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Use of qualitative research in architectural design and evaluation of the built environment

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Abstract

Ergonomics is everywhere design. Aim of each architect should be the optimization and efficiency of the proposed design solutions, the correct diagnosis and meet the needs of users, the implementation of priority investment objectives as a business, future thinking in terms of sensitivity to changes in object and to anticipate all the consequences of their decisions. In today's world, the basis of all activities is knowledge. Development of the Internet led easy access and transfer of knowledge. At the same time excess and information overload can cause confusion. It is essential to proper diagnosis, which knowledge is valuable and useful. The built environment and its users are a direct source of knowledge for design. In order to acquire this knowledge be used qualitative research (quality: technical, functional, organizational, behavioral, economic), observation, surveys, interviews, way-finding, participations, etc. On the basis of 15 years of experience in the field of qualitative research conducted in many places, their own projects and in the classroom with students of architecture, the authors have developed their own methods of knowledge acquisition from the built environment. These methods are mainly based on a simplified POE (Post Occupancy Evaluation) adapted to Polish conditions. The paper presents selected research projects in the field of architecture conducted at the Faculty of Architecture at the Silesian University of Technology. The Faculty has been involved in quality analyses of the built environment since the nineties of the twentieth century.

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1. Introduction

The built environment is a source of valuable knowledge for designers, which is knowledge about the buildings and users. Currently, architects need the professional cognizance to design, it is also required for investors and end-customers. With a choice of research methods and techniques knowledge can be reached from the built environment. Qualitative research is a source of universal methods for assessment of whole objects, as well as selected elements of the building: zones, interiors, outdoor spaces, and above all, it provides recognition of users opinion. They are useful in planning, programming and architectural design. The approach to design with using research fits into the current trend, associated with quality assessment in architecture known as: *research by design* and *design by research*.

Theoretical grounds are based on literature studies and evaluations of dozens of objects with different functions conducted by the authors during several years. Presented research was carried out: qualitative (in terms of technical quality, functional, organizational, behavioral, economic), observations, surveys, interviews (with users, managers, experts, investors), way-finding, participatory. Authors' views in the field of architectural design and teaching students of architecture were also presented.

Among the most popular methods of the built environment evaluation are: POE - Post Occupancy Evaluation and BPE - Building Performance Evaluation. Based on the simplified POE method and personal experiences own methods of evaluation objects adapted to Polish conditions were developed. In response to the needs of contemporary architectural design (qualitative) there was proposed the model of the architect-researcher (Fross K., 2012), who design with use of the study [7, 8]. On their grounds he draw conclusions and formulate guidelines for the future design. In this way, he is trying to avoid mistakes and make use of good design practices. This model extends the designer's interest to the stage of building exploitation. Therefore, after the completion of the object he continues to evaluate and observe to verify the design decisions and to draw conclusions for new projects [5].

Examples presented in the following part, were chosen to show the versatility and effectiveness of the evaluation for a variety of functions. Qualitative research is suited to the initial phases of planning, object programming and designing, that is, at every stage of the design process (investment and during use). Certainly the most appropriate stage of the design process where the use of pre-designing is absolutely necessary is programming. Qualitative research can help in the correct diagnosis of future groups of users (customers) and their needs. It helps to understand good design practices while avoiding errors (in terms of technical, functional, organizational, behavioral and economic quality) committed earlier (on other facilities). It is important to formulate clear aims of research, criteria for evaluation and selection of appropriate research methods [6, 7].

This second part presents selected examples of own research carried out on objects by authors, provides applied research methods and techniques and presents the main results of the evaluations. Other examples are described in the Fross K. publications listed in the bibliography [7, 8, 9, 10]. Interesting examples of qualitative research also shows Winnicka-Jasłowska D. in publications [17]. Also worth analyzing are examples of research, carried out by Masły D. [12]. Other very interesting opinion of blind people about difficulties encountered in the built environment, outside (especially in the city) and inside buildings (at home, at school, in other interiors) shows Ujma-Wąsowicz K., Fross K.: "*Greenhouse of Senses*" [14]. Also interesting problems of the built environment and urban space moves in studies concerning the identification of space and its perception Brzezicka (Gumińska) A. [2, 3, 4]

2. Examples of authors' own research

2.1. Example 1 – The new library building - (2014, 2015) (elaborated by Klaudiusz Fross)

2.1.1. Aim of research

Obtainment of general knowledge, initial reviews of the new realization of widely available public facility.

