THE IMPACT OF LOGISTICS ON PRODUCT ASSORTMENT POLICY: AN ILLUSTRATION WITH Q-COMMERCE

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ABSTRACT

A new stage in the evolution of e-commerce, quick commerce (or Q-commerce) is expanding rapidly on several continents. Its business model is based on ultrafast delivery since the online shopper receives the product between 10 and 15 minutes after ordering via an application on his/her smartphone. Q-commerce introduces a real supply chain revolution thanks to the promise of a much shorter delivery time than in traditional e-commerce. However, this reactivity introduces a double constraint: Q-commerce companies can only offer their shoppers a very limited product assortment, and the preparation of orders requires the presence of multiple micro-fulfillment centers, or dark stores, in the heart of cities. This research note proposes a reflection on the stakes and the future of Q-commerce, by underlining that the product assortment policy, in other words the retailer's offer strategy, is strongly conditioned by the efficient organization of the logistical operations.

***Key words**: Dark stores; Last mile; Logistics; Q-commerce; Ultrafast delivery.*

บทคัดย่อ

ควิกคอมเมิร์ซเป็นอีกขั้นหนึ่งในวิวัฒนาการของอีคอมเมิร์ซกำลังขยายตัวอย่างรวดเร็วในหลายทวีป มีรูปแบบธุรกิจที่ขึ้นอยู่กับการจัดส่งที่ฉับไวทำให้ลูกค้าที่ซื้อสินค้าออนไลน์สามารถรับของได้ภายใน 10 ถึง 15 นาที หลังสั่งซื้อสินค้า ควิกคอมเมิร์ซถือเป็นการปฏิวัติโซ่อุปทานอย่างแท้จริง อย่างไรก็ตามความฉับไวนี้ก่อให้เกิดข้อจำกัด 2 ประการ คือ ความหลากหลายของสินค้า และการเตรียมสินค้าตามคำสั่งซื้อจำต้องมีคลังสินค้าขนาดย่อมหรือคลังมืดกระจายอยู่หลายแห่งกลางใจเมือง งานวิจัยนี้นำเสนอความเสี่ยงและอนาคตของควิกคอมเมิร์ซ โดยเน้นนโยบายความหลากหลายของสินค้า ซึ่งเป็นกลยุทธ์การเสนอของผู้ค้าปลีกที่ขึ้นอยู่กับประสิทธิภาพการจัดการลอจิสติกส์เป็นสำคัญ

คำสำคัญ: คลังมืด ไม้สุดท้าย ลอจิสติกส์ ควิกคอมเมิร์ซ การจัดส่งที่ฉับไว

INTRODUCTION

The concept of quick commerce (or Q-commerce) has been gaining momentum for several years in Europe, the United States and Asia. It is based on the marketing promise that convenience goods will be available within minutes of an online order on a website via a smartphone application. This promise refers to the traditional issue of online logistics service

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quality, which has been widely studied elsewhere (Huang *et al.*, 2009; Rao *et al.*, 2011; Murfield *et al.*, 2017; Zhang and Smutkup, 2021). To be able to keep such an extremely ambitious promise (we talk about "instant deliveries"), Q-commerce companies have set up an original logistical system based on dark stores, in other words small warehouses whose objective is to ensure ultrafast deliveries. Located in the heart of cities, the dark store takes the form of a "ghost" store, with shelves where products are stored, but unlike a traditional store, these are not accessible to shoppers, but only to order pickers who select the products, which are then transported by delivery drivers on bicycles or scooters to the homes or workplaces of online shoppers.

