TAKING INTO ACCOUNT THE VIEWS OF VISITORS AS A TOOL FOR URBAN PARK DEVELOPMENT: THE CASE OF ELAGIN PARK IN SAINT PETERSBURG

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Goal: to develop a framework for customer insight for urban parks that allows to elicit common use patterns as well as needs of various customer segments to increase park management effectiveness. **Methodology:** in the example of the Elagin Park in St. Petersburg, we show that customer insight by means of principal component analysis and cluster analysis gives possibility to identify non-obvious behavioral patterns of park visitors as well as segment the park visitors. We test our framework by using primary data on 701 respondents, collected by means of CAWI-survey. **Findings:** the derived segments differ from those which urban parks traditionally consider. The identified behavior patterns and needs of these segments show possible directions for revising the development of the park. **Originality and contribution of the authors:** this study demonstrates the possibilities of quantitative analysis in determining directions for the development of city parks by the example of on Elagin Park in St. Petersburg, Russia. This fills the gaps in research on managerial approaches in the contemporary urban park development.

Keywords: urban park, park management, customer insight, customer segmentation.

JEL: R11, R14.

INTRODUCTION

Urban parks play an important role in developing the sustainability of modern cities. Urban parks can be considered as a manifestation of the Right to the City concept of H. Lefebvre, providing citizens diverse and inclusive urban environment [Lefebvre, 1996]. Being the same time green and public spaces, they perform a set of ecological and social functions [Bell et al., 2008; Van den Berg, Jorgensen, Wilson, 2014; Staddon et al., 2018; Tyaglov et al., 2020]. On one hand, an urban park is a "lung" of the city that reduces the negative effect of harmful emissions into the atmosphere [Bowler et al., 2010]. On the other hand, it is a recreational facility where the citizens can walk, do sports, walk the dog, and spend time with family, friends, and others. Despite the diversification of recreational facilities in urban agglomerations [Isachenko, Isachenko, Ozerova, 2021], urban parks in their traditional form remain popular as places for communication [Tsurik, 2018]. In sum, urban parks have a positive impact on the physical, mental, and social health of citizens [Sundara Rajoo et al., 2021].

Scholars from various fields have paid increasing attention to urban park development during recent decades [Paul, Nagendra, 2017; Yu, Zhu, He, 2020; Slepnev, Ryazantseva, 2021]. However, there is still a lack of research on park management and the behavior of park visitors [Pinto, Ferreira, Pereira, 2021]. In real life, the development of urban parks is based on the peculiarities of their facilities, which neglects the identification of visitors' needs. This way, parks do not elicit the needs of their audience.

The absence of customer insight makes it difficult to develop urban parks for the sake of increasing the value of the park for the visitors [Van Rensburg, Venter, Strydom, 2012]. Assuming that customer insight can be referred to as a "non-obvious understanding of your customers which, if acted upon, has the potential to change their behavior for mutual benefit" [Laughlin, 2014, p. 76], then possible actions for urban parks may include adjustment of park facilities to the needs of the current and prospective visitors to change either the goal or frequency of their visits or their portraits. Since the visitors are non-homogenous, i.e., they satisfy their needs through various activities, customer segmentation is an integral part of the customer understanding and the following actions [Hirschowitz, 2001; Bailey et al., 2009].

Therefore, this study aims to develop a framework for customer insight for urban parks that allows to elicit common use patterns as well as needs of various customer segments to increase park management effectiveness. To test this framework, we rely on a quantitative approach that encompasses principal component analysis (PCA) and cluster analysis of the collected primary data from our survey. Thus, we further show how the use of customer insight allows for the segmentation of visitors into groups that are different from those, derived employing approaches, traditionally implemented by urban parks. We show that traditionally derived groups of park visitors are non-homogeneous and can be redefined upon some important behavioral peculiarities.

The object of our analysis is Elagin Park in St. Petersburg — a natural and architectural ensemble, situated aside the center of the city, occupying an island in the flow of the Neva River, close to the Gulf of Finland. Park representatives affirm that the park competes for visitors with other parks in the area. Therefore, it is interested in better communication with its prospective visitors.

Our theoretical contribution is multifold. First, we tackle the need for research in urban park management. Second, we develop a framework for customer insight of urban park visitors that allows us to construct an approach to park visitors' segmentation and test it. Third, we derive a few non-obvious patterns of consumer behavior

that provide room for further research. The developed customer insight framework can be used by partitioners which constitutes the managerial implication of our study.

This paper is structured as follows. In the first section, we review the extant theory and develop a customer insight framework for urban parks. In the second section, we describe Elagin Park — the object of our analysis. In the third section, we proceed with the methodology where we provide descriptive statistics of our sample and introduce the application of PCA and cluster analyses. In the fourth section, we interpret the results. In the fifth section, we provide discussion of possible application of the proposed framework.

