INVESTIGATION OF LEGAL ISSUES AND CONTRACTUAL CONSIDERATIONS ASSOCIATED WITH BIM USE IN CONSTRUCTION PROJECTS

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ABSTRACT

INVESTIGATION OF LEGAL ISSUES AND CONTRACTUAL CONSIDERATIONS ASSOCIATED WITH BIM USE IN CONSTRUCTION PROJECTS

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Building Information Modelling (BIM) has expanded its use worldwide in recent years, as it brings efficiency and better quality to the construction industry. This expansion also motivates researchers to investigate potential problems that may occur while adopting and using BIM. Since it has modified the nature of the relationships between the parties to differ from traditional project delivery, legal issues such as Model Ownership and Intellectual Property, Contractual Relationship of Parties, Design Liability may become more critical. Hence, institutions and authorities have published protocols and standard forms of contracts to overcome such issues. However, lately, there have been several BIM-related case-laws in the courts of leading countries in BIM, such as the UK and the USA, which noted the problems encountered due to some of the perceived legal issues mentioned above. Therefore, in this thesis, first BIM related legal issues in the literature are examined and then several BIM-related case laws from the UK and the USA are investigated and linked with perceived legal issues of BIM in the literature. Afterwords, construction contracts and protocols related to BIM are explored and current state of

BIM adoption and regulations in Turkey are presented. After examining BIM-related legal and contractual issues and associated solutions of standard contract forms and ISO 19650 standards, this study offers recommendations for national contracting framework of Turkey. This study aims not only to investigate legal issues and case laws related to BIM, but more importantly, to lead the way for more effective use of BIM nationwide by making interpretations of legal cases and standards and by providing recommendations for contract documents.

Keywords: BIM, Legal Issues, Case Law, Contracts, Standards

ÖZ

İNŞAAT PROJELERİNDE BIM KULLANIMI İLE İLGİLİ HUKUKİ SORUNLARIN VE SÖZLEŞMESEL ÇÖZÜMLERİNİN İNCELENMESİ

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Yapı Bilgi Modellemesi (YBM), inşaat sektörüne verimlilik ve kalite artışı getirdiği için son yıllarda dünya çapında kullanımını yaygınlaştı. Bu yaygınlaşma aynı zamanda araştırmacıları YBM süreçlerini projelere entegre ederken ortaya çıkabilecek olası sorunları araştırmaya motive etti. Taraflar arasındaki ilişkilerin doğasını geleneksel proje tesliminden farklı olarak değiştirdiği için Model Sahipliği ve Fikri Mülkiyet, Tarafların Sözleşmesel İlişkisi, Tasarım Sorumluluğu gibi yasal konular daha kritik hale gelebiliyor. Bu nedenle, kurumlar ve yetkililer bu tür sorunların üstesinden gelmek için protokoller ve standart sözleşme formları yayınladılar. Bununla birlikte, son zamanlarda, Birleşik Krallık ve ABD gibi YBM kullanımında önde gelen ülkelerin mahkemelerinde, yukarıda bahsedilen yasal sorunlar nedeniyle YBM ile ilgili birkaç dava görüldü. Bu nedenle, bu tez çalışmasında, öncelikle literatürdeki YBM ile ilgili yasal sorunlar derlenmiş, ardından Birleşik Krallık ve ABD'den YBM ile ilgili çeşitli içtihatlar incelenerek bunlar literatürde YBM'ye yönelik algılanan yasal sorunları ile ilişkilendirilmiştir. Daha sonra BIM ile ilgili inşaat sözleşmeleri ve protokolleri incelenmiş ve Türkiye'deki YBM'nin benimsenme düzeyi ve yönetmeliklerin mevcut durumu

sunulmuştur. Bu çalışma, YBM ile ilgili yasal ve sözleşmesel konuları ve standart sözleşme formlarının ve ISO 19650 standartlarının ilgili çözümlerini inceledikten sonra, Türkiye'nin ulusal sözleşme çerçevesi için öneriler sunmaktadır. Bu çalışma, sadece YBM ile ilgili hukuki konuları ve içtihatları araştırmakla kalmayıp, daha da önemlisi, hukuk davaları ve standartları yorumlayarak ve sözleşme dokümanları için önerilerde bulunularak YBM'nin ülke çapında daha etkin kullanılmasına öncülük etmeyi amaçlamaktadır.

Anahtar Kelimeler: YBM, Hukuksal Sorunlar, Hukuk Davaları, Sözleşmeler, Standartlar

To my loved ones.

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LIST OF ABBREVIATIONS

ABBREVIATIONS

2D: 2 – Dimensional

3D: 3 – Dimensional

4D: 4 – Dimensional

AIA: American Institute of Architects

BEP: BIM Execution Plan

BIM: Building Information Modelling

bSTR: buildingSMART Turkey

CAD: Computer Aided Design

CDE: Common Data Environment

CIC: Construction Industry Council

DAB: Dispute Avoidance Board

DB: Design – Build

DBB: Design – Bid – Build

EIR: Exchange Information Requirenments

FIDIC: Fédération Internationale Des Ingénieurs-Conseils

GDP: Gross Domestic Product

IPD: Integrated Project Delivery

IPR: Intellectual Property Rights

ISO: International Organization for Standardization

JCT: Joint Contract Tribunal

LOD: Level of Development

LOI: Level of Information

MIDP: Master Information Delivery Plan

NEC: New Engineering Contracts

PPA: Public Procurement Authority

PPCL: Public Procurement Contract Law

PPL: Public Procurement Law

PPP: Public Private Partership

TIDP: Task Information Delivery Plan

YBM: Yapı Bilgi Modellemesi

CHAPTER 1

INTRODUCTION

Since the first years of civilization, construction, which has affected a wide range of people in terms of economic benefits, aims to create better living conditions for society. The construction of buildings that benefit society both physically and socially, from religious assembly centers to hospitals, from political buildings to schools, also has a financial impact by activating economic life. At the same time, it acts as an intermediary conveying the sociocultural structure of the period in which it was built to future generations and conveying information about the periods when there was no writing.

From this point of view, it can be said that there is a strong correlation between the construction sector and social development. The construction industry, which has developed like other industries with the industrial revolution, has difficulties catching up with the digitalization process that started with Industry 4.0 in recent years. The digitalization trend, which affects everyone's daily life, from daily shopping habits to smart homes, faces difficulties in penetrating the construction industry.

From the global economic perspective, the construction industry is the industry with the largest share, with a 13% contribution to GDP (McKinsey&Company, 2020). However, compared to all industries, the construction industry is considered to be among the most backward sectors in terms of digitalization and productivity (McKinsey&Company, 2016).

Different reasons can be given for the construction industry's inability to catch up with this digitalization trend. Construction projects consist of unique projects that do not repeat each other compared to other industries. For this reason, a procedural production chain is not applicable for every project (Koeleman et al., 2019). On the

other hand, long-term relationships may not be established as different stakeholders come together in each project and try to accomplish a task.

Market characteristics can be cited as another factor in the construction industry's inability to catch up with this digitalization trend. Unclear employer demands, uncertainties about the ground conditions, the complex nature of construction projects, the excess of manual production in the field, the low profit margin compared to the risks in the projects, the cooperation environment hindered by a highly fragmented ecosystem, working with different stakeholders on short-term contracts rather than long-term relationships; by pushing the industry towards a project-centered approach; causes low productivity levels, slow adaptation to digitization and innovation, and low customer satisfaction due to timetable and budget deviations (McKinsey&Company, 2020).

We are at the edge of the transformation of the construction industry. Many necessities and factors of this change can be shown. Developing industry and digitaliziation of daily life cause employer demands to change and increase in this direction. Now employers demand structures that can be integrated with modern technologies, from infrastructure systems to their houses. With the integration of new technological developments in construction, the overall cost of a project can be decreased. From augmented reality to drones, from robotics to sensors, too many developments can be adapted to construction today.

In today's world, to reduce the environmental factors affected by global warming and increasing carbon footprint, there has been a trend towards high energy-efficient and sustainable structures. To eliminate these problems and enable efficient construction processes, digital solutions should be considered (Wyman, 2018).

In the changing construction conjuncture, limited public budgets, approaches that focus on the costs that will occur throughout the project life cycle instead of only the manufacturing phase, more sustainable project demands have pushed the construction industry to an approach that focuses on the product rather than the

project, invests in technology and attaches importance to human resources, integrating the value chain. Moreover, it makes it more industrialized by digitizing its processes with systems such as Building Information Modelling (BIM), inventing new production methodologies and materials (McKinsey&Company, 2020).

All stakeholders in the industry, from engineering firms to contractors, material manufacturers to equipment suppliers, will be affected by this change. However, the impact of the digitalization process on all stakeholders and the internalization process of this transformation by the stakeholders may show variety (Wyman, 2018). From this point of view, the stakeholders' expectations may differ, and there may be disruptions in the cooperation processes (Winfield, 2020). For this reason, it is important to determine the legal framework in which the expectations are determined, and the relations of the stakeholders will be shaped with clear lines. Thus, this transformation will be able to sit on a more solid ground and become permanent.

The industry is also waiting for change (McKinsey & Company, 2020). Still, one of the most prominent obstacles that can be seen in this adaptation is the problems experienced in the contractual frameworks to the developing technology (National Building Specification, 2019). Producing more understandable and applicable contract frameworks and documents for BIM, which has the greatest impact on digitizing construction processes, is critical to address these problems.

1.1 Problem Statement

Enabling innovation and efficiency to the construction sector BIM brings new challenges. These difficulties, combined with the above-mentioned problems of the construction industry, can reach different dimensions and leave professionals alone with processes that the industry has not encountered before. For the benefits of BIM to become a habit in the industry, it is important to eliminate these difficulties or take precautionary measures. In the construction industry, which has difficulties keeping

up with the digitalization process due to the reasons mentioned above, different stakeholders have adapted to these digital processes with BIM at different levels. With this differentiation, problems arose both in a practical manner like coordination of the stakeholders and technological manner like interoperability. Although these problems may gradually disappear with the establishment of BIM culture in the sector, the solutions that can make BIM use functional are legal and contractual issues.

For this reason, it is necessary to reveal the legal and contractual problems that may be encountered in BIM processes. However, simply uncovering potential problems may not be helpful enough. A more practical solution can be put forward after determining how the potential problems should be handled in the contracts. In a project where the legal regulations are sufficient and the contractual frameworks are established correctly, it will be possible to create an order in which the duties and responsibilities of the parties are clearly stated, and the problems that may arise in the later stages of the project are avoided.

From this perspective, it is necessary to establish a contractual framework that covers and solves the legal and contractual problems related to BIM to make the wide range of BIM uses practically possible.

1.2 Objectives

The main objectives of this study, which will fill the gap created by the absence of a comprehensive study of the legal and contractual aspects of BIM processes in the literature, can be listed as follows.

- Revealing legal and contractual issues related to BIM processes.
- Investigating how the potential problems presented in the literature occur in practice by examining the grounding of BIM related legal problems in the courts.

- Presenting a comprehensive analysis of internationally used standard contract forms that address BIM processes.
- Examining how the legal issues mentioned in the literature are handled with the approach of ISO 19650 standards.
- Making suggestions on how to eliminate BIM related contractual and legal problems in Turkey.
- Creating a contract framework that can prevent potential BIM related legal and contractual problems by creating a suitable specification while proposing regulations in accordance with the current legislation in Turkey.

1.3 Methodology

The methodology in this thesis consists of 4 parts (Figure 1.1). In the Identification step, which is the first of these four stages, legal problems are defined based on literature and case law reviews. Then a survey is conducted to understand the local conditions in relation to BIM related legal issues, to see whether there are similarities and differences between the problems in the literature and in Turkey. In the second step, the Analysis, contract forms and the ISO 19650 standard are examined. In the 3rd step, Remedy, recommendations are created with the information gathered in the first two steps. In the last step, Verification, the results of the thesis and recommendations madeare evaluated through survey work and expert interviews.

Figure 1.1 Methodology of the Thesis

Compiling the studies mentioned in the literature and revealing the potential legal and contractual problems identified in general is one of the indispensable steps in a study to be conducted in this field (Assad et al., 2020; Dao et al., 2021; and Erpay, 2020). In addition to these, examining the results seen in the courts and observing how these problems revealed in the literature find a response in professional life is of critical importance in terms of being able to sit on a practical basis. Moreover, understanding the BIM-related provisions of the standard contract forms widely used in the world and how they determine the risk distribution among the stakeholders is another indispensable step in terms of setting an example while presenting the results. Also, taking advantage of the standards related to BIM used in the construction industry isalso beneficial in terms of the sustainability of the proposed recommendations. Therefore, it is necessary to examine how these standards deal with related issues. As a result, both legal and contractual analysis related to BIM will be presented and suggestions specific to Turkey will be given by using a methodology that has been similar to what is used by previous academic studies on legal issues.

1.4 Outline

This thesis consists of eight main chapters, which are introduction, current state of art, BIM-related legal issues, BIM-related case law, construction contracts and protocols related to BIM, the current state in Turkey, recommendations for BIM in Turkey and conclusions.

In the first chapter, the introduction, the relationship between BIM and the construction industry and the critical importance of the contractual and legal processes that constitute the main theme of this thesis are mentioned.

In the second chapter, an extensive research of the studies in the literature on BIM related legal issues and contractual approaches was made, analyzed in detail and categoried.

In the third chapter, a thorough analysis of different legal and contractual problems revealed in the literature related to BIM are made and the common aspects are combined, and these problems are divided into categories. These categories were then ranked in order of importance.

In the fourth chapter, the cases arising from the BIM-related problems in the courts of the UK and the USA, where the use of BIM is widespread, are analyzed in detail and examined under the categories of legal problems.

In the fifth chapter, standard contract forms and protocols, which are frequently used in the construction industry in the world, are examined in terms of BIM and how they deal with BIM-related issues.

In the sixth chapter, the state of BIM use in Turkey has been analyzed and the international standard that has been put into practice recently has been examined. In addition to this, the status of the current contractual framework in public construction projects in Turkey has also been revealed.

In the seventh chapter, in the light of the analyzed standard contract forms, international standards and court decisions, necessary arrangements and additions to be made within the framework of the contracts and in the tender documents are recommended for the effective use of BIM in Turkish public construction projects. Also, contract related resources of ISO 19650-2 are examined by considering Turkish conjuncture.

In the eighth chapter, the general evaluation and summary of the outputs of this thesis are given.

In addition, a technical specification created within the scope of this thesis, which can be used in all construction tenders, especially public construction projects in Turkey, and which complies with ISO 19650 standards, is included in the appendices.

CHAPTER 2

LITERATURE REVIEW

By using BIM “Legal Issue”, BIM Legal Issue and BIM Legal Contract keywords on Scopus and Web of Science databases, 58 publications have been identified in the literature related to legal issues related to BIM and its implications on the construction contracts.

On the other hand, the words "BIM" and "Contract" were searched in Turkish in the Council of Higher Education Thesis database and Google Scholar in order to scan articles, conference papers and thesis studies published in Turkey. As a result of this research, a total of 4 thesis studies and 4 publications related to the contractual and legal fields of BIM were determined. These identified publications are stated in section 2.6 Studies on BIM and Contractual Relationships in Turkey.

The studies identified in the literature are given in Table 2.1 in a categorized form. Studies in the literature review are examined in the light of these categories in this section.

Table 2.1 Categorization of Reviewed Publications

Category	Publications	Number of Publ.
2.1. Problems in Adapting to BIM	(Babatunde et al., 2020; Faulkner, 2007; Gu & London, 2010; McAuley et al., 2012; Oduyemi et al., 2017; Olatunji, 2014; Sardroud et al., 2018; Shehzad et al., 2021; Smith, 2014; Wójtowicz, 2019; Zhou et al., 2019)	11

Table 2.1 (cont'd)

2.2. Potential Legal Issues Related to BIM	(Abd Jamil & Fathi, 2018, 2019; Adibfar et al., 2020b; Almarri et al., 2019; Arensman & Ozbek, 2012; Arshad et al., 2019; Dixit et al., 2019; Eschenburch & Bodden, 2018; Fan et al., 2019; Guangbin et al., 2011; Kymberli & Ashcraft, 2013; Olatunji & Akanmu, 2015; Pandey et al., 2016; Sabow & Zahn, 2005; Segnalini, 2018; Simonian, 2010; Sözen & Dikbaş, 2016)	17
2.3. Legal Issues and Associated Solutions	(Abd Jamil & Fathi, 2019, 2020; Adibfar et al., 2020a, 2020b; Alwash et al., 2017; Arshad et al., 2019; Assaad et al., 2020; Charlesraj & Gupta, 2019; Chong et al., 2017; Dao et al., 2021, 2020; Fan, 2014; Fan et al., 2018, 2019; Hsu et al., 2015; Jo et al., 2018; Klemt-Albert et al., 2018; Kuiper & Holzer, 2013; Liao et al., 2019; Mahamadu et al., 2013; McAuley et al., 2012; Zhang et al., 2017; Zhou et al., 2019)	23
2.3.1. Regional Solutions to Legal Problems	(Assaad et al., 2020; Babatunde et al., 2020; Charlesraj & Gupta, 2019; Dao et al., 2020, 2021; Fan, 2020; Hsu et al., 2015; Jo et al., 2018; Klemt-Albert et al., 2018; Kuiper & Holzer, 2013; Liao et al., 2019; McAuley et al., 2012; Zhou et al., 2019)	13
2.4. Contractual Approaches to Problems	(Bodea & Purnu, 2018; Fan, 2020; Ma et al., 2014; Mohamed Salleh et al., 2019)	4
2.4.1. Standard Contract Forms, Standards and Protocols	(Al-Shammari, 2014; Assaad et al., 2020; Manderson et al., 2015; Winfield, 2020)	4
2.4.2. Contract Framework Recommendation	(Arshad et al., 2019; Chong et al., 2017)	2
2.4.2.1. Regional Contractual Frameworks	(Albano & Di Giuda, 2018; Dao et al., 2021; Fan, 2014)	3
2.5. Legal Impact of BIM in the Delivery Phase of a Project	(Shehzad et al., 2021)	1
2.5.1. The Effect of BIM on Claim and Dispute Processes	(Abd Jamil & Fathi, 2020; Araya, 2019; Bodea & Purnu, 2018)	3
2.5.2. Project Delivery related BIM Solutions	(Chin et al., 2008; Ku & Pollalis, 2009; Winfield, 2020)	3
2.6. Studies on BIM and Contractual Relationships in Turkey	(Akbaş, 2019; Atabay & Öztürk, 2019; Demircan & Alp, 2020; Ergen & Öktem, 2017; Erpay, 2020; Sözen & Dikbaş, 2016; Tezgiden, 2019; Tosun, 2019)	8

2.1 Problems in Adapting to BIM

The construction industry, which has been digitized day by day since the transition to CAD-based systems, encountered some resistance while transitioning to the BIM system. Different reasons for these resistances have been revealed in the literature. Resilience to change, lack of collaboration among project stakeholders, and users' inexperience with BIM-based approaches can be cited as the leading topics of these issues (Sardroud et al., 2018; Smith, 2014; Zhou et al., 2019). Although the resistance to change decreases as the prevalence of BIM in the construction industry increases, the inexperience of users in BIM, the lack of relevant training, and the initial cost of BIM can increase the level of resistance of people (Babatunde et al., 2020; Gu & London, 2010; McAuley et al., 2012). Even in some countries' construction industry, the cost of application can be seen as the most prominent factor that hinders the adoption to BIM (Wójtowicz, 2019).

In addition, the users who believe that the BIM system has a complex structure and getting used to it will take time, hesitate to integrate into the system and continue to do their work with the current traditional methods (Sardroud et al., 2018). In the construction sector, the involvement of more than one stakeholder in the processes during the project and the necessity of working with different parties in each project can be an obstacle to the cooperation environment required by BIM. For this reason, the inability of stakeholders who are accustomed to traditional management to adapt to the BIM system can seriously damage the implementation of projects (Sardroud et al., 2018).

Along with these obstacles brought by the sectoral approaches, there are some changes triggered by the BIM system. Those changes affected the process of the projects and organizations in managemental, technical and contractual & legal ways.

The requirement for collaboration and interoperability increases greatly with BIM. In this sense, it is important for different software applications used by more than one discipline to work together to be able to communicate with each other (Olatunji,

2014). However, the interoperability issue has seen as one of the most prominent technical challenge related to BIM (Babatunde et al., 2020; Oduyemi et al., 2017). Although people in the industry are willing to increase interoperability, there are steps to be taken to standardize and mature interoperability expectations (Faulkner, 2007). Extensions such as Industry Foundation Classes (IFC) are used to meet these expectations. However, extensions like this may also have deficiencies in terms of standardization, usability, and vocabulary used (Gu & London, 2010).

On the other hand, version tracking is one of the problems that BIM brings. Large variations between software versions can cause information loss between different versions of the same software (Gu & London, 2010). Version tracking of information and documents produced during the project process, such as software, is another technical problem that needs to be determined to ensure data integrity.

Potential problems that may occur in model servers and cloud systems to be used in BIM applications are among the technical problems faced by users (Gu & London, 2010). These security problems reach a different dimension with problems such as intellectual property and design ownership. Inadequate regulations in countries related to cybercrime may prevent the parties from protecting themselves in case of a legal problem related to the information shared in the BIM system (Sardroud et al., 2018).

Lots of information transfer takes place in the process starting from the conceptual design of the project to the drawing of the as-built projects and from there until it is transferred to the operation phase. In this process, the control and management of project information and documents is critical in terms of minimizing data loss (Gu & London, 2010; Smith, 2014). From this perspective, BIM should also be addressed from a managerial point of view.

Along with these managerial and technical problems of BIM, it also brings changes to contractual frameworks and legal contexts (Gu & London, 2010; Shehzad et al., 2021; Wójtowicz, 2019). By increasing the knowledge of legal community of construction industry, construction contracts which are mostly pre-dated should be

reviewed and new standard contract forms should be created in order to cooperate BIM in the project (Faulkner, 2007). Legal and contract related problems will be discussed in more detail with the publications mentioned in the below section.

2.2 Potential Legal Issues Related to BIM

Studies related to the contractual and legal field of BIM draw attention to different points. While some studies reveal the legal and contractual problems that may be encountered in BIM-related projects, others include solutions with these problems. In this section, review of the literature dealing with contractual and legal issues from different perspectives will be included.

Until recently, legal community had very limited knowledge of BIM (Sabow & Zahn, 2005) and the problems mentioned in the literature had not been tested before the courts (Arensman & Ozbek, 2012). However, as mentioned in the 4th chapter of this thesis, the legal community started to develop their awareness on this issue.

Along with the problems that arise due to the differentiation of BIM processes from traditional methods in general, different problems may also be revealed in terms of the duties of the stakeholders involved in the BIM process. Those legal issues related to BIM can hinder the potential uses of the technology even for heritage science (Segnalini, 2018).

First of all, the issue of legal status of model can create some contractual issues since BIM may not be included completely into contracts (Almarri et al., 2019). Its status may vary from project to project, but it is mostly not referred in a way that it has contractually binding effect (Pandey et al., 2016).

Secondly, current legal and contractual systems are built upon definite responsibilities of contracting parties. But with a collaborative working environment of BIM these lines of responsibilities may become unclear (Arensman & Ozbek, 2012). It is now difficult to follow the owner of information or model within the project working with BIM (Sabow & Zahn, 2005). The responsibility regarding to

design, in that context, can create ambiguity. Even if the parts of design now shared among various stakeholders like MEP subcontractors or material suppliers, they can be seen as the one in charge (Guangbin et al., 2011; Simonian, 2010). With such liabilities on the architect's standard of duty may become higher with such liabilities. Standardization of such expectations may be hard to determine and may result to misconception of standard of care. Therefore, the designers of project may be treated as they served below the required standards (Almarri et al., 2019). This is due to the fact that the receiver of a model wants to rely on the model he receives to add up on it and create their model. Therefore, it's not abrupt them to expect a defects-free model and designers should be liable for their negligence (Fan et al., 2019). However, parties may embed information or an element without an intention of leading any party in any way but for the visualization purposes only. However, if the receiving party of that model uses that specific element as a reference to create their model, then it may be hard to identify the responsible of the error in the design (Arensman & Ozbek, 2012).

Also, by modelling the project with more information, the designers add more value to the project when it is compared with the traditional designs. However, they do not take any monetary compensation in return. On the contrary to monetary compensation, they may be awarded with lower prices since they are working on hourly basis and with BIM the design processes may become shorter.

Thirdly, copyright issues should be identified in the contracts in a well-defined manner when compared with the traditional contracts (Pandey et al., 2016). The increasing data exchange with BIM reveals the necessity of addressing the relevant issues more comprehensively in contracts and technical specifications (Arshad et al., 2019). It is important to ensure all usage rights related to the project of each contractor involved in the project process by the employers. If the environment where the information and documents related to the project are stored is subject to the management of another stakeholder, it is a point to be considered in this sense that the relevant information and documents are delivered to the employer in case of any contract termination.

While some of the practitioners argue that the copyright and extracted information from models should remain with the creator architecture or engineer (Arshad et al., 2019), the client should own the model in order to run the project in a way they desire.

Normally, designs are subject to copyright only to the extent that they have a certain level of independent, original and artistic content. For example, designs made by engineers may not be subject to copyright as they are generally considered a reflection of technical requirements. However, due to the information included in the models with the BIM system, this issue can be looked at from different angles and some exceptional situations may occur. Although the models do not reflect an artistic content, they may be subject to copyright due to the information they contain (Eschenburch & Bodden, 2018). However, design parameters defined in line with the needs of the employer will not fall under this protection and would be seen as the property of the employer (Adibfar et al., 2020b).

Although architectural drawings and renderings can be protected by copyright, copyright laws are usually drafted so general that they cannot address issues that can be considered specific to BIM (Adibfar et al., 2020a). For this reason, issues such as duplicating digital models without permission should be handled with a separate regulation (Adibfar et al., 2020b).

Fan (2014) takes copyright issue one step further and elaborate the issue by questioning how the business knowledge should be protected and how BIM elements whose creation requires hard work can be protected. Apart from ownership of model and information, data loss may cause a problem since transfer of data increases with BIM (Arshad et al., 2019). Therefore it can be concluded that contracts should have provisions regarding to digital data (Fan et al., 2019).

Moreover, many phases of project like facility operation and decommissioning are not aligned with BIM and the current applications are therefore not as integrated as BIM needs (Abd Jamil & Fathi, 2019). In traditional processes, after the construction of a building is completed, the documents and drawings related to the building can

be approved by the authorities and used in the operation phase. While these documents and drawings are contractually binding for operators, the contractual status of the information in building information models is not entirely clear. There may be different approaches in this regard. First, models can be viewed as tools used to create plans and specifications. In this case, the models cannot be called a contractual binding. Models can be seen as equal just like plans, but this time it is necessary to determine superiority between documents. Additionally, use of an information embedded into a model by a party of construction contract may pose a problem when the model is transferred to facility managers (Kymberli & Ashcraft, 2013). In such cases, it may be necessary to determine the permitted uses at the contract stage. On the other hand, it can be said that most facility management professionals avoid the electronic transfer of confidential information that may create security vulnerabilities (Dixit et al., 2019). Therefore, the success of a project to be used for facility management depends on the correct handling of the problems matched with BIM in the contracts. Together with these legal problems, an effective use of BIM can be established by addressing the collaborative environment that BIM needs throughout the life cycle of projects in contracts (Olatunji & Akanmu, 2015).

In addition to the common legal and contractual problems mentioned in the literature, regional legal or contractual problems may also occur. There are few studies carried out in the Turkish conjuncture in which this study will present solution proposals. Public contracts shape additional problems revealed by these studies. The first point to be stated as the first problem is that the public procurement system generally carries out projects with the design-bid-build system. Since the BIM system is used more efficiently with systems such as design-build or Integrated Project Delivery (IPD) (Alwash et al., 2017; Pandey et al., 2016), it can be said that the legal framework is not ready for BIM adaptation since it is not open for early contractor involvement in processes of projects (Sözen & Dikbaş, 2016).

Contractual relations in Turkey are usually similar to one-sided agreements. The contract constantly mentions the contractor's obligation and does not impose an obligation on the employer rather than making the payment. This eventually prevents

cooperation in the sector. There are unilateral provisions in the articles of the contract. As an example of this, it is seen that the risks related to the project are on the shoulders of the contractors much more in Turkish public contracts compared to international standards such as FIDIC (Uğur, 2010).

2.3 Legal Issues and Associated Solutions

Different solutions are suggested in the literature as a solution to the problems raised. Regarding the determination of the roles and responsibilities of the stakeholders, Chong et al. (2017) mentions the necessity of determining the responsibilities of the role of BIM Manager in the contracts well, and Abd Jamil & Fathi (2019) mentions that the tasks that are expected to be done by the designers, such as quality control, should be undertaken by responsible persons such as BIM Manager or BIM Coordinator since they can take too much time of the engineers and architects. Alwash et al. (2017) on the other hand, states that changes are necessary to resolve liability issues, as well as intellectual property rights (IPR) and status of BIM-related documents. In order to allow these changes, the industry should establish a collaborative way of working with contracting methods like alliancing.

IPR related issues should be handled in contracts of the parties (Abd Jamil & Fathi, 2019). As with the last model to be delivered to the employer, there should be contractual provisions regarding each model element. The provisions regarding the final model to be delivered to the employer and that each creator will own the copyright of the model they produce should be dealt with in separate contracts (Fan, 2014). In fact, an ownership distinction can be made not only at the model but also at the level of model elements. In addition, Fan (2014) suggests that the original creator of the model can be followed as a result of configuring the elements to be used in the BIM model with a certain coding system. Regarding this issue, Fan et al. (2019) has shown that QR code application can be used for this tracking.

Regarding to BIM use in further stages after the delivery of the construction project Abd Jamil & Fathi, (2020) state that in order to deliver more useful models to the operation phase, in design-build works, the requirements related to the model should be determined correctly in the first contract, preventing future contractual and practical problems. It also at great importance that data integrity is preserved during transfer of the information between stages of a project.

Common data format should be mentioned in the BIM execution plan. Modelling deliverables should be defined well in the contract documents or BIM Execution Plan (Arshad et al., 2019). Also, provisions related to model and data transfer can differ from project to project. Cloud systems can mitigate the security related risk of data transfer while sharing of information taking place collaboratively (Mahamadu et al., 2013). Regardless of system used in data transfer, contracts should have clauses regarding to data loss (Chong et al., 2017). In order to solve information-sharing related issues Zhang et al. (2017) proposes a cloud-based multi-server approach in which the owner of the information can be controlled by its creator.

Fan et al. (2018) conducted a comprehensive study in 2018 by combining 55 studies in the literature on legal problems associated with BIM and suggested solutions to these problems. In this study, they presented the problems compiled from the literature in 4 main titles and 26 sub-titles. Those main titles are incompatibility of procurement system, liabilities, model ownership and IPR, unclear rights and responsibilities. In the third chapter of this thesis, extensive research has been made to find the studies in the literature until today and these studies areanalyzed by building on the work carried out by Fan. As a result of this analysis, legal problems were logically categorized according to the frequency of their mention in the literature.

2.3.1 Regional Solutions to Legal Problems

Some studies have revealed the problems specific to their countries by conducting country-specific research. For example, whilst the IPD system is claimed to be the most compatible with BIM, according to the research study conducted by Charlesraj & Gupta (2019), practitioners in the sector avoid such a contractual approach, considering that it has not been sufficiently tested due to the low prevalence of IPD contracts in India. Therefore, it is of great importance to conduct research to identify local legal problems related to BIM. Investigation of how these problems is answered in the universal sense and adapting the best practices to the countries as a solution proposal has been observed as one of the methods applied.

In that manner, Hsu et al. (2015) show that the adoption of the Taiwanese construction sector to the BIM processes depends on resolving duty of care and risk allocation related contract terms, stipulations regarding ownership of copyright and changes in the perception of public tendering agencies. It was mentioned that the inability of tenderers to stipulate a certain software tool on the grounds that it leads to unfair competition will cause an incompatibility between the tools used by the administrations and the tools used by the contractors, thus preventing an effective use of BIM.

Similarly, along with revealing the main problems related to BIM encountered in the public and private sectors in China, Zhou et al. (2019) investigate the level of these problems in other countries. By examining how these problems are handled in other countries, contractual and practical recommendations that can be used in China are put forward as well. Liao et al. (2019) focus specifically the relation of consultants and employers in BIM enabled projects and discloses the perception of liabilities of parties in BIM contracts. Fan (2020), on the other hand, compares the contractual regulations and legal issues of countries regarding BIM and tried to show the common and different obstacles for BIM adaptions of Taiwan and China.

Moreover, Dao et al. (2020) conducted similar research on Vietnam and try to picture current state of the country. Not having the duties and responsibilities of the stakeholders clearly defined in the terms of contracts is seen as the most important reason for Vietnam's difficulty in BIM adaptation, while the as-built control from hard copies leads some difficulties due to the lack of a digital deliverables acceptance system by public authorities. In the same manner, Babatunde et al. (2020) claim that while the lack of awareness and initial cost of BIM is the prominent one, legal and contractual issues along with the lack of motivation of policy makers are other main issues regarding to BIM adoption in Nigerian industry as well. Furthermore, Jo et al. (2018) show the current state of Malaysian industry and after mentioning several internationally used standards of contracts related to BIM specific legal and contractual issues, it investigates local standard contracts of Malaysia regarding to those issues and put forth how they can possibly handle with legal aspects of BIM.

For the Ireland, McAuley et al. (2012) demonstrate a pilot project and show the perceived outcomes of using BIM in projects. Although they have demonstrated the gains from BIM on their pilot project, he states that Ireland is far behind keeping up with the requirement to use BIM in public works projects that will become mandatory in the UK in 2016. He claimed that the legal requirement of BIM may create an environment of discrimination for Small and Medium Enterprises (SME), as well as require "an act of faith" for the state. In addition, it also sheds light on the obligations of the parties and model ownership, which should be addressed in contractual frameworks.

Moreover, Kuiper & Holzer (2013) discuss how ready the construction industry and the contractual framework in Australia are for BIM and talked about how contractual standardization should be. Also, Klemt-Albert et al. (2018) investigate legal and contractual issues matched with BIM and revealed the solutions that can be used in the contractual framework and implementation in Germany.

In their work, which examines the legal issues related to BIM in Vietnam and makes suggestions to the contractual framework, Dao et al. (2021) reach its

recommendations by following certain steps as a methodology. First, they measured how much the potential legal problems related to BIM, which are revealed in the literature, are met in their country through a survey. They then compared the contractual documents and standards used in the UK with those used in Vietnam. Then, they put the problems seen in its country in order of importance, determining a contractual framework that will eliminate these problems and comply with international standards, and made recommendations to their country. Finally, they validated this process and results with expert opinions to evaluate the suggestions and comments put forward.

Assad et al (2020), who started their work by examining two standard contract forms and a protocol widely used in the USA, both examine and compared how they deal with BIM-related problems in their clauses, then investigated the cases arising from BIM-related problems in the country's courts. Together with this review and the view of the literature, they made evaluations for each legal and contractual issue that they identified regarding BIM. Finally, they made contractual recommendations for each problem category by compiling from the relevant documents.

2.4 Contractual Approaches to Problems

Bodea & Purnu (2018), who stated that considering the increasing collaborative environment with BIM, the duties and responsibilities determined by the law and within the scope of standard contracts are affected, mention that the appropriate legal and contractual framework should be determined before signing the contract. In addition, they state that even some standard contract forms such as FIDIC do not include BIM-related issues in the contract, the issue that needs more attention is to address BIM related issues in contracts, such as intellectual property rights and design submission procedures. While talking about the design delivery processes, they claim that the contractual enforcement of the models should also be specified in the contract. In addition, they believe that choosing a procurement method that allows early contractor involvement is more appropriate for the collaborative nature

of BIM. In the same manner Mohammed Salleh et al. (2019) claim that IPD is the best procurement method for BIM enabled project, allowing early contractor involvement. Although the collaborative environment in BIM requires a procurement method such as the IPD, some of the IPD side-effects like ambiguities in the division of responsibilities may overshadow its benefits (Ma et al., 2014).

Furthermore, Fan (2020) mention that the provisions regarding data management strategy and method should be included in the contract, emphasizing the importance of determining the data method strategy in a flexible way in order to adapt to the developing technology.

2.4.1 Standard Contract Forms, Standards and Protocols

Studies carried out on how contracts find solutions to related legal problems are also evaluated within this scope. A wide range of research has been carried out, from contract forms that are widely used both nationally and internationally, to standard contract forms with regional use.

Assaad et al. (2020) and Arshad et al. (2019) discuss the AIA E203 standard contract form and ConsensusDOCS document used in the USA and some international projects using BIM. Assad et al. (2020) also provides a comparison of these two sources and recommends additions to its clauses. Apart from standard contract forms, BIM protocols, which can be defined as documents dealing with the more technical aspects of the works, were also investigated. In this context, CIC BIM Protocol, AIA G202-2013, AEC BIM Protocol are some protocols examined (Al-Shammari, 2014; Arshad et al., 2019; Manderson et al., 2015).

On the other hand, Winfield (2020) talks about how the international organization for standardization (ISO) 19650 standard has benefits in terms of data control and information management during the execution of projects and examines the effects of the standard's methods to be used in works carried out with BIM.

In terms of locally used contract forms; after identifying the categories of legal issues, Manderson et al. (2015) examine the GC21 General Conditions of Contracts used by the public in New South Wales (Australia). As a result of the content analysis they conducted, they did not only reveal how the contract form handle these problems but also, they drew attention to a few points which should be added to the contract form such as the necessity of using open standards and the inclusion of the BIM Execution Plan in the contracts.

2.4.2 Contract Framework Recommendations

Although the use of BIM itself is increasing, the use of standardized BIM protocols remains low (Chong et al., 2017). Therefore, when considering BIM, contractual provisions should be evaluated together with BIM-specific requirements, taking into account the risks of the parties. In this direction, some studies in the literature have focused on the contractual framework that should be applied in projects to be carried out with BIM.

Chong et al. (2017) offer a contract framework proposal from the pre-contract period to the post-completion process by specifying the legal aspects that are important to BIM users in the contract provisions. It outlines the provisions that should be included in the contracts, such as adding provisions on Payments and penalties to the contract, creating standard forms in which model development processes will be followed, applying the standard of care to all stakeholders involved in BIM processes, and the responsibility of the data included in the models being the person who produces the information.

By looking at how legal issues are handled in standard contract forms used in the industry, Arshad et al. (2019) identify the mitigation methods that should be taken to remove identified risk factors related to BIM. Then, by creating a contractual framework, they more clearly state which stakeholder has what role by determining the duties of the employer, contractor, and consultant (engineer/architect) in these

steps in design-bid-build (DBB) works. Similarly, they also set out measures where stakeholders must take action together such as the preparation of a BIM execution plan and the appointment of a BIM manager that will eliminate legal risks in BIM processes.

2.4.2.1 Regional Contractual Frameworks

Dao et al. (2021) evaluate the contractual procedures in Vietnam and determined the resource flow related to the document and BIM in the pre-contract preparation process for a project to be done with BIM, taking into account the ISO 19650 standards, and revealed which processes the contract documents should be prepared through.

Albano & Di Giuda (2018) also underline that the contract framework that will increase cooperation is of critical importance for BIM. However, they claimed that the IPD model, which is more frequently applied in the USA, is not usable because it does not comply with the regulations on contract law in Italy. They proposed the framework alliancing contract, which is also implemented in Europe, as a contract framework that can be used in their country. In this framework, instead of involving multiple stakeholders in the same contract, as in IPD, a cooperation agreement that covers the contracts between the stakeholders becomes the document governing the contractual relations.

2.5 Legal Impact of BIM in the Delivery Phase of a Project

The fact that BIM's applications in contracts differ from institution to institution or between companies can be seen as one of the reasons why users hesitate to use BIM. With regard to ensuring interoperability between stakeholders conducting their business with different legal orders and policies, Shehzad et al. (2021) define the compliance of contracts with the legal framework related to BIM into levels. In this definition, five different compliance levels were determined under 4 main headings

as insurance framework, administrative support, copyrights and contract environment, and stages from organizational level to project level were revealed.

Apart from this study, other studies that address the contractual and legal problems that may be encountered during the delivery phase of the projects can be examined under two sub-titles: the use of BIM during the execution of the project and its effect on dispute resolution.

2.5.1 The Effect of BIM on Claim and Dispute Processes

Apart from the pre-contract phase, BIM processes also have an undeniable impact on the execution of the project. The use of BIM in resolving disputes that may occur during design or construction is one of these effects.

Although BIM brings unprecedented problems to contractual processes, it also eliminates potential conflicts that may arise during the execution of projects by providing effective communication and information exchange. However, as Bodea & Purnu (2018) indicate with the inclusion of new technologies in the processes, the constructions become more complex and the number of disputes increases, and the use of effective options in the resolution of these disputes begins to gain importance. BIM is changing the way models and documents are created and developed, the estimation of time and budget by 4D and 5D Modelling, and how production is controlled by using it in the field. As a result of all these, the analysis of the claim and dispute processes has also changed. For example, Abd Jamil & Fathi (2020) suggest trainings and workshops after the close out phase while handing over the project to facility managers to decrease the potential disputes regarding to BIM.

Araya (2019) mentions 5 effects of BIM on conflict resolution in his study, which brings together the studies in the literature that mentioning the effects of BIM on conflict resolution. The resolution of delay claims through better visualization, the elimination of potential claims by eliminating the uncertainties related to quantity calculations, and the elimination of potential disputes by presenting formal

documentation in a collaborative environment can be cited as examples of these effects.

2.5.2 Project Delivery related BIM Solutions

Winfield (2020) mention how the way the document management system of the National Annex, published for use in the UK in the information management processes determined within the framework of BS EN ISO 19650, resolves potential problems that may arise between stakeholders.

Introducing an overall BIM management system to improve the fragmented structure between stakeholders involved in projects throughout an asset's lifecycle, Chin et al. (2008) take a session-based approach to information sharing processes such as file access permissions. They claimed that this approach will positively affect the collaboration environment in the construction industry. In the same manner, Ku & Pollais (2009) examine the current state of model-based collaboration in the industry and examined the legal and contractual awe of cooperation.

2.6 Studies on BIM and Contractual Relationships in Turkey

Sözen & Dikbaş (2016) in their work mention in section 2.2 aimed to reveal the contractual and legal problems related to BIM in Turkey. Also, this study addressed the difficulties that may be experienced in adapting BIM processes to Turkey.

On the other hand, with the increasing use of BIM in projects carried out in Turkey, Ergen & Öktem (2017) propose a transitional framework to users trying to adapt to BIM processes. They also mentioned the BIM Execution Plan and content that users who adapt BIM should produce in accordance with contracts and specifications. Likewise, Atabay & Öztürk (2019) examine the BIM Implementation Plan used in the projects in Turkey and talked about what a plan suitable for local situations would contain and how to ensure coordination. Demircan & Alp (2020) mention the

disputes that may arise from contracts and legal reasons in their work, which focuses on the conflicts that the use of BIM can cause. Emphasizing the importance of communication between stakeholders, as well as the responsibilities of the parties, and the employer's expectations from designers and contractors were specified correctly in the contracts, the authors mentioned that the regulations in force in Turkey can be made interoperable with BIM software and can be used effectively. In this regard, Akbaş (2019) presents the BIM-based method he developed for the automatic control of building codes with a sample project application in Turkey.

Erpay (2020) examine the legal problems and causes of disputes in the literature after working on international guidelines and standard contracts in his study. Then, after investigating the situation in the sector through a survey, the author presented a checklist covering the points to be considered during the preparation of a contract. Tosun (2019), on the other hand, examine the guidelines and standards used in countries that made the use of BIM mandatory and made a comparative analysis of them. While conducting this study, she draws attention to the lack of standards in Turkey by revealing the necessary theoretical understanding for standardization. Although this study reveals the comparisons and differences of international standards on the application of BIM, it does not make a contractual and legal evaluation in terms of legal issues.

Furthermore, Tezgiden (2019) investigates ISO 19650 standards and information management stages in his work. After this examination he prepared an information protocol template by using CIC BIM Protocol 2nd Ed. He rearranges the wording and phrases of the protocol to make it suitable with ISO 19650 Standards. Although this study adapts the relevant protocol in accordance with ISO 19650, it does not make any regulation regarding the use of this protocol on national construction sector. Also, an evaluation of the solutions of the ISO 19650 standard in terms of legal problems is not included in this study.

