FORSCHUNGSFORUM
DER ÖSTERREICHISCHEN
FACHHOCHSCHULEN

University of
Applied Sciences

THE CUSTOMERS' PERSPECTIVE ON LAST MILE DELIVERY WITH PARCEL LOCKERS: APPLYING INNOVATION IN THE FIELD OF SUSTAINABLE CITY LOGISTICS

David Strauß, Andreas Breinbauer, Fachhochschule des BFI Wien

Abstract: Parcel lockers are an innovative way to solve the last mile problem that has been increasingly exploited in recent years. As a result, the scientific literature is also addressing this topic with increasing frequency. However, neither in practice nor in the scientific literature has the customer perspective been afforded particularly strong consideration so far. This paper addresses this issue with a qualitative explorative content analysis of respondents' comments from the survey research on a white label parcel locker in the "Alterlaa" residential complex (23rd district of Vienna/Austria). The research question, "What aspects are important to customers with regard to parcel lockers?" was answered by inductively evaluating n=127 relevant survey comments. From the customer perspective, slipper distance, interface management as well as technical implementation and physical implementation emerge as the four key success factors with regard to (White Label) Parcel Locker.

Keywords: Parcel Locker, Customer Perspective, Last Mile

IMC Fachhochschule Krems GmbH
www.imc.ac.at

Piaristengasse 1
3500 Krems
Austria, Europe

+43 2732 802
office@imc.ac.at

Firmenbuchgericht: LG Krems an der Donau
UID: ATU 37552304
FN: 79297p

1 INTRODUCTION

Urbanization and e-commercialization pose new challenges for parcel logistics in the context of the sustainable city logistics (SCL) especial in the last mile (LM), in particular in urban agglomerations. At its core, this involves the rapid delivery of many individual deliveries at the lowest possible cost in the last step of the supply chain, which is predominantly handled by courier, express and parcel service providers (CEP) [3]. In this context, special attention is paid to a zero-emission delivery as a key principle of a SCL. Comparing different innovative technologies used to optimize LM in 65 European cities, it is found that parcel lockers (PL) are one of the most commonly used solutions [4]. PL (smart locker) are defined as a combination of (different sized) compartments to a box complex, which are used for unattended and automated drop-off and pick-up of parcels (self-service technology) [8] and whose service can be accessed at any time (24/7) thanks to electronic encryption technology. PL emerge as either closed (carrier-specific) or as white-label (universal, carrier-neutral) systems (WL). When suitably sited, PL contribute to the financial [11] and environmental optimization of the LM [2]. This innovation benefits the environment, CEP service providers, and end consumers alike. Current research deals intensively with trade-offs and recommendations for action between or on the success factors of location, costs, and environment [2]. The customer perspective (CP) is usually not specifically at the center of research on LM Logistics in relation to PL. However, putting customer at the center of interest is essential for achieving sustainable market implementation, since PL fail when customers do not use or demand the service. This article sheds light on the CP by answering the research question: "What aspects are important to customers regarding Parcel Locker?"

2 METHOD

The CP can be described as a multidimensional construct consisting of "cognitive, emotional, behavioral, sensory, physical and social responses" [10] that influences the probability of use [12]. By focusing on the CP, customer satisfaction can be addressed to increase the likelihood of using a PL (network).

2.1 QUALITATIVE CONTENT ANALYSIS

Mayring's qualitative content analysis was first introduced in 1983 and is seen as the most frequently used text analysis method [7]. Mayring describes QI goal as "the systematic, question- and theory-driven analysis of textual material from" [7]. QI is strongly oriented towards the research material in order to reveal latent meaning in a multi-layered process of understanding. In its approach, QI is designed for comprehensibility and reproducibility [6]. A prerequisite for this is a precise knowledge of the primary source and its context of origin, where the authors of those sources are always considered reasonable [5]. Through a category-guided approach, the direction of the analysis and aspects of investigation is given [6].

IMC Fachhochschule Krems GmbH
www.imc.ac.at
Piaristengasse 1
3500 Krems
Austria, Europe
+43 2732 802
office@imc.ac.at
Firmenbuchgericht: LG Krems an der Donau
UID: ATU 37552304
FN: 79297p

Categories are thereby defined as "aspects of meaning of the text" [7], "which are brought to linguistic short formulas" (ibid.). The content is reductively clustered in the categories which reveal the hidden meaning and in conclusion lead to answering the research question.

