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Table of Contents

Comparison of Ottoman Era Skopje Bazaar with Similar Bazaars

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Abstract

The formation of the typical Turkish bazaar in cities is directly related to the understanding of "futuwwa" and the tradition of "akhism". As a common-public education organization that trained well-behaved professionals with high moral values, the Akhi organization shaped the bazaars that formed the center of the social life of the Ottoman city.

These cities, which were built according to an understanding that protects unity and integrity while glorifying individuality, are under threat today for different reasons. The aim of this study is to comparatively analyze the social and architectural changes that have taken place over time in the bazaars, which were built in recent history and have a rich cultural diversity even within themselves. For this purpose, based on the Skopje Bazaar, the bazaars of Istanbul, Bursa, Tokat, Korçe (Görice), Novi Pazar, Sarajevo, Monastir and Thessaloniki were analyzed.

Key Words: *Medival Ottoman bazaar, urban heritage, akhism*

1. Introduction

The formation of the typical Turkish bazaar in cities is directly related to the understanding of "futuwwa" and the tradition of "akhism". The Futuwwa, was broadly present in Anatolia from the 13th century onwards, especially through the akhisim in the bazaars. In Anatolia, the Ahi order was transformed into an well organized structure through the social, political and even military struggles of Ahi Evran, a follower of phzlospsher Evhad al-Din Kirmani. Fetâ means "young, valiant, generous" in the Arabic dictionary, while futuwwa means "youth, heroism, generosity" (Ocak 1996, p.261). According to the worldview of interconnected phylosophers such as Ahmet Yesevi, Evhadu'd-Dîn-i Kirmanî, Ahi Evren, Hacı Bektaş, Hacı Bayram, Edebali, people should make a living through manual labor. This means a division of labor at certain points. Akhilik can also be described as a set of norms of this division of labor based on Islamic morality (Barkan, 1942, p. 11). As a common-public education organization that trained well-behaved professionals with high moral values, the Akhi organization shaped the bazaars that formed the center of the social life of the Ottoman city.

In this article, the similarities and differences of the Skopje Bazaar, which constitutes the core culture of the akhi concept in Europe, with other bazaars created in the same period are discussed in the context of cultural continuity. The connection between shops as an architectural unit and crafts as a social unit in the medieval Turkish Bazaar, which spread from Skopje, constituted the most fundamental and determining factor of medival Turkish urban culture.

Turks created a unique identity in literature, art, architecture and urbanization with hundreds of years of accumulation from the geographies they conquered in their westward movement from the 9th century onwards. The Ottoman Empire also started to build its own civilization facilities in the newly conquered lands according to this new way and style. In the cities, an infinite richness of images was created with works that were created using the same materials and did not repeat or deny their predecessors (Ayvazoğlu, 1999, p.25). These cities, which were built according to an understanding that protects unity and integrity while glorifying individuality, are under threat today for different reasons. The aim of this study is to comparatively analyze the social and architectural changes that have taken place over time in the bazaars, which were built in recent history and have a rich cultural diversity even within themselves (Figure 1). For this purpose, based on the Skopje Bazaar, the bazaars of Istanbul, Bursa, Tokat, Korçe (Görice), Novi Pazar, Sarajevo, Monastir and Thessaloniki were analyzed.

Figure 1. Different type of storefront

2. Bazaars

2.1. Skopje Bazaar

In the late 14th century, Skopje came under Ottoman rule and became the center of the Ottoman Empire during the Balkan campaigns of Mehmet the Conqueror (İnbaşı 1995, p.9). In the 16th century, it became an inner region city of the Ottoman Empire, the majority of which was Muslim. Ottoman urbanization in the Balkans, unlike the urbanization culture in the east, is characterized by more frequent and smaller urbanization, forming parts of a larger economic system through the akhilik organization. The development of cities in the Ottoman Empire took place around religious, social, commercial and educational facilities established through foundations.

The Bazaar of Skopje was established in a central area where all roads in the city intersected, close to the castle and on the hilly north side of the river. In the 17th century, Skopje was known as a vibrant commercial center of Europe, but the biggest disaster it suffered was in 1689 when the Austrian army under the command of Piccolomini set the city on fire. The city never regained its former splendor (Ayverdi, 1981, p.84).

From the mid-19th century onwards, the city received an intensive Muslim migration following the Ottoman territorial losses in Europe and regained its central position. Intensive infrastructure and transportation investments were made in the city during this period. The railway line, which was connected to Thessaloniki in 1873, was extended to Belgrade in 1888, thus Skopje established a direct connection with Central Europe (Ankay 2015, p.22).

On the other hand, municipal activities were carried out in accordance with the Provincial (Vilâyet) Municipality and Dersaadet Municipality Laws enacted during this period. According to a document dated August 17, 1908, it was requested to reorganize the area by taking the zoning law into consideration in the new planning to be made in the bazaar, and to grant loans for this purpose or to allow the shop owners to build another floor. Therefore, in the Kazancılar Bazaar where the fire broke out, masonry buildings of stone or brick with large height and internal volume were built on a straight line. For large openings in the roofs of these buildings, sheet metal rails were used instead of wood [1] (Figure 2).

Figure 2. In a building built after the 1908 fire using jack arch for roof construction

In 1913, the Ottoman rule in Skopje came to an end. After this date, all the Islamic monuments in the new settlements on the south side of the Vardar River were destroyed over time. However, after the 1963 earthquake, the Skopje Institute of Town Planning and Architecture (ITPA) was established under the auspices of the United Nations and a conservation plan was prepared for the bazaar (Figure 3). According to the plan, the central areas of the city were connected by monumental "walls" and "gates", referring to European medieval city plans (Stefanovska et al. 2012, p.93). According to the 1970 zoning study, the jewelers' texture on the upper side of the Çifte Hammam was replaced by "service crafts" over time, extending to the end of the street where the Bitpazar is located today. On the street lined with stove makers, only one stove maker's shop that has been in the same pro-

fession for more than 100 years has survived to the present day. The places designated for eating and drinking have partially survived to the present day.

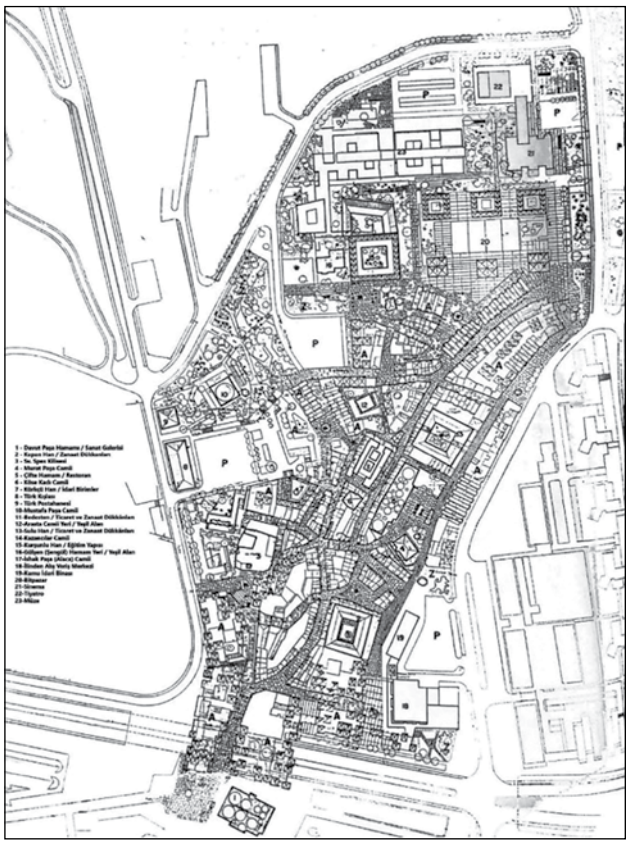

Figure 3. ITPA Plan for the Skopje Bazaar (Arsovski, 1970: 54).

Although some of the souvenir shops have been relocated, a row of shops on the north side of the bazaar, including a chocolate shop, and a few quilt shops have survived from that period. Most of the area marked as "specialized craftsmen" on the map has been lost and only one blacksmith shop has survived. Most of the area marked on the map is today outside the Bazaar Conservation Area. The area where the boilermakers were located has been transformed into an area where entertainment areas are concentrated today (İbrahimgil, 2018, p.134).

In the 19th century, there were approximately 90 different occupational groups in the bazaar. In the bazaar, where strict craftsmen discipline was practiced, artisans were administered by a legal and administrative structure consisting of Muslim, Christian and mixed classes. The craftsmen belonging to the mixed class were subject to both administrative systems and bore the seal of both religions. This understanding was largely maintained until the 1960s (İbrahimgil 2018, p.142). This shows that the culture of Akhi was continued as a tradition, albeit partially, until recent history.

The shops in Skopje Bazaar came together in three types (Figure 4). The first one is the shops formed by surrounding the monumental buildings, the second one is the type that forms an island of shops back to back, and the third one is the shops lined up in a single row with the emptying of the back over time. There are seven different types along the façade, the most common being ground + 1 storey (Figure 5). The upper covers of the shops are covered with three types of roofs. The most common roof type is the shed roof, which extends backwards from the front façade in a single plane and provides space on the upper floor. 376 (57%) of the shops within the conservation area were built with masonry construction system.

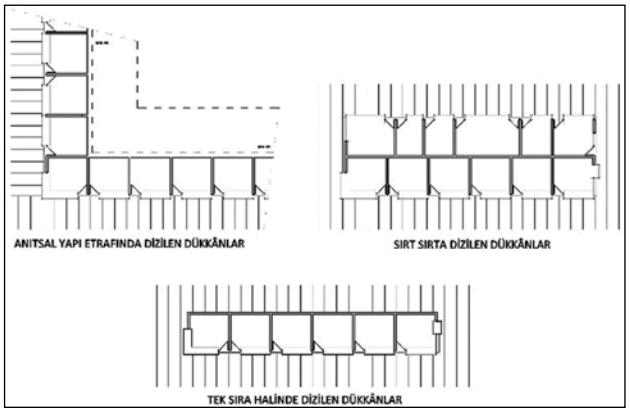

Figure 4. Layout typology of the shops

One of the most important architectural formations in the typology of the medieval Turkish Bazaar is the storefront. The use of glass in the shops, which were initially glassless and shuttered, led to the formation of a storefront typology (Figure 6). Today, a very rich storefront typology has emerged in the bazaar, eight horizontally and three vertically.

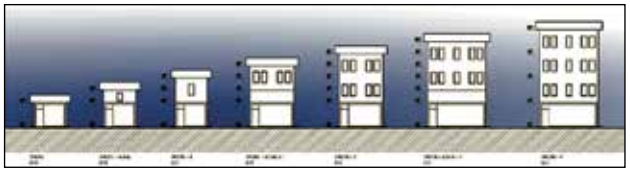

Figure 5. Types of storey heights

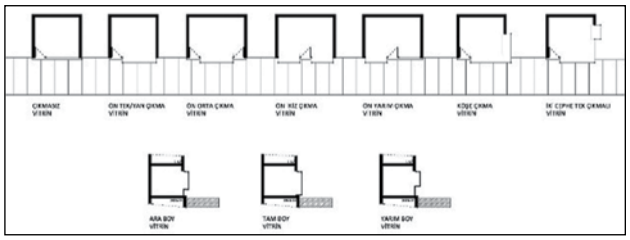

Figure 6. Typology of storefronts in shops

2.2. Istanbul Grand Bazaar

Immediately after the conquest of Istanbul, Sultan Mehmet the Conqueror gave the city its Turkish identity with the zoning and settlement plans he initiated. In order to strengthen the commercial activities in the city, which had weakened during the Byzantine period, he built a bazaar with two thousand shops and two bedestens. The location and position of the Istanbul Bedesten and the bazaar surrounding it were personally determined by Mehmet II. The Grand Bazaar was established to be one of the world's leading economic centers and to repair the defacement during the conquest and to restore the city (İnalcık, 1997, p.125). These efforts were not only based on construction, but in order to restore the social structure of the city, he invited Ali Kuşçu from Samarkand, one of the brilliant centers of science and culture of that period, to Istanbul and put him in charge of the madrasas he established (Aydın, 1989, p.408).

The Turks expanded and developed the commercial area of Istanbul from the extension near the Hagia Sophia Mosque, centering on the Grand Bazaar, to Sirkeci, Eminönü and Tahtakale. The area around the Beyazıt Mosque and the Old Palace (now the university headquarters) limited this part of the bazaar (Cezar, 1985, p.78). Thus, the roads coming from Hagia Sophia, Edirnekapı, Yedikule and the Golden Horn would converge at Beyazıt Square (Sönmez, 1993, p. 3). In this neighborhood, which constituted the most crowded district of the city and was mostly based on shopping, professions were divided into sections and different professional groups settled together (Cerasi, 1999, p.81). For example, even today, the locations of bookbinders and booksellers in the Grand Bazaar have remained almost unchanged for five centuries (Ayverdi, 1985, p.219).

The Grand Bazaar was built around a fifteen-domed bedesten structure. Inside this bedesten, small compartment shops lined up adjacent to the walls and vaulted shops were built on the walls facing outwards. When it was first built, it was in the form of streets with poles and shops lined up behind the poles (Eyice,1992, p.510). When the endowments related to the Grand Bazaar are examined, 849 shops were built immediately after the construction of the bedesten, and 265 more shops were added to the bazaar after the construction of the second bedesten a very short time later. In addition, nearly 800 more shops within the bazaar area were built during the reign of Mehmet II (Sönmez, 1993, p.7).