2.7 Conclusion

While a significant part of the studies in the literature talks about the legal problems related to BIM, the other part focuses on how these problems can be solved or what kind of measures can be taken from a contractual point of view. However, the lack of a study investigating both how the legal problems put forward in the literature and they are met in real life draws attention. On the other hand, some studies look for solutions to BIM-related problems on a regional basis and produce solutions to the contract structures of countries. In this sense, with a similar methodology, to fill the gap in this area in Turkey, it should be evaluated how the BIM related legal and contractual problems can be resolved in the context of public construction projects in Turkey.

CHAPTER 3

BIM – RELATED LEGAL ISSUES

As BIM had penetrated into the sector, researchers have conducted surveys and published papers on the legal aspects of BIM, and several studies have characterized the potential legal issues. There are various issues categorized differently in each publication. In this chapter, a unique categorization of potential legal issues will be done by investigating related publications.

To collect the legal problems mentioned in the literature, a wide search was done. As a result of the scanning, it was realized that the paper of Fan et al. (2018), which is one of the comprehensive studies in the literature, is a study that compiles 55 studies from major publications that addressed legal issues related to BIM until 2017. For this reason, considering that more studies may have been carried out in recent years, this thesis focused on the period 2018-2021 and expanded the study of Fan et al (2018). In addition to these articles, it can be seen that between 2018 and 2021, there are 26 more publications and case studies that mentioned legal aspects of BIM or how to overcome these obstacles, when the keyword "BIM Legal Contract" is used for searching through Scopus. After the elimination of the publications that did not directly considered legal issues, a total of 16 publications are found between the years of 2018 and 2021. While 4 of these are conference papers, 11 are journal articles, and 1 is a book. Additionally, a book from 2015 is added to those publications. Although all researchers and authors use different titles when explaining the problems they put forth, the mentioned problems can be categorized under a few titles by considering their explanations of the issues. In this regard, by giving more importance to the issues mentioned by a considerable number of authors and investigating the work of Fan et al. (2018) at the sub-title level (Table 3.1), the subjects included in all research studies can be examined under these six categories that we have identified (Table 3.2).

Table 3.1 Legal Issues Mentioned in the Reviewed Publications

Publication	Issue	C1	C2	C3	C4	C5	C6
Fan et al. (2018)	The use of BIM contract documents					3	
	Inappropriate level of BIM details when delivering						1
	Liability exposures to design errors				23		
	Standard of care	9					
	Model Ownership and IPR		39				
	Unclear Rights and Responsibilities			30			
	Coordinating and controlling the model				8		
	Privity of contract and rights to rely on	15					
Dougherty (2015)	Standard of Care	1					
	Responsible control of the design				1		
	Spearin Warranty			1			
	Model development, use, and reliance	1					
	Legal Status of Model					1	
	2D-3D Conversions						1
	Copyright and Intellectual Property		1				
	Duty to Inform			1			
Assaad et al. (2020)	Standard of Care in Model's Contributions and Sharing	1					
	BIM Management and Collaboration				1		
	Roles and Obligations			1			
	Use of BIM Data	1					
	Compensation and Information Establishment	1					
	Discrepancies in or between Models						1
	Copyright Ownership and Intellectual Property Rights		1				
	Indemnity			1			
Dao et al. (2021)	BIM Model Issues				1		
	Data Issues	1					
	Available BIM legal system	1					
	Technical Issues	1					
	Rights & Responsibilities		1	1			

Table 3.1 (cont'd)

Adibfar et al. (2020a)	Copyright		1				
Adibfar et al. (2020b)	Copyright		1				
Abd Jamil & Fathi (2020)	Technology Compatibility						1
	Auditing Procedures		1		1		1
	Responsibilities, ICT Protocols			1			
Fan (2020)	Principle and Policy	1			1	1	1
	Responsibility and Risk			1			
	Intellectual Property		1				
	Management and Tool				1		
Dao et al. (2020)	Rights and obligations of Stakeholders			1			
Liao et al. (2019)	Ownership and IPR of BIM		1				
	Unclear design delegation			1			
	Liability of the BIM consultant				1		
	Payments related to the use of BIM	1					
Abd Jamil & Fathi (2019)	Intellectual Property		1				
	Liability	1		1			
	Process-related risks allocation				1		
Jo et al. (2018)	Ownership of the BIM Model		1				
	Intellectual Property Rights		1				
	Model Management and Record				1		
	Allocation of Risk			1			
Abd Jamil & Fathi (2018)	Compensation and Consideration	1					
	Conflicts of Contract			1			
	Data Security				1		
	ICT Protocols			1			
	Intellectual Property		1				
Almarri et al. (2019)	Is the Model contract document					1	
	IPR		1				
	Unallocated risks			1			
Fan et al. (2019)	Contract Structure and Policy	1		1			1
	Contractual Relationships and Obligations			1			

Table 3.1 (cont'd)

	BIM Model and Security		1				
Arshad et al. (2019)	Intellectual Property		1				
	Professional Liability			1			
	Cost compensation	1					
	Standard of Care	1					
	Legal Validation						1
	Model Management				1		
Eschenburch & Bodden (2018)	Rights to Data		1				
	Liability			1			
	BIM Management				1		
Sardroud et al. (2018)	Liability Issues			1			
	Intellectual Property Rights		1				
	Technological Aspects				1		
	Behavioral Risks			1	1		
TOTAL		30*	55	49	38*	5	7

*Total numbers are decreased due to repeating papers in Fan et al. (2018).

Table 3.2 Categorization of Reviewed Legal Issues in the Literature

ID	Legal Issue Category
C1	Standard of Care
C2	Intellectual Property Rights and Model Ownership
C3	Contractual Relationship and Responsibilities of Parties
C4	Coordination and Control of the Design
C5	Legal Status of BIM
C6	2D-3D Utilization

Although publications referred to the issue of standard of care under different titles such as Policy and Consideration, they can be related to C1. C2, which is the topmost issue in the literature regarding BIM, on the other hand, is mentioned under almost the same titles as IP Rights or Copyright. While C3 is mainly referred to under liability-related titles, C4 is mostly stipulated under managemental issues. The legal status of the BIM model and 2D-3D utilization are the least mentioned issues, and

each paper considered different aspects of these categories. Also, the weights of these categories are given in Figure 3.1.

After considering all the works listed in Table 3.2 the number of publications and the weights of them becomes more evident, as shown in Figure 3.1. Intellectual Property and Model Ownership related issues are the most mentioned issues in the publications with 30%. It is followed by professional liability-related problems, Contractual Relationship and Responsibilities of Parties, and Coordinating and Control of the Design. The fourth issue is Standard of Care with 16%. The last two issues with 3% and 4% are the Legal Status of the Model and 2D-3D Utilization, respectively. Therefore, in the remaining part of this section, the six categories that we have identified will be explained in detail.

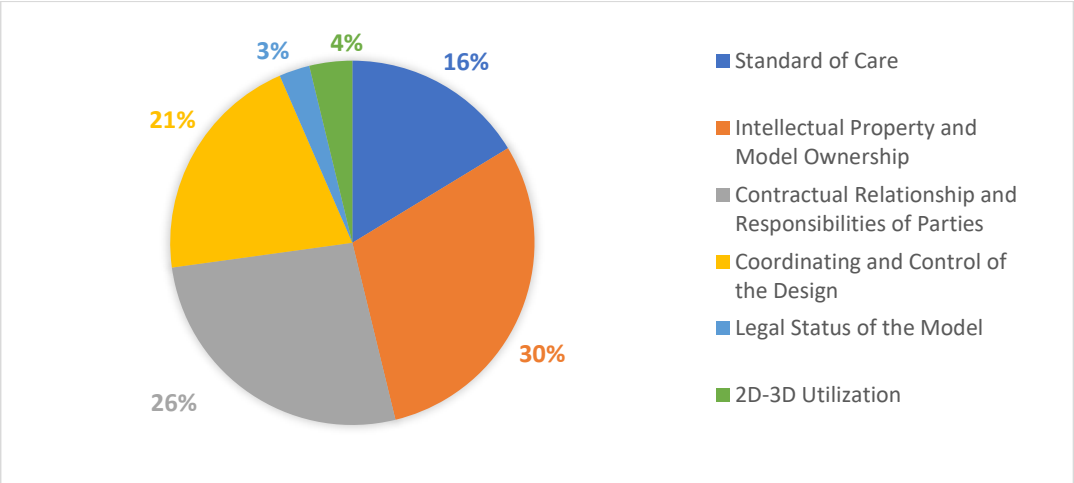

Figure 3.1 Weights of legal issues mentioned in the literature

3.1 Categories of BIM – Related Legal Issues

3.1.1 Intellectual Property Rights and Model Ownership

The construction sector is keeping up with BIM. Therefore, the information that is provided becomes more comprehensive. The models are three-dimensional and intelligent, they contain detailed physical and functional information that can be

benefited throughout the project life cycle, and the transmission of data has increased. All of these factors started to highlight the issues related to Intellectual Property Rights. In BIM, everyone provides input to the model, which makes it unclear who has done what. In some circumstances, it may become more complicated since each collaborator can create new models with the information provided by each other, and therefore, each may have a derivative model, and even if a single model emerges, it can become a model that many stakeholders are entitled to.

There may be more than one opinion regarding ownership. First of all, some may argue that the owner of the information is the creator of that information. In a similar way, the owner of the information can grant a perpetual right of use license to another party to use that information in relation to that specific project, such as calculations, fabrications, marketing, etc. In contrast, another view can argue that collaborators producing information must grant all rights and ownership of the model to the employer. Thus, the employer holding this license can use these models and information in further projects.

In addition to all these, some other problems can be mentioned that can be associated with ownership. Even if architects give a license to use the model to the contractor; another party, or even a competitor, can later access that information that the creator party wants to protect its intellectual property rights. Confidential trade secrets are now easier to access, and it is more difficult to detect which user or a third party that is not directly involved in the contract reaches that information, as things are now done in a digitalized environment. While protection of business knowledge is counted as an important topic, it is also a significant problem that a party can reach and use a family or an element created by another collaborator who has spent hours and days while creating them. Worse than that, the ways of protecting rights such as copyright are related to the protection of a unique product, so it is not applicable to universal and non-exclusive products such as BIM elements. For this reason, the owner of an element that needs hard work for creation can neither apply for a patent with regard to its production nor claim any rights on it in a possible controversy.

3.1.2 Contractual Relationship and Responsibilities of Parties

BIM, which emerged with a multi-disciplinary nature, rearranges the contractual relationships of the parties differently from conventional procurement methods. Contractors or subcontractors involved in the early stages of the project may establish relationships with the main contractor or owner and have a direct impact on the projects. Notwithstanding that, BIM creates new roles and responsibilities such as BIM Coordinator, BIM Manager, BIM Modeler, etc. These roles become more crucial, especially in large and complex projects. When the flow of information is faster than the control of these procedures, it may become an important issue. A model manager, for example, is responsible for the coordination of information that goes into the model and ensures effective use of the model (Sebastian, 2011).

This collaborative environment causes the parties to be involved in each other's procedures. As in the case of the early involvement of a specialty contractor or a fabricator in a contract, it allows them to give advice to the contracting party. This, in some cases, results in the avoidance of responsibility under means and methods. Traditionally, a contractor is in charge of the means and methods, even if s/he is obligated to use the plans and specifications supplied by the employer. On the other hand, the Spearin doctrine protects a contractor from incorrect or misinterpreted information provided by the employer. Yet, this does not mean that the contractor has no liability if the owner has approved their means and methods. However, in common law, these risks shifted towards the contractor and the designer instead of the owner (Henderson, 2010).

3.1.3 Coordination and Control of the Design

In traditional construction, the architect is responsible for the design. But the way of designing is changing with BIM. There is more than one contributor to the design, from manufacturer to erector. Therefore, the responsibility and control of design may go beyond the reasonable control of the architect. The sector should also evolve with

these and keep up with the new foundations. These changes can also be followed by the "Rules of Conduct" published by the National Council of Architectural Registration Boards (NCARB). In 2018 they made an important change in the professional rules of conduct. Previously, they defined the circumstances in which architects can sign and seal the technical submissions as (i) they prepared by them (ii) they prepared by under the architects' responsible control. Responsible control is defined as the amount of control the architect has on the submission by using its profession with regard to the required standard of care. Reviewing and correcting the inputs of others to the submission does not include responsible control since it may go beyond the architect's professional knowledge. In the latest version, they indicated that an architect should sign and seal technical submissions under its responsible control except for stated circumstances (National Council of Architectural Registration Boards, 2018), later defined in the provision as :

> *An architect of record may sign and seal technical submissions not required by law to be prepared by an architect, including information supplied by manufacturers, suppliers, installers, contractors, or from the architect of record's consultants when that information is intended to be incorporated into the architect of record's technical submissions, and the architect of record has reviewed such information and can reasonably trust its accuracy.*

Controlling and coordination of the information is essential from schematic design to the as-built phase. In every milestone or for all uses of BIM, it is crucial to have a negotiated level of development (LOD) to not to face reliance issues as mentioned above but also not to cause any inefficiency during the design phase. Even if one seeks to obtain a LOD 500 for a specific part of the project, for example, it should be defined at which stage they want to reach such LOD. In this manner, the inclusion of end-users' needs prior to deciding LOD's of crucial parts is one of the essentials of BIM. Therefore, the coordination of stakeholders has a noticeable effect after the completion of the project on the operational use of the model.

3.1.4 Standard of Care

In common law, a tort is a wrongful act or omission that causes a victim to suffer injury or harm. Torts can be classified as; intentional torts, negligence torts, and strict liability torts. As a negligence tort concept, Standard of Care indicates that an architect/engineer must utilize the same level of care with the professionals of their expertise in the same circumstances while giving services related to their duty of care. As in the past, every technology that is new to the industry and being adapted later becomes a standard and an indispensable element of the industry as it is accepted. Just like CAD in the past, with the inclusion of BIM in the construction sector, it is starting to introduce innovative and efficient methods as well as creating new expectations. For instance, it is now easier to detect clashes and prevent other design-related issues prior to construction by enabling BIM tools; thus, it is not abrupt to say that the expectations from architects/engineers will be higher with regard to their professional skill and care. As BIM evolves, the number of errors will decrease, and these expectations will ultimately become the new standard. The number of errors will decrease as the number of the projects utilizing BIM increases. However, these standards are not yet decided by a protocol or any contract document, but they can be defined by the courts (Arensman & Ozbek, 2012).

Additionally, the perception of the standard of care can create reliance issues. Apart from the software reliance issue due to excessive and essential usage of the software, collaborators should rely on information that is provided by another party. Especially in a platform like BIM that needs an existing collaborative nature, parties continuously share information throughout all phases of the project in which others should rely on and perform their work based on them. Architects/engineers need to get too many inputs from their collaborators and carry out their work, and they still need to satisfy the requirements of their standard of care. Therefore, limitations of liability and indemnification agreements may need to be included in the agreements of the collaborators, even if it restricts the collaboration to some extent.

Inevitably, this conversion on the standard of care brings a compensation problem as well. As the risk and the expectations shifted towards designers, it is reasonable for them to expect monetary compensation. In fact, as BIM presents a more efficient way for processes, it aimed to reduce time wasted in design as well as in construction. Therefore, the price that designers obtain will be deducted since they commonly paid for hourly rates. Therefore, designers and other parties working on hourly basis hesitate to conduct business in a smarter way (Hastie, 2019). Apart from reduced person-hours of designers, the implementation cost of BIM will be a burden on the shoulders. The cost includes not only the necessary software and hardware but also includes training of employees for BIM. However, neither employers nor contractors will be willing to pay for such cost compensation.

Furthermore, BIM alters the way how the doctrine of privity protects the designers of the project, therefore affects the standard of care. The doctrine of privity of contract preserves parties from being sued by third parties who have not a direct contractual relationship. However, recent case laws displayed that the courts discuss negligence claims regarding the contractor's reliance on the information supplied by the uncontracted architects/engineers by knowing that the information will be trusted by the contractor. Also, the information is later understood to be faulty by negligence or misinterpretation (Simonian, 2010). Negligence, in that manner, is an essential phenomenon to identify clearly to comprehend the extent of the standard of care issue regarding BIM.

3.1.4.1 Negligence

The difference between the law of tort and contract law is that the parties enter into a legal agreement to be concerned about contract law; on the other hand, individuals often incur liability in tort without a contractual relationship. As a compressive branch of law, tort generally focuses on recovering the injured parties' losses while maintaining the current situation. Particularly tort of negligence is often in the domain of the construction sector since professionals may perpetrate negligent acts

while performing their jobs with other stakeholders. Since these issues may cause significant problems, they spend much money on indemnity insurances.

Negligence is one of the most critical parts of tort. It includes physical or mental injury or damage suffered by another party as a result of the negligence of a person or institution and pure economic losses without causing any material damage.

The case that builds the foundation of the law of negligence is Donoghue v. Stevenson (1932). Donoghue's friend brought her a ginger beer (Stevenson) in an opaque bottle. After she drank some of it, she noticed a dead snail in the beer. After she became ill, she sued the manufacturer, Stevenson. Since her friend brought the beer to her, she has no contract with Stevenson, but the House of Lords found the manufacturer liable for negligence. They decided that even in the absence of an agreement, creator of a product can be liable to its ultimate customer. As a result, they established vital principles to be tested in the event of negligence.

- The existence of a duty of care is owed by the defendant to the claimant
- Breach of that duty by falling below the appropriate standard of care
- Presence of causation of the damage to the defendant with that breach
- Proof of the damage is not too remote a consequence

"Duty of Care" is a legal obligation that requires a party to provide service at the standards that it must reasonably satisfy while engaging in an activity that could predictably harm the other party. Even if it can be defined by the law, it can also be determined by the law's jurisprudence. It should be first determined if there is a duty that exists, and then the standard to that duty should be defined. The question of whether the duty of care exists is sometimes hard to answer. The standards of care are subject to change as the expectations of society change. As mentioned above, the claimants should either refer to a former case to show that they are in the same duty situations or convince the court that their situation is new to the industry. For example, construction works mostly depend on paper-based work in the past years, but they are mainly conducted on computer-based programs as time goes by now.

This evolution also affects the nature of the situations encountered. Because of such changes body of knowledge of the profession and industry itself usually sets reasonable standards.

Causation is necessary to distinguish the harms that are not direct effects of negligence. If other circumstances contribute and escalate the harm, then the cause of the duty of care cannot be found liable for its consequences. It is crucial to notice that it is necessary but not essential for the claimant to prove the origin of the effect. When there is no other possible direct cause of the harm, the defendant can be found liable.

Finally, the claimant should prove that the consequence of the breach of duty is not too remote from the origin. The existence of that test prevents the defendant from compensating and limits their liability to a reasonable extent. However, if the kind of harm is foreseeable, then the defendant can be held liable even if the extent of the harm goes beyond the anticipation. For example, a contractor in a construction project leaves a crane negligently unattended and without proper warning in a site, and a non-authorized person climbs on top of the crane. Then he falls on to another person. The person on the ground dies because of the impact of the collision. In such a case, the contractor cannot be held liable for the harm (death of the person on the ground) since the consequence goes far beyond the foreseeable impacts.

On the other hand, assume that a contractor leaves a hanging weight on the hook of the crane, and a force majeure event, like an unforeseeable natural disaster, happens. Because of this, the weight drops onto a worker and leads him to die. In this situation, even if the cause of the occurrence is unforeseeable, the contractor can be held liable since the kind of damage (death of the worker) is foreseeable.

While defending against a negligence claim defendant may set out some related elements. They may prove that the claimant was aware of the risks involved in the discussed act. If this is the situation in which the claimant was prepared for the risk, the case will likely end up in favor of the defendant. Other than that, the claimant may prove that the defendant had a free choice or voluntary acceptance of the risk

while carrying out the activity subjected to discussion in the court. While free choice indicates the employees acting in a breach of their agreements with employers mainly, voluntary acceptance of risk represents the awareness of a defendant clearly by being paid for such a risky activity. Apart from these, another case can be faced in the construction that a party may be harmed while trying to rescue the injury caused by another party's negligence. In such a case, the claimant can be compensated by the negligent party, even if they are willing to risk.

As discussed above, the causation of the harm is one of the essential elements to determine. Any other party should not have broken the chain of the causes between initial negligence and the final harm. If this is the case, then legally, harm may not be directly linked with the initial negligent party. Also, the negligence may be both defendant and claimant product, which is called "contributory negligence." However, it should be clarified that the defendants should not have any effect on the occurrence of negligence, but they may affect the intensity of the harm by the negligence of the claimant. Thus, this situation decreases the compensation obligation of the claimant.

Professionals should make the distinction of negligence type carefully. Negligence statements can be more harmful than negligence acts due to their relevance to pure economic loss. Advisory statements of parties (architects, advisors) can be investigated under this category. They have a duty of care if the party they advise goes into a dispute with a third party. The court will judge them as they were aware that the claimant would rely on their negligent advice.

As a different concept, there may be a contribution of more than one party in particular negligence. In such a situation, the injured party can sue all of the involved parties. If the court decides that they all impact the damage, the claimant can charge the many from the party, whichever he or she likes. As long as the claimant receives the total of the decided amount, he or she can take the monetary compensation in any possible proportion. However, if the party sues only one of them and gets the amount, he or she cannot later decide to move for another judgment against other parties.

Nevertheless, if a negligent party loses the case lonely against the injured party, it is in the position that it should move to a judgment against other negligent parties to prove that they were also liable for that specific negligent act or statement. Only after the proof of their contribution, a court can decide how much they affect the damage and in which percentage they should compensate for the monetary compensation.

3.1.5 Legal Status of BIM

The legal status of the BIM model can vary according to the project. While in some, it is not a contract document but used between parties and is not submitted to the agencies as it is a "co-contract document" in which it governs the affairs between parties or "inferential document" in which the model stands for only visualization purposes (Pandey et al., 2016). Also, parties can maintain the conventional way of designing without including the BIM model as a contract document. In this application, the producer of one model is not obligated to validate the integrity and accuracy of the model they provided, but this reasonability stays with the receiver of the model (Ku & Pollalis, 2009). In order to facilitate that use, the coordinator of the collaboration process describes the geometric rules and 3D design and construction-related information to the downstream contributor. This is called an "accommodation document" (Ashcraft, 2008). On the other hand, if a legally binding rule or model is not found, one cannot impose the desired geometries as precise guides to use. The priority of the model receiver is that the model he receives is reliable for his own use. From this point of view, if the shared information and models are shared for the purpose of "information only," instead of producing a model from these inputs, the users only refer to this information and create their own model by using the original 2D contract documents; thus, the collaboration is undermined. The model creator should assure the users of the integrity and the accuracy of the model in order to facilitate that concern, and the process will be more efficient since everyone will not create their own separate model. By inducing such a validation system, every contributor can derive their model from supplied models. However, the designer is

concerned since the reuse or alteration of their model may be beyond their liability. Even if this concept is also valid for 2D models, the risk is higher when these processes are pursued in an electronic environment (Larson & Golden, 2007).

3.1.6 2D – 3D Utilization

As the sector moves towards BIM, traditional 2D design documents or projects of the buildings are wanted to be converted into 3D models. While this conversion takes place, the required LOD should be defined well. It is crucial to satisfy the intended purpose of the conversion. Apart from that, in a project that uses 2D documents as the contract documents and then converts those into the 3D format, it may constitute a problem to revise 2D models used as a baseline when 3D models are used to continue with the design (Dougherty, 2015). Sometimes conversation from 3D to 2D can cause a validation problem for the quality of the model since the handovers are made on 2D formats traditionally (Abd Jamil & Fathi, 2020). Also, it may be ambiguous which model should have priority in such circumstances where there is a conflict between 2D and 3D documents.

3.2 Legal Issues in Turkey

A survey was developed to understand the local conditions regarding BIM related legal issues to see whether there are similarities and differences between the problems in the literature and in Turkey. This survey consisted of 4 main parts which are demographic information and BIM experience, contract frameworks and standards, BIM related issues in projects, and legal problems in relation to BIM use. Questions under these categories can be seen in Appendix A. While this survey was sent to 700 members via buildingSMART Turkey (bSTR), which is an organization working on facilitaing the adoption of BIM in Turkey, it was also delivered to the professionals in our network via LinkedIN. As a result, 43 users participated in the survey conducted among professionals who use BIM processes in their projects in

Turkey. When the demograpy of the participant is considered, it can be seen that the majority of the participants give design services in the sector (Figure 3.2). It is followed by construction contractors and BIM consultans.

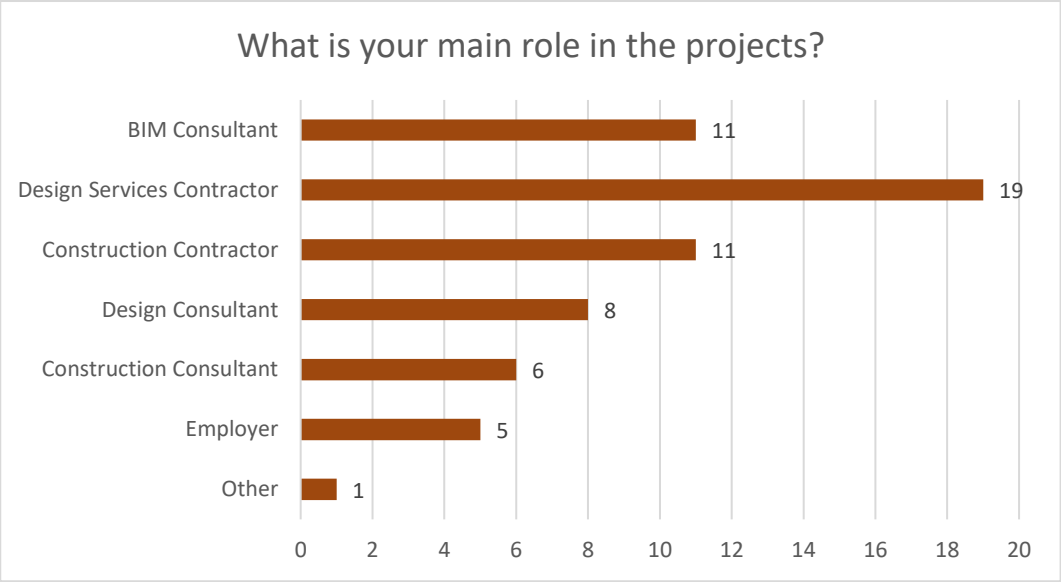

Figure 3.2 Roles of Participants

While 33% of the participants have used BIM for more than 10 projects, about half of the participants used BIM for more than 6 of their projects in the sector (Figure 3.3).

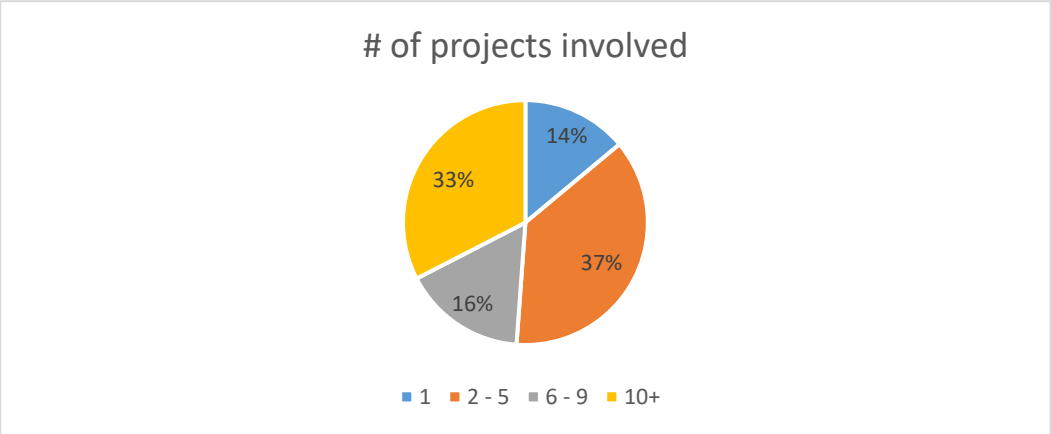

Figure 3.3 Number of Projects Involved by Participants

Also, almost half of the participants have BIM experience for more than 5 years (Figure 3.4).

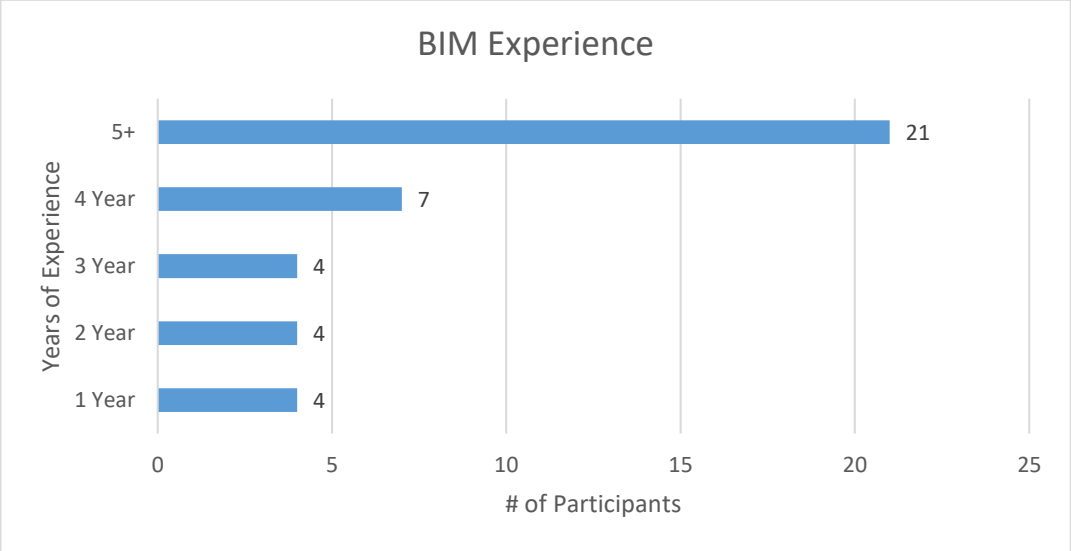

Figure 3.4 BIM Experience of Participants

Next, most of the participants used BIM processes in their design services work (Figure 3.5).

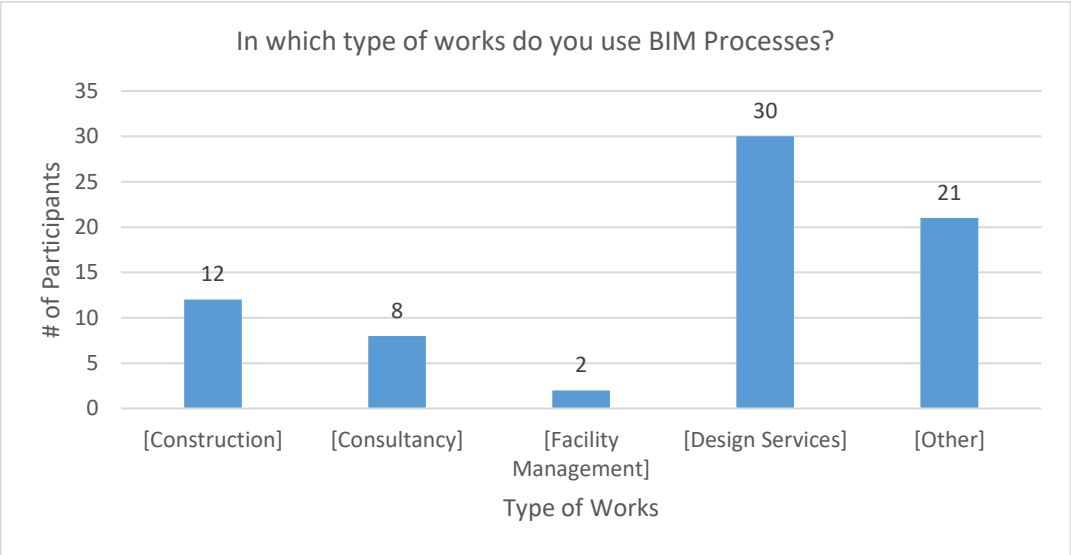

Figure 3.5 Work Types using BIM

As a result of this study, it has been revealed to what extent the BIM-related problems categorized within the scope of the thesis are encountered in the projects carried out in Turkey (Figure 3.6). Looking at the results, 96% of the participants think that new roles and responsibilities have emerged with BIM (58% Strongly Agree & 38% Agree). However, up to 62% (30% Strongly Agree & 32% Agree) of respondents believe that the roles and responsibilities of project stakeholders have become unclear with BIM. Among other stakeholders, 91% (58% Strongly Agree & 33% Agree) of the respondents think that there has been a significant increase in the standard of care of designers with BIM processes. While 72% of the participants stated that there were disagreements between the parties in the transition between 3D-2D, 61% of these problems were resolved by sticking to the 3D model. On the other hand, while 68% (21% Strongly Agree & 47% Agree) of respondents have concenrns about Model Ownership and Copyrights, 28% (2% Strongly Agree & 26% Agree) of them found contract clauses regarding to ownership and IPR insufficent (Figure 3.6).

As understood from the survey results, the legal status of the models in the projects in Turkey does not cause many problems in the projects, i.e., 65% of respondents claimed that the BIM model is contractually binding. Finally, 42% of the participants stated that model coordination became more difficult with BIM. One of the participants, a company representative who has been providing BIM Consultancy services for more than 5 years in the sector, stated that the biggest reason for the coordination problems is the companies' insistence in maintaining their old-style design understandings instead of adapting to the renewed and developed design processes with BIM.

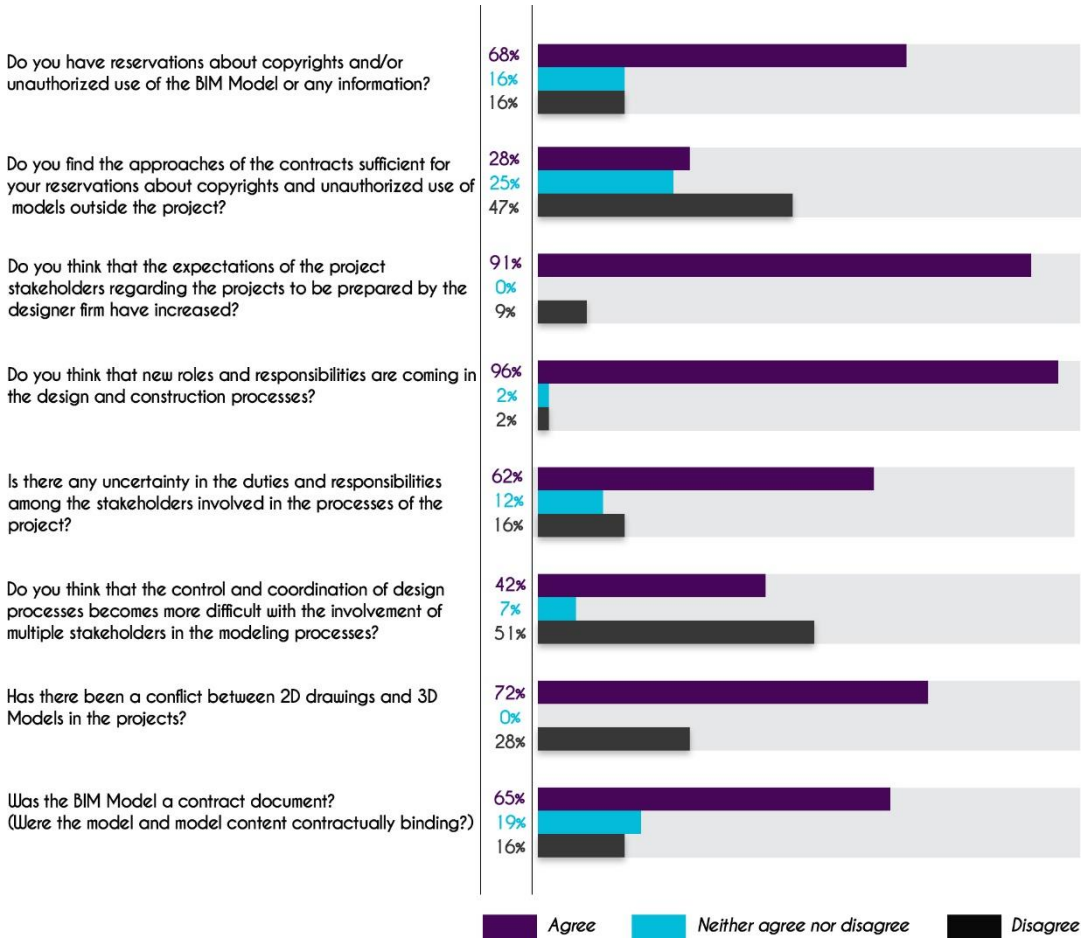

Figure 3.6 Contractual Issues in Turkey

3.3 Summary and Discussion of the Chapter

Since BIM has come into existence in the sector, researchers have been working on the legal side of BIM. Researchers pointed out different legal incompatibilities, including liability-related issues (Ashcraft, 2008), the standard of care, intellectual property rights (Arensman & Ozbek, 2012), and contractual challenges (Dougherty, 2015; Pandey et al., 2016). In the perspective of Ashcraft (2008), contrary to traditional methods, BIM, seeing communication and integration outside of the usual patterns, causes blurring of the boundaries between duties and responsibilities. This matter makes it difficult for practitioners to adopt BIM and leads to changes in the term “Standard of Care,” as Arensman & Ozbek (2012) indicate. BIM has changed

the relationships between roles and increased expectations, leading the job qualifications of the architect who is responsible for the design to mount. Thus, architects are now expected to create projects with fewer errors. In addition to these, BIM aims for more efficient use throughout the life cycle of a project with increased collaboration between stakeholders. This collaboration process creates new roles and unrolls the importance of coordination among the participants (Sebastian, 2011). Even if the inclusion of parties in the creation process of a model may cause ownership issues, these issues are not conceptually different from the concerns in traditional methods. As Larson & Golden (2007) indicates, in contrast to this idea, the use of the model now may go beyond the anticipation of the creator. Also, a model can have more than one owner since there is more than one contributor (Ku & Pollalis, 2009).

These studies focus on different angles of using BIM and infer some different legal issues that may arise. This chapter examines dozens of the issues identified in the literature in detail and categorizes these potential legal issues that laid heavily on academic studies. These categories can be sorted by their importance as Intellectual Property and Model Ownership, Contractual Relationship and Responsibilities of Parties, Coordination and Control of the Design, Standard of Care, Legal Status of Model, and 2D-3D Utilization.

Considering the percentage of answers to questions examining the situation in local contracts, Intellectual Property Rights and Roles and Responsibilities of Parties, as parallel to the results on related literature (Figure 3.1), draw attention among the BIM-related legal problems encountered in Turkey. However, a greater weight appears in the reservations about Standard of Care than in the literature.

CHAPTER 4

BIM – RELATED CASE LAW

As seen in the previous chapter, researchers have been conducting studies on legal and contractual fields for a long time to increase the practical functionality of the Building Information Modelling (BIM), which allows more effective use throughout the life cycle of projects by generating information instead of only constructing structures. Although the number of these studies is far less than the studies conducted on other BIM-related fields, one of the most critical aspects that should be identified for the use of BIM is legal issues. However, the practical deficiency of the works in the literature is the fact that BIM has not been legally tested in the courts to build case laws yet (Eadie et al., 2015; Arensman & Ozbek, 2012). This situation made it difficult for the literature to find a factual basis and created legal uncertainties regarding BIM. Uncertainty in this area is one of the obstacles for potential users who have legal and contractual reservations about transitioning to BIM processes to adapt (McCabe et al., 2019). Users in the industry think that such problems still could not be solved by standardized management frameworks and protocols (National Building Specification, 2019). However, as the use of BIM has become widespread, related problems started to appear in the cases carried out in the courts of BIM-leading countries. This part of the study aims to find out these court cases and evaluate them in detail to see how they relate to the expectations in the literature in terms of legal issues and create a clear understanding of legal challenges that BIM has brought into the construction sector. Investigating the reasons for these lawsuits will help the people who carry out their business with BIM to see the reasons for the legal problems that may occur in terms of actual events and pave the way for them to take the correct steps in the contractual sense with inferences made from those lawsuits.

In this chapter, the BIM-related court cases encountered in the courts of the BIM-leading countries were examined and compared in the Summary and Discussion of the Chapter in the light of the categories of legal problems previously presented in the literature. A search carried out in web databases shows that 9 BIM-related case laws are found in UK and USA courts. Although it is not yet mature enough to create a detailed archive, examining these cases within the framework of the categorization mentioned above will be expected to form a legal basis for the studies in the literature, as well as creating a clearer perspective regarding the legal part of BIM in this sector, where working with BIM has become more common.

Before reducing them down to 9 cases, a total of 12 cases in the USA were found by using search keywords such as construction project, building information Modelling, 3D model, BIM at "Leagle." In the same way, 4 cases are found in the UK by using the exact keywords at "Bailii" and "Google." The number of cases, which was 16 in total, was reduced to 9 as a result of an in-depth examination of the cases. While performing this elimination process, it was paid attention to whether the problems in the cases were caused by the BIM implementation. In other words, the fact that a job is done with BIM does not mean that it will be among the reasons of these case laws. It was not taken into consideration if the cause of the problem examined in court is a problem that may be encountered in works done with traditional methods or the underlying reason of the case is the same in traditional procurements. Only issues that can be matched with the use of BIM were considered.

The decision documents of the identified cases are examined and summarized in section 4.2. Then, these cases were also evaluated in terms of legal issues that were divided into categories in the previous chapter. The cases examined and the legal problems identified in these cases are summarized in Table 4.1 The table lists the Lawsuits, the countries and cities where these cases were heard and the years of cases. In the last column of the table, the categories of problems identified in the cases are specified.

Tablo 4.1 List of Casses and BIM Related Legal Issues

CASE No.	CASE LAW	YEAR	COUNTRY/ STATE	CATEGORY of ISSUE
L1	Trant Engineering Limited, V. Mott Macdonald Ltd,	2017	UK / London	►Contractual Relationship and Responsibilities of Parties ► Intellectual Property and Model Ownership
L2	North American Mechanical, Inc., V. Walsh Construction Company II, L.L.C,	2015	USA / WI	►Contractual Relationship and Responsibilities of Parties ►Coordinating and Control of the Design
L3	3D Imaging Services, L.L.C., V. McLaren, Inc.	2017	USA / MI	►2D-3D Utilization
L4	Advancetec, L.L.C, V. Wohlsen Construction Company,	2017	USA / VA	►Intellectual Property and Model Ownership
L5	The Design Partners, Inc., V. Five Star Electric Corp,	2017	USA / NY	►Contractual Relationship and Responsibilities of Parties
L6	Merrill Iron & Steel, Inc., Plaintiff V. Blaine Construction Corporation,	2017	USA / PA	►Contractual Relationship and Responsibilities of Parties ►Coordinating and Control of the Design ►Legal Status of Model
L7	Ma Mortenson Company, Inc., V. Timberline Software Corporation	2000	USA / WA	►Standard of Care
L8	Kt Group Limited, V. NCR Corporation	2019	USA / NY	►Intellectual Property and Model Ownership
L9	BAM PPP Infrastructure Cooperative U.A. V. National Treasury Management Agency and Minister For Education And Skills	2016	UK / Ireland	►Standard of Care

4.1 Case Laws

4.1.1 Trant Engineering Limited v. Mott Macdonald Ltd.

In the case of *Trant Engineering Limited v. Mott Macdonald Ltd*. (2017), UK Ministry of Defence (Owner or Employer) employed Trant Engineering Ltd. (TEL) (Contractor and Claimant) for £55 million Mid-Atlantic Power Project (Project), which comprises both the readjustment of existing power generation facility and the construction of a new power plant station at Mounty Pleasant Complex in the Falkland Islands. Prior to awarded to the tender, Trant engaged Mott MacDonald Ltd. (MML) (Designer, Consultant, and Defendant) to give both design and consultancy services from preliminary to detailed designs and design coordination and implementation of BIM, if their bid was successful. Additionally, MML planned to carry out all this design coordination and management through the design data management software called *ProjectWise*.

The Court in which the first reported BIM lawsuit was filed defines BIM as

"… a software system which is intended to assist the design, preparation, and integration of differing designs and different disciplines for the purposes of adequate and efficient planning and management of the design and construction process."

