# Spatial organisation of the new forms of e-grocery and ready-made food trade in a large Russian city

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# SPATIAL ORGANIZATION OF THE NEW FORMS OF E-GROCERY AND READY-MADE FOOD TRADE IN A LARGE RUSSIAN CITY

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*This work aims to identify fundamentally new features in the spatial organization of e-grocery and ready-made food trade in a Russian city, distinct from those typical of traditional food retail enterprises. Focusing on St Petersburg, the article describes the emergence of a completely different system of requirements imposed by new forms of online food retail in the space of a large Russian city, compared with traditional industries and retail organization methods. The spatial and temporal parameters of the new shopping model are considered, and a comparative analysis of its spatial competition with already established models is presented. The spatial organization of new online food retail is demonstrated in the context of the placement system of new types of offline objects, the emergence of new flows, their impact on urban development and the effect on the outdoor and transit advertising markets, as well as on the labor market. Based on this analysis, it is concluded that new-type physical objects such as distribution warehouses, warehouse stores (fulfilment centres) and dot-com objects are placed according to entirely different principles. If the location of a service point is no longer a competitive advantage as seen by the buyer, faster delivery, hidden from the consumer, emerges as a critical factor in new competition. The paper also analyses the significance of spatial organization principles associated with this factor.*

**Keywords:**
retail, spatial organization, e-grocery, online trade, ready-made food, Russian city

## Introduction

Intensive digitalisation of the economy and new trends in consumer preferences in the international and Russian markets have given rise to new forms of e-grocery and online trade in ready-made food (online food retail, OFR), the two phenomena being closely intertwined[1].

[1] Dumont, J. 2019, As e-commerce rises, grocers grapple with prepared food delivery, *Grocery Dive*, URL: https://www.grocerydive.com/news/as-e-commerce-rises-grocers-grapplewith-prepared-food-delivery/556655/ (accessed 01.08.2021).

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By the end of 2019, the five largest markets with the highest user penetration in the online food delivery segment were Singapore (with a penetration rate of more than 40 %), the Netherlands, Hong Kong, the United Kingdom and Canada. Over half the US and UK population order food online at least once a week[2].

The COVID-19 pandemic has dramatically accelerated the transition to OFR. In the US, sales in the e-grocery segment increased by 14 % in the first month of the lockdown alone. In Russia, this trend is also apparent [1—4].

According to the study conducted by the NAFI Analytical Center in April 2020, the majority of Russian Internet users (67 %) made purchases online during the lockdown; each fourth (26 %) ordered food delivery. Thirteen per cent of Russians started ordering food online during the lockdown, whilst the same percentage (13 %) used grocery delivery services earlier[3]. According to M. A. Research, in 2020, the size of Russia's e-grocery market was 174 billion roubles, or 1 per cent of the total food retail market[4]. According to various estimates, e-grocery will grow at 33—40 % a year in 2021—2025. In 2022, the e-grocery segment is expected to reach 415—445 billion roubles, provided the plans of companies in the field have been implemented. In such a case, it will account for 2.2—2.4 % of food retail[5]. The demand for online food delivery continues to grow in the country: in 2021, it increased by 73 per cent over six months year-on-year[6].

This trend is especially visible in large cities. In St. Petersburg, the first six months after the introduction of the pandemic restrictions saw a twentyfold increase in the number of online grocery orders[7].

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[2] Raguzin, E., Torchalla, J., Cavadini, N., Williams, H. 2020, Ready Food. Can grocers get a bigger bite? *Olyver Wyman*, URL: https://www.oliverwyman.com/content/dam/oliver-wyman/v2 /publications/2020/November/Ready_Food.pdf (accessed 07.11.2021).

[3] Russians are not ready to give up food delivery to their homes after the end of self-isolation, 2020, *NAFI Research Centre*, URL: https://nafi.ru/analytics/rossiyane-ne-gotovyotkazyvatsya-ot-dostavki-produktov-na-dom-posle-okonchaniya-samoizolyatsii/ (accessed 28.07.2020) (in Russ.).

[4] The share of e-grocery in 2021 is about 2 % of food retail turnover, 2021, *Research Agency M. A. Research*, URL: https://ma-research.ru/novosti-issledovanij/item/326-dolya-e-grocery-v-2021-g-sostavit-okolo-2-oborota-prodovolstvennogo-ritejla.html (accessed 30.12.2021) (in Russ.).

[5] Petersburgers exchanged bakeries for marketplaces, 2021, *Business Petersburg*, URL: https://www.dp.ru/a/2021/07/28/Digital_vmesto_bulochnoj (accessed 29.07.2021) (in Russ.).

[6] Express delivery is required by our hearts: the car market is adjusting, 2021, *Business Petersburg*, URL: https://www.dp.ru/a/2021/07/27/JEkspress-dostavki_trebujut?utm_source=yxnews&utm_medium=desktop (accessed 29.07.2021) (in Russ.).

[7] Grinevich, Ya. 2020, The courier is on the way: the number of orders of products at home in St. Petersburg has increased twenty-fold, *Rossiyskaya Gazeta*, URL: https://rg.ru/2020/11/03/reg-szfo/chislo-zakazov-produktov-na-dom-v-peterburge-vyroslo-v-dvadcat-raz.html (accessed 03.11.2020) (in Russ.).