The Grand Bazaar reached its highest level in the 17th century, but took its final form after the earthquake of 1894. In the early 1900s, the shops consisted of 6-8 foot narrow and small spaces called cabinets, consisting of a section where the seller sat and closed shelves behind him. The doors consisted of shutters that moved up and down. Since the use of glass was very limited, there were no showcases and the goods were hung on shutters or kept on shelves (Eyice, 1992, p. 511).

2.3. Bursa Bazaar

Bursa is the most typical example of Turkish urbanism not only in terms of the bazaar but also in its entirety. It is the most important city in the Turkish city that best reflects the layout of the bazaar, where the buildings with different functions are fused with each other with a placement order and neighborhood formations are exhibited (Cezar, 1985, p.90). The proximity of the bazaar to the castle provides security, topographically it is on the threshold between the mountain and the plain, and in terms of the development status of the city, it is on the ring road (Cezar, 1985, p.57). The construction of the bazaar was shaped around the vaulted "Uzun Bazaar" extending in a straight line from the bedesten, the core of the Ottoman Turkish bazaar, westward to the Koza Han gate (Cerasi, 1999, p.81).

In addition to monumental buildings such as inns, caravanserais, mosques and baths, other bazaars, some of which were in the form of arasta, were also lined up around this Uzun Çarşı Street (Figure 7). Madrasahs, on the other hand, were often excluded from the bazaar, but with the enlargement of the bazaar, they remained in or near

the bazaar (Cezar, 1985, p.98). According to archival records, the Bursa bazaar underwent many changes over time due to fires and earthquakes, and some places that were previously closed were opened and some places that were open were covered (Ayverdi, 1981, p.130). Bursa inns are generally two-storey masonry buildings with a courtyard in the middle. The inner courtyard of most inns is surrounded by porticoes.

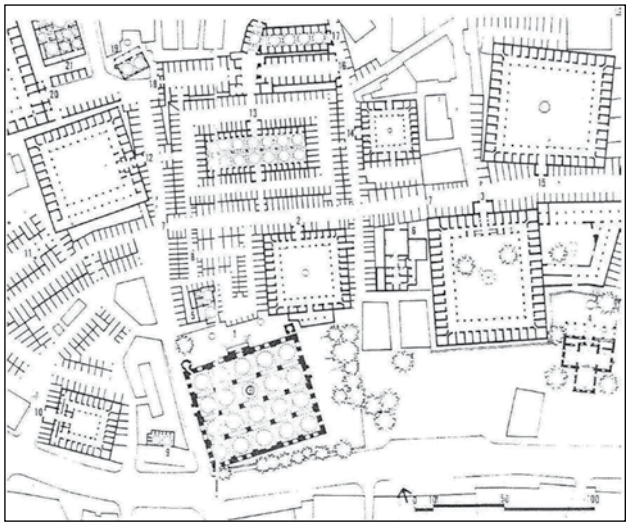

Figure 7. Plan view of the buildings in the inn district (Kosifoğlu, 2000, p.176)

2.4. Tokat Bazaar

The bazaar of Tokat began to form during the Danisment period, became more prominent during the Seljuk period and developed during the Ottoman period. Being located on caravan routes in the middle of Anatolia, its proximity to mineral deposits and silk weaving and silk-based weaving made the city a commercial center. Tokat's bazaar developed longitudinally in parallel with the topography of the land on the southern slope of the castle built on the top of a steep slope. The main part of the Tokat bazaar, consisting of the Bedesten, the adjacent arasta, the nearby inns and shops, is an important example of the "Long Bazaar" street formation, even in a city built on a faulted area, in terms of both proximity to the castle and the effort to fit the topography and to settle in the central part of the city (Cezar, 1985, p.65).

In the bazaar of Tokat, monumental buildings are located close to each other in the bazaar area due to topographical conditions. Sulu Street is the long street of the bazaar (Figure 8). The bedesten adjacent to the arasta is located in the middle of this street (Aksulu & Kuntay, 2013, p.33). Most of the large and small inns, madrasahs, baths and mosques built in different periods are on this line. Most of the buildings were built with rubble stone or cut stone.

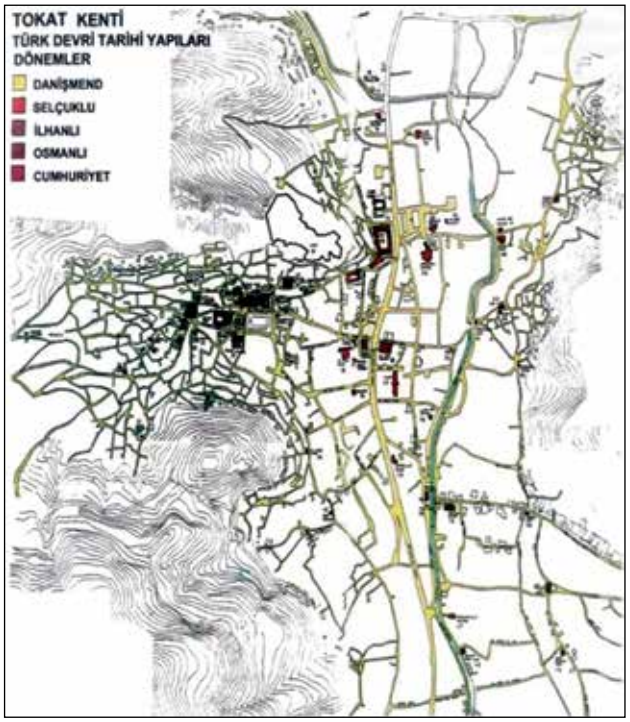

Figure 8. Tokat Castle and city development (Aksulu ve Kuntay, 2013, p.33).

2.5. Novi Pazar Bazaar

Novi Pazar was founded in the mid-15th century by Isa Bey, the son of Ishak Bey, the conqueror of Skopje, as a Turkish city south of Eski Pazar (Pazarişte / Trgovişte). The city is located in the mountainous region of Sanjak, a crossroads where all roads intersect between Sarajevo, Dubrovnik, Zeta, Skopje and Niš, especially in the east-west trade of the Balkans through valleys and plateaus. The foundation of the city was laid around a small garrison building on the plain where the Joşanica River flows into the Raşka River, with mosques, inns, baths and shops built on both sides of the water (Aruçi, 2008, p.100). According to the travelers who visited the region, the buildings in Novi Pazar, one of the most populous cities of the Balkans, were made of mudbrick and stone (Figure 9). However, after the Vienna Defeat (1683), the city was burned

and destroyed. The region, which was exposed to plunder and attacks many more times after that, lost its commercial importance with the annexation of Bosnia and Herzegovina by Austria. On the other hand, Novi Pazar was included in the Ottoman European railway project for the commercial revival of the region, which remained under Ottoman rule until 1913 (Premoviç, 2014, p.12).

Starting from the period of Gazi Isa Bey, many monuments have survived in the city. The core of the bazaar is formed by the foundation monuments built on both sides of the Joşanica River west of the Raşka River. The bazaar extends from this point towards the castle and the Altun Alem Mosque. The bedesten within the bazaar is currently used for accommodation and shops.

Figure 9. Shop windows and stalls in Novi Pazar (Premoviç, 2014, p.122)

2.6. Görice (Korçe) Bazaar

Located in the south of Albania, Görice was an early Ottoman city, incorporated into Ottoman rule by Mirahor İlyas Bey in the early 15th century.

The surviving Görice Bazaar developed between the Ilyas Bey Mosque and the inns. The bazaar runs parallel to today's city square. The four surviving inns in the city face the market square of the bazaar (Figure 10). Görice inns, which are larger than other inns in Albania, show traces of the vibrant commercial life of the past (Sulo et al. 2014, p.144). The texture and shops of the bazaar, most of the monumental buildings of which have been demolished, show typical 15th century bazaar characteristics.

Figure 10. Korçe Bazaar and inns (Sulo et al., 2014)

2.7. Saraybosna Bazaar (Başçarşija)

Sarajevo was conquered by Isa Bey, the grandson of Pasha Yiğit Bey, the conqueror of Skopje, in the 1460s. From a small town, it became an important cultural and commercial center of Europe after the Ottoman conquest. The city experienced its main development during Gazi Hüsrev Bey's sanjakbeylik in Bosnia (1521-1541) (Šabanović, 1959). The Başçarşija also developed around the Gazi Husrev Bey Complex (Mujezinoviç, 1985). In this period, many craftsmen from Bursa, Skopje and even Tabriz were settled in these regions through the akhilik organization in order to revive trade and create the social fabric in the newly conquered regions or existing cities. The "inverted T-plan" or "zaviyeli" mosques, which are common in this geography, met the temporary accommodation needs of the ahis until they established order in the bazaar. The akhi imam, who was assigned to this type of mosque, directed and managed the akhis who came to the city, and the imam performed the worship services in the mosque.

Sarajevo, just like Skopje, was captured by the Austrian Army for a short period of time after the Defeat of Vienna and the city suffered great

destruction (Figure 11). However, thanks to its rich foundations, Sarajevo was able to recover in a more vibrant way in a short time and was called Başçarşı, meaning the crown of the bazaars (Bejtić, 1952, p. 232).

Figure 11. Ali Paşa Mosque and Bedesten (Alić et al., 1999, p.12)

Bosnia-Herzegovina was annexed by the Austro-Hungarian Empire in 1908. In 1914, it would go down in history as the place where World War I would be ignited. From that date until 1995, the city turned into a site of genocide, the intensity and method of which continued to increase. On July 20, 1945, the Sarajevo City Council decided to demolish the shops of the Old Bazaar and within three days, a part of the core of the bazaar was demolished. Subsequently, the demolition was halted by a general decision taken by the Belgrade Assembly and it was decided to preserve the monuments. Thanks to this decision, the bedesten, madrasah and inn of Gazi Husrev Bey Complex were saved from demolition (Alić et al. 1999, p.9).

Sarajevo, which in many ways shares the same fortunes as Skopje, was planned as a modern city in the 1970s, immediately following Skopje. The Başçarşija, like the bazaar in Skopje, was built on the riverside and covered an area of 14 hectares, half the size of today's Skopje bazaar. The urban fabric of Başçarşı is shaped by the intersection of many narrow streets filled with craft workshops, shops and warehouses, as well as some monumental foundation monuments with specific public functions (Kudumovic, 2020, p.529).

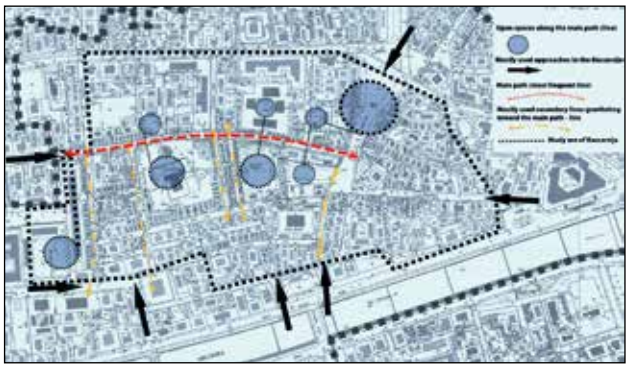

Figure 12. Most frequent path of Bascarsija (Kudumovic, 2020, p.533)

While Başçarşı represents the position of an important trade, culture and art center of the Balkan geography for 600 years, it also reflects this rich cultural environment from the past today. Within the authentic texture of Başçarşı, it continues to be a meeting place for people from all walks of life in the city with the daily habits of traditional life (Figure 12).

2.8. Manastır (Bitola) Bazaar

The city of Manastir (Bitola) was founded around the Drahor stream at the slopes of Mount Pelister in N. Macedonia. Although most of the surviving monuments in the city were built in the 16th century, it has come to the fore as an important center in Ottoman political history, especially since the second half of the 19th century. According to the 1875 salnames, 45 of the 119 mosques in the sanjak were located in the Central Sanjak of Manastir. This number was 22 in the Sanjak of Prizren, 8 in the Sanjak of Debre, 30 in the Sanjak of Skopje and 44 in the Sanjak of Iskodra (Sarı, 1996, p.102). Even after the wars and World War I, according to the census conducted in 1919, approximately 16,000 of the city's population of 40,461 people were Turks. Consulates of many states were opened in the multinational city. From 1919 to 1921, the Turkish population in the city decreased dramatically and the city's population dropped to 28,000 (Prifti, 2003, p.562).

As the headquarters of the Ottoman III Army after the Russo-Turkish War of '93, Manastir be-

came one of the fastest modernizing inland cities. The city, which developed faster than other cities in the Ottoman hinterland with the effect of the railroad connected to Thessaloniki, closely reflected the architectural development of the last period of the Ottoman Empire (Figure 13). During the last period of the Ottoman rule in the Balkans, two types of urban development are noteworthy. One is the modern construction of that period, led by Thessaloniki, and the other is the traditional construction seen in Skopje and other cities in the inner region and less populated cities (Stilinovic et al., 2013, p.927)

Figure 13. Monastery, city plan (Stilinovic et al., 2013).