MML started its services for the Project after they were given to go-ahead signal from Trant in May 2016. Following that month, they send via emails their Proposed Contract and Schedules, which summarize the work they supply, and Terms of Payment, which defines lump sum fee of £780,000 and schedule of payments from June 2016 to September 2018, assuming that the design phase would be complete by March 2017. It also defines the rates of any additional works. The Proposed Contract, on the other hand, contains some relevant provisions that may affect the resolution process of the claims. Firstly, there is a limitation of liability provision, which limited the liability of MML in the event of a breach of contract up to £1 million. Secondly, it contains a provision in the payment clause that gave the right to MML to suspend

the work if Trant failed to make payment. Thirdly, it includes an intellectual property provision that states that upon full payment under the agreement, license to use all rights of the model is entitled to Trant and third party authorized by the client of the Project.

However, this proposed contract was never signed or returned by Trant. In fact, parties disputed on the scope of the work of MML in which MML claimed that the scope becomes wider than envisaged at the initial stages. Next, Defendant invoiced two interim payments of £250,000 plus VAT to Trant in early 2017, but they were not invoiced according to their proposed schedule, even if they represent the works carried out. These invoices were eventually paid to Defendant by Trant. On the other hand, the main issue that put the relationship of the parties into a broke down is caused by two further invoices that are claimed by MML in amounts of £475,000 plus VAT and of £1.626 million-plus VAT, of which Trant gave pay less notice for the latter one. The claimant paid neither of these invoices. Therefore, MML noticed that it would suspend the works if the amount of the first invoice were not made on 2 June 2017. Later that day, they denied access of stakeholders to servers of ProjectWise by aborting the passwords. One week then, Defendant sent a letter and mentioned that it was suspending all works due to unpaid invoices and due to the absence of a binding contract and appeal to their intellectual property and ownership rights of design data.

After Trant received a rejection of their application to MML to gain re-access to design data that had already been supplied to the public use for the Project, they applied to the High Court of Justice in the Technology & Construction Court, pursuing a declaration as to the contract and the injunction.

The claimant claims that MML defines the scope as BIM preparation, coordination, and implementation and provides a contract to the sum of £780,000, of which £500,000 has already been paid. Also, they claim that even if they did not sign the proposed contract, they could be counted as accepted those terms since NAMI made payments to MML, and they continue to perform the work.

As the judge referred to solve the issues of injunction payment to the decision of *American Cyanamid Co (No 1) v Ethicon Ltd & Ethicon [1975] UKHL, AC 396*, she applied several tests to reveal this case.

MML claims that there was no contract between them by stating that the works and payments were not carried out according to those schedules, and they raised an issue in Aug 2016 about the scope of their work. Also, former payments were not directly linked with any part of their work or any terms or provisions of the purposed contract, but they were merely summing up the tasks they had already performed. Additionally, the defendants claimed that Trant did not have the right to design data, which have not previously been supplied since there is no binding contract between them. Even if the terms of the proposed agreement considered, the clause on IP rights stipulates no rights of use to Trant in such a case.

The judge asserts that it is not possible to decide whether there is a contract between parties. On the one hand, even if the schedules, provisions, or scope of it are issues of fact and have not been settled yet, there was a contract between parties since they both continue to do their work in means of designing and making payments. On the other hand, there were disputes on the scope and price of work at the early stages; hence, there was no binding contract on a legal basis. Thus, it was evident for the Court that there is a serious question to be tried.

Next, even if MML claims that the claimant exaggerates the circumstances since they have already given the pdfs of the design data which had previously been paid, it would not let Trant start from scratch, and the £1 million liability limit is adequate for possible losses, the judge asserts that the limitation of liability is not enough for potential loss of the claimant since the Project is £55 million and a part of a more extensive project.

The Court decided to apply for the injunction in favor of the claimant, claiming that the design data was previously shared for use, and in adjudication or a possible trial, if the Defendant comes out right, they may receive even more than the amount of the

necessary compensation. Apart from that, Trant indicates that they are ready to pay *usual undertakings in respect of any damages.*

4.1.2 North American Mechanical v. Walsh Const. Co. II

In the case of *North American Mechanical v. Walsh Const Co II* (2015), Mercy Walworth Hospital and Medical Center in Wisconsin (Owner) contracted with Walsh Construction Company (Walsh) (Defendant and Contractor) to remodel and expand the existing hospital facility (Project). Afterward, Walsh subcontracted the installation works of HVAC systems to North American Mechanical, Inc. (NAMI) (Plaintiff and Subcontractor).

Before NAMI submit their bid to Walsh, they made it clear to perform the work with Walsh's schedule of work; thus, the claimant made their assumptions and preparations regarding their part accordingly. Apart from that, NAMI was obligated to participate in the BIM process as other subcontractors, in which Walsh created 3-D models by converting 2-D models supplied from Mercy.

The Project was lagged from early stages, and NAMI faced a shortage of spaces in the construction site and could not perform their job as they contemplated at the biding stage due to improper coordination of Walsh. Thus, they sued Walsh to seek for breach of contract and quantum merit, but the Court denied their latter appeal and refused Walsh's summary judgment and the full trial held in this case.

Although NAMI calculated and prepared the BIM Modelling part of its' bid as $107,000, they later submitted four change orders for a total of $708,520 compensation. They showed several reasons for these claims as they involuntarily strained to "*make changes to duct and piping runs, including adding duct and pipe offsets, increase the size of supply air fans, and add condensate traps*."

NAMI explained the causes of those "BIM claims" in two parts. Firstly, they issued that the responsible architect failed to allocate enough space for installation for the material that NAMI specified to use, and thus this issue cause some "*major*

modifications" later to be performed by them. Secondly, they complained about other subcontractors since they did not participate enough in the BIM system and caused scheduling issues as they occupied spaces that needed to be reserved for NAMI to perform their work. Additionally, they support their claims by stating that they informed Walsh to expose some Modelling errors and discrepancies on BIM models like wrong wall thicknesses and conflicting door elevations.

On the other hand, Walsh stipulates that these BIM claims should be considered not separated from Article 11.3, which specifies that "*NAMI is bound to Walsh to the same extent that Walsh is bound to Mercy*" in an event caused by Owner or contract document. Furthermore, it continues as "…*If [Walsh] cannot in good faith certify [NAMI's] Claim, [Walsh] shall not be required to submit [NAMI's] Claim [to Mercy], and in such case [NAMI] waives its right to seek compensation from [Walsh] or [Walsh's] surety(ies) for [NAMI's] Claim(s).*". Also, it stipulates that Walsh "*may*" either direct the claim to the Mercy by itself or authorize NAMI to present their Claim to Mercy. The latter part of the clause caused a misinterpretation issue since the right of Walsh was referred to by "may" instead of any stipulation that made it a requirement.

For the first claim, even if Walsh arranged a meeting to discuss the issue with Mercy and NAMI, the Owner did not certify any compensation by stating the reason that the original design drawings "*are schematic in design and coordination is required per contract to make the systems work.*" For the subsequent two claims, Walsh sent the requests to Mercy, but they both rejected since NAMI could not prove those changes could not be foreseen by the time they prepared their bid. Finally, they did not send the last request to the Owner.

As opposed to these opinions of the Defendant, NAMI argues that all of their claims fall outside of the scope of Article 11.3 since the BIM model is not a "Contract Document" since it stipulated in the contract as "…*it was merely Walsh's take-off of the Contract Documents to be used to coordinate the work*." However, its employees gave testimonies in the Court in which they said that BIM Claims arose from the

omissions of the architect of the Mercy, i.e. NAMI could not establish a solid ground for their opinion.

Furthermore, NAMI mainly focused on the fact that Walsh did not do what it was capable of and acted not in good faith while do not authorize them to sue Mercy or did not push them to compensate the claims. Nevertheless, as mentioned above, the courts considered that Walsh was not required to do so since the article referred to the issues as "may."

Although BIM responsible for Walsh admitted that Walsh unexpectedly faced an issue that causes NAMI to perform some additional Modelling works, NAMI did not prove that these BIM claims were directly linked with such a problem. They claimed a single comprehensive claim but did not present anything to show how these scheduling or Modelling issues worth or related to the amount. Therefore, the Court decided not to grant any of the BIM claims in favor of NAMI; even if they may presume that NAMI deserves some amount of money, they are not in the place that decides how much is owed without any proves supplied by the claimant. However, the court awarded NAMI to have compensation for the approved change orders that Walsh could not effort to defend against.

Apart from these, the Court stated that NAMI's representation of such claims under the name of "BIM Claims" is not proper, and the title may mislead since all of the claims are somewhat related to issues that caused by changing of works rather than monetary loses due to reModelling of works. Also, Walsh stated that just a tiny percentage of the requested amount is due to BIM hours.

4.1.3 3D Imaging Services, LLC v. Mclaren, Inc.

In the case of *3D Imaging Services, LLC v. McLaren Inc.* (2017), McLaren (Owner and Defendant) and 3D Imaging Services (Contractor and Plaintiff) contracted in January 2014 to perform 3D laser scanning of existing architectural and structural

members and creating a BIM model of those buildings. The final document which will be provided to McLaren is decided to be a .dwg file for AutoCAD.

The agreement states that the Contractor will be in charge of assigning the "…team to download and register all individual scans collected by the on-site laser scanning… After the completion of registration, the [Contractor] will provide a BIM team to create the architectural and structural model in AutoCAD (2010)" Also, the agreement stipulates that the model will be on LOD 100 basis and represent one and accurate model of the conditions.

Defendant paid $445 of the total $2,225 contract amount and left the rest to be paid after completion. However, after Defendant is given the model, he issued it due to the fact that they were not able to manipulate the model in the way they desired to do so and hold the rest of the contract amount unpaid since they wanted a 2D model of the Project. When the Plaintiff rejects this request, this issue becomes a dispute that could not be sold and moved to the Court.

Defendant defends in the bench trial that they could not change the model as they need, and the model was like a "*Google Earth picture of a building*." On the other hand, the claimant defends that what they did was taking 3D laser scans and creating a 3D model, and they showed many ways to create a 2D model out of the 3D .dwg file they provided to McLaren. Therefore, the district court held that Plaintiff is owed $1,780 plus attorneys cost from Defendant stating two facts. Firstly, an experienced person in the sector could easily convert a 3D model to 2D. Secondly, when one contracted with a company named "3D Imaging Services" that advertises their 3D works, one should expect a 3D model. Nevertheless, even if Plaintiff claimed that the contract language was clear and the Defendant did not issue any ambiguity, this judgment is later reversed by the circuit court on appeal because of ambiguousness since there was no explanation whether the term "model" is 2D or 3D.

After all, in the latest court decision, the judge referred to the following cases to illustrate the misinterpretation of the circuit court. They are as follows:

"[A]n appellate court should not conduct an independent review of credibility determinations, disregard findings of fact, or create new findings of fact." Smith v Anonymous Joint Enterprise, 487 Mich. 102, 113; 793 N.W.2d 533 (2010).

"*A contract is considered ambiguous when the words may be reasonably understood in different ways.*" (Emphasis added intentionally) Raska v Farm Bureau Mut Ins Co of Mich, 412 Mich. 355, 362; 314 N.W.2d 440 (1982) and courts may not "*create ambiguity where the terms of the contract are clear.*" Frankenmuth Mut Ins Co v Masters, 460 Mich. 105, 111; 595 N.W.2d 832 (1999). Also, "… *court must look at the contract as a whole and give meaning to all terms.*" Auto-Owners Ins Co v Churchman, 440 Mich. 560, 566; 489 N.W.2d 431 (1992).

All in all, the Court stated that there could not be any reason to create ambiguity if there is no indication of it. In other words, there is not an issue of the meeting of minds since the name "model" has no meaning rather than a 3D model. There is not any mention of the 2D model in the contract; in fact, the 3D model can be transformed into a 2D format easily. Consequently, the Court reversed the order of the appeal court.

4.1.4 AdvanceTec, L.L.C. v. Wohlsen Construction Company

In the case of *AdvenceTec,LLC v. Wohlsen Construction Company* (2017), Datwyler Pharma Packing USA (Owner) went out to design and build tender for pharmaceutical processing/manufacturing plant. While Wohlsen Construction Company (Contractor and Defendant) was preparing their bid, they negotiated with AdvanceTEC (Subcontractor and Plaintiff) to perform the design and construction of a particular part of the work. The Subcontractor's expertise is in the design and construction of cleanrooms.

One month later, they meet to discuss the provisions of the Letter of Intent, which was going to constitute the basis of their relationship until they sign a subcontract agreement. AdvanceTEC intended to reserve all rights of the Instrument of Services

(IOS) for itself. The definition of IOS included "*design drawings, 3D BIM models, engineering calculations and loads, detailed estimates, value-engineered solutions, detailed project sequence schedules of work for the project, OEM lists, and prequalified subcontractor lists.*" They insist on framing the work as design-build instead of design-assist since they thought that it was going to have a significant impact on when ownership rights are considered. They said that they could accept to perform design-assist, value engineering, estimate services until they sign a design-build subcontract if all work products shall remain property of them until that agreement. After the handover stage is completed and they paid for their work, a royalty-free license was going to be given to the Owner for solely use to the Project.

However, even if the executed LOI defined the work as "design-assist/build" service, the only provision about the ownership of the designs and works produced by Plaintiff states a conditional right that if the relationship between Wohlsen and the Owner ended without executing a contract "*all work product produced by Subcontractor pursuant to this Letter shall be the property of, and provided to the Owner.*"

After a few months, the Contractor notified Plaintiff by stating they ended the relation between them and requested Plaintiff to sign an "… *Acknowledgment of Termination of Letter of Intent and Final Release of Liens and Claims.*"

"As an inducement to [Defendant] making the requested payment, and contingent only upon receipt of the Final Payment Amount, [Plaintiff] agrees that all rights to the drawings, specifications and other documents (`Instruments of Service'), including those in electronic form, prepared by [Plaintiff] or its subcontractors or subconsultants (of any tier), including all statutory, common law and contractual rights of ownership to the Instruments of Service, shall transfer to the Contractor and may be used by the Contractor and the Owner in any way in connection with the design, construction, use, maintenance, expansion or promotion of the Project."

However, AdvanceTEC said that they were not going to sign such a letter since it is one-sided and force them to grant the rights of IOS to the Contractor. Additionally,

they claimed that they are the owner of the IOS by referring to Section 201(a) of the Copyright Act.

"Initial Ownership.—Copyright in work protected under this title vests initially in the author or authors of the work. The authors of a joint work are co-owners of the copyright in work."

Therefore, they requested from Defendant that they should immediately relinquish the use of IOS; in this way, the issue goes to the district court for declaratory judgment and injunctive relief on the rights of use of IOS.

Since the application is on declaratory judgment, the Court will determine the rights of parties depending on executed LOI between them. Thus, the Court looked for the only provision in the LOI regarding rights on IOS, which states, "*Should the Owner elect not to execute a contract with Wohlsen, all work product produced by AdvanceTEC pursuant to this Letter shall be the property of, and provided to the Owner.*" Nevertheless, as Court has indicated, this lone provision states nothing about which party should convey the rights of IOS in the case of an unexecuted subcontract agreement. Still, it stipulates conditional rights in the event of the Contractor would not be awarded by the Owner for the Project. Even if he Plaintiff defend that this clause states only the rights of the Owner on the IOS and states nothing about the rights of Defendant, Wohlsen should not be able to continue to use such services, Court denies that idea since this lone provision reference only a conditional transfer of rights to a third party and does not necessarily mean that Defendants further use of the IOS is unjustifiable. Although the intent of the AdvanceTech was to hold the rights of IOS if they would not sign a subcontract agreement, the Court cannot force any regulation requiring a new contractual term that has not presented into the original transaction. Consequently, the Court dismissed Plaintiff's Complaint about Declaratory Judgment as the signed document did not support such a claim.

4.1.5 The Design Partners, Inc. v. Five Star Electric Corp.

In the case of *Design Partners Inc. v. Five Star Electiric Corp.* (2016), Five Star Electric Corp. (Defendant and Owner), an electrical contractor, has gone into several agreements with The Design Partners Inc. (Plaintiff and Contractor), who serves as a computer and design consulting firm, related to construction projects at Madison Square Garden and the World Trade Center PATH station in New York in September 2010. In their consulting agreement, the Contractor will be responsible for supplying personnel to the Owner with electrical background on BIM services whose responsibilities are pre-defined in the contract, such as producing 3D Models, coordinating with other trades, converting 2Ds to 3Ds, etc. Apart from consulting agreement, the parties also signed a training contract in which the Design Partners will afford some training sessions for the employee of Five Star and teach them how to use and utilize software and methods related to BIM.

After several months the parties faced some issues related to some of the works. Firstly, some of the purchase orders of the Contractor have not been paid. Secondly, the Owner interfered with the Employment Agreements of Contractor with its two consultants. Lastly, the training contract was breached. By giving references to the above-stated reasons, Design Partners sued the Owner on six different counts. However, for the sake of this particular study to enlighten the issues in the aspect of BIM, only the count related to the Training Contract will be investigated, i.e., Count 5 (Breach of Training Contract).

First and foremost, the Training Contract describes the work as they "will be limited to a maximum of 6 Five Star personnel (Trainees) who will be dedicated to the training module for a minimum of 12 training sessions and a maximum, if necessary[,] of 26 training sessions (the training module)." And it gives either party the right of termination of the contract by providing 1-month of advance notice if the "*first training module*" was completed priorly.

Four weeks following the beginning of the training sessions, Defendant terminated the contract by an email sent to Plaintiff. Also, they had been paid for the first four lectures. Even though the parties agreed that the courses were not held on a weekly basis as stipulated in their agreement, they have disputed the reasons for this issue. While Defendant argued that the reason for the delays was caused by scheduling issues of Design Partners2 trainers, Design Partners defend that the Owner was the responsible party for these issues. Apart from that, Five Star claimed that the agreement between them is not a complete agreement since neither party signed it. Additionally, they argued that even if the agreement is valid, they still have the authority of termination since the related provision gives rights for either party.

Nevertheless, the Court denied the claim of Five Star by stating that they had already paid the amount stipulated in the Training Contract; hence, they can be counted as agreed on all of its provisions even if there is no sign of them directly. In addition to that, the Court considered that the lone provision about termination states a right for each party as a condition related to the "*first training module*," but it did not contain any definition as to what shall this phrase mean. Therefore the Court looks for the only other provision stats training sessions:

"…training class will be limited to a maximum of 6 Five Star personnel (Trainees) who will be dedicated to the training module for a minimum of 12 training sessions and a maximum, if necessary, of 26 training sessions (the training module)."

As a result, the Court concludes that a training module is a bunch of lectures that consists of a minimum of 12 sessions and a maximum of 26 courses. Nevertheless, if the "first" training module is considered as 26 sessions that it will be meaningless to give rights of termination to the party, as the buyer of the service should have the authority to end the contract if he or she did not see contemplated benefit from it. On the other hand, the Court shed light on the matter of scheduling issues as they understand that these issues arose from Five Star's trouble to arrange a room and its staff for the sessions, even if Defendant argued that they terminated the contract since

the courses did not hold on a weekly basis. Consequent to the reasons stated above, the Court held that Five Star should pay the amount of 8 lessons to Plaintiff.

4.1.6 Mortenson Company Inc v. Timberline Software Corporation

In the case of *Mortenson Company v. Timberline Software Corporation* (2000), M.A. Mortenson (Plaintiff) negotiated with Timberline Software (Defendant) to purchase their software (Precision) specialized in the preparation of construction bid. After they agreed on the license agreement, Mortenson received the software and started to utilize it in their works. However, the employees of Mortenson faced an error multiple times while they prepare a bid for a project. Yet, as the pop-up screen of "Precise" indicated, they rebooted the program, and the work continued from where they left. After they completed the estimations, they submitted their bid for the project. After submission, they figured that the value they had given for the project was 2-million-dollars below as it should have been. Therefore, they sued Timberline for breach of warranties.

After Mortenson moved the decision of the trial court that granted the summary judgment in favor of Timberline for appeal, the court stated that both the terms of the license agreement are a part of the contract, and the limitations of the remedies clause are enforceable. The provision of limitation of remedies stipulated that software makers cannot be liable for any damages such as lost profits, consequential damages due to the inability to use the program. Also, it indicated that the liability of Timberline "*in no event shall exceed the license fee paid for the right to use the programs*." Thus, the appellate court affirmed the decision of the trial court of granting the summary judgment in favor of the Defendant.

4.1.7 KT Group Ltd. v. NCR Corp.

In the case of *KT Group Ltd. v. NCR Corp.* (2019), NCR Corporation has negotiated with Tesco to supply them with supermarket self-checkout kiosks in 2013. Later

NCR hired KT Group Limited as a subcontractor to design, manufacture and deliver a pilot version of two different types. They signed Non-disclosure agreements (NDAs) to cover all confidential information related to production drawings, which consisted of 3D CAD files of detailed components of the products.

NCR contracted with KT since they were capable of doing prototyping and their expertise in the field of their study; therefore, they were capable of finding the right companies both for manufacturing and assembly. KT was designing the product by taking comments from NCR and creating a design that can be directly used for production. After finalization of the design of the kiosk Version 1, KT selected Karrie to handle the metal manufacturing work of the kiosk in 2013. After all, Tesco was satisfied with the assembled final product.

The NDA both parties has signed for both versions of the kiosk has the following clauses (apart from Version specific naming) :

"…[f]or a period of three years from the date of disclosure . . . and notwithstanding the termination of this Agreement, Recipient will: (a) not use Discloser's Confidential Information other than for the Authorized Purpose; (b) promptly notify Discloser upon discovery of any unauthorized use or disclosure of the Confidential Information; (c) exercise the same degree of care in protecting Discloser's Confidential Information as it uses to protect its own Confidential Information of a similar nature, but in no event, less than reasonable care; and (d) not disclose Confidential Information to any third party, except to its Affiliates and subcontractors who (i) have a legitimate need to know to accomplish the Authorized Purpose, and (ii) are obligated to protect the Confidential Information…."

It also provided that the rights of the design remain Discloser's property except for authorized uses. Related to these concerns in defined Confidential Information as the information supplied and copyrighted by KT related with production and drawings given to NCR to evaluate if they purchase hardware for various stores and "*which is: (a) clearly designated, labelled, or marked as confidential or its equivalent at the*

time of disclosure; or (b) of a nature such that the Recipient knows or should know it to be confidential."

In 2014 KT started to design Version 2 kiosk by taking reviews from NCR and obtained the approval of them for the design. After some time, NCR emailed for a request for a quote (RFQ) for a larger scale manufacturing of subassemblies of a minor part of the kiosk to KT and six companies, including Karrie, and attached "*CAD, PDF, and procurement*." After Karrie was awarded for the project, KT figured the attached files were their own designs and sued NCR in 2015 accordingly for breach of contract, misappropriation of trade secrets, etc. Then, the jury awarded KT $50,000 on its unfair competition claim but did not grant a breach of contract claim since they could not prove the damages they suffered. However, NCR went for this judgment since they think that they should not have been granted for unfair competition claim since it is a duplicative form of breach of contract claim and since they believe that they acted in the allowance of "Authorized Purpose" defined in the NDA.

Nevertheless, the jury decided that NCR misinterpreted "Authorized Purpose" since it could be understood that they had agreed not to use those production drawings for the aim of "*price negotiations on future orders*." Also, the jury noticed that NCR has acted "*out of a dishonest purpose*" since they acted as if they will stick to the NDA, but further, they used the documents contrary to the intention of KT. Even if KT tried to maintain its rights on the drawings and 3D CAD files, NCR abused its purpose against them. Notwithstanding that, the jury indicated that NCR exploited the outputs of the performance of KT in its benefit without the authorization of the Discloser. The main reason why the jury inferred such a conclusion is NCR's attitude throughout their relationship with KT. NCR's intention was to go out to quote with the drawings they obtained from KT with their possible suppliers to build long-term relations despite the NDA they have signed. This caused misguidance of KT because they were assured by NCR that the files they provided would not be shared with the third parties "*to get alternative price quotes*." Consequently, the jury denied the

NCR's motion, and they did not change the award of $50,000 on KT's unfair competition claim.

4.1.8 Merrill Iron & Steel, Inc. v. Blaine Construction Corporation

In the case of *Merill Iron & Steel Inc. v. Blaine Construction Company* (2017), Allegheny Ludlum Steel Corporation (ATI) (Owner) contracted with Blaine Construction Corporation (Contactor) for the construction of the Hot Rolling Processing Facility in Pennsylvania. Then the Contractor subcontracted for design, erection, and furnishing to HOH Engineers, Inc. (HOH), Century Steel Erectors Company (Century Steel), and Merrill Iron & Steel, Inc. (Merrill), respectively. There is more than one suit related to this project.

In the first suit, after a number of purchase orders have been executed, Blaine withheld some amount of money from Merill due to some gaps in the column seats and bending connection plates. Therefore, Merill filed suit in the court to declaratory judgment against all other stakeholders of a project, negligent misrepresentation claims against HOH Engineers and right to indemnification against HOH Engineers and Century steel, and finally, unjust enrichment against ATI.

Firstly, Merill wants the Court to determine that all the products that were produced and made available are compatible with the plans and models were given to them and that if there is a problem arising from these products, Erector-since they cannot build them correctly-, Designer-since they designed it incorrect- or ATI -since they are not able to manage it properly- will be held responsible. However, the application is rejected since the Court cannot shield them from potential failure liability.

Secondly, Merill claimed that they would not be responsible for the problems that will arise in connection with Column seats and connection plates. However, since no lawsuit was filed against Merill regarding the claim or there was no monetary loss, the court decides that the situation is premature and rejects the application.

Thirdly, Merill indicated that because of HOH's defective design, the mentioned incident has occurred and that their contractor kept their payments because of this reason, and therefore appealed to the Court with the claim of Negligent Misrepresentation. Negligent Misrepresentation is a lawsuit that can be opened as a result of a loss of the party resulted from using the information provided by the other party who is aware of the fact that this information will be trusted by others regardless of whether they know that the provided information is wrong or not. Also, there is no need to have a contract between parties to claim such an action. Therefore, the court finds Merill justified and rejects HOH's application, which requests rejection of Merill's negligent misrepresentation application. Notwithstanding that, Merill was awarded for their punitive damage claim against HOH due to the same reasons.

Fourthly, Merill claimed that ATI was unjustly enriched since they were not paid. However, the Court rejected that application by stating that a third party who is not a part of the relevant contract cannot be sued due to unjust enrichment where the contracted party who benefitted does not request such an action.

In the second case related to that project, the issue arose between HOH and Blaine. They have agreed that HOH will provide design services, including schematic design documents and construction documents as 3D BIM models, in coordination with equipment providers. Also, the design process overlapped with the manufacturing and construction in a way that even if the design has not been finalized yet, other producers continue with enough design documents. However, as HOH indicated, there were too many unexpected changes throughout the design phase. They did not foresee such changes in the preliminary design phase, and this resulted in HOH carrying on reModelling and new calculations related to the changes. On the other hand, Blaine claimed that some of these changes have resulted from omissions of HOH in some of the design documents. As a supporting idea, HOH confessed that they did not indicate reasons for some changes, even if they clouded all of them since there were too many changes that they could not handle. As a result, Blaine has not

paid the money of HOH due to their dissatisfaction, and HOH stopped conducting work since they have not been paid.

The court investigated this issue in two parts. In the first one, they resulted that Blaine should pay the amount of money that they have been invoiced for the change orders even if Blaine claimed that they have overpaid to HOH since they still have not supplied them the as-built BIM models of the project, but instead they provided pdf files. The court indicated two facts to support their decision. Firstly, Blaine had committed in their agreement that they would continue to make payments to ensure continuity of the business, but in doing so, these payments did not mean that they waived their rights related to the delivered works, in case of a negative situation, the necessary compensations would be directly taken from HOH or their insurer. Secondly, since HOH did not seek a total claim for all of their payments, it is not necessary for them to supply as-built BIM models in a summary judgment. The issue related to these models should be seen and decided by a jury in a full trial.

In the second part of the case, Blaine could not prove that the amount they withheld is directly linked with correcting HOH errors. In this way, the court found no genuine material of fact and entitled HOH the amount of money.

4.1.9 BAM PPP Infrastructure Cooperative U.A. V. National Treasury Management Agency and Minister for Education and Skills

In the case of *BAM PPP Infrastructure Cooperative U.A. v. National Treasury Management Agency and Minister for Education and Skills* (2016), BAM PPP PGGM Infrastructure Cooperative U.A. (Applicant) was one of the bidders to tender for the design, finance, construction, and maintenance of the Dublin Institute of Technology's former St. Brendan's Hospital's Central Quad and East Quad (Project). The National Treasury Management Agency (NTMA or the Authority) was responsible for conducting procurements and select the contractor on behalf of the second respondent (Minister for Education and Skills).

The subject matter of this case is the acceptance of the documents submitted by some bidders after the deadline, following the end of the tender process of the project. Unlike traditional methods, the tender process and collection of bid documents were carried out electronically. Bidders would upload their bid documents to the system through the web-based interface through the application preferred by the employer. During this loading process, two bidders, including Eriugena, who won the tender, had some problems. These problems are caused by the files being uploaded to the system taking up ample space. Especially federated models produced in accordance with the 4D Modelling requested by the employer from the bidders were the most important factors for these files to reach large sizes. The bidders who tried to upload these documents to the system as a single piece had problems more than once, so they uploaded them to the system in pieces. Due to these and similar software problems, the uploading of some documents to the system exceeded the deadline and time predetermined by the employer.

The employer accepted the tender offer with these late submissions, and the winner of the tender became one of the parties that submitted the document late. Appellant, one of the companies participating in the tender, applied to the court on this issue. The court concluded this case in favor of the employer based on the reasons stated below, confirming that the proposal was admissible even though it was a late submission. Although no express or implied authorization was given in the tender documents, it was decided that NTMA has the discretion to accept late bidding documents both under the terms of the invitation to negotiation and in 'exceptional circumstances ' by law.

What constitutes the “exceptional circumstances” is the decision of the contracting authority and has a wide margin of appreciation in this regard. In this context, the Court considered that NTMA had the right to take into account the context of an expensive 31-weeks-long tendering process and the public interest in the progress of the project rather than the risk of abandoning the project. Otherwise, the late

submitted two offers among the three proposals would have faced the elimination issue.

Only 8 of 280 documents submitted had passed the specified deadline. Of these eight documents, 2 of them are repetitions of the previously submitted ones, and the information in 5 of them is the same as the information given in the previously submitted ones. Only one document contained information previously undelivered. In addition, as approved by the creators of the software for which the contract documents were loaded, the last editing date and time of all submitted documents were before the determined deadline.

The bidder had inadvertently exceeded the set time, as he had difficulty uploading large files due to reasons not under his control. However, the bidder did not gain an unfair advantage in loading a few small documents after the deadline. For these reasons, it is reasonable to accept this proposal, which is loaded late, and proportionate exercise of discretion in the circumstances.

4.2 Categorization and Examples of Legal Issues in Case Law

4.2.1 Intellectual Property Rights and Model Ownership

Designers and some other subcontractors may want to protect their models from undesired uses of unauthorized people. In such cases, they generally try to enforce some clauses in their agreements. While doing so, the language of the contract should be defined well in order to balance their expectations with the needs of the employer and the contractor. Since they put in hard work while creating a model, they do not want that third parties to reach to model or the contracted party to use the model prior to full payment of the works. As in the example of L1, where the defendant (Mott MacDonald) proposed a contract involving a clause related to the intellectual property rights of the model, the defendant blocked the access of the claimant to design models by stating the related clause do not postulate rights to them. However,

the court decided to apply for the injunction to the previously supplied materials in favor of the claimant by stating that the limitations of liability of the designer may likely not enough to compensate the potential loss of the claimant.

Furthermore, in a circumstance like a confidential trade secret is supposed to be shared, specialty subcontractors may hesitate while sharing the information they created since a competitor may later access such data. This situation may have become more visible with the adoption of BIM. Apart from the 3D environment, now subcontractors are needed to supply more detail into the model to increase the utilization of the model for the end-users. As this hesitation can be compensated by increasing the contract price, some undesired outcomes may arise if the clauses related to IP rights did not arrange clearly. As in the case of L4, the defendant (Wohlsen) negotiated with the claimant (AdvanceTEC) as a subcontractor, whose specialty is the design and construction of cleanrooms in a bidding process of a project. Their efforts in determining the scope of the contract show their reservations when sharing their models. For this reason, they do not intend to provide design-support services. However, in the end, they negotiated on a contract that has a conditional provision about the ownership in which the works under the agreement will be the property of the Owner (Datwyler) if the relationship between Wohlsen and the Owner is ended up without executing a contract. After the relation is ended prior to the bidding stage, AdvanceTEC wants the defendant to stop using the model. From the point of the claimant, they are the owner of the model since Copyright Act mentions the ownership on the side of the author of the model, but on the other hand, the Court can decide only by referencing the signed document between parties to decide on a declaratory judgment requisition. Therefore, the decision is made in favor of the defendant since the lonely provision on IP rights states a conditional right that can or cannot be interpreted in a way that inhibits the defendant from using the supplied materials.

Additionally, some designers may want to protect their copyrighted models or 3D geometries from third parties' access. Hence, they permit their clients to use the model only for the purposes in the scope of the project. In this way, clients can use

the model from construction to marketing purposes as long as it is related to the project, but it cannot go further. In the case of L8, when the defendant (NCR) sent the documents of the previous project to new applicants of the 2nd kiosk, they breached their NDA with the claimant (KT Group). They could not be awarded in their claim since they did not show any monetary losses regarding breach of the contract. Nevertheless, the court awarded them $50,000 on their unfair competition claim since the defendant uses the model beyond their negotiated "authorized purposes". Although this case is not directly related to the construction industry, this problem regarding 3-dimensional models is important because it sets an example for the situations that may arise as a result of employers using BIM models delivered by the previous contractor in a different project.

4.2.2 Contractual Relationship and Responsibilities of Parties

Different problems may arise as the relationships of the stakeholders within the framework of their responsibilities begin to intersect, and the borders become disappeared. At this point, it is crucial to identify the interconnections between the relations of the parties clearly. An example of such issue in the case L2, other subcontractors except NAMI did not contribute to the BIM model; however, NAMI had been informed that other subcontractors were also going to participate in the BIM models and processes as well. After claiming a number of change orders, they sued Walsh for failing to take the necessary care in conveying their claims to the employer (Mercy). They cited the relevant article in their contract as a basis for their attitude. In this clause, there is a statement indicating Walsh "may" either direct the claim to the owner by itself or authorize NAMI to present their claim to them. Whilst the subcontractor claims that the contractor had not acted according to the statement, the court indicated that the use of "may" keeps the contractor in a position to decide.

Even if there is no direct contract between any stakeholders, parties can still be liable for their acts to the third parties. The tort of negligence restrains the parties by acting negligently while conducting their parts of the work (see 3.2.4.1. Negligence). This

phenomenon has found a place in the case of L6. Blaine withheld some amount of money from Merrill due to some gaps in the column seats and bending connection plates. Hence, the furnisher filed a lawsuit against the designer (HOH) in terms of negligent misrepresentation and others in terms of declaratory judgment to prove that they are not liable for such errors in the construction. The court stated that the issues were derived from the mistake or omissions of the designer (HOH) and decided that they were in negligence. Due to that reason, the contractor held the money of the claimant. Therefore, they decided to make HOH pay punitive damages to the furnisher. Next, they concluded by rejecting the declaratory judgment action by stating that the case is premature since there is no monetary loss suffered or they had not been sued due to those claims. What this situation showed is that the increase in the standards of architects' duty brought extra responsibilities to them. Gathering more than one stakeholder for a specific work can cause the parties to avoid their responsibilities and seek the blame one another. However, the parties should be aware that although they do not have a contractual commitment to the BIM platform, they can be held liable for the negligence.

The main issue of the case of L1 was originated from the issue of responsibilities of parties. The designer, in that case, was also the coordinator of the BIM process. After non-payment of the invoices that they thought they should have been made, they banned the access of the contractor by changing their passwords. On the one hand, the designer was required to be paid, but on the other hand, the contractor should be able to use the produced models. As it can be understood from the situation here, while conducting such a business in order to avoid such complications, duties and responsibilities should be given to the appropriate parties. It is necessary to avoid gathering the responsibilities under a single stakeholder, which may harm the project in case of merging with each other.

On the contrary of working methods of industry people working consistently within the order they have established, BIM has enabled the progress of software and allows the production of intelligent models. However, users may encounter some problems, especially when getting used to these processes. As mentioned above, these problems

may arise from being unfamiliar with contractual relationships as well as adapting to the software used. From this angle, there is one issue that can be related to the implementation cost of BIM. In the case of L5, in which the Claimant (Design Partners) is responsible for giving training sessions related to the software they are using in BIM. After four classes the Defendant (Five Star) terminated the training contract via email. However, the agreement stated that either party could terminate the contract by providing 1-month of advance notice if the "first training module" was completed priorly. On the other hand, the contract did not define the length of the first training module. Therefore, the court used its judgment to define the optimal number of lessons by commenting on "somehow" related clauses with the training modules and charge the defendant to pay the money due to those missing lessons.

4.2.3 Coordination and Control of the Design

In the L1 case, we saw what kind of complications could occur as a result of the coordination of the project and another responsibility being assigned to a single stakeholder. Coordination has become of great importance, especially in a platform like BIM that encourages all disciplines to conduct business together and within the framework of mutual goodwill. As in the case of L2, when the defendant went to install a piece of special equipment, space was already occupied by another subcontractor who should have participated in the BIM process not to cause such a complication. In the same case, NAMI sought compensation for "labor inefficiencies." They asserted that Walsh changes some conditions that let them have to spend too many extra person-hours due to poor management of the contractor. Also, in the L6, the application of the claimant shows that proper coordination should be established in order to avoid such complications when more than one party exercises on the same field of the project. As stated above, Merill applied to the court to determine that they do not have liability since they furnish the materials according to plans. Even if there will be any failure, they claimed, these will be the results of other subcontractors or the owners since they could not handle to manage the project.

However, the court rejected the application of Merrill since the court cannot shield them from potential failure liability.

4.2.4 Standard of Care

As systems become automated by technology penetrates into procurement methods, the use of software increases. The gradual decrease in user errors increases the interest in technology-integrated areas such as BIM. However, trust in computers and software can also cause some trouble. An example of this was seen in a lawsuit that occurred when it was just beginning to lay the foundations for BIM. In the case of L7, while the claimant (Mortenson) was utilizing the software, they faced an error multiple times and rebooted the program as the software message indicated. After they had finalized their bid and had submitted it to the authority, they found out that the bid they gave was 2-million-dollars below the value it should have been. Then, the claimant sued Timberline for breach of warranties. In the appeal, the court stated that the provision of limitation of remedies stipulated no liability to software makers for any damages such as consequential damages, loss of profit due to failure of the use of the program. The court also indicated that the liability of the defendant "*in no event shall exceed the license fee paid for the right to use the programs*." Consequently, in the circumstances like that, the clients can hold the contractor liable instead of a third party. From this perspective, standards of care concerns of contractors should comprise their software liabilities.

Problems like this may not only happen to contractors. Similarly, employers may encounter some software problems while trying to adapt to advancing technological processes. As in the case of L9, the contractor can be victimized for reasons beyond their control. Moreover, the reason for this grievance is that the software that employers trust can cause problems. In such cases, it may mean that employers think twice when using software and managing contractual processes with the software. Also, in the same example, having utilized a digitized approach to even tendering procedure make employers control the time the tenders manipulate the documents

lastly. In this example, the professionals decide the time of the last edition on the document to decide if the bidder gains an advantage by submitting documents later than other bidders.

4.2.5 Legal Status of BIM

There may be different approaches regarding the contractual status of the BIM model. While some people argue that the BIM model should be included in the contract, others may think that it should be a document to coordinate processes and create a visualization. Making the distinction on this issue clear will prevent problems that may be encountered later. As in the case of L2, NAMI applied for more than one claim by stating the number of changes they made on the BIM model due to deviations from initial original design drawings. However, the employer had rejected the application by stating that those drawings were schematic and should be coordinated to make the system work. As a defense against the claims of NAMI, Walsh said that the clause regarding those claims protects them since these claims had fallen into the scope of the article. However, the article valid when the event is caused by the owner or a contract document. Thus, the claimant asserted that their claims were not in the scope of that article since BIM Models were not "contract documents" whilst they are merely takeoff documents of the contract documents for the contractor to coordinate the procedures – as their subcontract agreement had indicated. The issue is resolved against the claimant since its employees confessed that the problems they faced were due to the employer's faults. Thus, BIM claims are found out in the scope of the mentioned article.

4.2.6 2D – 3D Utilization

In the case of L3, the negotiation is made on providing models on LOD 100 basis. After the defendant made the initial payment, 3D Imaging Services scanned the building and created the model. However, when the defendant (McLaren) received

it, they were not satisfied with the model since they were not able to manipulate the model in the desired way. Also, they added that they wanted a 2D model of the project and did not pay the rest of the amount. In the trials, the claimant showed more than one way to convert a 3D model to 2D format. The final court decided that an experienced person should be able to convert a model quickly. Even otherwise, the contract has no indication of a 2D model. Therefore, they decided that a "model" is a term that is used to define a 3D figure instead of a 2D drawing. In this sense, this case can provide a legal basis for the potential conflict that the word "model" can create.

4.3 Discussion

The most common problem in legal problems appearing in the cases examined in this section is the Contractual Relationship and Responsibilities of parties seen in 4 out of 9 cases as shown in Figure 4.1. This problem is followed by the Intellectual Property and Model Ownership issue, which showed up in 3 cases. Then, Coordinating and Control of the Design and Standard of Care issues come with two lawsuits each. Finally, just like the frequency of mention in the literature, there is Legal Status of Model and 2D-3D Utilization problems.

While in the literature, the most mentioned issue was Intellectual Property and Model Ownership with 30% (Figure 3.1), in the lawsuits, the most seen issue in the court decisions is Contractual Relationship and Responsibilities of Parties with 31% percent (Figure 4.1). Apart from the top two legal issues, the importance is given in the literature, and those encountered in court decisions have a similar course. Also, the legal issues related to BIM in contracts in Turkey as a result of the local survey (Figure 3.6), it can be said that the Intellectual Property Rights and Roles and Responsibilities of Parties are topmost issues in all three of them.

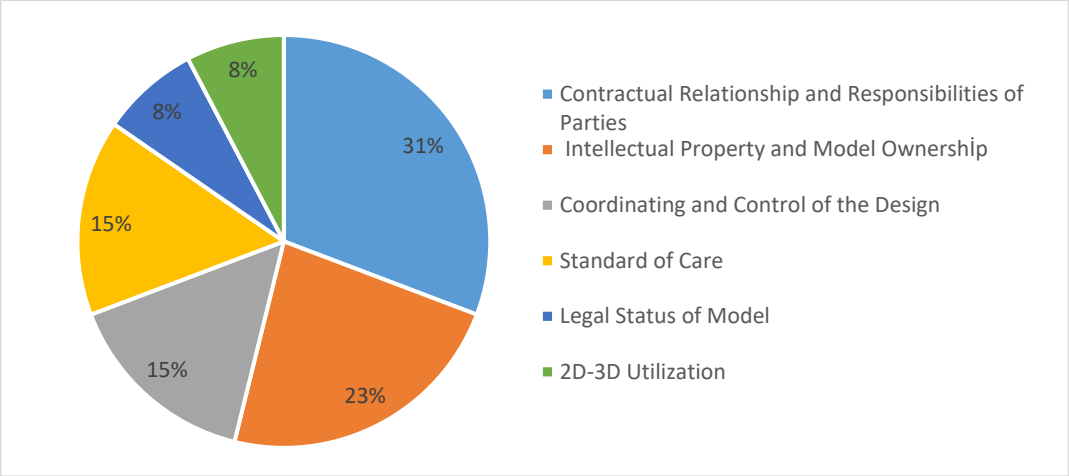

Figure 4.1 Percentages of Legal Issues in Lawsuits

The topmost issues in both lawsuits and the researchers' perspective are about parties' relationship and responsibilities, coordination of parties, and intellectual property rights. These issues stem from the side effects of the collaborative environment BIM brings with it. These issues need to be taken into consideration by the professionals while conducting business with BIM. By clarifying these issues, they can experience a less complicated process from the model development to the construction delivery process. In this context, protocol and contract forms originating from BIM-leading countries take different approaches to address such problems. However, they each agree on the need for specific framework on such issues. The collaborative environment should be managed well. Therefore, such roles as BIM Manager and BIM Coordinator have emerged recently. Regardless of the names of such roles, their responsibilities loom large. The responsibilities of them can be fulfilled by Project Managers responsible for managing the contract as a whole. Managing how the parties in the contract conduct their parts, monitoring how the information is carried out by the contractors, maintaining BIM execution plans of parties, ensuring the accuracy of models are some of the critical responsibilities of them. These agents should serve as a separate entity in the contracts by respecting the interests of all parties. Therefore, these roles will reduce the risks of designers

due to mismanagement, and eventually, duties of care of architects and engineers in the design process will be rearranged.