The scale of the phenomenon points to the spread of a new universal type of food shopping, which apparently affects the offline spatial organisation of food trade in Russia's largest cities.

New forms of OFR have received much attention in the literature in economics, business, sociology and geography. Juan Martín et al. offer the most general sectoral and thematic systematisation and classification of research in the area [5]. The economic models of interaction with consumers in the e-grocery market have been explored by Mike Kempiak and Mark Fox [6], whilst Johanna Småros and Jan Holmström have proposed the most comprehensive approach to the problem [7]. Sociological studies of consumer behaviour [8—10] and economic investigations describing the prospects of new food industry formats [11—13] help identify the prevailing trends in the industry and trace local and global changes in the provision of food services. International [14; 15] and Russian [2; 3] marketing analysts, economists and specialists in finance have looked at the spatio-temporal aspects of the impact of Internet technologies and forecast their growth rates and geography. Most of these publications appeared in 2018—2021, indicating the growing relevance of the topic.

This work examines the spatial features of new forms of food retail, including OFR, and explores various models of delivery services and order aggregators. The main focus of the research is what affects the structure of the material public space of a city, namely the spatial (offline) forms of online food retail organisation. The purpose of this work is to identify fundamentally new types of food retail enterprises and describe the spatial organisation of industry facilities responding to qualitative changes in the market structure influenced by global trends in digital technology development.

## Data and methodology

This study focuses on St. Petersburg, one of the two Russian metropolises. This choice was driven by the city's prominent position in the Russian market in terms of online retail concentration and its proportion in the total turnover, which is comparable to that in Western European cities [16]. The city is also a leader in several other dimensions: St. Petersburg's Samokat was the fastest growing national online retailer in the e-grocery segment (May 2020—May 2021)[8]. The total online sales of stores and food delivery services amounted to 26.1 billion roubles

[8] Zaitseva, D. 2021, St. Petersburg delivery service is leading in terms of online sales growth, *Business Petersburg*, URL: https://www.dp.ru/a/2021/06/28/Naperegonki_za_klientom (accessed 28.07.2021) (in Russ.).

in May 2021, the year-on-year growth reaching 112 %[9]. As noted in our earlier study, St. Petersburg is not specifically influenced by the 'capital city' factor [16]. Moreover, most of its residents actively use online technology, partly because it is one of the most visible 'smart cities' nationwide[10].

The data collection methodology employed in this study comprised several stages:

— collecting initial information about the types of new industries and enterprises in St. Petersburg, using international classifications, business analytics, data from business aggregators and company websites, and, when clarification was needed, expert interviews;

— selecting 'model' cases from across the study types. The choice was informed by examining the relevance of a company's business model and its market presence (leadership in the microsegment, as shown by business analytics, advertising and marketing);

— identifying the competitive advantage of the new business types over the traditional ones, using the methods of spatial marketing analytics [16];

— conducting a comparative geographical study of the spatial organisation of the new and traditional formats.

A dynamically developing new form of food retail involves placing Internet technologies at the foundation of food retail, i.e. e-grocery[11]. The e-grocery system implies the global embrace of Internet technologies, the use of a delivery system and the creation of fundamentally new offline objects: warehouses of a new type and the distribution centres termed dark stores (inaccessible to visitors, they are designed to handle online orders) [17; 18]. These objects are the focus of this study.

The earliest e-grocery ventures, which appeared in the West in the late 1990s-early 2000s, did not meet with much success; these companies had to close when the so-called 'dot-com bubble' burst [19; 20]. The reintroduction of online elements into retail took place in 2013: first in the UK[12], then in France, Germany

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[9] Grinevich, Ya. 2020, The courier is on the way: the number of orders of products at home in St. Petersburg has increased twenty-fold, *Rossiyskaya Gazeta*, URL: https://rg.ru/2020/11/03/reg-szfo/chislo-zakazov-produktov-na-dom-v-peterburge-vyroslo-v-dvadcat-raz.html (accessed 03.11.2020) (in Russ.).

[10] Rating of smart cities in Russia, 2019, Minstroy Rossii, URL: https://minstroyrf.gov.ru/upload/iblock/e7e/Krupneyshie-goroda-_ot-1-mln-chel._-2019.pdf (accessed 20.08.2021) (in Russ.).

[11] In the scientific literature, along with e-grocery, such concepts as "foodtech" and "online food retail" are also widely used, however, due to the relatively recent appearance of this format on the market, the terminology has not yet settled down.

[12] Somerville, M. 2013, Tesco opens sixth dotcom centre in Erith, *Retail Gazette*, URL: https://www.retailgazette.co.uk/blog/2013/11/42203-tesco-opens-sixth-dotcom-centre-in-erith/ (accessed 18.07.2021).

and North America. By 2020, it had spread widely beyond the Western countries. In Russia, the e-grocery format appeared much later, albeit drawing on international experience. According to the Infoline agency, in the first half of 2021, the largest national player in the e-grocery segment was X5 Group with a turnover of 23.6 billion roubles; SberMarket ranked second with 21.7 billion roubles; Vkusville, third with 21.2 billion; Samokat, fourth with 15.9 billion; Yandex Lavka, fifth with 11.7 billion[13].

