Towards AI Platforms for Stationary Retail

Tim Schopf
Department of Informatics
Technical University of Munich
Garching, Germany
tim.schopf@tum.de

Kilian Dresse
Department of Informatics
Technical University of Munich
Garching, Germany
kilian.dresse@tum.de

Florian Matthes
Department of Informatics
Technical University of Munich
Garching, Germany
matthes@tum.de

Abstract—A major challenge for stationary retail is the increasing digitization of business. While online retailers can increase their sales through data-driven AI applications, brick-and-mortar retailers are left behind because they have less data available due to their traditional physical stores. To bridge the gap between physical stores and online stores, in this paper, an AI platform that connects the digital world with stationary retail is proposed. A digital twin, which represents instances of physical stores in digital form, builds the core of the AI platform. The AI platform can enable digital business models, as well as sales and operations processes that have not been possible to date.

Index Terms—Digital Twin, AI Platform, Retail, Knowledge4Retail

I. PROBLEM STATEMENT

The revenue and popularity of online retail is continuously rising, while stationary retail is left behind [1]. A big reason for this is that e-commerce, digital platforms, and digital transformation pose major challenges to offline businesses in the retail industry [2]. While online retailers can collect large amounts of data and use AI to increase profits, this is not the case for brick-and-mortar retailers. Due to changed customer behavior, online retailers are experiencing growth rates of up to 9.5%, while stationary retailers stand at 1.5% [3]. To "revolutionize" stationary retail, merchants need to evaluate new ways to improve value propositions and expand their services [2], [4]. For this purpose, data must be available on, for example, the movement of products or the customer's interaction with a product in a store, which is currently not the case. The availability of such data would enable new services, e.g., the optimization of store layouts, the support of store employees, or an augmented shopping experience for customers.

II. SOLUTION PROPOSAL

In order to close the gap between physical stores and online stores, the industry needs to make an effort to connect the digital world with stationary retail. However, it is not enough to only have individual digitization solutions, but a holistic concept for the entire industry is needed. To achieve this goal, an AI platform for stationary retail is needed which enables the industry to develop data driven applications. Thereby, among other things, two key factors of retail need to be supported by

the AI platform. First, *strategic retail marketing* by optimizing the product placement inside a store to accelerate turnover and create a more personal shopping experience. Secondly, *intelligent intralogistics* by optimizing and automating store internal logistics, from the arrival of new deliveries to the refilling of shelves. The improved management of logistics needs to be complemented by real-time tracking of items in shelves and detection of out of stock situations. To achieve this, the AI platform needs an API for smart devices such as cameras and service robots. In addition to tracking the placement of items, the smart devices and service robots can also provide various assistance to customers and retail businesses.

To meet the requirements stated above, a digital twin may form the core of the AI platform. A digital twin is a digital replication of a physical object in the real world [5]. In the case of the AI retail platform, the digital twin replicates an instance of a supermarket facility, storing amongst other things, the precise locations of all placed products in their respective shelves. It needs to communicate with the various AI applications through a standardized API, as well as with other components of the system, such as the Enterprise Resource Planning (ERP) software and human resources. The digital twin enables the creation of realistic digital worlds and can enable digital business models, as well as sales and operations processes that have not been possible to date. For example, using the proposed AI platform as a backbone, in future retail stores, employees can advise customers while robotic systems are in charge of stock-taking, replenishing and collecting scattered items.

REFERENCES

[1] G. Heinemann, "Die Neuerfindung des stationären Einzelhandels: Kundenzentralität und ultimative Usability für Stadt und Handel der Zukunft," Springer-Verlag, 2017.

[2] T.P. Böttcher and L. Rickling and K. Gmelch and J. Weking and H. Krcmar, "Towards the Digital Self-renewal of Retail: The Generic Ecosystem of the Retail Industry," In: International Conference on Wirtschaftsinformatik. Springer. 2021, pp. 140–146.

[3] F. Kolf, "Der Einzelhandel droht 2019 zum Opfer der Digitalisierung zu werden," Handelsblatt GmbH, Düsseldorf (2019).

[4] C. Kaplan, S. Tewes, et al., "Redesigning Business Model Strategy: The Digital Future of Retailing in Europe," In: Journal Of International Business Research And Marketing 4.3 (2019), pp. 7–13.

[5] M. Grieves, J. Vickers, "Digital Twin: Mitigating Unpredictable, Undesirable Emergent Behavior in Complex Systems," In: Transdisciplinary Perspectives on Complex Systems. Springer, Cham. (2017), pp 85–113, https://doi.org/10.1007/978-3-319-38756-7_4