Moreover, an operational responsibilities table that will be updated in the processes starting from the planning of the Modelling process to the delivery process should be created with the joint effort of all stakeholders. This table will represent the responsibilities of parties with the progressions they need to make on their parts. Determining the level of development for modelling elements each responsibility of the parties is critical. In this way, a party involving in the contract becomes aware of the level of trust they should have in using the information provided by other stakeholders. However, when a problem occurs in any part at a particular stage, it will easily be understood who is responsible for this problem. Thus, whose negligent act causes a third party to suffer while using the information provided by the parties can easily be determined. This distinction will prevent a party from being punished for the fault of another party. This will also affect the standard of care issue of architects and engineers regarding their design liabilities.

Furthermore, clients can establish a collaborative approach while signing contracts with the parties to achieve their goals and objectives while handling more than one contractor. This type of strategy can either be added as an appendix to the contracts signed separately with the parties or can be done in a way where all stakeholders sign a single contract. In this way, contractors can define the separation of their roles and responsibilities- in communication with others - with more specific lines as they are obliged to move forward in cooperation with each other. Likewise, the flow of information between contractors becomes more effective. If all stakeholders sign a multi-party agreement, it will be a legal obligation for everyone to carry out their business in collaboration. It is clear that this will contribute positively to the progress of the works, the separation of roles and responsibilities, and the progress of the project as a whole. However, it should not be forgotten from a management perspective that such a contract will be much more challenging than a typical bi-partied agreement. It should also be noted that this obligation to cooperate that is included in contracts separately for each contractor does not create a legal

commitment. In such approaches, it is necessary to carefully determine the scope of the agreement of each separate contract.

A contract strategy that the client is in the center and separately managing all other contractors is a common strategy in the sector. The inclusion of such an approach, as stated above, can ease the works that utilize BIM. However, in such an approach, clients need to hold ownership of the information provided by separate contractors. It is the only way for them to run the information model they have in relation to the project. It also means that, while contractors are liable for the information they provided, the Clients are liable for the errors in the model they have since they hold its liability. In fact, the client can use those models solely for the project unless otherwise stated. Also, the employer's rights to use the model may be restricted to a certain extent if agreed upon by the contractor's request.

Industry habits, which have been going on for years, forced individuals and companies to continue their projects as 2D for a long time. While all other sectors can keep pace with technological developments with ease and willingness, the construction sector has lagged behind in adapting to advances in technology. This difficulty in adapting has begun to break with the realization that some country governments will benefit from using new technologies such as BIM, 3D Scanning, Augmented Reality in their projects. In this way, BIM's usage has begun to accelerate and increased so much that it has become a standard nowadays (National Building Specification, 2020; Hore et al., 2017). Difficulty in the process of adapting to BIM between 2D and 3D is an expected result due to these past traditions. In this sense, determining whether the drawings or the model is the priority at the first stage in the projects that work with both 2D and 3D is of great importance in terms of preventing the parties from disagreement in possible conflict situations. However, as the use of technology in the sector begins to increase, potential problems in 2D-3D transformations will also disappear. This evolution of the industry may decrease the number of possible disputes even before they ended up in the courts. In this framework, it is also important that created 3D models are "contract documents" that can be relied on and that the deficiencies and mistakes made are legally binding.

Creating a model for visual purposes only or using the model as only a document that will provide coordination between stakeholders as in case L2 prevents the creation of an effective working environment by restricting the usage areas of BIM.

As it can be understood from the previous works of researchers, the users may abstain from utilizing BIM since it has not been tested in the courts until recently. However, the sector has been started to face BIM-related legal issues. Evaluating the court cases from the BIM point of view and handling them in a collective resource provide a basis for the academic studies in this context. These also enable users to anticipate the real-life legal problems they may encounter while conducting a project in the construction industry.

A total of nine cases from the courts of BIM-leading countries, the USA and UK, have been investigated. Eight of the cases are from the construction sector, while one of them is from manufacturing. These cases have been evaluated in respect of the categorization of legal issues from the previous chapter. Examining the cases in an organized way created a better understanding by linking the foreseen potential legal issues with real-life examples that went to the courts. Even if the legal systems and applicable laws can differ state-wise or country-wise, the fundamental principles behind the causes and the results can be considered the same. Therefore, these case laws can establish a solid ground for the people all around the world who hesitate to utilize BIM.

CHAPTER 5

CONSTRUCTION CONTRACTS & PROTOCOLS RELATED TO BIM

The legal and contractual problems mentioned in the previous sections have been one of the issues that have been given importance since the first years of BIM's introduction into the sector. Some institutes and institutions working on a regional and global scale with experts in their field have tried to develop standard procedures and methods to address these problems. It would not be wrong to say that these measures were initially established on theoretical grounds. Later, these measures evolved into a system based on more solid grounds, learning from the results of practical use learned through trial and error.

These systems may differ by country. The perspectives of the legal orders of the countries within the framework of the applicable law and the construction works regulations can differ from each other. Besides, this becomes much more important in the standard contract forms used in international projects. On the other hand, it can be a challenge to reflect on the contracts the necessity for the stakeholders to work together and to create a collaborative environment that BIM brings with it.

Moreover, the procurement method to be implemented in the project can lead to differentiation of steps when dealing with BIM from a contractual perspective. In systems such as Design-Bid-Build, BIM can be handled with an approach that emphasizes effective contract management among stakeholders, whereas a different approach can be considered in the Design-Build system. By considering these, professional organizations in construction created specific standard documents on the subject, taking into account different procurement methods and different customer demands.

The leading countries in the contractual initiation and advancement of this area are none other than countries that have managed to adapt to BIM the fastest. After BIM

started to be used in the industry, the governments made it mandatory to implement its use in its own projects in the USA, and the UK, then the contracts and forms started to emerge accordingly. Within the scope of this thesis, it is crucial to consider these standard contract forms, and to examine the contractual approach of BIM in countries, to understand the lessons learned and how these contract forms are implemented. Making the correct conclusions from the results of this knowledge will let us find an answer to the question of how we can be benefitted from the know-how of these contracts. Therefore, the JCT and NEC standard contract forms, which are most widely used in the UK (Winfield & Rock, 2018), and standard contract documents of AIA for the USA industry will be examined in this chapter. In addition to those, taking it out of the country-based perspective, FIDIC, the most widely used contract form internationally, will also be of interest in the way it handles BIM.

Moreover, BIM protocols, which evaluate the technical details of BIM more carefully, will also be examined in this section. These documents are standard forms that can be used in addition to contracts or even mandatory in some contracts. While the first and only protocol used in the UK is the protocol published by the Construction Industry Council (Construction Industry Council, 2013), due to the adaptation of the PAS 1192 standards as the ISO 19650 - *Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) — Information management using building information modelling* standards, the ISO Protocol has been recently published to increase the applicability of this protocol internationally. The details of these protocols will also be discussed in this chapter.

5.1 JCT

5.1.1 History of JCT

Royal Institute of British Architects (RIBA) formed the Joint Contracts Tribunal (JCT) in 1931, and they published the first standard form of a building contract with

a different name. They decided after decades to continue operations under a limited organization in 1998 as JCT Limited. After the 2010s, when BIM is started to be considered by the UK government, JCT established the "BIM Working Group" to work on BIM and its applications to the contracts. The Group published the first document related to BIM and JCT to suggest to users some advice related to BIM, Public Sector Supplement in 2011. The document's main aim was to suggest guidance to include BIM into projects and suggest amendments to support public project use. However, this document could be used as guidance for private projects as well. This document advised incorporating either a BIM protocol to cover related issues or making specific changes on the used JCT contract by using suggested steps of the Group. This document could be considered a groundbreaking document by that year since it was one of the first kind of contractual approaches to BIM. After these years, the sector was eventually involved in BIM processes due to mandating the UK government at least a BIM Level 2 in their projects in 2016. Following these advancements, JCT published the 1st Practice Note regarding BIM to improve the understanding of people who are not familiar with BIM and explained its related terminology. Shortly after, they published 2016 versions of the JCT suite of contracts, and they applied the terms in the practice note by developing them further. Lately, they published the 2nd practice note, "BIM and JCT," in 2019, after the publication of the Winfield Rock Report. They defined how specific amendments can be used together with JCT 2016 editions.

5.1.2 Structure of JCT

The JCT has mainly 12 contract families published in 2016 to ensure the contracts support a wide range of construction-related activities from complex projects to personal homeowners' works. These families of Contracts can be considered depending on the procurement strategies and can be listed as follows. (*In the list, only the details of the most commonly used suites in the BIM construction industry*

are given to have a simplified list. The whole list can be seen on the website of the JCT.)

- Management Procurement
    1. Management Building Contract
    2. Construction Management Contract
- Traditional Procurements
    1. Standard Building Contract
        a. With Quantities (SBC/Q)
        b. Without Quantities (SBC/XQ)
        c. With Approximate Quantities (SBC/AQ)
        d. Sub-Contract Agreement (SBCSub/A)
        e. Sub-Contract Conditions (SBCSub/C)
        f. Sub-Contract with sub-contractor's design Agreement (SBCSub/D/A)
        g. Sub-Contract with sub-contractor's design Conditions (SBCSub/D/C)
        h. Short Form of Sub-Contract (ShortSub)
        i. Sub-subcontract (SubSub)
    2. Measured Term Contract
    3. Intermediate Building Contract
    4. Prime Cost Building Contract
    5. Minor Works Building Contract
    6. Repair & Maintenance Contract

7. Home Owner Contract

- Design and Build Procurement

1. Design and Build Contract

    a. Design and Build Contract (DB)

    b. Design and Build Sub-Contract Agreement (DBSub/A)

    c. Design and Build Sub-Contract Conditions (DBSub/C)

    d. Short Form of Sub-Contract (ShortSub)

    e. Sub-subcontract (SubSub)

2. Major Project Construction Contract

- Integrated Procurement

1. Construction Excellence Contract

JCT also published a Practice Note (*Deciding on the appropriate JCT*) to inform the users while deciding on the type of standard form of the contract they need. As **Winfield Report 2017** indicates, the most used JCT forms are traditional and Design-Build (DB). While the contents of them are different headings of the clauses are as follows:

- Agreement
- Conditions

1. Definitions
2. Carrying out the Works
3. Control of Works
4. Payment
5. Variations (Changes in DB)

6. Injury, Damage, and Insurance
7. Assignment, Performance Bonds and Guarantees, Third Party Rights and Collateral Warranties
8. Termination
9. Settlement of Disputes

- Schedules
  1. Design Submission Procedure
  2. Variation and Acceleration Quotation Procedure (excluded in DB)
  3. Insurance Options
  4. Code of Practice
  5. Third-Party Rights
  6. Forms of Bonds
  7. JCT Fluctuations Option A
  8. Supplemental Provisions

5.1.3 BIM Approach of JCT

In 2016 JCT include BIM in its standard terms and conditions of almost all suites of contracts except "Home Owner Contract". They take a high-level approach to the incorporation of BIM. In that manner, they defined BIM protocol as a contract document by referring to it in the contract particulars and completed as appropriate by the parties. Even if there was no other protocol than the CIC BIM Protocol when the standard form of contracts had been published, there is no dictation of any specific protocol, and the selection is left to the users. In this way, it can be said that JCT is designed as flexible as possible. The protocol is then to comply with that is in accordance with existing provisions of the JCT terms and conditions. If there is

any conflict, the terms and conditions of the main contract have the priority upon the protocol used. As it is stated in Clause 1.3, "… Nothing contained in any other Contract Document … shall override or modify the Agreement". If this clause were not included in the contract, then the situation may be different in common law since the inclusion of an agreed document would typically override.

Nevertheless, the assumption there is that there should not be any conflict between them since the only place in the contract that mentions BIM is the clause that references to use of the protocol. So, the related part of the contract with the BIM is, therefore, up to the protocol. However, if the employer's requirements, for example, are related to documents and schedules, it may require something different than the protocol. So in the case of a conflict, the priorities should be set out well between parties to not face a situation as in the case of MT Højgaard A/S v E.On Climate & Renewables UK Robin Rigg East Ltd. In the decision of that case, the Supreme court agreed that the parties are bound by the terms of the contracts and their technical annexures. Even if a conflict occurs, the clauses should be considered with their natural interpretations.

The definition of design documents is enlarged to include information provided by the Contractor. Therefore, JCT lets the users utilize design and information submission procedures of bespoke BIM protocol. They stated that some changes might appear in a number of BIM processes, like formats, communication methods, and copyrights. If there is no indicated submission procedure in the protocol, the parties are free to use the Design Submission Procedure of JCT at Schedules. Apart from that, some changes in the communication clause of the JCT and elsewhere recognize the fact that the information may come in via BIM protocol rather than any other mechanisms.

The aim of the 2nd Practice Note of JCT is to provide the sector comprehensible guidance to users of JCT with BIM. The main concern of the Notes is JCT DB contracts since it is the most common one in the sector. However, they are applicable to other suites of contract as well. The Notes do not include any amendments or

clauses to the contracts, but they more suggest vital points while preparing BIM-related documents and give advice for the essential aspects that should be taken into consideration in the bespoke BIM protocol. In this way, they provide checklists at the appendices of the document for the BIM protocol and Employer's Information Requirements (Pantry, 2019).

Moreover, the Notes are the first standard form of contract document that considers ISO 19650. Whilst 19650-1 is a framework document that consists of principles and concepts related to processes of BIM, it is essential to include its terminology in contracts to increase the usability of the standard form of the contract all around the global construction sector.

5.2 NEC

5.2.1 History of NEC

After the first New Engineering Contract (NEC) had been published in 1993, it had been utilized internationally for a decade, and the NEC3 contract suite was published in 2005. In those years, BIM was not included in the contract since it had not a variety of use in the sector. Having the increasing number of usages of BIM by the clients and contractors in the following years alerted the institutions to take a step forward regarding the contractual side of BIM. In 2013 The Construction Industry Council (CIC) published the CIC BIM Protocol Rev1. In the same year following this advancement, NEC published a document called “How to use BIM with NEC3 Contracts,” which includes several ways to deal with contractual matters that arise by having BIM into contracts. They also suggested ways to use the CIC BIM protocol to use with NEC3 contracts.

Additionally, even in that year, they indicated that using the Secondary Option “Partnering” with the contract would make the works more efficient. Those

secondary options will be mentioned later on. After all, the institution released NEC4 in 2017 with a new secondary option, X10- Information Modelling.

5.2.2 Structure of NEC4

Although they are used mostly for civil engineering works, NEC4 published a variety of suites of contracts. The commonly used one, which is Engineering and Construction Contract (ECC), has six different Primary Options in itself. They are two priced contract options, two target contract options, a cost-reimbursable contract, and a management contract. Apart from ECC, they recently published Alliance Contract (ALC), which is considered helpful and advised to use in conjunction with BIM. The whole list of suites of contracts as follows:

- Engineering Construction Contract (ECC)
    - Engineering and Construction Subcontract (ECS)
    - Engineering and Construction Short Contract (ECSC)
    - Engineering and Construction Short Subcontract (ECSS)
- Professional Service Contract (PSC)
    - Professional Service Subcontract (PSS)
    - Professional Service Short Subcontract (PSSC)
- Term Service Contract (TSC)
    - Term Service Subcontract (TSS)
    - Term Service Short Contract (TSSC)
- Supply Contract (SC)
    - Supply Short Contract (SSC)
- Alliance Contract (ALC)

- Design-Build and Operate Contract (DBO)
- Dispute Resolution Service Contract (DRSC)
- Framework Contract (FC)

The main feature of NEC4 is to present a flexible contracting method to the parties. Giving a free choice to the clients while preparing the contract makes them comfortable choosing which kind of contract structure is appropriate for their project. It is not only a pricing strategy to be determined by selecting a Primary Option but also practicing the works by using Secondary Options. While NEC4 suggests some of the Secondary Options to be used with some of the main contracts, they are designed to be used with all of the main suites of contract. They also define the contract data in two parts. The Client provides information for the first part (Payment details, Termination, etc.). The Contractor offers information in the second part (Key personnel, risk register, etc.) However, the ECC is considered in our domain since most of the project utilizes this contract suite.

ECC consists of mainly three parts, the first of which is Core Clauses. Then, depending on the selection of the Client, the Main Option of the contract is defined. Thirdly, Secondary Options, again depending on the choice of the Client, are decided to be whether cooperated in the contract. Apart from those, the Client specifies the method selection of avoiding and resolving disputes. Finally, the Client is free to add any Additional Conditions to the contract as Z clauses.

NEC4 published core clauses relevantly for each Main Option of ECC. Those options are:

- Option A – Priced contract with activity schedule
- Option B – Priced contract with bill of quantities
- Option C – Target contract with activity schedule
- Option D – Target contract with bill of quantities

- Option E – Cost reimbursable contract
- Option F – Management contract

The Core Clauses of those suites of contracts are given under nine sections. Those sections are general terms that cover the boundaries of the contract. The relevant definitions of some of the clauses related to BIM will be given in the further sections of this work. The headings of the sections are:

- General
- The Contractor's main responsibilities
- Time
- Quality management
- Payment
- Compensation events
- Title
- Liabilities and insurance
- Termination

Moreover, there are X1-X22, Y1-Y3, and Z sections, which are Secondary Options. The X Options have clauses related to specific parts of the projects that may shift the contracting parties' risks. Therefore, care must be taken by determining them to include in the contract. Y Options consist of three UK-specific documents. Z Option exists for additional conditions if needed. Apart from those, the Client should select, as mentioned above, one of the W Options regarding dispute procedures. The third W Option is the latest inclusion of NEC regarding dispute resolution strategies. It is applied where parties are selected not to use an adjudicator but a Dispute Avoidance Board (DAB). In this way, it can be said that they followed a similar approach with FIDIC in dispute procedures. The list of all Secondary Options is:

Option X1 – Price adjustment for inflation

Option X2 – Changes in the law

Option X3 – Multiple currencies

Option X4 – Ultimate holding company guarantee

Option X5 – Sectional completion

Option X6 – Bonus for early completion

Option X7 – Delay damages

Option X8 – Undertakings to the Client or Others

Option X9 – Transfer of rights

Option X10 – Information Modelling

Option X11 – Termination by the Client

Option X12 – Multi-party collaboration

Option X13 – Performance bond

Option X14 – Advanced payment to the Contractor

Option X15 – The Contractor's design

Option X16 – Retention

Option X17 – Low-performance damages

Option X18 – Limitation of liability

Option X19 – Not used

Option X20 – Key Performance Indicators

Option X21 – Whole life cost

Option X22 – Early Contractor involvement

Option Y (UK) 1 – Project Bank Account

Option Y (UK) 2 – The Housing Grants, Construction and Regeneration Act 1996

Option Y (UK) 3 – The Contracts (Rights of Third Parties) Act 1999 Option

Option Z – Additional conditions of contract

5.2.3 Core Clauses

As other Core Clauses of the ECC suite can be considered similar to other standard contracts regarding keeping the balance of risks between contracting parties, NEC4 made a bold attempt by separating Clause 10.1 into two parts. The main objective of the contract is to emphasize the need for cooperative work in construction projects. Previously in Clause 10.1 of NEC3, it is stated that the contracting parties "shall" act as stated in the Contract and a "spirit of mutual trust and cooperation." After years of experience and maybe results of some court cases like Mid Essex Hospital Services NHS Trust v Compass Group the UK and Ireland Ltd (t/a Medirest) [2013] EWCA Civ 200. The appellate court judge stated that such a clause is open to misunderstandings and could be given different meanings can be concluded. Thus, parties who would like to impose a general duty of good faith in their contracts should indicate it by stipulating it expressly in a separate sentence "with a full stop at the end." This is generally not the case in many civil law systems except common law, as mentioned in *Yam Seng Pte Limited v International Trade Corporation Ltd (2013) EWHC 111 (QB).* Since the doctrine of good faith is acquired from Roman law, the requirement of "good faith" does not directly recognize common law systems. Therefore, NEC4 separated Clause 10.1 by adding 10.2. Now the contract stipulated the Client's mandatory requirements, the Contractor, Project Manager, and the Supervisor shall act as stated in the first one. They shall act in the spirit of mutual trust and cooperation in the second.

The theme of Clause 10.2 may cause parties to abstain from using this contract and to be biased towards the agreement since the meaning of it may be seen as vague and

unenforceable. People doing business in the sector with traditional methods get used to relationships in which one of the parties gains value while the other loses. Therefore, they may have difficulties in adapting to a system where each stakeholder knows that they are on the same train in both gain and loss, with projects carried out in cooperation.

On the other hand, it is not clear how to determine if one party fails to act in "good faith" and how to determine a remedy. Apart from that, some of the parties stated in the clause do not have direct contractual relationships. When it is considered from such an angle, Clients may wish to exclude or invalidate this clause from the contract because the spirit of mutual trust and cooperation is difficult to prove quantitatively. However, it is suggested that the existence of such a clause can encourage the users in a way that they adhere to the spirit of cooperation, and both parties benefit from its outcomes. Even if it does not mean anything, it suggests that the parties involved in the contract should talk and listen to each other. Additionally, it is not the only obligation in the contract that requires cooperation since the systems like early warnings are also support the main idea of the mutual work.

5.2.4 Secondary Options

5.2.4.1 X10 – Information Modelling

The Secondary Option X10 Information Modelling is designed to enable the users to utilize the contract with or without a BIM Protocol inclusion. It is also suitable with all of the main contracts, whereas with a different approach in DBO and ALC. It covers both creation and updating related matters of an "Information Model." The contract defines BIM Models in two phases. It uses the term "Information Model" (PI) to describe the federated BIM model that clients hold their responsibility to. Also, it used the title "Project Information" in the mean of information models created by the contractor. Nevertheless, it gives the ownership of both the Project Information and the Information Model to the Client. This is because they can freely

select to conduct the works with separate contracts while they are at the center of those relations. So, they ought to be able to host and run the model liberally. On the other hand, the Client is only responsible for the faults in the Information Model, and the liabilities of PI stand with the contractor of that model. Besides, the contract uses "Information Execution Plan" instead of a BIM execution plan for the document's name that specifies how the Contractor issues Project Information.

In a different manner, the liabilities are different in DBO and ALC since the main principles of contracts are entirely different. In such contracts, the Contractor or the Alliance creates and runs the model throughout the project until the handover. Therefore, they hold the responsibility of both the Information model and Project Information. In those contracts, duties of the Contractor or Alliance are considered in fitness for purpose. To that extent, the inclusion of Secondary Option X18 Limitation of Liability may be considered by the contracting authorities.

In the Information Model Requirements (IMR) part as a sub-section of the Scope, the Client gives every desired detail of how and in which form they want each contractor to supply information. It includes the collaboration way of the Contractor with other contractors. They can also define the Information Execution Plan (IEP) requirements to enforce consistent IEPs across the providers. In the case that there are different IEPS, the management of those might cause a problem for the Client or the consultant. The Contractor presents its Information Execution Plan (IEP) to specify Modelling-related matters and define how they conducted the Modelling works of the project. Nevertheless, it is suggested to leave the timing of the Modelling matters to the Programme instead of IEP. Even if there are standard rules about its content and its updating schedule, NEC imposes no formal restrictions for the content and updating of IEP. Changes on IEP can be carried out either due to the desire of the Contractor or due to the instruction of the Project Manager. Also, compensation events can impose a change since it may be ended up in the Scope changes. The PM has two weeks to approve the change; otherwise, the Contractor has the right to keep up with the changes. At this point, while the Contractor supplies a piece of information for PI, it is not liable for the mistakes and errors unless it failed

while performing its parts of the work in standard, reasonable skill, and care. However, this is not the case in DBO and ALC, as mentioned above. All those procedures and definitions in X10 can be followed from the FIGURE below. The blue squares are showing terms included in X10, and the Red ones are the terms of the ECC contract.

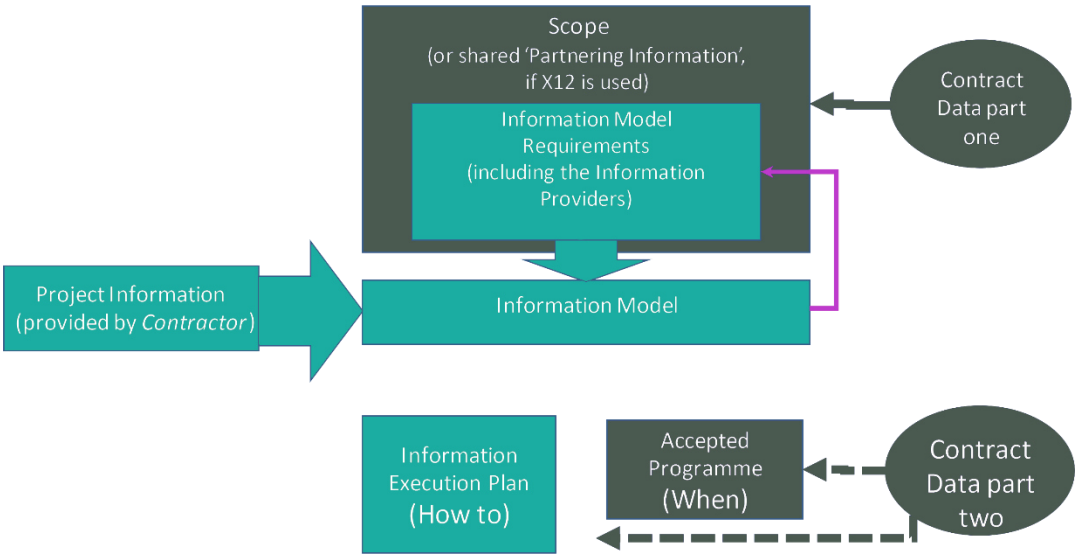

Figure 5.1 Defined Terms in X10 (Heaphy & Patterson, 2018)

Unlike other counterparts, NEC4 X10 does not indicate any contract-independent central entity of "Information Manager" within the option. In other words, there is no definition of a person that coordinates the information supplied by different contractors. However, the Project Manager or Service Manager in NEC suites of contracts who manages the contract as a whole can take the role of Information Manager effectively under the clauses of the contract (Heaphy & Patterson, 2018).

Moreover, there is no template or the exact equivalent of "Responsibility Matrix" in the option. However, it is suggested from the Client to include their needs on such a matter in the Information Model Requirements to force the Contractor to plan such an organizational approach.

5.2.4.2 X12 – Multi-party Collaboration

The naming of the Secondary Option is changed from "Partnering" to "Multi-party Collaboration." The naming itself may be misleading in a way that creates a delusion of a multi-party agreement. However, this option is a supplementary document for the existing bipartite agreement. Also, it does not have any remedies stated in the clauses. The multi-party agreement of NEC4 is Alliance Contract, as mentioned in the suites of contracts. The main aim of this option is to create a collaborative environment between stakeholders of the project by encouraging parties to work together to achieve common goals. In order to impose such use, this option should be included in all of the ECC contracts between the Partners. These Partners may not necessarily have a direct contract with the Promotor of the partnering procedure. In many cases, this Promotor is the Client; however, any contractor may also be a Promotor since one of the Partners may enforce a subcontractor or particular supplier to be a part of this Core Group. If a Partner requires and decides to subcontract work, it should notify the Core Group beforehand if there is a reference in the Partnering Information regarding subcontracts. This is because this party should be willing to become a partner if needed by the Group. This Core Group is generally lead by a representative of the Client.

Moreover, it should be noted that the inclusion of that Secondary Option does not impose or create a legal bind between Partners who are not directly included in the main contract (Eggleston, 2019). These Partners are defined in the Schedule of Partners. This schedule is a live document since there may be more Partners in future steps of the Project. The document which specifies how this Partnership works together is "Partnering Information". This document's goal should be set out well in the initial steps of the contract by the Client to ensure if any party later included in the partnering procedure by the Contractor, this party embodied in the process without any misconception. In order to define the goals and objectives of the Core Group, the Client should indicate their goals carefully in each of the Contract Data Part one of the contractors. Additionally, there are key performance indicators (KPIs)

that set out bonus targets for the Partners. Also, if any Partner fails to achieve those goals, all of the other Parties lose the chance of getting the bonus. However, these should not be utilized in conjunction with Secondary Option X20 Key Performance Indicators.

The Partnering procedure creates an information flow between parties. When a piece of information is needed from a Partner, this partner should provide that information to the Partner that needs to carry out its work in its Own Contract. This also includes early warnings for risk allowance and advice to control cost and time. However, this may create a circumstance that one Partner does not want to share its confidential information or a licensed product that may affect its market condition in a negative manner. Since there is no direct contractual obligation regarding that issue, this Second Option is not clear on such a problem.

5.2.5 Use with CIC BIM Protocol Rev.2 – 2018

Apart from definition, differences between NEC4 and CIC BIM Protocol rev. 2, there are some differences and challenges to be considered while utilizing them together. Firstly, as stated in the subclause of the article "Obligations of the Project Team Member" 4.1.2, a Member should share Specified Information on CDE at the time indicated in either the Responsibility Matrix or Information Particulars or any other part of the Agreement. However, this idea is different in the NEC4 X10. Even if there are no rules to determine a responsibility matrix in the Protocol, those dates stated above -related to the CDE- should be defined in IMR. This matrix consists of the information that answers the questions of "who", "what", and "when." The dares on the Matrix should also be included in programs submitted to the Client. In relation to these, when Clients want to have the Protocol into the contract with X10, they should carefully decide on Clause 25.3 of ECC in which there stated a non-predetermined remedy for failing to achieve a Key Date. They can either change it to predetermined damage or use it as a "null".

Secondly, as it is stated in 3.1.3 in CIC Protocol, the Employer shall review and update Information Particulars and the Responsibility Matrix in each project stage, if necessary. However, such changes in the ECC contract can cause a change in the Scope directly, and therefore, creates a compensation event.

Furthermore, the role of Employer's Information Manager and Built Asset Security Manager in the Protocol can be delegated to Project Manager or Service Manager in NEC4 suites of contracts since there are no separate entities in the NEC4 for these roles.

5.2.6 Use with ISO 19650-2

NEC has published a practice note to define the framework of using ISO 19650-2 with NEC4. It is stated that Information Protocol should be added to IMR to make it a part of the Scope. Apart from the difference of several definitions of terms, it is essential to match the terms Appointing Party, Lead Appointed Party, Appointer, and Appointee to Client, Contractor, or Consultant carefully to create a clear understanding. The Client should decide which documents in the Information Particulars to include in IMR since any change in those will eventually cause a compensation event under the ECC contract. For instance, the inclusion of the BIM Execution Plan or Task Information Delivery Plan as Information Particulars to the IMR and changing them through the project phases may later trigger a compensation event. The Protocol's Risk Register should not be confused with the Early Warnings Register in NEC4. While the former one is a document prepared by Lead Appointed Party for its Teams, the latter one is a bipartite document that is prepared for each ECC contract differently. So, keeping those documents separate would be more useful since there are one Early Warning Registers for each contract. However, if they are wanted to be used together, then a set of standard entries should be defined for all Risk Registers specific to the delivery of the information (Patterson & Winfield, 2021). In addition to the date, it is crucial to notice that any change in a Risk Register should not trigger a compensation event, therefore not included in the

Scope. In order, such changes in any Information Particulars of ISO Protocol do not cause compensation event they should not be included in the Scope. They can be linked with any other document in the ECC, like Information Execution Plan. A more detailed BIM Execution Plan, including Responsibility matrices, etc., may be more useful in that manner.

The linking of the times is another critical issue to be discussed. As Protocol stated, those times should be defined in "Information Particulars". However, to be more precise and utilize both the contract and the protocol, those dates and related conditions, for example, one of the Responsibility Matrices, can be pointed to "key dates" of Contract data part one.

Furthermore, in the Protocol, each Lead Appointed Party has its Execution Plan for all of its team. Therefore, if there is more than one Lead Appointed Party, there is more than one BIM Execution Plan (IEP in NEC4 language). If the clients want to force those parties to have as similar BIM Execution Plans as possible, they should include such requirements by including the Secondary Option of X12 to run the project in a more joined-up manner. Also, there is no specific place in the NEC4 X10 that specifies who is going to do what and when as in the ISO Protocol. The Protocol states more than one responsibility matrices. Those are from the High-Level Responsibility matrix supplied from the Client to Team's Task Information Delivery Plans. These documents may work well with the inclusion of X12 as well.

5.3 AIA

5.3.1 History of AIA

The American Institute of Architects (AIA) has published its first contract document in 1888, Uniform Contract. After that year, gaining more knowledge and experience let them publish their first set of standardized general conditions for construction. These conditions were revised 16 times until 2017. Thanks to the institution's

experience from legal and actual cases, they have constantly revised documents throughout the years. Generally, AIA collects that knowledge and updates its documents in 10-yearly periods.

Nevertheless, this system worked a bit differently in the BIM case. The first documents they published were in 2007, which is the E201 - Digital Data Protocol Exhibit and C106 - Digital Data Licensing Agreement. Since digital data and BIM quickly evolved, they published E202 in 2008. Since there was no standard way of practicing such areas in the construction industry, they collected comments and issued draft documents for public review. They developed E203 and C106 in 2013 and two other exhibits G201 and G202, influenced by their first documents. The ones in use are those documents published in 2013.

5.3.2 Structure of AIA documents

AIA organized the documents into families. Those families are:

- Conventional (A201) Family
- Construction Manager as Adviser (CMa) Family
- Construction Manager as Constructor (CMc) Family
- Design-Build Family
- Integrated Project Delivery (IPD) Family
- Interiors Family (for FF&E procurement services)
- International Family (for the U.S. architects working abroad)
- Program Management Family (for the Owners with more than one consultant)
- Small Projects Family
- Digital Practice Documents (for the project using BIM and digital data)

- Contract Administration & Project Management Forms (for management of all delivery methods)

In the scope of our chapter, we are going to focus on Digital Practice Documents more.

The other components of the contract documents are series. Those series can be listed as:

A- Owner/Contractor

B- Owner/Architect

C- Other Agreements

D- Miscellaneous

E- Exhibits

G- Contract Administration and Project Management Forms

The AIA has its unique numbering system for its documents. They named the documents by the first ladder indicating the “Series” of the agreement. The second position is coming from the number of “Types” of the document. They defined 8 Types, including prime agreements, guides, etc. The third ladder indicates the delivery method. For instance, while 0,1 and 2 indicate conventional delivery method (Design-Bid-Build), 4 indicates Design-Build, and 9 indicates IPD. The fourth number dictates the “Sequence” of the documents with the same series, type, and delivery method. Finally, they add the edition year of the document at the end of the document's number. For example, an Owner can use the document A101 to contract with a Contractor for a DBB project if they would like to practice with a stipulated sum or A102 for Work Plus a Fee pricing system.

The most used AIA documents are A101 and B101 for conventional contract methods for Owner/Architect and Owner/Contractor relations, respectively. There is another document, A201 -General Conditions, that aims to set a collaborative

environment in the contract processes and coordinate the responsibility of those involved by being an umbrella document. The contract document A141 is frequently used in the industry for Design-Build contracts between the Owner and the Design-Builder. All related contract documents or exhibits mentioned in the document at the upstream of the document flow. For instance, A201 has stipulated the use of E203 in clauses 1.7 and 1.8 that suggest parties use that document to form a basis for their relationship with digital data and BIM. In this way, it can be said that all of these document follows a meaningful sequence in a practical manner.

5.3.3 BIM Approach of AIA

In the transitioning process of the documents from E201 and E202, they realized that some of the BIM specific documents, which are so-called "live" documents, cannot be handled in the provisions of a contract document since you may not have all of the contractors or sub-contractors of a project on board, especially in a conventional project. Therefore, the inputs of the documents like the model element table cannot be detected from the beginning of the project and may be needed to be updated through the project. So, moving such provisions from an agreement to an exhibit enable users to change and evolve those more fluidly and frequently. They moved those into form documents, so they will not be a part of the parties' agreement. Hence, if one needs to adapt the forms based on project circumstances, one can do so without having to amend all the agreements on a project.

5.3.3.1 E203 – 2013 Building Information Modelling and Digital Data Exhibit

This document aims to set the essential understandings for the parties to use BIM in their project. This document was not designed to use as a standalone document but must be attached to an agreement. This agreement can be A101 and B101 for conventional methods or A141 for design-build. Project Participants at the flow of

the project must include this document in their agreements if the contracting parties somehow included or using the information related to BIM processes. This document ensures that everyone included in the project has the same ground and expectations (Assaad et al., 2020).

In Article 1 of E203, parties are accepted that they will include this exhibit in their downstream agreements to define their contracting parties as Project Participants. In the following clause, it is stated that parties should notice their discomfort if they believe that the protocols attached to that exhibit change their scope of work. Otherwise, they may later count as if they waive from any claims.

Article 2, which is named "Transmission and Ownership of Digital Data," consists provision of the intellectual property rights and liabilities of parties related to the use of the creations. It declares that the copyright of the creation stays with its creator and will not be conveyed to the receiver but the Party transmitting the data gives permission to the receiver of the Digital Data. These permissions are related to the "right to use, modify, or further transmit Digital Data" and for the project's sole purposes. It is important to note that the article ends by indicating the conflicting situation between the ownership provision of the article and the Agreement. It dictates that in the case of a confliction, the provisions of article 2 shall prevail.

Article 3 sets forth the process for establishing the protocols. It indicates the need for the Parties of the agreement that they should establish further details of protocols "as soon as it is practical". It basically sets down the basics of BIM use and points to the G202 for the details. It also has a table that clarifies the "Anticipated Types of Digital Data" for the parties to determine which data will have proceeded in a digital manner and which data will not. Data like submittals, modifications, or models should be defined if they will be entered into the Electronic Data Management System (EDMS) of the BIM procedure. Parties also indicate their intention to use Building Information Modelling in that table.

In the first subsection of Article 4, the parties declare the extent of the responsibility of the model developer. If parties agreed to use this document as a "reference only"

document for other Project Participants, their sole purpose would be defined to fulfill the obligations of the Agreement. Therefore, any other third parties that will use the model will not have any level of reliance on them and may not have damage due to the model creator's negligence. In other words, it is a disclaimer of the model creator that expresses if any party would use the model for anything rather than just looking at it, then they might be needed to pay for the damage of the creator if they are sued related to the use of the model. This approach takes root from the fact that the author of the model may unintentionally put an element just for visualization or some other purpose, and it may contain too much detail that actually the author would not include. Alternatively, they may place some elements with approximate places. Therefore, they do not want anybody to rely on that. However, if the contracting parties agreed that the model would be used by other Project Participants rather than the Parties only, they will define the extent of reliance and Authorized uses in later subsections of Article 4.

The Anticipated Uses of BIM, like coordination or estimation, also is defined here. If the parties do not indicate a use like estimation and later, they want to do so, the models may not be created or relied upon for that use. In addition to that, it stated that parties should “use and rely” on the model in accordance with the most recent version of the protocols. This indication is vital since the protocols might be revised periodically to answers the project needs. As the project transitions from design to completion, some of the responsibilities may transfer from designer to constructor or facility manager. Also, the article states that the Party received a model in accordance with the protocol can rely on the model to the extent of the minimum LOD defined in the protocol even if the model contains more information than needed. It also assigns the responsibility of the management of the model like the management of CDE, naming conventions, or any other related procedures to a Project Participant.

To satisfy the needs of the end-users, clause 4.9 clarifies the use of the model in the post-construction period. The owner indicates its requirements for operating the project / Space Management, Energy Management, etc.) after completion in the table

provided in that clause. If the designer is later expected to do more than these requirements, this table forms a basis for them to support their rights.

5.3.3.2 G201 – Project Digital Data Form

This document is only three pages long, and as with other G forms, this form is not a part of neither agreements nor exhibits. It is an explanatory document for the practitioners using digital data. If these forms were contract documents, the participants would need to amend their agreements every time the protocol was revised. However, the stipulations in Article 3 of E203 contractually obligate the Parties to follow the protocol.

It is a general digital data protocol rather than a BIM-focused document. If Project Participants are using an EDMS, they indicate the use and responsibilities related to that system in that form. The table provided in Article 3 should be filled to determine the format of the digital data and authorized uses, respectively. The more BIM-specific document is G202, and it will be discussed in the next section.

5.3.3.3 G202 – Project Building Information Modelling Protocol Form

As E203 establishes the basis of BIM use, it suggests that Parties form a Protocol to define the details (Atkins & Mendelson, 2016). In that manner, G202-2013 can be seen as an extension of those intentions. Due to its nature, this protocol is revisable as the project evolves. However, parties should be aware of the fact that if the extend of Protocol goes beyond their scope, they can claim for compensation as it is mentioned in E203 with the requirement of 30 days written notice.

In section 1 of Article 1, there is a list provided to be completed by the Parties to indicate responsible persons from the BIM model. There may be more than one "individual responsible" from the same Project Participants since they all may have a different aspect of the Modelling role. This is aimed to encourage more

collaboration and let users communicate with each other by directly contacting the responsible person. Additionally, the term "Model" is defined by indicating the uses of the protocol. The parties can add their collaboration procedures or meeting schedules in the 3rd section of the article as well. Next, the other sections clarify software needs and training and support needs. Since this document can be seen as old dated and the industry still had a little understanding of BIM-related software, AIA included that into their BIM protocol. However, this training includes the Owner's specific needs. For example, the Owner may want its architect and the contractor to get used to facility management software to utilize the BIM model more efficiently. Finally, there is a Table to dictate to Parties to attach specific model management protocols. These protocols can be Modelling related issues like "Naming Conventions", "Design Coordination," or "Coordinate Systems".

The following article covers issues related to the Level of Development (LOD). This article defined each LOD's minimum requirements. This identification plays a vital role in solving the reliance issues. For instance, an architect may use a very detailed model from his or her library for visualization purposes and leave the details embedded in it, and later any other Project Participant may use that information if there is no procedure like LOD. The article defines LODs in two parts for each of them. The first part defines content requirements, and the second defines "Authorized Uses". Authorized uses classified as "Analysis", "Cost Estimating", "Schedule", "Coordination", "Other Authorized Uses" For example, the content requirements of LOD 200 defined as "graphically represented within the Model. with approximate quantities, size…" and the Authorized Uses are stated as it can be used for "time-scaled appearance" or approximate cost estimating.

Finally, the last article provides a Model Element Table, which indicates the responsibilities of all elements in any LOD and in each milestone of the project. This table is revised throughout the project. As other participants involved in the procedure and expectations become shaped, this table follows the streamline of the project. It is created at the initial phases and creates a base to meet the understandings

of all Project Participants. This table also eliminates the problem of trust between stakeholders.

5.3.3.4 C106 – Digital Data Licensing Agreement

The Agreement has almost the same provisions as those in the E203-2013 with a bit of modification. The licensing document stated that the Digital Data, which constitutes the substance of the agreement, is licensed to the Receiving Party by knowing that the copyright owner of the data is the transmitting party. Parties indicate a fee for the transmission of data from the Transmitting Party to the Receiving Party. The latter can use and share the model with its contractors or consultants solely for the Project stated in the Agreement. It should be noted that this agreement is a standalone document and can be used separately from any other contract if there is no other existing agreement that covers the licensing issue. Also, this document can be helpful for the security of confidential trade secrets.

5.4 FIDIC

5.4.1 History of FIDIC

FIDIC (Fédération Internationale des Ingénieurs Conseils*, International Federation of Consulting Engineers*) was established in 1913. The federation expanded by the inclusion of 60 different countries later. They published their first form of contract in 1957, the Form of Contract for Civil Engineering construction works. They add two other contracts to that in 1967 and 1995, respectively, for the MEP engineering sector and design-build works.

