

URBAN FAÇADE

DESIGNING ISTANBUL'S WATERFRONT

EDITED BY ALESSANDRO CAMIZ AND ÖZGE ÖZKUVANCI ŞİMŞİR



DRUM Press, Istanbul, 2025

Dynamic Research on Urban Morphology books - 8

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*Dedicated to the memory of Orhan Hacıhasanoğlu,
the best dean we ever had.*

URBAN FAÇADE
ISTANBUL WATERFRONT

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Digital Survey in Beyoğlu, Istanbul

Reading the shapes and values from the Built Heritage

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Introduction

If any city or town have a story to tell, Istanbul should be considered as a complex storyteller, with a mix of different stories, coming from the East, from the West, from the Black Sea or from the Mediterranean and native from the site of the city itself. The consequences of this mix sometimes may move people to have the idea that its urban development should be the result from a frozen past, blocked on a specific moment in time, difficult to read because the strong overlapping on such urban context, with many continuous transformations in the urban tissue and fronts, bringing multiple changes in functions, behaviours, rules. All these transformations push over the elements from the built heritage, especially those of considered of minor artistic value, like houses and the original urban tissue, in a perpetual condition of exploitation and reuse, dragging them across ages with substitutions, abandonments, alterations, integrations, superfetation, demolitions. As stated in a previous presentation of this survey intervention: “The actions of the people living and using the neighbourhoods sometimes cause the decay of a structure into poorly used facility, sometimes it acts changing decay into opportunity, keeping somehow alive the place” (Verdiani, Arslan, Cicek, 2019). Nevertheless, even if this consciousness about urban development is clear in most of the



Fig.1. The area of the intervention with the sectors covered by the digital survey operations.

people observing a neighbourhood in a historic city, the possibility to read and recognize all the factors causing the present appearance is not an easy task. In the context of a workshop, as well as for any following study, the need of gathering massive information capable to capture the qualities of a place is very compelling, it may allow having impressions from the place, but at the same time it records a trustable and detailed representation for further analysis and interpretations. In the case of the waterfront of the Beyoğlu quarter, the use of 3D laser scanner for urban documentation allowed to capture a digital 3D model, mainly based on the description of the urban fronts, usable for investigations and understanding. It worked as a first central node in the interpretation of the complexity of a difficult mix of commercial activities, past abandoned industrial blocks and significant buildings, part of a neglected built heritage. In the following lines, there will be the description of the main passages and activities aimed to the definition of a well detailed digital model, based on the classic point cloud representation and enriched by photographic and photogrammetric surveys, oriented to be the base for architecture interpretation, from the present use, to its potentialities, to its issues and priorities and to the identification of some geometrical layout at the base of the generation of the main built heritage elements emerging in the survey area.

During the activities of the Urban Design workshop: “Urban Façade: Istanbul Waterfront” held in



Fig. 2. Participants and instruments at work in the Beyoğlu neighbourhood.



Fig. 3. Participants and instruments at work in the Beyoğlu neighbourhood.

Istanbul in March 2019, students from the Özyeğin University, University of Parma and University of Florence attended in the survey team or in the redesign team of the urban blocks of the Galata waterfront. For the survey team the whole work was focused on the use of a 3D laser scanner unit for the digitalization of the urban fronts, with the integration of additional approaches mainly based on traditional, photography and photogrammetry surveys. The survey operations were brought on using both high end instruments and the tools directly available from the participants, with “hands-on” sessions in which they started learning how to work with digital survey tools applied to such an urban environment. The main task of the operations of the digital survey was the production of a well-detailed digital twin of the area with the description of all the main relationships between the place, the uses, the overlaying of transformations and an appropriate extra set of details about the most relevant elements in terms of quality and heritage value. Bringing to end a model based on a balanced dataset, with an overall amount of data not “too much demanding” in terms of hardware and processing time was an important factor in the situation of the workshop, where fast data exchange and quick data management may be mandatory in the final results of the activities. During week of the workshop, while the design students brought on their proposals to enhance



Fig. 4. Perspective view of the aligned point cloud.



Fig. 5. Orthographic view of the aligned point cloud.

and redraw the Galata waterfront, the survey teams conducted their work on the field of the Galata neighbourhood. The frequent interactions between the teams and their tutors the interchange of materials produced various practical benefits to the overall experience.

Main features of the intervention area

The survey intervention took care about a very lively area, with a clear and continue exploitation of all the architectures of the Beyoğlu neighbourhood by its users and inhabitants, this is well clear since the first visit: the approach to the buildings from the users is very practical, sometimes the choices, aimed in finding space and solutions for new functions may vary from simply adaptive to the state of the building to almost aggressive solutions, with demolitions and replacements of parts. The new parts overlap the older and at the ground floor all is blended by the colourful mix of goods presented on the outside by the shops. The change in time of the kind of commercial activities often leaves traces with the persistence of some previous elements, with the possibility to meet even weird solutions adopted in front of the decay of the existing structures. In this context it is possible to consider five main significant cases that define the characteristics of the intervention area:

- The shops directly along the waterfront. They are the most picturesque, presenting writes, insignias, and even curious architectural decorations that characterize the front, almost no common element seems to unify or connect one building to the other, nor in shapes, nor in style or colours. The mix is barely balanced in the height of each floors, but their number varies and often some levels look abandoned or clearly used as a depot. The main functions here are commercial with some hardware shops or small restaurants offering fish or various street foods. The hardware shops often "erupt" in the street front with the exhibition of their goods, again very colourful, repetitive, even funny because the apparently paradox of having large items and serial metal or plastic tools appearing in front of the windows, capturing the attention as much, and sometimes even more, than the architecture itself. The restaurants present "marine" styles and have fishermen tools and items to underline the type of food they offer. The chaotic, but very original and site-specific aspects of the place is capable to attract various tourist visits, from the single visitor to small and medium groups, interested in experiencing the food and the typical atmosphere of the place. In general, it is possible to say that the active part of each building is concentrated at the

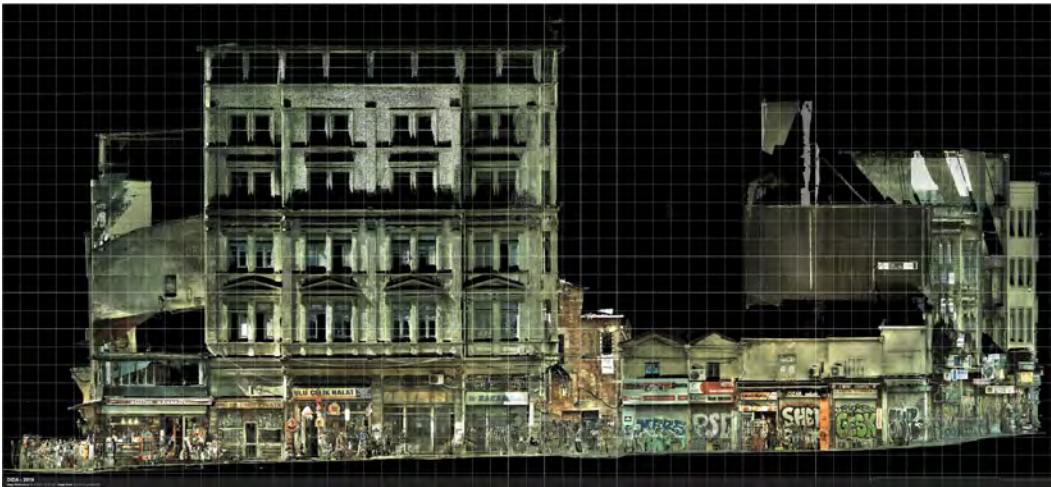


Fig. 6. Orthographic view of the aligned point cloud.

ground floor, while the upper floors are used at service of the main commercial activity or just abandoned or partially used (Verdiani, Arslan, Cicek, 2019).

- The Caravansary/Bazar (Bordini, Cottini, 2019) and other archaeological remains. In this curious balance between built heritage and marketplaces, these two are the most surprising situations. The Caravansary represent one of the many building from this specific typology well-structured in Turkey and all across the middle east (Khan Madel,1988). The intense reuse of the Caravansary is mainly done by hardware shops and various technical assistance services, with minimal exceptions because of a painter studio and a bike garage/seller. In the Bazar Bedesten Fatih the situation is dominated by hardware shops; they completely saturate the inside. In both cases the bold walls protect quite well the original structure of these architectures, the interventions are modest and mostly based on adding some superfetation or carving the walls to add some updates to the cooling/electrical/plumbing plants. Thus, only minimal attention is given to the maintenance of the external/internal and common parts, the two buildings look used in a sort of logic "until it works, we use it" that seems to wear little by little the architecture and the quality of the spaces (Verdiani, Arslan, Cicek, 2019).

- The shops/services in the inner part of the blocks - the inner portion of the blocks presents a higher level of decay, with even more altered parts and where the process of abandon and partial reuse of the higher floors is even more evident. The ground floors keep on being completely occupied by several hardware shops while the quantity of restaurants decreases. In some rare case there is the tentative to open some pub activities on the upper floors, thus the access to them is gained only passing by various abandoned or partially used levels. The alleys and small squares inside the blocks are filled by the goods from the shops, or, sometimes, used as very intensive parking lots (Verdiani, Arslan, Cicek, 2019).

- The (partially) abandoned industrial lot. At the end of the dense market area, there is a large



Fig. 7. Perspective view in the Caravansary of the aligned point cloud.

industrial lot, it is in poor to bad conditions, and presents an original and, apparently, “naughty” reuse of many ground floor spaces. A large part of the previous industrial building has been demolished and its area cleaned from the main ruins, thus a large part of structural stumps is present on the front facing the removed sector. From the ground level, moving along the perimeter it is possible to notice many poorly realized parts, some older, sometimes decorated by simple pilasters with capitals, some apparently even older walls, and a certain number of shops taking place no matter the condition of the rest of the building upon. These shops keep “alive” some parts of the building; thus, they are in questionable situations on the front of safety and efficiency (Verdiani, Arslan, Cicek, 2019).