On an operational level, dark stores occupy a surface area of 100 to 300 m^2 and contain between 1,000 and 2,000 items of convenience goods. In order to respect a delivery time of 10 to 15 minutes, the dark stores are located in direct proximity to shoppers, excluding long-distance orders. As a result, Q-commerce is a niche market that only addresses large cities such as Paris, Amsterdam, Berlin or Madrid, because this form of retailing must rely on a potential 150,000 to 200,000 shoppers to be delivered. At a time when urban shoppers are increasingly doing small but frequent purchases, and when smartphone use has become a reflex –if not an addiction– for millennials (Thompson and Thompson, 2017), Q-commerce seems particularly well positioned to respond to new online consumption habits. As emphasized by Bommireddipalli (2022), "consumers who used to be willing to step out and visit their neighborhood mom-and-pop stores or malls now prefer to stay home. Add to this the work-from-home lifestyle for busy professionals and the concerns of the aging population, consumers today are willing to pay a higher price for on-demand instant delivery. As shifts like urbanization, rising disposable incomes and single households continue to grow, this number will only multiply".

Q-commerce companies still have to significantly expand their offer to get rid of the "convenience purchase" label imposed by the narrow range of products. For example, Gorillas in Germany has doubled its fruit & vegetable offer from 50 to 100 items, while signing numerous partnerships with butcher's shops, fishmongers, cheese dairies and even breweries and bakeries operating near its dark stores. This evolution risks to complicate the logistical operations in terms of preparation of orders, because the upstream of the supply chain will then be split up to the extreme, whereas it is massified in the case of traditional e-commerce, with full load supplies from powerful suppliers (Yu *et al.*, 2017). The central question is therefore to know if the logistical constraints linked to the *time-based competition* strategy initiated by Q-commerce will not have a strong influence on the assortment policy of retailers. In order to prepare and deliver orders as quickly as possible, they risk being condemned to reduce the size of their product assortment, thus preventing competition based on a wider offer.

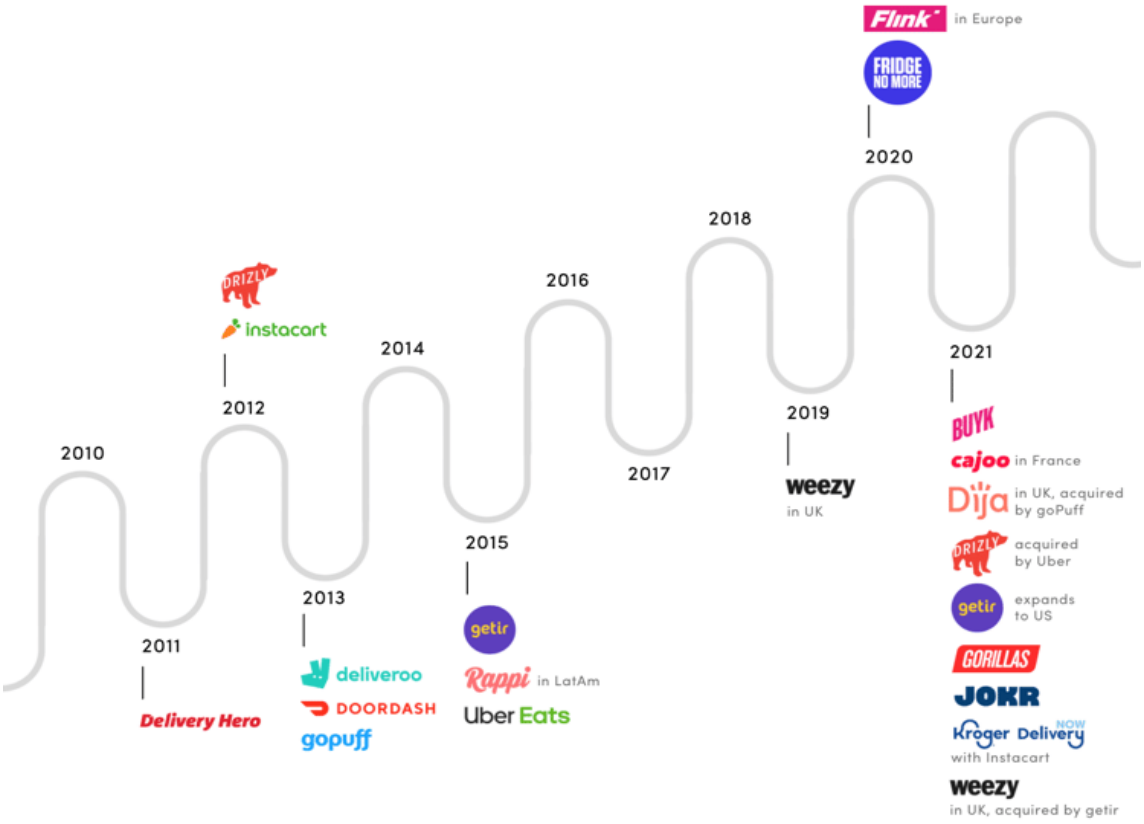
To argue this point, the research note is organized in three sections. In the first section, the central place occupied by the product assortment in the marketing mix of Q-commerce companies is highlighted. The central hypothesis is that the shopper turns to Q-commerce to "buy" primarily an ultrafast delivery service associated with a limited number of products. In the second section, the logistic system resulting from the requirements of ultrafast delivery is presented, insisting on the key role of dark stores. In order for the Q-commerce business model to survive, the improvement of the dark store operation is essential, which explains the current reflection on technological and managerial innovations that should allow to guarantee the marketing promise of recurrent instant deliveries. In the third section, we look at the future of Q-commerce in a potentially hostile environment, with both local authorities wishing to