5.4.2 Contract forms of FIDIC

While the contracts' roots reach previous years, the primary accepted forms are released in the late 1990s. The first editions of the main contracts of FIDIC are as follows:

- Conditions of contract for construction 1st Ed (1999 Red Book)
- Conditions of contract for plant and design-build 1st Ed (1999 Yellow Book)
- Conditions of Contract for EPC and Turnkey projects 1st Ed (1999 Silver Book)
- Client/Consultant Model Services Agreement 1st Ed (1998 White Book)
- Short form of Contract 1st Ed (Green Book)

In 2008 they published one more main book, Design-Build-Operate (DBO) Contract 1st Ed (Gold Book). After 18 years of experience, in 2017, they published the 2nd editions of those books published in 1999. They are:

- Construction Contract 2nd Ed (2017 Red Book)
- Plant and Design-Build Contract 2nd Ed (2017 Yellow Book)
- EPC/ Turnkey Contract 2nd Ed (2017 Silver Book)
- Client/Consultant Model Services Agreement 5th Ed (2017 White Book)

They also published some additional contracts to answer the specific needs of the construction industry all around the world. For instance, they released Dredgers Contract 2nd Ed (Blue-Green Book) in 2016 to be used in dredging and reclamation works construction and Conditions of Contract for Underground Works (Emerald book) in 2019 to be used in the underground project where the Contractor designs the works according to Employer's reference documents.

5.4.3 BIM Approach of FIDIC

FIDIC released the new editions of its 1999 Rainbow Suite, Red, Yellow, and Silver Books in 2017. However, while 49% of FIDIC users utilize BIM in their project (Albtoush et al., 2017), they still did not contain BIM-specific provisions (Bodea & Purnu, 2018), but they mentioned its importance in Advisory Notes. Therefore, the practitioners of FIDIC needed to include BIM-related documents by themselves and tried to incorporate them suitably without conflicting with the provisions of the main contract. They can even use the BIM-specific documents of other standard contract forms by amending them into their agreements.

However, related modifications in the contracts should be very well defined not to cause any misunderstanding between stakeholders. Since the parties in FIDIC generally from more than one country, the possibility of emerging a misunderstanding is not low. The parties now utilizing BIM with FIDIC suites generally include BIM-specific conditions in particular conditions. In that manner, it is mentioned by FIDIC that "Clear and unambiguous drafting is fundamental to all Contract Participants understanding their roles and duties …". Hence, it may be beneficial for the people that use BIM with FIDIC to utilize definitions with international standards, i.e., ISO 19650.

On the other hand, it would not be wrong to say that it is difficult for FIDIC to make a change in contract forms. Its use in international projects can make it challenging to make such radical changes. Establishing a standard that must be prepared following the laws and regulations of all countries can also be encountered with unexpected difficulties. For these reasons, it would not be right to expect FIDIC to change the body of its contracts. They can produce a guidebook and a standard protocol describing how to use BIM with their contract.

Following these, it was announced in the annual report (FIDIC, 2017) that the FIDIC business practice committee (BPC) was working on producing a "Technology Guideline" and "Definition of Scope Guideline Specific to BIM" by reviewing the

impact of BIM in the international construction industry. Following that, they announced in 2019 that they produced a draft BIM Protocol, and they tried to finalize it. In the latest report, they said that they are about to publish the Protocol, which is intended to provide a detailed understanding of BIM with cross committee work involvement.

FIDIC defined its priority precedence in sub-clause 1.5. After the publication of a protocol, these relations may be needed to consider again. For instance, in CIC BIM Protocol, it is defined that in the case of a conflict with a stipulation made in the protocol and any contract document clauses, the protocol shall prevail. Such priority should be defined well to solve issues that may be faced in BIM procedures. Similarly, the BIM Execution plan can be considered in the Programme of clause 8.3 and as a condition to commencement under clause 8.1.

One other issue that should be mentioned is the copyrights of parties. FIDIC indicates in sub-clause 1.10 that the Contractor should give a royalty-free license to the Employer for the design documents. However, this may not be the case in the BIM case since there may be more than one collaborator of design, and therefore the Contractor may not be the only author of the design documents.

Apart from that, the design obligations of parties should be set out well. It is fitness for purpose in all suites of FIDIC except white book. However, the case may be different for all design collaborators or it may be the standard of reasonable skill and care for some parties.

5.5 Protocols

5.5.1 CIC BIM Protocol

In 2013 Construction Industry Council (CIC) published the first BIM protocol to enable the industry to work with BIM in a more standardized way. After five years of experience and knowledge, they revised the protocol and published its 2nd edition

in 2018. In addition to that, one of the main aims of the organization was to make the protocol suitable for the standards of PAS 1192.

At the 1st edition of the protocol, there was a precedence clause that has been discussed by the professionals for years. The protocol was taking precedence over all other contract documents. However, they changed this aspect by informing the protocol users in the guidance part of the document by stating that they should indicate their intention before starting the project. They claimed that the protocol should take precedence to be more helpful, but the users are free to determine which one to determine. Also, they propose an "incorporation clause" in the guidance for the users to include such a clause in the main contract to amend the agreement. Additionally, it indicates how the users of JCT and NEC4 can use the protocol and arrange the priority of the documents.

It can be said that the protocol's new edition focuses more on information rather than the model as in the PAS 1192 series. They exclude the definition of the model, but they indicate "Specified Information" by referring to the Employer's Information Requirements (EIRs) and the provisions BEP (Construction Industry Council, 2018). They also removed the governance of the model over the drawings since they saw the 2-dimensional drawings developed by working on a model output can have further detail contained in them.

The protocol also indicates that if parties do not use a security-minded approach to the project, they should indicate that Appendix 3 of the protocol will not be used. If they would like to compile the work so that PAS 1192-5 dictates, they should prepare the Security Requirements.

The second section of the protocol defines that in the event of any conflict regarding project information specified in the protocol, parties should notify The conflict or inconsistency to other parties, and they should try to resolve the problem with a meeting that is set together. In other parts, this clause is recalled when a conflict appears between the EIRs and BEP.

The obligations of the employer are mentioned in article 3. The employer assures that they comply with the obligations under Information Protocols. They agreed that they would update the Information Particulars and the Responsibility Matrix (it was Model Production and Delivery Table previously) when necessary in each stage of the project. Also, they accept that they will appoint an Information manager to establish and manage the processes and procedures defined in the Information Particulars. Likely, the obligations of the project team member are defined in the next section. The obligations can be summarized as using reasonable skill and care to comply with the Information Particulars and the Responsibility Matrix while providing information and using other team members' information and proving the information by satisfying the Level of Definition need.

Furthermore, the protocol changes its attitude towards copyrights. Previously, it gives them ownership of the model to the project team member and gives them the right to revoke the licenses in the event of nonpayment. Now it gives priority to determine the ownership-related issues to the main contract. If there is no related clause in the contract, the creator of the information can give licenses to the users of the information to utilize it for the project's purpose. They do not include any provisions related to revoking the licenses. Also, they redefined the Permitted Purpose. It refers not only to Level of Definition rather than Level of Detail but also includes the status code and functional state of the information such as WIP and Shared.

At the end of the protocol, there are three appendices, the first of which are left blank for the parties to insert a Responsibility matrix to identify Specified Information to be supplied. The second appendix refers to Information Particulars like EIRs, BEP, and Project Procedures. The last appendices are designed for Security Requirements if parties would like to conduct their project with such an approach.

5.5.2 ISO BIM Protocol

In the introduction of the protocol, the authors indicated that they developed the protocol by developing the conditions of the CIC BIM Protocol 2nd ed. to make it more suitable with the requirements of ISO 19650 standards. They also indicated in the introduction that the parties of that protocol should indicate both the priority of the documents in the event of a conflict between the Appointment and the protocol and the essentiality of mentioning the protocol in the "incorporation clause" of the Appointment to make it contractual binding. The protocol itself gives an example of such a clause.

On the cover page of the protocol, there is a checklist for all of the Information Particulars of ISO 19650 and definitions of the parties of the protocol (Croft, Winfield, et al., 2021). Even though the protocol is designed so that it is capable of utilizing even if some of the Information Particulars are left blank, it is suggested to parties to include all of the Information Particulars as much as possible. Also, some of the documents here may not be applied between all parties. Since the protocol designed for all of the supply chain's relation, some of the documents may be less applicable to some parties. In addition, that some of these documents even will not exist at the time of the appointment date, or some of them will be partially completed and will be updated in the former phases of the project by their nature, like the BIM Execution plan. Updating of such documents should not cause any compensation event since the protocol indicates in its clauses that these documents are subject to change over the course of time (Croft, Davidson, et al., 2021). Hence, the cover page acts as a checklist, making it easy for parties to include the documents needed to run their business under the ISO standards.

The first section is about the interpretation of the protocol. In 1.3 of the first section of the protocol, it is stated that if the Appointing Party (Employer) is not one of the Parties of the protocol, then none of the stipulations in the protocol will affect the Appointing Party. In one of the following clauses of the section, the precedence of the documents is prescribed. If there is no particular clause on the cause of the

conflict between the protocol and other documents forming a part of the contract, the protocol provisions should prevail.

The Appointing Party's obligations, such as appointing of individuals to undertake the client's responsibility as stated in the ISO 19650-2 defined in the protocol's third section. The following section states the obligations of everyone. It stipulates that everyone should conduct their work with the Information Particulars. They should establish and comply with them. In addition to that, 4.10 and 4.11 state the preparation of the missing documents in the Information Particulars and updating information management documents like BEP.

The following section defines the CDE solution and workflow. Importantly it defines extra obligations for the Appointing party as setting up the CDE and being responsible for arranging workflows and security of the information containers' storage. Extra obligations regarding the management of the information are stated in section 6. The duty of establishing Exchange Information Requirement (EIR)is given to the Appointing party while the Lead Appointing party should check the information models' compliance with the EIR. Also, 6.5 states that the parties should comply with the Project's Information Standards and Production Methods and Procedures, which are defined in the Information Particulars.

The 7th section of the protocol suggests that parties define the Level of information need. However, it does not mandate or suggests any templates regarding the level of information need. Next, section eight is related to the use of information and copyrights. However, if the main contract has clauses regarding ownership, the contract has precedence over the protocol. Unless the contract has related provisions, the protocol states that the owner of the information is the creator of it. However, they should give a non-exclusive royalty-free license to such an extent that the receiving party can use, transfer, and run the model within the project's scope.

Section 11 of the protocol defines the rules related to the security of the system according to ISO 19650-5. However, if parties do not identify the Security

Management Plan in the Information Particulars, this section will have no effects on the Parties of the protocol.

In the last section of the protocol, the protocol defines the clauses that will still be applied after the termination of the protocol, such as copyrights.

5.6 Summary and Discussion of the Chapter

BIM has been handled with different perspectives in different standard contract forms. The JCT refers to an already used BIM protocol rather than taking an ambitious step as was done in the NEC4 to solve BIM-specific issues in-house. Users can also add any other protocol they want to the contract. However, there are a few critical points to be aware of when doing this, such as the superiority of documents. Although FIDIC has not published a document within its structure for a long time, it does not refer to any document as JCT does. Based on this, we can say that it leaves its users with this problem. Users can even use the X10 document presented as a Secondary Option in NEC4 in addition to FIDIC to handle BIM processes. Of course, considering the latest developments, they are on the verge of taking an essential step in this area. AIA, with a different point of view from JCT, has foreseen the Protocol to be used in the contract, within its own structure, for users to carry out related works through this protocol.

Events experienced in the past play a critical role in shaping standard contracts and protocols. One of the most prominent examples of this is that the CDE's control in the ISO protocol being imposed on the appointing party (i.e., Employer/Client), as a reflection of the lessons learned from the *Trant v. Mott MacDonald* case mentioned in the previous sections. Thus, for any reason, any stakeholder within the scope of the contract will not be able to disrupt the project in this way. Also, the effect of confliction between contract documents in assessing the performance of the contractor set a good example for the UK situation in the case of *MT Højgaard A / S v E. On Climate & Renewables UK Robin Rigg East Limited and another.* As a result

of such cases, in case of a possible conflict between the contract documents, how this problem will be solved, or which document will be considered superior, it has started to be considered more carefully.

Another effect of both case laws and previous literature on legal issues may be seen in the ownership provisions of contract forms. As can be seen in all of the contracts stated in this chapter, all contract forms contain clauses on copyright and model ownership, even though these clauses are handled differently from each other. These clauses will play a significant role in reducing future copyright issues to reasonable levels.

From a contractual point of view, regardless of which contract form or protocol to use, it is of great importance how to handle some of the documents brought up with BIM. It should be determined that whether live documents like BIM Execution Plan (BEP) should be treated as contract documents. While the parties want the BEP to be a legally binding document, the Employer may request it to be a live document that can be updated when necessary. However, the fact that living documents like BEP become contract documents can make updating process painful. The employer does not want the update of such documents to trigger a "compensation event". In this respect, while establishing the contract structure, it is a critical point to determine the positions of such documents well for the healthy progress of the project.

Especially the importance of standardization in the UK's contractual area was a factor that triggered international standardization. This success led to the internationalization of the PAS-1192 standard, widely used in the construction industry in the UK, to form ISO 19650 standards. Those standards were adopted by Turkey recently. They will eventually be used in the sector soon. Nevertheless, it should not be forgotten that this change in the UK and the progress in the technological field have only resulted from the government's perspective on BIM and the request for BIM to some extent in its public projects. Technological advances previously attempted to be incorporated into the construction industry have never found such a permanent place as BIM did (Winfield & Rock, 2018). Hence, in the

next chapter, the level of standardization and ability of comprehension of the contracts and specifications related to BIM in Turkey will be examined.

CHAPTER 6

CURRENT STATE OF TURKEY

Following the emergence of the term BIM in 1992, the use of BIM processes in the USA began to be seen with the "General Services Administration (GSA)" through the Public Building Services (PBS) in the early 2000s. With the widespread use of BIM in the USA, steps have been taken towards standardization. In 2012, the national BIM standard was published by the National Institute of Building Sciences. Although there is not a general BIM mandate since there is no single institution capable of imposing a national mandate on BIM (Goodman, 2019), the BIM requirement for state-based public projects started in 2010 in Wisconsin for projects over $5 million (Yoders, 2009). With these developments, the use of BIM in the USA has spread rapidly and reached high numbers (Dodge Data & Analytics, 2017).

European countries also followed this trend. In many countries, especially in the Scandinavian countries, BIM requirements have started to be seen in the public. Even in countries where the use of BIM is not mandatory, it has reached a vast scale of users. Many European countries' governments and ministries are taking essential steps by publishing road maps under the title of transition to BIM and digitization in the construction industry. Leading examples of these can be shown that France and Germany, which reached 81% and 74% in the use of BIM in infrastructure (Dodge Data & Analytics, 2017), will make BIM mandatory in their own projects in the near future with the road maps published in 2014 and 2015. In fact, the use of BIM has become compulsory according to this road map as of 2020 in the projects of institutions affiliated to the ministry of infrastructure in Germany and 2017 in projects in France (Infrastructure, 2015; European Comission, 2017).

Following the strategy document published in the UK in 2012, the BIM obligation applied in public projects in 2016 caused the standards related to BIM to develop

rapidly. In this sense, it can be said that although UK is late in BIM adaptation than the USA, it has achieved more significant work in standardization. This process in the UK also played an essential role in shaping international standards. This BIM deployment in the UK has earned a permanent place, unlike the technological breakthroughs previously experienced. The most significant factor in this was the insistence and enforcement of the government on the use of BIM (Winfield & Rock, 2018).

Turkey has started to get its share from the digitization trend in the construction sector, which continues to adapt to the advancements in the world. BIM processes have been used effectively in Turkey for a long time. BIM Processes, which have a wide range of use from infrastructure projects to mega-sized superstructure buildings, started to become widespread with the participation of municipalities at first, it later emerged in large-scale PPP projects (Figure 6.1).

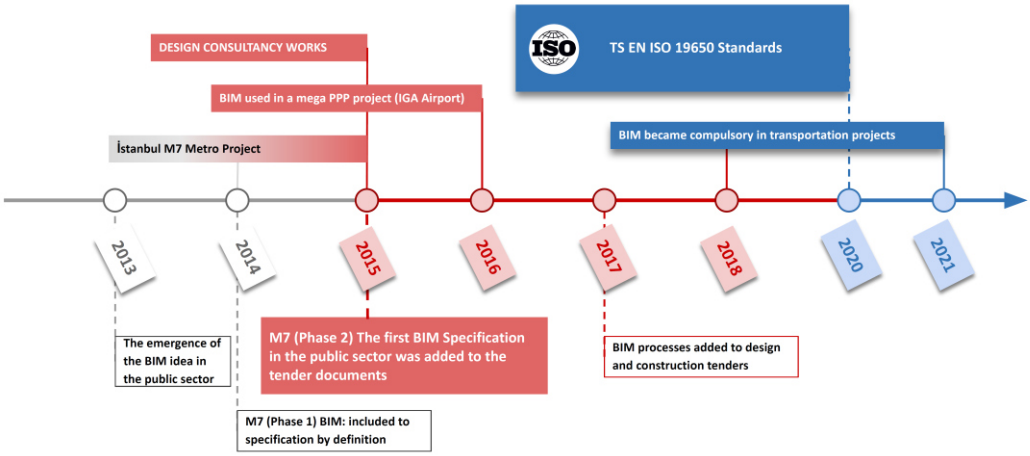

Figure 6.1 Timeline of BIM in Turkey

Considering that especially public and public-private-partnership projects in Turkey occupy the majority of the sector, the role of the public bodies in this digitalization process will be at an undeniable level. Just like in the UK, the rate of spread of BIM usage in Turkey will increase with the use of the BIM system in public projects. In early 2015, BIM requirements began to be added to contracts in metro projects. With

this transformation that started in those years, the number of design and construction works done with BIM has started to increase in recent years. Recently, the BIM obligation in public projects that will ignite digitization processes in the construction sector in Turkey has applied for Infrastructure construction projects. With the Technical Specification (T.C. Ministry of Transportation and Infrastructure, 2021) document published by the Ministry of Transport and Infrastructure of the Republic of Turkey at the beginning of 2021, the institutions affiliated with the ministry are required to integrate the BIM processes in their new construction projects. Although this situation can be regarded as a revolutionary step, it may be a matter of debate to what extent it is suitable for the system in Turkey within the framework of the conjuncture and existing legal regulations.

In order to understand how BIM processes will become functional in public projects, it is necessary to determine the general picture of procurement processes in projects. Although there are studies on this issue to improve the project development stages in Turkey and to catch up with today's standards (BuildingSmart Turkey, 2021), these stages can be shaped according to the traditions of public institutions. In some institutions, preliminary projects, final projects, application projects, and shop drawings progressing with construction are followed, while in some institutions, construction work is started with the preliminary project, application project is determined according to the situation in the field, and the projects are completed. However, in any case, it is necessary to make correct inferences by considering the compatibility of the generally followed framework with the BIM processes. As can be deduced from both project development stages, procurement processes in Turkey can be defined as a classic Design-Bid-Build. Although BIM processes are seen as more useful in harmony with the Design-Build method (Alwash et al., 2017), they can be helpful in both methods by providing the correct collaboration. In the traditional project development stages, an inefficient process emerges when the information produced and used by the project process becomes useless for various reasons and disappears among large archives while passing the project stages. In

order to eliminate this problem, BIM processes should include the connection between these project development phases.

In Turkey, no tenders can be made for construction without the preparation of an application project. However, as stated in clause c of article 62 of the Public Procurement Law (PPL) numbered 4734 (Republic of Turkey - Public Procurement Authority, 2020), in cases where the technical and financial characteristics cannot be determined with the necessary clarity due to the specific and complex nature of the construction work subject to the tender, the tender can be made over the preliminary or final design. Before the institutions go for the construction tender, they start a project design tender with their concept project ideas. The winner of this tender starts to understand the needs of the institution and create preliminary projects in this direction. In these preliminary projects, if it is superstructure work, comments from other disciplines are taken, and only architectural solutions are focused on. If it is an infrastructure project, the optimal route is studied as a concept, with few or no ground studies. During the final project phase, the areas reserved by the designer company with comments from other related disciplines are now detailed and designed. In this direction, clash detections of all disciplines are made, and federated models are created to control project cost and field applicability. After this stage, it is legally ready for project construction tender. The institution which goes for the tender of the constriction works with these application projects will give the duty of preparation of as-built projects to the contractor of the construction works. The contractor can carry out this final design process either in-house or through a design subcontractor. When the construction work and as-built projects are completed, the employing institution can host the information to be transferred to the business process in the project common data environment with the BIM models when the projects are in the operational phase, or share them with the operating company, if any.

Continuing this flow from the beginning of the project to the operation phase without interruption and with minimum loss is of great importance for the healthy success of the project. The fulfillment of this requirement creates the necessity of a standardized understanding of information production and management. As mentioned in

previous chapters, UK, experiencing the inefficiency in such information management processes, has adapted its own standards to suit international use and created the ISO 19650 standard to meet this need. The most significant innovation brought by this standard is the solutions it brings to information management processes. However, the interpretation of these solutions in accordance with the chemistry of the country is one of the only tasks that will increase the applicability of the standard.

6.1 Current Standard Adaptation – TS EN ISO 19650

6.1.1 History and Structure of ISO 19650 Standards

Standardization, which started in the United Kingdom with BS standards in the 2010s, started to accelerate with the strategy plan published by the government in 2011. In this plan, 2016 was set as the target of transition to fully collaborated BIM (The Cabinet Office, 2011). Thus, between 2013 and 2017, these standards gradually began to find a place in the industry. By 2017, almost all standards related to BIM processes were published (except PAS 1192-7) and started to be used as seen in the Figure 6.2.

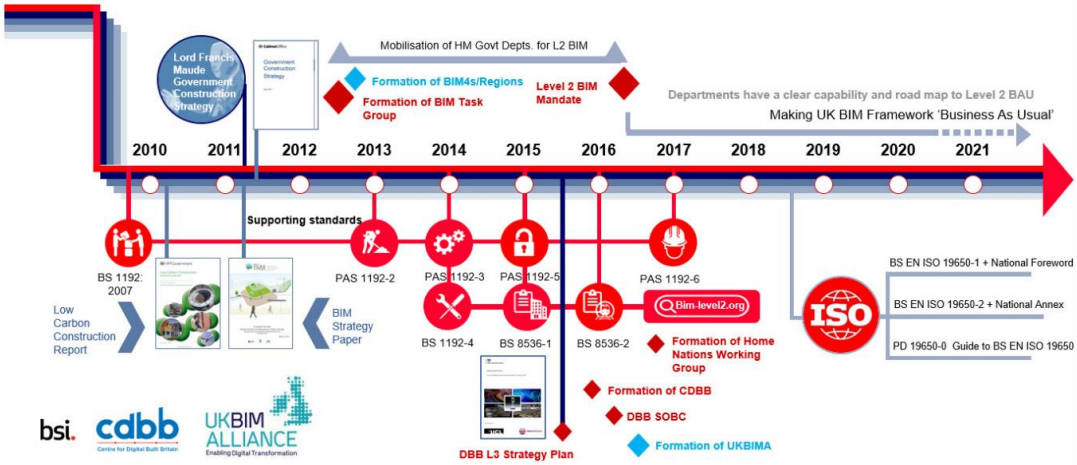

Figure 6.2 Timeline of Standardization of UK BIM (Wilkinson, 2019)

To briefly touch on these standards and their contents:

- **BS 1192:2007:** Collaborative production of architectural, engineering, and construction information. Code of practice
    - It provides a commonly accepted basis for fundamentals of production of information from naming conventions to efficient data use in operations of buildings. Withdrawn and Replaced by BS EN ISO 19650-1 & BS EN ISO 19650-2.
- **PAS 1192-2:2013:** Specification for information management for the capital/delivery phase of construction projects using building information Modelling. Withdrawn and Replaced by BS EN ISO 19650-2.
    - It is built on the code of practice of BS 1192 and focuses on the delivery phase of the project.
- **PAS 1192-3:2014:** Specification for information management for the operational phase of assets using building information Modelling. Withdrawn and Replaced by BS EN ISO 19650-3.
    - It was designed to work incorporation with BS 1192 and focused on the operational phase of the project.
- **BS 1192-4:2014:** Collaborative production of information. Fulfilling employer's information exchange requirements using COBie. Code of practice.
    - It is closely aligned with other PAS 1192 standards and BS 1192. BS 1192-4: 2014 defines a methodology for the transfer of structured information between the parties throughout the life cycle of the Facilities. These codes of practice help employers set their expectations while helping contractors prepare concise, clear, and accessible information. It encourages the use of COBie (Construction Operations Building information exchange). The use of COBie

ensures that information exchange is reviewed and verified for appropriateness, continuity, and completeness.

- **PAS 1192-5:2015:** Specification for security-minded building information Modelling, digital built environments, and intelligent asset management. Withdrawn and Replaced by BS EN ISO 19650-5.
    - It describes the need and implementation of reliability and security controls throughout the life cycle of an established asset (including BIM project lifecycle) to provide a holistic approach. It defines the steps that must be taken to establish security-oriented approaches within an organization.
- **PAS 1192-6:2018:** Specification for collaborative sharing and use of structured Health and Safety information using BIM
    - It provides guidance on the generation, flow, and usage of H&S information throughout the project lifecycle and sets a framework for the application of H&S information through BIM processes.

First of all, BS 1192 and PAS 1192-2 became BS EN ISO 19650-1 and BS EN ISO 19650-2 standards at the beginning of 2019, and as of 2020, 4 of these standards formed the BS EN ISO 19650 - *Organization and digitization of information about buildings and civil engineering works, including building information modelling -- Information management using building information modelling* standard family. The contents of these standards are very similar to the contents of the standards they originated from. The standards currently applied in the UK can be listed as follows:

- **BS EN ISO 19650-1:** Concepts and Principles
- **BS EN ISO 19650-2:** Delivery phase of assets
- **BS EN ISO 19650-3:** Operational phase of the assets

- **BS 1192-4:2014:** Collaborative production of information. Fulfilling employer's information exchange requirements using COBie. Code of practice
- **BS EN ISO 19650-5:** Security-minded approach to Information Management
- **PAS 1192-6:2018:** Specification for collaborative sharing and use of structured Health and Safety information using BIM

The standardization of digitization in the construction sector was also affected Turkey. In 2020, these standards were accepted and published as TS EN ISO 19650 standard family in its original language. Currently, studies are ongoing to translate these standards into Turkish.

6.1.2 Contractual Aspect of the Standards

TS EN ISO 19650-1 lays the principles of the approach of the standard. It defines the essential concepts like information requirements and CDE Workflow. It defines information requirements in four sections. Examining the information requirements by separating them from each other helps to take more accurate steps in determining the needs. These requirements can basically be examined under two separate titles. The first of these is information requirements at the organizational level, while the other can be thought of as requirements covering specific needs at the project level. Of course, these two titles are not entirely separate concepts from each other. Organization-level requirements become more detailed and become project-level requirements. While the needs for each project may vary, the general requirements of an organization will remain more or less the same. These High-level requirements are more described in ISO 19650-1, while other requirements and concepts are discussed more in 19650-2.

Since the years when BIM started to enter the industry, employers who are unfamiliar with its use have come to the contractors with new requests as they realize what BIM

is capable of. This put new burdens on contractors long after contracts were signed. BIM was mentioned with open-ended general definitions in the contracts. As stated in the strategic plan of the UK, putting definitions such as Level-2 BIM, whose content is not explicit, into the contracts created burdens that the parties could not handle and disagreements that would lead to disruption of the works in the later stages of the work. With the increasing awareness of BIM in the industry, this problem has become one of the issues addressed in the establishment of standards. Now, employers are asked to determine what kind of information is needed within the organization before even the idea of the project is formed. Even more importantly, it is asked to put forward the "reasons" for the need for this information. This last request actually constitutes a more important value than it seems.

Although the level of awareness is increasing day by day, not all organizations have the same level of expertise. An employer who does not know the reason for information requirements may not know what action s/he should take when s/he needs to detail his needs on a project-specific basis. However, an employer who has provided the reasons can elaborate the information requirements to the project level in a clear and understandable way and include them in their contracts. From this point of view, ISO standards will contribute positively to the industry in terms of increasing the functionality of contracts and eliminating potential conflicts that may arise.

Organizational Information Requirements (OIR)

- Organizational Information Requirements are one of the high-level requirements and define why information is required. In short, OIR can be defined as the starting point for all information management activities (UK BIM Alliance, 2020). OIR is the set of high-level information requirements that an organization determines in relation to all its activities. However, these goals need to be made more usable by transforming them into understandable and rationalized goals. Examples of such rationalized purposes can be found

in TS EN ISO 19650-3 Annex A.2. Also, it is also essential to set goals that define why these activities are a need.

Asset Information Requirements (AIR)

- Asset Information Requirements (AIR) is one of the detailed information requirements. It describes the detailed information requirements established regarding the asset part of the purposes specified in the OIR. It specifies the detailed information required by the Employer or Operator in order to manage physical assets throughout their life cycle. AIR content can indicate clear information needed in operational needs such as emergencies, insurance renewals, repairs.

ISO 19650, which brings a new perspective by preserving the relationship between the usual stakeholders in traditional methods (Figure 6.3), defines Employer, Contractor, and Subcontractor as Appointing Party, Lead Appointed Party, and Appointed Party, respectively. Also, it presents groups that are formed by different combinations of these parties. These groups provide a more practical perspective in terms of knowledge production and management.

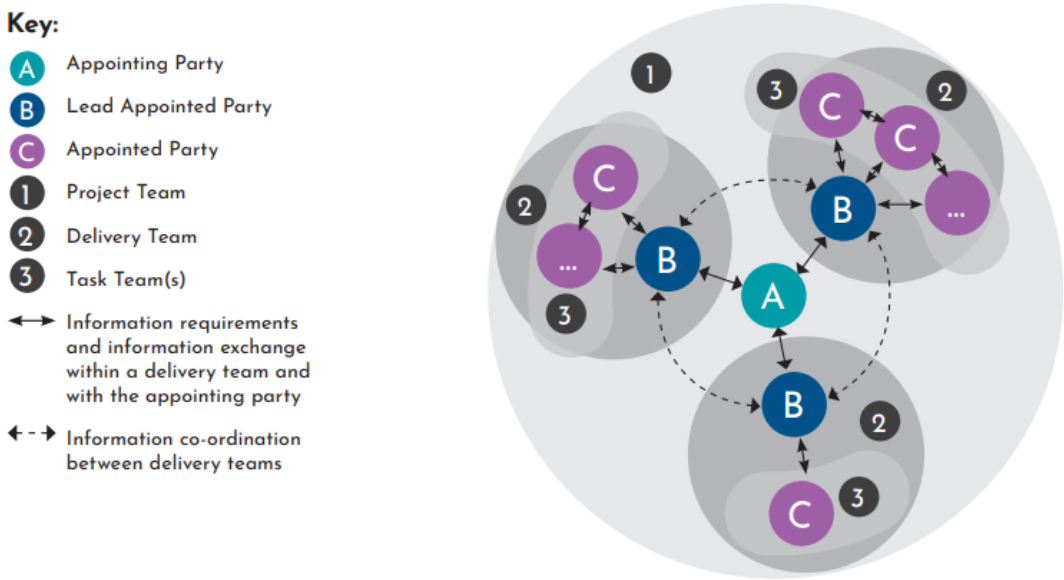

Figure 6.3 Relations of Parties as in ISO 19650 (UK BIM Framework, 2019)

TS EN ISO 19650-2 divides the information management process during the delivery phase of assets into eight stages (Figure 6.4). If the correct steps are taken to prevent potential problems before the contract is signed, it will be improbable that a BIM-related contractual problem will be encountered during the execution of the contract. In addition, since the purpose of this thesis is to address the contractual problems related to BIM and provide solutions to them, the parts of these nine stages until the signing of the contract will be examined. Proper execution of these first steps can reduce the number of BIM-related contractual problems in the delivery phase of a project.

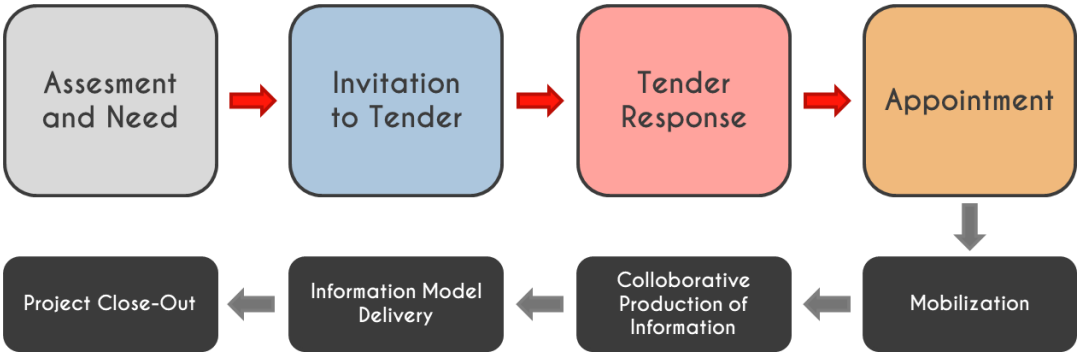

Figure 6.4 Information Management Stages according to ISO 19650-2

6.1.2.1 Assessment and Need

ISO 19650-2 first mentions the requirement of an appointment by the employer for the responsible person to undertake the information management function (Figure 6.5). Employers who are not sufficiently experienced in BIM can make a deal with a third party and have this task undertaken by them. Thanks to this approach, employers who do not have the competence to regulate information requirements and information management processes can also be involved in BIM processes. The primary task of this assigned person or institution will be to prepare the Project Information Requirements (PIR) document by adapting the OIR prepared by the Employer to the needs in the project specification. The purpose of this document is to provide an understanding of the high-level information that the Employer needs

during a design and construction project. For this reason, some of the requirements found in OIR can be directly transferred to PIR. While creating this document, the relevant person or institution must first determine the reason for the project and the expectations of the employer. Then, the information and objectives required by the different departments of the employer organization specific to the project must be determined. In addition, it is necessary to determine the project Plan of the Works and to reveal the project information delivery stages and the targets in these stages. The critical decision points to be determined in connection with these stages, and the decisions to be made at these decision points should also be presented.

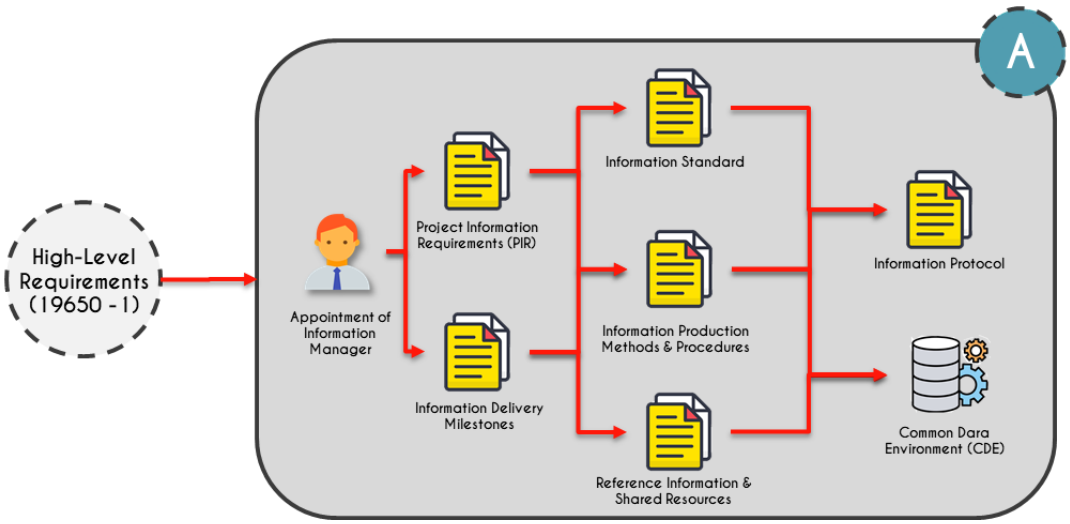

Figure 6.5 Assessment and Need procedure according to ISO 19650 - 2

One of the most critical points underlined by ISO 19650-2 is the Level of Information Need. ISO brings a more holistic and logical approach to these levels, which have been tried to be described first with LODs and then with LOIs until today. It draws attention to the point of “need” beyond expressing the levels with general numbers whose contents are not completely clear. In order to eliminate the disagreements encountered in the sector regarding these abbreviations and to emphasize the word "need" in the cluster, the use of this term without abbreviation can be considered among the points to be considered (UK BIM Framework, 2019).

Level of Information Need is a framework that defines the quality, quantity, and level of detail of the information. It is used to convey the degree of knowledge required for its purpose clearly, neither more nor less. Defining the Level of Information Need without a clear purpose would not be in line with the ISO approach. Accordingly, if the employer is not capable of determining the Level of Information Need, it at least should indicate the reason for the need for information to make the contractor provide the necessary information to achieve the goal. Level of Information Need is the key to the preparation of detailed requirements such as AIR and EIR. As it can be understood from here, the first and indispensable action to be taken when determining levels is to determine the reason why the information is needed. Then, if possible, the geometric, alphanumeric, and documentation information of this need should be determined.

Along with this process, the details of the standard applied in projects related to structuring and classification of data should also be determined with the Information Standard document. Similarly, the resources that the employer uses as a reference when determining the information requirements or standards of the employer and/or the documents that the employer wants the contractors to use as a template should be determined. In this way, the step referred to by the employer as "Reference Information and Shared Resources" in ISO will also be completed.

Following these steps, ISO 19650-2 takes a reformist approach and advises employers to determine the CDE and related workflows before the bidding stage. As mentioned in the BIM-Related Case Law section, in Trant v. Mott MacDonald, it is understood how reasonable such an approach is due to the events that took place regarding the control of the CDE. Apart from that, this situation is critical to creating a common language among the projects in the portfolio of employers who carry out different projects. Similarly, the fact that the CDE and the workflows in the delivery of information and documents are under the employer's administration and control will contribute to the progress of the works more smoothly and without interruption by providing central management.

As the last step of this stage, an Information Protocol should be established by the employer, including all documents and contractual relations required for the execution of the related works. This document has a critical value in that the necessary documents created under the ISO 19650 Standard family for information production and management are also contractually binding. It should be prepared in accordance with the spirit of the main contract and without disturbing the balance between the stakeholders.

While preparing this protocol, care should be taken to ensure that all stakeholders (Employer, Main Contractor, Subcontractor, Manufacturer, etc.) involved in the BIM processes to complete the work can adapt the protocol to contracts between them. Just as NEC4 states that to ensure collaboration among stakeholders, X10 Secondary Option should be included in every stakeholder's contract; attention should be paid to this point to provide an environment with high cooperation in ISO's approach.

6.1.2.2 Invitation to Tender

Exchange Information Requirements (EIR) can be thought of as the specification that describes exact information requirements. The purpose of this document is to ensure that the information and documents required by the employer are described at the required level of detail and transferred to the contractors clearly. It also assists the employer in choosing the right tenderer who is able to fulfill the demands. Since this document will mostly be a contract document, it will be in the interest of the employer to describe the information required for the project in enough detail. Otherwise, a change in the later stages of the work may lead to undesirable consequences.

EIR should be determined in 3 stages. The first and most important of these is to determine the purpose of the emergence of information as a need. This purpose can come directly from AIR (operational requirements), as well as requirements related

to the delivery phase, by detailing the requirement summaries in the PIR. Secondly, this information needs to be structured. The structuring process is of critical importance in terms of enabling the employer's received information to be used effectively in line with his request. What is underlined here is a widespread misuse in the industry. Employers define their use of BIM in contracts with very general and cursory expressions in BIM-enabled projects. Phrases such as 4D Simulation or Level 2 BIM has no actual meaning without clearly detailing and defining them. Nevertheless, specifying the actual needs for such phrases with information breakdown structures makes contractors understand the actual need, and the goal to be achieved will be more straightforward.

The third and last point is the definition of information. Employers should define information in terms of information content, form, and format. Since determining the details of information can become complex, it is necessary to determine a different breakdown structure for objects, properties, and information containers and proceed accordingly. While demanding different parameters for different parts, care should be taken not to create a contradictory situation, and when determining the EIR, one should act in a well-structured order.

Comprehensive and precise preparation of these information requirements will enable tenderers to prepare the Preliminary BIM Implementation Plan, in which they describe the extent to which they understand the EIR and how to handle the processes related to BIM. This "Pre-BEP" application will significantly help the administration to choose the right bidder. However, at this point, the employer should determine the evaluation criteria as quantitatively as possible to make the selection among the bidders (Figure 6.6).

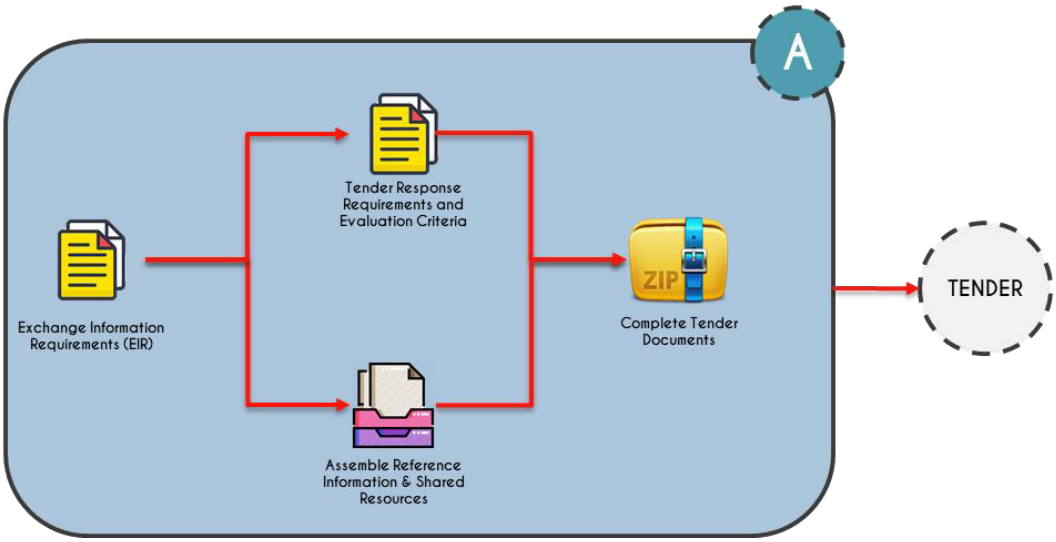

Figure 6.6 Invitation to Tender procedure according to ISO 1960 – 2

6.1.2.3 Tender Response

This standard also describes some documents that should be prepared as tender proposals (Figure 6.7). To satisfy the requirements of clause 5.3.2 of ISO 19650-2, a Pre-BEP must be provided by a tenderer in their tender response. Under ISO 19650-2, the BEP is one of several resources generated by the lead appointed party on behalf of the delivery team to transmit the information management approach. Other resources were also included in BEP in PAS 1192-2, but they dealt with separately in ISO 19650-2. Some examples of those documents are the mobilization plan, risk register. These documents differ from each other in terms of the subject they deal with.

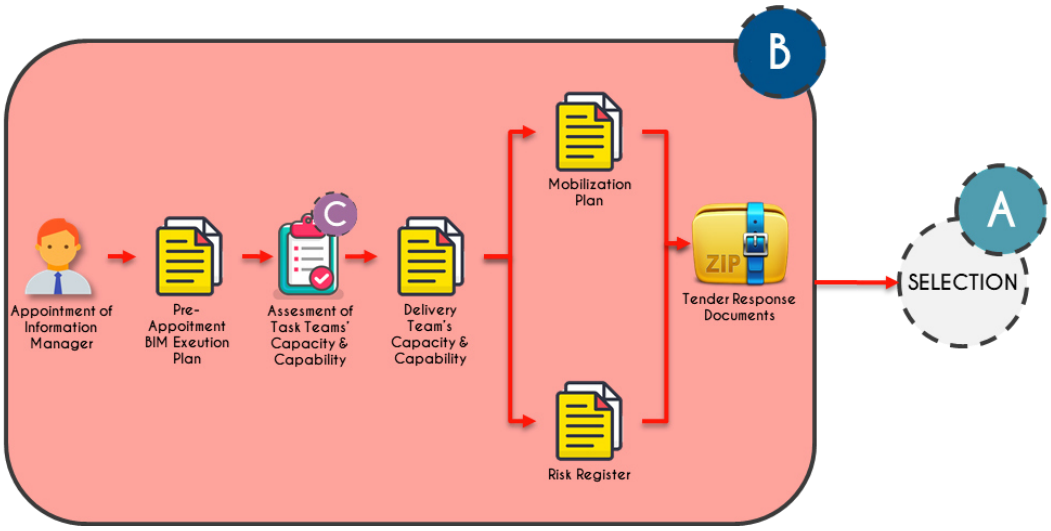

Figure 6.7 Tender Response procedure according to ISO 19650-2

The Pre-BEP proposed by ISO, different from the methods currently applied in the sector, is the document that has the most critical place among them. Pre-BEP is the document in which tenderers describe how they understand and interpret the employer's requests under the BIM framework and how they will handle it if they can become the contractor of the project. This document is a valuable document for the employer to evaluate potential contractors in terms of BIM. If employers set a Pre-BEP template or referred an existing structure of a BEP prior to the bidding stage, they can collect the same type of Pre-BEP from all bidders and bring the usefulness of the document to even more measurable levels. Apart from those, Pre-BEP may include the delivery team’s high-level responsibility matrix that defines the responsibilities of task teams related to a deliverable from the information model. This matrix will be turned into a Detailed Responsibility Matrix in the next stage. Also, tenderers may propose advice to employers regarding the project’s information production methods and procedures, information standards, and/or software or hardware to be used with the project.

