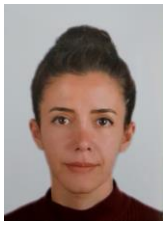
Investigation of Knowledge About Building Deconstruction Concepts of Companies in the Field of Urban Transformation in Turkey

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Abstract: *Buildings are demolished uncontrolled regardless of the disassembly and recovery possibilities in demolition activities realized within the scope of urban transformation. As a result of the demolition works carried out mostly by using traditional methods, excessive constructional waste is generated and left to nature. This situation causes important environmental and health problems and increases the consumption of energy and natural resources. It is necessary to produce innovative and environmentally protective solutions in order to reduce the negative consequences of demolition activities within the scope of urban transformation. The concept of deconstruction, which is considered as an alternative for the demolition of buildings, is one of the solutions evaluated in this context. It is possible to eliminate or reduce the negative effects of demolition activities by using building deconstruction methods in the field of urban transformation. However, the applicability of appropriate methods depends on the knowledge of the companies serving in the field of urban transformation about the concept and methods of deconstruction, and their level of having appropriate infrastructure and equipment. In this context, a field study was conducted in order to determine the knowledge levels of firms operating in the field of urban transformation and their general approach to the concept of deconstruction. In the study, a questionnaire was applied to company officials in accordance with the survey method, the answers were analyzed with the SPSS program, and the findings were obtained depending on the frequency and percentage distribution, average and standard deviation values of the answers. Findings were evaluated using the pairwise comparison method. As a result of the study, a general evaluation has been done on the knowledge and implementation levels of the companies in building deconstruction.*

Keywords: *Building deconstruction, urban transformation, demolition, disassembly, recovery.*

Türkiye'de Kentsel Dönüşüm Alanında Hizmet Veren Firmaların Bina Yapıbozum Kavramı ile İlgili Bilgi Durumlarının Araştırılması

Özet: *Kentsel dönüşüm kapsamında gerçekleşen yıkım faaliyetlerinde söküm ve geri kazanım olanakları sorgulanmadan binalar kontrolsüz bir şekilde yıkılmaktadır. Çoğunlukla geleneksel yöntemlerin kullanılarak gerçekleşen yıkım çalışmaları sonucunda çok fazla yapısal atık oluşmakta ve doğaya terk edilmektedir. Bu durum önemli çevre ve sağlık sorunlarına neden olmakta enerji ve doğal kaynakların tüketimini arttırmaktadır. Kentsel dönüşüm kapsamında gerçekleşen yıkım faaliyetlerinin olumsuz sonuçlarının azaltılması için yenilikçi ve çevreci çözümlerin üretilmesi gereklidir. Binaların yıkımı için bir alternatif olarak görülen yapıbozum kavramı bu bağlamda değerlendirilen çözümlerdendir. Kentsel dönüşüm alanında bina yapıbozum yöntemlerinin kullanılması ile yıkım faaliyetlerinin neden olacağı*

olumsuz etkileri yok etmek ya da azaltmak mümkündür. Ancak uygun yöntemlerin uygulanabilirliği kentsel dönüşüm alanında hizmet veren firmaların yapıbozum kavramı ve yöntemleri konusundaki bilgi birikimlerine, uygun altyapı ve ekipmanlara sahip olma düzeylerine bağlıdır. Bu bağlamda çalışmada kentsel dönüşüm alanında faaliyet gösteren firmaların yapıbozum kavramı ile ilgili bilgi düzeyleri ve konuya genel yaklaşımlarını belirlemek amacı ile bir alan çalışması yapılmıştır. Çalışmada anket yöntemi ile firma yetkililerine sorular yöneltilmiş, yanıtlar SPSS programı ile analiz edilmiş, yanıtların frekans ve yüzde dağılımları, ortalama ve standart sapma değerlerinden yararlanılarak bulgular elde edilmiştir. Bulgular ikili karşılaştırma yöntemi kullanılarak değerlendirilmiştir. Çalışmanın sonucunda firmaların bina yapıbozum konusu ile ilgili bilgi ve uygulama düzeyleri ile ilgili genel bir durum tespiti yapılmıştır.

