

CONFERENCE
PROCEEDINGS

**5th INTERNATIONAL
ACADEMIC CONFERENCE ON
PLACES AND TECHNOLOGIES**

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PLACES AND TECHNOLOGIES 2018

THE 5TH INTERNATIONAL ACADEMIC CONFERENCE ON PLACES AND TECHNOLOGIES

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ARCHITECTURAL CREATION AND ITS INFLUENCE ON HUMANS

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ABSTRACT

Comfort is a very complex subject and can be viewed as a physical, psychological, and socio-cultural element in the design of the living or working space. The relationship between architecture and people is very multiplex and its quality is perceived through pleasantness. Contemporary approach in architecture is defined for energy efficiency and environmental responsibility and thus introduces new space organization schemes, functional patterns, and design and construction technologies, mainly requiring creation of new materials. But the process is bi-directional; apart that architectural solutions meet human needs they create new ones. Comfort is also associated with human health. According to the World Health Organization, human health is defined not just as the absence of disease but in terms of a total sense of physical, mental and social well-being. In order to find the criteria for comfort assessment, it is necessary to identify all factors that affect the users and their experience of space. Factors that cause people's dissatisfaction in the working or living space are defined as stressors. The paper refers to the consideration of the influence of some elements of design and construction of office buildings on the feeling of comfort of employees. The research is focused on assess how employees evaluate the achieved comfort in the case of different office types and facade technologies. This research discusses the questionnaire created by authors in order to clarify the sources of stressors, and the effects that these stressors have on human behaviour, to his personality, especially on oral hygiene.

Keywords: Working space, Comfort, Stressors, Questionnaire, Employee's health.

Introduction

Architectural creativity is related to the historical moment in which it takes place, and it is important to achieve an active positive relationship with the situation that has been encountered. It is not just a dialogue between architectural creations, between them and the environment, but also with human beings - users. Creating this dialogue needs to rely on experiences from the past but also on the current development of society, technology, design theory, needs and habits of people and modern approaches to evaluating comfort and the quality of living and working space. The sense of architectural creativity has always been the satisfaction of the human being. It is a very complex topic and can be treated from different angles. Today, the extreme importance in the research is dedicated to the relationship between comfort in the space and the well-being of users, and this will be the focus of research in this article.

Architecture's weight, its ability to define and confine, construct and constrict, and frame and

1 Corresponding author

be framed by light, space, time, and humanity allow it to act as an agent of creation (Piacentini, 2014). Piacentini points out: "Its ability to engage both passively and actively with an individual's experience help to create and develop the social, political, and cultural contexts which define the world into which architecture and its inhabitants are born."

When it comes to the impact of architectural design on human, Ernest Dimnet said: "Architecture, of all the arts, is the one which acts the most slowly, but the most surely, on the soul." (www.brainyquote.com/quotes/ernest_dimnet_161039). It is also convenient to mention that Steve Jobs (www.brainyquote.com/authors/steve_jobs) made the following remark: "Design is not just what it looks like and feels like. Design is how it works." The role of technology is important for the quality of architectural design. Architectural design and technologies are causally and consequently connected both in terms of their development and the possibilities for creation. In this regard, it is worth mentioning the following statement by the architectural theorist Jonathan Hale (Hale, 2012): "A discussion of technology in architecture might usefully begin with a redefinition of 'architecture as technology.'" His opinion is that technology has a wide and still often neglected dimension and it can be overcome "if we include within the category of technology the sum total of all the things that we produce in the pursuit of a better life".

Buildings are human creations in which people spend most of the day doing a variety of activities. Architectural creation can put a form or function or construction into the foreground, although these elements of the design process are causally connected. But, in any case, it is necessary to create a favorable relationship between the users and the space and components of the building construction, in order to achieve well-being of the users. In the recent past, considerable attention has been devoted to researching the impact of the built space on human health, and from this aspect, the impact of the interior space of buildings, taking into account functionality, design and technical characteristics as well as the applied materials. The significance of this can be underlined by the following note: "We shape our buildings and afterwards our buildings shape us", expressed by Winston Churchill in 1943 while considering the repair of the bomb-ravaged House of Commons (Bond, 2017).

