

Value-Oriented Management of City Development Programs Based on Data from Social Networks

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Abstract. The paper presents the results of a pilot study of the possibility of using a value-based approach to managing city development programs. The value model of a person includes a static description of the values, motivations and expectations of a person, taking into account his social, demographic group and life situation. The value model of life in the city involves the description of transitions between motivated and non-motivated social groups. City development management is considered from the point of view of the composition of development projects, which requires the formation of a way of presenting the project in the "language" of a value management model, which includes an assessment of the timeliness of the city development project. The paper proposes to determine the values of residents through social media profiles and comments generated by users. Values are described using the Schwartz method. The work contains comments from sources - Google Maps, Telegram, Vkontakte. To validate the information received, a survey of residents was conducted, to compare a real person with a virtual profile, using the revealed correlations, it was concluded that with the help of information from social networks, it is possible to determine values and use them to manage city development programs.

Keywords: value-oriented · urban planning · parsing · data collection · mathematical modeling

1 Introduction

Today, urban development is one of the most important tasks of humanity. The quality of life depends on the quality of the environment that the city forms. All residents of megacities and small towns are part of their location. Their lifestyle, habits, requests, needs and values shape the environment, on an equal footing with environmental and economic factors.

The development of the cities themselves depends on the type of economy of the country and other features, however, the principle itself is often similar. A state may have one global document indicating the vector of development of mountains, for example, a

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development strategy up to a certain year. Based on such programs, global documents for individual cities can be formed, which also describe a development strategy that contains goals and objectives for the development of the city. But among other things, such strategies may contain separate local programs - city development programs that already affect certain industries - security, medicine, affordable housing, social policy and other areas.

But how to correctly allocate priorities between these specific individual programs? How do we know that this year we need to strengthen the development of security in the city, and not medicine? There are different approaches in classical urban studies and urban management theory. For example, based on the economic indicators of last year, macroeconomic regions, in the negative case, such decisions can be made based on the desires of individual leaders associated with political popularity. All these methods are significantly outdated, and require improvement for the sustainable development of cities.

The weak side of management is the lack of statistical methods for determining the implementation of the strategy. To date, statistics represent a limited set of indicators for municipalities, among which one can distinguish the size of territories, population, employment and wages, industrial production, construction, environmental protection and others. In addition, there is a long time interval between the presentation of statistical information and decision-making; at the same time, the information provided does not always reflect the real situation in the city. The problem in the field of management is that the social component of the object of management – the values of citizens - is not taken into account. There is no correlation between the distribution of the program budget among themselves with the significance for people in terms of values and needs.

To solve these problems, this paper considers the possibility of using a value-oriented approach to the management of city development programs, using the example of St. Petersburg.

2 Research Design

To ensure sustainable development and high quality of life in an urban environment, it is necessary to use intelligent urban technologies and pay special attention to the practice of taking into account eco-psychological technologies [1–3].

In the process of urban infrastructure development, it is necessary to take into account the cosmopolitanism of urban culture, the peculiarities of material and immaterial traditions, the values and needs of city residents at different levels of the urban environment in order to achieve ecological, cultural and economic sustainability of the entire city [4]. A modern city can be represented as a dynamic, semiotic structure that unites many life worlds of individuals [5], which exist in an inseparable socio-cultural unity. Currently, the interconnection of heterogeneous urban elements is supported primarily by information technologies that provide communication links between residents, the managing sector and infrastructure

One of the most effective approaches to managing the development of the city's infrastructure can be considered a value-oriented approach [6]. This approach takes into account cultural and value transformations in local communities of the city for

territorial expansion of infrastructure. The values, needs and hobbies of each individual resident of the city are not independent concepts, but are intertwined, determined by con-text, culturally diverse and related to how we see ourselves and perceive the urban environment.