regulate the expansion of dark store networks, and traditional retailers wishing to protect the rents of their physical stores in the cities.

DELIVERY TIME VS. PRODUCT ASSORTMENT

Q-commerce is a component of ubiquitous commerce, or u-commerce, which offers the possibility for a shopper to buy products anywhere and anytime, via applications on a smartphone, and whose importance has sparked an explosion of academic research since the 2000s (Zhang and Liu, 2011). For the retailer, it is an additional point of contact with the shopper whose main feature is ultrafast delivery, within minutes, after the order is taken. The concept was first implemented in the United States by Kozmo.com at the end of the 1990s but was quickly stopped due to lack of profitability (Wu, 2001). Relaunched in 2013 by Gopuff, again in the United States, targeting students, Q-commerce benefited from the Covid-19 pandemic to expand during successive lockdowns (Paché, 2023). Figure 1, compiled in February 2022 by Profitero, confirms that 2021 is clearly the year of take-off. Although the penetration rate is still limited and concentrated in large cities, where urban density is sufficiently high to guarantee a minimum number of potential clients, there is real potential for development, particularly among millennials who are adept at the "cult of urgency".

Figure 1: The Rise of Q-commerce: 2021 as a Milestone



Source: Profitero Consulting (2022)

The success of Q-commerce depends initially on the ability to determine shoppers' precise product expectations, both in terms of product categories and purchase frequencies, in other words to "paint a portrait" of the online shopper, to use the expression of Kooti *et al.* (2016). The simplest way to do this is to use historical data to anticipate future sales, which is a prerequisite for available inventory to accurately meet demand, and to couple this data with

demand forecasting tools to replenish inventory in real time. Of course, Q-commerce can only succeed if a coherent pricing policy is implemented, taking into account the competitors' offer. Before deciding on a company, shoppers do search for the best offers on different applications, and price comparison is undoubtedly an essential aspect of the shopping experience, including the use of price search engines (Hackl *et al.*, 2021). A competitive pricing strategy does not mean that Q-commerce companies are reduced to systematically lowering their prices; rather, it is about adjusting prices relative to competitors without significantly impacting the bottom line.

If the price of products is an important element of the retailer's marketing mix (Filser *et al.*, 2020), the competitive advantage of Q-commerce companies is also and above all based on the respect of a short delivery time, which is much shorter than what e-commerce usually offers (three to five days). However, unpredictable factors such as an explosion of last-minute orders, traffic jams or unfavorable weather conditions can disrupt the planning of deliveries and then the management of the last mile (Macioszek, 2017). To cope with this, the retailer will try to locate as close as possible to the shopper, and to offer a smaller product range so that the order preparation and delivery can respect the promise made to the shopper of a short delivery time. Since delivery is made within 10 to 15 minutes after placing an order online, the products must be considered as being of primary necessity and/or of short-term use; these are product categories for which the postponement of the purchase may prove problematic for the shopper's satisfaction, and which most often obey an impulse (ice creams, confectionery, cakes for aperitif, drinks, flowers, etc.).

