Cashierless Stores – the New Way to the Customer?

The check-out process is one of the biggest pain points in shopping. While Apple is the pioneer in cashierless shopping, several other corporations have initiated first concepts during the last months. Innovative, IoT-driven businesses like Amazon Go or Avec Box are trying to improve the process. The recently established concepts vary and a deeper understanding of the underlying functionality is still missing. Our qualitative desk research and store visits give a first overview of the design dimensions, challenges and opportunities for cashierless stores.

Prof. Dr. Marcus Schögel, Severin Lienhard

The first store providing an Internet of Things (IoT) shopping experience has recently been opened to the public. The Amazon Go store, using an app, cameras and sensors, provides IoT-based shopping that mainly aims to reduce queuing times at the cashier desks (Dougal, 2018; NZZ, 2018). Besides this US concept, a variety of cashierless stores is currently emerging worldwide, like “Habitat by Honestbee” in Singapore or the “Avec Box” in Switzerland (Valoría, 2019). Currently, large sums are being invested in the expansion of these new cashierless concepts. Amazon plans to open 3,000 cashierless stores by 2021 (Soper, 2018). Practitioners suggest that tech companies are already offering their products and services to retailers for test runs (Capgemini, 2019). Therefore it can be concluded that this is just the beginning of a bigger trend.

The traditional check-out process plays a central role in retail. Currently, it is still mostly done through a combination of human contact with the cashier and machine-assisted services such as self-checkout stations or through electronic service solutions like pick-up stations (Fitzsimmons, 2003). Nowadays, a variety of new technologies that have never existed before enables retailers to establish cashierless concepts (Capgemini, 2019). In the present paper, cashierless concepts are defined as stores that abolish traditional physical cashier desks and apply the newest technology in their check-out process.

The general need of streamlining the paying process has existed for some time, as waiting at the check-out has always been perceived as one of the least satisfying parts of a shopping experience (Caballero, Lumpkin, Brown, Kansinos, & Werner, 1985; Kahneman, Wakker, & Sarin, 1997; Verhoef, Arnoldes, & de Hoog, 2004; Scholz, 2017). To pay special attention to the check-out process also makes sense from the company’s perspective. First, the peak-end rule highlights the importance of the check-out because it states that what customers tend to remember most is the way an experience ended (Bourouis, Eriksson, Mansjö, & Thiel, 2019). Second, automation in retail enables companies to save up to 81 % of the time currently needed for cashier activities (Begley, Hancock, Kilroy, & Kohli, 2019).

Therefore, it is an appropriate step for retail companies to work on the enhancement of the check-out process. Since retailers approach this problem in highly different ways, an investigation into the merits of these emerging solutions is necessary. The development on the part of the companies themselves as well as the strong media coverage of cashierless shops show the importance of the topic. Yet it remains an open question how exactly the existing concepts differ or what forms they take. Therefore, the following research questions are formulated:

• Which cashierless store concepts exist in the market?
• What are the purchasing phases in cashierless stores?