The relationship between the psychological state of a person and the urban environment in which he exists is widely discussed by various specialists in the framework of sociology, psychology, urban studies, anthropology, etc. In order to create an accessible environment that meets the values and needs of modern man, constant monitoring of human interaction with his spatial environment is necessary. An important part of such studies is the study of visual-semiotic elements of urban space and their impact on the psychological state and stress level of city residents [7], studies of autobiographical and historical memory of the city, the attitude of residents to architectural objects of the city, studies of semantic cognitive maps of the city [8], studies of urban identity, studies of socio-cultural capital of the city, studies devoted to the study of the influence of landscaping and noise levels on the psychological state of a citizen [9]

It is worth noting that often the theory of urban space design does not take into account the results of socio-psychological research, the complexity and variability of the emotional experience of residents, which is important when planning convenient infrastructure. Following Reinald D. and Elffers H. rethinking and expanding the concept of "protected space" O. It can be said that a successful urban space planning should be based on an analysis of the daily interaction of city residents with infrastructure facilities that ensure the satisfaction of basic needs, the realization of values and interests. In the study Karami S., Ghafary M., Fakhrayee A. It is indicated that satisfaction with the state of the surrounding urban environment is closely related to the fulfillment of the needs of residents, as well as the degree of openness and dialogicity of the space they create [10].

The daily introduction of information technology into our lives has changed our understanding of urban space, and most importantly has changed the experience of inter-action of a city resident with the environment. Virtual space is mixed with physical space and is often replaced through a large number of visual images [11]. A resident of a modern city has the opportunity to “be present” in any corner of the city, any socio-cultural location, at any event in real time through social networks and media space. Such inclusion allows you to actively change the urban environment to realize your socio-psychological needs and creates a new complex form of urban space that needs to be studied and monitored.

Value-based management is a tool for ensuring the quality of life in the city [14]. A smart city is characterized by services for the population aimed at meeting the needs, and on the other hand, a city management system to ensure sustainable development and improve the quality of life of residents. Studies indicate that the quality of living depends on and is determined by the structure of the needs and values of residents, while they can change over time due to changes in the urban environment and differ for different socio-demographic groups.

Based on these concepts, it is proposed to transform a value-oriented approach for managing city development programs.

3 Management Object

In this paper, the process of formation and management of city development programs is considered on the example of St. Petersburg. It is proposed to transform a conventional decision-making system, the effectiveness of which is measured on the basis of economic indicators based on an approach based on value indicators.

St. Petersburg development programs are measures to solve social and economic problems to improve the well-being of the city's residents. They are developed for a certain period of time (most often for 5–10 years), and include strategic objectives and goals, as well as ways to achieve them. City development programs may include infrastructure projects (for example, the construction of roads, school complexes and kindergartens), social and economic initiatives aimed at improving the standard of living and business development in the city. St. Petersburg development programs are usually developed with the participation of the public, the business community, city authorities and other interested parties. They cover many areas, such as ecology, transport, healthcare, small and medium-sized business development, tourism, education and culture.

The current management process has the disadvantage that there is no direct connection between residents and the state, there is a large time interval between the results of the implementation of programs and the distribution of the budget for the next year. Based on the performance indicators, a program is formed for the next year, without paying attention to the values of citizens. That is why, in this paper, we propose a management process based on a value-oriented approach that will take into account, in addition to actual metrics, also indirect ones that are related to the real needs and values of citizens (Fig. 1).

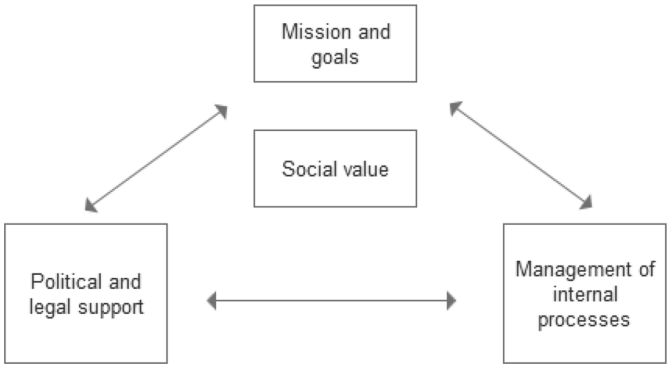

Fig. 1. Value-based management scheme

The development of a new method of managing city development programs with the application of a value-based approach will allow assessing the effectiveness of management through integral characteristics of the state of society and quality of life and the ability of projects to improve this quality of life.

