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Re-functioning of Inter-War Modernism Buildings in Kaunas (Lithuania): the Aspect of Users' Comfort

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This study is aimed at analysing the possibilities of contemporary use and re-functioning of Kaunas inter-war modernism buildings from the users' comfort point of view. For the study, we have selected the building of the House of Commerce, Industry and Crafts designed in 1937 - 1939 by the well-known architect of this period V. Landsbergis-Zemkalnis that was continuously used and re-used for the administrative, office, and library purposes through its entire existence. In the frame of this research the analysis of literature, including the peculiarities of heritage building re-functioning from the users' comfort point of view and the historical context of the case study building, and the field study including the photographic survey and the measurements of thermal conditions during warm (August) and cold (March - April, with central heating) seasons were carried out. The research on site has shown the favourable conditions for the users according to the contemporary standards; however, the deterioration of some building's structures threaten its heritage values and the use possibilities in the future. It can be concluded that the prestige generated by the heritage values and social significance of Kaunas inter-war modernism architecture together with the appropriate thermal conditions for the users encourage sustainable renovation and re-functioning of such buildings for the needs of contemporary society.

Keywords: heritage building, cultural heritage, re-functioning, sustainability, inter-war modernism, thermal comfort, Kaunas, Lithuania.

Introduction

Relevance of research. Heritage building means a building possessing architectural, aesthetic, historic or cultural values and designated by the competent authorities (Heritage..., 2013). The multifaceted significance of preservation of heritage buildings is undoubted and embedded in the international, regional, and national documents. For example, the Declaration of Amsterdam, adopted by the Congress on the European Architectural Heritage and the Council of Europe in 1975 underlines that apart from its priceless cultural value, Europe's architectural heritage gives to the peoples the consciousness of their common history and common future; therefore, its preservation is a matter of vital importance (The Declaration..., 1975). The preservation of heritage buildings for the present and future generations is related with the activities of heritage management and conservation. Management of heritage object involves making conscious choices about what happens to it and includes the widest possible range of actions and decisions, such as:



establishing the appropriate decision-making group and processes; setting up decision-making structures to implement strategies; assessing significance; deciding to open or not open a site to visitors; approving site works and physical conservation; arranging access rights or means to achieve access (such as transport) or even deciding to take no action etc. (Castellanos and Descamps, 2009). However, according to the International Cultural Tourism Charter, “a primary objective for managing heritage is to communicate its significance and need for its conservation to its host community and to visitors (International..., 1999). According to F. G. Weaver (1997), “architectural conservation deals with issues of prolonging the life and reliability of architectural character and integrity, such as form and style, and /or its constituent materials, such as stone, brick, glass, metal and wood. In this sense, the term refers to the professional use of a combination of science, art, craft and technology as a preservation tool”. These definitions reveal that the field of heritage preservation involves both tangible (prolonging the life span of the building, its use and re-use, preservation of the authentic fabric) and intangible (influence on local identity, communication of significance etc.) aspects and their interactions enabling present and future generations to benefit from heritage buildings. The potentially long and hardly definable life span of heritage buildings determines the importance of their continuous adaptation to the needs of changing society including re-use and re-functioning without losing both tangible and intangible values. According to G. Golmakani (2011), sustaining heritage buildings by restoring and re-using them with their original character is important for development of culture.

The aim of research is to analyse the possibilities of contemporary use and re-refunctioning of Kaunas inter-war modernism buildings from the users’ comfort point of view both concentrating on the case of the building of the House of Commerce, Industry and Crafts (sometimes translated as Commerce, Industry and Crafts palace) and the measurements carried out in it and the analysis of the wider context of the problem including both literature review regarding building re-functioning and users comfort and the historical context of the building. The building of the House of Commerce, Industry and Crafts designed in 1937 - 1939 by the well-known architect of this period V. Landsbergis-Žemkalnis that was selected for this study as the representative object of high architectural quality that was continuously used and re-used for the administrative, office, and library purposes through its entire existence and demonstrates well the refunctioning possibilities and maintenance challenges of the modernist building of inter-war era. The applied research methods include the analysis of foreign and Lithuanian literature, the photographic survey on site, and the measurements of thermal conditions during the warm and cold seasons.