The dominant trend associated with the new format, which will be examined in the study, is omnichannel, i.e. seamless communication with the customer achieved by integrating offline and online touchpoints into a single system[14] [21] (Table 1).

Another trend worth of scholarly attention is online prepared meal delivery (OPMD), which is taking over the food retail market[15]. There are two variants thereof: ready-to-eat meals sold by offline supermarkets and catering establishments both at stores/restaurants and online; fully online establishments. The latter format is not confined geographically to a retail space or visitor flows, but requires automation and competent placement of facilities for order preparation and fulfilment (dark kitchens) [12].

Food retail and prepared meal delivery services are rapidly converging because of the synergy effect of selling groceries and preparing meals/beverages, supported by a delivery service[16] (Table 1).

The facilities used by new online food retail (dark stores and dark kitchens) will be referred to as 'dot-com objects'[17]. Below we will look at how their location, catchment areas and delivery methods are affecting the success of the industry [18].

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[13] E-food. Online sales of products may exceed 1 trillion rubles by 2024, 2021, *Kommersant*, № 142, p. 1, URL: https://www.kommersant.ru/doc/4938078?utm_source=yxnews&utm_medium=desktop (accessed 12.08.2021) (in Russ.).

[14] Omnichannel in retail — a new trend in customer service, 2021, *ABM Cloud*, URL: https://abmcloud.com/omnikanalnost-v-ritejle-novyj-trend-klientskogo-servisa/ (accessed 12.08.2021) (in Russ.).

[15] In the literature, the terms ready-to-eat meals, ready-made food, ready meals, heat-and-eat meals, grab-and-go prepared foods are used to define this category.

[16] Spencer, S. 2020, Webvan Founder Is Back Just as Online Grocery Orders Take Off, *Bloomberg Finance L. P.*, URL: https://www.bloomberg.com/news/articles/2020-05-12/webvan-founder-isback-just-as-online-grocery-orders-take-off (accessed 02.07.2021); Fairhurst, M., 2020, Why Ready-To-Eat Meals are an Important Investment for Grocery, *Mercatus*, URL: https://www.mercatus.com/blog/ready-to-eat-meals-investment-for-grocers/ (accessed 01.08.2021).

[17] Dotcom is a term applied to companies whose business model is based on working within the Internet.

*Table 1*

**Types of new online food retail formats**

| Format | Description | Organisation method | Companies active in St. Petersburg |
|---|---|---|---|
| e-grocery | Fully online (no physical stores, referred to as 'stores' below) | Dark store, delivery | Yandex Lavka, Samokat |
| | Mixed: stores accessible to customers buyers + a special service for online orders | Stores + warehouse stores, in-house and partner delivery | Perekrestok V prok, Vkusville, Azbuka Vkusa, Lenta Online, Pyaterochka Dostavka |
| | Delivery aggregators (partner stores and warehouse stores) | Company-owned and partner delivery | iGooods, SberMarket, Utkonos |
| Online prepared meal delivery (OPMD)[18] | Production and delivery services | Reception and registration of orders by phone, through a website or application. Company-owned kitchen (dark kitchen) and directly employed couriers | Dva Berega, Dostaevsky |
| | Fully online, partner delivery | Own dark-kitchen, partner delivery | BrightKitchen, MnogoLososya, Foodband (Moscow) |
| | Mixed stores (shelves in supermarkets); + (optional) meals available in sales areas | Storage and delivery as part of general delivery from the store | Perekrestok, Lenta, OK, Pyaterochka; Vkusville, Azbuka Vkusa |
| | Information service (order aggregator) | Meals from third-party restaurants, partner delivery by courier services and restaurant couriers | Yandex Eda (+ FoodFox, purchased in 2017 by Yandex), Obed.ru |
| | Order aggregator and delivery | Meals from third–party restaurants; company-owned or third-party delivery service | Delivery Club |

*Source:* prepared by the authors, based on data from the RBC news Agency, DP, Yandex Spravka [18—20].

[18] In addition to the mentioned aggregators and online sellers of ready-made food, the St. Petersburg market presents long-existing chains on the market: Yami-Yami, MyFood, Ollis, Tokyo City, Milti, etc. In addition, every second catering establishment launched its own delivery projects in 2020 (URL: https://www.dp.ru/a/2021/04/12/Gorshochek_ne_vari).

## Results and discussion

Table 1 summarises information about the new forms of online food retail, using existing classifications[19] [22; 23].

These new forms of retail are a product of a new spatial type of shopping, which appeared in an already saturated market [24]. At the same time, this new type had to compete with the existing ones [13], pulling away their customers[20].

Tables 2 and 3 present our vision of competition between new and traditional types of retail.

*Table 2*

**Competition between new and traditional types of food retail in St. Petersburg**

| Traditional type of grocery shopping | Frequency of demand / purchases | Formats | Competitors of the new type |
|---|---|---|---|
| 1. Mid-transformation kiosk-based | daily | Kiosks, pavilions, street vendors, outdoor markets | Samokat |
| 2. Stores for 'the new poor' | 1—2 times a week | Government-supported stores, discounters (Narodny, Polushka), some markets | Social services with delivery, Svetofor |
| 3. Post-transformation large stores | Once every 1—2 weeks | Hypermarkets, some supermarkets Perekrestok, Lenta, OK, Karusel, Azbuka Vkusa, Auchan, Prizma, METRO | iGooods, SberMarket, Perekrestok Vprok, Utkonos, Lenta Online, delivery by OK |
| 4. Post-transformation small stores | 2—5 times a week | Chain stores (Pyaterochka, Dixi, Magnet) and independent stores: speciality, department convenience, shops-in-shop, pavilions | Samokat, Yandex Lavka, Pyaterochka Dostavka |

*Source:* prepared by the authors based on data from the RBC News Agency, DP, Yandex Help [18—20].