LITERATURE REVIEW

Nowadays urban parks have become a subject of analysis in many fields of study. Authors explore different characteristics of urban parks: e.g., recreational [Paul, Nagendra, 2017; Kaymaz, Oguz, Cengiz-Hergul, 2019; Taylor et al., 2020], cultural [Bell et al., 2008; Slepnev, Ryazantseva, 2021], historical [Gullino et al., 2020; Lidzhieva, 2020]. The sociological dimension of analysis pays much attention to the role of parks in the facilitation of communication with citizens [Slepnev, Ryazantseva, 2021], the availability of parks for different groups of citizens [Rigolon, 2016; Yu, Zhu, He, 2020], their impact on health and wellbeing [Van den Berg, Hartig, Staats, 2007; Ward Thompson, Aspinall, 2011] and even the impact of park view on job productivity [Sop Shin, 2007; Gilchrist, Brown, Montarzino, 2015].

Urban parks can be considered both as non-competing objects of urban infrastructure that satisfy a set of common needs of the citizens or as competing products that should be offered to potential customers [Tisma, Jókövi, 2007]. The latter implies customer insight and subsequent change in positioning, communication, or developed facilities and services that correspond to the needs of current and prospective visitors.

A broad definition of customer insight is given in [Smith, Wilson, Clark, 2006] who refers to customer insight as 'knowledge about the customer that is valuable for the firm'. Information is a valuable resource that can and should be gained by the firm to outcast its competitors. There are four stages in customer insight development [Said et al., 2015]. The first stage implies an identification of the firm's needs and the acquisition of information that is aimed to satisfy these needs. In the second stage, this information is disseminated across the firm. During the third stage, a shared interpretation within the firm is built. The fourth stage implies the storage of insight into organizational memory. In this paper, we focus on the first stage, i.e., on the acquisition of necessary information from customers that can be used to satisfy two goals: increasing the number of visitors and changing either the goal or frequency of their visits or their portraits.

Revealing the use patterns of park visitors facilitates effective decision-making not only for its promotion and attracting new customers [Jun, Kyle, Mowen, 2009; Saayman Dieske, 2015], but also to manage visitors' flow, decreasing the number of certain groups of visitors, if necessary [Huettermann et al., 2019]. For customer insight, it is necessary to perform citizens' survey to collect information about the interrelation between their behavior and socio-economic characteristics, incentives, and attitude to different factors [Saayman, Dieske, 2015; Tkaczynski, Rundle-Thiele, 2011; Bailey et al., 2009], including travel time to park [Jun, Kyle, Mowen, 2009; Xie et al., 2020].

Some socio-economic characteristics (e.g., place of residence, parental status) have a significant impact on the behavior of park visitors [Park, Yoon, 2009]. Therefore, the inclusion of both types of characteristics — socio-economic as well as behavioral — in the model — is justified [Tkaczynski et al., 2015]. In this study, we use both groups of

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│  │  Socio-economic characteristics │ │  Behavioral characteristics   │ │
│  │  • Gender [Paul, Nagendra, 2017] │ │ • Frequency of visiting [Paul,│ │
│  │  • Age [Paul, Nagendra, 2017]    │ │   Nagendra, 2017]             │ │
│  │  • Parental status [Taylor et al.,│ │ • Goal of visit [Jun et al., 2009]│
│  │    2020]                         │ │ • Facilities in the park [Xie et al.,│
│  │  • Home-park distance [Paul, Nagendra,│ │  2020]                    │ │
│  │    2017]                         │ │ • Physical atmosphere in the park│ │
│  │                                  │ │   [Taylor et al., 2020]       │ │
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│  │  Common behavioral and        │   │     Customer segments         │ │
│  │  socio-economic patterns      │   │     of urban park visitors    │ │
│  │  of urban park visitors       │   │                               │ │
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│  │ Increase in the quality of managerial│ │ Opportunities for further park│
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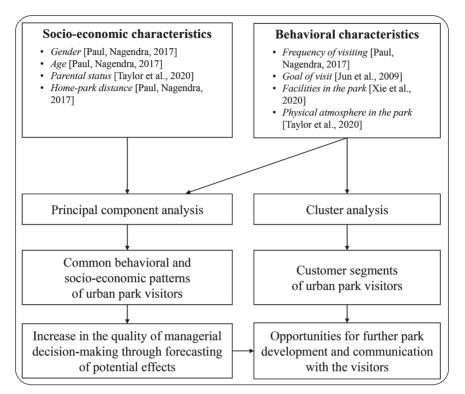
Fig. 1. The proposed framework of park visitors' customer insight

characteristics while developing the framework for park visitors' segmentation, which is presented in Fig. 1.

We first suggest performing a principal component analysis that can be used for various purposes, among which is correlation assessment among the chosen variables. For our analysis, this allows us to spot common use patterns of respondents and thus increase the quality of managerial decision-making. In contrast to the correlation matrix, it allows one to grasp the holistic picture of variables' correlation, not just pairwise correlations.

