. Batteries and flight times
2. Failsafe-redundant systems
3. Navigation
4. Higher levels of automation
5. Trust and acceptance

Future steps: Academia-industry collaborations

We are seeking for industry partners to commence an applied **Innosuisse project**.

Objective: To **explore** and **experiment** value-add applications of drones to **improve specific manufacturing operations** and **increase productivity.**

Thank you!

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The Chair of POM's research on drone and Industry 4.0 Technologies

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