- The remains of the ancient Constantinople walls: this part may be resumed in three main episodes, all these parts, even if at a certain distance from the main intervention area are strongly an element that in the past influenced the development of Beyoğlu (Camiz, 2020). The partial wall perpendicular to the channel is well preserved and easily readable, even if the huge bridge rising over it tends to overcome the sense of the place. The other sectors are difficult to interpreter and to reach for most of the visitors of the quarter, while they are inside in the blocks or even integrated in new buildings. The two main towers are in poorly conditions; thus, they are still standing and with quite complete walls and openings, thus the internal conditions seem quite poor and with unclear structural safety (Camiz, Alessi, Michelon, 2019). The lots around the towers, in time were the place of various constructions, mainly aimed to some industrial functions, right now of all those buildings there are just traces in the surrounding walls. The front of walls corresponding to the tower closer to the well know Galata tower is included in a recent building, now a restaurant and it is possible to have a close look to the well restored masonry of the former internal side of the defensive wall.

The overall result coming from this mix operate on the neighbourhood in a quite picturesque way, with a rich composition of very original and spontaneous architectural solutions: former industrial buildings, valuable but neglected built heritage elements, connected by a “minor” tissue used according to need and partially matching ideas. The result is colourful and cacophonous, transmitting a sense of specificity that is not based on “quality” or “order” but is most of all clearly guided by the different personal intentions, all practical but not optimized. With an evident waste of space supported by the cheap approach to the use of the sectors in poor condition. This happens quite often in all the middle floors, missing a panoramic view or suffering from some concerning or light



Fig. 8. Views and details from the Caravansary.

structural issue. What happens is that instead of planning a recovery or restoration, the owner (or its neighbour for what is possible to guess from certain situations) keep on using the spaces in form of depot, warehouse or simply leaving it open to various uses. This is quite clear entering the staircases offering an access and exploring some of the upper floors: in most of the cases even the doors are left open or missing, allowing a weird but direct view on these abandoned properties. In such a condition the option for applying restorations seems merely an extra feature that most of the users of the area seem not be able to adopt. The improper use of spaces emerges even from the need of car parking, some partially abandoned, marginal, or simply empty lots are filled by cars, it is a commercial activity, people leave their vehicle to a parking operator who sometimes try to fill the lot with as many cars he can, creating at all the effects an even more chaotic block, isolating the access to some parts of the area. But these vivid and stochastic activities are not permanent: when the shops close and during the closing days, the whole area radically changes its aspect, with all the inner parts of the lots becoming almost desolate, free from exhibited goods, from people moving around, from overcrowded parking lots. In this condition the specific condition of the quarter emerges: there is something like a colourful intangible heritage that is corroding little by little the built heritage with its wills and behaviours. The high level of details, the large extension of the area and the mix of small to medium size items disseminated all around the shops and restaurants areas made quite complex to define a “quick” tool to gather details, “intangible features” and architectural descriptions of this apparently stochastic settlement. This situation, with variable, but essentially commercial, use at the ground floors and very various uses (often altered towards “service” spaces) of the upper floors it is not easy to survey or document in a detailed way, especially in the short time of a workshop, nor it is easy to think about strategies that may preserve the specific mood of the place or even just evaluate the chances in success of an intervention.

To start creating a proper base it was decided to operate a process of digital survey to be the further connection for other kind of data.

Survey strategy from data gathering to post-processing

The digital survey intervention on the area was based on the use of a single 3D Laser Scanner unit, capable to gather points at high speed up to the distance of 300 metres. The Leica Geosystems



Fig. 9. Views and details from the Caravansary.

ScanStation C10 is a 3DLS based on “time of flight” measurement (Bini, Bertocci, 2012). It can gather points according to a panoramic field of 360° on the horizontal and 270° on the vertical. Each gathered point is measured with an accuracy of about 4 millimetres at ten metres on normally reflective materials (Bianchi et al., 2016). All the scanning work was planned accordingly to the logic of a well-balanced point-cloud with a proper level of definition for an architectural and urban survey, considering a grid of about one point each centimetre at ten metres of distance for almost each scan station. The C10 unit has also the option to use its internal camera to remap the colours of the pointcloud with a sequence of panoramic pictures, covering without parallax error the same field of view of the laser measurement system.

This photographic function, even if time consuming (it requires about the same time of the point-cloud generation itself), came out very useful in the documentation of the Beyoğlu neighbourhood, with its urban fronts rich of colourful and weird elements, the coloured point cloud turned out to be more efficient in describing with plenty of details a complete 3D model of all the façades, hanged items, signs, shop setups and masonry works.

The fully panoramic and long-range features of the measurements done by the C10 unit and its good accuracy at full distance, allowed to plan an optimized series of scan stations covering all the exteriors fronts of the blocks along the waterfront and some of the most significant interiors.

The overall scanning time took about three days, covering an area of about 40.000 square metres with 98 scan stations, gathering about one billion of points (963.022.466). Such an amount of data is not large, nor it can be considered impressive in front of the actual standards, thus it was not in the program of the operations to produce a massive dataset, with the risk of having a complex management of the data and time-consuming operations, not well suitable with the needs of a workshop. The aim was to produce a “proper” documentation, immediately usable to have a tool for bringing on studies and analysis. Indeed, the workshop was in need with fast readiness of base and contents. In this sense the choice of this survey planning worked out perfectly, creating a well-balanced dataset with information about each single building and a level of detail usable to reproduce the context without problems in scale 1:50.