[19] Thomas-Dupuis, F., Harrison, N. 2018, Future of Retail and Consumer Goods: A Preview, *Oliver Wyman INC*, URL: https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2018/January/Boardroom_Vol3/FutureOfRetailAndConsumer-Goods_final.pdf (accessed 22.07.2021).

[20] The classification of the existing types of shopping is described in detail in our earlier work [16].

*Table 3*

**Competition between new and traditional types of catering in St. Petersburg (the 'model' customer earns 66,000 roubles, the average pay in St. Petersburg)**

| Traditional catering type | Potential frequency of demand/ purchases | Formats | Competitors of the new type |
|---|---|---|---|
| Restaurant | 2—5 times a month | Restaurant | Restaurant delivery services, Yandex Eda, Delivery Club, Dostaevsky, Tokyo City |
| Café | 2—5 times a week | Cafés, food courts, kiosks, pavilions | Yandex Eda, Delivery Club, Dva Berega, Ollis, Tokyo City |
| Fast food/canteen | Daily | Fast food establishments, canteens, food courts, kiosks, pavilions | Yandex Eda, Delivery Club |

*Source:* prepared by the authors, based on data from vc.ru [20].

The new formats mean new spatial organisation of stationary retail objects selling groceries and prepared meals. It is reasonable to assume that if new formats compete effectively with traditional ones, this competition will manifest itself in the city space as objects characteristic of the new format and in the displacement/spatial reorganisation of traditional objects.

Objects of the first and fourth traditional types, as shown in Table 2, are usually located in such a manner as to include places of residence and transit routes of potential customers into their catchment areas. Thus, location is critical for them. The second and third types, on the contrary, require customers to travel to their facilities, sometimes over considerable distances [16]. Yet, all traditional food retail objects rely on the general principles of placement, regardless of the shopping type. Maximum traffic from the target audience is pursued, along with location optimisation in relation to competitors and other advantages in the competitive environment [25]. But competitors from new online food retail are guided by entirely different principles when locating their physical objects: distribution warehouses, warehouse stores (fulfilment centres) and dot-com facilities. Let us juxtapose these principles with various groups of competitors from traditional offline shopping formats: those of the first and fourth types, on the one hand, and the second and third, on the other (Table 2).

The strongest competitor to traditional convenience stores, kiosks and pavilions (the first and fourth types, Table 2) is the Samokat e-grocery service launched in 2018 in St. Petersburg. In March 2021, it had 411 dark stores operating in four cities. By the end of 2020, the network had 108 dark store warehouses in St Petersburg, compared to 59 in March 2020[21]. At the same time, the traditional retail leaders, Magnet and Dixi, which merged in 2021, had four times as many stores each[22]. The total number of kiosks and pavilions competing with them in the city is estimated at 3,000—4,000 [16]. According to the co-founder of Samokat, when choosing the location of a dark store, a complex of factors is considered, particularly the territorial range, the number of residents and the average household budget in the area. The most important factor is courier route optimisation in terms of physical logistics and cost[23]. Since the company claims to offer probably the fastest food delivery worldwide[24], the range of each of its dark stores does not exceed 1.5—2 km[25]. Depending on the size of a city, the company's dark stores face competition from up to several hundred traditional stationary objects, such as convenience stores or pavilions. This number of objects is designed to meet the need for grocery stores within the slipper radius or when walking in the city [16]. Operating as a scalable warehouse, a dark store can meet the needs of most, if not all, residents of an area within a radius of 1.5—2 km. Thus, it can supplant hundreds of stationary objects. Naturally, such a limiting case is impossible, but a certain approximation may occur in reality. The main advantage of the first and fourth type outlets (Table 2) was saving time on shopping, which was ensured by locating the outlet as close to the customer as possible. But this advantage is nullified when the total time of online purchase (order + delivery) is equal or shorter than that needed to enter a traditional store, choose goods, pay and take them home. Moreover, there is a new logistical advantage, that is, delivery service [26].

[21] Evseeva, E. 2020, "Samokat" reported 18 million orders in the service at the end of the year, *Internet platform vc.ru*, URL: https://vc.ru/trade/191843-samokat-otchitalsya-o-18-mln-zakazovv-servise-po-itogam-goda (accessed 15.07.2021) (in Russ.)

[22] Boyarkova, G. 2021, "Magnet" acquired the capital's ambitions. What does the takeover of "Dixie" mean for the market and buyers, *Fontanka.ru*, URL: https://www.fontanka.ru/2021/05/18/69921287 (accessed 15.07.2021) (in Russ.); Dixie stores in the Leningrad Region, 2021, *Dixies.ru*, URL: https://dixies.ru/magaziny/leningradskaya-oblast/ (accessed 15.07.2021) (in Russ.)