Explicitly, the central issue is how shoppers evaluate the delivery attributes offered by online retailers, especially the delivery time, the delivery slot, and the delivery fee, and the level of individualization of the last mile delivery options (Luttermann *et al.*, 2021). This is a recurring question, the managerial dimensions of which are, for example, at the heart of Amazon's logistics service strategy, which offers differentiated delivery times, with the fees charged to the shopper increasing as the delivery time is reduced. Nguyen *et al.* (2019) thus sought to analyze the extent to which "mental accounts" for time, for money, or for convenience impact the choice of one delivery option over another. Their research revealed three shopper segments with distinct preference structures: a price-oriented shopper segment, a time- and convenience-oriented shopper segment, and a best-value shopper segment. While the research was conducted in the context of traditional e-tailers, its findings may be useful for Q-commerce companies in maximizing shopper satisfaction and identifying their true time sensitivity in relation to a diversity of product offerings that will be technically limited due to the small size of dark stores.

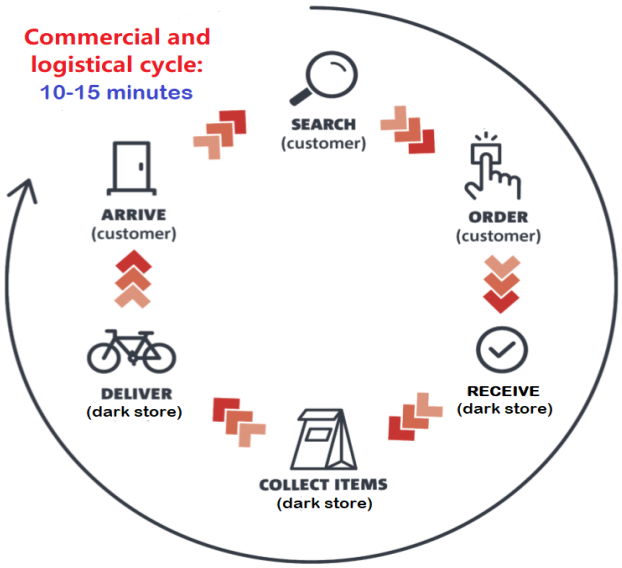
Indeed, the management of product assortment is complicated by the limited number of storage locations and the limited space dedicated to order preparation in dark stores, whose surface area, as we have said, is usually between 100 and 300 m^2. Under these conditions, it is not easy for Q-commerce companies to find the best category trade-offs, which are essential to their success. Some product categories are indeed sensitive to stock-outs, such as milk for breakfast cereals or flour for dinner cakes. It is true that substitution between products can be envisaged to cover a sufficient level of the shopper's needs in the short term, but it seems difficult to generalize substitutions; for example, it will be difficult to change a package of diapers for another product present in the shopper's home. It is therefore necessary to evaluate the essential and non-substitutable nature of certain products in order to keep them in the assortment, and to be able to deliver them in 10 to 15 minutes. It is therefore possible to affirm that logistical constraints define the configuration and size of the product assortment,

which is in line with the work of Kautish and Sharma (2019) on the e-tailing service experience in reference to the online product assortment.