One of the other documents that prospective lead appointed parties should include in their tender response is the mobilization plan. The purpose of this document is to show the tenderers' approach to the mobilization of information management to the

employer. This document can be considered as a Gantt chart or a table that shows the flow of activities related to information management (i.e., education of appointed parties related to BIM with workshops, the establishment of CDE and related workflows, etc.)

One other important document in the tender response phase is the Risk Register. All bidders should identify the risks they have inferred on the project and contract. This document, in which they evaluate these risks and state their assumptions about the risks and their possible consequences on the project, is named Risk Register by TS EN ISO 19650-2. This document encompasses all risks related to information production, delivery, and management.

6.1.2.4 Appointment

This step, which is the fourth of the information management stages (Figure 6.8), includes the steps to be followed by all stakeholders between the appointing party determining the contractor of the work after the tender process and the signing of the appointment.

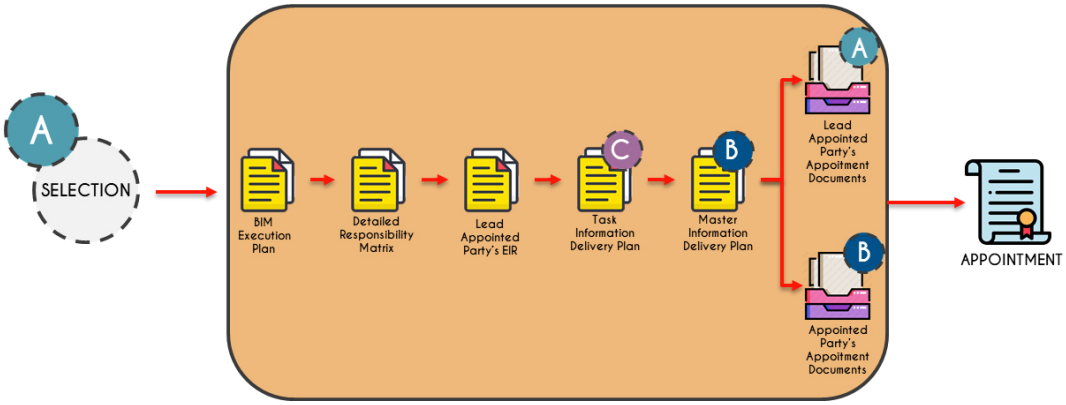

Figure 6.8 Appointment procedure according to ISO 19650-2

The first of these steps and perhaps the most important in terms of information management is the creation of the BIM Execution Plan. The winner prospective lead appointed party (which became the Lead Appointed Party) will detail the Pre-

contract BIM Execution Plan, which he submitted among the tender response documents, with the feedback from the appointing, and specify how he will manage the BIM-related processes before the appointment is signed. Then, the lead appointed party will create the Detailed Responsibility Matrix using the High-Level Responsibility Matrix submitted in the pre-contract BEP. The Responsibility Matrix specified in the ISO 19650-1 clause 3.1.1 and described in clause 10.3 should provide the information management functions and the teams/people responsible for them as a minimum requirement.

As can be understood from ISO 19650-2 clause 5.4.2, this document should be in a matrix format describing what information will be produced by which task team and when. At this point, users should not confuse responsibility matrixes with information delivery plans. The lead appointed party who prepares the Responsibility Matrix collects Task Information Delivery Plans (TIDPs) from its appointed parties according to the EIR that it creates by adding its own requirements (if any) to the appointing party's EIR. Then, by combining these TIDPs, it prepares the Master Information Delivery Plan (MIDP) that will be the general determinant of the information delivery plans and will be presented to the appointing party. TIDPs and MIDP should be considered plans that describe how responsibility matrixes will be delivered by the delivery team. The appointed parties will use the detailed responsibility matrix prepared by the lead appointed party and prepare their TIDPs by considering the outputs requested from them to support it. While ISO 19650-2 clause 5.4.7 makes it a necessity for all appointed parties to prepare TIDP, it also requires them to update it when necessary. Likewise, similar responsibilities for MIDP are valid against the appointing party for the lead appointed party. In addition, the appointing party may send a template determined in the MIDP format to the lead appointed party among the reference documents and request that the MIDPs be prepared in accordance with that format. Similarly, lead appointed parties may choose to dictate their templates for TIDP to all appointed parties, since if the number of parties under the same lead appointed party is too much, then it may be complicated to manage them with distinct types of TIDPs.

After all these matrixes and plans are prepared and approved, there is no obstacle to signing an appointment in accordance with ISO 19650 part 1 & 2. After the information management stages are completed without ignoring the important points and in accordance with the framework defined by ISO, potential problems that may be encountered in the execution of the work will primarily be eliminated. These practices, which have been tried by professionals in the sector and are now accepted as a standard, make the contractual relations of the parties as well as the information production and management processes significantly transparent, allowing a more understandable and straightforward process.

6.2 Regulations in Public Projects

As mentioned in the previous sections, the most prominent driving force in the spread of BIM Processes in Turkey, as in the world, will be public projects. For this reason, it would be appropriate to examine the contractual framework in public projects and to make suggestions in this direction. However, in order to make relevant suggestions, it is vital first to understand the bidding and contracting processes in the country and understand the documents and regulations related to this issue. The Public Procurement Authority was established by publishing Law No. 4734 on the necessity of implementing new practices in tenders specific to works requiring public expenditure and regulating the tenders in separate laws in accordance with their specific characteristics. In order to make the procurement legislation of the state regarding these works in line with the procurement legislation of international organizations such as the European Union and the World Trade Organization, the procurement of goods or services that require public expenditures and construction works are included in the scope of this Law. In addition, the issues related to the contracts issued as a result of public tenders for the same purpose were not regulated within the scope of this Law, and a separate law, Law No. 4735, was prepared on this subject.

In the law, in order to parallel the international procurement practices, four tender procedures have been determined: open tender procedure, restricted tender, negotiated tender and direct procurement. In the implementation of the restricted tender procedure, it is obligatory to declare prequalification, and this tender procedure is limited to the works for which the open tender procedure cannot be applied because the nature of the job requires expertise and/or high technology.

The works that can be done through the bargaining method were limited to the works that are characteristic and need to be done urgently in parallel with the international legislation, and the technical conditions are re-determined to be carried out in two stages.

Due to the nature of the work, the direct procurement procedure has been arranged, taking into account the situations where it is inevitable to meet the needs of a specific bidder without making an announcement. The upper limit of the works that can be directly procured is published in the official gazette every year, and the 2021 price limit is determined as 121,405 TL (Cumhurbaşkanlığı İdari İşler Başkanlığı Hukuk ve Mevzuat Genel Müdürlüğü, 2021).

The Public Procurement Contracts Law No. 4375 is aimed to determine the principles and procedures for the regulation and implementation of the contracts made by the institutions and organizations subject to the Public Procurement Law in accordance with the provisions of the Law. Thus, in order to continue the efficiency and supervision of the tenders made in accordance with the Public Procurement Law, unity will be achieved in the regulations and practices regarding the contracts.

In order to be parallel to international practices; Three types of contracts have been determined: turnkey lump sum, lump sum, and unit price contract. In order to realize the implementation union, it is stipulated that the contract forms are prepared by taking into account the business types, and the administrations will bid for their projects based on these contract forms.

With the changing sectoral expectations and developing technology, it may be necessary to make changes in some documents and processes published by the institution. For any changes, additions, and/or removals in the type documents published within the Public Procurement Authority, this amendment is made by publishing the regulation in the Official Gazette as a result of the suggestions of the PPA.

The new perspective that TS EN ISO 19650 standards brought to the information management stages also includes multiple requirements. When the innovations starting from the tender documents in the pre-tender process to the contractual relations in the process of execution of the works are evaluated on a country-specific basis, situations against these flows and regulations may occur outside of the usual tender and contract processes. In this context, the first step to be taken is to understand the tender documents published by the PPA.

6.2.1 Documents related to the Construction Contracts

Public Procurement Authority (PPA), which publishes the draft contract and administrative specifications to be used in construction works, also publishes similar documents for consultancy and service procurement works. In this study, the main contract types that employers will make with contractors will be discussed. However, the recommendations here are also adaptable to consultancy work, as the primary responsibility of the consultants in the current contracts is to check that the project contractors are doing their work in accordance with the construction contract and specifications, so a proposal is also made for consultancy works indirectly.

6.2.1.1 Agreement Form

Basically, the regulation that provides technical functionality to the principle as mentioned in the 4th clause of Public Procurement Contract Law (PPCL) "… in the contracts to be issued, provisions contrary to the conditions in the tender document

cannot be included" is included in the 27th article of the Public Procurement Law (PPL). According to the provision of the said article, it is obligatory to include the agreement form in the tender document. The agreement form is in the form of a sample of the contract that the administration will make with the contractor who won the tender. At the same time, it is in parallel with the provisions regarding the implementation phase of the contract in the administrative specifications. The agreement form can also be defined as the main document that determines the rights and responsibilities of the parties in the work subject to the tender and forms the contractual basis for the project. On the other hand, as stated in Article 5 of PPCL, it is obligatory to take the standard contract form texts issued by the PPA and published in the Official Gazette as an agreement form, and it is not possible to change the standard provisions of it.

All rights and obligations of the parties are clearly stated in the agreement form, and the contract text prepared on the basis of this draft is signed with the successful bidder. Therefore, it is not possible for the administration to include a provision that is not included in the agreement form published among the tender documents in the contract to be signed with the contractor. At the same time, it will not be possible for the administration to change a provision in the agreement form to give different results in the signed contract.

6.2.1.2 Administrative Specifications

Specifications are divided into two as administrative and technical. Administrative specifications are documents that specify the rules that indicate on which administrative issues the tenders will be held. Technical specifications, which include the details of the work, will be mentioned in 6.2.1.3.

In the administrative specifications, the criteria to be met by the bidders and the articles about bidding processes are included. Bidders prepare their bids by taking

into account the terms specified in the administrative specification and submit them to the administration organizing the tender. The Administration also mentions the documents that the bidders want to include in their tender offer letters. With the Official Gazette regulation numbered 29959 published in January 2017 (Başbakanlık Mevzuatı Geliştirme ve Yayın Genel Müdürlüğü, 2017), it has been made possible for the administration to request the documents specified in the technical specification, which must be submitted within the scope of the bidder's bid, in addition to the administrative specifications. The importance of this situation will be mentioned in the following titles.

There is more than one form of administrative specification publish by PPA for different tendering procedures. Three different tendering procedures are mentioned in the 18 articles of the Public Procurement Law No. 4734. The procedures and evaluation criteria applied according to the tender procedures may vary, as well as the administrative specifications. The first of these tender procedures is the Open Tender procedure described in Article 19. The open tender procedure is the one in which all bidders (without seeking a pre-qualification) can bid.

Secondly, Restricted Tender, as specified in Article 20, is the procedure in which bidders invited by the administration can submit bids as a result of the pre-qualification assessment to be made. Where the open tender procedure cannot be applied due to the nature of the work requiring expertise and/or advanced technology, and the construction work tenders with the approximate (estimated) cost calculated by the administration exceeding half the threshold value institutions can procure the goods, services and construction works.

Finally, the negotiated tender specified in Article 21 is defined as the method that can be used by the administrations in cases specified in 6 sub-articles of this article. These situations are listed as; failure to submit offers as a result of the tender made by other methods, the urgency of the project in cases such as natural disasters or lack of security, the inability to determine the necessary technical and financial criteria due to the unique and complex nature of the service subject to the tender, and the

administrations' finished goods, materials or services with an approximate cost of up to fifty billion Turkish Lira.

6.2.1.3 Technical Specifications

The documents in which the technical details of the work and the products related to the work are described are called Technical specifications. The type of product to be purchased should be specified in this document with the features that the employer should have. Likewise, if there is a Technical feature that is not desired to be found, it is also stated here.

Although the Agreement Form and Administrative Specification forms are the documents published by the PPA, there is no standard form for these specifications since the technical specifications can be specific to the projects' own needs. Therefore, institutions should pay attention to some points while preparing these specifications. Technical specifications should be prepared within the framework of the PPL and the secondary legislation published pursuant to this Law, in a way that will ensure transparency, competition, equal treatment, reliability and do not specify a specific brand, model patent, source, or product, and ensure maximum participation as possible.

In addition, while preparing the technical specification, the administrations should know what they want, make detailed studies on the costing items, and take into account the legal periods and work intensity in the purchasing process. In the technical specifications, there should not be expressions such as the reason for preference, the technical characteristics of the desired material should be specified. Product features should be fully reflected, and commissions should not hesitate during the purchasing and Inspection stages.

6.3 Survey Results on Legal Aspects of BIM and Contractual Arrangements in Turkey

In the survey study mentioned in Section 3.2, some questions were asked to reveal the current state of BIM use in Turkey. When the question asked to reveal the concerns experienced by BIM users in projects is considered, the main problem is claimed by the majority of the participants as other project stakeholders not using BIM in the projects they are involved in (Figure 6.9). This answer was followed by the concern of employers not requesting BIM in the projects, while 14 respondents stated that they saw the lack of standardization as a problem.

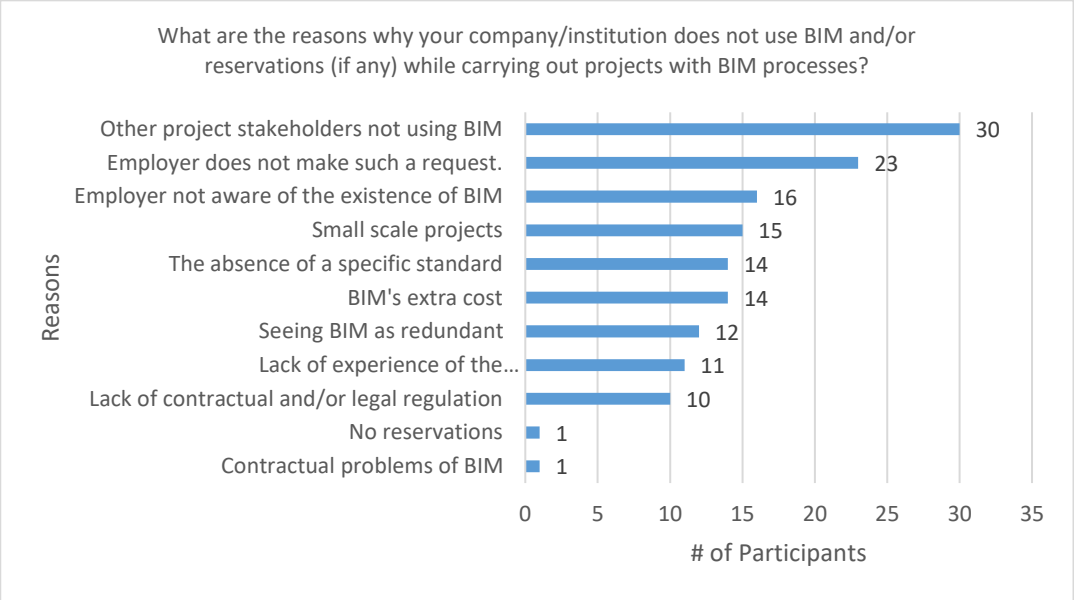

Figure 6.9 Reasons of Reservations of Participants Regarding BIM

While only one of the participants stated that the contractual problems related to BIM did not cause any reservations, 79% of the participants stated that they carried out projects with BIM without any contract documents or provisions related to BIM (Figure 6.10). To reveal the state of standardization in Turkey, respondents were asked whether they are familiar with ISO 19650 standards. As seen in Figure 6.11, almost 40% percent of people still do not know the requirements of ISO standards.

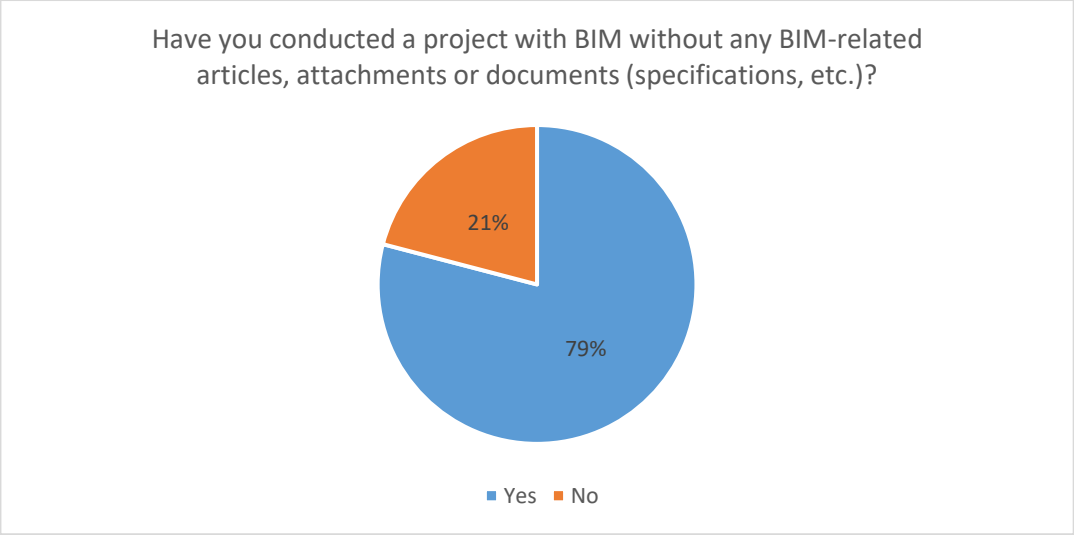

Figure 6.10 Respondents Conducting BIM Work without Contract Document

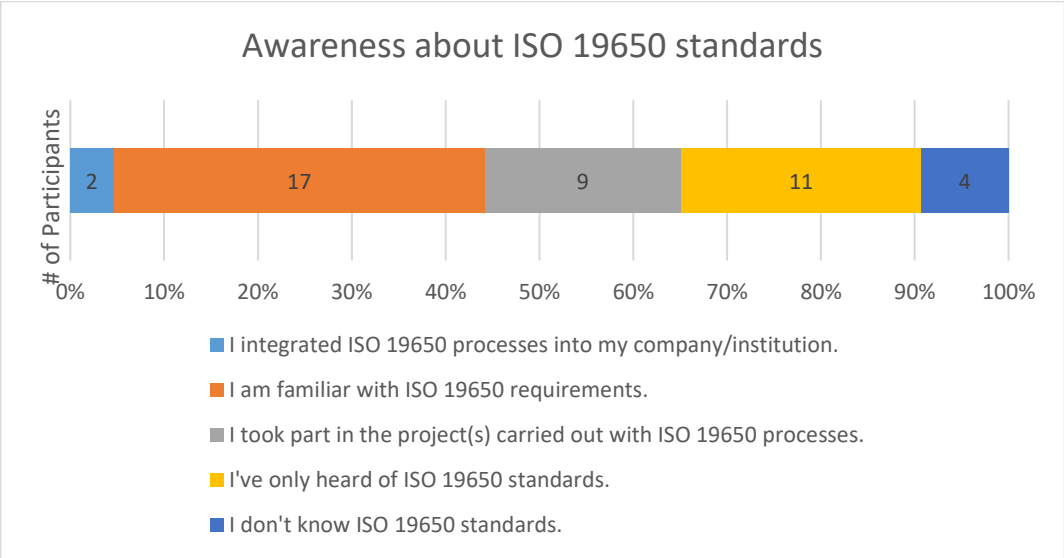

Figure 6.11 Awareness of Respondents Regarding ISO 19650

In addition, the participants were asked for their opinions on the compatibility of ISO standards and BIM processes with the current public project processes and regulations (Figure 6.12). The majority of the participants agree on the necessity of a guidance describing how BIM processes should be used in public projects (84%) and the necessity of a study describing how ISO standards will be implemented in Turkey (84%).

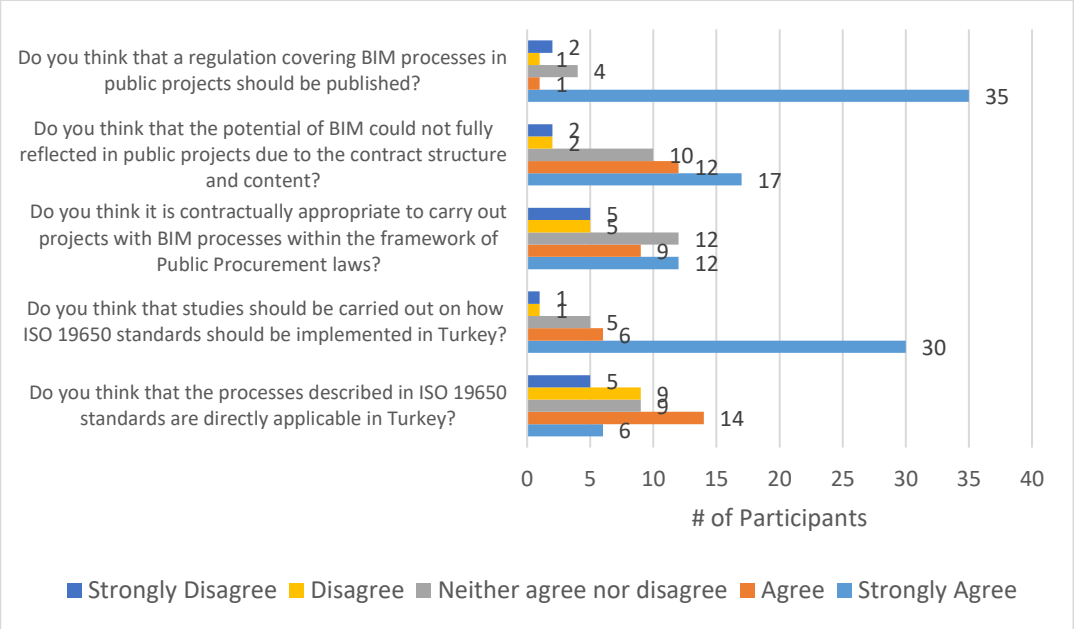

Figure 6.12 Compatibility of ISO 19650 and BIM with Turkey

Participants asked whether they had a dispute caused by a BIM-related issue. As can be seen, from Figure 6.13, while 42% percent of the respondents had such an experience in their projects, disputes of 16% of the participants ended up in a time extension or cost claim. The reasons for the disputes take their roots from mostly BIM Models, followed by due to additional request not specified in contract documents, as seen in Figure 6.14.

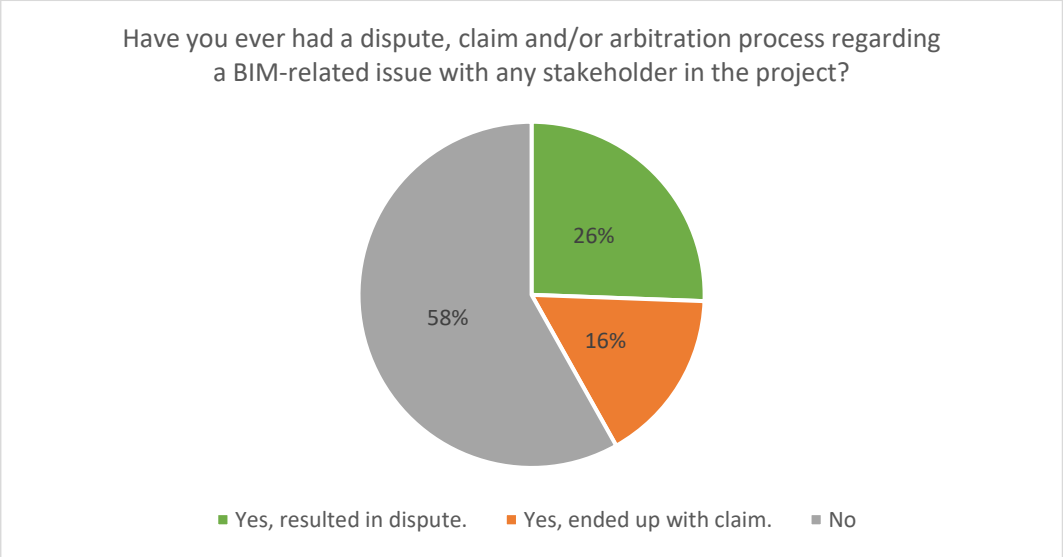

Figure 6.13 Disputes and Claims Regarding BIM

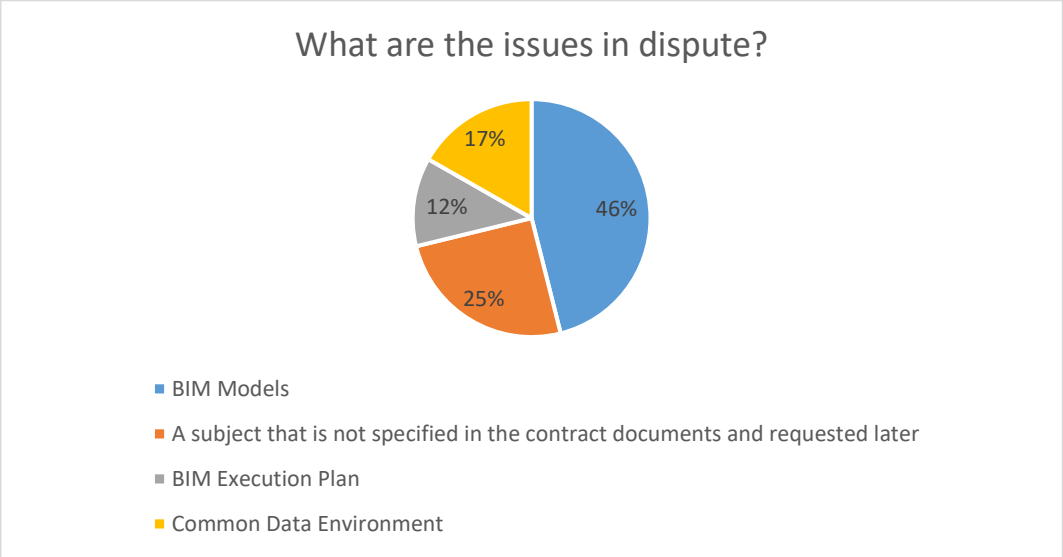

Figure 6.14 Issues of Disputes

The question asked to evaluate the extent to which the BIM Technical Specifications used in the projects in Turkey can reflect the employer's demands, is answered only by 5 respondents as "requests are stated in detail" (Figure 6.15).

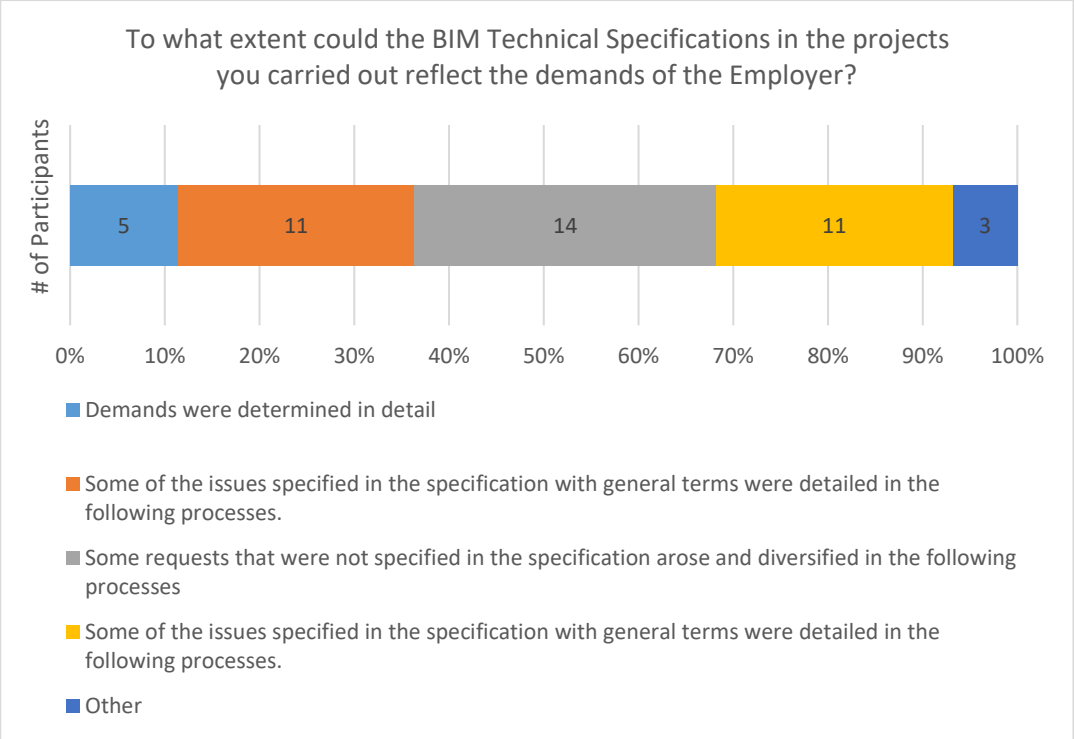

Figure 6.15 Demands in BIM Technical Specifications

When the participants were asked if BIM works were done beyond the scope, which were not specified in the BIM Technical Specification, 14 respondents said that it was done due to in-house requirements of the firm, 8 of them said that it was done by taking addtional time or cost, and 9 said that the work was actually done with the claim that it was already a part of the technical specification (Figure 6.16).

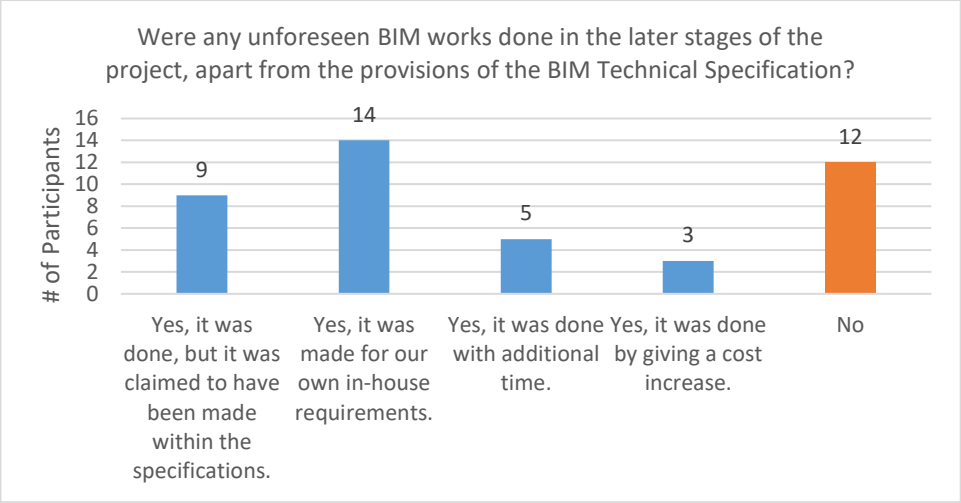

Figure 6.16 State of BIM Requirements in Later Stages of the Project

6.4 Summary

A correct understanding of the current contractual framework is required to make suggestions for the elimination of contractual problems that may arise regarding BIM. For this reason, contract documents currently used in public construction projects in Turkey are examined in this section. The documents examined within this framework are the contract draft, which constitutes the body of the administration-contractor relationship; administrative specification defining pre-tender processes; The PPL and PPCL, which are the laws that determine the rules for the creation of these documents, together with the technical specifications containing the technical details of the work to be done.

At the same time, this chapter examined the perspectives regarding pre-appointment and delivery processes of the currently accepted standards in Turkey, i.e., TS EN ISO 19650. The pre-contract parts of these information management processes have been examined in detail; since the legal problems encountered would take roots from the processes before the contract is signed.

As understood from the survey results, the contractual dimension of BIM in Turkey is not yet developed. Considering that its past in the sector is not very old, this cannot

be considered as an unexpected result. However, considering the increasing trend in the use of BIM in public projects, some regulations may be required on how public institutions can integrate into BIM processes.

CHAPTER 7

RECOMMENDATIONS FOR BIM IN TURKEY

In this chapter, recommendations and regulations will be included within the context of previously examined contract documents and BIM-related standards currently used in Turkey. In this context, contractual documents that will be used in BIM processes together with ISO standards will be examined first. Then, several recommendations and amendments will take place for the agreement form and administrative specification forms used in public tenders. Finally, a technical specification proposal that can be used in work carried out with BIM will be presented.

7.1 Contract Related Resources of ISO 19650 - 2

In order to make a contractual proposal for the works to be carried out with BIM, it is necessary to understand the documents involved in these processes along with the approach of ISO 19650-2 to these processes. Understanding what these resources are and how they are handled will enable the applicability of the recommendations to be made. Also, it will be seen that how these resources may prevent corresponding legal problems from occurring (Table 7.1). For this reason, it is necessary to examine these sources one by one. These resources can be listed as Common Data Environment (CDE) as in Clause 5.1.7, Information Protocol as in Clause 5.1.8, Exchange Information Requirements (EIR) as in Clause 5.2.1, Tender response requirements and evaluation criteria as in Clause 5.2.3, Pre-appointment BIM Execution Plan (Pre-BEP) as in Clause 5.3.2, Risk Register & Mobilization Plan as in Clauses 5.3.5 and 5.3.6, Detailed Responsibility Matrix and Information Delivery Plans as in Clauses

5.4.2 and 5.4.5, in the order of their involvement in information management processes.

Table 7.1 Resources of ISO 19650 – 2 and Legal Issues

Legal Issue Categories	**Resource of ISO 19650-2**	**Related Feature**
Standard of Care	EIR	Well defined information needs by using Information Standards and Level of Information Needs
Intellectual Property and Ownership	Information Protocol	Common Data Environment, IP Rights Provisions
Contractual Relationships & Roles and Responsibilities of Parties	Information Protocol Responsibility Matrices	Information Manager stipulation, Information production methods and procedure
Coordination of the Design	MIDP, TIDP CDE	Access Rights to Information containers (CDE)
Legal Status of BIM	Information Protocol	Provisions related to the status of the information deliverables
3D-2D Utilization	Information Protocol	Level of Information Need

7.1.1 Common Data Environment

Most of the information, from the documents related to the projects to the document procedures within the institutions, remains useless in the archives without being digitized. Traditionally paper-based project processes become more controllable by digitizing with BIM. With the BIM and ISO 19650 standards, administrations have become obliged to determine a procedure and workflow for CDE to be used at the project level. The employer must first decide whether they are capable of

constructing the CDE solution within their own organization. Otherwise, they can get help from a third party in this process. This assistance can either be a service through direct procurement or can be obtained as a pre-project consultancy service. By obtaining such a consultancy service, this company can be assigned as an information manager to manage the information processes on behalf of the Administration during the realization of the project. Even though the ownership and control of the CDE system can be transferred to another stakeholder when the work starts after the contract, it must be defined by the employer before the tender.

Information Manager, assigned within the organization or externally, must organize the CDE solution and workflows in accordance with the information and document production, acceptance, and management processes of the institution. This solution may consist of procedures describing approval processes and times or a system set up to be managed over an electronic document management system. In this context, there are multiple electronic data management software available today that can provide the features that ISO 19650-2 is looking for in the CDE solution. However, it is critical that the workflows be applied rather than what the software is able to meet the needs of the employer in accordance with the standards.

There are some features that a CDE solution that conforms to the ISO standard should have. The first of these is that each information container has a unique identity, and these identities comply with predetermined rules. Second, there are rules on what kind of values should be entered in the fields where information will be entered. In this way, users will be able to find the desired information more quickly. Another requirement is that each information container is needed to have status (suitability), revision, and classification (as defined in ISO 12006-2) information. In this way, the most up-to-date versions of the documents will be easily followed.

Next, information containers must be able to switch between states. For example, a document that is being worked on stated as WIP should be able to be switched to a Shared state easily. Finally, by providing access control at the level of information

containers, a system that will not allow everyone to access every information container and will be convenient to allow stakeholders within the framework of roles and responsibilities should be designed. In this way, the reliance issues that may occur will be prevented.

7.1.2 Information Protocol

The Information Protocol is a document that is directly added to the contract and ensures the contractual binding of information management processes. In order to be linked to the main contract, an incorporation clause must be included in the contract. This protocol will be used not only for the contract between the Administration and the Contractor but for all contracts related to BIM processes in the supply chain. Therefore, it should be prepared in a way that will ensure this harmony. A deficiency in this chain of contracts will also hamper the efficient working environment brought about by cooperation and collaboration. An example of this protocol has been published by the UK BIM Framework and is reviewed in section 5.5.2 of this thesis. Since it is in a standard document format that can be attached to contracts, a recommendation for this document in the form of an Information Protocol that can be applied in Turkey will be presented in section 7.2.3.

7.1.3 Exchange Information Requirements (EIR)

EIR is the resource where the information requested by the administration or the assigned information manager described in sufficient detail for the project. Thanks to the well-described EIR, potential conflicts in the development stages of the project will be minimized, resulting in a smoother project management phase. While the Information Protocol determines the contractual liabilities of the parties, the EIR document describes what duties the employer assigns to its contractor or subcontractors. In other words, the source that lies at the core of information production processes is EIR. Following the other critical steps in determining the

EIR mentioned in section 6.1.2, the employer will have the tender documents prepared in a standardized manner.

7.1.4 Tender Response Requirements and Evaluation Criteria

It is critical to evaluate the tender response requirements and evaluation criteria specified in TS ISO 19650 -2 clause 5.2.3 according to the country dynamics. There are some criteria determined in the evaluation of tenderers. These criteria may vary according to different tender procedures. In this regard, tangible evaluation criteria must be determined that can evaluate contractors related to the BIM parts of the work they carry out. These criteria should not contradict with the spirit of competition. There are some critical procedures in ISO's own body regarding these criteria. The collection of the Pre-contract BIM Execution Plan from the bidders and the evaluation of these plans is one of them. With this document, the employer can see the BIM implementation plan he received, to what extent the bidder understands the employer's demands, and how the bidder will fulfill these requests. A sample study conducted regarding the evaluation criteria will be referred to in section 7.2.2.1 of this thesis.

7.1.5 Pre-Appointment BIM Execution Plan

While preparing the Pre-BEP, the bidder prepares this document in accordance with the BEP draft determined by the employer in accordance with ISO 19650-2. If such a draft is not provided by the Administration, bidders may prepare this document in accordance with the seven headings in 5.3.2 of ISO 19650-2.While preparing this document, it will be beneficial for the bidders to encounter fewer problems in the execution of the work by obtaining information from possible subcontractors. In addition, it can contribute to the development of the information production methods and procedures and the information standards of the project.

The step of detailing the BEP again before signing the contract and arranging it with the feedback of the employer is mentioned in the Appointment step in ISO 19650 Standards. The tenderer who is designated to get the project must follow some steps between getting the job and signing the contract. If these steps are not taken into account, situations may arise that contradict current regulations and PPL as it prevents competition between contractors. An administration cannot in any way change the terms of the tender or engage in activities that will provide an advantage to a party and cannot present a situation that the contractor cannot foresee while preparing its bid as a condition of signing a contract after the tender process is completed.

7.1.6 Risk Register & Mobilization Plan

Thanks to the risk register to be added to the tender response documents by the bidder, it can be determined how the bidder anticipates the disruptions and risks related to the design processes and how s/he can postpone them. On the other hand, the mobilization plan, in which the tenderer specifies how to mobilize the necessary resources and technology and what steps to take before starting the works, can also be a critical document at this stage. This document will be a plan that covers how the tenderers test the CDE solution of the administration, the suitability of their own infrastructure to these processes, the training to be given to the delivery teams, and other general training. However, it should be noted here that the Mobilization Plan and Risk Register documents provide outcomes that may vary from person to person and do not rely on objective and quantitative observation. So, the scoring of these documents will not be fair. At this point, an evaluation criterion can be determined in which it will be sufficient only to create and submit these documents.

7.1.7 Detailed Responsibility Matrix and Information Delivery Plans

Before signing the contract, the winner tenderer uses the high-level responsibility matrix to create a detailed responsibility matrix describing who will do what and when and submit it to the administration. The different point in the detailed responsibility matrix is that the tenderer specifies when these responsible persons will fulfill their duties in addition to the document in which they describe the responsibilities and duties presented in the Pre-BEP.

However, ISO 19650-2 defines this matrix as a reference resource to be used in the preparation of MIDP and TIDPs rather than as a contractual document. The main contribution of the Detailed Responsibility Matrix is that the subcontractors have the feel of the responsibilities related to the parts that the contractor intends to subcontract. Thanks to this resource document, stakeholders will be able to have the same basic understanding.

Then, the delivery team composed of the contractors and subcontractors will begin to create TIDPs and MIDP. While creating TIDPs, it is critical to determine the dependency and predecessor relationship between the relevant tasks and responsibilities on the detailed responsibility matrix and to match these responsibilities with the levels of information need. By linking these responsibilities, a more effective information management process will be carried out. As different stakeholders can be integrated into these processes during the project process, it is vital that MIDP and TIDPs can be included in the contract as a live document, just like BEP. The contractor who created the MIDP through TIDPs collected from subcontractors will be responsible for keeping the MIDP resource alive and up-to-date. ISO 19650-2 clause 5.4.6 mentions that these plans should be included in contracts. However, at this point, this issue should be addressed by paying attention to the potential problems that may arise from the participation of live documents in the contract.

7.2 Recommended Changes in the Documents of the Contract

As mentioned above, these resources, which will gradually enter the sector in Turkey with ISO, also restrict the potential legal problems related to BIM. However, the compatibility of ISO standards, which present the mentioned resources and approaches in an internationally acceptable manner, with the existing contractual structure and regulations in Turkey remains uncertain. Therefore, when the uncertainties created by the mutual exchange and cooperation environment established between the project stakeholders are minimized with the proper steps, especially not acting against PPL and PPCL, BIM processes will be able to be adopted faster to the contractual structure in Turkey. Nevertheless, it would be preferable that the ISO 19650 resources, which are the contract documents that will remain alive during the project processes, are handled correctly within the contract. Their functionality is preserved while not creating a situation contrary to the legislation.

In this section, the necessary changes to be made and the articles to be added to the contract draft, and administrative specifications to be used by the public institutions in the tenders to be issued- defined in the upper section - will be discussed. Although these changes and additions will be proposed by staying within the existing PPA framework as much as possible, there may be situations where an additional regulation is needed in some cases. Also, a proposal for the Information Protocol, which is discussed as a document that specifies the obligations and responsibilities of the parties in ISO 19650-2, addresses the intellectual property rights and mentions some conditions and requirements related to work, will be included in this section. This recommendation is given in Turkish text in Appendix C.

It should be underlined that the contractual articles and the Information Protocol to be proposed here will be used by public institutions and by making relevant additions when organizing BIM relations between companies in the private sector.

Of course, if the current agreement draft does not comply with the requirements of BIM and the requirements of ISO 19650 standards, the relevant clauses may need to be changed. However, the fixed articles of this document published by the PPA can only be changed by issuing a regulation. So, the public institutions that use PPA cannot make any changes in these articles in line with their own wishes. In other words, if an institution is progressing with BIM processes in one project and does not use these processes in another project, or if a public institution does its projects with BIM and another institution does not do it with BIM, two institutions cannot use different contract drafts. Therefore, care should be taken that the changes to be made in the draft contract do not create a contradiction for the work done with conventional methods. This does not apply to clauses that can be added under the PPA because these items can be added or removed by the requesting public agency for the desired project. Apart from such clauses, there is an “Other Terms” article at the end of both the agreement draft and the administrative specification. “Other Terms” is an entirely blank section, which is used to provide flexibility in contracts to the institutions in order to respond to the specific needs of their projects. It will be possible to make additions to other terms, provided that the added items are reasonable in professional and contractual terms.