2.1.2. Research methods

For preliminary and "fast" (15 minutes) assessment of the object, observation methods of usage and behavior of the users with building round and a brief conversations with the staff were applied. Evaluation was overall and was carried out from the customer's position.

2.1.3. Research results

List of observed errors, shortcomings, notes treated as first insights from observational studies:

- lack of users, empty object, only staff is visible,
- expensive building for a modest resource of books,
- essential function is marginalized and located on a narrow entresol, which makes it necessary to install lift (additional cost of investment and operation),
- lack of privacy in the use of the main space - mutual obstruction,
- lack of privacy while using computers (ability to glancing by service and passers-by),
- lack of space to "willing stay" in the building - the object is not friendly, does not invite to stay in, no additional functions supporting maintenance costs: xero service, gastronomy, book store, ATM, offices for rent, etc.
- lack of multifunctionality – lapse of investment and programming assumptions– object should be the answer to the real needs of today's users – for example, municipal recreational and cultural center within a library

2.1.4. Conclusions

This example shows how much information can be obtained by expert (architect) during the 15-minute round of the building and performance of the general observational studies from the client position. Studies were supplemented by a brief conversation with the service. Preliminary research should be complemented by further, wider studies to confirm the observations and explanations of design decisions and program. As a result of this short study, a serious deficiencies of object were elicited, so significant that both the object itself and the idea of the program were rated negatively, emphasizing completely wrongly prepared investment program and lack of understanding of the future users-customers' needs. The general conclusion points the poor functional, economic and behavioral quality of the object. This is an example of "aesthetic" architecture, but not "functional" or usable, because the outer body of the building makes a good impression, draws attention to its fashionable shape.

2.2. Example 3 – *Quality Analyses of Polish Universities Based on POE Method (2013-2014) (elaborated by D. Winnicka-Jasłowska)*

2.2.1. Aim of research

The case study summarizes the research experiences of the author, related to the quality assessment studies of university buildings and campuses in Poland. The scope of the quality analyses was conducted in University of Silesia in Katowice and it was the general efficiency assessed from the point of view of organizational and behavioral needs of users. The main research tools of the pilot quality assessment studies carried out by the author was focused on the selected buildings and university campus space.

The spatial and facilities changes initiated at Polish universities since Poland access to The European Union, as the member, are rather more intuitive than supported by results of analyses. To be effectively transformed, the existing campuses must be analyzed not in terms of their supporting functions (traffic, parking lots, greenery) but in terms of their academic qualities (informal contacts, places for meetings and dialogues) in compliance with the aesthetic and way-finding needs of their users. The manners in which university space is currently utilized should be examined in order to find the optimal, most effective solutions. The studies on university space should engage facility managers and main users: students and university staff. The programming and design of modern functional and spatial solutions for university facilities should be preceded by in-depth analyses of their functional needs in relation to the organization of the academic processes. Unfortunately, in Poland such analyses are not conducted. In the absence of "universities research" the author has been making quality analyses of university facilities and sites for many years. Based on the example of University of Silesia in Katowice (Poland), the author shows the method of analysis performed during the course with students at the Faculty of Architecture in Technical University of Silesia

2.2.2. Research methods

The method of analyses used by the author was based on worldwide trends in quality assessment in architecture. POE - Post Occupancy Evaluation is the method of assessing quality criteria of architectural objects (technical,

functional, economic, organizational and behavioral quality). The analyses were also based on the author's experience gained over years of conducting case studies of buildings and university sites in selected scopes.

