Notes on an Adaptive Reuse Experience in Design Studio

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ABSTRACT

Conservation and adaptive reuse of historical buildings is one of the most important pursuits of architectural practice and architectural education alike. Architectural education programs are responsible for training qualified graduates in design and practicing of conservation projects. There are several courses to teach students in the theory of conservation methods in architectural education; however, application in the design process is often lacking. On the other hand, studying adaptive reuse projects in education offer a chance to transfer knowledge of conservation as well as probe into an important design problem. In this context, the aim of this study is to share an adaptive reuse experience of design studio students, investigation of the problems, solution-seeking and decision-making process in the studio. Within this framework, the study first examines the concept of conservation and its significance in architectural education, discusses the concept of adaptive reuse as a method of conservation, and analyzes the decision making process of an adaptive reuse experience in design studio, under the headings of 'use selection decisions', 'planimetric decisions', 'volumetric decisions' and 'structural and material selection related decisions.'

Keywords: adaptive reuse; built heritage; architectural education; design studio

INTRODUCTION

Historical buildings may lose their original function in time, due to the evolution of basic urban functions and subsequently the living environment, according to altering lifestyles and requirements (Engin, 2009). Different conservation methods, such as conservation, restoration, rehabilitation or adaptive reuse may be applied to buildings which no longer serve their original use, depending on their relative importance in history, physical condition or proposed uses (Elsorady, 2013). One of these conservation methods,

adaptive reuse of built heritage is a subcomponent of the rehabilitation process. As a means used to extend the active life of the building, adaptive reuse of buildings with historical value by ascribe new functions is a combination of ensuring and conserving sustainability (Kuban, 2000). It is necessary to provide contemporary uses to protect the built heritage and to provide a new life to these buildings in order to carry them to next generations. The way to follow for this approach is 'adapting these old buildings when the original function is no longer relevant or desired with new uses which is called as 'adaptive reuse' (Tanaç Zeren, 2013). Ways to conserve built heritage is one of the most crucial subjects to be taught in architectural education. During education there are several courses to teach students in the theory of conservation methods. However their application in the design process is often lacking. Design studios are foremost learning environments of architectural education, transforming theoretical knowledge into practical and architectural knowledge into skills. The aim of this study is to share a design studio experience by asking how to transform theoretical knowledge of conservation into skills and approaching the process of adaptive reuse of historical buildings as a design problem. Within this framework, the study first examines the concept of conservation and its significance in architectural education, discusses the concept of adaptive reuse as a method of conservation, and analyzes the decision making process of an adaptive reuse experience in design studio, under the headings of 'use selection decisions', 'planimetric decisions', 'volumetric decisions' and 'structural and material selection related decisions.'

ADAPTIVE REUSE AS ONE OF CONSERVATION STUDIES IN ARCHITECTURAL EDUCATION

Adaptive Reuse Process

Buildings change in time and very few of them can maintain the function they were initially designed for. A defunct and abandoned building can fall into ruin in a short period of time if not regularly maintained and repaired. Thus, adaptive reuse appears to be a solution as a dimension of conservation (Köksal, 2005). It is one of the most important interventions of conservation to attribute new and semantically and functionally appropriate functions to historical buildings with symbolical meaning and value and integrate them into contemporary life in an efficient manner (Özer, 1979). Adaptive reuse was reviewed in literature prior to the experience of adaptive reuse as an intervention of conservation in architectural education: The reuse of buildings is initially developed as a method to protect historically significant buildings from demolition. The Urban Land Institute defines rehabilitation as '*a variety of repairs or alterations to an existing building that allow it to serve contemporary uses while conserving features of the past.*' Therefore adaptive reuse is a component of rehabilitation (Cantell, 2005). The

most important aspect of the architectural conservation is '*the recycling of old buildings by adapting them to uses different from those for which they were originally built'*. Adaptive reuse helps to extend the life of historical structures by adapting their functions in response to contemporary needs (Yildirim & Turan, 2012). Built heritage that through adaptive reuse has a new use for some socially useful purpose, appears to be the most effective approach for a self-financing and sustainable form of preservation (Yung & Chan, 2012). The most successful built heritage adaptive reuse projects are those that best retain the building's heritage significance and add a contemporary layer. New work should be identifiable as a contemporary intervention, rather than a poor imitation of the original historic style of the building, and looking for a new use for the building that is compatible with its original use (Asoobar, 2009).