Shaped in the late 19th century, the Bazaar of Monastir was shaped by the rows of shops lined up around a wide and long road starting from the Drahor River, passing through the Military Idadi and extending to the train station (İbrahimgil, 1999, p.111) The formation of the Turkish bazaar transformed from "Long Street" to "Wide Street". The shops lined up on the Wide Street are brick masonry buildings with a much larger area than the traditional shops. In this type of building, which has very few similar examples in Skopje, volta flooring was used especially for large openings in the upper cover. The traditional bazaar developed around the Davut Pasha Bedesteni, which formed the core of the old bazaar on the opposite bank of the Drahor Stream. The old bazaar continues along the river to the west and extends to the castle to the east. The surviving monumental Ottoman monuments are also located in this area. The covered bazaar with 900 shops mentioned by Evliya Çelebi has not survived (Çayırlı, 2000, p.27).

2.9. Selânik (Tessaloniki) Bazaar

Although Thessaloniki was first conquered in 1387, the actual settlement took place after 1430. Following the conquest, extensive reconstruction and settlement activities were undertaken, and populations were moved here from many places to make it a commercial center (Delibaşı, 1987, p.89). By the end of the 15th century, it was the city where most of the Andalusian Muslims and Spanish Jews who refugeed to the Ottoman Empire were settled (Sambanopoulou,2008, p.217). In 1910, with a population of 150,000, it was the most populous city in the empire after Istanbul (Keil, 2009, p.352).

Figure 14. Thessaloniki's evolving urban fabric in history

In 1867, the city's sea walls were demolished and the coastline was reorganized. In return, the city walls were strengthened. During this period, many new public buildings, military buildings, hospitals, schools, hotels, theaters and large commercial buildings were built in the rapidly industrializing city (Aktsaoglou, 1991, p.36). Steel was used as a structural material in these new buildings, and although many different architectural styles were seen on the facades, Eclecticism and Art Nouveau style were generally adopted (Traskosopolou, 2008, p.220) During the reign of Sultan Abdülhamid II, new residential areas were planned opposite the Vardar Gate and Kelemer Gate, the main gates of the castle (Patieridis, 2009, p.16).

Since its foundation in antiquity, Thessaloniki has developed on nine axes. Three of these are Vardar Street, Mithat Pasha Street and Military Rüştiye Street, which run parallel to the coast from the center of the castle, and Eski Tophane Street and Gümrük Street, which run along the coast (Figure 14). These horizontal avenues intersect with four roads, two of which are outside the city walls and two of which run perpendicular to the coast. Most of the city's important buildings are on these nine roads. In the city, where a few mosques, baths and late mansions are still standing today, the bedesten was built at the intersection of Vardar Street and Sabri Paşa Street. Vardar Street is a long straight street with a multi-part road layout on the south side. While the organic texture has been preserved in the old upper city area of the city, the old lower city area has the appearance of a planned city.

3. Evaluation

The Ottoman Empire, which spent all its energy on conquering the West with a religious fervor since its foundation and throughout its existence, created a political and social structure in the cities as envisioned by Islam at the peak of its power. One of the most important characteristics of Islam is that it transforms the people and societies it reaches, creating new and decisive commonalities among them that did not exist before. The Ottoman Empire was faithful to this understanding and designed the bazaars, the space where everyone's needs were met, as an area of social encounter on the largest scale. The final point of this form of construction, whose characteristic features became evident during the reign of Sultan Mehmet the Conqueror, can be considered as the Grand Bazaar. It is known from various historical documents that in bazaars with a shopping frequency above a certain level, the main bazaar axis was transformed into a closed street over time. These 15th century Ottoman bazaars, or Traditional Turkish Bazaars, reflect not only local and architectural richness with their monumental structures and traditional bazaar texture, but also social diversity and colorfulness that encourages the coexistence of different cultures. In this respect, bazaars are a cultural meeting ground for different tradesmen and users even at the individual level. In addition to this, the historical past rooted in the Ahlism in the bazaars has influenced everyone who trades here, creating common behaviors and lifestyles among people.

The traditional bazaar type in Ottoman cities was gradually abandoned with the municipal law of 1856, and Western-type bazaars began to form along the same axis. This can be observed especially intensely in port cities and cities with railroad connections. This type of construction, which enabled industrial production, negatively affected foundation institutions and craftsman guilds. However, since this negative impact took place over a long period of time, craftsmen could be protected from the spreading capitalism and foreign economic exploitation. The image of the 15th century Ottoman bazaars, with their red hipped roofs, domes, minarets, small and densely built silhouette, carries a sentimental meaning of the past. Yahya Kemal expressed this in his poems as "architecture that blends into the life of the nation".

4. Conclusion

For the Ottoman Empire, Skopje was the most important center point of urban reconstruction and human regeneration in the Balkans. The architectural formation seen in the Skopje Bazaar can be observed in other Rumelia cities, albeit at different scales. Since the halal earnings of individuals in the Ahi culture were based on direct labor, the size of the shops was also based on individuality. This means that the bazaar, among the foundation works, should be interpreted as a form of construction in which a large number of independent craftsmen engaged in their own crafts independently.

These city bazaars, which gained a unique identity in the cultural environment of the Mehmet II period, were established near the castle or, if it was a large castle, within the castle, between neighborhoods, on a connecting road that formed a trade axis in the city center. The bazaar developed as an axis on the caravan route. From the second half of the 15th century onwards, Istanbul developed as the center of the most powerful state in the world with a population exceeding half a million. The Istanbul Grand Bazaar, the most prominent commercial space in this environment, represents the most refined form of other city bazaars in the Ot-

toman geography. Among the common characteristics of these bazaars is that they were formed in such a way that a certain branch of tradesmen could coexist, and that they were ordered according to a certain size among the foundation works. Commercial activity was not allowed within the residential area.

Today, all of these bazaars are under threat, albeit for different reasons. Especially old city centers in the Balkans are direct targets of identity conflicts. While most disasters in the built environment can be repaired, in cities caught in the middle of identity conflicts, genocide, deportation, burning and destruction of sacred symbols, in essence, attacks on identities have begun to build a new identity by destroying an identity and cultural heritage. On the other hand, uncontrolled growth and tourism pressure threaten these bazaars, which have social and physical authenticity, from a different direction. In the processes of reconstruction of the bazaars, the social fabric is often neglected and the traditional construction turns into a décor. As a result, bazaars, which have very deep social and architectural roots, are affected by emotional accumulations according to periods, turn into a showcase of history and fail to reflect their values.

In order to preserve the cultural continuity of these bazaars, which are the product of a unique cultural environment, and to pass them on to future generations, public awareness should not be based on enmity or gain, but on the bazaar culture where even individual differences show solidarity. In addition, in order to preserve the traditional shop unit that glorifies individuality, very sensitive conservation plans should be prepared and design guidelines should be created for simple repairs.

Endonotes

[1] COA, TFR 1 A File No: 39/1; Rumî 4 August 1324 / Gregorian 17 August 1908

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Overview of the 70's construction systems applied in the residential settlement "Aerodrom" - Skopje

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Abstract

The intensive housing construction in the Republic of North Macedonia, which began in the 1960s, especially after the catastrophic earthquake in Skopje in 1963, was based primarily on the huge development of the construction operation, whose power and opportunities could not be expressed only in Macedonia, but with great success was carried out with the largest construction operations in the former: SFR Yugoslavia, Czechoslovakia, USSR; as well as in Germany, the Arab countries: Algeria, Iran, Iraq, Egypt and others.

According to the approved new urban plan of the city of Skopje, the most intensive building construction in Macedonia started in the seventies. New residential settlements emerged (Karpoš, Železara, Kisela Voda, etc.), which on a large scale began to give the physiognomy of the city. Also, the construction of the central city area with social, administrative and residential buildings started even more intensively (according to the project of the Japanese architect Kenzo Tange), designated as "city wall" and "city gates".

The growth and expansion of the city on a daily basis pressured the management structures, among others smaller ones, to start building the largest residential complex "Aerodrom". The buildings were built with inflexible technologies (with large surface and tunnel plates), where the possibility of changing the organization of the apartments is excluded, which was not the case with the buildings built with classical skeletal systems.

This paper aims to give an overview of the applied construction systems and technologies of construction and the correlation between the structure and the construction of the apartment and the structure of the family in the residential buildings from the settlement "Aerodrom" in Skopje, built in 1977.

Key words: *construction systems, technologies of construction, residential settlement, "Aerodrom" – Skopje*.

1. Introduction

The task of this research is to make a brief analysis of the basic urban plan towards the main project for the settlement "Aerodrom" in Skopje and analysis of the existing (built) condition, and the purpose of the research is to obtain knowledge about the characteristics of certain types of construction systems applied in residential buildings, as well as the characteristics of the technological systems of realization.

Each of the systems applied in the settlement is analysed separately:

- the system "REMO" of large surface plates with chairs,
- the "REMO" system of tunnel plates and
- the frame system, to complete this research by comparing all the previously mentioned systems in terms of construction dynamics.

Several scientific research methods have been used to design this study according to the nature of the problem and the field of research: analysis, own field research, comparison, synthesis of the results. The research was performed with the help of data obtained from the operational plans for the implementation of the neighbourhood units and the technical documentation for them.

After the synthesis and comparative analysis of the data collected and the results of the analyses, the basic principles and conclusions were announced at the end of the paper, as a good basis for possible future similar research.

2. Analysis of the basic urban plan for the settlement "Aerodrom"

The "Aerodrom" settlement is a mass housing neighbourhood situated in the eastern part of Skopje. The first residential units on the territory date back to the post-war period, representing a logical extension of the city towards east. However, what today could be recognised as the most distinguishable built structure within "Aerodrom" was constructed during the late 1970s and 1980s in order to meet the housing needs and much of the predicted/expected growth and development of the city after the earthquake in 1963 (Bulletins on the condition of the housing construction, regarding the realization of the medium-term program and the program for 1978 and 1979).

The catastrophic earthquake of 1963 in Skopje was a turning point in the history of the city. Between 1000-1100 inhabitants died, 70% of the housing area was destroyed and 150.000 inhabitants or three quarter of the population of the city were left homeless. There was a need for a quick response to find ways and forms to meet the housing needs for a large number of people (Bakalchev at al., 2021, p. 215).

At the same time, it presented an opportunity to raise the standard of living. With the growing number of residents and the policy of an 'open city', the demographic analysis predicted 154.000 new inhabitants whose housing needs were to be met by the early 1980s. The new "Aerodrom" mass housing neighbourhood, was supposed to meet more than half of the projected needs (Milovanović at al., 2022).

The Basic Urban Plan of Skopje from 1965 is made under the auspices of The United Nations, where a special trust fund is formed and the whole operation is about humanity and solidarity from countries from all over the world, and due to this unfortunate circumstances, it brought worlds' attention to Skopje and it is known as "the most famous urban plan of Skopje" (Lazarevska, M. and Markovski, B., 2019, p.64).

The Basic Urban Plan for the residential area "Aerodrom" - Skopje, was the basis for step-by-step preparation of detailed urban plans and implementation, as an integral part of the general conception of the city. The preparation of this important urban plan for the citizens of Skopje was entrusted to the Institute of Urbanism and Architecture - Skopje, which was the executor of the basic plan of the city. The Institute for Urbanism and Architecture - Skopje, as the holder of the task, in its execution cooperated with the Yugoslav Institute for Urbanism and Housing from Belgrade, which was the winner of the award of the competition for the settlement "Aerodrom" – Skopje (Basic urban plan "Aerodrom" – Skopje, 1976). The Consultative Board and other participants such as local communities, the Association of Architects, interested communities, who through suggestions and consultations contributed to its successful completion, had a great contribution in the process of preparing and following this important and complex task (Review of conceptual-architectural projects of the residential area "Aerodrom" – urban units A1 and A2, 1977, p. 12).

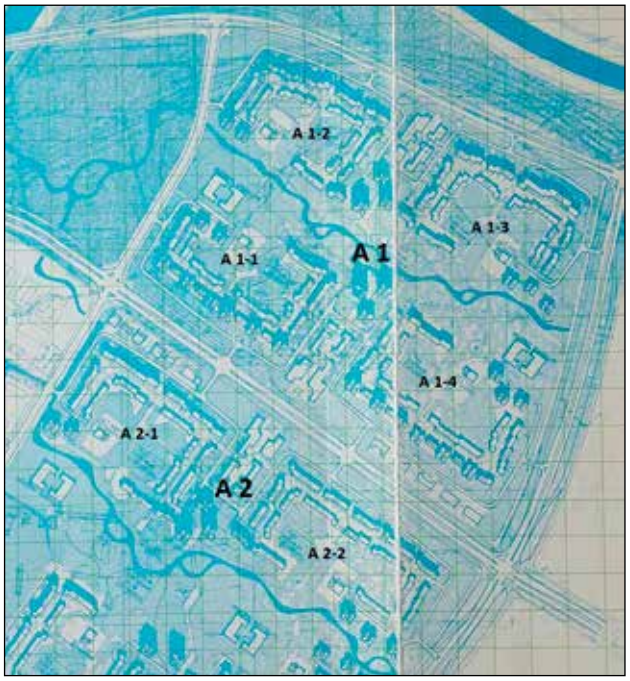

Figure 1. The urban plan for the residential area "Aerodrom" – Skopje (Detailed urban plan of urban units A1 and A2, 1975).

