

# Urban information spaces as the basis of the system “Smart City”

**E Akhmedova, A Zhogoleva and A Teryagova**

Samara State Technical University, 194, Molodogvardeyskaya str., 443001, Samara, Russia

E-mail: [ter\\_a\\_n@list.ru](mailto:ter_a_n@list.ru)

**Abstract.** The article touches upon the issues of information spaces formation in the environment of large Russian cities exemplified by Samara. The taxonomy of city information spaces with the consequent placement of the integrated sites of information distribution characteristic for Smart City, i.e. infoboxes, is determined. The main criteria of an urban environment informative value are formulated. The results of architectural and urban planning research of the urban environment fragments with the consequent experimental projecting are given.

## 1. Introduction

According to politician and scholar William Martin “...life quality as well as the perspectives of social changes and economic growth increasingly depend on information and its exploitation” at the modern informative stage of social development [1].

Modern urban space gives architecture a diversity of possible interactions with time and information: “architecture is the chronicle of the world” as N.V.Gogol wrote.

In 2018 three cities of Samara Region – Samara, Togliatti and Novokuybyshevsk – entered the Federal programme “Smart City”. Modern technologies “Smart City” are not only the saturation of urban spaces with the necessary means of timely and modern information, but the integration of technologies and the Internet for the effective functioning of municipal services and structures [2].

Urban environment performs a double function in regards to a customer’s provision with information. On the one hand, it is a cover – location for the positioning of the objects of information distribution and communication. On the other hand, urban spaces themselves inform, direct and coordinate users’ actions and dictate a certain life scenario with the help of their spacial organisation.

The purpose of this work is to determine the taxonomy of city information spaces with the following placement of the integrated sites of information distribution characteristic for Smart City, i.e. infoboxes. In terms of location the research of informative value of the urban environment was held in Samara within the preparation to the 2018 FIFA World Cup [3].

The work presupposes that the formation of the relative spatial basis for informational and communicational field of the city will allow modernising the used equipment qualitatively in



Content from this work may be used under the terms of the [Creative Commons Attribution 3.0 licence](https://creativecommons.org/licenses/by/3.0/). Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

accordance with the swiftly changing technologies.

Much attention must be given to such qualities as information richness, interactivity, hospitality in the conception of informative urban environment creation [4]. The means of information transfer, its character, speed of acquisition: these qualities become important features of architecture along with the functionality, solutions in levelling and cubic capacity.

## 2. Materials and methods

Within the scope of work in Samara more than thirty areas of urban environment absolutely different in their function, architectural and levelling characteristics and places of spatial localisation were investigated. The conception of a smart city's core creation inside the urban structure of Samara was based on the virtual unification of the parts of Samara State Technical University scattered campus. As there is no clear line between the city and campus, the structures act as an integral whole. We cannot call this type a "campus" in the conventional sense; generally these are university objects scattered along the complex urban structure. Intellectual and academic life grow stronger due to the immediate proximity of university buildings, infrastructure and residential districts. The necessity of a single information network creation for such an object is obvious, the more so as by virtue of the spatial organisation the final result is supposed as the getting of a universal system of municipal information distribution. Constant daily interaction of the university with the city contributes to the best integration of the educational block in Samara's environment.

Two main types of informative and communicative basis formation for the urban environment can be distinguished. These are linear information systems and local information sites.

The first type is based on the ground of the axes of transport- pedestrian framework of the urban environment. For such a big city as Samara the information support of traffic arteries is not something unique. Traffic control with the help of signs, lights, demarcation was firmly established long ago. During the preparation to the 2018 FIFA World Cup in Samara some "impurity content" of media coverage with the excess of advertising and drawbacks of historical and architectural image was marked. Later these problems were partially eliminated. Linear information systems accompanying pedestrian routes are more complex and diverse. The analysis showed that the level of informational comfort of pedestrians was provided to a lesser degree whereas the physical efforts for movement and getting modern information were rather high.

The second type of information distribution in the urban environment is the local information sites; they are normally based in the most important nodal points of the framework. The creation of such information blocks for the "smart city" conception is not a temporal or unrequired option [5,6]. Currently the objective necessity is the provision of information at all possible levels.

The necessity of creation of literate and harmonious navigation system and modern information distribution as well as preservation of the environment access and Universal design requirements allowed formulating the main criteria of information capacity:

- quick recognition of reference points in the urban environment due to the uniformity of their presentation;
- determination of one's spatial localisation in relation to the main city landmarks;
- determination of the optimal direction of movement with the help of navigation devices given in the information site;
- receiving of information at all accessible levels of perception: visual, acoustic, kinesthetic;
- orientation regardless of the time of the day;
- minimisation of efforts spent on the receiving of information.

The method included natural investigations with photofixation and survey of citizens.



