Shopping facilities as a factor in polycentric urban development: problems and prospects

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Abstract. The aim of the study is to develop the conceptual provisions and practical recommendations for the urban territory development on the principles of polycentricity using shopping centers as public and business spaces of attraction for the uniform distribution of transport load and more efficient performance of various urban functions.

Theoretical studies were carried out using the methods of analysis and synthesis of the existing scientific developments in the field of modern cities’ territorial and urban organization.

According to the study results, the following issues have been obtained:
- the main provisions and results of the evolution studies of the cities’ polycentrization have been summarized;
- the need for the development of conceptual images and approaches to the modern municipal urban planning management based on polycentrism has been proved;
- the effectiveness of a polycentric urban space compared with monocentric urban space has been substantiated;
- the recommendations for improving the spatial organization of a large city based on the use of shopping centers as the multicentric urban model’s core have been given.

1. Introduction
Modern cities are undergoing transformational changes due to the increase in the population motorization, the preservation of the historical centers’ target building, the rapid construction of micro-districts on the city periphery, and the growing importance of shopping and business centers.

The subject of the study is to determine the economically feasible format of urban infrastructure based on urban planning localization of shopping centers as the core of a polycentric urban model.

The study showed the complexity and heterogeneity of the theoretical base in this scientific research area, the inconsistency of practical experience in the formation of monocentric and polycentric urban systems [1-3]. Megacities are often overgrown with new suburbs and the business activity continues to develop in the historical center.

The listed reasons in relation to the research subject necessitated the conceptual foundations’ development of a polycentric urban model with shopping centers as network nodes. The functional and spatial framework of the proposed model will radically reformat the logistics infrastructure of the city, disperse the load on it, redirecting the transport concentration, business, cultural flows, increase the efficiency of all city functions.

2. Methods and materials
The study was carried out using the methods of analysis, synthesis, based on the territorial capital theories, territorial economic systems’ self-development, the urban systems’ theory, the concept of a compact city.

The authors of the territorial capital theory R. Camagni, R. Capello, R. Giffinger understand this category as the material and social capital of the city, providing the conditions for business, attracting investments, creating comfortable living conditions for the population [4,5].

For the purposes of our study, we used the essential characteristics of material capital, including the organizational and spatial characteristics of the city, taking into account logistics infrastructure, urban planning parameters and economic indicators.

A review of the scientific publications on the reasons for the restructuring the urban space from a monocentric to a polycentric format based on the organization of individual urban units, including retail facilities, made it possible to identify two most important approaches.

The first is represented by the concept of a multinuclear city (C. Harris and E. Ullman), and the second is associated with the concept of the dialectical development of the center and the periphery of the city (L.B. Kogan) [6,7]. The indicated scientific directions differ in their understanding the ways of organizing the socio-economic functions of a city outside its center. The scientists from the USA justify the “equal” emergence and development of the main urban center and peripheral centers. The latter appear on the market expediency basis at the initiative of entrepreneurs and local communities, taking into account the value of real estate, land and various resources. In fact, the city center develops independently and secondary centers are added to it. Soviet scientists believed that the functions were subtracted from the center and transferred to the periphery with a “prohibition” of duplication. In fact, both theories are based on solving the problems of centralized urban planning, implying various options for the urban functions’ redistribution at the local resources’ expense.

Numerous publications are devoted to the study of the essence and structure of polycentric cities. In general, we can distinguish the following representations of scientists on this issue:

- dominance of the historical center over the secondary urban centers in urban planning and socio-economic aspects;
- urban transport logistics directly affects the pace and development level of the city polycentricity;
- the logistics infrastructure of shopping centers forms the urban public directions as well as the business flows;
- the remoteness of secondary urban centers is leveled by the presence of the shopping center infrastructure, providing the population and business with autonomous resources for work and leisure;
- polycentricity changes residents’ perceptions of the historical center’s attractiveness, mainly due to a reduction in forced mobility.

The study showed that it is the time spent on everyday trips that are the most important parameter of the effectiveness degree in a polycentric city. Thus, H. Richardson rightly believes that the monocentric format of the city increases the amplitude of pendulum migrations and traffic congestion in conditions of the residential buildings’ high density. [8] In turn, A. Bertod and C. Dean argue that a monocentric city is a more predictable value, all of which depend on the distance to the center. [9] The practice of combining the morphology and functionality of the single-core and multi-core cities shows mixed results. For example, in the UK since the mid-90s, the approaches of the “big village” and “work at home” have been used to develop the urban areas. On the one hand, local communities really played a big role in the secondary urban centers’ formation and the socio-economic burden reduction on the historical center of cities. On the other hand, modern residents have high mobility, which is an instrument of competition for highly paid work, regardless of where it is located.