A value-oriented approach to management is a methodology based on the identification of key values that guide managers and co-workers in their professional activities.

My work describes the composition of urban problems, the current management process, and demonstrates at what stage it is possible to use a value-oriented approach. To test the method, information sources on the Internet were selected, to collect information about the values of citizens, the following sources were selected: geoinformation service - Google Maps, Vkontakte social network, Telegram messenger.

For completeness of the data, 3 types of text sources have been specially selected, the processing of which will allow determining the values and requests of citizens to the city in real time.

Figure 2 shows the general scheme of data collection and processing to determine the values of citizens.

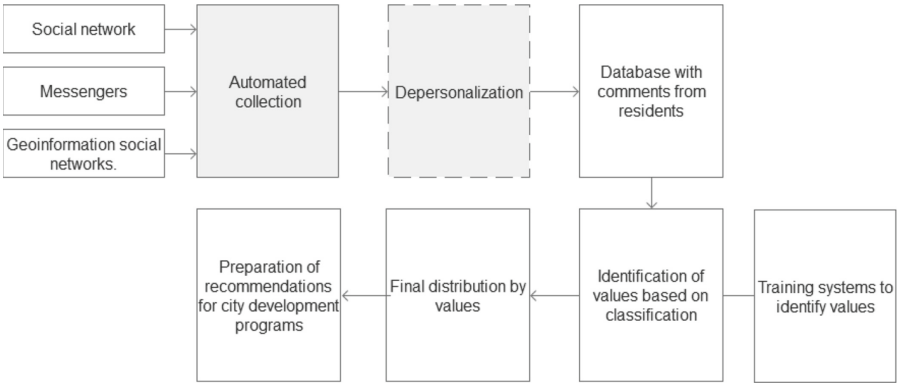

Fig. 2. General scheme of data collection and processing to identify values and needs

Schwartz's theory of basic individual values is used as a fundamental theory. Schwartz's theory of basic individual values is a theory that describes universal motives associated with people's value behavior. Schwartz's theory suggests that people pursue several basic values in their lives, which are key factors for explaining their behavior and preferences. These values range from personality characteristics to the socio-cultural context in which they live. Schwartz's theory is widely used in interpersonal and cross-cultural studies, where it is used to explain why people perceive and react differently to the same situations in different cultures.

The design of the study was based on the ideas of Widodo J., who points out that in order to successfully improve infrastructure, it is necessary to build a dialogue with city residents, take into account their cultural and digital experience in interaction with tangible and intangible values at different levels of the urban environment [12]. The paper presents the results of research conducted in Indonesia, which may be applicable to other emerging economies. The author examines practical and basic principles that can help cities better understand the interaction between people and the urban environment, and take the right steps to preserve the health and well-being of residents.

The research presented in the paper also emphasizes the need to support local culture and take into account the uniqueness of each city in planning the urban environment, as well as the importance of training and the transition to innovative approaches in urban space management [12].

4 Value-Oriented Approach

The cultural environment surrounding the citizen, the mentality of micro- and macro-communities, is formed on the basis of urban space and determines the leading social and individual values. Based on the theory of Sh. Schwartz can identify ten basic values that influence the formation of a reference lifestyle in the minds of city residents in an urban environment. Let's describe the relationship of basic values with elements of the urban environment, which can be objectively identified in the analysis of digital experience.