Despite different ranges of the undertaken studies and types of facilities (buildings and campuses), some research steps were the same. In the case of each of the analyzed building or campus, the research was divided into two stages. The first stage involved the theoretical and organizational preparation of the research team, including:

- Studies on literature concerning the HE issues,
 - Collection of the information about the campus or analyses university building,
 - Examination of the architectural and construction documentation,
 - preparation of drawings and functional analyses, measurements of class rooms and lecture rooms to determine the actual space floor standards per one student;
 - Obtaining permission for conducting studies in the building and at the campus and appointing the time of in-situ visits;
- Stage two involved the performance of the analyses, in the following order:
- Walkthrough with the facility manager to detect the main problems,
 - Compilation of the assessment criteria list, the functional, organizational, behavioral and technical quality – in view of the organizational efficiency of the university site /campus;
 - Interviews with users (students) conducted, in proportion, in all the buildings of the faculties located at a given campus- focused on the efficiency of the use of space, its functionality, aesthetics and safety;
 - The second in-situ visit – interviews and questionnaires and further observations (including the ergonomic analysis of class room and lecture rooms, in view of the efficiency of the use of space, its functionality, aesthetics and safety- as subjectively perceived by its users;
 - Summary of the results of the interviews.

For a more detailed description of the analyses - see [15,16,17,18] and other publications of the author in Polish. A synthesis of the conclusions from the case studies is presented below.

2.2.3. Research results

The studies were divided into stages corresponding to specific functional, technical, behavioural and aesthetic quality. During stage I the transport and traffic connections between the University and the region were analyzed, and, in addition, a general inventory of the sites was taken. Stage II concerned technical quality. Technical quality does not only involve the technical condition of the buildings and the infrastructure, but also engineering, technical and technological amenities that should provide safety and ease of use. The first criteria subjected to the analysis were the safety of people and property. The maintenance of the buildings and their surroundings was checked too. Stage III concerned behavioral and aesthetic quality. The assessment criteria were, among others: way-finding, aesthetic perceptions of users, and social integration at the campus.

In the case of university buildings, the analyses were, first and foremost, focused on spaces associated with the teaching and learning processes and social integration. There is a growing awareness of the need for shaping the space of HE buildings to support integration, meetings, team work, formal and informal contacts. The author's analyses entailed both old and new generation university buildings in view of their fulfillment of students' needs and new forms of student activity.

2.2.4. Conclusions

The conclusions give grounds for further, in-depth studies that may lead to the introduction of favourable spatial changes in university facilities and campus sites. The analyses run in the university buildings and at the campus showed that a university must be unified in terms of its buildings and sites.

2.3. Example 4 – IDENTITY OF HISTORIC PLACES OF URBAN AREA TECHNICAL ASPECTS OF (2014, 2015) (elaborated by A. Brzezicka (Gumińska))

2.3.1. Aim of research

The purpose of the research work is to present the revitalizing projects by date in the historical spaces of cities in the aspect of location identity questions, formation of image restricted to the scale of a structure and street. What are the sources of similarities, whether there is a genome identity space center and urban elements? Does any urban identity genome really exist, could it be similar or identical in different cities? What is the reason for such phenomenon? What is the method that cities or their spaces use in the search for their own unique image, brand name?

2.3.2. Research methods

confronting urban public spaces such as streets, squares and buildings, landscape architecture in various European cities, a comparison of the elements constituting the identity and image of the city and places. The research method is to confront the selected examples of revitalized structures, sort them out by determined degrees of interference in the structure. Methods consisting in genetic algorithm may be used to classify the characteristics selected for building a phenotype. The general foundations of the research method are: definition of the characteristics of a specific structure, place; selection of the features, according to determined conditions; creation of characteristics with a new value; creation of sample parameters, features (technical quality, aesthetics, composition) that determine the image of the structure. To determine the characteristics of a location, the following city center structure elements have been analyzed: proportions of main passageways, squares; façades of town planning interiors (façades of tenement houses, color range, finishing materials, vertical gardens), finishing elements, color range, texture, method of using building materials in paving of streets, squares; dominants: specific structures, structures of various scale, important for specific space, e.g. fountains, monuments, symbols, plaques (characteristic elements related to specific space). The selection of features consists in finding elements characteristic for a specific location, able to create the image of the said location. The selection should be carried out using the criteria determining the features that a phenotype creating element must meet. The conditions are determined through criteria that shall lead to finding, out of the multiple characteristics of a structure, the features responsible for creation of image based on the cultural heritage and identity at the same time.