Anahtar Kelimeler: *Bina yapıbozumu, kentsel dönüşüm, yıkım, söküm, geri kazanım.*

1. INTRODUCTION

Urban transformation is a concept that includes the actions and strategies created to improve the collapsed and deteriorated areas of the city as a result of war and natural disasters and to improve the economic, social, environmental and physical issues with an integrated approach [1]. In urban transformation practices, instead of maintenance, refurbishment or reinforcement works aimed at reducing the disaster risk of the buildings, the buildings were rapidly demolished and constructed.

Earthquake is the prominent natural disaster in Turkey. The possibility of a devastating earthquake is very high for the large settlements include the 70% population of the country in Turkey. For instance, in the earthquake scenario for Istanbul, it is predicted that approximately sixty thousand buildings would be heavily damaged and fifty thousand people would die [2]. According to the Ministry of Environment and Urbanısation, nearly 14 million of the 19 million houses in Turkey are required to be examined in terms of disaster risk. In this context, the Ministry of Environment and Urbanization predicts that buildings do not meet the earthquake-safe design and construction criteria, should be demolished within the next 20 years. Accordingly, it aims to demolish and reconstruct an average of 334.000 buildings annually within the scope of urban transformation [3]. Accordingly, it is aimed to consider that the urban transformation covers a large portion of the existing building stock in Turkey, a transformation process in which the roles of all relevant disciplines are defined and the control mechanisms work properly should be planned. Unplanned approaches to urban transformation, rapid demolition and construction activities have created many environmental and management problems such as energy and natural resource consumption, waste generation, health and safety. Many researches have been initiated to produce more environmentally solutions to reduce the problems that arise. One of them is the concept of building deconstruction, regarded as an alternative to demolition. Implementations within the scope of this concept aim to reduce the amount of constructional waste by researching the disassembly and recovery potential of buildings that have completed their service life before demolition. It also helps to reduce many negative environmental impacts caused with demolition by using more environmentally friendly and innovative methods in cases where demolition is inevitable.

2. DECONSTRUCTION

The concept of deconstruction first arose in the 1960s with the leadership of post-structuralist philosopher Jack Derrida, as an opposing view to the concept of structuralism. The concept of deconstruction advocates that old texts can be reconstructed and new meanings constructed, based on the acceptance that language is a tool whose outlines are not clearly drawn. Derrida saw the concept of deconstruction as a metaphor, especially an architectural metaphor [4]. The concept of deconstruction, which has become widespread in fields such as philosophy, literature, linguistics, sociology, aesthetics, and communication, turned into a trend in the field of architecture by architects such as Peter Eisenman and Bernard Tschumi

in the 1980s. Esin (1989), explained the concept of deconstruction in the field of architecture as "the coexistence of forms that are different from each other, that affect each other, even disrupt, but do not try to destroy each other. "

In many scientific studies published in the 1990s, the concept of deconstruction has been suggested as an important strategy that can assist architects in solving problems such as natural resource consumption, economic waste, more and more deterioration of the ecological environment caused by conventional disassembly and demolition. In this context, deconstruction can be explained as "a strategy that allows the parts of a system and the whole system to be reused or recycled, in other words, to be disassembled and decompose successfully for recovery. "

With the introduction of design strategies such as "design for recycling", "design for reuse", "design for reproduction", "design for disassembly" which were previously applied in the field of industrial product design, the "Design for Deconstruction (DfD) " approach has developed in architecture. DfD is a design approach that aims to recover environment and its parts at the end of service life, thus extending their lives. With the DfD approach, it is possible to systematically disassembly the components of buildings without causing damage at the end of the service life, and to extend their lives by reusing or recycling these components in the future. This approach allows the existing and new building stock to serve as primary resource and material for future changes, extracted and obtained from the existing building stock rather than consuming the natural environment. Therefore, the DfD approach can be regarded as an alternative solution to traditional demolition where all components turn into constructional waste [6, 7].

Deconstruction, unlike demolition, provides natural resource conservation by preventing the creation of constructional waste with recycling and reuse approaches [8]. According to Macozoma (2001); "Deconstruction prevents most of the wastes generated in construction and demolition from going to waste areas". This helps to extend the life of building components, to reduce health problems caused by demolition, and to use waste storage areas in a controlled manner.