The current situation is confirmed by the experience of other countries and cities. So, the polycentric cities of Stuttgart, Frankfurt, San Diego, Dallas demonstrate a significant reduction in the travel time of the residents to working places, compared with monocentric Munich, Hamburg, New York, Chicago. A ten-year study of the adjacent territory in American Cambridge showed that a ten percent increase in local-area commercial space has reduced the number of daytime traffic vehicles by fourteen percent.
At the same time, world urban studies show opposite results in the field of polycentric urban development. In Washington, Oslo, the cities of China and South Korea, the average distance covered by the residents in conditions of polycentricity not only did not decrease, but increased by an average of 3-9 km, which negatively affected the travel time. At the same time, in such cities as Marseille, Lyon, Paris, with increasing distances, the travel time of the residents practically did not increase due to the high level of public transport development.

Thus, most scientists are inclined to conclude that, despite the creation of secondary urban centers, there is a violation of the local territorial balance in the number of inhabitants and jobs. It is necessary to monitor the qualification structure of the population on the part of local authorities in order to create an appropriate base of jobs in the location. So, G. Garro wrote that “... the sub-center should contain at least 15 million square feet of public business functions (1.4 million sq. m.) so that the subway line conducted to it would be cost-effective in the US ...” [10].

3. Research results

3.1 Analysis of modern theories of polycentralization of the Russian cities

In the middle of the 2000s, in response to the need to restructure the large Russian cities’ infrastructure and change the paradigm of urban development, there were developments by the local urbanists in this area.

The importance of using the polycentric paradigm was indicated by L.V. Gaykova, noting the urban development’s centrifugal tendencies in connection with the economic attractiveness of cheaper land, labor and material resources outside the city’s historical center. Moreover, the author uses as a significant factor “... greater interest of modern citizens in the nature of work than in its proximity to the place of residence ...”. L.V. Gaykova is considering a cluster approach to creating a polycentric city [11]. P.V. Ivanov supported this idea for the city of Rostov-on-Don, which is characterized by daily pendulum migration of the population with a simultaneous increase in the residential areas’ remoteness. [12]

A.A. Krasilnikov developed the elements of an integrated approach to the analysis of polycentric cities from the point of view of planning and development of the secondary urban centers, conducted the experimental studies at the interface with sociological and psychological methods (for example, the relationship between the desire to study and work and the distance from the residence place). [13]

The works of A.A. Kayasov, K.I. Tesler, T.V. Filanov are devoted to the study of the multifunctional city centers’ role in the transport load redistribution and the ecological situation improvement [14,15].

A. A. Vysokovsky proposes to use the term “nodal areas ... with a high concentration of public, commercial functions and other activities with a low content of other functions - housing, recreation, production ...”. This approach increases the urban planning efficiency.

The opinion of M.S. Kalmykov, proposing to use the concept of a multifunctional territory of the city with the obligatory presence of transport as a planning parameter of polycentricity. Similar studies are carried out by S.A. Kolesnikov, using the category of “highly urbanized multifunctional nodes of the urban structure”.

It is possible to disagree with N.V. Pereverzeva that the general tendency to use consolidated retail facilities for service, food, leisure and work is obvious for the large cities. The author calls such locations the “central trading zones” and defines them as an integral independent urban development object that meets the specific needs of a particular society and directly forms the core of one of the polycentric city’s secondary centers. N.V. Pereverzeva emphasizes that continuity of these zones’ service by public transport is important here, taking into account the distance from each other.

Thus, modern scientific research in the field of polycentric urban studies is highly controversial, which requires further research on this topic.

3.2 Shopping facilities as “the gravity centers” in the polycentricity system
The results of the study made it possible to clarify that the main characteristic of a polycentric city is the presence of several gravity centers, which fundamentally distinguishes it from a single-core city with a single historical center. In addition, the relative location of these centers of attraction is of particular importance, since the effectiveness of urban logistics, that is, the management of transport, financial, labor and material flows, depends on this.

The most debatable is the question of the parameters for determining the centers of attraction that form the spatial city framework. Since the 80s of the twentieth century, such centers have been understood as the territories where labor is applied (M. Fujita, H. Ogawa). Currently, the scientists are increasingly inclined to believe that the secondary city centers are the objects of trade, services, entertainment and recreation (S. B. Pomorov, R. S. Zhukovsky, M. Batti, De Goy).

In our opinion, the criteria for the selection of such objects include the size of the area, the availability of transport communications and direct traffic, traffic (foot traffic), labor resources, the level of competition, the population size and density in the location, and the concentration of residential real estate.