[23] Klyzhenko, L. 2021, "Samokat": how does the express delivery service work? *Retail.ru*, URL: https://www.retail.ru/photoreports/samokat-kak-rabotaet-servis-ekspress-dostavki/ (accessed 15.07.2021) (in Russ.).

[24] Chirin, V. 2020, The St. Petersburg "Samokat" was the first in Russia to launch food delivery in 15 minutes. How the service develops business in two cities and competes with corporations, *Gazeta*, URL: https://paperpaper.ru/photos/peterburgskij-samokat-pervym-v-ros / (accessed 15.07.2021) (in Russ.).

[25] *Samokat*, 2021, URL: https://samokat.ru/ (accessed 16.07.2021) (in Russ.).

If the location of a traditional outlet is no longer a unique advantage, other factors may help them compete with online retail. These factors are both traditional (price, product range, goods selection method) and specific (unavailability of online technologies to the user, delivery restrictions, personal communication at stores, socialisation associated with traditional shopping which is perceived as a pastime activity, etc.).

As the number of dot-com objects grows, traditional convenience stores and discounters are opening new facilities in St. Petersburg as a result of omnichannel, i.e. convergence with online shopping: most traditional chains are launching delivery services[26].

Both in St. Petersburg and nationwide, traditional large-format shopping is in decline. M. A. Research reports that, in 2020, the contribution of hypermarkets and cash and carry stores to the total everyday retail turnover in Russia decreased from 18.2 to 15.4 % year-on-year; of supermarkets, from 19.2 to 18.4 %. Other retail formats, however, became more visible over the period[27]. Competition between the new formats and the second and third type outlets (Table 2) also has specific spatial features.

The main online shopping trend in the study segment is not the emergence of fully online businesses, as described above, but the development of omnichannel [19; 21; 27].

In terms of organisation, omnichannel does not mean replacing traditional stores with dark stores, but rather existing super- and hypermarkets taking on the function of a fulfilment centre for delivery services. Large chains are more successful in pursuing the omnichannel strategy: they create new facilities without closing existing ones, which are used as stores and fulfilment centres with a delivery function. At the same time, companies with a less successful marketing strategy and new chains shrink. In 2020, this happened to high-end retailers (the Land supermarket chains had to shut down seven stores) and speciality retailers (three Optoclub Ryady hypermarkets ceased operations along with 13 Viktoria stores)[28]. Hypermarkets excelling at omnichannel build new facilities. Their op-

[26] Dmitrieva, D. 2021, Without trolleys and baskets: the era of hypermarkets is coming to an end, *Business Petersburg*, URL: https://www.dp.ru/a/2021/06/30/Bez_telezhek_i_korzinok (accessed 16.07.2021) (in Russ.); Matveeva, I. 2020, The Magnit has taken over new points of St. Petersburg and other regions of Russia, *Moika78.ru*, URL: https://moika78.ru/news/2020-10-21/496149-magnitzavladel-novymi-tochkami-peterburga-i-drugih-regionov-rossii/ (accessed 16.07.2021) (in Russ.).

[27] Sinyavskaya, A. 2021, FMCG-retail 2021: online and discounters, *M. A. Research Agency*, URL: https://ma-research.ru/stati/item/296-fmcg-ritejl-2021-onlajni-diskauntery.html (accessed 16.07.2021) (in Russ.).

[28] Poddubny, A. 2020, St. Petersburg supermarket chain cuts business, *RBC*, URL: https://www.rbc.ru/spb_sz/02/11/2020/5f9fb4ed9a7947341f3a7b9d (accessed 16.07.2021) (in Russ.).

erations are carried out as follows: a courier/merchandiser picks a grocery order, collects the goods from the shelves, and delivers it to the customer. The Perekrestok chain, which has in-house delivery services (Perekrestok Vprok and Perekrestok Express) opened 11 new regular stores between 2019 and 2021, their total number reaching 111, and built a 7,000 $m^2$ dark store in the north of the city[29]. Unlike Perekrestok, Lenta — another major supermarket chain — did not launch a delivery service but acquired one of the leaders in delivery services, Utkonos, whose 9,500 $m^2$ warehouse was incorporated into the company's operations. Lenta also built a 70,000 m2 warehouse, which can be extended by another 10,000 $m^2$ [30]. Almost all hypermarket chains that have not set up in-house delivery operations use the services of delivery aggregators, such as iGooods or SberMarket. Self-delivery services and aggregators operating at traditional hypermarkets minimises the significance of the location factor. To a user of an online service, physical proximity to a particular store or chain does not matter any more. For such consumers, the key factor is delivery time, to which chains pay special attention when choosing the location for a new facility [28].

Omnichannel, which offers flexibility between online and offline purchases, gives hypermarkets an edge over fully online services, but traditional placement factors remain important to the consumer as well.

Major chains have a competitive advantage of reaching large audiences when entering the online market since they already have an extensive network of hypermarkets/fulfilment centres located at arm's length from their customers. At the same time, niche online retailers that do not have either a chain of dark stores or full-range grocery stores are becoming increasingly popular [29]. Focusing on a narrow segment (farmer's, high-end, ethnic or other products), they either lease existing warehouses or build their own. Another visible trend is companies trying to operate at various levels: Perekrestok combining hypermarkets with small-scale and online formats, or Samokat striving to break into large format retail.