Currently, BIM is not mandatory for public construction projects yet; it may not be meaningful to disrupt the usual contract draft and administrative specification body. Therefore, additions that can be made by the PPA and the relevant ministry without the need to prepare a regulation and changes and additions that require a regulation are discussed separately. In this section, solutions and suggestions that are more need-oriented and eliminate potential legal problems are specified with items referred to as "short term". However, to the extent that a complete BIM adaptation can be achieved in the long term, some changes in the body of contract documents may contribute to the formation of effective BIM processes.

In this section, recommendations will be given in relation to the documents in the contractual framework in Turkey, taking into account the legal and contractual problems mentioned in the literature and tested in the courts and the resources that

will be included in the contract processes with the ISO 19650 standards. In this way, firstly, the articles to be added to the contract form and the administrative specifications, and the suggestions related to the issues that need to be regulated will be mentioned. Then, in the last section, suggestions regarding the technical specifications that can be used in the projects will be included (Figure 7.1). The BIM technical specification created in this study will be given in Appendix C.

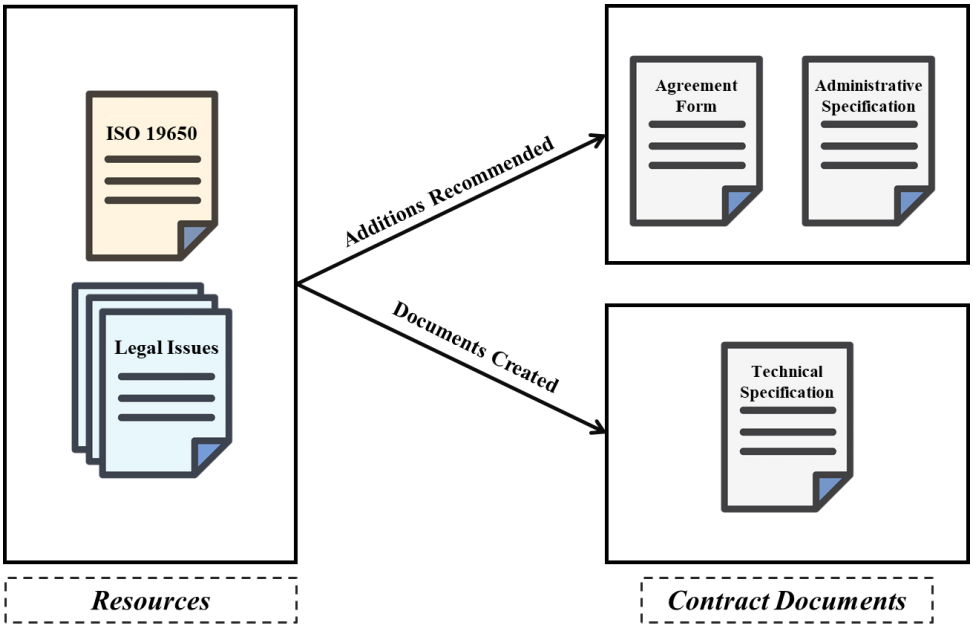

Figure 7.1 Methodology for Recommendations

7.2.1 Agreement Form

As the agreement draft is the contract document that governs the overall relationships of the contracting parties, care should be given while changing its clauses or adding new clauses, to not to change the risks of the parties. Without going into the technical details of the BIM processes, the functions of the contractual documents in the processes and the contractual relationships of the stakeholders should be addressed. In order not to change the body of the accustomed agreement form and to leave the details to technical specifications, related amendments can be done as in the JCT contracts. Just as in JCT, if the parties are carrying out the project processes with

BIM, they can specify this in the first part of the contract. Similarly, it would be more appropriate to approach the agreement draft with a high-level perspective. However, as JCT does in "Design Submission Procedures", it is necessary to recommend changes and additions, taking into account some of the items affected by BIM processes.

Contract documents are described in Article 8 of the agreement draft. While the documents constituting the tender document are given in this article, the priority order among these documents is given in the sub-clause 8.2. There are two types of arrangements, different for the unit-priced project and lump-sum projects. According to this order, the documents comprising the tender documents and their order can be listed as follows (Documents pertaining to unit-priced jobs are indicated in italics.):

1- General Specifications for the Construction Affairs

2- Administrative Specifications

3- Agreement Draft

4- Implementation Design (*Unit Price Recipes and Schedule*)

5- Room List

6- Special Technical Specifications

7- General Technical Specifications

8- *Concept / Final Design*

8- Remarks (if any)

9- Other Annexes.

Except for the documents specified in this list and their annexes, no other document type has been defined within the scope of the contract. For this reason, using the Information Protocol with its direct Turkish equivalent will first require a new definition of "Protocol" in this article. It is necessary to adopt a more appropriate approach to the contract structure to allow faster and more effective results of

additions and changes to be made within the framework of ISO 19650. When it is used as described in section 7.2.3, it is seen that this document is at the level of special technical specification in public tenders. With such a solution, Technical Specification for BIM will fulfill the purpose and function of the Information Protocol without making any changes to this article.

However, at this point, there arises the possibility of another problem that needs attention. If the Information Protocol (BIM Technical Specification) is prioritized for contract documents as a document at the same level as other specific technical specifications, unwanted problems may arise in the event of a conflicting provision in other technical specifications. In particular, if the issue that will create a conflict situation is not an issue that is also addressed in the agreement draft, the parties may need to reconcile among themselves in such a dispute. In order not to encounter such an undesirable situation, the order of superiority of these documents can be reviewed, and the steps to be taken in case of conflict can also be described in the specifications.

ISO 19650-2 mentions the necessity of using the Information Protocol, which will be created by the appointing party, in contracts with all appointed parties to be included in the BIM processes, in order to increase the interoperability between stakeholders and to ensure that the appointing party's demands can accurately reach the entire supply chain. In order to provide an environment for this sharing, a clause should be added to Article 15, which is the section of the agreement draft, which covers the related issues regarding contracts to be made with subcontractors. In fact, although the contractor who will subcontract a part of the work related to the BIM processes tries to apply his own specification one-to-one in order to transfer the responsibilities on himself in the main contract to the subcontractor, the existence of such a clause will also prevent the opposite.

If the Institution (Appointing Party) lets the lead appointing party use subcontractor for a portion of the works, then they indicate this allowance in clause 15.1. In 15.2. it is indicated that the entire work cannot be outsourced to subcontractors, and the responsibility of subcontractors for their work does not remove the responsibility of

the contractor. In clause 15.3, it is stipulated that provisions in the General Specification for Construction Works are applied for the employment and responsibilities of subcontractors. In 2019, two other subclauses related to the percentages of works that can be subcontracted were published in the Official Gazette (08.08.2019-30856 R.G./13 mad.)

Proposed clause for management in accordance with the ISO 19650 standard regarding subcontractors:

"The Contractor will act in accordance with the provisions of the BIM Technical Specifications regarding the responsibilities of the Subcontractors to be included in the processes described in the BIM Technical Specifications."

The addition of a clause under this article governing relations with subcontractors requires a regulation to be issued. However, in order to benefit from the positive effects of this clause in a short time, this article can also be added to the Other Terms section. In this way, while there will be no change in terms of functionality, it will be used more flexibly. In that manner, it can be said that for the short-term use, this clause can be added to the Other Terms article, but for the long-term, this clause should be added to Article 15. However, it should be noted that the addition of such a clause to Article 15 of the agreement draft will be possible and logical after making the use of BIM in construction works mandatory in public projects.

The conditions regarding the termination of the contract are included in the 26th article of the agreement form. In this article, it is mentioned that the provisions of the Public Procurement Contracts Law No. 4735 and the General Specifications for the Construction Affairs will be applied in case the contract is terminated. Considering the General Specifications for the Construction Affairs, the administration may purchase the goods belonging to the contractor in case of termination of the contract as mentioned in the 12th clause of the 47th article. Other articles explaining this article are generally related to the purchase of unpaid assets related to field productions by the administration. However, the sharing of various information and BIM models via CDE, which goes along with the construction

phase, and the status of other documents that have not yet been paid, and the issues related to the rights on the CDE may be among the issues that should be added to this general specification in the long run. In other words, in the short term, no proposal has been made on this issue, but it has been brought to the attention of users.

As mentioned in the introductory part of the ISO Information Protocol published in the UK, an "incorporation clause" must be included in the articles of the signed main contract to ensure that the Information Protocol is legally and contractual binding. In this direction, in order to reinforce the bindingness of the BIM Technical Specifications to be used for BIM and information management processes, the public institutions that will bid with BIM should add an article on this subject in Article 33 "Other Terms" section of the contract draft. The clause suggestion that can be added here is as follows.

"The Contractor will carry out the works within the scope of this contract in accordance with the terms specified in the BIM Technical Specification and its annexes."

7.2.2 Administrative Specifications

With the publication of the Official Gazette specified in Article 6.3.1.2, the documents required in the BIM Technical specification can be defined within the scope of the "documents specified in the Technical Specification that the bidder should submit within the scope of his bid". For this, it may be appropriate to mention these documents by name in the Other Terms section, as it is understood by the contractors. In the short term, by taking the first steps with Pre-BEP and creating sectoral awareness, it can be included among these documents in the Risk Register and Mobilization Plan.

In the Open Tender Procedure, the contractor may be asked to elaborate and arrange the Pre-contract (Draft) BIM Implementation Plan with the feedback from the administration after it is clear that the contract has been awarded. However, this

cannot be thought of as a bargain. The administration has to sign a contract with the contractor who submitted the proposal in accordance with the administrative specifications and was among the evaluated offers after passing the qualification criteria and then won the tender as the most economically advantageous among the other offers unless it provides a reasonable justification. As it can be understood from the regulations in the current law, this reasonableness is only the case that the party who is awarded the tender cannot submit the performance bond within the specified period. If we put all these aside, it is possible for the contractor, who won the tender with the feedback given by the Administration in good faith, to make some changes to this document. However, this regulation should comply with the main document submitted by the tenderer in the tender proposal and should not constitute a situation that would disrupt the competition between the tenderers.

On the other hand, even if the aforementioned situation is resolved, the bidder who won the tender is required to sign the contract within ten days after the announcement, as mentioned in Article 41 of the Law numbered 4734, by bringing the performance bond. As it can be understood from here, for an approach that will try to stay within the framework of the law, it does not seem practically possible to expect the Appointment steps, which is the 4th of the information management processes described in ISO 19650-2, from the successful bidder within this limited time. Although it may be possible for the bidder to arrange the Pre-contract BIM Execution Plan submitted within the proposal with the feedback from the administration, it is not possible for the contractor to prepare a detailed responsibility matrix and prepare a MIDP without signing the contract.

When viewed from the two aspects mentioned here, it does not seem possible to integrate the new understanding brought by ISO 19650-2 to the pre-contract process without a change in the current legal structure. So, a new regulation is needed. However, this approach of ISO 19650 can be taken into consideration with a different point of view so that these processes that come with ISO 19650 can be integrated into the system faster and give results in the short term.

In this approach, the tenderers in the tender response include the documents mentioned in the Tender Response procedure, which is the third step of the ISO 19650-2 information management processes, in the tender documents. Then the administration determines the most economical bid that won the tender and announces the result of the tender. The Appointment step, which will start operating here according to ISO 19650-2, can be postponed a little, and it can take place before the "Mobilization" step in the process after the contract is signed. Thus, the contractor signing the contract can update the Pre-contract BEP with the feedback from the administration and prepare the MIDP document to submit to the administration within the period determined by the administration. (Since the TIDP document is not a document to be submitted to the administration, it is not mentioned here.) Since this process will take place after the contract is activated, it should be specified in the technical specification instead of the administrative specification. As a result, while adaptation will be possible in the short term with this approach, the uncertainty created by the documents created and included in the contract before the contract will be removed. What is meant by the uncertainty here is that these documents, which are signed and included in the contract, are kept alive and up-to-date due to their nature. The availability of these documents while signing the contract may make it difficult for them to be updated in the future.

Based on this approach, the clauses proposed to be added to administrative specifications of all types of tender procedures' Other Terms article are as follows.

XX.1. Tenderers shall submit the proposed Draft BIM Execution Plan as an attachment to their proposals, considering the conditions specified in the BIM Technical Specification and its annexes, in order to complete the works specified within the scope of this work.

XX.2. Tenderers shall submit the Mobilization Plan and Risk Register documents mentioned in the BIM Technical Specification and its annexes as attachments to their bids.

Contracting entities also specify in the administrative specification at the pre-tender stage which qualifications will be available to the bidders who can participate in the tender. Although there is a document called "Prequalification Criteria" in the restricted tender method, this document is named as "Qualification Criteria" in other procedures. The step of determining the evaluation criteria, which is in the 2nd of ISO 19650-2 information management processes, should also be handled at this stage.

7.2.2.1 Evaluation Criteria

In order to determine these criteria, it is necessary to look at the regulations in the current legislation. The Regulation on Implementation of Construction Works Tenders (KİK, 2021) is a document that best describes these processes and is up-to-date with the corrections of the public procurement authority. As stated in Article 61 of this document, the economically most advantageous bid, which was previously determined directly on the lowest price basis (Akçay et al., 2012), can either be determined only on the basis of price or by combining factors other than price with the price. In the continuation of this article, the regulation describes non-price factors and the regulations for these factors. In the first clause of this article, it is permitted that the administrations can determine the factors such as operation and maintenance cost, cost-effectiveness, efficiency, quality and technical value, time as non-price factors, taking into account the nature of the work subject to the tender. In the second paragraph of the same article, it is required that the monetary values or relative weights of the non-price factors and the method of calculation, and the documents to be submitted for the evaluation of these factors are clearly specified in the administrative specification.

In the 3rd sub-paragraph of the same article, an issue that may be important in the part of carrying out BIM processes is mentioned. According to this article, it is forbidden for the administrations to determine non-price elements in a way that eliminates competition on the basis of a brand or model. In determining the criteria

to this extent, attention should be paid to not using a company name or product model for the software to be used.

Studies on determining the most economically advantageous offer by including non-price elements are available in the literature (Akçay, 2003; Gencer, 2003). Apart from these, there are also non-price element calculation methods in general use in the web-based e-tender software created in an electronic environment, which are in use today (KİK, 2019). However, especially in the tenders where the open tender method is used, it is observed that non-price elements are not included much, and the lowest price, which is not caught in the extremely low examination, is taken as the most economically advantageous offer (Akçay & Manisalı, 2007). This attitudes of public clients may be caused due to hassle of converting non pricing factors to numerical impact elements (Sözen & Dikbaş, 2016).

As stated in clause E of Article 30 of the relevant regulation, the administrations can determine the documents they will request from the candidates or tenderers to be used in the evaluation of economic and financial adequacy and professional and technical adequacy. Of course, administrations must comply with the stipulations of the previous article while determining these criteria. The previous article states that these criteria cannot be determined in a way that restrains competition.

However, documents regarding facilities, machinery, equipment, and other things to be used in works are regulated in Article 41. Considering the software and hardware to be used in BIM processes, the importance of this article title for BIM is understood. As stated in this article, information regarding the facility, machinery, equipment, and other things foreseen to be kept in the workplace for the execution of the work subject to the tender shall be included in the agreement draft. However, the facility, machinery, equipment, and other things cannot be determined as qualification criteria. As it can be seen from this article, although there is a document that can be included in the draft contract of hardware and software to be used in the works and can be requested from the contractors, they cannot be in a position to prevent or limit the parties from bidding. As mentioned in the second subparagraph

of the same article, the administrations can determine these documents as non-price factors if they are specified in the administrative specifications. However, at this point, if this equipment, which should be the contractor's own property, is determined as a non-price item, the effect of this element on the overall bid score will not be more than one percent. Only the public procurement agency is authorized to change this rate. It should also be noted that the facility, machinery, equipment brought to temporary import or acquired through financial leasing are deemed to be the bidder's own property, provided that the lease contract is submitted and it is documented that the rents until the first announcement or invitation date of the tender are paid.

In addition to these, it is also underlined that administrations may request contractors to use domestic goods in order to highlight domestic software. Considering the Regulation on Implementation of Construction Works Tenders from this point of view, it can be interpreted that the regulation has the necessary basis for BIM and digitalization processes, as it contains such articles related to software.

Based on all this information mentioned above, the Tender Response Requirements and Evaluation Criteria that will be recommended for the administrations to use in their projects can be listed as follows:

BIM Related Work Experience – Capability and Maturity

A particular point can be given to the bidders' completion of work related to BIM. In other words, the ratio of the project costs of the projects they have already completed to the approximate cost of the work subject to the tender can be determined. Thus, the BIM experience of the bidders can be awarded. This criterion is the most important parameter to determine the competence of the bidder related to BIM. Therefore, points must be determined in certain percentage intervals. An example of recommended scoring with relative weights is presented in Table 7.2.

Technical Personnel Requirement

Although with Official Gazette announcement in 2012 (Başbakanlık Mevzuatı Geliştirme ve Yayın Genel Müdürlüğü, 2012), the obligation to submit a tender with

the list of Key Technical personnel who have been working within the company for at least one year has been removed, a similar application can be applied to the works to be carried put with BIM if such legislation is published again. However, since comparing the experiences of the employees prevents competition and does not rely on quantitative observations, it will work with an all-or-nothing logic instead of percentage scoring as in work experience.

In addition to the key technical personnel, although they are not included in the current state of the Regulation on Implementation of Construction Works Tenders, administrations can request from the bidders the notarized Technical Personnel Undertaking, which is stated in the administrative specification, that the technical personnel will be accommodated within the company if the job is taken (Cumhurbaşkanlığı İdari İşler Başkanlığı Hukuk ve Mevzuat Genel Müdürlüğü, 2019). However, in this study, these two documents will be evaluated under the title of "Technical Personnel" as a single item. It can be evaluated as two separate criteria on request. An example of recommended scoring with relative weights is presented in Table 7.2.

Ownership of Software and Hardware

It is not possible for administrations to specify a brand or model in contracts and specifications. However, administrations specifying the use of BIM under the contract expect contractors to provide software and hardware that allow these uses. At this point, the administrations may request the tenderers to document whether they have the software and hardware that they will use to provide the BIM usage specified in the contract. Considering the points specified in Article 41 of the Implementation Regulation, the tenderers submitting a certified copy of their software licenses as an attachment to their bids can be deemed as proof of this situation. However, it should not be forgotten that this non-price factor cannot be used in cases where a pre-qualification or qualification is required to participate in the tender in accordance with the legislation. An example of recommended scoring with relative weights is presented in Table 7.2.

As a result, in the light of the legislation and explanations mentioned in this chapter, it is understood that the qualifications of the documents to be submitted by the bidders before the contract within the framework of ISO 19650-2 cannot be considered as an evaluation criterion as long as they comply with the conditions described in the specifications. This is because the contents of these documents are not based on a measurable quantitative observation and, therefore, may undermine the spirit of competition. In this context, the existence of Pre-BEP, mobilization plan, risk register can only be seen as intention readings of parties. In other words, these documents to be described in the specifications to the bidders may be requested in the tender offers, but their content cannot be scored as a criterion or non-price element.

Table 7.2 Evaluation Criteria

Scoring Scope	Weight	Scoring Item	Weight	Scoring Criteria	Score
Professional and Technical Adequacy	0.60	Work Experience	0.44	Documents showing the experience of the work subject to the tender or similar works If 40% of the bid price 60% If 100% or above, then 100% of total point of this criteria. Values in between can be interpolated.	40% = 0.27
					100% = 0.44
		Technical Personnel	0.12	100%, If there is technical personnel employed as an engineer and/or architect with a minimum of 5 years of experience in the organization of the bidder at least one year before the tender and is working within the bidding day	If = 0.12
					If not= 0
		Technological Infrastructure	0.04	100%, If the bidder submits certified copies of the licenses showing that it has the necessary software and hardware to enable BIM use specified in the specifications.	If =0.04
					If not = 0
Economic and Financial Adequacy	0.40	Economic and financial adequacy criteria were not considered within the scope of this study, and their overall weight was assumed to be 40%.			

7.2.3 Technical Specifications

The resources mentioned in ISO 19650-2 in the pre-tender process ultimately support the employer in determining the EIR, and they are included as a reference. When we look at the contract framework in Turkey, the documents that give details of the works are seen as technical specifications. Technical specifications in the contract structure in Turkey are documents that describe in detail the information requested by the contracting authorities from the contractor.

When we look at the documents describing the requirements of employers in ISO 19650-2, at the first stage, the EIR document and the Information Standards that will include more detailed parts of this document come to mind. However, as can be understood from ISO 19650-2, the document that makes both documents contractually binding is the Information Protocol. This document is also a legal document that will determine the contractual rights and obligations of the parties. From this perspective, we can see this Information Protocol mentioned in ISO 19650-2 as a Technical specification due to its structure and function to continue to carry out projects according to the current contract structure. In other words, as mentioned in section 7.2.1, the term "Technical Specification" is included in the draft contract.

On the other hand, to support the cooperation environment between the stakeholders involved in ISO 19650-2 BIM processes, this document has a structure that can be used in the relations between all stakeholders in the contract chain. The article required to make this requirement contractually binding has been proposed in the contract draft title. Nevertheless, this title alone will not be enough. In this context, the text of the specification must be directly available to everyone. For this reason, it is necessary to pay attention to the language to be used when creating this specification.

In this sense, the ISO Information Protocol examined in section 5.6.2 of this study complies with the requirements of ISO 19650-2. However, this specification text and

its contractual approach to ISO processes do not fully address public contracts in Turkey. The fact that some documents mentioned in the Information Particulars section are not ready or not complete at the time of signing the contract is one of the features that do not comply with the regulation in public contracts. Additions and amendments to be made on documents signed in public contracts are not preferred much as they lead to compensation events. For this reason, documents that are not ready on the date of the contract or that are alive by nature should not be evaluated as the ISO Information Protocol handles.

Care has been taken to ensure that the specifications are given in this study apply to all public project stakeholders. For this reason, the contractual responsibilities and obligations of the specification parties are generally described. For the same reason, instead of using terms such as Administration, Contractor in the specification, different terms are used over contracts. The Turkish equivalence of Appointee and Appointor is used as is done in the ISO Information Protocol.

This document does not contain the exact technical details, as it has a characteristic that draws the general rules. The contracting authority will determine these technical details with documents such as EIR and Information Standards, mentioned in TS EN ISO 19650 standards, and will be prepared in line with the processes described in the 6.2.2 title of this study. This specification will become functional as a result of adding these documents in addition to the proposed specification. Likewise, a contractor who will use this document will make this document functional by determining its own EIR before signing the subcontract agreement.

Choosing the correct words to be used in the creation of contract documents is of critical importance. For this reason, in order to ensure that the technical specifications proposed in this study can be used by the relevant users, the full Turkish text of the proposed specification is given in Appendix C.

This document consists of 14 titles. On the cover page of the specification, Information Particulars are included to correspond to the logic used in the ISO Information Protocol produced for use in the UK. However, due to the reasons

mentioned above, the content of these details has been constructed differently, and living documents by their nature have been excluded from this list.

General conditions are mentioned in the first title. This section mentioned that the works in line with the specification would be carried out under ISO 19650 standards. In addition, the statement that no liability can be imposed on these parties unless the employer or the main contractor is a party to the specification is included here. In addition to these and the information management processes, the priority order in solving possible conflict situations that may arise between the documents included in the specification and other contract documents is also included. Although the priority is given to the agreement form, which is dealt with in Article 1.7, it is stated that the specification will be considered superior to other documents in cases where it does not contain a provision related to the conflict situation.

While participation in coordination meetings is mentioned in the second heading, it is mentioned that in case of resolution of conflicts, meetings can be held other than regular meetings. In the following article, it is stated that the administration may request to update the Information Particulars and other living documents such as the BIM Execution Plan. It is also mentioned that if any right of the parties arises in the event of a change, it will be evaluated in accordance with the contract and specification. In addition, it is mentioned that the person or party to undertake the information management processes will be appointed by the administration.

The parties' obligations are mentioned in Article 4, which constitutes the main body of the specification. In this article, the Information Particulars are made binding for the parties. In Article 4.4, it was requested by the Delivery Team to create a Risk Register and keep it up-to-date. In addition, the parties were asked to integrate information production methods and procedures by the Common Data Environment solution specified in the specification. In the Information Security clause, it is determined that the parties should act according to this plan if the Administration creates a Security Management Plan under ISO 19650-5. Furthermore, referring to Article 15 of the agreement form in Article 4.9, the parties are warned to use this

specification when signing contracts with their subcontractors to be included in the BIM processes. In the continuation of this article, it is mentioned that the BIM Implementation Plan and, as far as applicable, Master Information Delivery Plan and Task Information Delivery Plan documents are delivered and updated.

In Article 5, Common Data Environment Solution is discussed. In the first article of this title, it is stated that there is no limitation to the extent that the parties can fulfill their obligations in the contract and specifications regarding the software to be used during the processes and the formats they provide output. However, the responsibility for determining the CDE Solution and workflows is specified under the responsibility of the Administration, unless it is assigned to the designated party.

In Article 6, the obligations regarding the appointment of the person or persons to take charge on behalf of the parties and behalf of the Administration in the information management processes and the responsibilities of these persons are mentioned. In addition, in the following article, provisions are included to ensure the contractual enforceability of information needs levels.

Article 8 regulates the rights arising from the use of information and model ownership between the parties of the specification and other stakeholders involved in the processes. In general, the technical specification has been created in a structure that prioritizes the relevant articles in the main contract. However, it describes the regulation to be applied if the relevant provisions are not included in the main contract. Unlike the specifications used today, in this specification, the creator of the model and information is defined as the original owner of that information. However, the creator gives the other party the right to use it in a royalty-free and irrevocable license, along with the information and model it has provided. Furthermore, this model or information can be used or changed for permitted purposes. These permitted purposes are defined by referring to the level of information need related to that model or information and the status code of the information on the CDE. Of course, all these regulations will be valid in cases where there is no clause in the

Articles of Association regarding the ownership of data and models, and it is not stated that the information security breach is of critical importance.

While the obligations related to the transfer of information and documents are mentioned in Article 9, the creation of the lessons learned document at the end of the work is also defined as an obligation to the Appointee. Therefore, the Appointee will deliver the gains it has acquired in BIM and Information processes throughout the project to the other party at the end of the work with this document.

In Article 10, it is emphasized that the parties will not be liable for any adverse situations that may arise due to the change or reproduction of the information they produce without the permission and approval of the parties. In the following article, the criminal liability of the parties is mentioned in case of violation of the Information Security Plan.

In Article 12, the provisions of the articles that will continue to be applied in case of termination of the contract are specified. Finally, in Article 13, explanations of all terms used in the specification are included. All terms explained in this terms section are words written in the specification, starting with a capital letter.

Article 14 is left blank for annexes to the contract. The first step is for administrations to integrate the EIR document in this appendix. As a result of this addition, this specification will become fully functional. Other detailed documents such as Information Standards, Information Requirement Levels can also be added to these annexes. However, the main idea is that the administration or other stakeholders who will use this specification should correctly describe the information requested from the designated party. In other words, this document must be functional rather than which document is attached. The administration may choose to include information standards, information requirement levels, information production methods, and procedures as a section in the EIR documents.

7.3 Discussion and Assessment of Recommendations

In the previous chapters of this study, legal issues related to BIM presented in the literature and subsequently appeared in USA and UK courts were discussed. The contractual framework that can be used in public projects in Turkey has been suggested in this section, taking into account the standard contract forms used in BIM, within the framework of ISO 19650 standards, which have become the accepted standard in the world to solve these contractual and managerial problems. Within this framework, the articles that should be added to the contract draft and administrative specifications were described (Table 7.3), and the subjects that should be addressed in the technical specifications were mentioned. The Turkish version of Table 7.3 can be found under the Appendix B.

Table 7.3 Recommended Additions on Contract Documents

Document	Clause	Provision
Agreement Form	15. Subcontracts	*"The Contractor will act in accordance with the provisions of the BIM Technical Specifications regarding the responsibilities of the Subcontractors to be included in the processes described in the BIM Technical Specifications."*
Agreement Form	33. Other Terms	*"The Contractor will carry out the works within the scope of this contract in accordance with the terms specified in the BIM Technical Specification and its annexes."*
Administrative Specification	Other Terms	*XX.1. Tenderers shall submit the proposed Draft BIM Execution Plan as an attachment to their proposals, considering the conditions specified in the BIM Technical Specification and its annexes, in order to complete the works specified within the scope of this work.*
Administrative Specification	Other Terms	*XX.2. Tenderers shall submit the Mobilization Plan and Risk Register documents mentioned in the BIM Technical Specification and its annexes as attachments to their bids.*
Administrative Specification	Evaluation Criteria	Refer to Article 7.3.1.2.1
Technical Specification	A Complete Document	Refer to Article 7.3.1.3 and Appendix C

In order to facilitate practical applications in Turkey, the Turkish texts of the proposed articles and a proposal for a Technical Specification for use in public projects are given in Appendix B and C, respectively. While creating the technical specification text, the Information Protocol document published by the UK BIM Framework was used, and it was reconstructed by taking into account the specific applications in Turkey.

When we look at the contract structure formed by the suggestions made for Turkey in this study, it is stated in the other matters part of the contract that BIM processes will be used in the performance of the work, and these processes will be carried out according to the BIM Technical Specifications. Thus, the contractual enforceability of the BIM processes and the specification has been ensured. Then, referring to the EIR document in which detailed information and information requirements will be found in the annex of the Technical Specification, EIR has been defined as an integral part of the contract in this document. As a result, it was ensured that the works within the contract were carried out in line with the EIR. Those contract documents are defined at the pre-tender stage by the employer and cannot be changed without triggering a compensation event. However, the other reference resources prepared by the contractor may impose a change in the later stages of the project. An illustration of the relations of those documents is given in the 7.2.

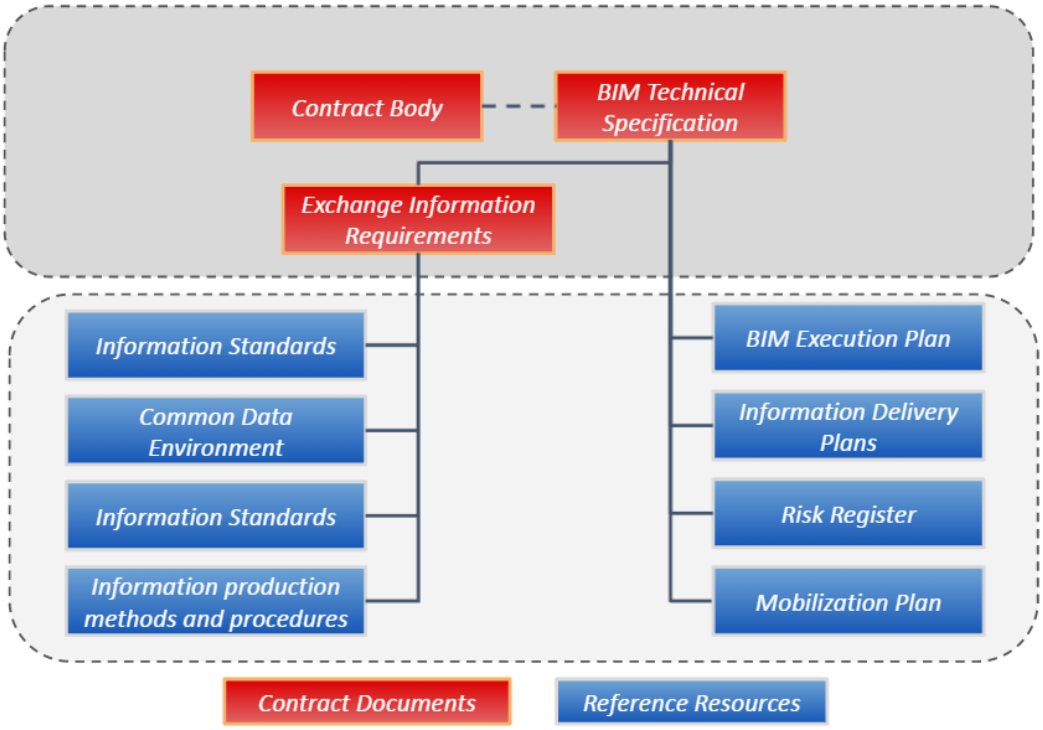

Figure 7.2 Relations of Documents in the Recommended Contract Structure

When the other standard contract forms discussed in Chapter 5 are examined in the same manner, some differences and similarities with the structure proposed above emerge. For example, when we look at the JCT 2016 contract structure, it has been stated in the main text of the contract that the parts related to BIM will be described in the BIM Protocol, and it has become a contractual requirement that the works under the contract are carried out under the BIM Protocol. In addition to this view in AIA documents, an exhibit, which will act as a bridge between the protocols to be used and the main contract, has been attended to the flow, and the same order has been provided. These contract structures can also be followed in the Figure 7.3.

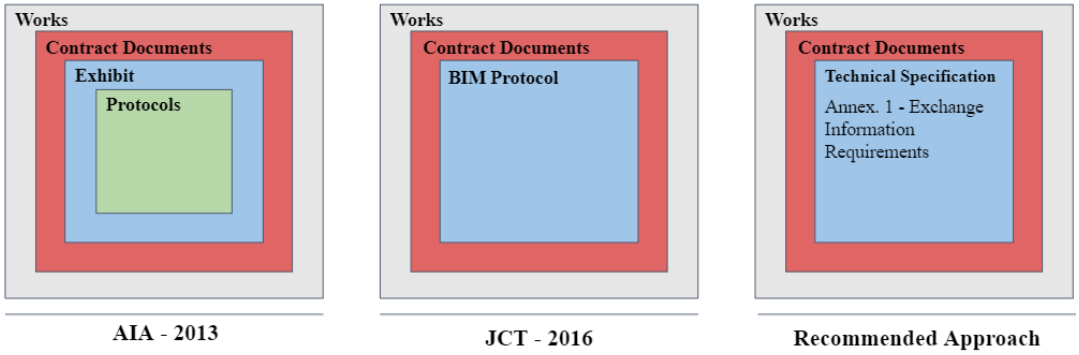

Figure 7.3 Comparison of Contract Structures

Table 7.4 summarizes how the proposed contract structure and proposed contract clauses provide solutions to the BIM-related contractual problem categories set forth in this thesis.

Table 7.4 Solutions for BIM-Related Legal and Contractual Issues

Categories	Recommendation	Related Feature
Standard of Care	Technical Specification - Clause 7 EIR	The Administration, who will describe exact information needs in the EIR document, will have determined what its expectation is when receiving this information from the contractor. These Level of Information Needs that are determined by the Administration together with the provision in the relevant article of the specification will be the most critical indicator of the performance of the contract deliverables. As long as the contractor meets this expectation, it will be satisfied with its contractual obligations.
Intellectual Property and Ownership	Technical Specification – Clause 8	With the provisions in the relevant article of the specification, the creator of the model is defined as its owner, unless otherwise is claimed in the main contract. Creator gives irrevocable license rights for all kinds of work-related use to the employer to whom the information is delivered, and the Employer is given the opportunity to use the models for permitted purposes.
Contractual Relationships & Roles and Responsibilities of Parties	Agreement Form – Clause 15	With the proposed article to be added to the 15th Article of the Agreement Form, Subcontractors who will be involved in the information management processes with BIM will also be able to integrate into the cooperation environment faster by not breaking away from the processes.
	Technical Specification – Clause 2, 3, 4	In the article on Coordination and Conflict Resolution, the importance of cooperation was emphasized by mentioning the necessity of the parties to hold regular meetings. However, in case of a dispute, meetings can be held outside of regular meetings. It is stipulated by the employer to appoint an Information Manager to manage the information production processes or to sign a consultancy agreement with a third party. In Article 4, the obligations of the contractual parties are specified, and the distinction between duties and responsibilities is clearly made.
Coordination of the Design	MIDP, TIDP Responsibility Matrix CDE Solution	In Article 4 of the specification, the importance of creating and updating the responsibility matrix and information delivery plans within the framework of ISO 19650-2 is underlined. In this way, coordination problems related to the design will reduce to a lesser extent. Establishment of the Common Data Environment following the system described in the ISO standards, as a contractual requirement, assignment to a contractor assigned by the employer or the employer, will establish a more organized common data environment and indirectly reduce coordination problems.
Legal Status of BIM	Agreement Draft– Other Terms Specification	With the clause added to the other terms section, it is underlined that the works will be progressed with BIM processes. Thus, documents produced in BIM processes gain a contractually binding status. Another indicator of this legality is the inclusion of the regulations regarding the information and models produced within the BIM Technical Specifications.
3D-2D Utilization	Specification – Clause 7	The administration, which has correctly determined the level of information needs in the models to be converted to 3D in 2D, will upload this request to the contractor as a contractual obligation through the relevant article in the specification.

7.3.1 Expert Interviews

A total of 4 semi-structured expert interviews were conducted to receive their opinions and criticisms about the problems and the proposed solutions put forward within the scope of this thesis. Some of the questions asked to the experts can be followed in Appendix A. These experts and their experiences can be seen in Table 7.5 below.

Table 7.5 Expert Information

Expert	Experience
Expert 1	A former member of the Public Procurement Board and a construction expert, who took part in high-level bureaucracy in public institutions.
Expert 2	A private company manager who has been a senior manager in the sector since BIM started to be used in Turkey, serving in the field of BIM design, construction and design consultancy in public and private projects.
Expert 3	A professional who led the public projects made with BIM in Turkey, represented the public side in metro projects and took the first steps of BIM use in the public sector.
Expert 4	Public procurement specialist, who has long-standing knowledge of public infrastructure tenders and contracts in Turkey.

In the opinion of Expert 2, the trigger of BIM implementation in Turkey should be the mandation by the state. While the expert mentions the importance that public projects should lead this progress, Expert 3 claims that the fact that the public is ahead of the private sector in BIM makes the private sector feel uncomfortable, so things are getting more disrupted. However, as the Expert 2 indicates, working with BIM can even change the hierarchy in the current functioning of public institutions. A more coordinated and collaborative work environment may become a requirement. On this subject, Expert 4 states that the institutionalization of government institutions is indispensable for BIM applications. On the other hand, Expert 3 explained why

the industry is not very open to innovations by stating people who have been doing business with a certain mentality for years have difficulty in changing this order. Expert 2 suggests that public personnel should also receive training on this issue and approach to BIM with an information approach rather than a model.

In addition to these, Expert 1 identifies the inadequacy of designs for public projects as the biggest obstacle among the difficulties of applying BIM in public projects. Stating that public institutions should give importance to design tenders in order for BIM to be established in the sector, the expert said that at least the final project should be ready and sufficient ground studies should be done in the projects that are in the construction phase.

Expert 2 argues that the most important problem with adding BIM to contracts is adding requests that will overload the specifications without knowing exactly what it is or how to use it. Such situations can lead to unavoidable consequences. For this reason, he adds that it is not correct for institutions to request the use of BIM from contractors, which cannot be beneficial during the project or operation phase, or to add it to the specifications without thinking about the expected use of BIM.

Regarding the legal issues raised within the scope of the thesis, the most important issue that the experts focused on was copyright and model ownership. Expert 3 said that copyrights can cause problems independently of BIM, but as in current public contracts, all the rights of the models created should be in the public institution. For this reason, if a company is agreed for the operation after the construction phase, it shows that all models should be delivered to this company without any copyright. But other than that, contractors feel hesitant to publish some models or information in order not to share the know-how of the contractors. Expert 2 states that sharing know-how will serve the BIM mentality better in order to enable faster adaptation.

Experts state that since BIM has only taken its first steps in Turkey, other legal problems have not yet occurred in such a way to cause major problems in the sector. In addition to these, Expert 3 argues that the problems related to the project flow

should not cause a disruption in the payments and that such problems should be resolved while the works are in progress.

In the thesis study, the items recommended to be used as evaluation criteria in public projects were asked to the experts. Expert 4 underlined that the recommended Technical Personnel item is very important and stated that this requirement has been repealed in the recent past which is actually a mistake that can cause problems in the long run. The expert emphasized that this point should be given due importance in order to accommodate experienced people in companies and to increase the quality of work. In addition, Expert 1 stated that companies in the sector should be given 1-2 years before BIM-related work completion is used as a non-price element or qualification criterion. It was announced that such a criterion would be introduced through the decision of the regulatory board, and that companies should gain experience with BIM, the expert said, adding that only then such a criterion would be applicable.

When asked about the compatibility of the current operation in public projects with the proposed contract structure, Expert 4 stated that the draft BIM implementation plan could be requested from the bidders by establishing a connection with the work program, in order to collect it from the bidders more quickly.

Regarding requesting documents from the bidders, Expert 1 stated that the contracting authorities can request them from the bidders as long as it is specified in the administrative specifications, but the point to be considered here is whether the work to be done has financial value and whether it creates an anti-competition. However, as stated by Expert 1, asking the winner of the tender to change the BEP before signing the contract creates a situation that will prevent competition, but it cannot prevent the signing of the contract. As a result, in the opinion of the expert, the BEP cannot be revised before the contract is signed, and if a revision is to be made, it can be done after the contract is signed.

CHAPTER 8

CONCLUSIONS

Through this study, potential legal and contractual problems related to BIM, which numerous researchers have put forward in the literature, were analyzed. These problems were categorized into more understandable and clear definitions. As a result of this categorization, 6 important problems were revealed. An order of importance was established by examining how often researchers discussed these problems in the literature. However, after this categorization, the issue of determining whether these problems were encountered in professional life, as in academia, arose. For this reason, the cases before the courts of the leading countries in the field of BIM were examined. This study investigated the extent to which the identified problem categories were seen in these cases. Problems encountered in real life were also analyzed by ordering them according to their frequency of occurrence.

Afterwards, a survey was conducted to understand whether the problems seen in the literature and in the courts of BIM-leading countries are met in local projects. As a result of this survey, how the professionals in the country evaluated the categorized legal issues was graded. Additionally, the opinions of professionals who serve in the construction sector in the country and take part in projects carried out with BIM processes were gathered regarding the integration of BIM into contracts and compliance with international standards in Turkey.

Furthermore, it was examined how all these legal and contractual problems were handled in the contract documents of the standard contract forms, which are widely used in the international construction sector. Along with the contract documents, ISO 19650 Standards, which bring regulation to BIM processes internationally, were also examined. After examining the solutions in both the pre-contract and delivery phase

of the projects, this study examined how these processes can be handled in local contracts. In accordance with Turkey's public procurement and contracting regulations, it has been determined how BIM processes can be integrated into the projects, and then some arrangements and additions to the standard contract documents have been proposed. Although more fundamental regulations will be required in the long run for a full BIM adaptation, recommendations have been made for transition to BIM in the short-term. In addition to these, a special technical specification form was created in a protocol format for use in projects to be carried out with BIM. This standard form has been created in a format suitable for use in tenders when it is detailed and supported by the institutions or contract managers in order to give Project spesific details with the right resources.

To verify and evaluate the recommendations of this thesis four expert interviews has carried out. Along with the suitability of the proposed contract articles and documents, expert opinions on contractual issues were compiled thanks to the interviews.

When viewed from a broader perspective for the long-term BIM adaptation, it is necessary to see that this transformation has brought about a great cultural change. This adaptation is a long marathon that may require a lot of effort rather than an innovation that could be a snap. For this revolution to take place, state institutions must take more innovative and visionary steps to keep up with these processes. In this process, each institution should determine its unique needs and create a roadmap for the transition to BIM.

In addition to all these, laws and regulations should support this transition process. In this sense, it can be shown among the future research topics that the impact of the Law on Intellectual and Artistic Works, together with the 7th section of the Turkish Code of Obligations numbered 6098, which governs private contractual relations on the BIM processes.

The effect of procurement strategies, which is another factor affecting this adaptation, on the processes in Turkey has an important place among the issues that

need to be investigated because it is thought that the Design-Bid-Build method, which is also applied in public projects in Turkey, undermines the efficiency of BIM processes and that methods such as Design-Build or Integrated Project Delivery (IPD) are more suitable for BIM (Alwash et al., 2017; Bynum et al., 2013).

Morover, new studies may be required in the long term for the conditions specified in the evaluation criteria proposed in section 7.2.2.1 of this thesis study. Future study areas can be considered in determining a valid maturity level that can be used to determine past work experience related to BIM or certification of technical personnel to be declared by contractors as BIM personnel.

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APPENDICES

A. Survey and Expert Interview Questions

A1.Survey Questions

The questions of the survey in Turkish are provided hereby.