The construction and demolition sector is responsible for the generation and disposal of a large part of waste, many of which can be recycled or reused. Deconstruction activities can recover million tons of construction and demolition waste for recycling and reuse. Deconstruction reduces the need for incineration and storage and gas emission in the air by reducing waste generation. Most importantly, it directly helps the construction and demolition industry from traditional consumption and destroying activities in the face of sustainability and reuse [10].

In urban transformation works where demolition activities take place intensely, the negativities caused by demolition are eliminated with the environmental and practical solutions offered by the concept of deconstruction and the process is carried out in a healthier way. The implementation of the concept of building deconstruction in the field of urban transformation depends on the teams to be assigned to have a certain level of knowledge about the methods, implementation techniques and related legal regulations that the concept includes. Therefore, in the study, it is aimed to determine the knowledge and implementation levels of firms working within the scope of urban transformation in Turkey about the concept of building deconstruction.

2.1 Deconstruction Methods and Techniques

It is possible to use building deconstruction methods such as disassembly, selective demolition and recovery to prevent the components of buildings from being released to the environment as waste when their service life ends.

2.1.1. Disassembly and Selective Demolition Methods

During the construction process, disassembly separates the building system into its components, allowing a high recovery within a certain order.

Disassembly of the building and its components is possible when certain design conditions are provided. In the publication entitled "Design Guide for Disassembly", it is emphasized that 10 basic principles are needed for the design of a building for disassembly [11].

- Document materials and methods for deconstruction
- Select materials using the precautionary principle
- Design connections that are accessible
- Minimize or eliminate chemical connections
- Use bolted, screwed and nailed connections
- Separate mechanical, electrical and plumbing systems
- Design to the worker and labor of separation
- Simplicity of structure and form
- Interchangeability
- Safe deconstruction

Conventional demolition can be defined as destroying the building without considering the recovery possibilities of the building components. In the specified situation, the recycling of components, hazardous material management, occupational health and safety issues are not considered very much. However, nowadays, the concept of selective demolition has emerged, which reduces environmental problems caused by the demolition of buildings and enables controlled recovery of building components.

Recently, many studies have been carried out on building demolition methods and tools, seeking more environmentally friendly and innovative solutions, giving importance to human health and safety. One of them is water jets that do not cause noise, dust and vehicle traffic, cares occupational health and safety, and provide less water consumption. They allow to disassemble the concrete and reinforcement inside the reinforced concrete system with the least damage [12].

Some methods and tools have been developed that allow the demolished parts to be separated on the site. One of them is grapple and magnet attachment, while the magnetic part selects the iron-containing building components, the clamp part allows the parts to be easily grasped from the rubble pile and moved to the relevant places. The other is bucket crusher attachment, helps to easily carry large size building components in the site as a result of demolition. It also ensures that the building components are grinded and decomposed in the site without going to recycling or waste areas [13].

2.1.2. Recovery Methods

There are several strategies for the recovering of a building system and its parts at the end of their life cycle, from complete relocation and reuse, to part recycling or incineration for energy It is possible to discuss recovery strategies under two headings as reuse and recycling. Reuse strategy is the process in which building parts removed from its original location and used it again at another location. Recycle is

the process in which building parts break down into raw materials so that they can be processed into building materials or manufactured into building components [14].

2.1.3. Deconstruction Implementation Processes

There are three important application processes for the separation of a building or building part that reaches the end of its service life. These are design, implementation and control processes for demolition / disassembly. The deconstruction implementation process of a building that has completed its service life is organized by considering its site, environmental, structural product and material properties, occupational health and safety, laws and regulations and the practice and training levels of the teams to work.

In order for deconstruction processes to function properly, there is a need for an information management system where design and implementation processes can constantly exchange information with each other. Necessary design information, analyzes, reports, documents should be delivered to the application teams through the information system, and at the same time, the return information about the necessary corrections in the application should be delivered to the design teams in a healthy and uninterrupted manner through the information system. There is also a need for an audit process to check whether the design decisions are made in accordance with the deconstruction and whether the decisions are implemented in the field under appropriate conditions [9, 15, 16].

2.1.4. Legal Regulations

In many countries, studies are carried out on planning, implementation and legal regulations to reduce and eliminate the negative effects caused by building demolition activities. In particular, the studies on the reduction of waste generation and the recycling of the waste generated have been supported by the governments. Selective demolition practices have become a legal requirement in many countries for a controlled demolition process by pre-designing the demolition process.