At the same time, consumer segmentation has been used for a long time employing various mathematical mechanisms, a special place among which is occupied by cluster analysis [Punj, Stewart, 1983], which not only determines the grouping of respondents based on their characteristics but also allows to measure their size. Such a technique makes it possible to increase the ac-

curacy of discerning between current and prospective visitors, elicit their needs and purchasing power, as well as predict their behavior in case of alterations in communication and infrastructural change.

ELAGIN PARK IN ST. PETERSBURG

Elagin Park was chosen as the object for analysis due to several reasons. First, this park is one of the most well-known parks in St. Petersburg, so most respondents should not only know about it but also have visited it at least once. Therefore, we can survey different citizens' recreational needs, including those people, who do not visit this park frequently.

Second, Elagin Park management runs a vigorous informational campaign on social networks, so it gives us the possibility to perform content analysis to define their main

approaches to park promotion and development. Therefore, we can compare the existing directions of Elagin Park development, chosen by the park management, and the results of our substantiative definition of prospective visitors' needs.

Third, Elagin Park development depends not only on its internal parameters (recreational facilities) and external characteristics (accessibility by public and private transport, a neighborhood with other well-known parks (Primorsky (Maritime) Victory Park and Park of 300th Anniversary of St. Petersburg) and residential areas). It also depends on unique limitations imposed on it (i.e., the formal status of a monument of nature). Unlike most urban parks in St. Petersburg, Elagin Park is subject to entrance fees on weekends and holidays. The ticket costs 100 rub. for adults and 30 rub. for children, students, and soldiers (it is almost equal to a single ticket price for urban public transport — 65 rub.). On weekdays the entrance to the park is free [Elagin Park, 2023a].

Elagin Park is located on Elagin Island at the mouth of the Neva River, where it flows into the Gulf of Finland. In 2012 the park was declared a monument of nature of regional significance "Elagin Island", and the territory, occupied by the park, became a monument of nature of regional importance [Elagin Park, 2023b], and Elagin Palace, situated in the park, is designated as UNESCO World Heritage Site [Elagin Park, 2023c]. These formal statuses impose certain limitations on managerial decisions concerning the development of the park. Elagin Park and Palace Ensemble often host different cultural and social events, organized by park management, including permanent exhibitions and seasonal festivals for St. Petersburg citizens (the most popular in the Tulip Festival, annually held at the end of May).

Besides its cultural and historical objects, Elagin Park is rather a big green area, having 94 hectares of land, and about 2.1 km length from east to west. Daily number of visitors equals approximately 15 000 visitors [Yamschikova, 2020]. Park is situated close to two metro stations [5- and 12-minute walking distance to them] and several residential areas (Fig. 2). To the south of Elagin Park, there is the upper-scale urban area — Krestovsky Island [Chereneva, 2020], city stadium and sports facilities, and Primorsky (Maritime) Victory Park — the main competitor of Elagin Park. On the Eastern border of Elagin Park, there is another urban park — Kamennyy (Stone) Island, which has recreational and upper-scale residential zones. On the Northern border, there is a Primorsky district with apartment houses for people with average and moderate income.

Elagin Park has different recreational zones, and sports facilities (Fig. 3), which may attract people who are interested in sports.

To define the main directions of Elagin Park promotion, performed by park management, we performed content analysis of publications in official accounts of Elagin Park in social networks. The analysis showed us, that the park is positioned by its management as a park for walking, with a focus on historical views in the park, safety, and comfort (Fig. 4). Some, but much less, attention is given to sport facilities and permanent art and historical exhibitions.

Therefore, we conclude that Elagin Park management promotes the park based on its three main infrastructural components: cultural and historical, recreational and athletic. Our conclusion was also acknowledged by the PR director of Elagin Park Marina Berezhnaya, whom we interviewed after getting the results of the content analysis. She approved that the current development of the park is aimed at attracting three main groups of visitors:

rest seekers, who visit the park with recreational intentions;

culture-seekers, who visit the park to participate in different cultural and social events;

athletes, who visit the park to go in for sports.

These three groups match the main facilities of Elagin Park (see Fig. 3). Hence,
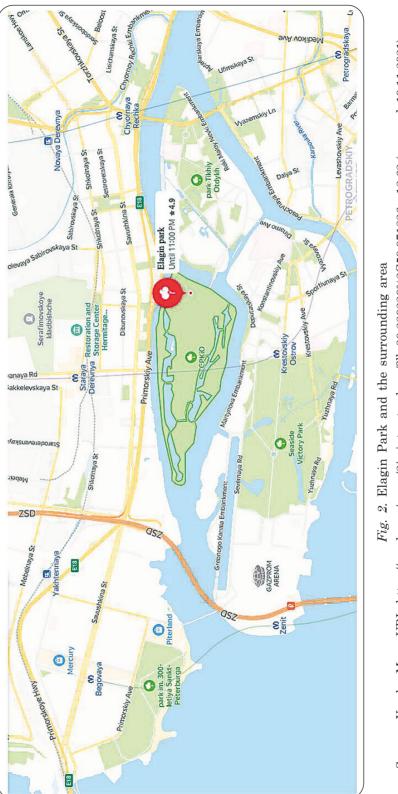
Fig. 2. Elagin Park and the surrounding area

Source: Yandex.Maps. URL: https://yandex.ru/maps/2/saint-petersburg/?ll=30.289229%2C59.971826z=12.62 (accessed: 19.11.2021).