The choice of the shopping facility location as a gravity center in a polycentric city is one of the most important principles of urban logistics (T.I. Nikolaeva, L.A. Kozerod). In this area of research, the theories of centralization, attraction, agglomeration and others have been developed. So, the centralization theory justifies the inverse relationship between increasing the distance to the shopping center and reducing the demand for the goods presented in it. However, at present it has become impractical to build the shopping centers in the historical core of the city due to the lack of parking spaces or their limitations, street congestion and the residential buildings’ saturation. In our opinion, it is the pedestrian and transport accessibility of the shopping facility that characterizes it as an attraction zone, which can also be defined as a logistics zone.

The theory of attraction considers not only the problems of attracting the customer flow to a shopping facility - the customers often make unplanned purchases in shopping centers, increasing the profitability of a retail space unit. Also, these studies are devoted to the shopping centers’ coordination as the cores in a polycentric system based on the logistic principles.

The agglomeration theory implies the closest possible location of similar stores in a shopping center, which facilitates the choice of customers, minimizes time costs and ultimately increases sales.

Thus, the trend of shifting the retail outlets to the borders of the city and to the suburbs is closely related to the polycentric paradigm - large regional and federal shopping centers form the business and entertainment environments, becoming the new kernels of the city’s life systems.

3.3 Development of the conceptual framework for the use of shopping centers as the core of a multicentric urban model in Rostov-on-Don

As we noted above, the issues studied in this article are multidisciplinary. To substantiate our proposal, we will rely on the research in the field of the social institutions’ transformation. In the conditions of a continuous information and technological revolution, a modern person seeks to universalize the consumption process, and the shopping centers take on leisure, educational, cultural, sports and corporate functions, becoming a structure-forming factor.

Shopping centers become the core of the sub-territories of the city, forming new social spaces, defining their boundaries in the polycentricity system. Despite the development of online shopping, shopping centers remain a place of support for social connections.

To create an effective polycentric urban model using shopping centers, the following conditions should be met:
- the balance of housing and places of employment within the secondary centers of the city;
- transport connectivity of polycentric locations, including the highly developed public transport, as well as the ease of integrating the logistics capacities of shopping centers into a polycentric environment;
- use of the land factor’s lower cost on the periphery;
- development of the secondary urban centers’ limited specialization to ensure competitiveness;
- development of a multifunctional ecosystem for urban residents based on shopping centers.

For modeling, we used the city of Rostov-on-Don, which has an area of 348.5 square kilometers, a population of 1,137,904 people, a density of 3,265.15 people per square km. This ratio defines the city as the most compact among the million-plus cities in Russia. The city is monocentric, has a highlighted historical center.

The negative consequences of a monocentric device for the city are:

- spot development in high-rise residential buildings in the historical center;
- ultra-high load of street highways with personal and commercial vehicles - all objects of work and study are concentrated mainly in the city center;
- irrational arrangement of the railway lines, dividing the city in half and creating an obstacle to freight and transport traffic.

Unlike the existing developments for transforming the monocentric organization of the city into a polycentric based on agglomeration-conurbation, we propose using modern trade objects as cores for the architectural spaces that combine open and closed pedestrian zones with entertainment, educational, medical, sports, cultural and other functions, as well as public services and banks.

As a multiplier effect, this model will reduce the transport load on the city's infrastructure and bring jobs closer to their residence places. In addition, a more rational distribution of labor and material resources of the city will ensure the formation and preservation of green areas, improve urban ecology.

We will use the results of an analytical study of the IDEM consulting company to describe the situation in the retail real estate market of Rostov-on-Don, which is one of the largest transport hubs connecting various regions of the country with seaports and resorts. In the city, the annual population growth is 0.5%, the retail trade turnover in the city approached to 900 billion rubles at the end of 2018. Rostov-on-Don ranks the fifth in the country in terms of provision of quality retail space after Krasnodar (738 sq. m per 1 thousand people), Samara (616), Nizhny Novgorod (589) and St. Petersburg (528) Rostov-on - Don - 502 sq. m per 1 thousand people (the same indicator is in Moscow).

Note that the experts understand high-quality retail space as a shopping center with an area of more than five thousand square meters suitable for rent with a shopping gallery, several anchor tenants, shops of international, federal and regional network companies, ample parking and a landscaped surrounding area. For the purposes of our study, it is important to study the spatial location of the shopping centers in the city. At the moment there are more than twenty shopping centers in the city.

In general, the city is characterized by a fairly uniform coverage of such shopping facilities as regional, single area and district shopping centers. Secondary centers are available, but still not enough for effective polycentricity. Regional trading centers (Mega, Horizon, MegaMag, Golden Babylon) dominate in terms of retail space, occupying more than half of the quality retail real estate market in Rostov-on-Don. However, shopping centers of regional significance prevail in the service area. In addition, the analysts pay attention to the insufficient number of parking spaces in the shopping centers’ territory. So, in 15 shopping centers with a norm of 4 car places, the average figure is 2.97 car places.