- The value of power associated with the presentation of a certain status will be reflected in the presentation of the attributes of wealth, authority, dominance. In relation to the analysis of the urban environment, this value will be realized through a demonstration of belonging to a number of urban social institutions and showing interest in objects of state power and management. Based on the analysis of this value, it is possible to evaluate the successful and unsuccessful elements of the image policy of the city administration, to identify attractive infrastructure facilities of the city.
- The value of achievement is associated with the presentation of social successes and competencies that will be presented in demonstrating belonging to certain professional and cultural circles. The analysis of such digital information posted by the residents of the city can help to assess the potential of the economic directions of the city's development, its labor resources in various fields.
- The values of hedonism and stimulation, related to the demonstration of pleasure, recreation and entertainment and can help in the analysis of the cultural and recreational resource of the city and directions in the development of entertainment infrastructure.
- The value of independence is associated with creative and research activity. This value can be analyzed through the study of scientific and creative urban communities and show the degree of realization of the scientific and technical potential of the city.
- The value of universalism is expressed in the understanding of the need to protect the well-being of the community and will be manifested in participation in social urban projects, volunteer and activist movements. This value indicates that residents support the development potential of a healthy society, the popularity and importance of social cooperation in society.
- The values of affiliation, traditional values associated with belonging to various social groups, can be assessed through the analysis of participation in local urban communities, the presence of individual symbols, rituals necessary to maintain a sense of belonging and stability. The analysis of this value can help to assess well-being in everyday interaction and life in individual urban locations, to reveal unfavorable elements of the environment.

– The need for security, as a basic component of the stability of the urban environment, can be assessed through the analysis of reviews and comments of residents of the city about different locations related to the description of social order, economic, environmental safety, mutual assistance, involvement of management structures in the organization of city life.

Through the value analysis of the digital image of the urban environment, it is possible to describe the social geography of the urban environment, identify the degree of development of human, technical and economic potential, determine the prospects for the development of a certain infrastructure, identify points of growth and development. The digital space provides a huge amount of open information that can be used for such analysis. Urban space includes many communication platforms implemented in both real and virtual environments, the value-oriented analysis of which is necessary to create effective socially successful management systems.

Additionally, a search was conducted in the Scopus database on the subject of the study, to review the methodology of value-oriented city management and development programs. It was possible to find separate directions described in [11–13]. The results of processing are illustrated in Fig. 3.