The 3D description of the buildings and the coloured point clouds allowed the reading of the various relationship between volumes, both in real dimension as well as in perspective, giving the possibility to archive a valuable image about the usage of the places and the various interventions on the buildings. A video about the workshop and showing the results of the complete aligned point cloud is available on the Google YouTube platform at the URL: https://youtu.be/5N_183iwkZc.



Fig. 10. First results from the SfM/IM photogrammetry.

A Nikon D800e, 36.3 Mp equipped with a Nikkor zoom 24-120mm F4 was available to allow additional "hands-on" experiences to the participants. The experiences in photogrammetric shooting during the workshop were then processed using the well know S.f.M./I.M. (Structure from Motion/Image Matching) photogrammetry software: Autodesk Recap Photography, Agisoft Photoscan/Metashape and Reality Capture. This part of the activities took care about various interesting details and some specific buildings, of the fronts from the Caravansary entrance to the waterfront and all along its extension, and of the bays in the internal court of the Caravansary. Some results from the photogrammetry taken in Beyoğlu during the workshop are accessible in full 3D visualization in the Sketchfab platform at the following URL: <https://skfb.ly/6ZzQ9> (Reuse of a capitol in form of basement for a very simple fountain inside the Caravansary) and <https://skfb.ly/6SXMQ> (floor stone with the sculpture of a snake, in front of the Galata Tower).

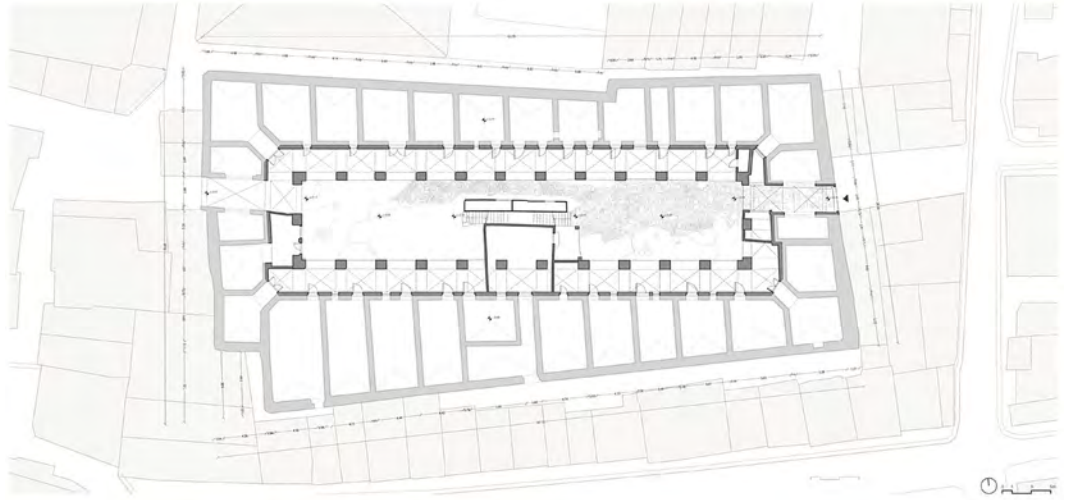


Fig. 11. Caravansary: plan view, ground floor.

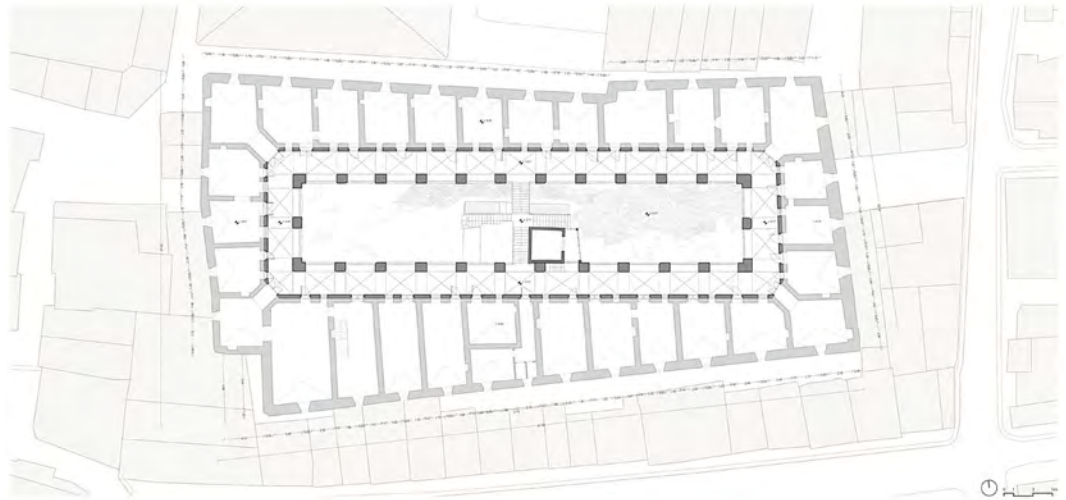


Fig. 12. Caravansary: plan view, first floor.