Fig. 3. Map of Elagin Park with marked facilities

Source: Elagin Park. Map of Elagin Island. URL: https://elaginpark.org/central-park/map-island/ (accessed: 14.02.2023).

Fig. 4. A tag cloud from posts of Elagin Park's official community in the VK social network, July — December 2020

Based on: VK. URL: https://vk.com/elaginpark (accessed: 14.01.2021).

we can conclude that park management mostly tries to attract visitors by promoting the current characteristics of the park. It relates the park to an infrastructural object, not a product.

Nevertheless, rapid population growth in the city and the increasing recreational needs of citizens provide the possibility not just to attract new visitors, but also to provide new facilities for new groups of visitors with different needs, including those who visit parks irregularly. Moreover, analysis of visitors' online references about the park, leads us to the conclusion, that Elagin Park loses competition with its neighbor — Primorsky (Maritime) Victory Park. We made this conclusion by comparing visitors' references in the three most popular web geo-mapping services in Russia [IXBT, 2020] — Google Maps, and Yandex.Maps and 2GIS (Table 1).

It is possible to see that Elagin Park received less grades than its competitor, and it was graded worse in two cases out of three. It can be connected not just to the entrance fee (there is no entrance fee to Primorsky (Maritime) Victory Park) but also may result from incorrect communica-

tion of Elagin Park management with its prospective visitors.

Each derived group of visitors may have a non-homogeneous structure. For instance, culture-seekers may either have or not have underage children, want, or do not want to pay for extra services in the park, etc. These differences influence their choice of the park for their leisure time. Therefore, taking into consideration such characteristics as travel time to parks, income level, marital status, pet ownership, and others, may become a basis for the design of an effective communication strategy with prospective park visitors.

Another source of miscommunication dwells in the method of data collection, applied by park management — questioning of park visitors, focus groups for visitors, or experiments, also held for park visitors [Wan, Shen, Choi, 2021]. It leads to the emergence of survivorship bias and low representativity of the sample which deteriorates the quality of managerial decisions.

These mistakes can be avoided by the inclusion of prospective visitors in the sample. The most convenient source for opinion polling is social networks [Wan, Shen, Choi, 2021]. Hence, we rely on this approach. The next section is devoted to the empirical results of our study, where we test the developed framework.

DATA AND METHODOLOGY

Sample

The data for the analysis were collected employing a structured CAWI survey on the VK online social network in February 2021. The questionnaire was posted in various unofficial communities in the VK consisting of citizens from various districts and neighborhoods in St. Petersburg.

The questions were distributed into four thematic parts. The first part was devoted to leisure preferences. In the second part, the respondents were asked to share their opinions about urban parks and their char-

Visitors' grading of two competing parks, 2021

Park	Google Maps		Yandex. Maps		2GIS	
	Number of grades	Average grade*	Number of grades	Average grade*	Number of grades	Average grade*
Elagin Park	16 253	4.8	752	4.9	180	4
Primorsky (Maritime) Victory Park	27 797	4.8	3 283	5.0	41	4.6

Note: * — maximum possible grade is 5.

Based on: Google. Maps. URL: https://goo.gl/maps (accessed: 12.11.2021); Yandex.Maps. URL: https://yandex.ru/maps (accessed: 12.11.2021); 2GIS. URL: https://go.2gis.com (accessed: 12.11.2021).

acteristics. We measured seven parameters: frequency of urban park visiting, reasons to visit urban parks, the most frequently visited types of parks, potential causes to reject visiting an urban park, and readiness to spend money on extra services in urban parks. The third part contained the same set of questions as the second but concerning Elagin Park. The fifth part inquired into the socio-economic characteristics of the respondents (gender, age, marital status, parental status, income level, and education).

Through a CAWI survey, we were able to collect data from 733 respondents. After the exclusion of non-residents of St. Petersburg and data cleaning, the sample was reduced to 701 respondents. The mean age in the sample is 39.6 which is relatively close to the mean age in the St. Petersburg population [Rosstat, 2021a]. The sample is skewed in terms of gender — 81% of respondents are women, while for the population their share is 54.8% [Rosstat, 2021b]. This gender disproportion nevertheless represents the gender structure of park visitors, since similar gender distribution exists among members of the official group of Elagin Park in VK — among 40 372 members 33 629 (83.3%) are women and only 6 715 (16.6%) are men [VK, 2023].