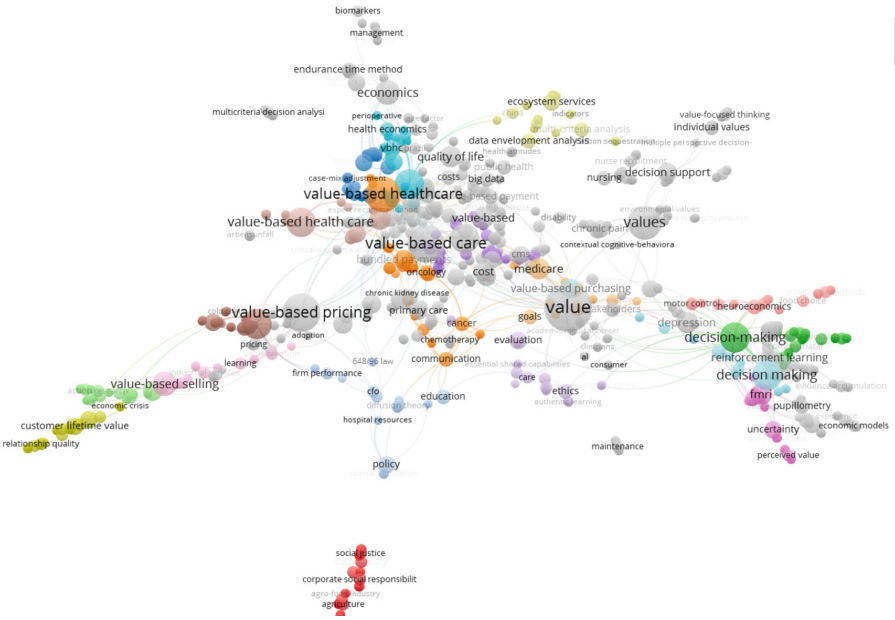

Fig. 3. Results of bibliographic analysis

5 Values and Social Networks

In the classical situation, to determine values, it is necessary to use a value questionnaire, for example, the Schwartz questionnaire. The Schwartz Value Questionnaire is a psychological diagnostic tool developed by psychologist Shalom Schwartz. The purpose of the questionnaire is to establish the personal values and orientations of the interviewee in various life situations. The questionnaire consists of about 57 questions to choose one of the two proposed options. Each question contains a number of ideals and values, from which you need to choose one that is closer to personal values and orientations. The answers to the questions help to set priorities in life values, such as self-realization, personal status, security, prosperity, harmony with the environment, etc. The analysis of the data obtained makes it possible to determine the basic value orientations of a person and her attitude to certain areas of life. The Schwartz value questionnaire is widely used both in research activities in psychology and sociology, and in applied activities, for example, in business to analyze the culture of an organization and to determine professional orientation.

This method allows you to accurately assess the basic values, however, it has a disadvantage - you need to answer 57 questions, the survey can take more than 30 min. It may be almost impossible or impractical to promptly interview a reliably significant sample of residents, which is why a new method is proposed in this paper - determining the values of residents through information in social networks.

However, in order to use such sources, it is necessary to conduct a validation that proves that it is possible to use social media data to determine values. To prove this hypothesis, an original method based on cyberpsychology was used in this work. It combined classical psychology with automated methods. The essence of the hypothesis is that there is a relationship between the real personality of a person with his profile in social networks and what the user writes.

The daily introduction of information technologies into our lives has changed our understanding of urban space, and most importantly has changed the experience of interaction of a city resident with the environment. Virtual space is mixed with physical space and is often replaced through a large number of visual images (Chen Feng, Hua-wei Xu). A resident of a modern city has the opportunity to “be present” in any corner of the city, any socio-cultural location, at any event in real time through social networks and media space. Such inclusiveness makes it possible to actively change the urban environment in order to realize their socio-psychological needs and creates a new complex form of urban space that needs to be studied and monitored.

To prove the hypothesis put forward, work was carried out in which the data after the survey of a real person was compared with the information that he publishes about himself on social networks. During the study, 3 stages of work were carried out:

- Psychodiagnostic survey of subjects using the Schwartz method from different urban communities to determine the main interests and needs that mediate interaction with the urban environment. Each respondent gave a link to their profile on the social network, as well as consent to the collection and processing of data.

- An automated analysis of the profiles of the subjects in social networks was carried out to identify the main value-semantic components of their information image, which is the basis for building communication.
- Identification of reliably significant relationships between the value-semantic attitudes of city residents, their needs for the development of infrastructure and the components of their profiles in the social network for the theoretical justification of value-oriented forecasting of infrastructure development needs.

Based on the data on the number of residents of St. Petersburg, the sample size for the survey was calculated - 330 respondents. The sample consisted of users aged 18 to 67 years (M = 31.12, SD = 11.54), 64% of whom (211) were women and 36% (119).

During the psychodiagnostic testing, the subjects gave links to their social networks. In the next step, we studied the profile of each user using automated methods. In this study, we analyzed only the main publicly available parameters.

As a result, a database of respondents was prepared to compare the collected information with the test results in order to identify significant relationships. For example, profile subscriptions, basic publicly available information, interests and other parameters were collected. All data has been processed and translated into binary code.

Using correlation analysis (Spearman correlation coefficient), we have identified the relationship between the needs of residents in infrastructure development. Infrastructure development, components of their profile in the social network and their personal characteristics that determine interaction with the urban environment (Fig. 4).