**Figure 1.** Investigation of the information distribution of the urban environment areas in Samara.

The investigated areas can be referred to both types of communication spaces [7]. The following tasks were set before the doers:

1. Determination of the significance of the area under investigation for the system of municipal information distribution and referring it to one of the types of communication spaces.
2. Investigation of all perception levels present in informants' area. These are visual informants: graphic, electronic and accompanying colour demarcation. Acoustic informants and the system of tactile information distribution, the means that help visually impaired people to orient in the environment. The acoustic devices are not new and embrace a mass of means including interactive action, audio guides and aural beacons. These means are more characteristic for local information sites. Tactile means are more often used in the linear information systems as they perform the function of accompanying informing: paving, textured print, tactile warnings. In local sites tactile informants are present in various types: from large-scale tangible models to stands with textured print or Braille script.
3. Revealing of gaps in the system of information distribution or ageing of devices and gadgets, drawbacks in the multilayered system.
4. Description of information environment safety for the given territory at different times of the day and in relation to a season.
5. The analysis of the efforts provided for all categories of users including foreigners, children and citizens with restricted mobility.

All the results of investigations were presented as graphic schemes with textual explanation in the table form with the conclusions.

### 3. Results

The conducted research gave the result in the form of an objective characteristic of the condition of communication urban spaces. Currently the prevalent usage of visual information distribution systems without the division into types is characteristic for Samara [8]. The complete absence of interactive action systems is elicited, the character of usage of acoustic and tactile information distribution does not always correspond with the requirements of “reasonable accommodation” [9]. Modern systems of information delivery are either implemented or are of an advertisement type. A conclusion can be made about the necessity of reconstruction and creation of a new approach to information distribution in Samara.

The tradition of building new objects, i.e. infoboxes, to represent important information in the adjacent nodes of urban environment as well as spatial and architectural environment of significant objects (museums, tourist complexes, multifunctional communal centres, etc.) emerged in the global practice. Infoboxes are normally high-technology objects of a new type representing pavilions with the inner space of original architecture in the newest architectural stylistics, i.e. minimalism, topological architecture, media architecture, etc. containing huge information capacity of data organised in the form of electronic-library system as a text (article), audio- or video information. This is interactive architecture that is projected for interaction with a human being.

They normally have a monoblock with touch-screen display in their basis that can be supplied with the scanner of bar-codes and a printer as an option. Tablets and smartphones can be used to scan the information. The main function of infoboxes is to supply a citizen, a guest with the opportunity to find answers to frequently asked questions on their own.

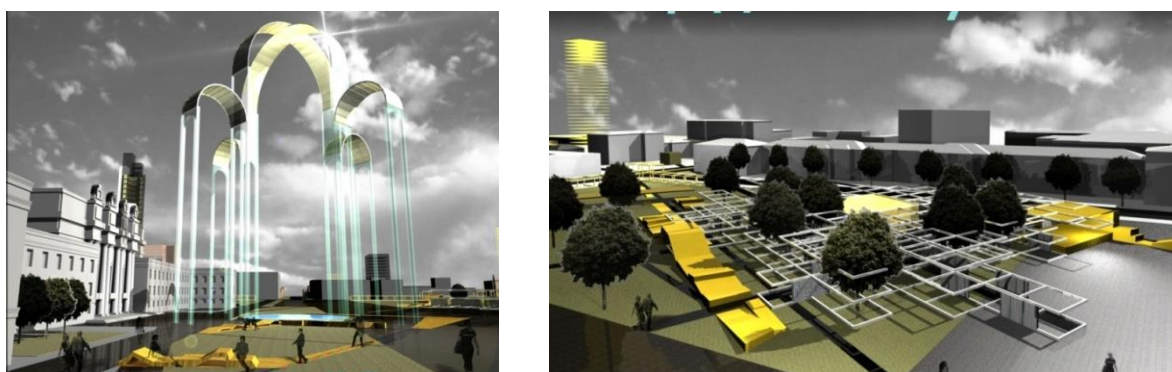
The examples of realised infoboxes in Europe and Russia show the value and uniqueness of such type of objects for the urban environment. Infobox Muzeon in Moscow reflects the information about the exhibitions, forums, events in the Central House of Artists – Centre for contemporary art on Krumskii Val [10]. Infoboxes in Zaryadye Park in Moscow reflect information about the tourist potential of the Russian capital’s historic centre, makes tourists get acquainted with the archeological and architectural monuments of the medieval centre of Moscow [10]. The infobox of the multifunctional complex of Sony Centre in Berlin reflects the opportunities of this unique complex, its objects of culture, education, entertainment and trade [11]. These objects of interactive architecture become an important means of formation of innovative, informationally rich, hospitable environment of a modern city. The creation of infoboxes can become the starting point for the development of Smart City global system.