The specific situation and the demands from the investor to approach immediately the construction of two local communities, required inverse planning work: determining the basic elements for the urban system for the settlement, elaboration of two local communities, and then defining the spatial organization of the remaining part of

the settlement, including the regional center: commercial, business, sports, entertainment and other content (AS + 2000, 1974, p. 12).

The definition of the basic elements of the system included: housing, green and water areas, traffic and central contents.

The first stage for the realization of the area "Aerodrom" were the local communities A1 and A2 which in the west reach the existing built part of the city, and in the east extend to the boulevard "Serbia" and occupy a net area of 105ha (Figure 1).

- Concept of spatial organization

The organization of housing is based on a hierarchical division of urban units, resulting from a fairly solid urban typification, as follows:

– area-settlement for about 100.000 inhabitants
– local community for about 12-14.000 inhabitants
– residential community (urban unit) for 6-7.000 inhabitants
– residential group (neighborhood unit) for about 3.500 inhabitants (Review of conceptual-architectural projects of the residential area "Aerodrom" – urban units A1 and A2, 1977, pp. 1-6).

Green and water areas have a separate function in environmental terms, to reduce the harmful effects of very large pollutants, industry located north and south of the settlement (iron industry, chemical and cement industry), as well as to improve the micro-climate (increasing the degree of humidity, better regulation of outside temperatures in the settlement, etc).

In that sense the system of greenery is concentrated, dominated by wide green belts that extend continuously, along the residential tracts in the settlement. The main green belts are broken down into double combs and penetrate deep into the housing clusters, providing a closer connection between the apartment and the greenery.

The traffic, in importance, is spatially organized in such a way as to form approximately equal squares in which the local communities are organized as basic planning units.

Along the longitudinal boulevards "Jane Sandanski" and "ASNOM", arterial city traffic takes place, and in the transverse streets of lower order, the flows are divided and collected.

The internal traffic in the local communities is organized in such a way that the space is maximally reduced, and it is functionally maintained along the perimeter, touching the housing that is organized semi-atrium along the pedestrian streets, in the form of a horseshoe.

The central contents are organized longitudinally in the space, placed transversely in the direction in which the settlement extends, interrupted by green belts and to some extent decentralized in the hierarchy of urban units (schools are situated in residential communities, and children's institutions and playgrounds, as well as the supply points - in the residential group-neighborhood).

The regional center is also decentralized.

The main part (commercial, business, cultural, administrative, educational, catering and other contents) is situated somewhat eccentrically in relation to the center of the settlement, drawn in the direction of the city center along the boulevard "Jane Sandanski", on both sides organized with a center of gravity drawn in the direction of the existing settlement Lisiče.

- Local community

Each local community can accommodate about 13.500 residents in approximately 3.800 apartments of different sizes, organization and features that best suit the structure and desires of the households living in them.

The local community is conceived as a basic planning unit that integrates the socio-political concept and the urban-spatial concept for housing organization, understood as a complex urban function, which in addition to housing (in a narrower sense), includes a number of daily and occasional functions important for life and the work of the inhabitants. It is also unified in the spatial-physical sense, which enables efficient and rational housing and communal construction.

The local community provides rich urban equipment and a very studied spatial organization of the accompanying elements of housing, such as: trade, catering, crafts, primary schools, kindergartens, elements of health care, culture, sports, recreation and greenery. Many of these facilities are located in the center of the local community.

The local community of 13.500 inhabitants is a suitable size for the organization of socio-political life, for organizing large and well-equipped supermarkets, for elements of culture and health care, but for the organization of high schools, health center, recreation center, etc. it is still small, therefore, these elements are organized at the level of the city area "Aerodrom" within its center.

At the same time, for the elementary units of the education system - primary schools and child care facilities, the local community is too large, so each of the two local communities is divided into four neighborhood units.

- Residential community (urban unit)

The residential community has about 6.750 inhabitants with about 1.900 apartments.

It is an important urban housing unit of lower order, in which, in addition to housing, other daily needs are met, primarily education and recreation.

The importance of this unit is shown in the urban-spatial and techno-economic sense, because the unification and typification of the urban elements enables more efficient organization of housing under equal conditions and efficient housing construction.

In a social sense, it is important as an urban unit in which socialization is realized on a larger scale, such as the residential group (neighborhood unit).

- Residential group (neighborhood unit)

The neighborhood unit is an element of the local and residential community of about 3.400 inhabitants with about 850 apartments.

This unit is the smallest urban unit in which, in addition to housing, the most basic additional functions are met: babysitting, recreation for the youngest, first-class supply and services (kiosks, buffets, hairdressers, etc.). This urban unit is primarily important from a sociological point of view, because it carries out the first process of socialization of the inhabitants, through meetings and social contacts.

The housing function is dominant here and all the elements most directly related to housing are in it.

In terms of construction and height, there are three types of buildings:

– low-rise buildings (up to 4 floors) without elevator,
– medium-high buildings (up to 8 floors) with elevator,
– high-rise buildings (over 12 floors) with two or more elevators.

Each of these types is suitable for different constructions and construction methods, but also for different households (depending on which floor the apartment is located on).

High-rise buildings are primarily suitable for singles and employed married couples without children, so they are dominated by that type of housing.

Low-rise buildings are suitable for multi-child households that can climb stairs on their own.

3. Construction systems and technologies of construction in the settlement "Aerodrom" – Skopje

In the preparation for performing this largest construction venture in the field of housing construction in Skopje, the Self-Governing Interesting Community for housing approached with great responsibility, changing the existing principles of operation.

Unlike the previous agreements in the realization of individual residential buildings, the construction of the first part of this complex was agreed on the principle of "engineering" with the largest construction organizations in the city: "Beton", "Pelagonija", "Mavrovo", "Ilinden", "Granit", "Tehnika" and "Ratko Mitrović".

After the preparation of the organizational works, as well as the preparation of the entire technical documentation, on November 13, 1977 (the Day of the Liberation of the City of Skopje), began the construction of the largest residential complex in Macedonia. The settlement "Aerodrom" was one of the three most intensive residential construction sites in the former SFR Yugoslavia, where the entire Macedonian construction operation was occupied, which included about fifty other industries from Macedonia and the former SFR Yugoslavia (cement, steel, metal, plastic, wood, stone, plaster, etc.).

All the previously mentioned construction organizations, within the adopted technical documentation, were left with full freedom in the design, as well as in the application of the latest achievements in construction technologies, according to the specifics and possibilities of their construction operations (Filipovski, 1986, p.7).

As a consequence, three constructive systems are applied:

– System of monolithic reinforced concrete diaphragms - walls in two orthogonal directions, with mezzanine construction - flat reinforced concrete monolithic slab. The main feature of this constructive system is that there are no beams, except in parts of the diaphragms – above the windows and above the doors.
– System of load-bearing reinforced concrete walls and frames in transverse and longitudinal direction. The mezzanine structures are flat reinforced concrete slabs.
– System of reinforced concrete frames in both orthogonal directions.

The system of reinforced concrete walls and slabs is applied in the neighborhood units A 1-1, A 1-3 and A 1-4. The combined system of reinforced concrete diaphragms and frames is applied in the neighborhood unit A 1-2.

The reinforced concrete frame system is applied in the neighborhood units A 2-1 and A 2-2.

For the used structural systems, a dynamic analysis of the construction for defined seismic impacts at the locality "Aerodrom" was made and based on the seismic stability criteria, the equivalent seismic forces were defined. Spatial three-dimensional static and dynamic analysis of buildings was conducted.

In order to define the seismic impacts of the objects, a dynamic analysis for the action of a real earthquake was performed, where the mathematical model of the construction is presented with concentrated masses.

The nonlinear response of the structure is obtained in both directions with the following parameters: relative displacement, relative velocity, absolute accelerations, ductility factors and plastic excursions for each floor of the building, and it is concluded that the results are within the allowable values for reinforced concrete constructions.

Each of these construction systems provides a choice of different construction technologies.

Individually, the following construction technologies were applied by the previously mentioned construction organizations:

– "Beton" - tunnel plates
– "Pelagonija" - tunnel plates
– "Mavrovo" - combined construction system ("omnia" mezzanine structures and frames)
– "Ilinden" - large surface plates "REMO"
– "Granit" - large surface plates "REMO"
– "Tehnika" - classical construction - skeletal system (Dimkov, 1997, p. 4).

According to the selected construction technologies that are solved with the most commonly used building material - reinforced concrete, the problem of thermal and sound protection is solved differently by applying in most cases of "sandwich" constructions (hollow light-concrete and clay blocks, siporex blocks, colored reinforced concrete, facade fugue brick, in combination with thermal insulation plasters, gypsum boards, ie by fitting "demit" facades).

In all these "sandwich" constructions the coefficient of thermal conductivity ranged from the unfavorable K=1.57, to the favorable K=0.67; 0.78; 0.81 or 0.88, which is less than the allowed K=0.93W/m2K for the second climate zone.

• Analysis of applied construction technologies

Cast concrete technology is based on four basic components:

– transport of concrete,
– armature,
– cranes,
– mobile portable plates.

The industrialization of all these components enables high productivity in the production of rough construction works. For these reasons, most of the construction companies in the settlement "Aerodrom" decided to apply the construction technology with "REMO" plates.

With the large surface plates "REMO" the three principles for application of this plate can be realized, with certain additional elements.

The first principle is that with standard and non-standard vertical panels, large surface plates are formed, with the help of which reinforced concrete walls with different shapes and dimensions are made.

The second principle allows horizontal panels with sloping supports and stabilizers to be added to standard and non-standard panels. In this way, semi-shells are formed, which are a basic element of the tunnel spatial plates.

The third principle allows the standard and non-standard panels to be used as a cladding that carries prefabricated reinforced concrete mezzanine slabs and at the same time allows concreting of the walls.

1. System of large surface plates with chairs

Two construction companies opted for this way of construction:

– "Granit" which realized the neighborhood unit A 1-1 with 18 buildings and
– "Ilinden" which realized the neighborhood unit A 1-2 with 19 buildings.

Due to the economy of the construction, ie, depending on the amount of available quantity of the plate, the construction of one floor was realized in parts.

The construction of these plates enabled easy formation of all dimensions and shapes that the designer foresaw in the adopted plan for realization.

Once formed, the plate is used for the construction of the entire building, and with some additions it can be used for other buildings as well.

The contact surface with the concrete can be a wooden pressed plate (applied to the buildings realized by the company "Ilinden") or a steel plate (applied to the buildings realized by the company "Granite").

Wooden boards can be 3-15mm thick, and are most often used with a thickness of 8mm.

The dimensions of the standard elements are adapted to the modular system for residential construction.

The basic elements of the "REMO" system are vertical panels that are made in three standard heights: 2.5m, 2.6m and 2.75m.

The standard elements are made in lengths of 2.5m, 1.25m and 0.625m.

The mutual longitudinal extension of the panels and their bringing to the same level is provided by the joints.

The fine leveling of the panels by height is enabled by the built-in spindles in the threshold of the panel.

The panels with a length of 2.5m and 1.25m have two girders built into the threshold in which wheels can be mounted if needed.

Each panel has a built-in stabilizer, and if necessary, a working platform.

Front closures are used to limit the length of the wall.

The panels are connected to each other with anchor joints, and the distance between the panels is fixed with conical steel bushings.

The plate is placed next to the wall beginning which is 10-12cm high, and is performed together with the slab, or additionally.

The weight of the plate together with the stabilizer and the working platform is 75 kg/m^2 (Plates REMO - 275, manual, 1973).

After the construction of the vertical reinforced concrete walls, movable chairs are mounted for the construction of the horizontal slabs. The "chair" consists of a steel structure, longitudinal beams through which a wooden ("Ilinden") or steel cladding ("Granite") is placed.

During the construction of buildings constructed by the company "Ilinden", individual plate positions were made classically, which is a consequence of the adopted combined construction system and it affected the dynamics of construction.

For construction of 1m^2 of the building floor plan with such plate it took 8.05h/m^2, or for construction of one floor height with a gross area of 370m^2 with 30 workers it took 15 days (Table 1).

Table 1. Construction dynamics of the neighborhood unit A 1-2 performed by the company "Ilinden" (Operational plans of the contractors of the neighborhood units in the settlement "Aerodrom" – Skopje, 1978-1979).

work operation	walls	slabs	whole floor 370 m2	h/m2	labor					used mechanization
	required hours	required hours	required hours		highly skilled	skilled	low-skilled	electrician	reinforcement	
- montage - reinforcement - electricity	24	40	64	4,86	7	10	4	3	6	- crane - mixer - reloading basket - vibrator - ordinary basket
concreting	12	12	24	1,40						
dismantling	12	20	32	1,79						
TOTAL HOURS	48	72	120	8,05						

The company "Granit" achieved a performance dynmics of 6.28 h/m^2 floor plan, or for construction of one floor height with a gross area of 400m^2 with 40 workers it took 9 days (Table 2). The measurements attached to the attestation for this plate envisage a production time, with good organization and rigorous planning, of 7.17 h/m^2 floor plan.