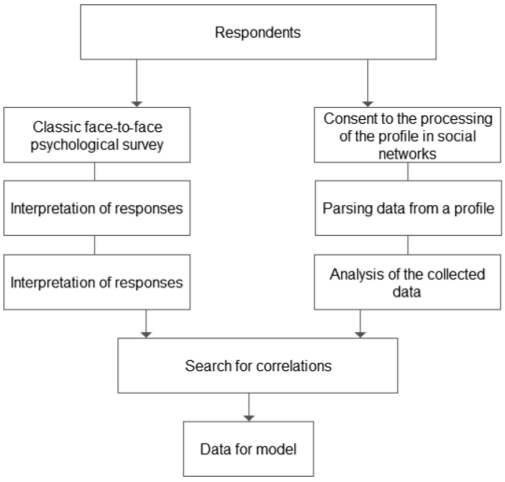

Fig. 4. A scheme for finding a correlation between a real person and a profile in a social network

Evidence has been obtained that social networks can serve as a source of information about the values of citizens. This information can be used to develop a model of citizens' values.

6 Data from Geoinformation Networks

At the previous stage, the possibility of using social network data was proved. Now it is necessary to determine which social networks can still be used.

As we found out, the Vkontakte profile and user comments sufficiently accurately describe the personality. It was proposed to supplement the set with two sources, Google Maps and Telegram messenger.

Google Maps is a mapping and navigation service developed by Google. With Google Maps, you can view maps of the globe at various scales, plan routes from one point to another, use the car navigation function, view photos and reviews of places on the map, as well as use geolocation-related functions.

Google Maps is used not only in the daily life of users, but also in business, to determine the location of companies and plan delivery routes or customer service. In addition, Google Maps can be used in tourism, education, scientific research and other industries.

In addition to routes, this service allows you to leave comments under every object you have visited, even under urban objects. It can be concluded that this is a kind of geoinformation social network.

For the current publication, it was decided to analyze reviews of parks and squares in St. Petersburg, to study communication practices and identify the values of residents. Recreational objects were collected by districts, there are 18 districts in the city, landscaping objects were selected for each of them using an internal Google Maps search, the words “park”, “garden”, “square”, “alley”, “forest”, “field” were used for search, then each object was saved as a link to the object card in the system.

Further, with the help of an automated parser, reviews were collected for each park. During the analysis, we managed to collect a database of recreation facilities presented in the Google Maps service, the final database includes 291 objects of landscape design (parks, squares, alleys). More than 360000 reviews have been processed. The final database of reviews was depersonalized, only the text of the review and the date were saved.

Based on the results of collecting statistical information, an assessment of various communicative practices of city residents was carried out: the number of reviews of parks and squares, the average rating indicated by a city resident in geoinformation resources, and also calculated the landscaping index of districts, which is based on the ratio of the total area of urban areas. The area of green spaces, as well as the number of green spaces per 10 thousand is calculated.

It is worth noting that the rating of parks and squares is interrelated with the subjective assessment of safety, comfort and aesthetics of the environment and can serve as a communicative practice as an indicator of the overall quality of life of the population of the city.

Table 1 shows an example of the distribution of topics identified in Google Maps reviews.

Table 1. Number of reviews for different security categories

Security category	%	Security category	%
Road and transport safety	59,1	Criminal security	6,6
Ensuring order	21,2	Road lighting	3,3
Aesthetic and environmental safety	9,2	Economic security	0,3

The obtained result indicates that it is possible to monitor several values from the previously mentioned ones using geoinformation social networks.

7 Data from Messengers

Telegram is popular in both personal and professional spheres. It is used to communicate with friends and family, to work in the office and exchange documents, to create and promote channels and groups in social networks, as well as for mass mailing of messages and advertising. Tele-gram also supports an API that allows developers to create their own applications and bots based on the messenger. This functionality is used for various purposes, from games and entertainment to banking applications and bots for monitoring stock prices.

In this messenger, in addition to chats, it is possible to create channels in which the author can publish news or content, and subscribers can leave comments. In this paper, comments are of interest. This question has not been sufficiently studied yet, since comment parsing has been available relatively recently.

In the course of the study, an attempt was made to use user comments to identify needs and values. For this purpose, comments to popular city channels were uploaded using automated methods. Further, using clustering methods, the main topics were highlighted, which were discussed in the city Telegram channel.