Towards a Functional Understanding of Cashierless Concepts

To examine the different concepts in more detail and to answer the research questions, the form of a multiple case study was used, which is one of the most commonly applied qualitative research methods (Yin, 2013). A multiple case study allows the researcher to discern differences between and within the cases (Yin, 2003; Baxter &
Check-out. In addition, the research thus, the pre-purchase stage equaled logics and the store design elements. an investigation of the applied techno - ry shopping included: a) the purchase down for cashierless shops. The myste - purchase process into the stages as the basis. These two authors divided by Lemon and Verhoef (2016) was used on the insights gained by the research team during their visits in the stores. In order to define this process, the article by Lemon and Verhoef (2016) was used as the basis. These two authors divided the purchase process into the stages: pre-purchase, purchase and post - purchase. Through mystery shopping, the stages were specifically broken down for cashierless shops. The mystery shopping included: a) the purchase of a soft drink or some cheap gadget, b) an investigation of the applied technologies and the store design elements. Thus, the pre-purchase stage equaled check-in, purchase equalized product selec - tion and post-purchase equalized check-out. In addition, the research team realized that quite often some app installation or customer card owner - ship was required in advance. There - re, this was added as a preparatory pha - se. To summarize, the first phase en - compasses the actions that the custo - mer must take before purchasing, while the second phase equals the check-in, meaning how the customer gets access to the store. In the third phase, the pro - duct selection is checked more closely and the final phase includes the check - out, with the focus on the process of paying and leaving the store. Over all phases, the proportion of user interac - tion to store interaction was examined. The technology used in each case was investigated as well. In addition, a fact sheet was created for each concept and related challenges were listed. Further - more, the concepts were classified on a continuum on four scales: • assortment: kiosk vs. department store, • development stage: prototype vs. on the market, • integration level: standalone vs. part of an experience, • geographic spread: local vs. global. Different sources per store concept were used in order to be able to apply the criteria listed above. The data ana - lysis was conducted in three steps. First, the store concepts were evaluated individually according to the defined criteria. Second, the data were compa - red across concepts revealing differen - ces and similarities. Finally, the key findings were summarized and brought together in table 1. Differences Between the Store Concepts The cashierless shops of these four in - dustries were established by different - sized companies, ranging from retaila - tionals (Alibaba, Amazon, Valora) to SMEs (Migrolino) to start-ups (Bingo Box). Geographically, the spread ext - ends from local (e.g. Saturn Express) to global (e.g. Apple Store). The formats also differ according to how well they are established on the market. Some have largely been rolled out, such as the Hema or Apple Store, others serve only as innovation labs (Sam’s Club Now) or are in their first project stages (Saturn Express). Their product ranges also dif - fer widely. Some focus on a rather small and specified product range (e.g. the Ali - baba Futuremart), others are complete department stores (e.g. Hema Store). When it comes to initiating a purchase, some of the concepts require the installation of an app in advance (e.g. Amazon Go, Hema Store). Their product ranges, however, are accessible without any barriers (e.g. Saturn Ex - press, Apple Store). As soon as the customer is in the store, product selection is the next step. Some concepts require the customer to scan a barcode (e.g. AveC Box) or tap a screen (Albert Heijn). Yet this task can also be skipped completely, as can be seen in the example of Amazon Go. Amazon’s concepts eliminate the enti - re check-out process by using in-store technologies like computer vision, sen - sor fusion and deep learning so the purchase is automatically completed once the customer leaves the store (Po - cket Lint, 2019). Other concepts use face recognition (Hema Store), comple - tion of the transaction in an app (AveC Box), scanning corridors (Tao Café) or scanning scales (Bingo Box) in order to complete the purchase.

Management Summary
Cashierless stores are created all over the world in a variety of formats and in different industries; they make use of the newest technological developments to eliminate the traditional check-out process. For each of the four defined phases of the purchasing process (preparation, check-in, product selection, check-out), the available technologies can be combined and applied in different ways. The opportunities for stores range from cost reductions to higher convenience to a potential refocusing on the customer. Satisfying customer needs, however, remains the main objective.
considerations play an important role. The investment in such a concept can be relatively high, depending on the selected design dimensions. Especially the well-known example of Amazon Go is mentioned again and again. It is controversial whether the advantages of this concept outweigh the costs (Grocery Dive, 2018). Many concepts, like Amazon Go, are based on an app. Research has shown, however, that the usage frequency of retail apps is relatively low (McKinsey, 2014). Therefore, it should be checked whether using an app is really target-oriented.

Another exciting aspect is the influence of missing cashiers on store design. Without cash registers, additional square metres become available which can be used for sales and thus increase turnover per square metre. At the same time, the opportunity for impulse purchasing around the check-out desk disappears. Therefore, the question arises whether the elimination of the check-out desk or automatic check-out will definitely increase the average shopping basket of the customer. A key benefit for retailers is that new data volumes are generated and can be used in a targeted manner. Manufacturers, on the other hand, are forced to ensure that their products are suitable for the respective concepts, by providing, for example, RFID chips on their products.