Architects need to be aware of the fact that the shape, lighting, colors, materials, design, and the way of combining components of the structure affect the creation of a positive/pleasant or negative/unpleasant experience of space. It is important to keep this in mind when it comes to designing buildings and spaces for different purposes, both in the case of new ones as well as in renewing existing ones.

Dr Raymond Lucas, head of architecture at the Manchester university, finds that creating the 'perfect' space is an impossible, and subjective, balancing act between form and function and is made harder by the fact that architects do not have the luxury of creating a prototype outside of computer or physical models, and are restricted by laws and often tight budgets, adding that building design is complex, and it is impossible to predict everything about a space before it is built (Gander, 2016).

Examining possible impacts by analysing people's experiences in relation to the various existing spaces can provide indicators important for sustainable design and construction at all levels - city, urban block, street, building and individual rooms. Since ancient times, there are various possibilities for the architect to challenge different gradations of experience of space. An architect needs to have a sense of assumption and assessment of the impact of his creation on human feelings.

Architect Barbara Holzer comments: "In urban settings, it is the composition of the buildings, the squares, the alleyways, and the relationship between density and openness that determine a place's expression. Spaces are formed with different identities, inviting people to linger or merely functioning as transit areas. Places and buildings that create a sense of identity are an essential component of our cultural roots. They offer points of reference and anchorage

in a globalized, continually changing world.” (Holzer, 2013). Internal space is argued as the main factor that affects physiologically and psychologically the human health (Elbailoumy et al., 2017). A space's form and design determines its positive as well as its negative effects, which everyone can experience in their own way (Holzer, 2013). Holzer found out that whatever the differing political, social and cultural characteristics that influence our perception and critical judgment and shape our actions and reflections, it is clear that built spaces generate substantial, individually perceived sensory impressions in all human beings. To truly enhance human well-being, building design needs to move beyond optimising single parameters such as temperature and humidity, to more holistic approaches that take their cues in health-supporting human behaviours (Steemers, 2017).

Innovative concepts of architectural objects aim to meet many requirements such as energy efficiency, eco-friendliness, use of advanced materials and user satisfaction. Architect Bjarkelings declares in an interview for ArchDaily: "Architecture is the art and science of making sure that our cities and buildings actually fit with the way we want to live our lives: the process of manifesting our society into our physical world." (Basulto, 2014). Modern society tends to have a healthy life and this is a new challenge to be achieved and one of the options is by adapting our physical environment to life. When it comes to comfort, more and more new buildings have performances that user can control thanks to the potential of innovative building envelope technologies and that concept is called adaptive facades.

The paper refers to the consideration of the influence of some elements of the design and construction of buildings, more precisely the office buildings, on the feeling of comfort of employees. The research focuses on assessing how employees evaluate the achieved comfort in the case of different office types and facade technologies, and on highlighting factors that interfere with a pleasant atmosphere for work, or in other words disrupt comfort, and to perceive how it affects human health. This paper is structured in four sections. The first section - Introduction contains a brief overview of research and attitudes about the impact of architectural design on human and points to the role of technology. The second section provides an insight into contemporary views on comfort in office buildings and the characteristics of the survey. The third section focuses on the analysis of the questionnaire through which employees estimated from different aspects the comfort achieved in the case of different types of offices and facade technologies. The intention is to point out the factors that disorder comfort, and to review how it affects human health. The fourth part is the conclusion. The research methodology includes a questionnaire aimed at examining the individual experience of physical and social factors, i.e. stressors.

Case study/ Subject and features of the survey

Case study is related to office buildings and assessment of the achieved comfort in the case of different office types and facade technologies. The relevant data are generated through a survey.

Majority of the employees spend most of the day in the office. Workspaces greatly affect the psychological well-being, activities, abilities and performance of employees. It is obvious that for employees work comfort is essential for quality of work, greater productivity and creativity and the preservation of health (Furundžić, 2015). When it comes to office buildings can be noted that the impacts relate to the type of office. A space in the office may contain several different activities, either simultaneous or sequential, and its boundary may be more or less substantial, varying from a solid wall to a line in the carpet (Raymond and Cunliffe, 1997).