Table 2. Construction dynamics of the neighborhood unit A 1-1 performed by the company "Granit" (Operational plans of the contractors of the neighborhood units in the settlement "Aerodrom" – Skopje, 1978-1979).

position		ways of working	hours spent	workers	h/m	labor structure			mechanization used		h/m2 gross
						highly skilled	skilled	Σ	type	number	
walls	reinforcement	REMO large surface plates and mesh reinforcement	8	4	0,33	5	8	13	- crane - pervibrator - reloading basket - pump	1 1-2 1 1	1,08
	montage		8	3	0,25						
	concreting		8	2,5	0,21						
	dismantling		8	2,5	0,21						
	electricity		8	1	0,08						
elevator		REMO plates	8	2	0,16		3	3			0,16
stairs		prefabricated	8	1	0,08						0,08
slabs	montage	the plate is with chairs, and the reinforcement is with mesh	8	8	0,67	5	19	24			
	reinforcement		8	4	0,33						
	concreting		8	4	0,33						
	dismantling		8	8	0,67						
			8	40	3,32	10	30	40			3,32
			8		2,96						
					6,28						

2. Tunnel plates system

The neighborhood units A 1-3 ("Beton") and A 1-4 ("Pelagonija") for the construction of the structural system which is spatial, used special equipment - spatial tunnel plates.

Standard elements of the tunnel plates are half-shells composed of vertical and horizontal panels joined at right angles. The length of the shells fits into the modular raster, the height approximately corresponds to the light height of the space between two mezzanine slabs, and the width approximately halfway between the load-bearing transverse walls.

The construction of all panels is entirely steel, ie on steel sheet with a thickness of 3mm (base surface in contact with concrete), serially welded "omega" profiles for hardening of surfaces.

Spatial rigidity is achieved with sloping tube supports, on the connections of which, on a vertical or horizontal panel, there are spindles that enable regulation of both panels, formation of a right angle and montage, ie. dismantling of the plates. All vertical panels at the base are equipped with saws and wheels that allow easier dismantling and transfer of the plate. The interconnection of the semi-schools is done with special closures that do not allow the cement milk to flow out of the plate.

Supporting elements of the plate are working and auxiliary platforms that solve the basic issue of the manner and direction of dismantling the tunnel plate, and also provide protection at work. The system of their fastening does not include any anchors in the concrete structure, but only a pin between two mezzanine slabs.

The thickness of the wall is achieved with the help of plate connections, ie. with hard "juvidur" pipes or steel bushings.

Temporary steel frames for forming openings in the walls and mezzanine slabs, with their construction enable adjustment of the dimensions in height and width and simple installation and dismantling without damaging the concrete edges.

By combining two essentially different procedures - concreting the walls and concreting the mezzanine slabs, the otherwise necessary delays are eliminated, which enables continuous work. With the help of this plate, precision in the performance is achieved, flat and smooth surfaces.

Flexibility, ie. possibility to change the spans is provided by supplementing the mezzanine panels on the tunnel plate.

To center the walls and squares vertically, concrete wall guides are used to support the wall plate on the next floor at a certain height, and are usually performed with a special plates at the same time as concreting the bottom slab.

The highest weight of the standard elements of the plate is 60-70 kg/m^2, ie it is lighter than the wooden plate.

With proper handling and maintenance of the plate: cleaning of concrete, smearing with appropriate coatings, use of cast concrete with minimum vibration; it can be used 500-800 times. The economy will come to the fore if the dismantling of the plate is done in the shortest possible time.

To accelerate the increase in strength of concrete, it is heated. The required amount of calories, ie. heat, is realized by heating the air in the closed spaces of the tunnel, on the basis of infra-red rays from a gas tank with various radiators. In the process of heating the concrete, protection is provided from the upper side of the slab with polyethylene foil. The construction company "Beton" with this system of spatial plate performed one floor with an area of about 332m^2 with 28 workers in 4-5 days, or about 2.31hours/m^2 floor plan (Table 3).

Table 3. Construction dynamics of the neighborhood unit A 1-3 performed by the company "Beton" (Operational plans of the contractors of the neighborhood units in the settlement "Aerodrom" – Skopje, 1978-1979).

work operation	I part 187,57 m2	II part 144,38 m2	whole floor 331,95 m2	h/m2	labor					used mechanization
	required hours	required hours	required hours		highly skilled	skilled	low-skilled	electrician	reinforcement	
- montage - reinforcement - electricity	225	75	430	1,30	3	8	5	4	8	- crane - mixer - reloading basket - vibrator - ordinary basket - gas heaters
concreting	64	64	128	0,39						
dismantling	115	95	210	0,62						
TOTAL HOURS	434	234	768	2,31						

The construction company "Pelagonija" realized one floor with an area of about 312m^2 with 29 workers in 5 days, or about 2.49 hours/m^2 floor plan (Table 4).

Table 4. Construction dynamics of the neighborhood unit A 1-4 performed by the company "Pelagonija" (Operational plans of the contractors of the neighborhood units in the settlement "Aerodrom" – Skopje, 1978-1979).

work operation	I part 177,61 m2	II part 135,06 m2	whole floor 312,67 m2	h/m2	labor					used mechanization
	required hours	required hours	required hours		highly skilled	skilled	low-skilled	electrician	reinforcement	
- montage - reinforcement - electricity	250	170	420	1,34	6	6	3	4	10	- crane - mixer - reloading basket - vibrator - ordinary basket - gas heaters
concreting	64	64	128	0,41						
dismantling	120	120	240	0,74						
TOTAL HOURS	434	354	788	2,49						

With measurements made on a building in New Paris, with this plate, one floor with an area of about 370m^2 with 12 workers was performed in 4 days, or for about 1.17 hours/m^2 floor plan.

The difference in the construction dynamics between the companies "Pelagonija" and "Beton" is due to the technological variant in performing the works with tunnel plates (the company "Beton" took out the tunnels from two sides, and the company "Pelagonija" from three sides).

3. Construction in a classic way with skeletal system

The system of reinforced concrete frames in both orthogonal directions is present on the buildings in the neighborhood unit A 2-1 (construction company "Mavrovo") and in the neighborhood unit A 2-2 (construction company "Tehnika").

In the company "Tehnika", the frames are performed classically, with cladding and pouring of concrete on the construction site. In the company "Mavrovo", the frames are performed classically, and the connecting beams are semi-prefabricated. Up to a certain height (above the neutral axis) they are pre-cast, and after mounting the cross-section is completed. The mezzanine constructions in some of the buildings constructed by the company "Tehnika" are flat slabs cast on the construction site, and in another part are "omnia" slabs, which are partially present in the buildings constructed by the company "Mavrovo".

"Omnia" slabs

The construction of the mezzanine structure with "omnia" slabs consists of pre-cast prefabricated slabs with a thickness of 4cm and with installed one-way bearing reinforcement, which consists of mesh reinforcement obtained by static calculation, and of triangular reinforcement bars used for connection of both layers of the concrete slab, for transporting and lifting the slabs and for carrying the lower reinforcement.

The second layer of concrete is poured on the spot over the prefabricated slabs after placing the distribution reinforcement. The prefabricated slabs rely on the ends and the middle, at a distance of maximum 2m and actually serve as a plate for the second layer of concreting.

The construction company "Tehnika", which constructed the buildings in the classical way, performed one floor with an area of about 300m^2 with 14 workers in 16 days, or 1m^2 floor plan in 6,40 hours (Table 5).

Table 5. Construction dynamics of the neighborhood unit A 2-2 performed by the company "Tehnika" (Operational plans of the contractors of the neighborhood units in the settlement "Aerodrom" – Skopje, 1978-1979).

work operation	chairs	beams + slabs	whole floor 300 m2	h/m2	labor	used mechanization
	required hours	required hours	required hours			
- montage	8	24	32	1,6	14	- crane - mixer - reloading basket - vibrator - concrete pump
- reinforcement	16	32	48	2,4		
- concreting	8	16	24	1,2		
- dismantling	8	16	24	1,2		
TOTAL HOURS	40	88	128	6,4	14	

The construction company "Mavrovo" achieved faster construction dynamics, because certain elements were prefabricated, ie one floor with an area of about 420m^2 with 22 workers performed in 12 days, or achieved a coefficient of 5.03 hours/m^2 floor plan.

Comparing the coefficients of the achieved performance dynamics in all six neighborhood units (Table 6), it can be concluded that the highest construction speed of the structures is achieved using the tunnel plates.

Table 6. Comparison of the achieved results in all six neighborhood units (Operational plans of the contractors of the neighborhood units in the settlement "Aerodrom" – Skopje, 1978-1979).

	coefficient of construction dynamics					
neighborhood unit	A 1-1	A 1-2	A 1-3	A 1-4	A 2-1	A 2-2
contractor	"Granit"	"Ilinden"	"Beton"	"Pelagonija"	"Mavrovo"	"Tehnika"
required hours for realization of 1m2 floor plan	6,28	8,05	2,31	2,49	5,03	6,40

4. Overview of the performed types of wall constructions and materials for their construction

Internal partition walls, external facade walls as well as their facade processing, in each neighborhood unit is solved in a special way. The review of separate housing units according to the technical documentation for the received projects and the actual situation is as follows:

1. Neighborhood unit A 1-1 (construction company "Granit", project company "Granit" and "Makedonijaproekt").

– The construction system has reinforced concrete walls (with a thickness of 15cm) in both directions.
– The facade processing of these reinforced concrete walls is covered with: EPS 4cm, plastic mesh and plaster of 1-1.5cm.

On the facade there are walls of Siporex blocks 20cm with a facade painted with synthefas, colorfully solved.

Walls with hollow ceramic blocks 25cm, built in extended mortar, are also used as facade walls.

– The inner partition walls are made of Siporex blocks 10cm, coated with wallpaper or ceramic tiles in the toilets.
– Between two adjacent apartments are walls made of Siporex blocks 20cm coated with wallpaper or are reinforced concrete walls with a thickness of 15cm, coated with plasterboards on both sides.
– The walls towards the stairwell are reinforced concrete with a thickness of 15cm, lined with tervol 3 cm and plasterboards on the side of the apartment.

Project company "Makedonijaproekt":

– The construction system has reinforced concrete walls in both directions.
– The external processing of the reinforced concrete walls is by siporex tiles with dimensions 60cm / H (floor height 280cm) / 10cm, with a facade of plastic mortar Teraplast.

There are also facade walls of Siporex blocks (60/25/175cm or 60/25/20cm) with a facade of plastic mortar Teraplast.

– All internal partition walls are made of Siporex blocks 10cm coated with wallpaper, and in the toilets lined with ceramic tiles along their entire height.
– Between two adjacent apartments, the walls are reinforced concrete with a thickness of 18cm, lined with wallpaper.
– Towards the stairwell, the walls are reinforced concrete with a thickness of 18cm. On the side of the living space they are covered with wallpaper, and towards the stairs they are plastered with Jumper plaster.

2. Neighborhood unit A 1-2 (construction company "Ilinden", project company "Institute of Urbanism and Architecture" and "Ilinden").

– The construction system has reinforced concrete walls in both directions with a thickness of 15cm or 20cm.
– Reinforced concrete facade walls are lined with "sandwich" from the outside. The "sandwich" consists of a 7cm concrete part and 5cm thermal insulation.

Walls of hollow ceramic blocks 25cm, plastered on the outside and lined on the inside with plasterboards, as well as facade brick walls with the same interior treatment, also appear as facade walls.

- The inner partition walls are made of Siporex blocks or gypsum blocks with a thickness of 10cm.
- Between two adjacent apartments, the walls are reinforced concrete, lined with plasterboards on both sides.
- The walls towards the stairwell are reinforced concrete with a thickness of 20cm and lined with plasterboards on the side of the apartment, and towards the stairs plastered with Jumper plaster.

3. Neighborhood unit A 1-3 (construction company "Beton", project company "Beton").

- The construction system has load-bearing reinforced concrete walls in both directions with a thickness of 18cm.
- The exterior walls are reinforced concrete with a thickness of 18cm coated with facade elements on the outside, consisting of Okipor 3cm and concrete slab 6cm. On the longitudinal facade walls, facade "sandwich" elements are placed, consisting of an 8cm concrete wall, a 3cm Okipor and a 6cm external reinforced concrete slab.
- The inner partition walls are made of gypsum blocks 7cm, and the toilets are made of Siporex blocks 10cm.
- Between two adjacent apartments there are reinforced concrete walls with a thickness of 18cm lined with wallpaper on both sides. There are also walls composed of: Siporex blocks 10cm, air gap 10cm and again Siporex blocks 10cm.
- Towards the stairwell, the walls are reinforced concrete lined with wallpaper on the side of the apartment, and painted with coatings for concrete walls on the side of the stairs.

4. Neighborhood unit A 1-4 (construction company "Pelagonija", project company "Pelagonija").

- The construction system has load-bearing reinforced concrete walls with a thickness of 15cm.
- The external reinforced concrete walls from the outside are treated with: EPS 4cm, polymer mortar with glass mesh and painting with acrylic coatings or by spraying.
- All internal partition walls are 10cm thick, made of wooden substructure and plasterboards. Between the boards is placed 4cm glass wool. The same type of walls is applied to the toilets.
- Between two adjacent apartments the walls are reinforced concrete with a thickness of 15cm.
- The walls towards the stairwell are reinforced concrete with a thickness of 15cm, processed towards the stairs in the same way as the facade walls.