2.2 RESEARCH PROCESS

First, the material was defined to include all comments collected during survey research about the WL PL at “Kaufpark Alterlaa” (Vienna, 23rd district: https://www.alt-erlaa.at/) conducted among all residents (3.130 residential units) between March and April of the year 2022 by the University of Applied Sciences BFI as part of the Vienna - Out Of The Box (WootB) project [13] (response rate of 16.6%, n=520 valid cases). A total of 206 comments (40% of n=520) were submitted and analyzed. All comments relating to PL, LM Logistics, online ordering and digitization were defined as the unit of analysis on the bases of theoretical considerations. This reduces the relevant comments by 79 to n=127 in the overview run. After this first run, categories are inductively formed in the first analytical run. In sweeps two and three, not only new categories are formed, but assignments to categories are determined; category labels, explications and summaries are sharpened, and misunderstood comments are patched up in their summaries or explications. In a fourth sweep, details are revised. In this process, a comment may be coded into multiple categories.

3 RESULTS

3.1 OVERVIEW

Out of the n=127 relevant comments, the explorative process of qualitative content analysis yields 151 different codes in twelve different categories (see Table 1). The frequency with which codes are assigned to categories already allows initial conclusions to be drawn about the RQ: more than one-fifth of all codes deal with the slipper distance, i.e., the immediate proximity to the PL, and this thus turns out to be the most relevant category with regard to the LML via PL. With about one-sixth of the 151 codes, the PL interface management (integration of all CEPs) can be identified as the second most important factor. Which leads to the assumption that in the customers perspective a WL PL integrating all CEPs is essential to satisfy their needs. Technical implementation, which refers to a problem-free technical usability of the PL (e.g. the QR scanner), and physical implementation (e.g. display size, security) share third place with a code frequency of about one-eighth. It can be summarized that besides the slipper distance, the CP refers to practicability, usability, and accessibility as success criteria of using PL.

IMC Fachhochschule Krems GmbH
www.imc.ac.at
Piaristengasse 1
3500 Krems
Austria, Europe
+43 2732 802
office@imc.ac.at
Firmenbuchgericht: LG Krems an der Donau
UID: ATU 37552304
FN: 79297p

Category/Code Name	Number Of Codes	Percent
Slipper Distance	*34*	*22,5*
Interface management (Integration of al CEPs)	*24*	*15,9*
Technical implementation	*20*	*13,2*
Physical implementation	*19*	*12,6*
Information management	15	10,0
General remarks	13	8,6
Surfaces Traffic avoidance	9	6,0
Process management	5	3,3
Returns	5	3,3
Delivery and rerouting	3	2,0
Employee protection	2	1,3
Regional	2	1,3

Table 1. Number of codes (n=151) in the respective categories (n=12).

3.2 FOCUS ON "SLIPPER DISTANCE"

For the most frequently occurring category, "slipper distance", the spatial proximity to the PL is referred to. The distance should be so short that it is possible to reach the PL without any effort, e.g., in slippers. In the literature a distance between 200 m and 250 m is suggested to be ideal, to realize all advantages of PL [9]. In the data a majority of 70% of the comments refer to a choice of location in and around (or in front of) the residential blocks. The mailrooms are explicitly mentioned. The (one-way) distance that residents have to cover is approximately 40 m to 50 m (equivalent to about one minute of travel time), not including the elevator ride, because this is automated and does not require any effort. This result must be seen in relation to the average age of the respondents (63 years, 14.5 standard deviation). It can be summarized that for the distance back and forth to the PL for customers in Alterlaa, about 100 m is considered ideal. The fact that PL are usually desired for the ground floor supports the assumption that the number of floors is not important. This suggests that the time required is not the decisive factor, but rather the distance to the PL, which is associated with effort. However, in still 17% of the comments, the shopping park is explicitly found to be a “nearby location”. This corresponds to a maximum (one-way) distance of approx. 400 m (incl. aisle length), which exceeds the optimal slipper distance given in the literature. To conclude the location wish refers to a so-called "residential box", but varies, however, due to the different perception of "what constitutes proximity" in the slipper distance perceived as optimal by the customer.