### 4. Conclusion

The suggested system of the classification of city information spaces is not a universal one. It touches the issue only of an urban information framework formation on the basis of existing (or being formed anew) transport and pedestrian ones. In the present work such important aspects as information distribution based on the architectural and spatial environment of buildings and constructions, the project formation of the most informative framework as interaction of urban spaces of different typologies are not investigated. It leaves space for further research and project practices. As a result of the performed work a series of experimental projects including the implementation of infoboxes in the existing canvas of urban environment was implemented. In the first project the information pavilion, i.e. infobox, has one more function apart from the transfer of the current information. The project suggests to recreate the sign of the place, i.e. the Cathedral church built on Sobornaya Square in XIX century and ruined in the middle of XX century. The infobox is projected as a pavilion-installation of metal fronted with plate-glass with interactive display where the history of life of this architectural monument is being broadcast.

On the results of the research of SSTU scattered campus information environment one more experimental project was conducted. On the ground of the growing information flow the priority of

higher education becomes the training of specialists able to find, process and apply the information. That is why in educational environment information richness, interactivity also become important architectural characteristics of buildings and complexes of educational institutions.



**Figure 2.** Reconstruction project of Kyibushev Square in Samara for the 2018 FIFA World Cup fan zone with the location of infobox-installation.

It is the project of transformation of university complexes as well as the current basic SSTU complexes into an open educational cluster for the city. The conception of Samara university complexes transformation into the clusters of innovative development represents a multilayered structure of three parts, where every node has a certain model of information flow organisation. Every node includes existing university complexes and has an important city-forming significance for Samara.

The nodial cluster spot in the historic centre of Samara was entitled “Samara yard”. In the basis of the project lies the idea to organise specialised architectural spaces for monitoring, transfer, demonstration, the analysis of professional and cultural information in the structure of historic quarters on the territory of universities and in public buildings. The main aim of “Samara yard” is the creation of information field and popularisation of university activity. To execute this task it is planned to place infoboxes.

Public spaces in the buildings are solved with the maximum opportunity for organisation secondary information flows in them: information functions (information objects, exhibition stalls, screens, Wi-Fi access to the Internet) are added to the main function.

Infoboxes, covered expo-yards, media zones, co-workings organise the processes of informal transfer and demonstration of information into non-educational spaces of universities, form innovative educational environment and realise the conception of the “third place” popular in contemporary education [12].

## References

- [1] Martin W G 1990 Information Society *Moscow Theory and Practice of Social and Academic Information: quarterly* **3** 115-123
- [2] Harrison C, Eckman B, Hamilton R, Hartswick P, Kalagnanam J, Paraszczak J and Williams P 2010 Foundations for smarter cities *IBM Journal of Research and Development* **54(4)** 1–16
- [3] Akhmedova E A and Vavilonskaya T V 2019 *Proc. Int. Conf. on Urban Form and Social Context* (Kransoyarsk) (Siberian Federal University) pp 881-891
- [4] Alawadhi S, Aldama-Nalda A, Chourabi H, Gil-Garcia J R, Leung S, Mellouli S and Walker S 2012 *Proc. Int. Conf. on Electronic Government* **7443** .40-53 DOI: 10.1007/978-3-642-33489-

4\_4

- [5] Hashem I A T, Chang V, Anuar N B, Adewole K, Yaqoob I, Gani A and Chiroma H 2016 The role of big data in smart city *International Journal of Information Management* **36(5)** 748–758 DOI: 10.1016/j.ijinfomgt.2016.05.002
- [6] Lombardi P, Giordano S, Farouh H and Yousef W 2012 Modelling the smart city performance *Innovation: The European Journal of Social Science Research* **25(2)** 137–149
- [7] Karakova T 2016 *MATEC Web of Conferences* **106** 01014
- [8] Samogorov V A and Pastyshenko V L 2018 Architectural Space Atmosphere *Architecture and Construction of Russia* **1(225)** 85-89
- [9] *UN Convention on the Rights of Persons with Disabilities*, available at: [http://www.un.org/ru/documents/decl\\_conv/conventions/disability](http://www.un.org/ru/documents/decl_conv/conventions/disability).
- [10] Smart City Moscow 2017 available at: <https://www.citiesdigest.com/2017/07/03/smart-city-moscow>
- [11] State Department for Urban Development and the Environment. (2015) Smart City Strategy Berlin, available at: [http://www.stadtentwicklung.berlin.de/planen/foren\\_initiativen/smart-city/download/Strategie\\_Smart\\_City\\_Berlin\\_en.pdf](http://www.stadtentwicklung.berlin.de/planen/foren_initiativen/smart-city/download/Strategie_Smart_City_Berlin_en.pdf)
- [12] Qiuju Luo, Jie Wang and Weijia Yun 2016 From lost space to third place: The visitor's perspective *Tourism Management* **57** 106-117