Q-COMMERCE LOGISTICS

The dark store, sometimes called micro-fulfillment center, is a small warehouse whose purpose is to prepare orders placed online by shoppers, and from which delivery personnel transport the products over a few hundred meters by bicycle or scooter (Shorung *et al.*, 2022). These are mostly former stores, now without shoppers, with shelves where products are stored. Dark stores are usually located at the foot of buildings, less frequently in basements, and operate in a catchment area of less than two kilometers. In short, what used to be a physical store is transformed into a logistical center in the heart of the city, an essential condition to guarantee ultrafast delivery (Kumar and Khatri, 2022). A city with several hundred thousand inhabitants therefore requires a Q-commerce company to have a network of dark stores ideally placed in the urban space. This is the case for the start-up Flink in Paris. Its logistical success is based on a network of dark stores located in the heart of each district of the French capital and organized in such a way that every Parisian lives, without knowing it, less than 10 minutes from the nearest dark store. It is therefore eligible for the commercial and logistical cycle of Q-commerce, as presented in Figure 2.

Figure 2: Commercial and Logistical Cycle Associated with Q-commerce



Source: Adapted from Delivery Hero Company (2022)

Beyond the location of dark stores, ultrafast delivery requires a total optimization of logistical operations, which can only be deployed on a product assortment of reduced size given the available surface. From this point of view, the organization of the products within the dark store plays a very important role, and it conditions the success of an optimal order distribution based on deep reinforcement learning (Kavuk *et al.*, 2022). Generally, dark stores are mapped and arranged according to the needs of shoppers in the catchment area (most ordered products, seasonality, etc.). At the start-up Cajoo, acquired by Flink in May 2022, thanks to staff training and route optimization, pickers know the topography of the dark store perfectly after 20 minutes, reducing order preparation time to an average of two minutes. In 2022, operations within dark stores are still very manual, however, with employees having a Personal Digital Assistant on their forearms to quickly scan products. Picking should be

rethought in the next years, as Seidel (2021) suggests, using three complementary technologies:

- *RFID chips and smart barcodes*. Thanks to this type of technology, it is easier to track the use-by dates of fresh products and to monitor stocks. Supply chain performance should be rapidly improved if we take the example of traditional retail.

- *Augmented and virtual reality*. Through the use of a smartphone or connected glasses, the operator is guided throughout the preparation of the order and is shown the location of each product as well as the optimal route to retrieve them.

- *Partial or total automation of the dark store*. With AI, IoT or robotics, the automation of dark stores allows to optimize both the storage of products (according to the recurrence of orders), but also to facilitate the collection of orders for operators.

While the technological stakes are high, the human dimensions of the future development of Q-commerce should not be underestimated. Perfectly located in the urban space and organized to facilitate last mile deliveries, dark stores require the presence of top managers and operators to make them work. For example, at the start-up Cajoo (Flink), the hierarchical structure includes a regional manager for each city, a hub manager who manages three or four dark stores, a hub lead who manages a single dark store, a pilot who is in charge of the opening of each new dark store, a team of pickers who prepare the orders, and the delivery drivers who transport the products to the shopper. While the organizations may differ on points of detail, the general problem remains the same for all Q-commerce companies, particularly with regard to the strategic role assigned to the delivery person, whose performance directly conditions the perceived level of online logistics service quality. To keep the promise of ultrafast delivery, three options are possible:

- The employment of salaried delivery drivers for greater reliability in delivery. The start-up Cajoo (Flink) has chosen to recruit its delivery drivers, train them and provide them with electric bikes.

- The employment of independent delivery drivers, with the status of self-employed, which allows for greater agility during order peaks. This is the case for the majority of Q-commerce companies.