Based on the results of the survey, 54.4% of our respondents are married, 40.7% have underage children, 5.4% have academic degrees, 73.2% have master's or specialist's degrees, and 9.3% have bachelor's degrees. 12% have secondary education and 0.4% have not graduated from school. In terms of respondents' employment, the following statistics were obtained: 61.3% consider themselves employees, 11.4% are self-employed, 8.4% are pensioners, 8.1% are currently unemployed, 6.6% are students, 4.1% are entrepreneurs. When asked about their financial position, the following answers were received: 2.3% — excellent, 41.2% — good, 36.2% — normal, 11.1% — bad, and 7.42% — awful.

Data analysis

Data wrangling and data analysis were conducted in RStudio software. Principal component analysis and *K*-means clusterization were performed with the *R* package *stats*. The grouping of respondents was fulfilled based on their choice of the reason to go to Elagin Park. We did not take into consideration those choices which: (a) were mentioned by only one respondent (respondents were able to add their answers); (b) were chosen by more than half of the respondents ("It is beautiful, I like the atmosphere", 596 out of 701). It was necessary to do so because those answers could distort the grouping procedure due to potential noise and multicollinearity [Fraiman et al., 2008].

The final list of variables that were chosen for further analysis is given in Table 2. For

Table 2

Variables description

Variable	Interpretation
Child	For me, it is important that my child likes to play there
Time	Travel time to the park is important for me
Accessibility	Ease of getting to the park is important
Sport	Possibility of doing sports in the park is important
Safety	Sense of safety in the park is important
Rest	Possibility to sit and relax in the park is important
Culture	Possibility to visit cultural events in the park is important
Food	Opportunity to have coffee or lunch in the park is important
Male*	Is male
Young*	Is younger than 30
Children*	Has underage children
Close*	Travel time to the park is less than 30 minutes
Frequent*	Visits Elagin Park at least several times a month
Subscribed*	Is subscribed to the Elagin Park web resources

Note: * — variables that were chosen for PCA but not for cluster analysis are marked with an asterisk.

PCA, we used both socioeconomic and behavioral variables since PCA allows us to spot multiple correlations among the chosen variables. In contrast, clusterization was performed based solely on behavioral characteristics — the needs of Elagin Park visitors.

The variables, given in Table 2, are used for visitors' segmentation employing PCA and cluster analysis. We use both methods since they provide us the possibility to get different results from the point of view of their interpretation.

Principal component analysis

Principal component analysis can be used for multiple purposes. Formally, it allows to reduction of the number of dimensions in the dataset through the rotation of axes. Additionally, PCA increases the interpretability of the data through visual representation [Labib, Vemuri, 2006]. One of the methods of graphical data processing, based on PCA, is biplot, which shows the location of variables in two-dimensional space relative to the principal components that are

dimensions with maximized variance of the variables in descending order.

However, this approach has two major limitations. First, the biplot does not provide any information about the size of the identified groups. Second, technically, defined groups represent rather common use patterns than discrete groups of visitors. Therefore, a more precise segmentation of prospective and existing park visitors requires a formal mathematical procedure that can be implemented by employing cluster analysis.

Cluster analysis

This approach implies finding the distance between respondents based on the aggregated discrepancy of their answers. To segment the respondents, a K-means cluster analysis was employed. This approach allows to minimize the intra-cluster variance while maximizing the inter-cluster variance. [Salminen et al., 2023] in their systematic literature review on algorithmic customer segmentation found that K-means as well as its variations were relied upon signifi-

cantly more often than other methods. The number of clusters was selected based on the elbow method. In addition, four is the most commonly selected number of clusters in previous studies on customer segmentation [Salminen et al., 2023].

RESULTS

Principal component analysis

The biplot for the variables from Table 2 is shown in Fig. 5. In contrast to the correlation matrix, the biplot allows retrieving the interrelation of all variables, not just pairwise correlations. Based on that we can discern common patterns among respondents. These patterns are graphically presented as four groups.

The main components of a graph are the *X* and *Y* axes, arrows, and dots. The axes correspondingly represent the first two principal components. Variables are depicted by arrows that are plotted in the two-dimensional space. The graphical re-

lationship between arrows indicates the correlation between the variables. For instance, if the arrows overlap each other, this means that the correlation between the two variables is 1, if the two arrows form an angle of 90°, then the variables are orthogonal, that is, uncorrelated. If the arrows point in opposite directions, then the correlation is –1. The dots on the graph represent the groups of respondents who gave the same answers for all questions considered for the analysis.

Based on the selected variables we have visually identified four groups of patterns. Each pattern may be considered as a certain group of visitors who have particular socio-economic and behavioral characteristics. We named these groups based on the longest arrow.