The office type can reinforce or thwart personal control by its architectural and functional features (Danielsson, 2010). This means that architectural features such as size, location and permeability of interior rooms, have an impact, due to their influence on the degree of social control, interaction and privacy (Evans, 2003). But also functional features such as ability to

work flexible and support feelings of autonomy and confidence at work at an individual and group level has an impact on personal control (Danielsson, 2010), Baker and Steemers(2000), exploring the roles of occupant controls in the environmental performance of buildings, concluded that provision of personal or local controls over the internal environment can extend the range of comfort. They indicated that buildings should be designed in a way that provides building users with good adaptive opportunity, which refers to the scope for adaptive interventions to environmental conditions.

Facade concept and structure should be designed to provide satisfactory user comfort. The innovative facade concepts are mostly present in buildings with high demands for: energy efficiency, modern design, safety systems, envelope as a symbol of economic and technological power. A new adaptive envelopes provide energy efficiency and economic through their capability to change their behavior in real time according to indoor-outdoor parameters by means of materials, components and systems (Aelenei et al., 2016).

Due to new technologies, the facade can be adaptable to the outside environment using a system which is operated manually, semi-automatically and automatically. For systems that have a semi-automatic and automatic control, indoor environment comfort is set up to standards, and this can be psychological stressor on the employees who need individually to set up indoor environment for comfort work.

Authors of this article conducted a survey in local conditions to find out the experience of employees in cases of different types of office space and facade design. It is important to note that constraints were noted regarding the response to conducting the survey, and non-acceptance is most often justified by the difficulty of devoting time to the survey due to significant work obligations. The survey was anonymous, which was extremely important for the respondents to know and believe, so that the honesty of the answer would be achieved. The survey was conducted in 2017. The authors prepared a questionnaire and conducted a survey, as well as processed the collected data. Because of this, but also because of the dilemmas that can create professional issues, the authors have decided to personally distribute questionnaires on-site and then collect them after about 15 minutes. The questionnaire contained a brief instruction regarding the procedure for selecting and marking the offered responses. Respondents showed interest in the content of the questionnaire and only about 1.5% did not fully answer the questions. Many have orally expressed the importance and support to parts of the questionnaire that were related to the health aspect.

Regarding spatial organization, the following types of office buildings were selected for the research: corridor type, with atrium and structures inside the shell (Figure 1). Buildings are located within the city blocks in New Belgrade and Novi Sad, as detached or in a row. Case studies include buildings built after 1980, during the period of intensive construction of modern office buildings in New Belgrade and other cities in Serbia. A number of representative samples were selected for each type of building, and amounted to 9 business units, each including between 20 and 50 respondents. The survey was conducted with 235 respondents. For the survey three types of offices were taken in consideration: private, shared - up to four and team room-between four and nine employees.

In offices, combined natural and artificial lighting is mostly in use. Ventilation types: only mechanical or combined with natural.

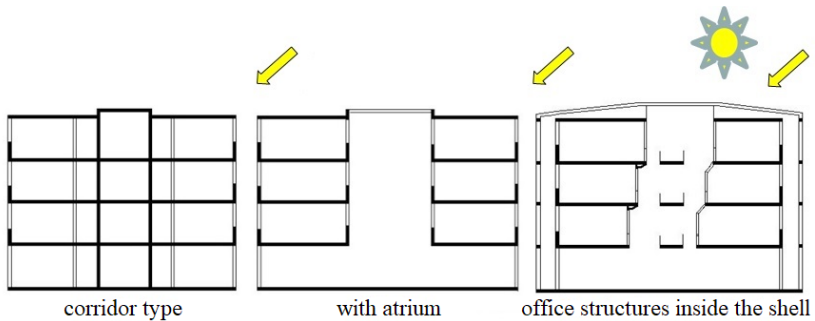


Figure 1: Considered types of office buildings

The represented type of facade is curtain wall with thermal insulating glass and metal sections. The following types of shading devices have been perceived: internal venetian blinds and external horizontal movable louvres (Figure 2). In offices, combined natural and artificial lighting is mostly in use. Ventilation types: only mechanical or combined with natural.