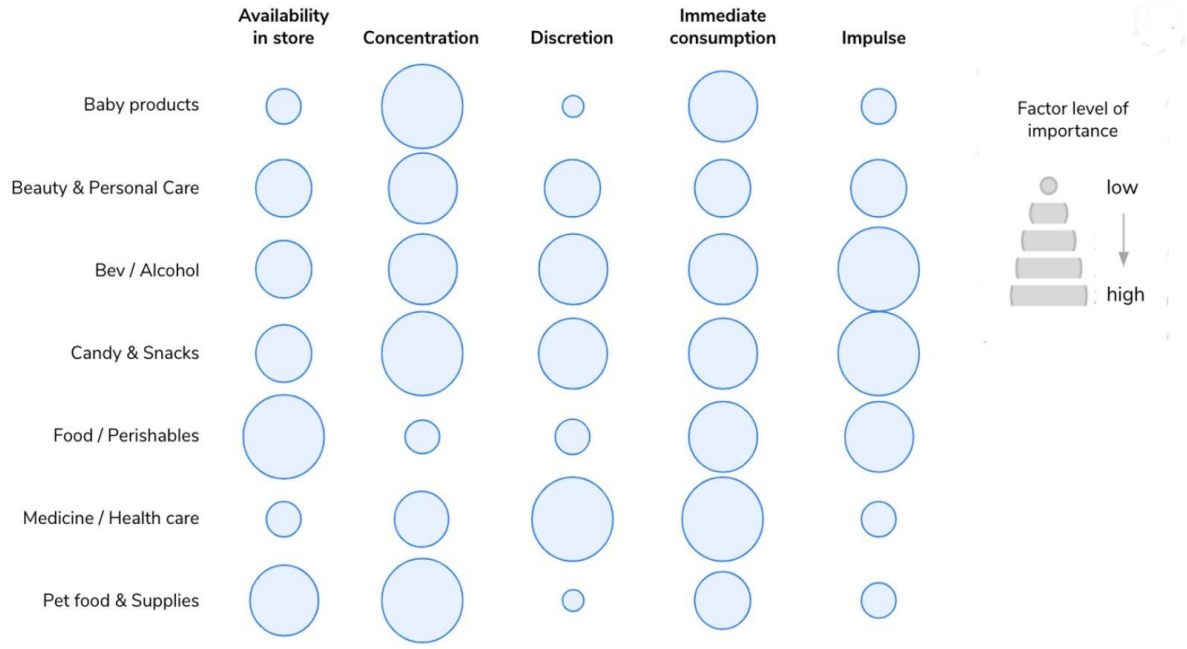
- The use of third-party partners, specialized in last mile delivery, as is the case for example with Carrefour Sprint, which uses Stuart to ensure deliveries with ecological vehicles.

WHAT FUTURE FOR Q-COMMERCE?

The Q-commerce business model has been developed to satisfy only very specific needs, the common characteristic of which is that they require near-instant availability: a missing ingredient for a cake made with one's children, a friend who arrives unexpectedly for an aperitif, a longer-than-expected day at work, etc. Figure 3 specifies the category affinity for Q-commerce, giving useful indications of the development potential. It is therefore the speed of execution of the logistics cycle that constitutes the source of competitive advantage, and the competition between Q-commerce start-ups corresponds to what Stalk (1988) calls time-based competition. Time-based competition seeks to compress the time needed to design,

produce, sell and deliver products, with an ultimate goal: extreme speed to market, to create a surprise effect compared to slower competitors. Although Stalk (1988) focuses on manufacturing firms, his reasoning applies perfectly to the retailing industry, since it is in contact with shoppers whose time is precious.

Figure 3: Category Affinity for Q-commerce



Source: Profitero Consulting (2022)

Obviously, it is important for Q-commerce companies to differentiate themselves with a good price positioning, as mentioned above, but one of the pillars of competitive advantage remains the respect of the ultrafast delivery promise (Paché, 2022). From this point of view, the presence of dark stores generates two real advantages for companies: reduced personnel costs, on the one hand, and better inventory management due to the reduced size of the product assortment, on the other. However, Q-commerce could very quickly face challenges that threaten its expansion. At the societal level, environmental activists are challenging the business model regarding its usefulness in a context of challenging overconsumption, at the same time as efforts are being made to initiate sustainable urban logistics (Sirjean *et al.*, 2019). But the most significant threats are economic and political:

- At the economic level, Q-commerce companies should find it difficult to expand outside of very large cities, while they are already experiencing a continuous increase in real estate prices and will have to invest in automated systems to make order preparation more reliable.