4 CONCLUSIO

This paper highlights the CP in regard to parcel lockers as a solution for SCL and especially LM Logistics. In a qualitative explorative content analysis of n=206 comments, slipper distance, interface management, as well as technical implementation and physical implementation emerge as most important categories to consider for policy makers, PL operating companies, and PL

IMC Fachhochschule Krems GmbH
www.imc.ac.at
Piaristengasse 1
3500 Krems
Austria, Europe
+43 2732 802
office@imc.ac.at
Firmenbuchgericht: LG Krems an der Donau
UID: ATU 37552304
FN: 79297p

manufacturers. Sustainability and environmental benefits as a key advantage of parcel lockers over conventional delivery methods are not directly issued, but avoidance of surface traffic as well as the desire for regional delivery services is. In other words: The key to a SCL is the maximization of customer convenience.

All results must be considered in the context of the surveyed population group, with an average age of 63 years (14.5 SD, range 18 to 93 years), as well as the Alterlaas residential area and “Kaufpark”.

IMC Fachhochschule Krems GmbH
www.imc.ac.at
Piaristengasse 1
3500 Krems
Austria, Europe
+43 2732 802
office@imc.ac.at
Firmenbuchgericht: LG Krems an der Donau
UID: ATU 37552304
FN: 79297p

5 REFERENCES

[1] Alterlaa (2024, January 10). Alterlaa. *Official Homepage Gesiba Alterlaa*. https://www.alt- erlaa.at/

[2] Breinbauer, A., Strauß, D., Hadzic, B. (2021). State of the Art: Paket- und Umschlagsboxen – Verbreitung, Erfolgskriterien und Best Practice Beispiele. Wirtschaft und Management, 7-44.

[3] Buzzega, G., Novellani, S. (2022). Last mile deliveries with lockers: formulations and algorithms. *Soft Comput. 2022*.

[4] Cagliano, A. C., Mangano, G., Zenezini, G. (2020). *Technological Trends in Last-mile Contexts: A European Perspective.* 8th International Conference on Information Systems, Logistics and Supply Chain: Interconnected Supply Chains in an Era of Innovation, Austin Texas, USA.

[5] Mayring, P. (2015). Qualitative Inhaltsanalyse. Grundlagen und Techniken. Beltz.

[6] Mayring, P., Hurst, A. (2017). Qualitative Inhaltsanalyse. In L. Mikos, C. Wegener (Eds.),

Qualitative Medienforschung. Ein Handbuch, utb.

[7] Mayring, P. (2019). Qualitative Inhaltsanalyse – Abgrenzungen, Spielarten, Weiterentwicklungen. *Forum: Qualitative Social Research*, *20*(3), 1-15.

[8] Meuter, M. L., Ostrom, A. L., Roundtree, R. I., Bitner, M. J. (2000). Self-service technologies: understanding customer satisfaction with technology-based service encounters. *Journal of Marketing*, *64*(3), 50-64.

[9] Niemeijer, R., Buijs, P. (2023). A greener last mile: Analyzing the carbon emission impact of pickup points in last-mile parcel delivery. *Renewable and Sustainable Energy Reviews*, 186, 113630.

[10] Olsson, J., Hellström, D., Vakulenko, Y. (2022). Customer experience dimensions in last-mile delivery: an empirical study on unattended home delivery. *International Journal of Physical Distribution & Logistics Management*, *53*(2), 184-205.

[11] Seghezzi, A., Siragusa, C., Mangiaracina, R. (2022). Parcel lockers vs. home delivery: a model to compare last-mile delivery cost in urban and rural areas. *International Journal of Physical Distribution & Logistics Management*, *52*(3).

[12] Vakulenko, Y., Hellström, D., Hjort, K. (2018). What's in the parcel locker? Exploring customer value in e-commerce last mile delivery. *Journal of Business Research*, *88*, 421- 427.

[13] Wienbox (2024, January 10). Wienbox Home. *Wiener Stadtwerke GmbH*. https://wienbox.at/

IMC Fachhochschule Krems GmbH
www.imc.ac.at
Piaristengasse 1
3500 Krems
Austria, Europe
+43 2732 802
office@imc.ac.at
Firmenbuchgericht: LG Krems an der Donau
UID: ATU 37552304
FN: 79297p