Teaching Architectural Conservation

Conservation of cultural assets and their transfer to future generations has become more and more important. Over the time, the different approaches of conservation have tended to merge and the principles of teaching conservation of the built heritage have been given an international backing through the recommendations of international associations such as UNESCO, ICOMOS and ICCROM (Embaby, 2014). As a result of these studies, many architecture schools included courses of conservation, started to research ways to transmit new methods and endeavor to transform theoretically transmitted conservation knowledge into practice. Conservation education should not be regarded as a mere theoretical method. Jokilehto (2006) suggests '*Conservation of cultural heritage is based on a methodology describing the decision making process. Cultivating conservation practitioners requires a clear career structure, where the necessary ingredients are merged, whether concerning concepts and theory, scientific methodologies or field practices*.' Creative adaptation aims to create a link to the past and an opportunity for architectural innovation and problem solving (Diamonstein, 1978). Design studios are undoubtedly the most important learning environment in architectural education where students learn how to solve problems and turn theoretical knowledge of architecture into practice. So, the design studio environment is one of the best catalysts to transform knowledge into skills for conservation education as well. In this study, students were given 'adaptive reuse of a historic building' as a design problem and the decision-making process was examined through problems, solution offers and steps taken.

ADAPTIVE REUSE EXPERIENCE IN DESIGN STUDIO

The curriculum of the program of interior architecture at the University where the case is conducted consists of two theoretical and elective conservation courses. These

conservation courses take place in the fourth and fifth terms. They consist introduction to conservation concepts with the understanding of the significance of heritage values, analysis studies, conservation interventions, conservation methods such as restoration, rehabilitation, etc. The design studio of the fifth term, case study of this research was aimed to transform the conservation knowledge given in class into practice, to promote students' abilities and skills in conservation projects, and to experience the decision making process of adaptive reuse of a historical building as a design problem.

The three main phases in the adaptive reuse design studioexperience (Figure 1) are:

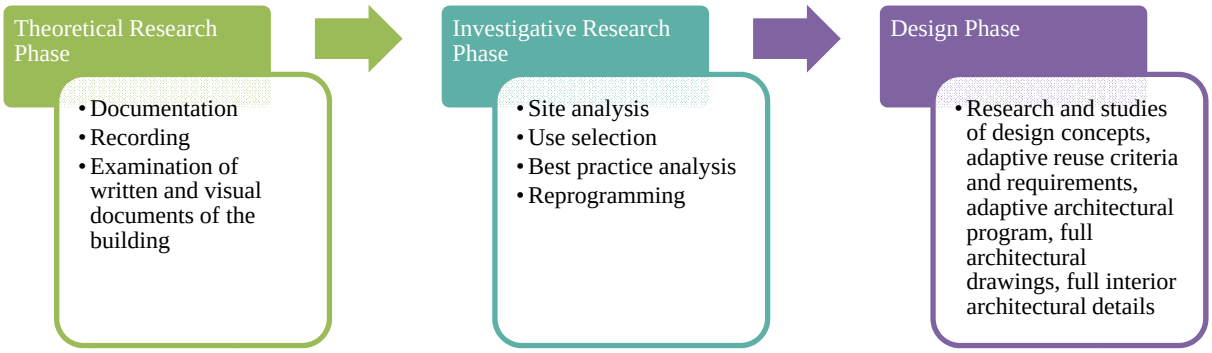

Figure 1. Main phases of adaptive reuse design studio

Theoretical research phase :

In this phase, students do research on the environmental, spatial, socio-cultural and economic transformations of built heritage to be reused and the surroundings through documentation and recording. Students also examine written and visual documents on the history of the building as well as surveying and restitution drawings.

Investigative research phase:

In this phase, students analyze the built heritage and surroundings by using communicative and informative tools like photographs, videos, sketches and interviews, thusly gain the skills to read the current architectural, spatial, socio-cultural and economic status of the built heritage and the surroundings. This phase develops the student ability to identify the social, economic and spatial characterization and the significant values of the built heritage. After the analyses, the new use of the built heritage is determined according to criteria specified in the literature. After determining the new use, case studies are analyzed and evaluated, an architectural program is prepared and design criteria, requirements and architectural design theories are investigated.