For the Caravansary documentation project there was the need of a specific intervention. In between the whole surveyed area, it represents one of the main historical building, with a full integration in the commercial activities which made extremely specific its condition. The survey intervention was carried out with different methodologies, integrating the in-situ direct annotation with digital survey technologies. The main activities were organized in three phases: the inspection, the survey with 3D laser scanner and the photographic and photogrammetric survey. In the first, the qualities and approximate dimensions of the Caravansary were reported, using freehand annotations and sketches. At this stage it was necessary to take photographs and measurements to fully understand the construction characteristics and composition of the masonry. This first step was useful to highlight the peculiarities of the building and to organize the subsequent activities, based on the time available and to the survey. The integrated digital survey, carried out with 3D laser scanner and photography, has made it possible to document such an articulated and complex building efficiently and accurately. The data obtained from the 3D laser scanner survey, carried out along the outer perimeter of the Caravansary and in the inner courtyard at ground floor level, were integrated with the data acquired from the photogrammetry of the porches at the level of the ground floor and at the first floor. Due to the access restrictions imposed by the property, it was not possible to enter the interior spaces of the shops with the 3D laser scanner. However, direct metric survey based on trilateration was carried out in some of the rooms on the first floor. The different data has been processed and integrated to provide an overall 3D image of the architecture with metric, morphological and material information. The realization of a three-dimensional survey is also interesting to analyze the architecture and its development, to better understand and recreate the traces of the transformation that has affected the building and its surrounding over the years. The photogrammetry survey of the Caravansary included general and detailed photographic documentation of the building and an acquisition of photographic data through the Structure from Motion (SfM/IM) photogrammetric processing. A detailed photogrammetry campaign was carried out along the entire loggia at the upper floor.

Four digital cameras were used by the tutors and by the students to complete the photogrammetric/documentation tasks: a Nikon D800E (36.3 Mp sensor) with a 24-120 mm F4 zoom lens, a Nikon



Fig. 13. Caravansary: plan view, roof view.

D3200, a Nikon D3100 (both with a 24 Mp sensor) and a Canon EOS 500D (15 Mp sensor) all with 18-55mm zoom lenses. The photographic documentation did not require any special settings, if not the classic SfM/IM technique optimization solutions like use of the minimum focal length, the lowest ISO sensitivity (to avoid sensor noise), the highest F-stop value combined with a shutter speed fast enough to guarantee stable and micro-motion-blur issues when shooting without a tripod to accelerate the operations, all according to the natural light of the moment.

Before data processing, all photos were cataloged and organized into different folders, depending on the portion of the building to which they refer. The photographic documentation was useful to obtain some images of the context of the Caravansary, from the outside streets, from the inner courtyard and from the accessible part of the roof. Closer images were taken for morphological details of interest such as superfetation, additions, spolia, signs of surface degradation. When needed, in some photos a tape measure was used to give a reference for the the scaling. The photogrammetric campaign was extremely useful for completing all the parts of the building that could not be detected using the 3D laser scanner, obtaining complete digital data of the facades and the loggia with the crossed vaults of the first floor.

All the single scans were aligned in the global point-cloud using Autodesk Recap, using automatic registration procedures, which turned out well working using morphological references in common areas between each scan. All the data were in the end saved into Autodesk Recap format (RCP). This choice was due considering three main points: for first Autodesk Recap is starting to be widely diffused and it provide a free license for Academic uses (so students, researchers and professors may use it at no cost) and it comes with a free viewer version; secondly it is well compliant and supported by Autodesk Autocad, Revit and 3D Studio Max, with the possibility to be used as a direct base for the production of 2D drawings, 3D models and BIM modelling; thirdly it allows some specific features that may turn out well in a documentation process: it allows to include text, images and links notations in the point-cloud, with the option to create very rich dataset, with the



Fig. 14. Caravansary: section views, across the court, long fronts.

connection of single points to images, texts and external documents of any kind (local or online).

RealityCapture is a SfM/IM automatic photogrammetry software developed by Capturing Reality that allows the creation of detailed 3D models. The Structure from Motion/Image Matching (SfM/IM) is a range imaging technique that, starting from points extrapolated from 2D images, allows the reconstruction of three-dimensional objects in the form of texturized meshes, effectively returning the object representing it both from a visual point of view, accurately reporting its morphological and chromatic characteristics, and offering an extremely trustable metric point of view. The procedure followed is that provided by the program workflow, with the import of photographs, on which an adequate number of shared points can be marked (control points) then proceeding with the alignment of the images and the creation of a scattered point cloud. From the dense cloud you get a mesh model, which is described by polygonal surfaces. The program automatically calculates it using the point cloud and some parameters regarding the decimation of the number of polygons. Once this model is obtained, it is possible to proceed with the texturing phase, at the end of which the 3D is well visible in all its realistic features. From this model it is possible to export snapshots, videos and high definition orthophotos.

The two models of the Caravansary obtained by Autodesk Recap and RealityCapture have been united in order to obtain a 3D object with the highest possible level of detail and to be able to integrate the laser survey of the court on the ground floor with the photogrammetric one of the loggias of the first floor.

In fact, through the RealityCapture function “Laser-scan Import” it is possible to insert a cloud of points from PTX or E57 format. Once loaded into the same file where the photogrammetric model is present, it simply takes to start the “reconstruction” phase and the program will automatically align the two models according to an automatic reorganization of common points. In this case the two models were integrated without any difficulty, obtaining a complete 3D with the whole court and both loggias.