In addition, green building evaluation and certification systems that are valid in many countries such as LEED, BREEAM, DGNB have been established for the sustainability and protection of buildings and building parts to be applied throughout the life of the buildings.

There are a variety of legal arrangements in Turkey, including demolition, recovery and urban renewal titles. These are;

- The Environmental Law, which was created in 1983 to protect the environment in line with the principles of sustainable environment and sustainable development,
- Excavation Soil, Construction and Demolition Wastes Control Regulation, which was created in 2004 for the management of construction and demolition wastes and excavation soil that will occur during and after the construction, demolition process,
- Regulation on the Landfill of Wastes, which was created in 2010, which includes technical and administrative issues related to eliminating environmental pollution caused by wastes, determining the acceptance conditions of waste storage areas and how the facility will be operated,

- The Law on the Transformation of Areas Under Disaster Risk, which was established in 2012, which includes the procedures and principles of improvement and renovation works to create healthy and safe environments in areas with risky structures,
- Waste Management Regulation, created in 2015, which includes certain criteria, conditions and features in order to reduce waste generation and use of natural resources and increase recovery opportunities in the entire process from waste generation to disposal without harming the environment and human health,
- It is the Green Certificate Regulation for Buildings and Settlements, which was created in 2017, which aims to eliminate adverse conditions affecting the environment by protecting natural resources and increasing energy efficiency in residential areas, providing evaluation, certification system, determining the authorities of those who will take part in the process.

The draft regulations that have not yet come into force are;

- Draft Regulation on the Control of Demolition Operations and Excavation Soil, Construction and Demolition Wastes in order to increase the efficiency and effectiveness of the demolition and excavation activities and the management and control of the excavation soil and construction and demolition wastes that will arise as a result of these activities in a way that does not harm the environment and human health and safety,
- It is the Draft Regulation on Sustainability Performance Urban Transformation, which includes the necessary conditions and procedures for the creation of more sustainable and ecological areas as a result of urban transformation applications.

3. METHOD

In order to determine the level of knowledge and implementation regarding the concept of building deconstruction, a survey consisting of 8 questions was prepared in the study. The survey was created using scientific research techniques. The questions were prepared in a clear and understandable language [17]. Participants were asked to read a pre-evaluation text before answering the questions. In this text, the aim of the study, short definitions about the concepts subject to the research, information about the protection of the institutional and personal data of the participants are included.

The sample of the study was determined as the companies operating in the field of urban transformation in line with the purpose of the study. According to TurkStat (Turkish Statistical Institute) data, the total building stock in Turkey is approximately 19.5 million, where about 4 million of this stock is located in Istanbul. In the same source, there is the information that approximately 70% of the building stock in Istanbul was built before 2001, 18% was built after 2001, and 12% is not known when it was built [18]. 68 thousand of 197 thousand risky buildings ascertained by the Ministry of Environment and Urbanization since 2012 are located in Istanbul [19]. According to the data; The majority of the buildings, constructed before 2001 in Turkey, which are uncontrolled and classified as risky are located in Istanbul.

In addition, ın Turkey, most of the construction activities in the urban transformation take place in Istanbul. For this reason, Istanbul province was chosen as the study area. Many companies operate in the field of urban transformation in Istanbul. Accordingly, in forming the sample cluster, priority was given to the companies that have an institutional and organizational infrastructure and with experience in urban transformation.

As a result of the researches conducted in this context, companies operating in the field of urban transformation in Kadıköy -a district in Istanbul- where urban transformation implementations take place the most, were examined. It was ascertained that these companies are members of the Anatolian Side Construction Contractors Association (ASCCA). It was foreseen that these companies, which operate under a corporate roof, will contribute to the planned execution of the study, and the sample cluster was determined as companies that are members of ASCCA and carry out urban transformation implementations.