All these trends cause the number and area of warehouses to grow. In 2020, 312,000 $m^2$ of warehouse space were brought into operation, which is 1.7 times

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[29] How the retail of St. Petersburg has changed in 2020, 2020, *Product Media*, URL: https://producttoday.ru/2021/01/12/kak-izmenilsja-ritejl-peterburga-v-2020-godu/ (accessed 17.07.2021) (in Russ.); Zaitseva, D. 2021, About those who stayed: St. Petersburg retail chains after the pandemic, *Business Peterburg*, URL: https://www.dp.ru/a/2021/04/19/O_teh_kto_ostalsja?hash=768771 (accessed 17.07.2021) (in Russ.).

[30] Kazakov, N. 2019, X5 Retail Group has started a large-scale reboot of stores in St. Petersburg, *Moika78.ru*, URL: https://moika78.ru/news/2019-12-09/332664-x5-retail-group-nachalamasshtabnuyu-perezagruzku-magazinov-v-peterburge/ (accessed 17.07.2021) (in Russ.).

that put into service in 2019 (184,000 $m^2$)[31]. A total of 4,030,000 $m^2$ of warehouse space was available for logistics in St Petersburg in 2020 (which is 15 % more than in 2019; in 2019 the year-on-year increase was 6.5 %)[32].

The key to the spatial organisation of OPMD is the focus on production outside traditional catering outlets: the larger a company, the more new objects — warehouses and dark kitchens — must be organised. Fully online services with in-house production capacities do not require any additional facilities, which is not the case for other ventures (Tables 1, 3). Combining new dot-com objects with traditional prepared meal se-rvices follow the same pattern as e-grocery and depend on both the catchment area and the volume/cost of the order.

There is competition not only between online food retail and traditional shops/restaurants, but also between dark stores/kitchens themselves. A new tool of spat tial competition, the speed of delivery is now critical [20]. When the location of a service point is no longer a competitive advantage as seen by the customer, speedy delivery (a process concealed from the customer) becomes absolutely dee cisive.

The speed of delivery depends on the type of service a company provides, i.e. whether it transports large and medium-sized goods over longer distances and periods (from 30 minutes to 1—2 days; the second and third types in Table 2) or delivers small-sized goods or small quantities over shorter distances and periods (10—15 minutes; first and fourth types). Some companies, such as Perekrestok, combine express delivery with large shipments [43]. There is minimal competition between these two main types of delivery associated with different types of shopping, catchment area sizes and consumer groups.

In the first case, the company strives to cover a larger area (the longer the distance, the greater the cost of the cargo required to ensure returns and a higher profit margin). The main competitive advantage of such companies is larger shipments and regularity of transportation (deliveries must be made either on certain days of the week or every day at certain hours).

Companies dealing with smaller shipments strive to deliver goods as fast as possible. Although quantity does not matter as much as it does in the case of large deliveries, the minimum price is set at the minimum to ensure returns (100—200 roubles). Here, the location of a fulfilment centre (dark store) is much more critical for success of a business than in the former case.

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[31] Warehouse and industrial real estate market St. Petersburg. Results of 2020, 2021, *Knight Frank,* URL: https://kf.expert/publish/rynok-skladskoy-nedvizhimosti-sanktpeterburg-itogi-2020 (accessed 17.07.2021) (in Russ.); Message from Lenta Media Center, 2020, *Lenta*, URL: http://www.lentainvestor.com/ru/media-centre/news-article/id/2666 (accessed 17.07.2021) (in Russ.).

[32] Warehouse and industrial real estate market St. Petersburg. Results of 2019, 2020, *Knight Frank*, URL: https://kf.expert/publish/rynok-skladskoy-nedvizhimosti-sanktpeterburga-2019-god (accessed 18.07.2021) (in Russ.).

Delivery time becoming a critical competitive factor in online food retail has lent significance to the principles of spatial organisation.

1. The principles of spatial division of territories between competing businesses have changed: in online trading, it becomes critically important not to establish and hold a local 'monopoly' but to secure the most effective coverage of the entire or maximum possible territory. The websites of companies, such as Perekrestok Vprok and Samokat, offer examples of macrozoning: macrozones with different delivery times in suburbs and the main city.

2. Zoning has become crucial for companies' logistics, making it possible to ensure universal delivery time and quality throughout the service area. This requires competent zoning into the catchment areas of dot-com objects and the micropositioning of these objects in relation to the boundaries of such areas. Unlike a standard convenience shop, a convenience dark store does not need to be located within walking distance from the homes of the target groups but should be located within a bicycle delivery range, have good access roads and unloading areas for low-tonnage freight transport. Dark stores often occupy the premises of former stores (Fig. 1).

Fig. 1. A dark store in a former regular store, St. Petersburg, February 2021. Photo by K. E. Axenov

Unlike a traditional hypermarket, a dark store or a hypermarket distribution centre should not be located near transport hubs or highways with transit traffic. They can as well be situated in industrial, suburban and other functional areas, the only requirement being accessibility by large-tonnage and low-tonnage freight transport. Probably, the development of delivery services working directly from stores (Lenta Online, OK Dostavka, etc.) will encourage large format chains to locate the stores that have become fulfilment centres in such a way that a relatively uniform universal delivery service can cover most of a city's territory. Dark kitchens do not need popular and expensive locations either, but generate demand for the least attractive locations, which are nevertheless adapted to housing a kitchen and can be easily accessed by transport. These are often unprofitable, bankrupt restaurants in peripheral areas with the lowest traffic, etc. (Fig. 2).