To create an effective polycentric urban model, in addition to the above-mentioned shopping centers, we suggest using shopping centers of a new format:

- Foodmall Lemon at the intersection of traffic flows of Aksaysky Prospekt (federal highway M-4 “Don”) and Maloe Zelenoe Koltso Street, in the trading cluster system of wholesale, retail and specialized markets. Of particular note is the step-by-step accessibility of the shopping center for the nearest housing estate, the presence of a park area and five-minute transport accessibility for residents of the densely populated cottage villages Yantarny, Kamyshyevakha, Izumrud:
- the retail park Torgovy prospekt, one kilometer from the city of Rostov-on-Don (Leninakan farm), along the Rostov-Novoshakhtinsk highway, next to the Suvorovsky microdistrict. Transport and pedestrian access to the park guarantee a steady flow of consumers due to the dense traffic of automobile routes, the availability of their own roads, the proximity of the northern part of the city, as
well as the Aksay and Myasnikovsky districts of the region. The potential reach of the consumers in the business park is 1 million people today. The park covers 6.5 hectares, divided into 20 land plots with the ability to combine commercial and commercial real estate in one place.

- the project of the Splash multifunctional complex located on a 57-hectare site between the cities of Rostov-on-Don and Aksay, about 10 km from the center of Rostov, near the Platov International Airport. Nearly 1.5 million people live in a thirty-minute transport accessibility from the complex. The forecasted average annual attendance of the complex is 949 thousand people. The complex provides parking for 7 thousand car spaces.

According to the Analytical Service “Realnoe Vremya”, the profitability of shopping centers in Rostov-on-Don is one of the most moderate in the country (11.4%), respectively, and the payback period is quite large (8.8 years). For comparison, in Volgograd - 19.6 and 5.1, in Omsk - 21.1 and 4.7 respectively. At the same time, a rather high sales price is observed - about 120 thousand rubles per sq. m in combination with a moderate rental cost of an average of 13.4 thousand rubles. per sq. m per year.

Currently, the market is stagnating, the purchasing power of the population will be low in the next two to three years, so the projects of multifunctional complexes with a unique concept and a favorable location for a polycentric model of the city are needed. In addition, there is another objective factor - the high development rate of online retail and, as a result, a decrease in the shopping centers’ attendance.

Therefore, it is necessary to replace the need for goods with the need for experience that cannot be obtained online. This will slow down and stop the drop-in traffic in shopping centers. A competitive advantage is the ability to generate the events and experiences with the customers. We offer the following elements of a new format shopping center as fundamental:

- Concept store - offers the customers a lifestyle, includes a cafe or space for various events;
- showroom (Showroom) - a demonstration of any goods from automobiles to furniture and clothing with the possibility of buying online;
- temporary store (Pop-up store) - to attract interest in the brand;
- a combination of a retail store and an online order office.

To justify the change in the concept of shopping centers, we present the dynamics of changes in the qualitative composition of tenants in the shopping centers, presented in the study “New trends in the real estate market 2020. Annual research of the Russian real estate market PwC in Russia”. So, the share of grocery stores decreased in the period 2013-2018 from 26% to 8%; the share of entertainment facilities increased from 7% to 23%, cafes and restaurants - from 5% to 9%, services - from 2% to 3%.

Thus, a polycentric urban model based on shopping centers as a core, should be based on the economy of impressions. Positive customer experience connects the residents of this location to a particular shopping center and their interests in the field of work, entertainment, knowledge, are shifted from the historical city center to the residence place. We also believe that large shopping centers should be complemented by small multifunctional shopping complexes in densely populated areas, providing the maximum number of functions at affordable prices.

4. Summary
Based on the results of the study, the following measures are proposed to solve the identified problems and the following conclusions are made:

- it is necessary to use shopping centers as an actual format for the polycentric urban model’s development;
- shopping centers in the polycentricity system should act as multifunctional complexes to create a local labor market and reduce tension on street highways;
- shopping centers as the core of the polycentric model should satisfy the whole range of needs of the local population in sports, medical, educational, financial, state, entertainment and other services.

Please note that such a trend called mixed-use has already appeared. Consumers want to get
everything in one place; therefore, the principle of urban construction will be mixed-use, combining housing (co-living), working areas (coworking), retail and warehouse space.
- shopping centers should become the community centers to ensure communication and relaxation of the population in the locations, implementing the principles of the impressions’ economy;
- the polycentric model as an instrument of decentralization will ensure the transformation of megacities into the structures with city-districts inside.

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