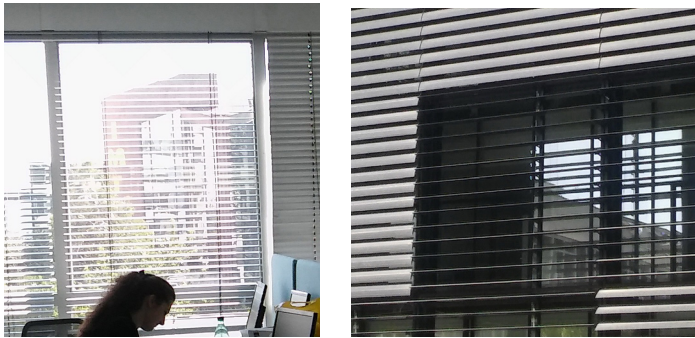


Figure 2: Types of shading devices (internal venetian blinds -left; external horizontal movable louvres -right)

Features of the survey

Studying users' satisfaction has been present for sometime and includes various areas of expertise. There is an established body of expertise related to the study of physical health with increasing quantitative evidence, but research into well-being in the built environment is a relatively recent and largely qualitative area of investigation that is nevertheless beginning to reveal consistent and widely accepted findings (Steemers, 2017). The current approach sees "health and well-being as interdependent; it holds 'prevention' as important as 'cure', and looks for long-term solutions rather than more immediately attainable treatments" (CABE, 2009). The World Health Organisation definition of health, formulated in 1948, describes health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (Huber et al., 2011; WHO, 2006). But the professional public is concerned with the limitations of this definition. The discussion of experts at the Dutch conference, however, led to broad support for moving from the present static formulation towards a more dynamic one based on the resilience or capacity to cope and maintain and restore one's integrity, equilibrium, and sense of wellbeing (Huber et al., 2011). Machteld Huber and colleagues (2011) propose changing the emphasis towards the ability to adapt and self manage in the face of social,

physical, and emotional challenges.

In the context of the aforementioned directions of redefining human health, it is also important to mention the significance of evaluating the user's comfort satisfaction. The survey is a research method that allows obtaining an opinion directly from the user regarding his satisfaction with comfort in the building. Regarding the concept of the questionnaire, different structures can be created depending on the theme and objective of the questionnaire. This research involves several factors that influence the psychological situation of the respondents, which relate to their perception of the inner space in which they are placed. Accordingly, a questionnaire and questions were created. An insight into relevant literature has shown that the consideration of the influence of some elements of the design and construction of office buildings on the employees' feeling of comfort is not sufficiently explored through a survey, especially not in the way it is done in this paper.

User assessment of comfort - Analysis of the questionnaire and Results

The study and survey are intended to highlight factors that interfere with a pleasant atmosphere for work or in other words comfort and how it affects human health. Therefore, these factors act as stressors on humans. These stressors can be physical and social. Physical are temperature, noise, light, air-quality. Social are privacy and personal environment. The research points to some effects of these stressors.

The analysis of the survey indicated that employees give priority to the possibility of individually setting up the indoor environment (Figure 3).

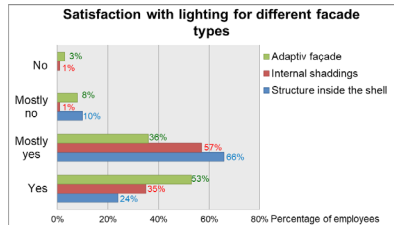
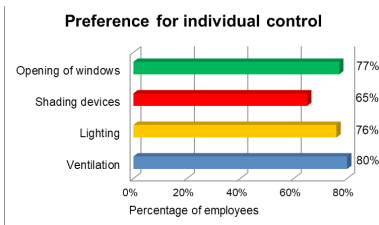


Figure 3: Support for individual control options Figure 4: Satisfaction with lighting

Assessment of lighting - In the case of adaptive facades with movable louvres, the largest number of employees feels lighting like a completely pleasant (Figure 4).

