Evaluation of PI boxes for last mile delivery

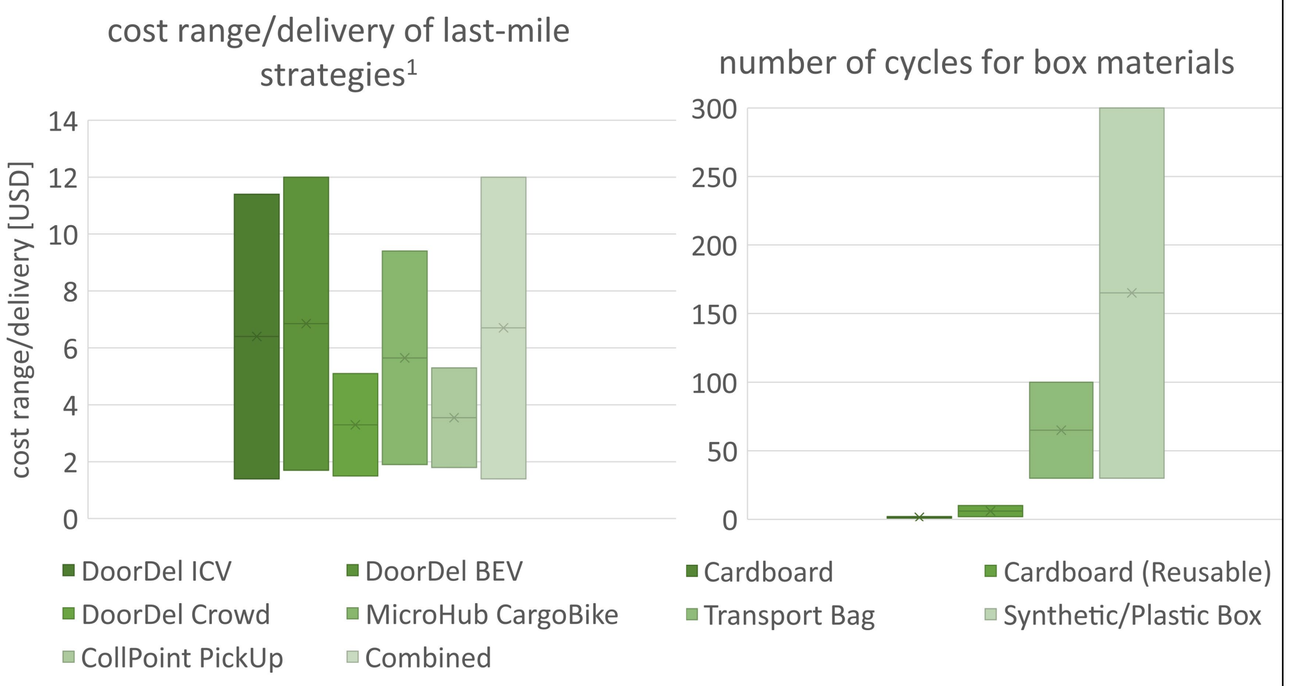
M. Reinthaler, P. König and M. Steinbauer

IPIC 2023
9th International Physical Internet Conference
June 13-15, 2023
Athens, Greece

PhysICAL

Introduction

The last mile is the most time consuming and cost intensive part of delivery processes. The handover of consignments to the customer, the associated multiple delivery attempts, unsecured depositing of consignments and the increasing problems with returns and packaging material require new approaches and solutions in the last mile.
Previous work has shown the cost range of different delivery strategies for the last mile segment, were the door delivery (DoorDel) was listed as the significantly most expensive method.
Furthermore, alternatives to the classic cardboard packaging are required in order to reduce packaging waste and to enable the reuse of packaging material. In contrast to reusable cardboard boxes, many more cycles can be fulfilled with transport bags and synthetic boxes.



[1]A. Pahwa, M. Jaller, A cost-based comparative analysis of different last-mile strategies for e-commerce delivery, Transp. Research Part E, Vol 164, 2022, https://doi.org/10.1016/j.tre.2022.102783.