It has been stated that 5 of the 155 companies that are members of ASCCA do not carry out construction activities anymore. The survey form was sent via e-mail to 150 companies that continue their activities. It was thought that there might be some difficulties in reaching companies by mail and in companies considering the survey. In order to get the responses safety and rapidly to the survey, it was decided to conduct the survey with face-to-face interviews. An appointment was requested by establishing direct contact with the companies via phone and e-mail. A total of 30 companies accepted the meeting request. It was ensured that companies fill out the survey form with face to face interviews. The interviews were implemented with the managers or the most authorized person (architects, technical managers, project managers, directors and deputy managers, managers and company owners) in the company. The survey was applied between 1 November 2018 and 15 December 2018.

The answers to the survey questions were evaluated using the SPSS 24.0 (Statistical Package for Social Science) program. While analyzing the answers obtained from the questions;

- Frequency and percentage distribution of firm characteristics,
- Average and standard deviation values were calculated in order to determine the knowledge level of firms about the concept of deconstruction.

4. FINDINGS

In the study, firstly, in order to understand the general structures of participating companies, questions were asked about their working areas, the types of services they provide and the teams they employ. According to the answers to the questions, first of all, the working fields of the companies are examined in Table 1.

While 9 (30%) companies participating in the research operate only in the field of construction, the other 9 (30%) operate both in the field of design and construction. 5 companies operating in both construction and production fields, 6 companies operating in both design, construction and production fields and 1 company operating only in the field of design.

***Table 1**. Working fields of the companies participating in the survey.*

Working fields	Frequency (N)	Percentage (%)
Design	1	3.3
Construction	9	30.0
Design and Construction	9	30.0
Construction and Production	5	16.7
Design, Construction and Production	6	20.0
Total	30	100.0

The working fields of the company authorities that answered the survey are included in Table 2. 12 of the company officials who answered the survey stated that they work in the field of design and construction, the other 9 only in the field of construction, 4 officials in the field of design, construction and production, and 3 officials in the field of construction and production. Twelve of the officials are company owners, and four of them declared their job descriptions as architects, one as civil engineer and two as contractors. 3 of the officials are company partners and one of them defined the professional group as architect. 3 of the authorities are managers and one of them has defined his role as an architect. While 4 of the officials are doing project control, 2 of them are the general manager, one is the assistant manager, one is the site chief, one is the procurement specialist and one is the administrative.

***Table 2.** The working fields of the company authorities that answered the survey.*

Working fields	Frequency (N)	Percentage (%)
Design	1	3.3
Construction	9	30.0
Production	1	3.3
Design and Construction	12	40.0
Construction and Production	3	10.0
Design, Construction and Production	4	13.3
Total	30	100.0

Service types provided within the scope of new building project, existing building maintenance-refurbishment-retrofit project, restoration project and urban transformation projects were gathered under 10 headings in the survey. The companies were asked which of the service types specified in the survey they provided within the company and the findings in Tables 3 and 4 are obtained. It has been determined that the companies participating in the survey serve within the scope of urban transformation project. In addition, while 29 companies (96.7%) provide services in the field of preliminary project design and drawing in urban transformation projects, 27 of them (90%) provide services in the field of detail and final drawings.

Table 3. *The services types that companies provide according to their project types.*

Service Types	New Building Project	Existing Building Maintenance-Refurbishment-Retrofit Project	Restoration Project	Urban Transformation
Preliminary project design and drawing	23	7	2	29
Detail and final drawings	20	6	3	27
Static calculations, drawings and reports	15	3	2	18
Mechanical system calculations, drawings and reports	10	3	2	13
Electrical system calculations, drawings and reports	10	2	2	13
Assembly and disassembly plan, detail drawings and reports	11	3	2	16
Demolition plan, detail drawings and reports	8	2	2	14
Scenario-based design and detail drawings	11	5	1	14
Recovery cost analysis	8	2	1	13
Life cycle assessment analysis	11	4	2	14

Table 4*. The services types that firms provide in the field of urban transformation.*

Service Types	N	%
Preliminary project design and drawing	29	96,7
Detail and final drawings	27	90,0
Static calculations, drawings and reports	18	60,
Mechanical system calculations, drawings and reports	13	43,3
Electrical system calculations, drawings and reports	13	43,3
Assembly and disassembly plan, detail drawings and reports	16	53,3
Demolition plan, detail drawings and reports	14	46,7
Scenario-based design and detail drawings	14	46,7
Recovery cost analysis	13	43,3
Life cycle assessment analysis	14	46,7

Findings regarding the teams employed by the companies are included in Table 5. According to this; most of the companies stated that they have architectural design team (87%), structural system construction team (63.3%), electrical system construction team (60%) and mechanical system construction team (56.7%). A small portion of the companies expressed that they have a demolition team (43.3%), an environmental health and safety team (36.7%) and a product design team (33.3%). In addition, very few companies stated that they have an assembly-disassembly team (23.3%), hazardous waste management team (10.0%), life cycle assessment team (6.7%), and constructional waste assessment team (6.7%).