**Key Takeaways for Managers**

**Goals of the cashierless concept**

From the retailer’s point of view, there are a variety of objectives cashierless concepts can help achieve. Some of these goals translate into lower product costs and rapid expansion (BingoBox), higher investment in the experience (Hema, Habitat by Honestbee) or increasing customer centricity at the PoS (Saturn Express). Cashierless stores may provide increased convenience for the customer or enable the refocusing on customer needs. Without a cash register, more time can be spent advising the individual customer (seller can continuously stay with the customer). On the other hand, opening hours can be extended in the case of non-staffed shops.

**Feasibility of cashierless formats**

Depending on the combination of the design dimensions, feasibility can vary considerably. First of all, it has to be taken into account that big retailers, for instance Coop, nowadays own different formats that work in different ways, meet different customer needs, and have different sizes and assortments (Coop, 2019). At the same time, cashierless concepts require huge investments and do not automatically lead to a competitive advantage. Therefore, it is crucial for retailers to

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**Main Propositions**

1. Cashierless concepts allow the store to refocus on the individual customer.
2. New technology can only provide the foundation for cashierless stores; a compelling customer experience requires additional measures.
3. IoT enables stores to implement successful cashierless concepts and drive growth.
4. A cashierless store opens up new opportunities for the whole customer journey within a store.
5. The acceptance of cashierless stores within the company can pose one of the biggest challenges.

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**Fig. 2: Selected Advantages and Disadvantages of Cashierless Stores**

<table>
<thead>
<tr>
<th></th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td><strong>Costs</strong></td>
<td>Reduced labor costs</td>
<td>High implementation costs</td>
</tr>
<tr>
<td><strong>Revenue</strong></td>
<td>Higher earnings per m²</td>
<td>No impulse purchases at the cashier desk</td>
</tr>
<tr>
<td><strong>Customer Experience</strong></td>
<td>Check-out pain point is removed</td>
<td>Does not automatically address all customer needs</td>
</tr>
<tr>
<td><strong>Retailer</strong></td>
<td>Gathering (live) customer data</td>
<td>The more products are purchased the less time the check out takes up in percentage terms</td>
</tr>
<tr>
<td><strong>Manufacturer</strong></td>
<td>More space for products available in the store</td>
<td>Products must fit with the cashierless store system</td>
</tr>
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</table>

Source: Schögel / Lienhard, 2019.
define why they want to launch cashierless formats. (Cappugi, 2019) As soon as the goal is clear, the companies can figure out which design dimensions best suit their stores. Simply programming an app in which the customer can scan the products and pay directly might already meet certain customer needs.

Customer journey and customer experience in cashierless stores

Cashierless concepts have their own pre-purchase, purchase and post-purchase stages that represent the customer journey (Lemon & Verhoef, 2016). In order to improve the customer experience, the relevant touchpoints along the customer journey must be identified (Bourasli et al., 2019). When a retailer is thinking about implementing a cashierless store, the design should aim to provide the most memorable experience possible (Cappugi, 2019). In order to achieve that, the design dimensions are a good starting point. Over all four phases (including the preparatory stage), the retail company must figure out which dimension can lead to the best possible customer experience. It is important to understand that technology itself does not automatically meet customer needs (Cappugi, 2019). Rather, the customer journey has to be as satisfying as possible. Even if this means that the store has to provide a cash payment option.

Impact of technology and opportunities for cashierless stores

IoT is transforming retail. In concepts like Amazon Go as well as in other concepts, cashiers are replaced (Paul, 2018). Computer vision, sensor fusion and deep learning technologies enable the automatic detection of products and the IoT. Amazon Go shopping experience is completed by cameras, sensors, AI and its applications (Grewal et al., 2018). IoT plays a key role in this new type of shopping experience.

Lessons Learned

1. Cashiershops offer theopportunity to improve the unsatisfactory check-out process and reduce labor costs in store.
2. The focus should be on the available technologies and on how to combine them for each format. Different paths can lead to the desired goal.
3. Take advantage of the simplifications ofcashierless stores and invest, for example, in more time foradvising the customer.
4. Meeting the customer needs remains the main priority, even though this may include accepting cash payments.
5. Keep the peak-end rule in mind: a memorable customer experience is not automatically created by just implementing cashierless store technology.

IoT plays a key role in this new type of shopping experience.