Design phase:

This phase covers research and studies of design concepts, adaptive reuse criteria and requirements, adaptive architectural program, full architectural plans, sections and elevations, full interior architectural details and finishing materials. Design stage aims at students' ability to develop design thinking skills and design tools for the preparation of projects in the heritage conservation.

The most important process of adaptive reuse experience at the design studio is the decision making process. This study examines the problems faced in these phases, solution offers and the decision-making process experience through the steps of use selection, planimetric, volumetric and, finally, structural and material selection related decisions.

DECISION MAKING PROCESS IN ADAPTIVE REUSE EXPERIENCE IN DESIGN STUDIO

Use Selection Decisions

At the design studio, use selection decisions are made after assessing the preliminary data procured during the theoretical and investigative research stages. When the building is adapted successfully into the requirements of the new use, habitability level is higher for new users and, therefore, the new use is sustainable (Aydin & Okuyucu, 2009). This is the first and most important decision made to conserve the built heritage; thus, the selection criteria present in the literature and listed below have been discussed at the studio under the headings of environmental integrity (physical, socio-cultural and economic) and spatial integrity and the new uses of built heritages have been selected according to these criteria.

Environmental integrity (physical, socio-cultural and economic integrity)

Environment of the building is in direct relation with the use of the building. No matter how appropriate the volumetric features, spatial formation and functional relations are, a structure in an incompatible environment to new use cannot be accurately reused (Kasli, 2009). The significance of the conservation of physical characteristics of the historical building is emphasized together with economic and socio-cultural aspects (Ipekoglu, 2006). The adaptive reuse of a historic building should have minimal impact on the heritage significance of the building and add a contemporary layer that provides value for the future (Yung & Chan, 2012). It requires an adaptation to the current needs of a community, it entails significant social benefits such as job creation and crime reduction (Elsorady, 2013). The new use should take into account long-term socio-economic and

cultural viability of the site. Balancing cultural significance and economic viability is one of the major challenges in the reuse of historic buildings (Yung & Chan, 2012).

Spatial integrity

Use and program of a newly designed building is determined prior to the design process and spatial organization is shaped according to a predetermined program during the design process. However, when the building is one that is historic, authentic and worth conserving, its use is determined according to the spatial organization (Kasli, 2009). It is necessary to avoid uses involving radical interventions inside or outside the building while selecting and implementing the new use (Engin, 2009). The building's adaptive capacity can be determined by conducting a thorough analysis of the buildings and its structure (Cantell, 2005). Working with existing buildings turns upon the form/function dialectic and finally an adaptation only succeeds when there is a good match between new use and existing form (Latham, 2000).

The most ideal approach for the new use of a building is to select a scheme that is close and appropriate to old use, thusly minimizing the level of intervention in the spatial organization; requirements to be determined for a single-space structure should be functions for a single space. In historical buildings, adding partition walls disrupts the integrity of the structure; so, new functions like a cultural centre, an exhibition hall or concert hall are much more appropriate for this type of structures. Contrarily, a structure of recurrent spaces requires a series of operations, including interventions in its structural system, to be reused as a single space (Altinoluk, 1998).

Among the built heritages to be handled for the adaptive reuse experience in design studio, Feshane-i Amire was built in 1833 as a weaving mill, Tophane-i Amire was built during the reign of Sultan Mehmet the Conqueror (1451-1481) as a cannonball casting factory, Darphane-i Amire was built during the reign of Sultan Mehmet the Conqueror (1451-1481) as a mint and Galata Tower was built in 528 as a lighthouse. At the design studio, students have collected written and visual documents on these buildings, have procured the surveying and restitution drawings and have made a presentation to project group at the initial stage of the decision-making process. Even though these structures are currently in reuse for various functions, possibilities of the most compatible use have been assessed and determined according to the criteria for the purpose of experiencing the entire adaptive reuse process as part of the design studio concept. The first three of the structures are spacious industrial buildings with high ceilings; Galata Tower is a 13-story tower with a vertical solution. Industrial buildings with their large volumes offer a wide variety of possibilities for reconfiguring the spatial organization of the original

building (Eyuce & Eyuce, 2010). Some of the more popular conversions are made from industrial buildings to museums, live-work units, offices, art studios, residential units, schools, retail, and increasingly more are combining several uses together (Cantell, 2005). While selecting the use of the three industrial buildings and one tower handled for adaptive reuse experience at the design studio, environmental and spatial integrity were first analyzed. After the analyses and group discussions, it has been decided to use Darphane-i Amire (Figure 2) as an Art Museum, Galata Tower as a Museum of Architecture (Figure 3), Feshane-i Amire as a City Museum (Figure 4), Tophane-i Amire as a Sculpture Museum (Figure 5), as a Marine Museum (Figure 6) and as a Handicraft Museum (Figure 7).