Table 5. *The teams employed by the companies.*

Teams	N	%
Architectural design team	26	86,7
Product design team	10	33,3
Structural system design team	15	50,0
Mechanical system design team	10	33,3
Electrical system design team	11	36,7
Structural system construction team	19	63,3
Mechanical system construction team	17	56,7
Electrical system construction team	18	60,0
Demolition team	13	43,3
Assembly-disassembly team	7	23,3
Structural system production team	3	10,0
Plumbing system production team	4	13,3
Electrical system production team	5	16,7
Constructional waste assessment team	2	6,7
Hazardous waste management team	3	10,0
Occupational health and safety team	15	50,0
Environmental health and safety team	11	36,7
Life cycle assessment team	2	6,7

An open-ended question was asked to find out the teams within the companies, other than the teams specified in the survey. 13 companies expressed that they work with teams other than listed in the survey and / or receive services from subcontractors. One firm stated that it has “visual communication and advertising, landscape and botanical expert, geotechnical evaluation specialist, ground survey, map engineer” within the company, apart from the work teams listed in Chart 5, and two firms declared that they have benefited from the work teams of the municipality, especially on constructional waste.

Findings regarding whether the firms have information about building deconstruction are included in Table 6. 26.7% of the participants stated that they did not know the concept of deconstruction, 26.7% partially knew and 46.6% stated that they knew. All of the companies (96.7%) expressed that they had information about the demolition, 90% of companies had information about disassembly.

Table 6. *The knowledge level of firms about concepts related to deconstruction.*

Concepts	I do not know		I partially know		I know		Average	Standard Deviation
	N	%	N	%	N	%		
Deconstruction	8	26,7	8	26,7	14	46,6	2,20	0,84
Recovery-Recycling	-	-	6	20,0	24	80,0	2,80	0,40
Recovery-Reuse	-	-	6	20,0	24	80,0	2,80	0,40
Disassembly	-	-	3	10,0	27	90,0	2,90	0,30
Demolition	-	-	1	3,3	29	96,7	2,96	0,18

In the survey, the participants were asked whether there are any other concepts they know about the concept of building deconstruction. Answers given; It was ascertained as “no” with 80% and “yes” at 20%. When the statements given by the 6 companies that answered yes to the question are examined, the concepts stated by the companies are respectively;

- Consolidation, Reintagnation

- Sustainability
- Restoration, Renovation, Restitution, Conservation
- Post-modern architecture
- Reconstruction
- Ecological structure, ecology
- Maintenance-Refurbishment.

It was requested from the firms to answer which sources they obtained information about deconstruction and other concepts. The responses obtained are indicated in Table 7. 18 companies expressed their sources of information regarding Deconstruction as face-to-face meetings with other companies or individuals. 18 firms declared their sources of information on recycling as visual and audio materials, and 13 firms stated their sources of information on disassembly as visual and audio materials. Most of the participants who expressed their sources of information about the concepts as "other" represented this resource as "sample implementations."

***Table** 7. Information resources of firms about concepts related to deconstruction.*

Concepts	Printed	Digital	Audio / Visual	Individual	Other
Deconstruction	7	7	4	18	7
Recovery-Recycling	14	12	18	14	12
Recovery-Reuse	11	11	15	13	10
Disassembly	7	6	13	13	11
Demolition	10	8	12	18	15

When the knowledge levels of the companies participating in the research and their sources of information about the concepts were examined in cross tables. These findings are as follows:

- 7 out of 14 companies which have information about deconstruction stated that their information sources are printed and digital materials.
- 24 companies declared that they had information about recycling. It was determined that 11 of firms are printed materials, 10 of them are digital materials and 14 of them are audio and visual materials.
- 24 companies that have information about reuse. 10 of them explained their sources as printed materials, 9 of them as digital materials and 11 of them as visual and audio materials.
- 27 companies that have information about the concept of disassembly. A few of them stated that their information source is printed (7 companies) and digital materials (6 companies), while almost half (13 companies) have the information source with other companies and individuals (face-to-face interviews).
- 29 companies stated that they had information about the demolition. 8 of them expressed their sources as printed and digital materials, 11 of them as visual and audio materials and 18

companies as face-to-face interviews with other companies and individuals and their previous practices under the other heading.