- *Group 1. Male visitors.* This group contains variables: male, food, and culture. According to the graph, one can conclude that these visitors are interested in opportunities to eat. Even though the variable culture is in this group, it is dif-
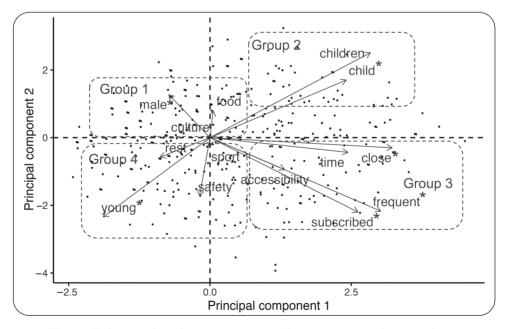

Fig. 5. Behavioral and socio-economic characteristics of respondents

Note: * — variables other than criteria to go to Elagin Park are marked with an asterisk.

ficult to make any conclusions due to the minuscule size of the arrow. In addition, most male visitors are not subscribed to the Elagin Park web resources and visit the park rather rarely.

- *Group 2. Parents with children.* This group contains variables: children, and child. People who have underage children are often penchant to choose parks where they can conveniently and safely spend time with their children. These people are often above thirty years old and live rather close to Elagin Park. Notably, the majority of parents did not choose safety as an important criterion for choosing Elagin Park, probably because they visit the park in the daytime. Also, this group indicated no need in places to sit and relax.
- *Group 3. Neighbors.* The group contains variables: frequent, subscribed, time, close, and accessibility. According to the graph, one can conclude that people, who live close to Elagin Park, are often subscribed to its web resources as well as visit it more frequently and value their short distance to the park and its accessibility.
- *Group 4. Young visitors.* This group contains variables: young, safety, rest, and sport. Most young visitors look for places where they can sit and relax. It's this group that needs the feeling of safety. A few representatives also prefer Elagin Park for the opportunity to do sports. People from this group less often have underage children and are less interested in cultural events than other respondents. Additionally, they do not need an opportunity to eat in the park.

Biplot allowed us to make a preliminary analysis of the relationship between variables and draw some conclusions about the behavior of Elagin Park visitors. The identified groups of visitors do not coincide with the ones that the park management is working with. Therefore, for park management, there is room for adjustment of their positioning.

Cluster analysis

Based on the selected behavioral and socio-economic characteristics of the respondents we identified four clusters. The number of clusters, derived by cluster analysis, equals the number, derived by principal component analysis. However, the use of a formal mathematical procedure for grouping changed visitors' profiles for the derived groups.

Table 3 presents the descriptive statistics of each cluster according to the variables that were selected for the clusterization procedure. The figures in the cells indicate the share of respondents in each cluster that fit a particular characteristic (have 1's for each variable). Bold font denotes characteristics that are either 0 or 100, which are particularly important for the description of cluster members' portraits. A set of important characteristics provided us the possibility to discuss sample names for each cluster.

People from the first cluster have no distinct preferences. These are people who did not indicate the need for accessibility of the park and availability of quiet places to rest as well as interest in cultural events. Hence, we name this cluster "Occasional visitors". This is also the largest cluster with a size of 31 %.

The second cluster is featured by the explicit interest in places for quiet rest. All people from this cluster marked this as an important criterion for visiting Elagin Park. At the same time, these people are not interested in cultural events and do not consider accessibility. Therefore, one may call these people "Rest-seekers". They constitute 23 % of visitors.

The third cluster consists of people who, in contrast to the second cluster, value accessibility. Few of them noted the need for food (3 %), sport (6 %), and safety (7 %). Elagin Park is probably well accessible to them (which they value), so we label them as "Neighbors". We also find it logical that they do not require opportunities for lunch since they might have lunch at home and

Description statistics of the in-model variables by cluster

Variable	Cluster 1. "Occasional visitors", %	Cluster 2. "Rest-seekers", %	Cluster 3. "Neighbors", %	Cluster 4. "Visitors of cultural events",%
Cluster size	31	23	20	26
Time	22	16	20	15
Food	12	15	3	11
Child	15	16	13	7
Rest	0	100	35	42
Culture	0	0	20	100
Sport	12	10	6	5
Safety	13	15	7	5
Accessibility	0	0	100	0

cannot get hungry on their way to the park. The size of this cluster is 20%.

The fourth cluster encompasses respondents who are primarily interested in cultural events. This group also represents an audience that does not require accessibility. This cluster was named "Visitors of cultural events" and encompasses 26% of respondents.

In Table 4, statistics on demographic and behavioral indicators that were not used for clusterization are given. The former include age, gender, marital status, employment type, possession of children, and time to get to Elagin Park. The latter includes the frequency of Elagin Park visiting, subscription to its web resources, and its assessment. It provided us with more insights about the defined clusters that we used for speculations about the possible ways for their attraction.