5. Neighborhood unit A 2-1 (construction company "Mavrovo", project company "Mavrovo").

- The construction system is mixed, with the application of vertical reinforced concrete walls and load-bearing beams in one direction.
- All facade walls are made of Siporex blocks 25cm. The Kalkan walls are reinforced concrete with a thickness of 16cm, walled on the inside with a brick placed on a ledge. The facade is made of plastic mortar.
- The inner partition walls are made of Siporex blocks 10cm. In the toilets, the walls are made of: hollow ceramic blocks 10cm, air gap 20cm and again hollow ceramic blocks 1 cm.
- The walls between two adjacent apartments are made of Siporex blocks 25cm.
- Towards the stairwell, the walls are reinforced concrete with a thickness of 16 cm, and inside are walled by a brick placed on a ledge.

6. Neighborhood unit A 2-2 (construction company "Tehnika", project company "Makedonijaproekt").

- The structural system is skeletal with frames in both orthogonal directions.
- All external walls are made of hollow ceramic blocks 25cm facade with plastic mortar.
- The inner partition walls are made of hollow ceramic blocks 10cm.
- The walls between two adjacent apartments and towards the stairwell are made of hollow ceramic blocks 25cm.

5. Conclusion

The fact that housing construction is increasingly becoming an economic rather than a technological problem is indisputable.

Investments that directly affect the economic efficiency of the project, are determined by the value of construction, craft and installation works on average around 50 - 60%. Such a high share of investment costs in industrial projects gives recognition to every effort to reduce construction costs.

In housing construction, these values are the dominant financial item in the total investments. On the other hand, the duration of the realization of the construction works affects the final price of the building, so the planning of the undertaking is an integral move important for the overall efficiency of the project realization process.

The participation of engineering disciplines, especially in the field of architecture and construction, in the realization of the investment undertaking during the whole life of the project, has a characteristic of direct impact on the efficiency of the construction process (in the period of design, preparation and realization) and indirectly - in period of exploitation.

The dynamic plan for performing the planned works (and accompanying activities) is the basis for planning the provision of financial resources by time and amount. The tunnel and large surface construction systems, applied in the residential settlement "Aerodrom" - Skopje, represented a high degree of industrial housing construction. However, these systems, although giving a low cost of basic construction work and construction (and thus reducing the cost at the very beginning of construction), by themselves do not provide a flexible functional solution for the apartments in the buildings.

The role of typification of apartments is much more important for enabling industrialization of finishing works, installation and equipment. Industrialization primarily means production and installation of serially standardized elements (such as: Facade walls, mezzanine structures, toilets, stairs, etc.).

Although industrial housing construction will shorten construction deadlines and reduce production costs, this cannot be achieved without mass construction of a large number of apartments on a large site (such as the "Aerodrom" residential area in Skopje).

The basis for the efficiency of a certain construction lies, of course, in its technical solution itself - but with significant influence are the other factors: the quality of production and installation - under constant and efficient control.

However, we should not forget the fact that the efficiency of a certain standardized construction largely depends on its proper application - that is, on the design solutions.

Disadvantages of mass application of typed constructions

The problem of the negative sides of the mass application of industrialized constructions, especially in mass residential construction - can be viewed from two basic points of view: technical-economic and human.

The main danger from the mass application of a certain functional-technical solution, from a technical-economic point of view, is the possibility of multiple repetition of one or more mistakes. The accident is that, not the rare, but the massive repetition of certain mistakes, makes them clearly visible - and then it is either very difficult or even impossible to effectively correct or remove them.

As a result of the great need for housing and for a more rational use of construction land, industrialized construction has been used in the construction of large apartment blocks and single-family homes, which, due to their uniformity and grayness, have a repulsive effect on the people who live in them.

This led to a tendency to identify efficient production methods with a dehumanized residential environment, to which the uneven quality of artisanal finished works contributed to a large extent.

This fact points to the danger of dehumanization in mass housing, realized only after many settlements had already been built - and when the disillusionment and dissatisfaction of many of their residents became apparent.

It is true that poorly executed finishing works affect the poor final result - but the fact is that even the best craftsmen are not able to successfully cancel the bad effects of the work of their "industrialized" predecessors.

On the contrary, many European residential areas are known for their extraordinary architectural solutions obtained by combining different systems and storeys to avoid these negatives. However, it

should be clearly emphasized that the issue of humanity in the construction of new residential settlements is not the only or primarily technical problem - so it cannot be solved on that level alone.

Some possible preventive measures to remove the negative consequences of the mass application of typed constructions

Realizing that the mass construction of housing cannot only aim to satisfy the quantitative and physical-qualitative needs of the inhabitants of the new settlements - and encountering difficulties of an organizational and economic nature, many countries opted for the "open" system that can be defined as mass, specialized and balanced industrial production of all building elements and subsystems whose compatibility is ensured.

The process of industrialization, in addition to increasing the productivity of work, the efficiency of construction and the realization of economy, must also satisfy the requirements for aesthetics and high quality of the human living space.

Realizing the inadequacy of the building procedures at that time - the "open" building system became a "social determination". There is reason to believe that "open" systems of primary structure and with a greater degree of freedom for the secondary structure, and with greater technological connectivity, would be significantly more suitable.

In the evaluation of the apartment and the neighborhood, the users will put their functional values, the general atmosphere in the neighborhood, rather than the architecture of a separate residential building or a larger ensemble, in the first place, even from an aesthetic point of view.

Therefore, architecture as a creative discipline, should be fully in function of social requirements (functional values of buildings, the general atmosphere in the neighborhood) and to allow it to be built rationally and close to the needs and desires of its inhabitants.

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Abstraction as an Approach to the Learning of Basic Design

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Abstract

The basic design lesson is an introductory course that teaches students the fundamental principles of design, including elements such as form, space, scale, proportion, and composition. It is also an introduction to both concrete thinking and abstract one, which is rather about ideas and general thought. Abstraction is one of the steps applied for design learning processes because it may improve students' capacity for creative thinking. In practice, architects may use abstraction to simplify complex design problems and create clear, concise solutions.

Basic Design Studio at Faculty of Architecture, Fatih Sultan Mehmet Vakif University (FSMVU), has dealt with the task of abstraction, while each generation's initial phase changed. This paper aims to define basic steps that guided students in FSMVU to apply abstraction in developing their final design, starting from objects from nature to geometrically defined shapes.

Keywords: *Abstraction, basic design, design studio, education, architecture*

1. Introduction

The design process leads to a creative solution broadly applied in different disciplines. Thus, it varies from process design to solution design. However, teaching the design process is essential in producing physical and spatial elements, particularly architecture. The attitudes toward the learning process also vary in different schools and among various scholars. Although the methods vary, basic design covers fundamental design principles, such as line, form, space, proportion, scale, color, texture, and composition. Most basic design lessons' syllabus comprises tasks that teach students to analyze and evaluate designs based on fundamental principles. Thus, introductory design courses often involve hands-on projects that require students to develop technical skills such as drafting, model making, abstracting, sketching, and presenting. In this way, different tasks may develop skills essential for evaluating design problems and developing practical solutions. These various tasks encourage students to think creatively and experiment with design concepts to create unique design styles and approaches.

Abstraction is a process widely applied and used in architectural practice that provides profound comprehension of details. This abstraction process helps to complex realms purifications to fewer details and arrangements into geometrically defined forms. Further on, developing abstraction thinking will allow them to deal with ideas to comprehend relationships among elements as a part of mental process in contrary to concrete thinking which is focused on defined facts objects within certain context.

In the practice the concept for the architectural design results from inputs taken from inspiration from understanding the particular environment and its features such as socio-cultural features, surrounding, users, geopolitical circumstances, level of cultural development, cultural status, understanding of beauty, etc. Nevertheless, different inputs would lead to the different final production while passing the process of understanding, extracting, purifying and defining final design.

This article explores the significance of Basic Design education in the context of design methodology, specifically the application of abstraction. A detailed examination of student work will demonstrate how abstraction can be used as an effective design tool to create regular and organized forms. In the end it will be possible to define success of students in dealing with complex environment while abstracting new regular and organised forms.

In doing so, this article will refer to the approach applied in FSMVU at Basic Design lessons with first year students at undergraduate program. In this research, the composition of the forms taken from the nature constitutes the first stage of the study. Further on abstraction task was developed throughout four hands-on tasks.

2. Basic Design Education and Its Implications in Türkiye

Design-based programs such as architecture and interior design encounter an introductory design course in the first year of study programs, which triggers and fosters skills such as conceptualizing, designing, organizing, and expressing. These programs incudes a drawing-based alphabet because they focus on creating spaces and built environments. Also, it introduces students to the systematic approach to design and basically their architectural designing skills are initiated with the introductory design course.

At first, students are taught about the basics of design by understanding basic elements such as line, point and pattern. Also, students are expected to explain their thoughts by drawing sketches in the practical exercises while being taught the importance and necessity of sketching. Later on, color theory and the ability to use colors are taught through techniques such as watercolor and charcoal. The basic design education process introduces also fundamental design principles such as harmony, balance, contrast, symmetry, repetition, and proportion, which are used in both, two and three-dimensional representations. Further on, it also integrates designing by conceptualizing and building masses and volumes using these principles while encountering concepts such as abstraction, combination, reduction, etc.

The Basic Design course in Turkish architecture and design faculties varies in scope and content, depending on the number of hours and semesters allocated by each faculty. For instance, some universities offer a 6-hour Basic Design course for two semesters, with the system covering Basic Design principles and elements and the applications of fundamental issues. Students work on small projects such as point-line-plane-volume, visual perception-gestalt, scale-ratio-hierarchy, light and color, static-dynamic effects, abstraction, and creating two and 3-dimensional compositions. The last task may involve constructing one-to-one scale models produced as a team work.

In some programs, Basic Design is a one-semester course. The course duration affects the content, with shorter periods focusing on Basic Design principles in 2D and 3D compositions.

However, a common problem encountered in almost every university's Basic Design course is that students do not have a background in drawing and design from high school education. Therefore, there is a need to develop skills such as sketching, drawing techniques, and visual communication techniques within the scope of the course; if the department's semester program does not include classes that teach these techniques, a part of the Basic Design course may need to be dedicated to this topic as well.

3. Case study: Abstraction steps in FSMVU Basic Design Studio

Abstraction is a mental process that helps isolate the common features in a group or the features of the whole parts as defined in the dictionary (Cambridge, n.d). It is a form of design thinking that helps to form specific qualities of a group or the parts. Thus, it is used in design studies. Abstraction can be defined as not a linear process but a cyclic process that helps to think about relations between parts and the whole to catch their relational essence. Thus, many researchers have utilized abstraction and types of abstraction in design studies. Gibson, Rapoport, Gestalt, and Appleyard define different types of abstractions in their studies (Gibson, 1950, 1968; Rapoport, 1977; Appleyard, 1973, 1980). Besides, Gencosmanoglu and Nezor classify the abstraction types as formal, functional, and semantic (Gencosmanoglu and Nezor, 2010). According to the classification, formal abstraction is a type of abstraction that represents concrete forms with their simplified and basic features. A functional abstraction is an abstraction form meaning more technical details on different subject matters. In semantic abstraction, subjective values, life experiences, culture, and knowledge of the individuals form the abstraction (Gencosmanoglu and Nezor, 2010).

Abstraction as a method in design processes has different approaches. According to Uraz (1993), purifying from details, decreasing/reducing, differentiating/emphasizing, and making comparisons are the processes of abstraction. According to Besgen, differentiating, isolating, correlativity, generality, simplicity, geometrization, and reaching the essence are the stages of abstraction (Besgen, 1996). The common idea of abstraction is to get the essence when looking at broad definitions.

In the Faculty of Architecture and Design at FSMVU, the Basic Design course is arranged as one semester 8-hour course. The course covers critical topics such as Basic design principles and elements, color theories, gestalt and abstraction.

As final projects students had task to design insect hotel, and the task of abstraction which is developed under the supervision of instructors and individual work. Students are developing their work upon receiving comments. It is an effective teaching method in this course, and it is done once or twice at every lesson.

The design of the insect hotel should be an assemblage of natural materials in the first phase of abstraction. In this study, formal abstraction is used for the geometric composition. The students were expected to simplify the relationship between reality and abstraction to the extent of keeping the essence of the composition.

3.1. Methods of the Study

The students were given a design problem to create an insect hotel using materials collected from nature and to assemble a composition measuring 21x21cm while adhering to basic design principles. The following steps were applied in the process of the study;

- Select natural materials and assemble them into one composition following Basic Design principles.
- Create a geometric composition in a 21x21 cm frame with organic materials such as leaves, branches, and cones.

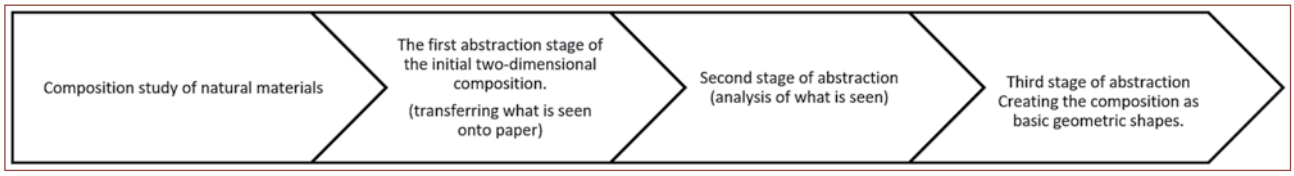

Figure 1. Stages of the Study

Figure 2. First stage of abstraction, the composition of natural materials in a frame by following basic design principles

- Draw the organic composition to the paper in freestyle in a 21x21cm frame and analyze the outcome.
- Purify forms from details.
- Isolating and simplifying forms.
- Finding the essence of the composition.