It was also verbally declared by the company officials that the face-to-face survey study contributed to the knowledge of the concept of deconstruction. In addition, companies' other sources of information;

- The Union of Chambers of Turkish Engineers and Architects (TMMOB) website, ASCCA official website
- Archdaily, Dergipark (engineering and basic sciences), Journal of Construction, Architecture XL Magazine
- Their field practices.

In the survey, it was asked to the firms whether deconstruction and other concepts are important for Turkey construction sector and the findings obtained in Table 8 are expressed. Participants were asked to evaluate the importance of these concepts. According to the answers given, firms stated that the concept was important for Turkey construction sector (Avg: 2.90).

***Table 8**. According to the companies, the importance levels of concepts, in Turkey's construction sector.*

Concepts	Unimportant		Less Important		Important		Average	Standard deviation
	N	%	N	%	N	%		
Deconstruction	-	-	3	10,0	27	90,0	2,90	0,30
Recovery-Recycling	-	-	3	10,0	27	90,0	2,90	0,30
Recovery-Reuse	-	-	3	10,0	27	90,0	2,90	0,30
Disassembly	-	-	3	10,0	27	90,0	2,90	0,30
Demolition	-	-	7	23,3	23	76,7	2,76	0,43

The companies were asked whether they know case studies in Turkey and other countries about deconstruction and answers obtained were examined in Table 9. 26 companies stated that they know about the most of the demolition practices in Turkey. Besides, 23 of them declared to know case studies about recycling, 17 of them about reuse and 11 of them about disassembly and deconstruction in Turkey. In addition, 3 of the companies participating in the research expressed that they know a case study in the world in the field of deconstruction, while 9 companies stated that they know examples of implementations in the world in the fields of recycling, reuse, demolition and disassembly. The responses given by the companies that stated their knowledge of case studies were examined separately and the following findings were obtained:

- It was stated that these concepts are used in demolition implementations in urban transformation projects realized in Turkey. It was stated that during the waste removal process after demolition, materials are separated to polymer, concrete metal... etc and processed in recycling facilities. In addition, it was stated that the construction areas where recycling materials (especially in infrastructure systems and as filling material) are mostly as metro and residential constructions.

- In addition to the demolition implementations in the process of urban transformation projects in Turkey, the conservation of cultural or historic buildings works are also given as examples.
- GOLD certified Mustafa Bey Apartment, Fikirtepe Evinpark Kadıköy Project and Ata apartment built in partnership with TERECE Gayrimenkul in Suadiye are given as case studies where the recycling concepts are applied.

***Table 9**. The number of case study about the concepts that the firms know in Turkey and the other countries.*

Concepts	Turkey	Other Countries
Deconstruction	11	3
Recovery-Recycling	23	9
Recovery-Reuse	17	9
Disassembly	17	9
Demolition	26	9

It was requested from the firms to response whether they know implementation techniques about deconstruction in Turkey and other countries, answers obtained were examined in Table 10. Total 26 companies stated that they know about the most demolition implementation techniques in Turkey. Besides, for the field of recycling 22 companies, the field of reuse 18 companies, the field of disassembly 16 companies and the field of deconstruction 9 companies also declared that they know implementation techniques in Turkey.

***Table 10.** The number of implementation techniques about the concepts that the firms know in Turkey and the other countries.*

Concepts	Turkey	Other Countries
Deconstruction	9	2
Recovery-Recycling	22	9
Recovery-Reuse	18	10
Disassembly	16	9
Demolition	26	11

The responses given by the companies that stated that they knew the application technique were examined separately. The following techniques came to the fore:

- For demolition; total demolition up to 6 floors, demolition shears up to 5 floors and mini machine techniques for buildings 5 floors and above 5 floors, excavator, crushing technique, hydraulic cutting, dynamite / electric blasting techniques,
- For recycling; separation technique,
- For reuse and recycling; disassembly of joinery, radiators, staircase and balcony railings and iron fittings in concrete to be sent to factories.