Refunctioning of heritage buildings and the users’ comfort

The practice of adapting to new functions an existing building is almost as old as building practice itself and the conservation of historic buildings is always facilitated by their socially useful purposes (Philokyrou, 2014). History of architecture and experience of heritage preservation demonstrate the importance of continuous use of heritage building for the maintenance of its good physical condition and its role in community and society. For example, the most known and well preserved are those ancient Roman temples that in the course of time were used as churches, museums etc. The analysis of heritage preservation terminology demonstrates that different terms exist to define the aspects of use for the authentic and other functions of heritage building. For example, the term “re-use” in general can be defined as “to use again” or “the use of a material more than once in its same form for the same purpose” (LeBlanc, 2011) and in the context of heritage buildings it more denotes to the situation when once abandoned or inappropriately used building can be re-used again for the same original or new function. In other words, term “re-use” may actually mean the change of function, but not necessarily. The term “convert” or “conversion” in the field of architecture and heritage preservation means “to change the use of a building” (LeB-

lanc, 2011) and related necessary interventions in to the building's fabric. Similar meaning can be attributed to the term "adaptive re-use", which implies "the recycling of an older structure often for a new function. Extensive restoration or rehabilitation of both the interior and exterior is usually involved" (LeBlanc, 2011). The Art & Architecture Thesaurus of Getty Research institution defines adaptive re-use as the "conversion of buildings". Some authors, analyzing the changes of functions and related interventions of heritage buildings use the term "re-functioning" (Golmakani, 2011), this term first of all implies the adaptation of the building to the new function, and may imply, but not necessarily, the intervention into the built fabric. The term "re-functioning" is used in other contexts as well, for example, in the field of German modernist theatre re-functioning means the aesthetics that is intended to "intervene in the process of shaping society" (Encyclo..., 2014). The idea that changing the function and the physical fabric of the heritage building changes its meanings and significances (its role in the lives of individuals, community, and society) is relevant in the field of heritage preservation as well. Consequently, in the context of this work, we will mainly use the term "re-functioning" because of its flexible and encompassing meaning.

The literature review has demonstrated that re-functioning of heritage buildings for various purposes is widespread and widely analyzed issue. According to M. Philokyprou (2014), in more recent times the phenomenon of heritage buildings re-functioning has become more widespread as both public institutions and building owners appreciate the value of historic properties and decide to prolong their useful life adapting them to the changing needs of society. M. Highfield (1987), M. Binney et al. (1991), K. Powell (1999) and many others had addressed this question from various perspectives. For example, M. Philokyprou (2014) had analysed the case of re-functioning of historic buildings in the centre of Limassol (Cyprus) for the needs of newly instituted university. M. Ulusoy et al. (2013) analyzed re-functioning of heritage buildings in the context of sustainability. The abandoned and derelict industrial buildings after the deindustrialization of Europe, many of them possessing heritage values, receive the particular attention in this regard. M. Binney et al. (1991) published the guide to practical ways of re-using mills, warehouses, maltings and other British industrial buildings. G. Golmakani (2011) had analyzed the re-functioning potential of industrial heritage buildings in North Cyprus. E. Mengusoglu and M. Boyacioglu (2013) presented the case of re-functioning of industrial heritage for residential purposes in Manchester. The issue of heritage buildings re-functioning has wider implications as well including urban regeneration and sustainability goals. According to M. Philokyprou (2014), the imperative of extension of the life cycle of heritage building is also related to various sustainability goals. She underlines that the re-use of existing buildings is one of the highest forms of sustainable design.

The paradigm of sustainability regarding the heritage buildings, however, requires not only minimizing the waste generation and the use of resources, maintaining the identity of the place and community, but also energy savings and the appropriate living and working conditions for the users of heritage buildings. Reviewed studies (Bellia et al., 2015; Burattini et al., 2015; Todorovic, 2012; Todorovic et al., 2015 and many others) had demonstrated that it is possible to improve the energy performance of an existing building achieving a significant energy saving with the respect of the building architecture, shape, function and the surrounding landscape (Burattini et al., 2015). It is possible to presume that some historic buildings are inherently sustainable including the users comfort as well; taking into account the original climatic adaptations of historic buildings, contemporary sustainable technologies can supplement their inherent sustainable features (Todorovic, 2012). For example, originally heritage buildings have natural ventilation. If all indoor air quality and thermal comfort parameters are kept, these buildings are meeting sustainability requirements, as no energy is needed for cooling. In some cases, compromises are necessary and mechanical ventilation should be introduced if we want to continue using heritage building. In most cases with natural ventilation, the biggest concern is overheating. New techniques are presented by scientists to assess thermal comfort of a naturally ventilated buildings (Chen et al., 2017; Hurtado et al., 2017).