The resulting model presented some minimal imperfections in the coloring and small parts missing. The first problem was caused by the color difference between the images of the point cloud and the photos of the RealityCapture model, also because during the three days of the campaign the weather, and consequently the natural light, was very variable. The second problem was due to the massive presence of footprints (boxes, building materials, goods) scattered throughout the building. Both issues have been addressed as much as possible through post-production in Adobe Photoshop CC.

Once the final model was obtained, it was used to produce and export a series of graphic materials, useful for the representation of this architecture, like sections, fronts from the orthophotos and so on, the group of these drawings served as bases for the following graphic refinement in Autodesk AutoCAD. The model size was checked using measurements obtained from the Autodesk ReCap point cloud. In this drawing phase, all the graphic materials were organized according to a hierarchy defined in base of the architectural elements of the building, in example creating different line styles between the contours of the façade arches and the other materials in the masonry like stones and bricks, distinguishing them by the thickness of the lines and with a gradual variation in tones from the grayscale.

The limited access to the interior areas of the Caravansary was potentially an issue, but this final phase of redrawing and refining allowed to integrate the missing parts thanks to the contribution

of an earlier survey carried out by the architectural firm EBG Mimarlik & Restorasyon, Istanbul who kindly made it available allowing the completion of all the secondary spaces and a global check of the whole resulting survey.

Some reflection about the interpretation of the surveyed area

The occasion of the workshop brought to the creation of a rich base of information, documenting the state of the neighbourhood in March 2019, it may be considered as a “static” archive, but it can be extremely dynamic, if considered as a starting point for following uses. In example it may be the focus of some reflections about the features and specific characteristics of Beyoğlu. As stated by the most consolidated theories for the interpretation of the waterfront evolution, this neighbourhood should be considered in the passage between “Deterioration” and “Rediscovery” (Pekin Timur, 2013). To correctly turn this transformation into a proper evolution, avoiding the risk of losing important local features, a correct knowledge about the entity and quality of the Patrimony is fundamental: the use of buildings, their potentiality, their specific features, the inner value of the “intangible heritage” and the one of the “built heritage” and the comprehension of the behaviours of the people. Any strategy “cutting out” the present considering the actual configuration “poor” or linked to “old” habits, like something just to be left behind and replaced by “new” and “more modern/actual” structures, should be successful from an economic point of view, but a failure in preserving the layering and the richness of the place (Osterlund, 2019). The overuse of certain spaces and buildings or the neglect or abandon of others should not be considered as a failure of these architectures but should be interpreted as a key lecture for moving towards recovering and adaptive changes in the uses. Otherwise, a transformation aimed to the logic of demolish/replace will simply produce no cultural awareness from the people living and using the quarter (Lusiani and Panozzo, 2017). Instead, all the levels of reuse are worth to be studied, analysed, and defined in a structure which may become the new “bones” of the waterfront regeneration, or the risk in having a quite standard, in a certain way “globalized” and then flattened and not attractive neighbourhood will be a more than perceptible risk (Türel, 2017).

If knowledge is a good point to start the reading of a place, when the will is to preserve and enhance properly the local qualities, digital survey and its fast and massive data gathering can serve this task in more than one way. The massive point-cloud, when edited in versatile software, allows to separate in layers or objects the various parts, passing from a massive description to a structured hierarchy of layers and objects, in simpler dataset. In example, the masonry of an ancient building, can be separated in the different types and phases of the construction, defining an element for each USM (Masonry Stratigraphic Unit) (Verdiani and Di Tondo, 2007). In the survey of this neighbourhood, exploiting the coloured point-clouds, it is possible to easily separate the commercial activities, the shop windows, the goods occupying space in front of the shops, the Cultural Heritage items, the parking lots, and the abandoned parts, etc... All with the possibility to be further enriched with metadata, links, like connections to online resources like those available in the “Istanbul Urban Database” (IUDB). The point cloud may become a versatile model telling the state of the place, allowing the exploration of interrelationship, change in levels, global issues, flux of the people moving in the streets. In a certain way, it can be considered a sort of base, or propaedeutic model, to a more complex and detailed 3D GIS tool or BIM base. With the vantage to allow a quick 3D identification of all the gathered information, having very fast learning needs and immediate use. Something to help the understanding from scholars and operators about the real balance between places, uses, people. It is quite clear that the weakness and the potentiality of this neighbourhood is in the approach of people to the built heritage and in their behaviours in its usage. The clearly massive and practical interventions tend to compromise the quality of the

places, damaging and altering. Thus, keeping a certain “picturesque” sense of the place which is easy to recognize as a strength in terms of originality and site-specific characteristics can be a proper choice to avoid the standardization of the quarter.

Then any intervention and or guidelines should start from a serious intervention on the cultural approach of the users. At now, it is evident a poor comprehension of the potentiality and value of the buildings from the people using them, they approach the buildings as “boxes” or as “raw materials” to be exploited as much as possible, keeping them in place by applying patches and adapting them to their needs (Verdiani, Arslan, Cicek, 2019). The old as well as the recent and the new to what they see as the simplest and practical solution. When the property approaches the subject of “quality” the results are most of the time based on a process of “delete and replace” or, often the intervention is like “a coat” or a simple covering to put over the existing elements.