2.3.3. Research results

Cities create your own brand, identity, location. In addition to positive regeneration effects, copying or tendencies are noticeable or renovation without respect to the cultural heritage of a city, structure or identity. The features that form the image of a city, structure should correlate with historical and cultural values, considering the conditions of the environment they occur in. Cities can achieve its image by creating new or renovation of existing symbols, typical building materials, elements contributing to the identity of the place, which allows you to generate an image of the city, and consequently lead to the economic and cultural development of the city.

2.3.4. Conclusions

The study have shown that cities that have their own distinct identity elements and are unique in their own brand stand out among other cities, are recognizable. There is a clear trend in the cities analyzed to use the individual aesthetic means to achieve the most distinctive and unique image. Cities tend to create their brand identity of the place. Often, in addition to the positive trends are such renewal without respect for cultural heritage. The most common are such phenomena as the repetition of identical elements of landscape architecture in various cities without customization, introducing elements not related to the cultural heritage of space, with tradition. The city's image for the user is quickly read in direct contact with the architecture and urban space. Ergonomics, according to research, is also applicable in the urban space. It allows the user to interpret the space, and therefore also positively identify with her.

2.4. Example 5 – STUDY OF THE HOSPITAL BUILDINGS MODERNIZATION AND COSTS ESTIMATION FOR GROUP OF NEW USERS (2012) (elaborated by D. Masły M. Sitek)

2.4.1. Aim of research

The new approach to the building delivery process puts enormous pressure on planning, building quality analyses, post-occupancy evaluations, architectural programming and conceptual design. The processes enable to create buildings for long-term gain with clearly defined goals. It must be kept in mind that buildings of the twenty-first century will have to perform thoroughly better related to the twentieth century ones, that their performance depends on the knowledge of the needs and expectations of their future users, and that the knowledge must be developed at initial stages of a building delivery process.

In 2007, The Faculty of Architecture at the Silesian University of Technology was invited to work with The Silesian Medical University on formulating strategies that would enable the organization to improve its services and enhance the quality of the built environment. At the time, The Silesian Medical University was embarking on the revitalization of selected facilities. In the 1990s, a period of the political system transformation in Poland, National Health Service buildings were repaired and adapted with haste and without a general strategy. The focus was on maximizing the use of the existing estate, not on the quality of built environment. This led to poor investment decisions, since a systematic evaluation of the physical environments in terms of what actual users' needs are was lacking. The Silesian Medical University was determined to ensure that the investment decisions were consistent and rational, based on knowledge of its major goals and required performance criteria of future built environment.

The main aim of the research team was to develop this kind of knowledge in the form of functional and spatial program. The other aims of the research project were: establishing interdisciplinary cooperation in the building delivery process, and adapting developed models of quality assessment to the specific needs of the analyses building type.

2.4.2. Research methods

The evaluation team consisted of two researchers from the Faculty of Architecture and the facility manager. At first it worked out the evaluation program, a quality assessment based on the POE methodology. Data about the present state of buildings and the most important information on the needs and requirements of users were collected. The subject of the quality evaluation were 3 buildings of Wyciska Hospital in Zabrze, Upper Silesia. The hospital was erected in the 70s of the twentieth century. The evaluation made used various research techniques including focused interviews, walkthroughs, as well as inventories of facilities and equipment. The research team proposed following structure of the study:

First visit – introductory meeting with Director General of the hospital, Heads of Departments and facility manager: purpose of the evaluation, timetable for the assessment, budget, and predicted scope of cooperation were discussed; a tour of the hospital to observe the overall quality of the building was made; the existing documentation was reviewed; analysis of received documentation and digital recording of floor plans needed to conduct further analysis and inventories. Second visit - Heads of Departments were interviewed in order to identify their needs, requirements and shortcomings in occupied buildings; walkthrough was made; the inventory of Wyciska Hospital was carried out; the documentation needed for the development of the functional program was selected and copied. Analysis of the data collected in the course of the walkthrough, focused interviews and the analysis of received documentation. Collected data essential for the development of a comprehensive picture of the organisation were: the real estate situation of the hospital; the hospital's specific processes or activities; the kinds of organisational challenges that The Silesian Medical University would have to face in the future; the occurrence of specific activities in space and time; the spatial adjacencies; the identified public and private zones; the flow of employees, patients, visitors, and materials; the hospital employees' attitude to the changes that may result from the quality analyses, the benefits and costs associated with the potential changes. Development of the preliminary functional program and design concepts. Third visit - the preliminary functional program and design concepts were reviewed by a focus group of the hospital management representatives. Development of the final functional program – a written document that qualified and quantified users' needs for the Wyciska Hospital. The complete program was presented for client approval and final suggestions and recommendations were discussed. Development of the final document.