Building users comfort includes thermal, visual, and acoustic comfort and air quality (Occupant..., 2017). Several studies have shown (Geng et al., 2017; Seppanen and Fisk, 2006; Fisk et al., 2005) that thermal comfort and indoor air quality have a crucial impact on employee's productivity and health. If heritage buildings are used as offices, they have to meet thermal comfort requirements. In this study we address the issue of the thermal comfort, which is relevant in Lithuanian climate with the expressed cold and warm seasons.

Kaunas interwar modernism and the House of Commerce, Industry and Crafts

With the passage of time, ongoing social changes, and the development of heritage preservation field the notion of heritage has expanded both from the point of view of typology and the age of the object, that is considered as valuable. According to J. Jokilehto (2007), "the cultural heritage <...> now also embraces the records left behind by the 20th century. <...> The idea of the heritage has been broadened to include both the human and the natural environment, both architectural complexes and archeological sites, not only the rural heritage and the country site, but also the urban, technical or industrial heritage, industrial design and street furniture." The history of the inter-war era architecture of modernism of the second largest Lithuanian city Kaunas and its patrimonialization well reflect these developments in the field of heritage preservation. Not so long ago this architectural heritage was appreciated only in the limited circle of professionals and enthusiasts, interested in the variety of architectural manifestations of the modern movement, the research into this architectural period was limited by the Soviet regime as well; now it is known as an outstanding and complex phenomenon and increasingly advertised both in the local, national and international contexts. Kaunas inter-war modernism architecture was recently awarded the European Heritage Label; its inclusion into UNESCO World Heritage List is anticipated as well.

Cultural context. The cultural context of the building under analysis is shaped by several events and trends of its era, including among others:

- the status of Temporary Capital of Lithuania attributed to the city of Kaunas in 1920, which had encouraged the concentration of institutions, population, professionals, cultural processes, the building boom, the development of infrastructure, and the search for the new identity and new ways of architectural expression. According to J. Kančienė (2007), as a result of this building boom, in the fourth decade of the 20th century Kaunas looked much less provincial compared to earlier decades: architectural expression shifted towards then fashionable functionalism, asphalted streets stretched with wide sidewalks, abundant lighting, buses ran instead of horse-drawn trams, city was full with taxis and private cars etc. According to the statistics, the construction was the most intense in 1931, when the world was already in the deep economic crisis.
- the development of modernism in architecture and design at the beginning of the 20th century, which had acquired different forms depending on a variety of cultural, social, political and other conditions in different contexts ranging from rational, economically efficient socially oriented trends to "cold and anonymous" International style or even monumental representative buildings, from total abandonment of decorative non-functional elements and attachment to any architectural tradition to integration of vernacular or ethnic aesthetics or even the features of classical architecture into design. In some instances, despite its superficial simplicity and uniformity, modernist architecture can integrate several of above-mentioned trends and gain distinctive local forms: "the new tendencies of modernism that spread through the most part of the Western World after World War I soon found their way into the young Republic of Lithuania. Local architects, that were coming home after the studies in Western European universities brought back the new architectural ideas, and transformed them into distinctive local form, that was later named Kaunas school of architecture (Laurinaitis, 2017)."

Fig. 1

Kaunas modernism architecture (in the postcards of the inter-war era) as a paradoxical merging of international trends and national style development, modernist minimalism and ornament, simplicity and grandeur and such is the building under analysis – the House of Commerce, Industry and Crafts (first at the top)