The final database consisted of an array of comments from residents. Further, using machine learning methods, all messages were divided into need groups. Table 2 shows the processing results. We can say that we managed to get the distribution of basic needs, which are discussed in the neighboring city channels in Telegram.

Table 2. Table captions should be placed above the tables.

Words highlighted during clustering	Quantity	%	Cluster
regime, fire, situation, operational, coronavirus, vaccination, control, restriction, spread, infection	4469	10,3	Safety
festival, sport, athlete, competition, team, game, sports, championship, guest, museum	3287	7,5	Leisure
construction, housing, house, object, emergency, apartment, gas, gasification, ruble, program	3205	7,4	Housing issue
road, street, kilometer, plot, landscaping, repair, work, road, yard, bridge	3109	7,1	Comfort of living
help, doctor, medical, hospital, patient, medic, healthcare, help, person, ambulance	2727	6,3	Health
school, building, kindergarten, new, renovation, garden, construction, build, facility, equipment	2672	6,1	Demographics
support, ruble, measure, payment, business, rate, income, family, loan, preferential	2491	5,7	Social protection
competition, guys, student, university, education, graduate, student, winner, youth, young	2238	5,1	Education
Other topics	1284	44,6	Other

8 Depersonalization

All stages of the work go through fine-tuning the boundaries of the use of personal data. However, this issue was resolved at the very first step, when developing the database and the parser. It excludes the storage of information about the name, age and other important information, only the text of the review or comment is stored in the database. Additionally, a Python script has been developed that analyzes the collected array and deletes all proper names, phone numbers and email. This approach allows you to depersonalize and depersonalize data. Additionally, a study of the legislative framework was conducted to comply with all norms.

This script was implemented based on the Yargy parser and the Natasha library. Yargy parser is a library for extracting structured information from a natural language text based on rules. This library is used to perform operations such as extracting dates, names, addresses, organizations and other named entities from the text in Russian and English. Yargy works by generating Parser combinators from rules describing the structure of data in the text. It can be used in various natural language processing tasks, such as analyzing news articles, machine learning texts, or building business logic through text query processing.

The Natasha library is a set of tools for natural language processing. In particular, it allows lemmatization, morphological analysis, extraction of named entities and other operations with text. Natasha uses the pymorphy2 library for morphological analysis

of words. The processing procedure takes place immediately after data collection, the deleted information is not duplicated anywhere.

The result justified the efforts, all the reviews remained depersonalized, firstly, we deleted all the contact information provided by the geoinformation network itself and at the second step, with the help of our script, we got rid of any mentions of personal data, thereby not violating the requirements.

9 Conclusions

The results obtained demonstrate that it is possible to use data from social networks for a value-oriented approach to managing city development programs. The data obtained cannot replace traditional planning methods, however, they can significantly supplement operational data for city management and solving strategic issues for the sustainable development of the city.

The chosen topic is socially significant in society, since technologies for creating a socio-psychological portrait of users will allow to assess the human capital of the state, and can also form the basis for the development of socio-spatial structures of the urban environment.

The use of new technologies and forecasting methods will improve the accuracy of the analysis of changes in the internal environment of urban space, forecasting the needs and needs of city residents, as well as the ability of the management system to adjust tasks and operational plans for changing the infrastructure to some new circumstances. The creation and use of predictive models based on social networks is one of the most promising areas for the creation and testing of new urban technologies.

The study of the socio-cultural and economic needs of residents of different districts of the city, which are represented in social networks, will allow us to characterize the needs of the city in infrastructure development at different levels of centralization, taking into account the spatial localization of people with different types of needs and requests, which in turn will allow us to implement one of the priority areas of urban development associated with improving the quality of the urban environment and ensuring the effectiveness of management and development of the urban environment.

This project is a practical and promising solution in poorly formalized areas of knowledge. In addition, the application of such a solution at the national level can be an example of the introduction of digital technologies and platform solutions in the areas of public administration, business and society.

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