Assessment of ventilation - The possibility of opening windows and combining natural ventilation with mechanical enables employees to feel the ventilation as pleasant, while in the case of office structure in the shell, employees feel that ventilation is mostly unpleasant and often noisy (Figure 5). The reasons for the unpleasant feeling are: air flow, air temperature incompatible with personal feeling, stuffy and odours.

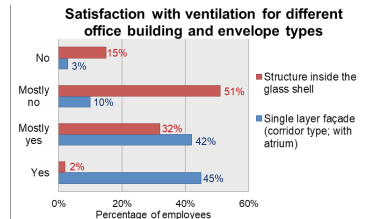
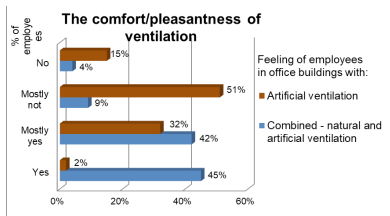


Figure 5: Satisfaction depending on the ventilation type (left) and office building and envelope types (right)

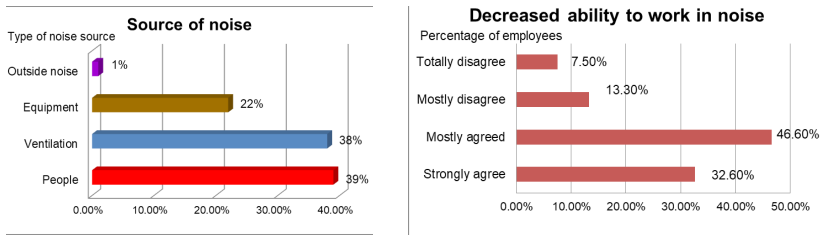


Figure 6: Sources of noise in office buildings Figure 7: Impact of noise on working abilities

Assessment of noise - Employees experience that sources of noise are mostly people, usually in team offices, as well as ventilation, and less equipment (Figure 6). Most agree that there is a decreased ability to work in noise, especially for working on new tasks (Figure 7).

Some effects of the impact of these stressors are analysed through this survey. The correlation between emotional state and periodontal problems is observed (Figure 8). From the aspect of the emotional state of employees, the following cases are selected: normal, borderline abnormal (presence of anxiety and/or depression) and abnormal (presence of anxiety and/or depression). Considering the group with normal emotional state 26% reported periodontal problems, while this percentage was 39% in the case of borderline abnormal and 75% in the case of abnormal. This consideration was chosen because people with a changed emotional state are less likely to maintain hygiene, which is especially reflected in the oral hygiene and the onset of rapid manifestations-periodontal problems.

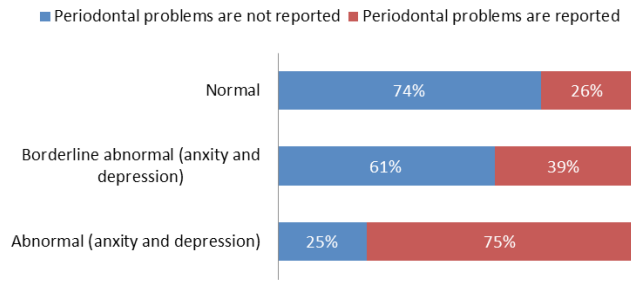


Figure 8: The correlation between emotional state and periodontal problems

The fact that emotional states can be associated with comfort conditions confirms the importance of integrated design and presents the architectural challenge.

Conclusions

New technology and design can be generators of stress for people working in the office space. It should be kept in mind when designing commercial buildings and office interiors. Based on the analysis of the results of the survey, the paper pointed out the harmful environmental factors that are generators of stress in office spaces. It has been noted that emotional conditions may be associated with comfort conditions. Also, the contribution is that this paper observes the correlation between emotional state and periodontal problems. Mitigating these stressors is crucial to reducing the incidence of stress-related illnesses.

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