2.4.3. Results of the study

The prepared studies, data collected and presented in the document by a team of researchers revealed a lot of important information. The knowledge collected in the study helped to organize and describe the planning process of modernization. The greatest weakness of the concept was an idea of transfer so many medical units from their current location to the selected object in the context of a shortage of available space in relation to the size of the target programmable units. Managers indicated by the management board of the hospital, which was to cover the transfer, tried to influence the programming process for the spatial needs by requesting additional space to allow in the future development and expansion of their units. Mismatch space potential utility of existing infrastructure to meet the expectations arising from the analysis of the needs of users forced to propose the expansion of existing facilities. The changes were to take an additional storey superstructure on the hospital building and reconstruction of technical building to the new educational and social role in order to create facilities for the students of the Academy of Medicine. The most important developed element, was a description of the estimated costs of implementing the modernization work and additional construction work and other tasks necessary to carry out, in order to match the existing infrastructure to the new standards and programmable forms of use of hospital buildings at Wyciska Street.

2.4.4. Conclusions

Carried out studies revealed a conflict between the plans of the hospital board and the expectations of users (employees of the organization). The strategic objective of the management department hospital was to obtain funds for the implementation of plans of reorganization and consolidation of services in the city so far Zabrze and Bytom while improving the living conditions of patients and the creation of facilities for the education process implemented as part of the clinical departments of the Medical University Hospital.

3. Summary and conclusions from analyses examples

All examples demonstrate the remarkable effectiveness of acquiring information through research techniques and methods of qualitative evaluation. The information is obtained directly from the source (from the users or the observations of the building). Simplified methods of procedure give quick results. It is perfect to use several methods at once, for example: observation round of the building with unstructured interviews (loose, spontaneous conversation), supplemented with survey or interview with the manager. The choice of research methods and techniques depends on the purpose, range or research directed to the selected problem or issue.

Observational, pre-designing and during use research can be an important source of information for designers. Research performed after the inhabitation of the accomplished object are used to verify the design decisions, which is helpful in the process of designers' self-improvement. Pre-designing and during use studies can significantly affect the quality of the design process and thereby directly on the quality of realized investments. It is worth noting that the evaluation of objects are not for criticizing the author of the project, but it's a main goal is to draw conclusions from made assessments for new projects in order to be able to design them better and better each time.

The main benefits of qualitative research for the designer: fast and reliable source of information, getting better and avoid past mistakes design, real justification of design decisions, verification of designed decisions and professional self-improvement.

The main benefits of qualitative research for building less trouble and costs of exploitation, efficient use of space, a better fit to the needs of space, improved building efficiency, easier management and keeping order.

The main benefits of qualitative research for users: better matching of the object, its lot and interior to the needs of users, improvement of users' satisfaction.

In summary the following general conclusions can be drawn:

- Design based on knowledge obtained through assessment of existing facilities has an impact on improving the quality of design solutions, the final result which is the object itself, as well as users' satisfaction.
- Assessment of existing buildings with similar features have a significant impact on the growth of knowledge about the function and can be complementary to the traditional approach to design.

- Qualitative research is helpful in determining the project priorities which have strategic importance for the success of the investment.

Quiddity of the subject captures S. Brand's quotation from 1995: it seems that there is nothing new in that ideas and that most of it is self-evident. Of course, people know a lot about the buildings they use. Of course, it makes sense to learn from the experience and transfer information back to the people who design buildings so that they can do it even better next time [1].

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