House of Commerce, Industry and Crafts. The search for the new architectural expression was started in the inter-war Lithuania's temporary capital. Initially the retrospective architecture imitating and interpreting the historical forms was predominant; however, it was soon replaced with more functionalist approaches (Kančienė, 2007). Each of the architects working in this trend "had their own style, marked by their unique variations of modernist elements – either by fusing them with classical architecture, search for so-called „national style“, or just by simply trying to adjust those ideas for the local conditions (Laurinaitis, 2017)". The design and construction of the building of the House of Commerce, Industry and Crafts demonstrates the attitude of that era towards the building important both in the architectural and institutional context. The first design competition was held in 1937 with the intended location of the building near the museum complex on Donelaičio Street. 28 projects were presented and the realization was entrusted to the second place winner architect Vytautas Landsbergis-Žemkalnis. Although the building was not realized in this location. The alternative location was selected at the beginning of Donelaičio Street, which had gained the gradual significance as a representative urban axis. The researchers note, that the architect had just slightly changed the previous design, made its "mirror reflection" and adapted to the site (Kančienė and Minkevičius 1993; Laurinaitis, 2012). In the 18th of February 1939 the building designed by V. Landsbergis-Žemkalnis was opened.

The design of the building embodies the more classical approaches applied to representative building of the state at that time. Even if the architectural forms and details are strongly rationalized, the arches and emphasized pilasters constitute an important part in the composition of the building. The luxurious interiors designed by the architect of the building are decorated with folk motifs. The importance of the building is emphasized by the works of art in the interior and exterior by the artists famous at that time – Bronius Pundzius, Stasys Ušinskas, Petras Kalpokas (Kančienė and Minkevičius 1993; Laurinaitis, 2012).



Fig. 2

Present exterior and interior condition of the building of the House of Commerce, Industry and Crafts demonstrates the signs of decay. Photographs by the authors

In 1940 after the Soviet occupation the institution of House of Commerce, Industry and Crafts was dismissed and the building was nationalized (Kaunas..., 2010). On the 1st of October 1950 the public library was instituted in the building (Kaunas..., 2016). The largest part of the building is still used by the subdivision of Kaunas County Public Library and houses the department of music publications, the department of rare and antique publications, and the department of children literature (Kaunas..., 2016). In 1991 the institution of House of Commerce, Industry and Crafts abolished by the Soviet regime was restored and currently occupies part of their historic building as well.

Such favourable function conditioned that the building has survived in a satisfactory condition till present times. However, already in 1960 the structural overload and deformation problems due to the storage of library funds in the building caused the need to transfer part of these funds to another location (Kaunas..., 2016). The building was repaired in 1968 and the roof was repaired approximately two decades ago, although works were of low quality. With the passage of time the problems of the building have aggravated. The leaking roof and the spreading mold threatens both building structures and its valuable features and the collections of valuable publications accumulated by the library (Anilionytė and Alper, 2016). The physical condition of the building, the safety of historic artworks and furniture as well as the conditions, in which the funds of library are stored still raise concern of institutions and society. This interest has intensified with the award of the European Heritage Label to Kaunas inter-war modernism and consequent marking the building with the table with the European Heritage logo.

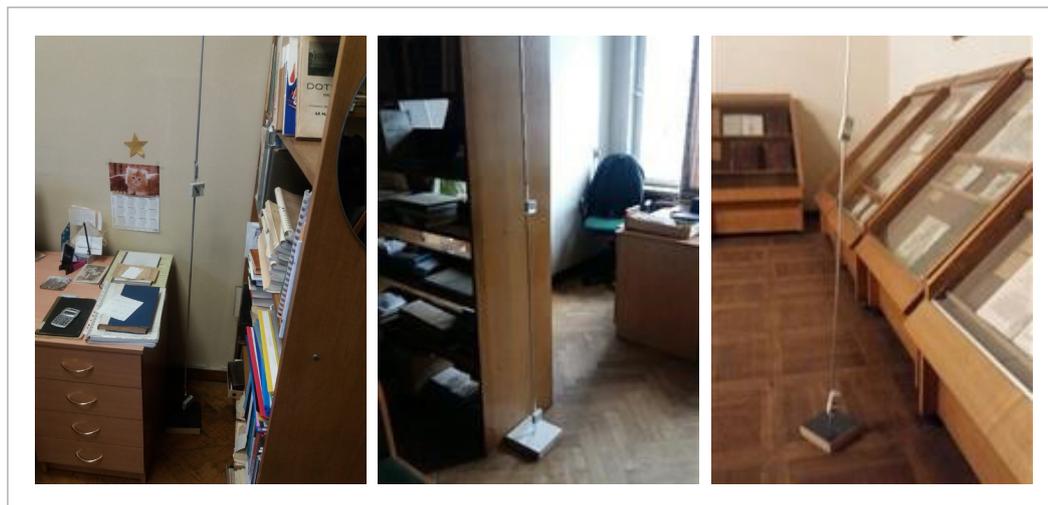
Several international standards and guidelines from International Organization for Standardization (ISO) and European Committee for Standardization (CEN) are giving requirements related to comfort and health. Studies are showing that comfortable room temperatures, good indoor air quality and effective ventilation are increasing the performance of people (Olesen, 2012).