Objectives

The PhysICAL project is focusing on PI concepts, such as the use of PI boxes. PI Boxes were identified according to appropriate features and integrated into a real-life last mile scenario, tested and evaluated. The pilot cases are in the area of:

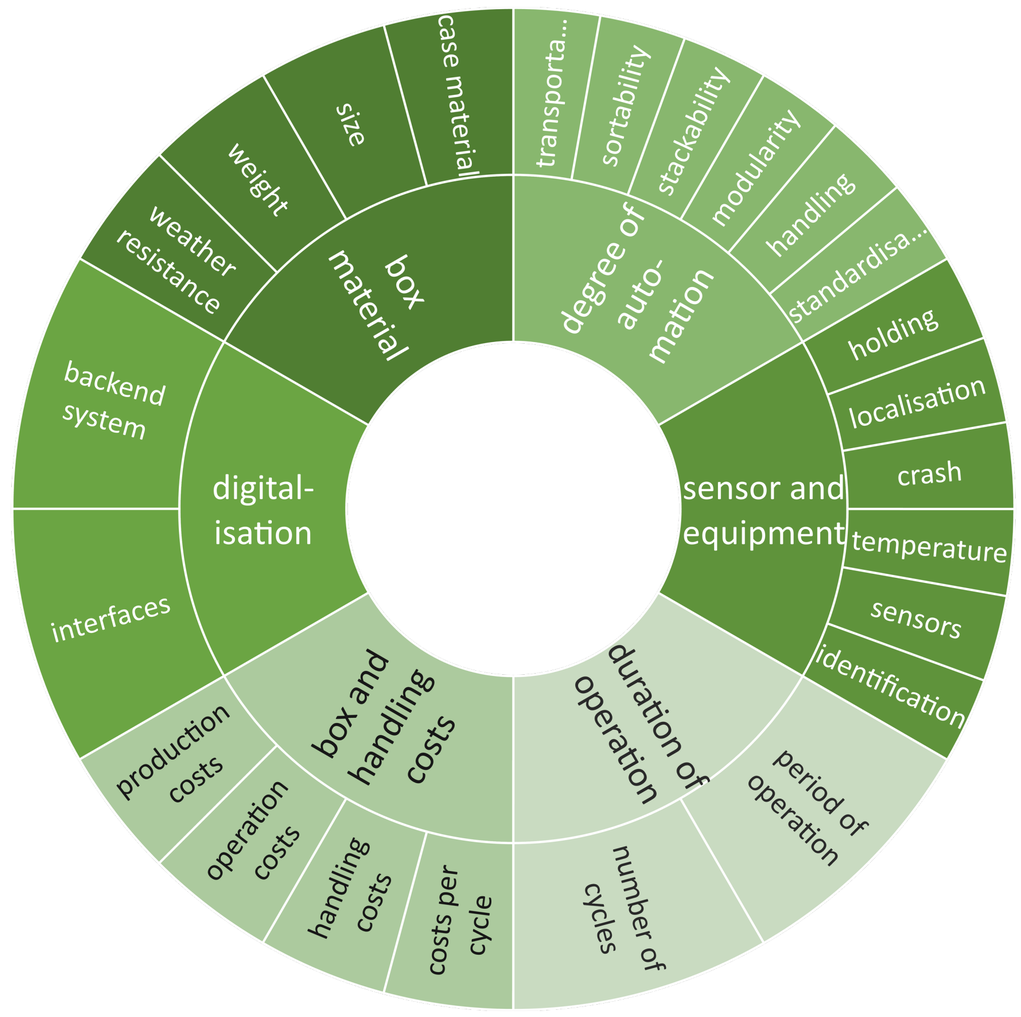
- **eCommerce**: including packaging and consolidation
- **Pharma logistics**: including B2B and B2C services
- **Wholesale**: consolidated delivery of materials to construction sites

The evaluation of the tests will be done by further specifying the feature matrix and the suitability for application scenarios, as well as according to the criteria of sustainability, including economic, ecological, social aspects.