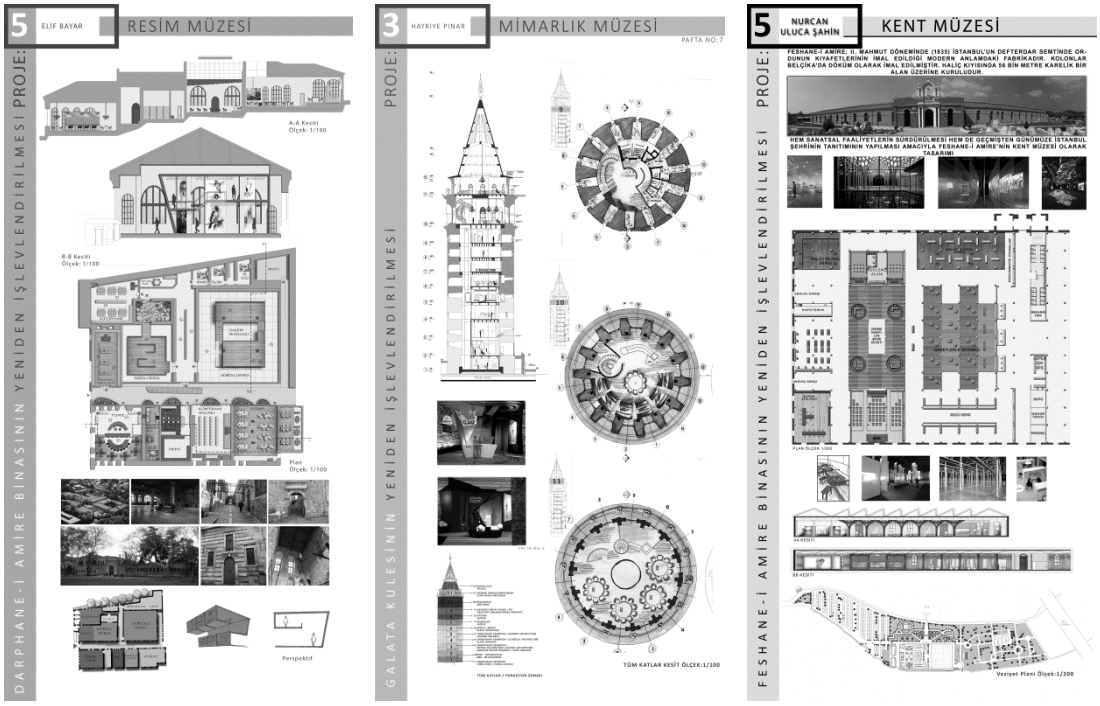

Figure 2. Project proposing adaptive reuse of Darphane-i Amire Building as an art museum

Figure 3. Project proposing adaptive reuse of Galata Tower as a museum of architecture

Figure 4. Project proposing adaptive reuse of Feshane-i Amire Building as a city museum