Fig. 2. Dark kitchen in a former restaurant, St. Petersburg, February 2021. Photo by K. E. Axenov

We have considered changing principles of placing stationary objects by online food retail. They are, however, not the only ones affecting the spatial organisation of cities. New retail has greater or equal impact on the reorganisation of flows, such as pedestrian and freight traffic, which is considered in this article along with the associated infrastructure and public relations [30].

The following features of new online food trade organisation greatly affect the organisation of urban flows:

— product selection has basically become extraspatial, not requiring physical travel around the city;

— the seller has taken on the transporting of purchases; the customer no longer moves to the merchant to make a purchase, but rather the merchant moves to the customer (which revives the kiosk shopping principle in a new incarnation) [16];

— although replenishing dark store merchandise inventory happens the same way as in the case of a regular retail store[33], the delivery of everyday goods, which

[33] Market overview of office and retail premises St. Petersburg, 2nd quarter 2020, 2020, *LLC "INDUSTRIA-R"*, URL: https://industry-r.ru/f/obzor_rynka_ofisnyh_i_torgovyh_pomeshchenij_2kv2020g_sankt-peterburg_pressa.pdf (accessed 18.07.2021) (in Russ.).

once meant a customer carrying purchases home, has turned into a transport and logistics operation; personal vehicles (PV) are now used to carry commercial cargoes alongside traditional cargo vehicles;

— commercial cargo traffic, which once used roads only, has moved to pavements, becoming a year-round affair (Fig. 3).

— such transport has become all-season and all-weather; the speed of PVs has exceeded the average speed of pedestrians, creating functional competition for once purely private (not commercial) traffic along the pavement and provoking a new spatial conflict in the city, which requires special regulation[34].

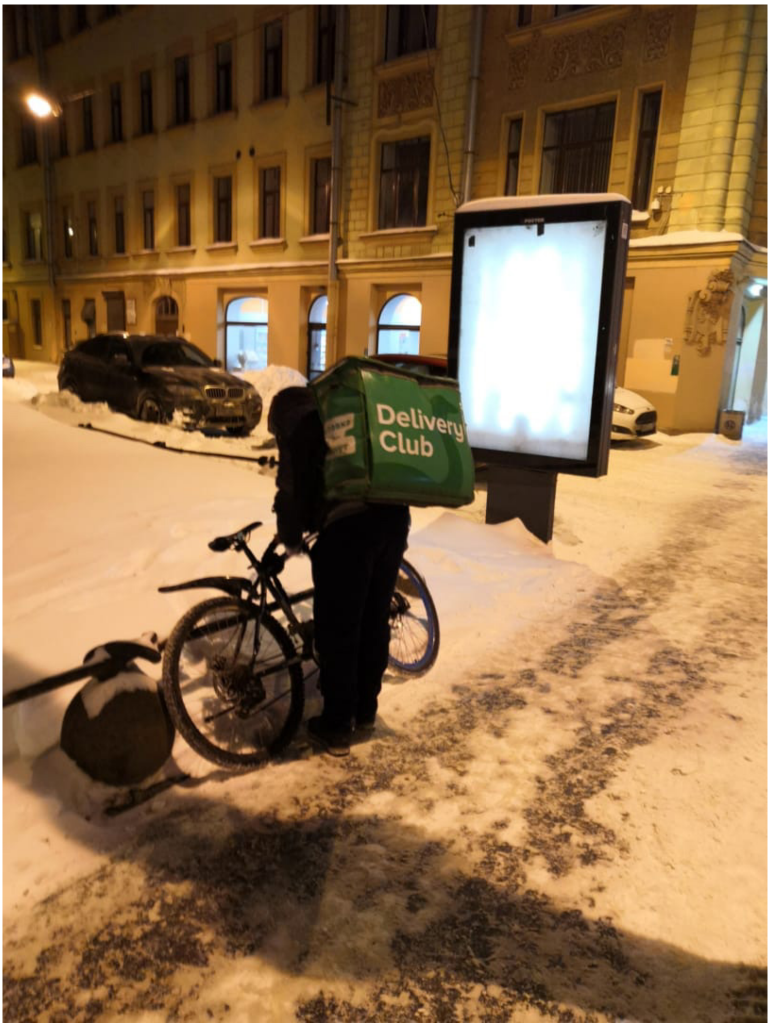


Fig. 3. The crisis of the old and the arrival of new outdoor advertising, St. Petersburg, February 2021. Photo by K. E. Axenov

[34] Requirements for a real estate object for dark-store placement, 2019, *Perekrestok.ru*, URL: https://www.x5.ru/ru/PublishingImages/Pages/Partners/EstateSearch/dark_store.pdf (accessed 20.06.2021) (in Russ.).

All these processes, however, require not only new regulation but also the reorganisation of the existing transport infrastructure and system as a whole (cargo and passengers vehicles, PVs and even pedestrians). Perhaps, the development of online retail has caused the most dramatic reorganisation of the transport system in many decades[35].