On such a subject, teaching and learning may find an interesting grip, while the users may see a direct benefit in their economic activity, which is mostly the management of a small shop or of a restaurant and/or pub. On site workshops operated by multidisciplinary scholars and students, connecting the universities with the users of the neighbourhood and the builder’s activities in the area, can be a great learning moment for all the parts and a cheap and efficient way to promote a positive evolution of the Beyoğlu area. Such a group of activities should be oriented to instruct about the value and strategies of the commerce, preserving intangible and built heritage together, reducing the negative aspects coming from the impact of standardization. An effort of this kind may bring to a fast recovering of some situations and even to bring people to invest in the area, with the potentiality to bring on the restorations of various abandoned upper floors.

This part should be a benefit in terms of safety and living quality. The subject of the valuable elements in this urban tissue, instead is quite complex, while a complete and appropriate recovering of the Caravansary and of the Bazar seem not possible keeping the actual use of the spaces. Thus, a gradual understanding of the potentiality by the owners with a change in the quality and characteristics of the shops, if brought on with a proper strategy should bring to a new and more efficient “reuse” of these places of significant value.

A significant point to start a possible recovering may even come from the recognition of the real value of some of the buildings, as the Caravansary itself, which presents a great potentiality. The “Han” was constructed in 1554 by Mimar Sinan (Necipoglu, 2005), one of the most eminent figures in the history of Turkish architecture, on behalf of Rüstem Pasha, Suleiman’s Grand Vizier, on the remains of the ancient Genoese church of San Michele (Çinaryılmaz and Ar, 2020). The historical importance of the caravansary seems now largely forgotten, but it could be rediscovered and safeguarded thanks to the accurate digital survey. Metrology and architectural reading are in this sense essential to reconnect it to its origin and then to its inner value. In this sense, the first step to take is to move back to the original measurement unit adopted by its architect and to the specific architecture solutions from the time of its construction.

The inflected arch and the zira, the Sinan’s cubit

During his tenure as imperial architect, Sinan was responsible for the construction of over 470 buildings, of all sizes and types. Unfortunately, most of the methods he used to model, size and build these buildings are unknown due to the scarcity of drawings and documents dating back to those years (Necipoglu, 2005). The oldest documents describing Ottoman architecture consist of a limited number of plants, sketches, and estimated reports that can be found in the Archives of the Ottoman Prime Minister and the Archives of the Topkapı Palace Museum. Among these documents,

Sinan's only true design concerns the Kirkcesme aqueduct project. The studies on the master's construction technique are almost focused on the imperial mosques of Istanbul, for which Sinan used all his design imagination in a different way each time, following the ongoing construction site personally. However, since Sinan's production was vast and often simultaneous over time, it is thought that he could use systems that would allow the design of stable and proportionate buildings in a short time, especially for those of minor importance, the execution of which was followed by other architects delegated by him.

Studies carried out by researchers on mosques and building complexes in Catalca, Istanbul province, have shown that Sinan often used a modular grid that followed a unit of measurement used by Ottoman architects, the zira (Alioglu and Orbeyi, 2010). The zira derives from the aršin, an ancient Persian unit of measurement that was used in the Russian Empire and Balkan countries to indicate the unit of measurement in length in the 16th century (Kula, 1987). The term aršin, which came to Russia and Turkey via Tartar, in Persian means "cubit". In the 18th century Peter the Great fixed its value at 28 Anglo-Saxon inches, corresponding to 71.12 cm of the decimal metric system. In Bulgaria it was 75.8 cm. In Turkey, where aršin was also called zira, it was 75.7738 centimeters (Gyllenbok, 2018). By superimposing a 1/2 zira modular grid over the plant and elevations drawings of the Rüstem Pasha Han, it is possible to determine that this measuring unit is the matrix of the grid used in the building the same kind of grid used by Sinan in many other buildings. The measures of the central court and the fronts seem to be multiples of this unit of measurement. This does not apply to interior rooms; whose irregular shape suggests that they are the result of an adaptation to the available space. The use of this system denotes how advanced construction technologies were in Ottoman times, and how intense the construction activity was: the zira was in fact also used to calculate the construction times and costs of a building. After the design phase, ottoman architects prepared estimative reports to determine the approximate cost of the building, which were then presented to customers. Counting the grid squares, the construction times were calculated and then the labor cost and the amount of material needed.

Looking at the façade of the Rüstem Pasha Han, what most eye-popped - especially to a foreign visitor - are the arches of the first floor and their peculiar and particularly evocative shape. This type of arch, called "inflected", "ship's hull arch" or even "ogee arch", has been particularly used by Ottoman architecture and can be found in many structures designed by Sinan. In the construction of this arch, the centers of the two lower arches are inside, while the upper ones are outside the inflected arch. When both centers of the two lower arcs coincide, a general form of inflected arc is created. The inflected arches have in many cases presented with the round intrados and the extrados instead cuspidate. This is the case at the Rüstem Pasha Han.



Fig. 15. Caravansary: section views, across the court, short fronts.