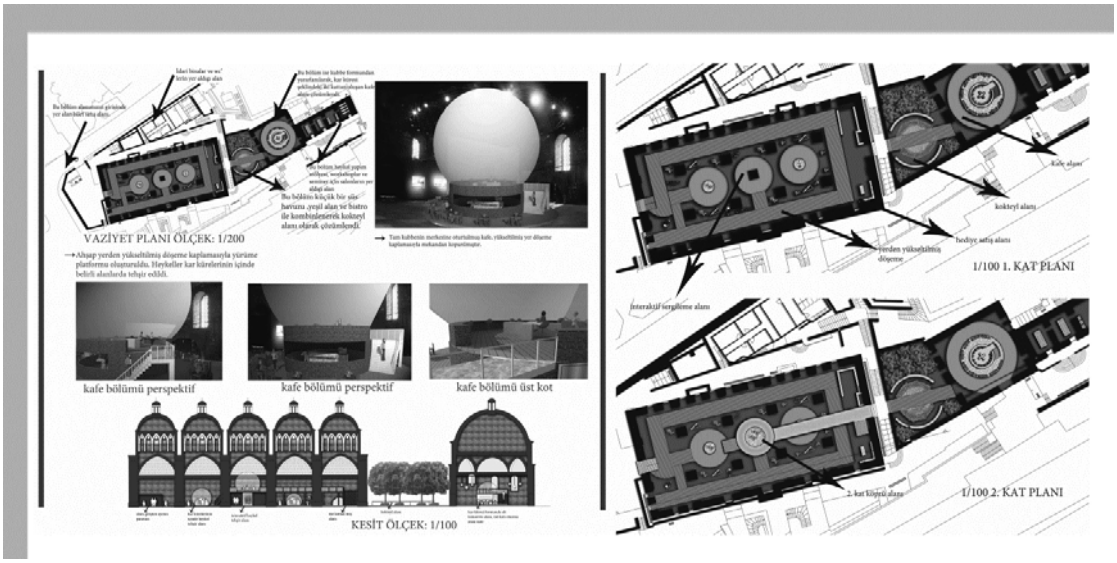

Figure 5. Project proposing adaptive reuse of Tophane-i Amire Building as a sculpture museum

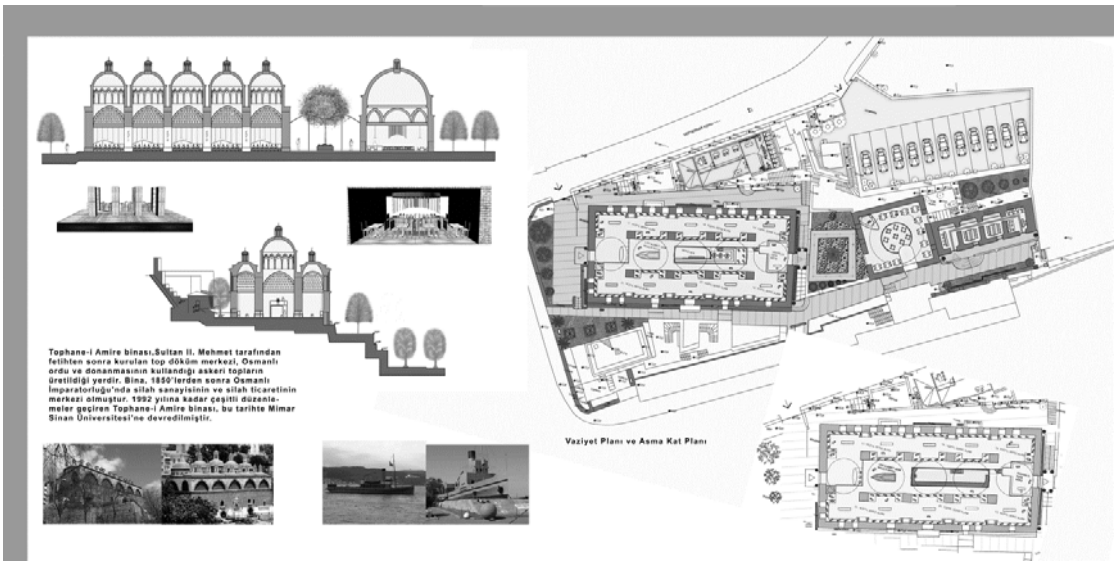

Figure 6. Project proposing adaptive reuse of Tophane-i Amire building as a marine museum