In Turkey and in other countries, it was asked to the firms whether they knew about the deconstruction legal regulations and responses were investigated in Table 11. Total 24 companies stated that they know about the most demolition legal regulations in Turkey. Besides, to the field of recycling 18 companies, the

field of reuse 8 companies, the field of demolition 8 companies and the field of deconstruction 5 companies stated that know the legal regulations in Turkey. Most of the companies stated that they know the Urban Transformation Law No. 6306.

Table 11. *The number of legal regulations about the concepts that the firms know in Turkey and the other countries.*

Concepts	Turkey	Other Countries
Deconstruction	9	2
Recovery-Recycling	22	9
Recovery-Reuse	18	10
Disassembly	16	9
Demolition	26	11

The studies conducted by the companies on the concepts were asked and the answers are given in Table 12. It was interviewed that companies mostly work in the fields of projects and implementation related to the concepts. It has been determined that the most studies have been done on recycling and demolition issues, while the least work has been done on deconstruction. One of the companies stated that, they have completed over 200 urban transformation Project. As the company that makes the most urban transformation applications in ASCCA, and comprehensively deals with the concepts related to deconstruction in their applications. Two of the companies stated that they carried out papers, seminars and projects on behalf of ASCCA, including concepts related to deconstruction.

Table 11. The studies that companies have done on deconstruction concepts.

Concepts	Article	Report	Book	Journal	Seminar	Project	Implemen -tation	Other	Total
Deconstruction	0	0	0	0	0	3	3	2	8
Recovery-Recycling	1	5	1	2	2	7	13	2	33
Recovery-Reuse	1	5	1	3	2	8	10	1	31
Disassembly	0	2	0	1	1	4	8	1	17
Demolition	1	3	1	2	2	7	15	1	32
Total	3	15	3	8	7	29	49	7	

5. CONCLUSION AND RECOMMENDATION

The general approaches of the companies working in the field of urban transformation regarding the concept of building deconstruction were examined together with a survey organization within the scope of this study. Firstly, a preliminary information section was created in the survey to help companies express their fields of work, the types of services they provide and the work teams they have within their organization. The demographic characteristics of the companies were determined with the information obtained from this section. In the light of the data obtained, it has been ascertained that all of the companies provide services in the field of urban transformation. The responses given by the companies for the types of services they provide in the field of urban transformation (Table 4) and the teams they have within their organization (Tabe 5) have been examined. As a result of the examination, the following findings were obtained:

- It has been determined that the most of the companies participated to the survey provide services related to preliminary project design and drawing, detail and final projects, static, electrical and

mechanical projects in the field of urban transformation. It has been ascertained that a small number of companies perform services such as assembly, disassembly, demolition plans, recovery and life cycle evaluation analysis.

- Although most of the companies have design and construction teams within their organization, it has been determined that very few companies do not have demolition, disassembly-assembly, structural waste assessment, hazardous waste management, occupational and environmental health and safety, life cycle assessment teams.

Later in the survey, questions were asked to determine the knowledge levels of the companies. The answers given to the questions were analyzed separately and in pairwise comparisons. The findings are summarized below:

- It has been ascertained that few companies know the subject of deconstruction and many companies know the other concepts.
- It is understood that the sources of information of the companies that indicate that they have information about the concepts are mostly audio / visual sources and people in the construction sector. It has been found out that companies do not use print and digital resources to obtain information about the concepts. The reasons for this situation are that companies are less interested in such resources, have difficulty in accessing resources, and lack of sufficient knowledge to examine resources.

As a result of the study, it is stated that firms working in the field of urban transformation have a general knowledge about the concept of building deconstruction; however, it was determined that their knowledge and implementation levels on the concepts are very low. It was understood that they had knowledge about concepts such as recovery, disassembly and demolition, but their way of obtaining information was not sufficient. In this context, it is recommended to carry out studies such as providing training on the concept, opening certificate programs and publishing guide books in order to increase the knowledge and implementation experience of companies. In addition, making legal arrangements regarding building deconstruction will help the urban transformation processes to be realized faster and with less environmental impact.

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