In the project's first stage, the students were asked to collect natural materials and create a composition for how these materials would be used. The students then created a cardboard base for the composition and arranged the collected materials within this frame. They were then asked

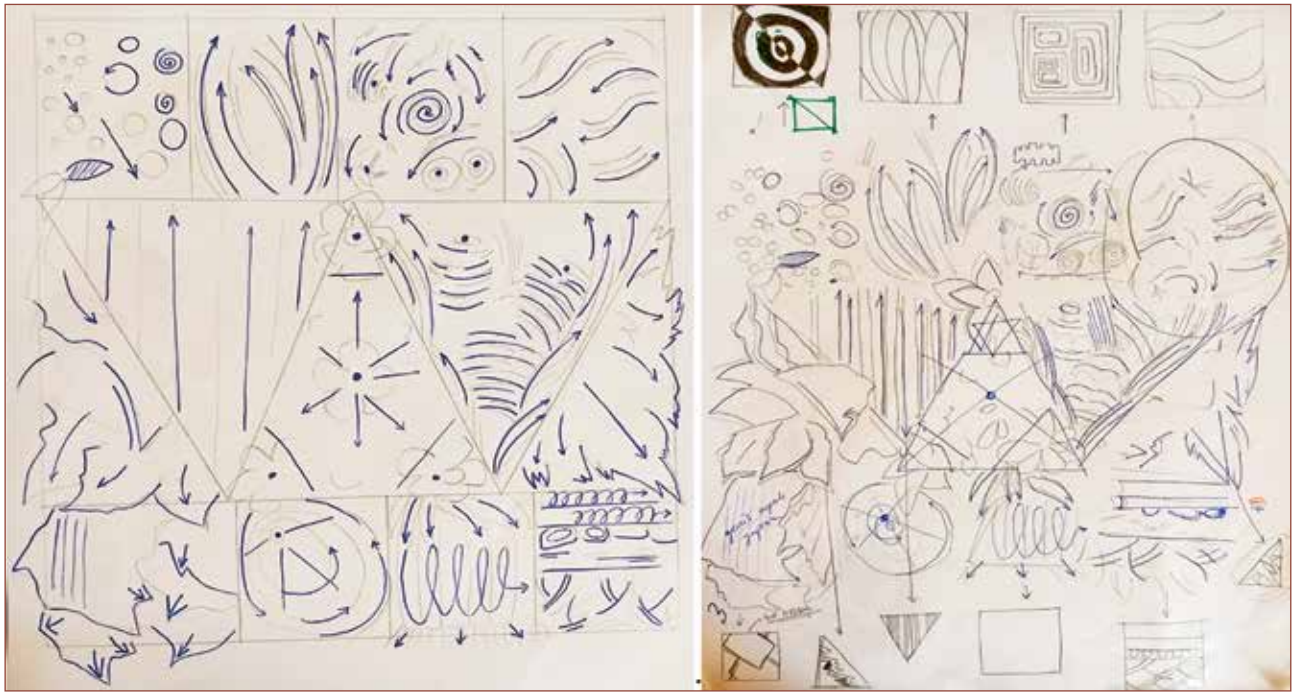

Figure 3. Second stage of abstraction, the composition of natural materials and analysis of the natural geometries in a frame following Basic Design Principles

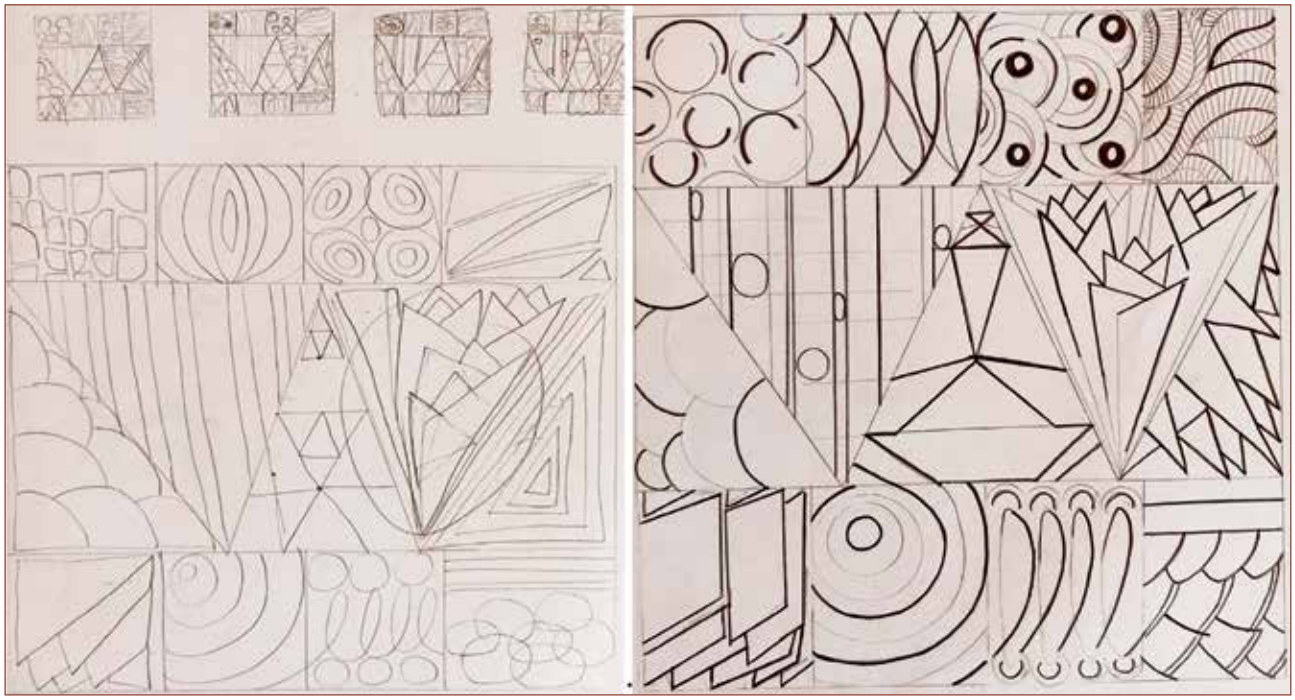

Figure 4. In the third stage of abstraction, the focus is on purifying forms from unnecessary details, simplifying, and geometrizing

to draw a two-dimensional composition of the resulting three-dimensional work. This first stage represents the initial abstraction phase of the project. The first stage visualised the completed insect hotel design, and the accompanying sketch shows the initial composition work (Figure 2).

In Figure 3, an analysis was made of the first drawing. In this stage, basic geometries were attempted to be discovered. After analysing the composition of the second stage, unnecessary details are eliminated, and forms are turned into elements in geometric compositions. The fourth stage of abstraction is characterized by simplifying and geometrizing the forms by purifying them from details. In this stage, the composition is reduced to its fundamental geometric shapes, such as circles, squares, and triangles (Figure 4). The aim is to discover the underlying geometric structure of the composition and to create a more simplified and unified form. By reducing the complexity of the composition, the focus is shifted towards the essential aspects of the design, which helps to strengthen the overall visual impact. This stage is important for the design process as it is also a foundation for the final composition.

6. Conclusion

The design as a process applied for developing new architectural forms start from idea toward space production which is result of the concept arouse from the objects and realm surrounding certain environments. To be able to deal with the architectural design in the future students at FSMVU are learning abstraction process as part of the curriculum of Basic Design lessons at first year of the undergraduate program.

This study showed processed of abstracting forms from organic and complex details to simplified geometrically defined one. It was conducted in three abstracting stages. As a result

Basic Design education provided students necessary skills needed to cope with complex design challenges and successfully accomplish. It can be applied to many other design problems to simplify complex issues and their structure.

Abstraction may help students to develop;

- Conceptual modeling skills; creating simplified representations of complex design problems to help understand the underlying structure and relationships.
- Parametric design approach; create complex and variable design solutions that can be adjusted based on specific parameters, such as parametric design.
- Finding repeatable solutions to design problems to develop design patterns that can be a possible starting point for other designs.
- Ability to structural thinking; developing the ability to behave in a complex environment and minimize it to certain fundamental elements. From more fluid, complex, and irregular to more organized and geometrically defined results.
- Ability to relational thinking; developing abstraction thinking will allow them to deal with ideas to comprehend relationships among elements as a part of the mental process, contrary to concrete thinking, which focuses on defined facts and objects within a specific context.

Acknowledgement

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Education and training of personnel in the field of waste management in PUC "Mediana" Nis

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Abstract

The sector of human resources management of the Company requires an approach that corresponds to the number and structure of employees. Human resource management policy requires long-term technological and financial investments, which results in increased competitiveness. On the other hand, the structure of the company's employees enables a significant degree of efficiency increase and finding measures to improve the company's operations, through education and training . The main goal of the work is the identification and analysis of the existing practice of waste management through the employees of the company, but also the selection of a new sustainable technology for converting waste into energy using Plasma technology. The paper is based on the research of a sample of 132 out of a total of 1073 employees in the Company.

Keywords: *employee education, waste-to-energy, electricity*

1. Introduction

The goal of employee education is to improve the company's activities through the primary selection of hazardous and non-hazardous packaging and other municipal waste, in accordance with the needs of future waste treatment for energy production. Collection, transport and disposal of municipal waste at the Niš landfill; mechanical preparation of non-hazardous waste for further transport and delivery of waste to authorized operators for reuse or recycling. It represents not only the legal but also the social responsibility of the company. It should also be noted that training should be institutionalized and an integral part of the company statute (Slavković, 2019).

2. Methodology

The research was conducted as applied research, using different research methods and techniques (survey, scaling, testing, interviewing). Descriptive method in research education is a set of scientific procedures that describe phenomena in upbringing and education (Aleksić and Kudumović, 2021).

The process begins with data collection with a Survey (consisting of data and metadata), which are standardized for this purpose. The process of filling gaps in the source data is shown in Figure 1.

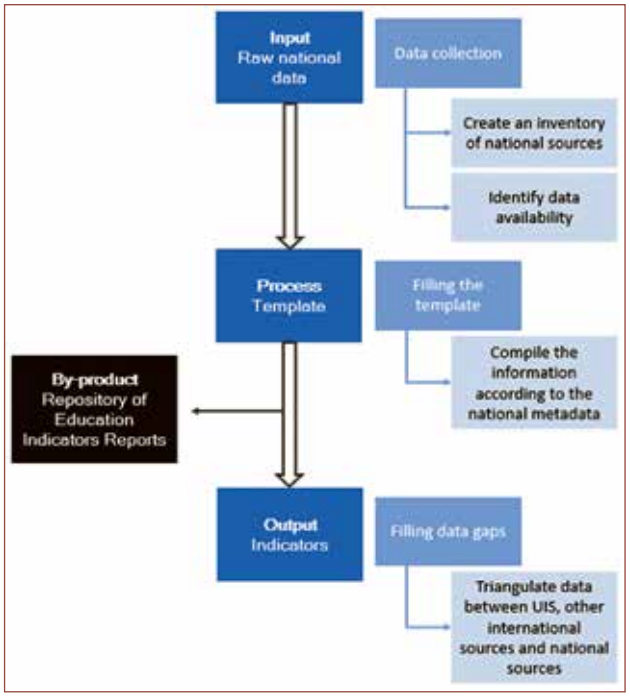

Figure 1. The process of filling the gaps in the source data (Temperley et al., (2018)

3. Results and discussion

A person responsible for waste management in the company on the basis of the objectives and development strategy of the company prepares Waste Management Employee Training Program. Employee Training Program consists of theo-

retical and practical parts of the training (Cim a group, 2019).

3.1. The theoretical part employee training

The theoretical part includes an oral presentation, which consists of the following areas:

- Application of legal regulations and SRPS ISO standard 14001:2015
- Instructions for handling waste material in Regiment "Mediana" Niš KR-C-013;
- Management of secondary raw materials IOP-A-003;
- Types of waste, with a proposal for their treatment in PUK "Mediana" Niš shown in table 1.

3.2. The practical part of the training

The practical part includes a demonstration of handling secondary raw materials in accordance with the needs of future waste treatment. Accident protection measures; Measures to protect the environment and human health.

3.3. A test for checking knowledge

The test consists of 15 questions (multiple choice/yes/no) to check their waste management knowledge.

The employee has successfully completed the training if they handle waste adequately and correctly answer 80% of the test questions (10 correct answers). If an employee fails, they are trained and tested again in a month. Waste management training, which arises during the work process of PUC "Mediana" Niš, is carried out in the following cases: upon admission to employment • change of workplace • company management. Employee training takes place in Serbian language and is adapted to the capabilities of people with disabilities. Supervision of employees is carried out periodically, or no later than once in four years for different workplaces.

Table 1. Waste types in PUC "Mediana" Nis

Waste types	Waste types	Treatment
Special waste streams	Waste packaging from hazardous substances	recycling / waste- to- energy
	Waste used oil	recycling / waste- to- energy
	Waste cloths absorbers	recycling / waste- to- energy
	Waste accumulators	recycling / waste- to- energy
	Waste oil filters	recycling / waste- to- energy
	Waste oil hoses	recycling / waste- to- energy
	Waste grease and oil sludge separators	recycling / waste- to- energy
	Waste from fuel oil boiler rooms	recycling / waste- to- energy
	Waste from fluorescent tubes	recycling / waste- to- energy
	Electrical and electronic waste	recycling / waste- to- energy
	Waste from perchloroethylene	recycling / waste- to- energy
	Waste tires	recycling / waste- to- energy
	Waste filters of air	recycling / waste- to- energy
	Textile waste	recycling / waste- to- energy
Metal waste	Waste ferrous metals	recycling / waste- to- energy
Metal waste	Waste non-ferrous metals	recycling / waste- to- energy
Packaging waste	Packaging waste	recycling / waste- to- energy
Municipal/ commercial waste	Municipal/commercial waste	Dispose of waste in landfills

The lecture is 45-minute long.