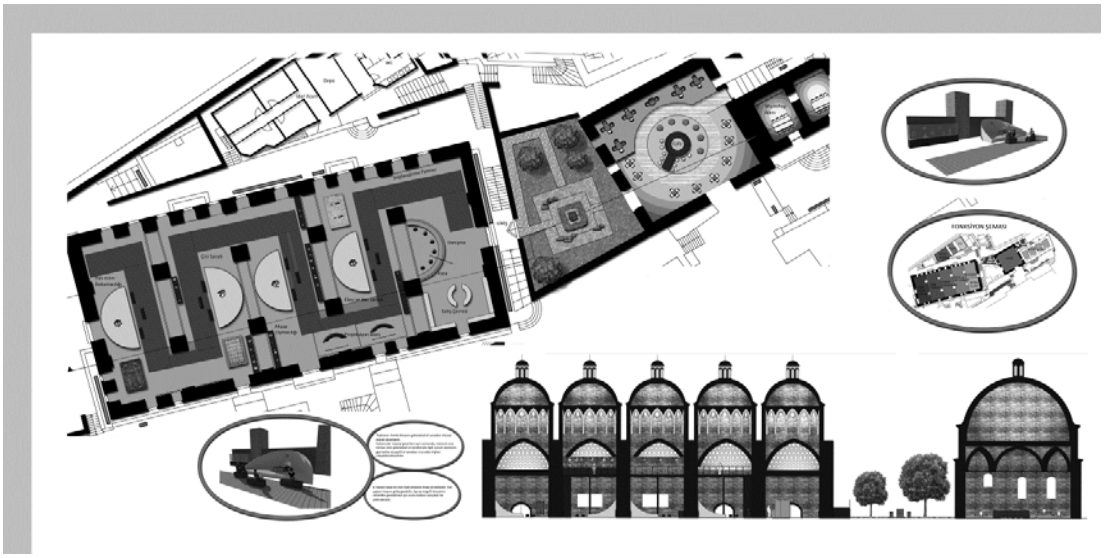

Figure 7. Project proposing adaptive reuse of Tophane-i Amire Building as a handicraft museum

Planimetric Decisions

It is possible to find a solution by making changes in the spatial organization to adapt the new use to the building during the adaptive reuse process. At this stage, planimetric decisions play an important role in implementing the functions as well as preserving spatial and volumetric characteristics of the historic building. Depending on the architectural program of the reuse process, certain interventions may be necessary. The important issue for these interventions is to conserve the planimetric characteristics that were designed for the use of the building's era during the intervention process and after reuse (Engin, 2009). This study examines planimetric decisions and the issues discussed while making these decisions during the adaptive reuse project according to spatial organization:

Circulating spaces:

Circulating spaces are common areas that provide connection between the entrance and other spaces. These areas consist of staircases, ramps, elevators, etc. vertically, and corridors and bridges horizontally. There is a need for additional circulation elements in the cases where the new and the original use contradict each other. These circulation elements of the new use should be installed in a reversible manner within the space (Kasli, 2009). Original proportions of the space should be maintained with elements like passages between mezzanine or mezzanine-original flooring, staircases, elevators, bridges etc. as individual elements. When there is a need to use new circulation systems, it is reasonable to use technology to install modern elements over original layers (Öter, 1996).

All three projects that proposed the reuse of Tophane-i Amire building as Handicraft Museum, Sculpture Museum and Marine Museum used ramps as circulation supplements that do not compromise perception of the space to reach partial mezzanines. These new circulation supplements, made of steel and glass, were designed independently from the existing structure. In Galata Tower reuse project, existing lifts were conserved; however lifts have been made transparent in order to feel vertical continuity of the new design. Materials offer visual contrast between the old and the new, the present and the past.

Common use spaces:

Common use areas are spaces like exhibition halls, conference halls and multifunctional halls and recreational sites, restaurants, cafés, etc. designed for social activities, depending on the architectural program. These spaces are generally installed in a single, integral space of the built heritage as a planimetric decision. If the existing building is not a monospace necessary for common use, one of the methods to follow to create spaces for the new use is to integrate spaces. This method is useful when it is necessary to have larger spaces in a scheme of recurrent units. According to the needs of the new function, it is possible to consider removing walls independent from the structural system (Engin, 2009). The point to take into account here is not to damage the general space perception of the historic structure and maintain the structure in a way that is reversible to its original state.

All the projects, including the ones that propose reuse of Tophane-i Amire building as a Handicraft Museum, Sculpture Museum and Marine Museum, Feshane-i Amire building as City Museum and Darphane-i Amire as an Art Museum, install the main exhibition spaces in a single space that does not damage the space perception of the original structure. Exhibition and circulation spaces are defined with elevated base planes or difference in floor coverings and flexible, light and demountable systems, vertical and lower than the height of an average person, are used as exhibition boards.