Outlook

The development ofcashierless stores is only just beginning. As established in the results and key takeaways of our research, retailers are in a process where they are considering launchingcashierless stores but are still faced with questions regarding how to proceed. IoT plays a key role in this new type of shopping experience (Dougall, 2018). The design dimensions serve as a tool to create a cashierless store. But all companies must be aware that success does not only depend on the dimensions used but also on the overall customer experience.

This field provides many opportunities for future research. Generally, IoT in retailing is one of the emerging forces and presents a wide range of research gaps (Grewal et al., 2017). Giving up the cashier desk has an impact on store design, for example. The question arises how to use this empty space efficiently. And the new technologies that are used raise questions about adoption or optimal technology design.

Literature

Florida Atlantic University: Boca Raton.
# Consumer Electronics

<table>
<thead>
<tr>
<th>Industry</th>
<th>Company</th>
<th>Store</th>
<th>Required in Advance of the Purchase</th>
<th>Check-in</th>
<th>Product Selection / Recognition</th>
<th>Check-out</th>
<th>Key Findings</th>
<th>Selected Sources</th>
</tr>
</thead>
</table>
| Media Markt/ Saturn | Alibaba | Saturn Express | Any time during opening hours (no barriers) | Barcode scanning opens the barrier | Completion of the purchase in the app by scanning QR code with the help of an employee | - First cashless store project of the company

# Gröcery Store

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<tr>
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| Alibaba | HonestBiz Ltd. | Habit by HonestBiz | Barcode scanning opens the barrier | Just take the products, the company packages and recognizes the products | - Freshness is the key element in this grocery store
- A lot of pain points are transferred from the consumer to the company | Alibaba (n.d), Alibaba. Retrieved from https://www.36kr.com/articles/1018502872212?Expires=1566263254&Signature=ncO7XWKnP4W3Bw%2F7bT6GlDJ3mXm2Fk%

# Convenience Kiosk

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<th>Selected Sources</th>
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<tbody>
<tr>
<td>Amazon</td>
<td>Amazon Go</td>
<td>Amazon Go-App</td>
<td>Barcode scanning opens the barrier</td>
<td>Check-out station what the products are produced</td>
<td>- Test store of Alibaba, consumers can just select their products and walk out</td>
<td>Alibaba (n.d), Alibaba. Retrieved from <a href="https://www.36kr.com/articles/1018502872212?Expires=1566263254&amp;Signature=ncO7XWKnP4W3Bw%2F7bT6GlDJ3mXm2Fk%25">https://www.36kr.com/articles/1018502872212?Expires=1566263254&amp;Signature=ncO7XWKnP4W3Bw%2F7bT6GlDJ3mXm2Fk%</a></td>
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# Valora AG

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<td>Migrolino</td>
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<td>Just walk out (automatic)</td>
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# Migrino AG

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<th>Check-out</th>
<th>Key Findings</th>
<th>Selected Sources</th>
</tr>
</thead>
</table>
| Bingo Box (Start-up) | Bingo Box | Bingo Box app (WeChat profile obligatory) | Barcode scanning opens the door of the store | Automatic RFID scanning on a desk | Place goods on scanner, scan QR code and pay, then an automatic door opens | - Unmatched concept in an automated container
- 24/7 access with a specific app | Retail Insight (2019), BingoBox. Retrieved from https://www.36kr.com/articles/1018502872212?Expires=1566263254&Signature=ncO7XWKnP4W3Bw%2F7bT6GlDJ3mXm2Fk% |

# Alibaba

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<th>Check-out</th>
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</tr>
</thead>
</table>
| Alibaba | Tao Café | Tao Café app | Barcode scanning opens the barrier | Store technology recognizes what the customer buys | Customer walks through a scanning corridor, automatic debiting in the app | - When ordering at the bar, the face recognition technology automatically deducts the amount from the underlying account
- Products bought are recognised when walking through a scanner | Alibaba (n.d), Alibaba.com. Retrieved from https://www.36kr.com/articles/1018502872212?Expires=1566263254&Signature=ncO7XWKnP4W3Bw%2F7bT6GlDJ3mXm2Fk% |