Transportation methods used in online trade create demand for low-tonnage commercial vehicles and delivery by PVs, as well as for corresponding leasing and rental services[36].

The variety of delivery methods generate demand for low-tonnage commercial vehicles, delivery by private vehicles, and relevant leasing and rental services[37].

Along with alterations in the spatial organisation of stationary objects and flows, the development of online food retail produce changes in the outdoor, indoor (BTL) and transit advertising industry [31].

The transition to Internet marketing, obviating the need to attract transit buyers with a retail outlet, reduces the amount of outdoor advertising by sellers at a particular point. This, in turn, alters the design of the urban environment: dark stores and dark kitchens do not have shopfronts, signage or window advertising. As a result, there are fewer opportunities for window shopping, which is an essential part of urban lifestyle; the function of the environment is changing, and its attractiveness for recreation and tourism is dwindling (Fig. 1, 2).

However, a new type of transit and outdoor advertising is emerging; it is placed on courier uniform and delivery vehicles. This type of transit advertising is not regulated, but obviously affects the traditional forms of outdoor and transit advertising, seriously changing the appearance of the city (Fig. 3).

Other effects, which have not been covered in this study, include changes in the organisation of the labour market, particularly its spatial makeup:

— the scale of delivery development has boosted demand for couriers and caused the 'next door' labour market to expand: the supply and demand for work in delivery is growing amongst residents of narrowly targeted territories;

— demand for the most mobile groups of the population — young people with bicycles and other personal vehicles — is increasing.

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[35] The Head of the TFR instructed to develop rules for scooters after a fight on Nevsky, 2021, *Business Petersburg*, URL: https://www.dp.ru/a/2021/05/19/Glava_SKR_poruchil_razrabo/ (accessed 20.06.2021) (in Russ.).

[36] This issue goes beyond the scope of this work and requires separate consideration.

[37] I'll swim, I'll fly, I'll get there: delivery services are experimenting with transport, 2021, *Business Petersburg,* URL: https://www.dp.ru/a/2021/04/05/Doplivu_dolechu_doedu (accessed 20.06.2021) (in Russ.); Express delivery is required by our hearts: the car market is adjusting, 2021, *Business Petersburg,* URL: https://www.dp.ru/a/2021/07/27/JEkspress-dostavki_trebujut?utm_source=yxnews&utm_medium=desktop/ (accessed 27.07.2021) (in Russ.).

## Conclusion

Focusing on the case of St. Petersburg, we have traced the development of new forms of online food retail in the space of a major Russian city. The classification we offer points to the emergence of an entirely new system of requirements imposed on the urban space by online retail. These requirements are very different from those associated with traditional industries and ways of organising retail. Online retail businesses are nevertheless material, and they generate special forms of spatial organisation in urban environments. We have considered the spatio-temporal parameters of the new shopping model and carried out a comparative analysis of spatial competition with already established models; in some cases, competition leads to the displacement of offline retail and, in others, to the reformatting of existing objects.

The spatial organisation of new online food retail has been considered in the context of the new offline object placement, the emergence of new flows and their impact on urban development, and the influence spatial makeup has on the outdoor and transit advertising markets, as well as the labour market.

The principles behind the placement of new physical objects — distribution warehouses, warehouse stores (fulfilment centres) and dot-com facilities — have been shown to be significantly different from traditional ones and dependent on the type of demand these facilities meet.

The delivery speed is becoming a decisive factor in spatial competition, superseding the location of a customer service point as the main competitive advantage. Accordingly, the importance of certain principles of spatial organisation associated with this factor increases. The principles of spatial division of territories between competing businesses have changed since, in the case of online trade, it is critically important not to establish and hold a monopoly on a particular territory but to ensure the most effective coverage of the maximum possible territory by a universal service. Zoning has become the key to companies' logistics, making it possible to ensure universal delivery time and quality throughout the service area.

The most important factor in reorganising city flows is the fundamental redistribution of major logistics functions between participants in the purchase of a product: the buyer, the seller and intermediaries. The seller has taken on the function of moving goods to the customer, often using a new type of commercial cargo transport for the city (personal vehicles) and new road infrastructure (pavements, driveways and passageways).

Some functions, such as marketing (both on the part of the seller and the buyer), have become generally extraspatial. Making a purchase no longer involves any movement on the part of the buyer. A purely online shopping model does not require traditional customer service points, such as stores, service shops, etc., which nevertheless remain part of omnichannel models.

Outdoor advertising by sellers at specific points has shrunk, accompanied by the emergence of a new type of advertising placed on courier uniform and delivery vehicles. These processes have taken a toll on the attractiveness of the urban environment.

An avalanche-like demand for couriers has swept the labour market, and new transportation methods generate demand for low-tonnage commercial vehicles and delivery by personal vehicles, as well as for corresponding leasing and rental services. The local segment of the 'next door' labour market is expanding along with the demand for the most mobile groups of the population: young people owning bicycles and other personal vehicles.

It seems that the penetration of new forms of online food retail in Russian cities will increase even when the COVID-19 restrictions have been lifted. This trend is global in nature: the rate of penetration of online food retail in developed countries was an order of magnitude higher than in Russia even before the pandemic, which has served as a significant catalyst making it possible to catch up with the leaders.

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