Special use spaces:

Special use spaces are areas designed for specific users according to the architectural program. For instance, rooms of a hotel and administrative units in an education building are special use spaces. These spaces are generally installed in the partitioned and recurrent areas of the built heritage as a planimetric decision. If the original building is monospace and there is a need to find a special use space for the new use, one of the methods to follow is to partition larger spaces according to the new use. For instance, old industrial buildings, depots and warehouses, and hotel rooms are suitable for recurrent units (Cantacuzino, 1975). It is important for these spaces to use flexible and

demountable systems, positioned at a height and made from materials that do not compromise the space perception.

The project that proposed the reuse of Feshane-i Amire building as a City Museum at the design studio installed administrative units in areas with partitioned designs instead of the single-volume main space, preserving the plenary perception of the main volume.

Service spaces:
Service spaces are auxiliary spaces like kitchen, toilet, technical volumes and depots etc. These spaces may be installed in partitioned volumes of the built heritage, like in the case of special use spaces, or inside an additional structure (Selçuk, 2006). Contemporary additions need to be in the smallest sizes possible and made from materials compatible with the colour, texture and materials of the historic structure, to maintain the integrity and to be removable without damaging the structure (Ersen, 1992).

At the design studio, in all of the reuse projects on the Tophane-i Amire building organization of the service spaces has been done in an additional building in the site, not inside the historic structure in order to maintain the single-volume perception of the historic building.

Volumetric decisions
Volumetric organization, which consists of characteristics like partitioned spaces or single-volume space and permeability or opacity of partitions, helps promote identity of the space with its psychological influence. In this context, maintaining the volumetric organization and perception of the space is a part of conserving the historical building (Kasli, 2009). A new use and new functional requirements to be fulfilled within the boundaries of an existing building will entail a new space ordering which in turn will necessitate substantial amount of changes to take place in the space configuration of the original building. A new space configuration may involve not only the complete rearrangement of floor plans but also may dictate radical changes in floor heights (Eyuce & Eyuce, 2010). In this case, it is necessary to approach the matter with a perspective that does not fundamentally change a floor plan or interior space that defines the entire historical and architectural character of the structure (Weeks & Grimmer, 1995). Volumetric decisions made during the transformation process of the interior may be grouped as vertical and horizontal changes:

Vertical change: Dividing the volume by adding new floors, mezzanines, suspended ceilings or elevation differences
Horizontal change: Dividing the volume with partitioning surfaces or panels

Two important volumetric decisions have been made at the design studio following the student discussions during group critiques:

'When it is necessary to use vertical partitions, it is decided to use panels and low dividers that define the necessary space only and do not compromise perception by completely dividing the original space'.

'When it is necessary to add floors for the requirements of new use, it is decided to use partial mezzanines with galleries that do not weaken the space perception and do not interrupt the relationship between doors, windows and niches, etc. with the original building'.

Within this scope, the project that proposed the reuse of Feshane-i Amire building as a City Museum used independent, flexible, demountable and light panels were used as partitions to define children's workshop and café spaces instead of walls that vertically divide the entire space and may damage the original architecture by direct contact, preventing the loss of original scales. Additionally, in the projects that proposed the reuse of Tophane-i Amire building as Handicraft Museum, Sculpture Museum and Marine Museum, steel-glass construction added for a higher perception of the exhibition hall downstairs horizontally divided the partial mezzanine but preserved the original space perception with gallery space around it.

Structural and Material Selection Related Decisions

The two most important principles in making decisions on structural and material selection for reuse applications are 'reversibility' and 'providing legibility of layers'. Reversibility principle is the primary criterion during the design process of adaptive reuse applications. Reuse is driven from two basic concepts: 'Reprogramming' and 're-architecture.' The former stands for the rearrangement of existing spaces for a new use and the latter defines the application of new programs by using the potential of language of architecture (Cengizkan, 2006). In reprogramming, most of the interventions in structural system are limited to repair and reinforcement work (Kasli, 2009). But in re-architecture, when spaces necessary for the new use cannot be created due to structural characteristics, it is possible to make interventions like opening new windows, removing or adding walls, removing floorings or adding new floor coverings, and building additional

walls (Selçuk, 2006). However, interventions made in the structure and material during re-architecture should not irreversibly remove identical characteristics of the original structure (Kasli, 2009).