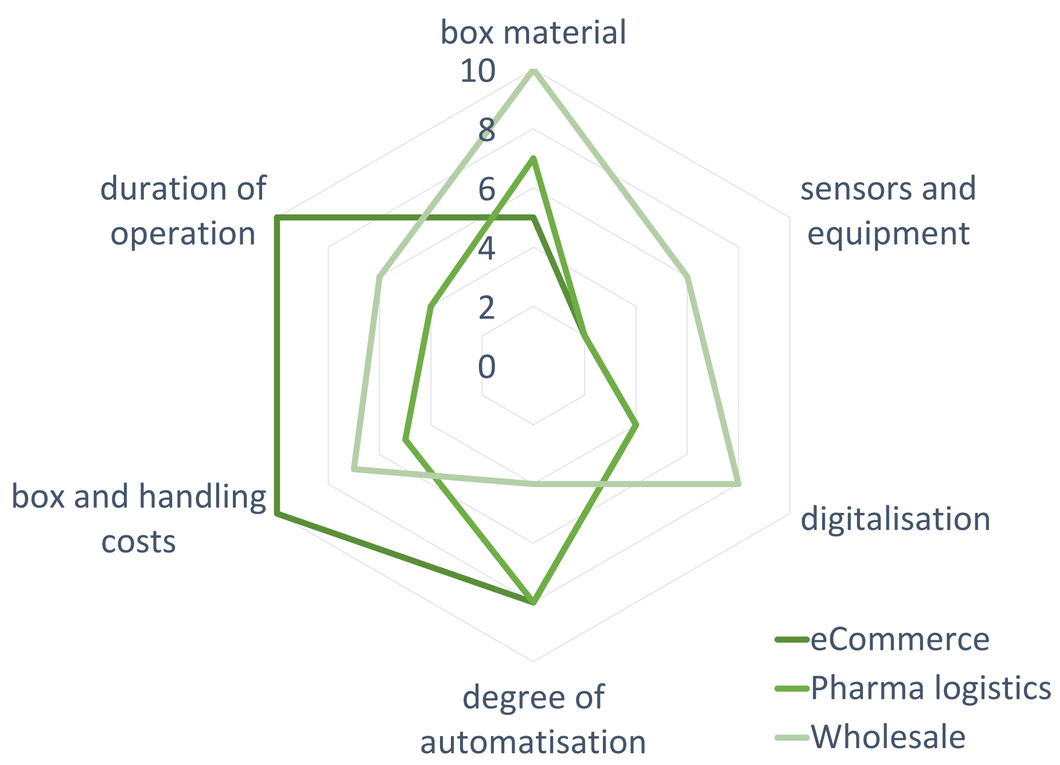
Methodology

Since each application scenario has its specific requirements and framework conditions, the identification of suitable PI boxes is essential. The relevant feature elements for were elaborated to identify the characteristics and performance of PI boxes. The elements were organized in categories to assess the properties of e.g. the materials and sensor technology as well as the handling and expected cycles of PI boxes that are currently available or under development. The assessment is based on the estimation of the suitability of the box in the respective category on a scale from 0 (not at all suitable) to 10 points (very suitable).
At the same time, this evaluation was also applied from the perspective of the use cases in order to describe the requirements of the features of the PI Box. This methodology results in a feature matrix that evaluates and connects both perspectives (requirements of the use case) and properties of the box on the same scale.

Results



As a result of the study the relevant feature elements for PI Boxes were identified and grouped in categories, as shown in the graph. This specifies the assessment metric that was used to assess the suitability of boxes and requirements of use cases from the perspective of the involved actors.



The PI Boxes and the suitability identified from this process will be integrated into a real-life last mile scenario, tested and evaluated. The evaluation of the tests will be done by further specifying the feature matrix and the suitability for application scenarios, as well as according to the criteria of sustainability, including economic, ecological, social aspects.

Acknowledgements

This work received partially funding from the Austrian Federal Ministry for Climate Action (BMK) in the “Mobilität der Zukunft” research program under grant number 877710 (PhysICAL).

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