"TEST

Read questions carefully. Choose and circle one letter. Only one answer is correct.
Enter personal information in block letters
To pass the test, you need ten correct answers
Name, father's name, surname and PIN: _____
_____
Workplace: _____
Department:_____
Date: _____

1. Waste is ?
a) Any substance or object that the holder discards, intends to discard or is obliged to discard;
b) Any substance

2. Types of waste depending on the dangerous characteristics that affect human health and the environment in PUK "Medijana":
a) Non-hazardous waste, hazardous waste and inert waste;
b) Hazardous waste;
c) Non-hazardous waste

3. Non-hazardous waste is:
a) Waste that does not have the characteristics of hazardous waste
b) Waste that has the characteristics of hazardous waste

4. Hazardous waste is:
a) Any substance that has at least one of the dangerous characteristics: explosiveness, flammability, etc
b) Waste that does not contain hazardous substances

5. Inert waste is:
a) Waste that is not subject to physical, chemical or biological changes
b) Waste that is subject to physical, chemical or biological changes

6. Municipal waste is?
a) Communal waste includes waste from households (household waste), as well as other waste that is similar in composition to household waste
b) Municipal waste is not household waste

7. Commercial waste is?
a) Commercial waste is waste generated in companies, institutions and other institutions, except household and industrial waste
b) Commercial waste is not waste generated in companies, institutions and other institutions

8. Industrial waste is:
a) Waste from industry or from the location where the industry is located, except for waste from mines and quarries
b) Non-industrial waste

9. Biodegradable waste is?
a) Waste suitable for anaerobic or aerobic decomposition, such as food and garden waste, paper and cardboard
b) Waste that is not suitable for anaerobic or aerobic decomposition

10. Packaging waste is:
a) Packaging waste is any packaging or packaging material that cannot be used for its original purpose, except for the rest in the production process
b) Packaging waste is not any packaging or packaging material

11. Packaging waste includes:
a) Paper and cardboard packaging, metal packaging, plastic packaging, wooden packaging, glass packaging, textile packaging
b) Metals

12. Who is responsible for waste selection:
a) All employees
b) Communal workers

13. Is the primary selection of waste in PUK "Medijana" clearly and visibly marked?
a) jes b) no

14. Waste treatment methods:
a) Reuse of waste for the same or another purpose - waste recycling; thermal treatment - obtaining energy from waste, burning/or co-incineration (pyrolysis, gasification, Plasma technology); biological treatment - anaerobic (biogas production) and aerobic digestion (compost production) digestion, chemical waste treatment; waste disposal
b) mechanical preparation of waste for further transport

15. Waste treatment for the city of Nis is:
a) Treatment of non-hazardous waste by sorting; mechanical preparation of non-hazardous waste for further transport; disposal of municipal waste at the city landfill
b) obtaining energy from waste by Plasma gasification

According to the results, the candidate has
a) PASSED b) FAILED" (Mediana, 2022)

3.4. Personal education

Personnel education /training is implemented as follows:

1. at the level of the organizational unit (OU)
2. at the Company level
3. external training.

Training activities for organizational unit (OU) level given are in Table 2 (Cim a group, 2019).

Internal lecturers can be those employees with an appropriate professional qualification and certificate as internal verifiers. Otherwise, external lecturers are hired.

4. Results

The structure and number of employees trained in waste management is given in graph 1. Chart 1. Structure and number of employees trained in waste management. The results of the training show that all participants completed the training with exceptional success.

Internal lecturers can be those employed with appropriate professional training and certification as internal verifiers. If there is no suitable staff, external lecturers are hired.

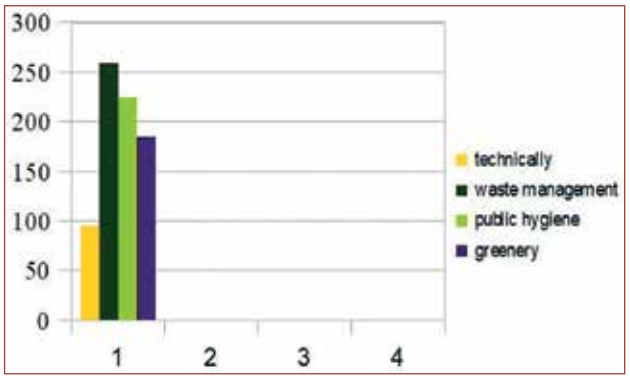

Chart 1. The structure of employees educated in waste management

5. Conclusion

Environmental analysis includes a detailed examination of each aspect of the business due to its impact on the environment. To make this analysis objective, an external company is engaged. The next step is for managers to create a program for the long-term settlement of the living environment (Jelenkovic and Lj., 2012).

Social corporate responsibility requires that companies strive for the optimization of transport and the sustainable choice of treatment for obtaining energy from waste, as well as the remediation of all sources of environmental pollution.

Personnel training must be a constant measure to continually improve the knowledge and skills of the employees, as well as to adjust the level of information, due to which all employees are

Table 2. Organizational unit level (OU) training

activity description	stakeholder
the training program	General supervisor for waste management
supporting documents / training records: • instructions, waste management training records • a test to check the learning progress, etc.	
the training is carried out according to the following activities: •employee's training records, •dynamic training plan	
success assessment	
data entry after the training	
records in the work process: • register of training programs, •questionnaire for assessing the effects of education / training in work, •evidence chart of employee training, • questionnaire for checking knowledge progress	

obliged to undergo waste management training to carry out their tasks efficiently.

Information and communication technologies (ICTs) must be harnessed to strengthen education systems, knowledge dissemination, information access, quality and effective learning, and more effective service provision.

The thematic indicator set will serve to chart global progress on education and monitor the SDG 4 education targets more comprehensively across countries, allowing the possibility to identify challenges regarding concepts of the targets that are not reflected well by the global indicators (UNESCO, 2016*)*.

Based on the above, as for PUC "Mediana" Niš, the following conclusions are reached:

- trained employees demonstrate knowledge and understanding of the fundamental concepts of waste management in the Company;
- waste management in PUC "Mediana" Niš requires cooperation and interaction at all levels of the Company;
- management and environment are aligned with the requirements of the SRPS ISO 14001:2015 standard and the relevant legislation,
- all employees demonstrate environmental awareness and a high level of training in human resources management and waste management.

Acknowledgement

We would like to thank the consulting company for the research they conducted in PUK "Medaina" Niš.

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Preparing the Camera Ready Paper for TTEM Journal

First Author [1], Second Author [2], Third Author [3]

[1] First affiliation, City, Country,
[2] Second affiliation, City, Country,
[3] Third affiliation, City, Country.

Abstract

In this paper are given the instructions for preparing camera ready paper for the TTEM Journal. The recommended, but not limited text processor is Microsoft Word (docx). Insert an abstract of 150-200 words, giving a brief account of the most relevant aspects of the paper. It is recommended to use up to 5 keywords. The Keyword should appear on the new line following the last line of the abstract, without a line space, set in Times New Roman 10pt.

Keywords: *Article, ready paper, TTEM Journal.*

1. Introduction

In order to affect high quality of the papers, the authors are requested to follow instructions given in this sample paper.

Title page - Every article has to have a title page with a title of no more than 10 words: name (s), last and first of the author (s), name of the institution the author(s) belongs to, abstract, keywords, introduction, etc.

The paper has to be typed on a standard size paper (format A4). All materials, including tables and references, have to be typed single-spaced. Main text should be set in 11 pt Times Roman, not in bold. All of the text should be printed as a double column and JUSTIFIED throughout.

Regular length of the papers up to 12 pages, (preferred text length is between 5000-7000 words). Footnote-comments, explanations, etc., cannot be used in the paper. Where cannot be avoid end noted should be used after conclusion with given numbers in a squared bracket [1].

2. Instructions for the authors

Main text body - Times New Roman 12 point's font should be used for the text. The manuscript has to be prepared in two columns separated by 5 mm. The margins for A4 (210×297 mm2) paper are given in Table 1.

Regular paper may be divided in a number of sections. Section titles (including references and acknowledgements) should be typed using 11 pt fonts with **bold** option.

Sections can be split in subsections, which should be typed in 10 pt *Italic* options. Figures should be one column wide. If it is impossible to place the figure in one column, two column width figure is allowed. Each figure must have a caption under the figure. For the figure captions 10 pt font should be used.

2.1. Tables and Pictures

Tables have to be numbered and shown by their order, so they can be understood without having to read the paper. Pictures also have to be numbered as they appear in text. All illustrations (pictures, drawings, diagrams, photos, figures etc.) have to be original. Authors are obligated to take Copyright permission, and any misunderstanding or conflict of interest will be responsibility solely of Author. Preferably the picture format is TIF, quality 300 DPI.

Table 1. Page layout description

Paper size	A4
Top margin	20 mm
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Right margin	18 mm
Column Spacing	5 mm

If they have been prepared or taken by Author than only year can be added Figure 1.

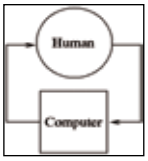

Figure 1. Text here (2018)

If they have been prepared or taken by someone else see Figure 2.

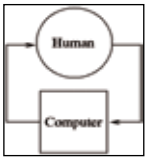

Figure 2. Text here (Esmer, 2018)

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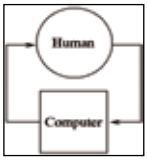

Figure 3. Text here (Nomidis, 1958, p.39)

3. Use of abbreviations

Use of abbreviations has to be reduced to mini- mum. Conventional units can be used without their definitions.

4. Conclusion

Be brief and state the most important conclusions from your paper. Do not use equations and figures here.

Endonotes

[1] Only where can not be avoided. The Endnotes headings are in bold but have no numbers.

Acknowledgements (If any)

Acknowledgements are to state about research supporting institution and title of the project (if any and where necessary), otherwise should not be written.

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The Reference headings are in bold but have no numbers. Format references in the APA style.

References inside text body should be written as follows:

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Two authors: (Stewart and Adams, 2022)

Three or more authors: (Kudumovic et al., 2022) When referring to pages in a publication, use

'p. (page number)' e.g. p.75 for a single page or 'pp. (page numbers)' to indicate a page range. e.g. pp.175-179.

(Kudumovic et al., 2022, p. 5) or (Kudumovic et al., 2022, pp. 5-18)

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e.g. Kudumovic, Dž. (2009), Nauka o čvrstoći I, Univezitet u Tuzli, Tuzla, Bosna i Hercegovina.

For book chapters: Surname, initials (year), "chapter title", editor's surname, initials (Ed.), title of book, publisher, place of publication, page numbers.

e.g. Kudumovic, L. (2018), "20th Century's Heritage of Bosnia and Herzegovina as an Integrat- ed Part of Cultural Routes-Authentic Bosnia and Herzegovina Case Study: Mining town Banovici ", Pasic, A., Juvanec, B. and Moro, J.L. (Ed.s), The Importance of Place Values and Building Practice in the Historic Urban Landscape, Cambridge Scholars Publishing, UK, pp.91-105.

- For journals

Surname, initials (year), "title of article", journal name, volume issue, page numbers.

e.g. Kudumovic, Dz., Cosic, S., Trakic, E. and Kudumovic, L. (2008). "Modelation And Optimisation Of Self Operating Pump Parameters", Technics Technologies Education Management, Vol.3 No. 2, pp. 51-56.

-For published conference proceedings

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in editor's surname, initials (Ed.), title of published proceeding which may include place and date(s) held, publisher, place of publication, page numbers.

e.g. Wilde, S. and Cox, C. (2008), "Principal fac- tors contributing to the competitiveness of tourism destinations at varying stages of development", in Richardson, S., Fredline, L., Patiar A. and Ternel, M. (Ed.s), CAUTHE 2008: Where the 'bloody hell' are we?, Griffith University, Gold Coast, Qld, pp.115-118.

-Adding http and DOI

Where possible add after reference http or DOI For any http add also accessed date. Eg.

Zhu, G. and Yu, G. (2020), "Apine apple flavor imitation by the not method", Food Science and Technology, Vol. 40 No.4, pp. 924-928. Available at: https://doi.org/10.1590/fst.26019 (accessed 20 October 2022)

Zhu, G. and Xiao, Z. (2017), "Creation and imitation of a milk flavour", Food & Function, Vol. 8, pp. 1080-1084. DOI: 10.1039/c7fo00034k

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e.g. Encyclopedia Britannica (1926), "Psychology of culture contact", Vol. 1, 13th ed., Encyclopedia Britannica, London and New York, NY, pp.765-771.

- For archival or other unpublished sources

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e.g. Erdoğan, E. G. (1996), „Istanbul'daki Osmanli Yapilarinda Kullanilan Devşirme Malzemenin Değerlendirilmesi", Unpublished Master Thesis, Istanbul, University, Istanbul.

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