- At the political level, under pressure from residents' associations, large cities want to regulate the anarchic installation of dark stores, which disrupt road traffic, generate noise pollution and lead to the failure of small stores that contribute to the dynamics of the city.

The last aspect is one of the most critical for the future of Q-commerce as many cities, including tourist cities, have faced the negative consequences of uberization in recent years, notably with the conversion of apartments into rental spaces leading to a "commodification"

of urban space (Oskam, 2020). What would cities like Paris, London or New York look like without their convenience stores, and what would become of the social link they are at the origin of? But local authorities cannot ignore the fact that city dwellers, and especially millennials, have a clear interest in being able to benefit from instant deliveries. The challenge is to find the right balance between the various retail formats, bearing in mind that the major limitation of Q-commerce, linked to logistical constraints, is that it cannot offer shoppers a broad portfolio of products. But shoppers also need to buy convenience goods for their daily lives. They can only find them in small shops or on traditional e-commerce sites, which offer local pick-up points (or "*pedestrian drives*").

This duality certainly explains why large retailers have understood the advantages of having both convenience stores and dark stores in the urban environment, playing on their complementary nature in terms of meeting shoppers' needs. One of the most interesting cases is that of Carrefour, the most powerful French retailer, which has been developing small downtown stores under the names Carrefour Contact and Carrefour City for the past decade. In 2021, Carrefour acquired a stake in the start-up Cajoo (Flink), giving it access to tens of thousands of low-priced products, whereas Cajoo (Flink) had to negotiate directly with manufacturers until then. Cajoo (Flink) now benefits from Carrefour's recognized expertise in the choice of product assortments, having all the data necessary to determine which products are to be favored according to shopping areas and types of shoppers. This is an excellent illustration of what Q-commerce could become, no longer a prisoner of its ultrafast delivery promise, but rather a force of attraction for traditional retailers wishing to capture shoppers across the full range of their purchasing behavior, and to do so, forging alliances with the most innovative Q-commerce start-ups.

CONCLUSION

Today's shoppers are increasingly impatient and prefer to use fast-track methods of purchasing convenience goods. While e-commerce has gone from one week to two to three days delivery time, Q-commerce offers a radically different shopping service with delivery of small orders within minutes. Since it is known that millennials adopt new shopping methods faster than seniors, having appropriated the Internet since their childhood, Q-commerce could become one of the next big trends in retail (r)evolution, and we can therefore understand why it is whetting the appetites of many companies, as evidenced by the regular takeover and alliance maneuvers since 2021, especially in Europe. However, it is important to keep in mind that companies of the "Q-commerce galaxy" must overcome significant obstacles to thrive in an extremely competitive environment. For example, delivery constraints could make it difficult to achieve sufficient profitability in the medium term, especially with the inability to increase the size of product assortments to increase the sales value of each order. To make matters worse, regulatory obstacles could also hinder the implementation of local logistics through the rejection of dark stores, which would condemn the promise of 10-minute delivery to death.

This rejection of dark stores is surprising because the business model is not revolutionary, since it is about increasing the reactivity of a delivery system by pre-positioning resources (pickers, deliverers, stocks) as close as possible to the demand. In humanitarian logistics operations, for example, it is understood that pre-positioning of food and emergency equipment is necessary to save lives, at the risk of seeing supply delays annihilate the action of the rescuers. Of course, Q-commerce is not "humanitarian" at all, but it relies on the same organizational mechanisms. The question is obviously whether the "all and immediate"

should be encouraged, by bringing out standards of delivery of products within a few minutes of purchase via an application. This is a real societal debate, and one that goes back to old questions about the value of time for a shopper. It is not up to logistics practitioners to take sides; perhaps they can simply point out the economic, environmental, and social costs that the Q-commerce business model will have if it develops on a large scale. Beyond the logistical dimensions, it is therefore a reflection on the society of the future that must be engaged, at a time when the scarcity of natural resources, climate change and recurring geopolitical crises are obscuring the horizon.

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