Cluster 1 (occasional visitors, 31%). Occasional visitors occurred to be the largest segment of Elagin Park visitors enclosing almost one-third of them. These people do not have any particular age patterns. Yet, the share of men is a little higher than the sample average (23% vs. 19%). This cluster has the smallest share of people who are subscribed to Elagin Park web resources (21% vs 36%

sample average) and who assess Elagin Park as excellent (38% vs. 46% sample average).

Cluster 2 (rest-seekers, 23%). In terms of age, this segment represents younger people. Thus, it has the highest share of 15- to 24-year-olds (15% vs. 10% sample average) and a little higher share of 25- to 35-year-olds (30% vs. 26% sample average). The share of men is a little higher than the average of the sample (23% vs. 19%). Simultaneously, this segment is featured with a little higher share of the non-married (50% vs. 46% sample average) and of the childless (33% vs. 41% sample average). People in this segment are on average less frequently employed (71% vs. 77% sample average) and tend to live further away from the park (26% vs. 31 sample average).

Cluster 3 (neighbors, 20%). These customers constitute the smallest segment. It is featured with a smaller share of men (15% vs. 19% sample average) as well as a little higher share of married (58% vs. 54% sample average), a significantly higher share of parents (50% vs. 41% sample average) and employed customers (82% vs. 77% sample average). The most striking peculiarity of these people (which became

Table 4

Demographic and behavioral profiles of the four clusters

Characteristic	Cluster 1. "Occasional visitors", %	Cluster 2. "Rest-seekers", %	Cluster 3. "Nearby-living parents", %	Cluster 4. "Visitors of cultural events", %	Sample average
Cluster size	31	23	20	26	25
Age					
15–24	11	15	7	7	10
25–34	28	30	23	21	26
35–54	51	43	59	59	53
55+	11	12	11	13	12
Gender					
Male	23	23	14	15	19
Female	77	77	86	85	81
Marital status					
Married	52	50	58	58	54
Not married	48	50	42	42	46
Employment					
Employed	77	71	82	78	77
Student	8	10	4	3	7
Other	15	19	14	19	16
Other socio-economic characteristics					
Has children	42	33	50	40	41
Lives within half an hour of the park	29	26	44	26	31
Other behavioral characteristics					
Visits Elagin Park at least once a month	27	27	45	24	30
Is subscribed to Elagin Park web resources	21	33	47	47	36
Assesses Elagin Park as excellent	38	43	57	51	46

the basis for their labeling) is that they live closer to Elagin Park (44 % vs. 31 % sample average) and visit it more frequently (45 % vs. 30 % sample average). This seems to be the most loyal audience since they are the most subscribed to the park's Internet resources (47 % vs 36 % sample average) and

giving Elagin Park the highest score (57 % vs. 46 % sample average).

Cluster 4 (visitors of cultural events, 26 %). This group has the lowest share of young people (28 % vs. 36 % sample average for 15–35-year-old sample average), and

therefore, students (3% vs. 7% sample average), and a little higher share of women (85% vs. 81% sample average). People from this group are slightly more often married (58% vs. 54% sample average). Visitors of cultural events live on average further away from the park (21% vs. 31% sample average live within half an hour) and visit it less often (24% vs. 30% sample average). Nevertheless, they seem to be quite loyal to the park with more often being subscribed (47% vs. 36% sample average) and assessing the park as excellent (51% vs. 46% sample average).

DISCUSSION

The use of customer insight allowed us to identify and predict use patterns of Elagin Park visitors. On one hand, with the help of PCA, we identified common use patterns. On the other hand, we were able to formally segment the visitors via cluster analysis and understand the needs of each cluster. Both results may help park management to shape their decision-making towards the needs of existing and prospective visitors as well as to decrease the flows of any chosen group if needed. We show that park visitors demonstrate use patterns and needs, that may differ from the existing structure of park facilities.

Comparison of approaches

As discussed previously, at the current moment Elagin Park seeks to attract three groups of visitors, based on the existing park infrastructure. Table 5 depicts the groups elicited by the Park management based on the structure of the existing park facilities and those derived via cluster analysis.

Both approaches delineate a group that visits Elagin Park to relax and rest — rest-seekers. However, the identification of park use patterns for the overall sample via PCA allowed us to get another important characteristic of this group: they are relatively young and value safety. Cluster analysis allowed us to estimate that this segment represents slightly more than a quarter (27%) of the visitors.

Both the current approach of Elagin Park to customer segmentation and cluster analysis identify the group of visitors of cultural events. Cluster analysis showed that among the respondents the size of this group is 26%. Via the proposed methodology we were able to reveal that these people are relatively loyal to the park and are ready to spend time and make an effort to get to Elagin Park even if it is not easily accessible.

It is worth mentioning that Elagin Park management also derived the group of sportspeople that is not identified by customer insight. It can be explained by the existence of sports infrastructure in the park and, therefore, the desire of Elagin Park management to exploit it. But at the same time, the customer insight shows us that citizens do not value it much. So, maybe it can be a good decision for the park management to decrease the number of sports facilities.