**Empirical
study and
results**

As mentioned before, a subdivision of Kaunas County Public Library and offices of the institution of House of Commerce, Industry and Crafts are located in the tested building. Two offices (Fig. 3) and conference hall were selected for the measurements. In each office, 3 people have a working place.

Fig. 3

The offices and the conference hall in the House of Commerce, Industry and Crafts where the measurements of temperature, relative humidity and CO₂ concentration were carried out



For the measurements of temperature and relative humidity HOB0 sensors were used. Sensors were attached to the stand at 0.1 m and 1.1 m height, to check temperature differences for the ankle and for seated person level.

Temperature and relative humidity measurements were carried out for one month during cold (17 March – 17 April, 2017) and warm (1 - 31 August, 2017) seasons. During the cold season, the central heating was on. The interval of sampling – 10 min.

Measurements of carbon dioxide (CO₂) concentration were used as an indicator of indoor air quality and ventilation effectiveness. Fluke 975 was used for CO₂ measurements. Measurements of CO₂ concentration were performed during the warm season in one of the tested office rooms.

Results of the measured temperature and relative humidity (average values) are presented in table 1. Data of working day (starting from 8 a.m. until 5 p.m.) was analysed.

Results show, that the average temperature in the tested offices during the cold season was slightly higher than recommended by the HN 42:2009 requirements (22°C). However, in the conference hall, the temperature was almost meeting the critical lowest value of 18°C. Temperature

Table 1

Average temperature (T) and relative humidity (RH) values measured in the tested offices and conference hall during the cold and warm seasons

Parameter/ the height of the instrument	Cold season		Warm season		Tested area
	0.1 m	1.1 m	0.1 m	1.1 m	
T, °C	22.7	23.1	25.3	25.4	Office Nr.31
RH, %	26	25	45	43	
T, °C	20.4	22.2	24.1	24.2	Office Nr.37
RH, %	27	25	51	44	
T, °C	18.7	19.4	23.3	23.6	Conference hall
RH, %	30	29	54	54	

differences at different heights were not significant and were not exceeding 3°C. Relative humidity was lower than 30% and was not meeting HN 42:2009 requirements. However, this is a common problem in the office buildings during the cold season. The results show, that tested parameters are meeting the requirements during the warm season. The average CO₂ concentration measured during the working days of warm season was 575 ppm.

1 The preservation and communication of heritage values are inseparable from the continuous use of heritage buildings for the changing needs of the evolving society. In this context it is necessary to acknowledge that some outstanding public buildings of inter-war modernism located in the centre of Kaunas awarded the honour to be marked with the table with the European Heritage logo are just partially used and stand almost abandoned raising concerns of further re-functioning and preservation. Such situation means that the social, economic, and cultural potential of these buildings is just partially employed or not employed at all.

2 The building of the House of Commerce, Industry and Crafts was selected for the study as an example of continuous use and re-functioning of the heritage building. Despite the need of renovation of the interior, exterior and some building structures, the measurements demonstrate the favourable conditions for office workers both in cold and warm seasons. Results in tested offices during the cold season are showing that the average temperature is slightly higher than recommended by the HN 42:2009 (22°C). However, the difference is not significant and cannot affect the people working in these offices. Results of warm season are showing that all the parameters are meeting the HN 42:2009 requirements. Taking into account that this heritage building has natural ventilation and offices are not overheated during the warm season it can be concluded that the building is meeting related sustainability requirements and after corresponding renovations can be successfully used for the present needs.

3 Social engagement and awareness of values of heritage buildings are crucial for their continuous functioning, re-functioning and preservation. However, their inherent sustainability and adaptability are important as well as the case of the House of Commerce, Industry and Crafts demonstrates. Both the prestige and values of heritage buildings including their often favourable location and their sustainability and re-functioning potential should encourage national and international investors and company leaders to consider having the offices in heritage buildings.

Conclusions

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