Another point to take into consideration while making structural and material related decisions for reuse applications is 'preserving all meaningful layers as well as the original style of a building.' The second most important principle in reuse applications is to analyze and uncover traces of the structure's era, maintain, bring together and overlap independent qualities of the old and the new, in other words, 'providing legibility of layers.' New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. Designers should be careful not to have structures of two different periods be in direct contact in adaptive reuse projects. There are technical and aesthetical reasons for this. (Öter, 1996). The new work shall be differentiated from the old and shall be compatible with size, scale, and architectural features to protect the historical integrity of the building (Asoobar, 2009). Details of new elements required by reuse may become concrete with technology and materials brought by the original design. Technology often integrates with design through the use of new materials. The goal is to achieve architecture of actual time through technology (Meiss, 1990).

These two principles have been debated over while making structural and material related decisions at the design studio and the best practice cases of these principles have been analyzed. The co-decision of the design studio group was designing mezzanines, staircases, ramps and other structural additions independent from the original structure in a way that reflects recent materials and technologies but also complements the original structure in scale and colour. For instance, in the project that proposed the reuse of Darphane-i Amire building as an Art Museum, the stone load bearing structural properties of historical buildings are preserved and the new spatial requirements are solved with additional steel/wood structural elements sensitively placed inside original building. In these projects the old and new co-exist as representatives of two different architectural era. In the project that proposed the reuse of Tophane-i Amire as a Sculpture Museum, cafés and exhibition halls under the domes have been put in a steel-glass sphere, explicitly distinguishing the old and the new.

CONCLUSION

Conservation of a cultural asset 'in use' is the correct approach towards conservation. Conservation without use is regarded as a conservative manner of museology (Tapan, 2007). Many buildings that cannot perform today in their original use have the potential

to be adapted for reuse. In order to have optimum use from scarce resources and profit financially, it is important to design old structures for reuse towards adapting to sustainable living, which has become a contemporary necessity. If the building with the reuse potential is a historic one with cultural value, 'reuse', as a means of conservation, involves further benefits because buildings with cultural-historical value are the most concrete references to information about older lifestyles. In this context, conservation, which is an important subject of architectural practice, is an area that should be studied starting from architecture education. However, this experience is conveyed merely as theory and design experience which is generally lacking in architecture schools. Adaptive reuse, extending the life of defunct building gives a wide array of architectural design possibilities. The most appropriate environment to transform theoretical knowledge into practice in schools is design studios. This study explains faced problems, searches for solutions and decision-making process during an adaptive reuse experience in a design studio. Decisions taken and criteria applied during the studio are summarized in figure 8.

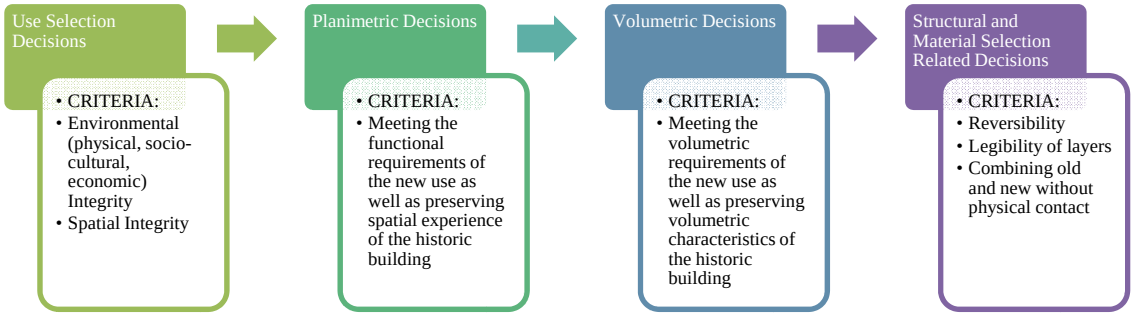

Figure 8. Decision making process in adaptive reuse studio

This study aims to share an educational process. There exist no a clearly stated design method, but just design criteria to follow as a source of guidance, when approaching to the development of adaptive reuse projects. Each design problem for adaptive reuse defines its own process of solution. The paper recommends the significance of design studios for teaching conservation projects which also offer a wide variety of possibilities for developing creative thinking skills of the students in dealing with the built heritage. Design studios are the most productive environment where students practice how to deal with heritage elements by developing creative concepts.

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