It seems that the inflected arch originated in India, where as early as the 3rd century BC the entrances to the Underground Buddhist convents were presenting arches shaped in this way. The way the shape moved and disseminate itself in the East and in Europe is not clear, in central and northern Europe, inflected arches appeared, with a few exceptions, only from the 13th and 14th century in late Gothic architectures. In Italy, these arches can be found with wide diffusion in Venetian architecture, which was clearly in strong relationship with the Byzantine architecture. So, the presence of this specific shape is the presence of an element worth of attention, capable to link a wide cultural, technical, and artistic process that treat and reuse shapes across times and historical events. The presence of a grid based on the zira and of this typical arch seems to clearly connect the Caravansary to the work of Sinan, repositing its style and underlining the importance and urgency of a proper recover of the building with a rigorous and appropriate restoration.

Conclusions

Taking part to a workshop is always a great moment of learning and growing for all the participants, which are, most of the time, a small group of people; thus, when the workshop is structured in the proper way, it may allow to create useful bases and give good roots to the value of Cultural Heritage in the mind of the future architects, planners, and patrimony experts, while, at the same time, it can be the starting point to further studies and research. Choosing the place and subject accordingly to the active and ongoing investigations, sharing and getting as an intellectual challenge the issues and specificity of the place, may bring on positive and ongoing ideas. With the possibility to develop solutions to articulated problems connecting building preservation, urban regeneration, social and cultural perspectives. Bringing digital technologies to work in these environments is a challenge in creating sustainable tools capable to efficiently support the research, while teaching about innovative and modern procedures. The following developments will completely depend on economic events, political choices, unpredictable transformations, but it is clearly worth to try defining procedures and approaches that may gradually contribute to the sharing of common knowledge about interventions, giving value to the present as a result of a series of events, not of mistakes. Beyoğlu is clearly not a neighbourhood frozen in a specific time, its transformation is ongoing, the waterfront has yet received various reorganization in the public areas along the channel, that now appear less chaotic, “cleaned” in a quite generic new asset, that has not strictly connected to the place, with pedestrians’ paths and a bicycle lane that should fit anywhere. The new assets move around some witness of the past, making them more or less well-preserved

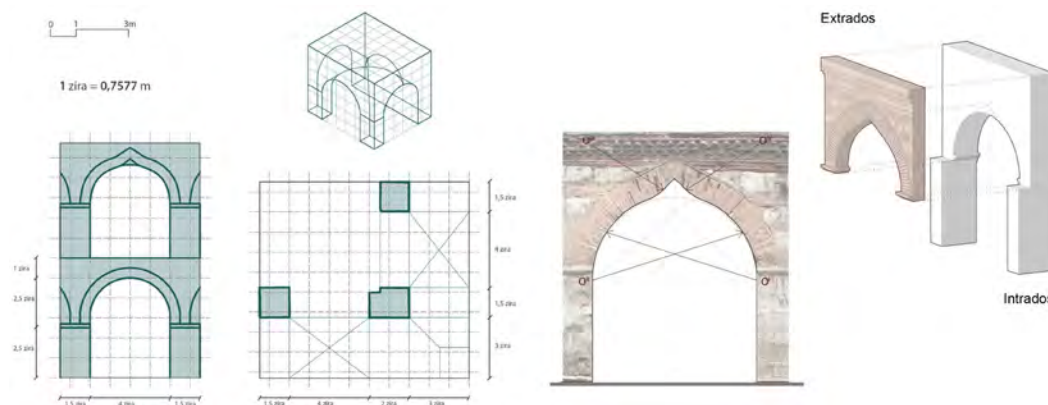


Fig. 16. Caravansary: schemes about the use of the grid in zira units and of the inflected arch.

abstract monuments. An intervention that seems just to underline the evident decay of many buildings creating the urban façade. The end to the long, traditional series of reuses of any kind of building, that may arrive with a brutal “renewal”, puts in the risk of causing the loss of important elements of intangible and tangible heritage.

Survey digital tools may be an excellent solution to build a proper base of knowledge, sharable in between different competencies. If the following steps will be addressed in keeping the value of the place or if the scenario will be all aimed to the demolition of what is considered without value it will be all a matter of culture and understanding, of social and economy choices. The implementation of digital media strategies, even passing by social networks, may success in promoting a better use of the built patrimony, not because it is the “right thing”, but because is the more convenient one. The vantage of the use of digital environment can be an excellent strategy for reading and finding possibilities, having the digital twin of the place always available and accessible with ease. This kind of tool can be well linked to the idea of expanding the practice of the workshop to other shared events, with teaching methods oriented to different professionals, proposing way to enhance the approach of the users to their building and to the comprehension of the better practises in the reuse and enhancement of layered contexts. Disseminating, sharing, and interlinking can be a good way, starting exactly from the real context, just to move to a digital information space, which probably is the correct environment for introducing abstractions and reflections and to start reasoning about possible results and ideas, defining a perspective for contexts that seem to move at the limit of their exhaustion. Underlining the value of Heritage should not be seen as a removal process of all that is in between a valuable past and the present, while the stratigraphy of a city in continuous changes is made by details and overlapping elements that are at risk of ruin when the intervention see the in applying of non-site-specific choices a standard in line with an undefined present.

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