Both PCA and cluster analysis identify parental status and close place of living as important characteristics of customer segments. Cluster analysis determined one group that combined both characteristics and corresponds to 20% of visitors.

Finally, cluster analysis defined a new group — occasional visitors (31% of respondents). This group may provide an important room for decision-makers to manage permanent visitor flows — either to increase or to cut them.

Thus, we showed that customer insight allows us to elicit the needs of urban park visitors and segment them, which provides opportunities for targeted communication, change in positioning, or infrastructural change. Since PCA does not identify groups, but it identifies behavioral and socio-economic patterns in the sample, we consider PCA as the secondary method that complements cluster analysis. Yet, we suggest its obligatory application before the clusteriza-

Comparison of groups of visitors: Park management approach and results of cluster analysis

Infrastructural approach	Cluster analysis
Rest-seekers	Rest-seekers (23%)
Visitors of cultural events	Visitors of cultural events (26%)
Sportspeople	–
–	Neighbors (20%)
–	Occasional visitors (31%)

Notes: for groups in the cluster analysis section, the corresponding size is given in brackets; dashes are used in case when a defined group has no analogue when another approach is applied.

tion, since it informs about the possible number of groups of patterns that can be used for choosing the number of clusters.

Limitations and future research

In addition to K-means clusterization, hierarchical cluster analysis was employed, and based on it we defined similar clusters. Such triangulation increases the validity of the obtained results.

This study is not free from limitations. First, the survey was held in winter, which might be a potential source of bias. For example, at this time of the year, people might have less penchant for sitting on benches and doing sports due to lower temperatures. In addition, in the winter of 2021, there were restrictions related to the COVID-19 pandemic which also might affected the responses. Some people might have had a lower interest in participation in public events (exhibitions, concerts, etc.).

Another limitation relates to the possibility of making changes in park facilities. Some urban parks are cultural and natural monuments and are subject to strict regional or state regulations. For example, Elagin Park is both a monument of nature of regional significance and Elagin Palace, situated in the park, is designated as a UNESCO World Heritage Site. This should be taken into account when: (1) surveying the population; (2) developing measures for infrastructural change.

Finally, the attraction of new visitors is limited by the park area and the space per visitor, required to satisfy the needs associated with a particular goal of the visit. Thus, people, who visit the park to sit and relax might be repelled by the presence of many other visitors. Simultaneously, this might be insignificant for visitors to cultural events. This should also be considered when managing visitor flows.

The limitations and findings of our study give room for a few avenues for future research. First, a study on another urban park and subsequent comparative analysis might invoke interesting findings. Second, research on the impact of subscriptions to urban park's Internet resources on visitors' consumer behavior might be valuable both for theorists and practitioners. Finally, we encourage the start of a discussion about the development of common scales for eliciting the visitors' needs for urban parks.

CONCLUSION

In this paper, we developed and tested the framework for park visitors' customer insight on the example of Elagin Park in St. Petersburg. We showed that customer insight can provide valuable results for urban park development. Disclosure of visitors' needs

may help to fulfill different goals of park management — to increase the number of park visits or to manage visitor flow.

The analysis was performed using primary data from a CAWI survey of 701 respondents. PCA and cluster analysis were used for the identification of behavioral patterns and customer segmentation. The derived segments occurred to be different from those that urban parks traditionally consider which gives room for changes in park positioning, communication with (various segments of) consumers, and development of park facilities. We conclude that the application of the proposed customer insight framework may contribute to the improvement of managerial decision-making.

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Учет мнений посетителей как инструмент развития городских парков: пример ЦПКиО им. С. М. Кирова в Санкт-Петербурге

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Цель исследования: разработать алгоритм анализа потребностей посетителей городских парков, который позволит выявить наиболее распространенные модели поведения и соответствующие им потребности различных групп населения для повышения эффективности управления парком. **Методология исследования:** на примере ЦПКиО им. С. М. Кирова на Елагином острове в Санкт-Петербурге показано, что использование представленного в исследовании алгоритма, включающего анализ главных компонент и кластерный анализ, дает возможность выявить наиболее распространенные модели поведения, а также сегментировать посетителей парка. Для тестирования алгоритма используются данные, полученные в ходе опроса 701 посетителя парка. **Результаты исследования:** полученные сегменты посетителей отличаются от тех, которые были выделены руководством парка. Выявленные модели поведения и потребности данных сегментов показывают возможные направления для пересмотра развития парка. **Оригинальность и вклад авторов:** данное исследование

демонстрирует возможности количественного анализа при определении направлений развития городских парков на примере ЦПКиО им. С. М. Кирова на Елагином острове в Санкт-Петербурге. Это восполняет пробелы в исследованиях управленческих подходов в развитии современных городских парков.