BIM'in Hukuksal Yönleri ve Sözleşmesel Düzenlemeler

AÇIKLAMA

Sizleri, Yapı Bilgi Modellemesi'nin (BIM) Hukuksal Yönleri ve Sözleşmesel Düzenlemeler konulu araştırmaya katılmaya davet ediyoruz. Bu araştırma, Orta Doğu Teknik Üniversitesi İnşaat Mühendisliği Bölümü, Yapım Yönetimi Yüksek Lisans Programı öğrencisi Fatih Kaya, Dr. Öğr. Üyesi Aslı Akçamete ve Prof. Dr. M. Talat Birgönül tarafından yürütülmektedir.

Bu çalışmaya katılım tamamen gönüllülük esasına dayanır. Aşağıdaki bilgiler çerçevesinde çalışmaya katılmaya karar vermeden önce anlaşılmayan herhangi bir konu olması durumunda yine aşağıda bulunan iletişim bilgileri üzerinden bizlere ulaşabilirsiniz.

ÇALIŞMANIN AMACI

Bu çalışmada, Dünya'da olduğu gibi ülkemiz inşaat sektöründe de gün geçtikçe yaygınlaşan Yapı Bilgi Modellemesi (BIM) süreçleriyle yürütülen projelerdeki sözleşmesel farkındalığın araştırılması ve yaşanan sözleşmesel ve hukuksal sorunların ortaya çıkarılması amaçlanmıştır. Diğer yandan bu araştırma, sözleşme yöneticileri, sektör uzmanı hukukçular ve BIM süreçlerinin yürütücülerinin, inşaat projelerindeki hukuki ve sözleşmesel konulara ilişkin mevcut anlayışını tespit etmeyi de hedeflemektedir.

Ayrıca, BIM süreçlerinin uygulanmasında yaygın olarak kullanılan uluslararası standartların yerel firma ve kurumların proje teslim süreçlerini yönlendirmedeki uygunluğu ve BIM'in kamu ihalelerinde kullanılması için gerekli ek düzenlemeler konusunda sektörün görüşleri ortaya koyulacaktır.

PROSEDÜRLER

Bu çalışmaya gönüllü katılmak istemeniz halinde, sizden beklenen, ilgili web tabanlı anket formunu doldurmanızdır. Tamamlaması yaklaşık olarak 8-10 dakika sürecek bu anket çalışması çoğunlukla çoktan seçmeli sorulardan oluşmaktadır ve dilerseniz sonuçlar sizinle de paylaşılacaktır.

GİZLİLİK

Ankette, sizden kimlik veya kurum belirleyici hiçbir bilgi istenmemektedir. Cevaplarınız tamamıyla gizli tutulacak, sadece araştırmacılar tarafından değerlendirilecektir. Katılımcılardan elde edilecek bilgiler toplu halde değerlendirilecek ve bilimsel yayınlarda kullanılacaktır.

KATILIM VE AYRILMA

Araştırma genel olarak rahatsızlık verecek sorular içermemektedir. Katılım sırasında sorulardan ya da herhangi başka bir nedenden ötürü kendinizi rahatsız hissederseniz cevaplama işini yarıda bırakıp çıkmanız mümkündür.

ARAŞTIRMACILARIN KİMLİĞİ

Bu çalışmaya katıldığınız için şimdiden teşekkür ederiz. Araştırma ile ilgili herhangi bir endişeniz varsa veya daha fazla bilgi almak için, lütfen iletişime geçiniz:

Dr. Öğr. Üyesi Aslı Akçamete Güngör	Fatih Kaya	Prof. Dr. M. Talat Birgönül
Orta Doğu Teknik Üniversitesi	Orta Doğu Teknik Üniversitesi	Orta Doğu Teknik Üniversitesi
İnşaat Mühendisliği Bölümü	Yapım Yönetimi Yüksek Lisans Öğrencisi	İnşaat Mühendisliği Bölümü
E: akcamete@metu.edu.tr (mailto:akcamete@metu.edu.tr)	T: 0 554 508 46 22 E: kaya.fatih@metu.edu.tr (mailto:kaya.fatih@metu.edu.tr)	E: birgonul@metu.edu.tr (mailto:birgonul@metu.edu.tr)

DEMOGRAFİK BİLGİLER ve BIM TECRÜBESİ

***Lütfen projelerdeki rolünüzü en iyi şekilde ifade eden unvanı seçiniz.**

Uyanların tümünü seçin

- [ ] İşveren
- [ ] Yapım İşi Yüklenicisi
- [ ] Tasarım İşi Yüklenicisi
- [ ] Yapım Müşaviri
- [ ] Tasarım Müşaviri
- [ ] BIM Danışmanı
- [ ] Diğer:

***Firmanızın/Kurumunuzun BIM ile ilgili proje portföyünün özel sektör/kamu projeleri oranı nedir?**

Aşağıdaki yanıtlardan birini seçin

- ( ) %0 - %100
- ( ) %20 - %80
- ( ) %40 - %60
- ( ) %50 - %50
- ( ) %60 - %40
- ( ) %80 - %20
- ( ) %100 - %0

***Daha çok hangi tip proje için BIM ile ilgili sözleşme ve/veya şartname kullandınız?**

Uyanların tümünü seçin

- [ ] Tasarım (Mimarlık/Mühendislik Hizmetleri)
- [ ] Yapım
- [ ] Müşavirlik
- [ ] Tesis Yönetimi
- [ ] Diğer:

***Firmanızın/Kurumunuzun daha önce dahil olduğu veya halen devam etmekte olan herhangi bir projesi için sözleşmesel bir BIM dokümanı (Sözleşme, Şartname) hazırladınız mı /müzakere ettiniz mi?**

EVET	HAYIR

***Firmanız/Kurumunuz BIM süreçleriyle kaç adet proje yürüttü?**

Aşağıdaki yanıtlardan birini seçin

- 1
- 2 - 5
- 6 - 9
- 10 ve daha fazla

***BIM ile ilgili deneyiminiz kaç yıldır?**

Aşağıdaki yanıtlardan birini seçin

- 1 Yıl
- 2 Yıl
- 3 Yıl
- 4 Yıl
- 5 Yıl ve daha fazla

***Firmanız/Kurumunuz, daha önce sözleşmesinde BIM ile alakalı hiçbir madde, ek veya doküman olmadan (şartname vb.) BIM ile proje yürüttü mü?**

EVET	HAYIR

***Firmanızın/Kurumunuzun, BIM süreçleriyle proje yürütürken (varsa) çekinceleri ve / veya BIM'i kullanmama sebepleri nelerdir?**

Uyanların tümünü seçin

- [ ] İşveren'in böyle bir talepte bulunmaması
- [ ] İşveren'in BIM'in varlığından haberdar olmaması
- [ ] Sözleşmesel ve/veya yasal düzenleme eksikliği
- [ ] Şirketin/Kurumun BIM ile ilgili tecrübe eksikliği
- [ ] Diğer proje paydaşlarının BIM kullanmıyor olması
- [ ] Yürütülen projelerin küçük çapta olması
- [ ] BIM'in gereksiz görülmesi
- [ ] BIM'in fazladan maliyet getirmesi
- [ ] Sözleşmesel problemler yaşatması
- [ ] Belirli bir standardın oluşmamış olması
- [ ] Diğer:

SÖZLEŞME ÇERÇEVESİ ve STANDARTLAR

***(TS EN) ISO 19650 Bina bilgi modellemesi (BIM) de dâhil olmak üzere, bina ve inşaat mühendisliği alanına giren diğer yapılar hakkındaki bilgilerin düzenlenmesi ve sayısallaştırılması standartları hakkında ne kadar bilgiye sahipsiniz?**

Aşağıdaki yanıtlardan birini seçin

- ( ) ISO 19650 süreçleriyle yürütülen proje(ler)de yer aldım.
- ( ) ISO 19650 süreçlerini şirketime/kurumuma entegre ettim.
- ( ) ISO 19650 gereklilikleri ile ilgili bilgi sahibiyim.
- ( ) ISO 19650 standartlarını yalnızca duydum.
- ( ) ISO 19650 standartlarından haberim yok.

***Aşağıdaki soruları görüşünüze en uygun şekilde cevaplayınız.**

	Kesinlikle Katılmıyorum	Kısmen Katılmıyorum	Ne Katılıyorum ne de Katılmıyorum	Kısmen Katılıyorum	Kesinlikle Katılıyorum
ISO 19650 standartlarında tarif edilen süreçlerin Türkiye'de doğrudan uygulanabilir olduğunu düşünüyor musunuz?	( )	( )	( )	( )	( )
ISO 19650 standartlarının Türkiye'de nasıl uygulanması gerektiği ile alakalı çalışmalar yürütülmesi gerektiğini düşünüyor musunuz?	( )	( )	( )	( )	( )
Kamu İhale Kurumu (KİK) kanunları çerçevesinde BIM süreçleriyle proje yürütmenin sözleşmesel olarak uygun olduğunu düşünüyor musunuz?	( )	( )	( )	( )	( )
Kamu projelerinde (KİK) sözleşme yapısı ve içeriğinden kaynaklı olarak BIM'in potansiyelinin tam olarak yansıtılamadığını düşünüyor musunuz?	( )	( )	( )	( )	( )
Kamu projelerindeki (KİK) BIM süreçlerini kapsayan bir yönetmelik yayınlanması gerektiğini düşünüyor musunuz?	( )	( )	( )	( )	( )

***Yürütmüş olduğunuz kamu projelerinde Sözleşme Tasarısında BIM ile ilgili bir madde/hüküm yer aldı mı?**

EVET	HAYIR

***Yürütmüş olduğunuz kamu projelerinde İdari Şartnamelerde BIM ile ilgili bir madde/hüküm yer aldı mı?**

EVET	HAYIR

PROJELERDEKİ SORUNLAR

***Yürütmüş olduğunuz projelerdeki BIM Teknik Şartnamelerini İşverenin taleplerini ne ölçüde yansıtabiliyordu?**

Aşağıdaki yanıtlardan birini seçin

- Detaylı bir şekilde istekler belirlenmişti.
- Şartnamede genel başlıklarla belirtilen bazı konular ilerleyen süreçlerde detaylandı.
- Şartnamede belirtilmeyen bazı istekler ilerleyen süreçlerde çeşitlenerek arttı.
- Şartnamede istekler belirtilmeyip BIM Uygulama Planında eklendi.
- Diğer:

***Daha önce projedeki herhangi bir paydaş ile BIM ile alakalı bir konudan anlaşmazlık, claim ve/veya tahkim süreci yaşadınız mı?**

Aşağıdaki yanıtlardan birini seçin

- Evet, anlaşmazlık (dispute) yaşadım.
- Evet, ek istek (claim) süreci yaşadım.
- Evet, tahkim süreci yaşadım.
- Hayır.

***Yürütmüş olduğunuz projelerde projenin ilerleyen safhalarında BIM Teknik Şartnamesi hükümleri dışında öngörülemeyen BIM işleri yapıldı mı?**

Aşağıdaki yanıtlardan birini seçin

- Evet, kendi şirket içi gereksinimlerimiz için yapıldı.
- Evet, ek süre verilerek yapıldı.
- Evet, maliyet artışı verilerek yapıldı.
- Evet, yapıldı fakat şartname içinde kalınarak yapıldığı iddia edildi.
- Hayır, yapılmadı.

***Aşağıdaki soruyu cevaplayınız.**

	Çok Kritik	Kritik	Emin Değilim	Az Kritik	Önemsiz
Yürütmüş olduğunuz projelerde BIM Uygulama Planının yerini ve önemini nasıl sınıflandırırsınız?	○	○	○	○	○

HUKUKSAL SORUNLAR

***Yürüttüğünüz projelerde BIM Modeli bir sözleşme dokümanı hükmünde miydi? (Model ve model içeriği sözleşmesel olarak bağlayıcı mıydı?)**

Aşağıdaki yanıtlardan birini seçin

- Evet
- Hayır
- Emin Değilim

***Yürüttüğünüz projelerde 2B çizimler ile 3B Modeller arasında bir uyuşmazlık yaşandı mı?**

Aşağıdaki yanıtlardan birini seçin

- Evet, 2B çizimler doğru olarak kabul edildi.
- Evet, 3B modeldeki bilgiler doğru olarak kabul edildi.
- Evet, 2B çizimlerin 3B modele uygun olarak düzeltilmesi talep edildi.
- Evet, 3B modelin 2B çizimlere göre düzeltilmesi talep edildi.
- Hayır.

***Aşağıdaki soruları görüşünüze en uygun şekilde cevaplayınız.**

	Kesinlikle Katılmıyorum	Kısmen Katılmıyorum	Ne katılıyorum ne de Katılmıyorum	Kısmen Katılıyorum	Kesinlikle Katılıyorum
BIM ile yürütülen projelerde ürettiğiniz bilgi ve bilgi modellerin telif hakları ve/veya izinsiz kullanımları konusunda çekinceleriniz var mı?	○	○	○	○	○
Telif hakları ve modellerin izinsiz proje dışında kullanımı ile ilgili çekinceleriniz ile ilgili sözleşmelerin yaklaşımlarını yeterli buluyor musunuz?	○	○	○	○	○
BIM ile birlikte proje paydaşlarının, tasarımcı firmanın hazırlayacağı projelerle ilgili beklentilerinin arttığını düşünüyor musunuz? (Daha kusursuz model, daha detaylı projeler, vb.)	○	○	○	○	○
BIM ile birlikte daha önceden tasarım ve yapım süreçlerinde bulunmayan yeni roller ve sorumluluklar geldiğini düşünüyor musunuz?	○	○	○	○	○
BIM ile birlikte projeye süreçlerine dahil olan paydaşlar arası görev ve sorumluluklarda bir belirsizlik yaşanıyor mu?	○	○	○	○	○
BIM ile birlikte birden fazla paydaşın modelleme süreçlerine dahil olmasıyla tasarım süreçlerinin kontrol ve koordinasyonunun daha zorlaştığını düşünüyor musunuz?	○	○	○	○	○

***BIM ile proje yürütürken hiçbir sorun hakkında bir hukuk danışmanından yardım almanız gerekti mi?**

✔ EVET	⊘ HAYIR

BIM ve sözleşmesel sorunlar ve düzenlemeler ile ilgili belirtmek istediğiniz başka bir konu varsa lütfen yazınız.

A2.Expert Questions

The questions of the expert interviews in Turkish are provided hereby.

Soru / *Question*
1. Kamu Projelerinde BIM'i uygulamanın zorlukları nelerdir? / *What are the challenges of implementing BIM in public projects?*
Uzman Görüşü

Soru / *Question*
2. BIM Süreçlerinin sözleşmelere dahil olmasıyla inşaat sözleşmelerine yeni sorunlar getirdiğini düşünüyor musunuz? / *Do you think that the inclusion of BIM Processes in contracts brings new problems to construction contracts?*
Uzman Görüşü

Soru / *Question*
2.1. Makul Özen Yükümlülüğünün BIM ile birlikte gündeme gelen sorunlardan olduğunu düşünüyor musunuz? / *Do you think that Standard of Care is a problem with BIM in construction contracts?*
Uzman Görüşü
2.2. Telif Hakları ve Model Sahipliğinin BIM ile birlikte gündeme gelen sorunlardan olduğunu düşünüyor musunuz? / *Do you think that Intellectual Property Rights and Model Ownership is a problem with BIM in construction contracts?*
Uzman Görüşü
Soru / *Question*
2.3. Paydaşların Sözleşmesel İlişkileri ve Sorumlulukları konusunda BIM ile birlikte gündeme gelen sorunlar olduğunu düşünüyor musunuz? / *Do you think that there are problems about Contractual Relationship and Responsibilities of Parties as a result of BIM usage in construction?*
Uzman Görüşü

Soru / *Question*
2.4. Tasarım Kontrol ve Koordinasyonu Zorluğunun BIM ile birlikte gündeme gelen sorunlardan olduğunu düşünüyor musunuz? / *Do you think that Coordination and Control of the Design have new challenges due to BIM usage in construction?*
Uzman Görüşü
Soru / *Question*
2.5. BIM Modelin Sözleşmesel Durumu BIM ile yürütülen işlerde sorun oluyor mu? / *Contractual Status of the BIM Model Are there any problems in the works carried out with BIM?*
Uzman Görüşü
2.6. 2d-3d arası geçişlerde yaşanan LOD sorunları BIM ile birlikte ön plana çıktı mı? / *Do the LOD problems experienced in the transitions between 2D-3D come to the fore with BIM?*
Uzman Görüşü

Soru / *Question*
3. Ortaya konulan legal ve sözleşmesel sorunları ISO 19650 standartları ne seviyede çözümleyebiliyor? / *To what extent can ISO 19650 standards resolve the legal and contractual problems raised?*
Uzman Görüşü

Soru / *Question*
4. Anahtar teknik personel, yazılım sahipliği ve BIM ile ilgili iş bitirme ön yeterlilik kriteri olarak ve /veya fiyat dışı unsur olarak ihalelerde kullanılabilir mi? Kullanırsa pratik anlamda bir fayda sağlar mı? / *Can key technical personnel or software ownership or BIM maturity be used in tenders as a pre-qualification criterion and/or as a non-price element? Does it provide any practical benefit if it is used?*
Uzman Görüşü

Soru / *Question*
5. KİK formatının BIM kullanılan projelere uygun olduğunu düşünüyor musunuz? / *Do you think that the framework of PPA regarding to contracts is appropriate for BIM implementation?*
Uzman Görüşü

Soru / *Question*
6. Sözleşme Tasarısına ve idari şartnameye eklenmesi önerilen aşağıdaki maddeler ISO gerekliliğini ne ölçüde yansıtabiliyor? Bu maddeler KİK mevzuatlarına uygun mu? *Eklenmesini önerdiğiniz maddeler var mıdır?/ To what extent do the following items proposed to be included in the Agreement Form and Administrative Specification reflect the ISO requirement? Do these substances comply with the PPC legislation? Do you have any recommended clauses to be included in the contract?*
Uzman Görüşü

Soru / *Question*
7. İhaleyi kazanan istekliden İdarelerin sözleşme imzalamadan önce başka talepte bulunmaları hem teorik anlamda hem pratik anlamda mümkün müdür ? / *Is it possible, both theoretically and practically, for the Contracting Entities to make other demands before signing the contract from the bidder who won the tender?*
Uzman Görüşü

Soru / *Question*
8. Önerilen Teknik Şartname yapısı ISO 19650 çerçevesini ne ölçüde yansıtabiliyor? Eksiklikleri var mı? Kamu ihalelerinde kullanıma uygun mu? / *To what extent does the proposed Technical Specification structure reflect the ISO 19650 framework? Do they have any shortcomings? Is it suitable for use in public tenders?*
Uzman Görüşü

B. Specification Turkish of Terms and Provisions to be Added in Contracts Survey

Clauses to be Included in Turkish

Belge	Madde	Hüküm
Sözleşme Tasarısı	15. Alt Yükleniciler	*"Yüklenici, BIM Teknik Şartnamesinde açıklanan süreçlere dahil edilecek Alt Yüklenicilerin sorumluluklarına ilişkin BIM Teknik Şartname hükümlerine uygun hareket edecektir."*
Sözleşme Tasarısı	33. Diğer Hususlar	*"Yüklenici bu sözleşme kapsamındaki işleri BİM Teknik Şartnamesi ve eklerinde belirtilen şartlara uygun olarak gerçekleştirecektir."*
İdari Şartname	Diğer Hususlar	*XX.1. İstekliler, bu iş kapsamında belirtilen işlerin tamamlanabilmesi için, BIM Teknik Şartnamesi ve eklerinde belirtilen şartlar dikkate alınarak, teklif ettikleri Taslak BIM Uygulama Planı'nı tekliflerine ekleyeceklerdir.*
İdari Şartname	Diğer Hususlar	*XX.2. İstekliler, BIM Teknik Şartnamesi ve eklerinde belirtilen Mobilizasyon Planı ve Risk Kaydı belgelerini tekliflerine ekleyeceklerdir.*
İdari Şartname	Fiyat Dışı Unsurlar	Bkz. Bölüm 7.2.2.1
Teknik Şartname	Bütün Belge	Bkz. Bölüm 7.2.3 ve Appendix C

C. BIM Technical Specification in Turkish

The BIM Technical Specification is attached hereby.

ORTA DOĞU TEKNİK ÜNİVERSİTESİ
MIDDLE EAST TECHNICAL UNIVERSITY

Kamu İhaleleri ile Uyumlu

BIM Teknik Şartnamesi

ISO 19650
Standartlarıyla uyumlu
Bilgi Yönetimi Protokolü

Rev. 1

BIM
TEKNİK ŞARTNAMESİ

Yönetici Özeti

Bu teknik şartname Yapı Bilgi Modellemesi (BIM) süreçlerinin dâhil edileceği projelerin teslim aşamasındaki sözleşme taraflarının görev ve sorumluluklarını belirlemek ve sözleşmesel bir düzenleme oluşturmak amacıyla, ISO 19650 standartlarının gerekliliklerini yansıtacak Bilgi Protokolü (Information Protocol) yerine kullanılabilecek şekilde hazırlanmıştır.

Bu belge oluşturulurken, ISO 19650 – 1, ISO 19650 – 2, ISO 19650 – 5 standartlarıyla birlikte, UK BIM Framework tarafından yayınlanan "*Information protocol to support BS EN ISO 19650-2 the delivery phase of assets*" belgesi temel alınarak Türkiye'de mevcut düzende kullanılan BIM Teknik Şartnameleri ve endüstri uygulamaları doğrultusunda düzenlemeler ve eklemeler yapılmıştır.

Bir projenin tedarik zincirindeki bütün paydaşlar arasında kullanılmaya uygun olması amacıyla üretilen bu belgenin sözleşmesel olarak bağlayıcılığının sağlanması ve BIM süreçlerinin projeye entegrasyonunu sağlayabilmek için işbu belgenin eklendiği sözleşmenin içerisine bu işlevi gerçekleştirecek madde(ler) eklenmelidir. Bu maddeler için örnek teşkil eden maddeler bu tez çalışmasının Appendix A. Bölümünde bulunmaktadır.

Bu belgenin işlevsel bir şekilde kullanılmasını sağlayacak en önemli nokta belgenin giriş kısmındaki Bilgi Ayrıntıları bölümünde belirtilen Bilgi Alışverişi Gereksinimleri başta olmak üzere diğer dokümanların yaratılarak Bilgi Ayrıntıları kısmında bu kaynaklara referans verilmesidir.

Revizyonlar

Revizyon 1	Eylül 2021	İlk Yayım

Yazar & Editör

Fatih KAYA

İçindekiler

Bilgi Ayrıntıları

Terim	Ayrıntı
Sözleşme	[Sözleşmeyi ve Tarafları belirtiniz]
İşveren/İdare	[İşvereni/İdareyi belirtiniz]
Ana Yüklenici	[Ana Yükleniciyi belirtiniz]
Tayin Eden	[Sözleşmenin işveren Tarafını belirtiniz]
Tayin Edilen	[Sözleşmenin yüklenici Tarafını belirtiniz]
İş	[İşin/Sözleşmenin adını yazınız / tarif ediniz]
Bilgi İhtiyaç Seviyesi	[Burada kaynağa/eke referans veriniz]
Bilgi Alışverişi Gereksinimleri	[Burada kaynağa/eke referans veriniz]
Proje Bilgi Üretimi Yöntem ve Prosedürleri	[Burada kaynağa/eke referans veriniz]
Proje Bilgi Standartları	[Burada kaynağa/eke referans veriniz]
Güvenlik Yönetim Planı	[Burada kaynağa/eke referans veriniz]

1. Genel Şartlar

1.1. Bu Şartnamede büyük harf ile başlayan kelime ve ifadelerin anlam ve tanımları madde 13'te belirtilmiştir.

1.2. Taraflar bu Şartname ve Sözleşmenin amaçları doğrultusunda, Tayin Edilen tarafın bilgi yönetim süreçlerini TS ISO 19650 standartlarına uygun şekilde kullanıp sağlayacağını ve Bilgi Ayrıntıları, Sözleşme, Şartname ve eklerinde belirtilen hususlar için süreçleri oluşturmak bu şartname altında Tayin Edilen tarafın yükümlülükleri olduğunu taahhüt ederler.

1.3. Eğer İşveren/İdare işbu Sözleşmenin Taraflarından biri değilse bu Şartnamedeki herhangi bir madde ya da hüküm İşveren/İdareye bir yükümlülük, hak ya da kısıtlama getirmez. Eğer Ana Yüklenici işbu Sözleşmenin Taraflarından biri değilse ya da Ana Yüklenici için bir sorumluluk içermiyorsa, bu Şartnamedeki herhangi bir madde ya da hüküm Ana Yükleniciye bir yükümlülük, hak ya da kısıtlama getirmez.

1.4. Eğer Bilgi Ayrıntıları içinde Güvenlik Yönetim Planından bahsedilmedi ise veya Bilgi Ayrıntılarında "Bu madde boş bırakılmıştır." şeklinde ifade edilmişse Şartnamedeki Güvenlik Odaklı Maddeler hükümsüz sayılacak ve uygulanmayacaktır.

1.5. Madde 13'teki anlamlarına bakılmaksızın Bilgi Modelinin, Birleşik Bilgi Modelinin, Materyalin ve Ortak Veri Ortamı Çözümü ve İş Akışının etki ve uygulamaları için Madde 4.9 un hükümleri geçerli olacaktır.

1.6. Şartname işbu Sözleşmenin bir parçasını oluşturmaktadır. Şartname ve Bilgi Ayrıntılarıyla Sözleşme veya Sözleşmenin bir parçasını oluşturan dokümanlar arasında bir çelişki veya uyuşmazlık durumunda bu durum Sözleşme hükümlerince çözümlenecektir. Eğer Sözleşme çelişki durumuyla ilgili bir madde veya hüküm içermiyorsa bu durumun çözümünde uygulanacak doküman arası öncelik sırası aşağıdaki gibidir,

a) Şartname
b) Diğer Sözleşme Dokümanları

1.7. Taraflar Şartnamede belirtilen yükümlülüklerini gerçekleştirirken sorumlu bir meslek adamı sıfatıyla gerekli dikkat ve özeni göstererek etkin bir şekilde, genel kabul edilen mesleki ve fenni tekniklere ve uygulamalara uygun hareket edeceklerini taahhüt ederler.

2. Koordinasyon ve Çelişkilerin Çözümü

2.1. Bilgi Ayrıntılarında belirtilen ve Sözleşme kapsamında yürütülen İşler ile ilgi bilgi koordinasyon toplantılarına Tayin Edilen tarafın uygun niteliklere sahip deneyimli personeli katılacaktır.

2.2. Taraflar İşler için üretilen bilgi ile ilgili herhangi bir ihmal, belirsizlik, çelişki veya tutarsızlığın bildirilmesi ve çözümü konusunda Sözleşmede belirtilen hususlarla hareket edeceklerdir. Eğer Sözleşmede konuyla ilgili bir madde bulunmuyorsa ve bir Taraf böyle bir ihmal, belirsizlik, çelişki veya tutarsızlığın farkına varırsa diğer Tarafı bilgilendirecek ve Taraflar bu tür ihmal, belirsizlik, çelişki veya tutarsızlığın Sözleşme ve işbu Şartname ile ilgili olarak nasıl

düzeltileceği ve / veya çözüleceği konusunda anlaşacaklardır. Herhangi bir anlaşmaya varılmazsa, Taraflar, Bilgi Ayrıntılarını dikkate alarak, ihmal, belirsizlik, çelişki veya tutarsızlığı düzeltmek veya çözmek için toplanacaklardır.

3. İşverenin Yükümlülükleri

3.1. İşveren/İdare, Tayin Edilen Tarafın işbu Sözleşmede bahsedilen yükümlülükleri kapsamında yer almadığı sürece, Bilgi Ayrıntılarının, BIM Uygulama Planının, Ana Bilgi Teslim Planının gözden geçirilmesini ve gerekliyse ilgili yüklenici tarafından güncelleştirilmesini sağlayacaktır. Tayin Edilen Tarafın Sözleşmenin imzalanması ardından gerçekleşen güncellemeden herhangi bir hakkı doğarsa Sözleşme ve Şartnameye göre değerlendirilecektir.

3.2. İşveren/İdare, TS EN ISO 19650-2'deki işveren sorumluluklarını yerine getirecek sorumlunun atanmasından sorumlu olacaktır.

4. Tayin Eden ve Tayin Edilen Tarafların Yükümlülükleri

4.1. Taraflar, Bilgi Ayrıntılarına kendilerine uygulanabilir oldukları ölçüde uyacaklardır.

4.2. Tayin Edilen Taraf, Bilgi Ayrıntılarında belirtilen yöntem ve prosedürlerin uygunluğunu test edip bunlar ile ilgili sonuçları Tayin Eden Taraf ile paylaşacaktır.

4.3. Ana Yüklenici, Teslim Ekibiyle ile ilgili Risk Kaydını oluşturacak ve sürdürecektir.

4.4. Tayin Edilen Taraf, kendi çalışanlarının ve yetkisi altında bulunan Teslim Ekiplerinin bu Şartname altında yapılan iş için kapasitesini ve uygunluğunu ayarlamak ile yükümlüdür.

4.5. Taraflar bu Şartname kapsamında yapılan İşler ile ilgili olarak bilgi üretme, paylaşma ve/veya yayınlama yükümlülüklerini yerine getirirken Ortak Veri Ortamı Çözümü ve İş Akışını kullanacaklardır.

4.6. Bir süre uzatımı veya keşif artışı durumunda Taraflar ilgili Bilgi Ayrıntısına uygun olarak bilgi üretme, paylaşma ve/ veya yayınlamakla yükümlüdürler. Bunları yaparken Bilgi Ayrıntıları, BIM Uygulama Planı ve ilgili Bilgi Teslim Planında belirtilen zamanlara uygun olarak hareket etmeleri, gerekirse bu zamanları da güncellemeleri gerekmektedir.

4.7. Taraflar Bilgi Ayrıntılarının kendilerinden sağlamalarını istediği bilgi ve desteği sağlamakla yükümlüdürler.

4.8. Tayin Edilen Taraf, Bilgi Alışverişi Gereksinimlerine uygun olarak üretilen ve teslim edilen bilgi ve modellerin kontrolüne ve kullanılmasına imkân sağlamak amacıyla Bilgi Alışverişi Gereksinimlerinde belirtilen ölçüde, kullanılan yazılımları Tayin Eden Tarafa sağlamak ile sorumludur.

Bilgi Güvenliği

4.9. Taraflar, (eğer varsa) İşveren/İdare tarafından üretilen Güvenlik Yönetim Planına bağlı kalacaktır. Ayrıca, Tayin Edilen Taraf hiçbir şekilde Güvenlik Yönetim Planında bahsedilen ve Tayin Edilen tarafın yükümlülükleriyle ilgili

olan herhangi bir politika, süreç ve prosedürün Tayin Eden Tarafından ihlal edilmesine de neden olmayacaktır.

Diğer Sözleşmeler

4.10. Madde 4.9'a tabi olarak, Taraflar İşlerle ilgili olarak büyük ölçüde aynı şekilde bilgi hazırlama ve/veya sağlama yükümlülükleri içeren alt yüklenici sözleşmelerine de bu Şartnameyi dahil edeceklerdir.

Bilgi Yönetim Dokümanları

4.11. Tayin Edilen Taraf TS EN ISO 19650-2 Standardı ve Sözleşmenin gerektirdiği ölçüde bütün bilgi yönetim dokümanlarının hazırlanmasını TS EN ISO 19650-2'ye uygun bir şekilde yapacaktır. Sözleşme imzalandıktan sonra Tayin Edilen tarafından hazırlanan ve onaylanan bu dokümanların zaman zaman gözden geçirilmesinden de Tayin Edilen Taraf yükümlü olacaktır.

BIM Uygulama Planı

4.12. Tayin Edilen Taraf, sözleşme tarihinden sonraki 30 gün içinde, sözleşme öncesinde Tayin Eden Tarafa sunmuş olduğu Taslak BIM Uygulama Planını yeterli ölçüde detaylandırıp güncelleyerek Tayin Eden Tarafa sunacaktır. Tayin Eden Taraf 10 gün içinde BIM Uygulama Planını inceleyecek, onaylamazsa revizyonunu isteyecektir.

4.13. Kabul edilen BIM Uygulama Planı, Tayin Edilen tarafından, Tayin Eden tarafın talebi olması durumunda güncellenecek ve proje aşamaları boyunca canlı bir belge olarak kullanılacaktır.

Bilgi Teslim Planları

Detaylı Sorumluluk Matrisi

4.14. Tayin Eden Tarafın İşveren/İdare olması halinde, Tayin Edilen Taraf, sözleşme tarihinden sonraki 30 gün içinde, ihale dokümanları arasına dâhil ederek İdareye sunmuş olduğu Genel Kapsamlı Sorumluluk Matrisini yeterli ölçüde detaylandırıp güncelleyerek Detaylı Sorumluluk Matrisi oluşturarak Tayin Eden Tarafa sunacaktır. Tayin Eden Taraf 10 gün içinde Detaylı Sorumluluk Matrisini inceleyecek, onaylamazsa revizyonunu isteyecektir.

4.15. Tayin Edilen Taraf, onaylanan Detaylı Sorumluluk Matrisine uygun olarak bilgi üretimi ve yönetimi süreçlerini yürütecektir. Bu matris Tayin Eden Tarafın gerekli gördüğü hallerde revizyonu istenebilecek canlı bir doküman olarak kullanılmaya devam edecektir.

Ana Bilgi Teslim Planı

4.16. Ana Yüklenici, sözleşme tarihinden sonraki 30 gün içinde kendi kontrolü altında bulunan Teslim Ekibinin İş Bilgi Teslim Planlarına uygun olarak, Bilgi Alışverişi Gereksinimlerinde ilgili başlık kapsamında bir Ana Bilgi Teslim Planı oluşturarak, İşveren/İdareye sunacaktır. Bu planın gerekli görüldüğü ölçüde güncellenmesinden Ana Yüklenici sorumlu olacaktır.

4.17. Ana Yüklenici kendi kontrolü altında bulunan Alt Yüklenicilerin İş Bilgi Teslim Planlarının, Ana Bilgi Teslim Planına uygunluğundan sorumludur.

4.18. Ana Yüklenici, bu Şartname kapsamında yürüttüğü İşlerini güncel Ana Bilgi Teslim Planına uygun olarak sürdürdüğünü kabul eder.

İş Bilgi Teslim Planı

4.19. Ana Yüklenici, kendi kontrolü altında bulunan her Alt Yüklenicinin bir İş Bilgi Teslim Planı oluşturacağını ve bu planı proje süresince Bilgi Alışverişi Gereksinimlerine ve Detaylı Sorumluluk Matrisine uygun bir şekilde güncel tutacağını kabul eder.

4.20. Tayin Eden Tarafın Ana Yüklenici olması durumunda, Tayin Edilen Taraf işbu sözleşmenin imzalanmasını takiben 30 iş günü içinde Bilgi Alışverişi Gereksinimlerine ve Detaylı Sorumluluk Matrisine uygun olarak İş Bilgi Teslim Planını Tayin Eden Tarafa sunacaktır.

4.21. Taraflar, kendilerine uygulanabilir olan İş Bilgi Teslim Planına uygun olarak hareket edeceklerini ve kendi kontrolleri altında bulunan her Teslim Ekibinin de bu planlara uygun olarak davranacağını kabul eder. Tayin Edilen Taraf, bu planların sözleşmeden sonra güncellenmesi sonucunda oluşan hakları (eğer varsa) bu Şartname ve Sözleşmeye uygun olarak değerlendirilecektir.

4.22. Taraflar kendi kontrolleri altındaki Alt Yüklenicilerin Bilgi Standardına ve Bilgi Ayrıntılarına uygun olarak bilgi üreteceği ve gözden geçireceğini taahhüt eder.

5. Ortak Veri Ortamı (OVO) Çözümü ve İş Akışları

5.1. Tarafların bu Şartname ve Sözleşmede bahsedilen yükümlülüklerine zarar vermeksizin ve de Şartname, Şartname ekleri ve Sözleşmede açıkça veya zımni olarak tam tersi belirtilmediği müddetçe:

5.1.1. Bu Şartnamenin uygulanacağı bütün bilgiler ve Bilgi Modellerini hazırlamak için kullanılacak yazılımın: ya da

5.1.2. Bu Şartnamenin uygulanacağı bütün bilgiler ve Bilgi Modellerinin paylaşımında ve yayınlanmasında kullanılacak yazılım formatının

İş ile bağlantılı olarak diğer taraflarca kullanılan yazılım ve yazılım formatına uyumlu olduğunu garanti etmez.

5.2. Tarafların OVO Çözümü ve İş akışlarına uygun olarak paylaştıkları Bilgi Modelinin veya diğer bilgilerinin kendi paylaşımlarından sonra gerçekleşen ve bilgiyi temin eden tarafın Şartname ve Sözleşme şartlarına uygun bir şekilde sunduğu elektronik verilerin bozulması, kasıtlı veya kasıtsız olarak değiştirilmesiyle ilgili olarak diğer tarafa karşı bir mesuliyeti yoktur.

5.3. Sözleşme kapsamında Tayin Edilen Tarafın yükümlülükleri altında olmadığı sürece İşveren/İdare OVO Çözümü ve İş akışını TS ISO 19650-2'ye uygun bir şekilde kurmak, uygulamak, yapılandırmak ve desteklemek ile yükümlüdür.

5.4. İdare, Bilgi Ayrıntılarında belirtilen süre boyunca OVO Çözümü ve İş Akışındaki bilgilerin güvenli bir şekilde saklanmasını düzenleyecektir. İşveren/İdare bu bilgilerin belirtilen süre boyunca güvenliğinden, bütünlüğünden ve korunmasından da sorumlu olacaktır.

5.5. Tayin Eden Taraf, Tayin Edilen Tarafın OVO Çözümü ve İş Akışındaki bilgilere makul seviyede erişimini sağlamakla yükümlüdür. Bu makul seviye; işbu Şartname ve Sözleşme kapsamındaki gerekli yükümlülüklerini yerine

getirmek için yeterli olan erişim seviyesi ve bu Şartname ve Sözleşme altında yükümlülüklerini yerine getirmek için belirlenen süre olarak tanımlanabilir.

6. Bilginin Yönetimi

6.1. Tayin Edilen Tarafın bu Sözleşme altındaki yükümlülüklerin bir parçasını oluşturmadığı ölçüde, İşveren/İdare kendi adına bilgi yönetim fonksiyonunu üstlenecek ve TS ISO 19650-2'ye uygun bir şekilde yürütecek bir kişi ya da müşavir/danışman/mühendis ataması yapacaktır.

6.2. Atanan kişi ya da müşavir/danışman/mühendis bilgi yönetim görevini TS ISO 19650-2'ye uygun olarak gerçekleştirirken Bilgi Ayrıntılarına uygun bir şekilde teslim edilen Bilgi ve Bilgi Modellerinin Bilgi Alışverişi Gereksinimlerine uygun bir şekilde teslim edilip edilmediğini gözlemleyerek kabul işlemleri için gerekli adımları atacaktır.

6.3. Tayin Edilen taraf Bilgi Ayrıntılarında ve diğer Şartname dokümanlarında kendisine verilmiş olan bilgi yönetim görevlerini TS ISO 19650-2 standardına uygun bir şekilde yerine getirecektir. Bu görevler aşağıda verilen maddelerle kısıtlı değildir.

6.3.1. Bilgi yönetim görevini üstlenecek kişi ya da kişilerin atamak

6.3.2. Tayin Edilen Taraf, eğer Ana Yüklenici ise, kendisine bağlı olarak çalışan Teslim Ekiplerinin İş Bilgi Teslim Planlarını birleştirerek Ana Bilgi Teslim Planını oluşturmak

6.3.3. Sözleşme ile ilgili olarak Proje Bilgi Üretim Yöntem ve Prosedürlerini test etmek

6.3.4. Tayin Edilen Taraf, eğer Ana Yüklenici ise, kendine bağlı olarak çalışan Teslim Ekiplerinin sağlamış olduğu bilgileri gözden geçirerek OVO Çözümleri ve İş Akışına uygun bir şekilde İşveren/İdareye teslim etmek ve eğer teslim için uygun değilse reddedip düzenlettirerek yeniden teslim etmek

6.4. Taraflar kendilerine uygulanabilir oldukları ölçüde Proje Bilgi Standartlarına ve Proje Bilgi Üretim Yöntem ve Prosedürlerine bağlı kalacaklardır.

7. Bilgi İhtiyaç Seviyesi

7.1. Taraflar, Tayin Edilen Tarafın teslim edeceği bilgilerin Bilgi İhtiyaç Seviyelerinin ve / veya Bilgi İhtiyaç Seviyelerini belirlemeye yönelik ölçümlerin Bilgi Ayrıntıları kısmında belirtildiğini kabul ve beyan ederler.

8. Bilginin Kullanımı

8.1. Tarafların veri koruma ile ilgili yükümlülükleri Sözleşmeye uygun olarak belirlenecektir. Eğer Sözleşmede ilgili bir madde bulunmuyorsa, Tarafların İşle bağlantılı hak ve yükümlülükleri için Veri Koruma Dokümanları geçerlidir.

8.2. Taraflar şunları kabul eder:

8.2.1. Eğer Sözleşmede Tayin Edilen Tarafından hazırlanan ve/veya sunulan Materyal ile bağlantılı herhangi bir telif hakkı, manevi haklar, tasarım hakları, veri tabanı hakları (veya diğer fikri mülkiyet hakları) ile ilgili bir hüküm varsa, bu Şartnamenin 8.3. ve 8.5. maddeleri geçerli

olmayacak ve Sözleşmedeki maddeler aşağıdaki durumlar için gerekli olduğu takdirde değiştirilecektir:

a. Bu Şartname kapsamında veya onunla bağlantılı olarak Tayin Edilen Tarafından hazırlanan ve/veya sunulan Materyal ve Materyalde bulunan veya Materyalden elde edilen herhangi bir tescilli çalışmayı kullanmak; ve

b. Bu Şartnamenin madde 8.6 ve madde 8.9'da belirtilen sebepler gibi durumlarda Tayin Edenin, bu İş kapsamında Tayin Edilen Tarafa lisans ya da alt lisans vermek

8.2.2. Eğer Sözleşmede ilgi maddeler yoksa, bu Şartnamenin 8.3., 8.4. ve 8.5. maddeleri uygulanacaktır.

8.3. Madde 8.2 ile bağlantılı olarak, bu Şartname kapsamında veya onunla bağlantılı olarak Tayin Edilen Tarafından hazırlanan ve/veya sunulan Materyal ve Materyalde bulunan veya Materyalden elde edilen herhangi bir tescilli çalışmanın hakları Tayin Edilen Tarafa ait olacaktır.

8.4. Madde 8.2 ve 8.5 ile bağlantılı olarak, bu Şartname kapsamında veya onunla bağlantılı olarak Tayin Edilen tarafından hazırlanan ve/veya sunulan Materyal ve Materyalde bulunan veya Materyalden İzin Verilen Amaçlar doğrultusunda elde edilen herhangi bir tescilli malın iletilebilmesi, kopyalanması, çoğaltılması ve kullanılması için Tayin Eden Tarafa telifsiz ve geri alınamaz inhisari olmayan lisans verir. Bu lisans veya alt lisans, Tayin Eden Tarafın sözleşmesi olan diğer paydaşlara aynı şartlarda (bunlarla sınırlı olmamak üzere) alt lisans verme hakkı içerir.

8.5. Madde 8.4 kapsamında verilen herhangi bir ruhsat aşağıdaki durumlar için herhangi bir hak içermez:

8.5.1. Tayin Edilen Tarafın Sözleşme altındaki istihdamının sona ermesinin ardından İzin Verilen Amaçlar için bu tür bir değişiklik veya değişiklik yapılması durumu hariç olmak üzere, Lisans ve / veya alt lisansın ilgili olduğu herhangi bir Materyali, Tayin Edilen Tarafın yazılı izni olmadan tadil etmek veya değiştirmek; ya da

8.5.2. İşlerin herhangi bir uzantısı ile ilgili olan bir lisans ve/veya alt lisansın verildiği Materyalde bulunan herhangi bir tasarımı yeniden üretmek.

8.6. Madde 8.8'e tabi olarak, Tayin Eden Taraf, Tayin Edilen Tarafın alt yüklenicileri dışındaki herhangi bir üçüncü kişiye ait olan Materyalin iletilmesi, kopyalanması ve kullanılması ve İzin Verilen Amaçlar doğrultusunda bu Materyalde bulunan veya bu Materyalden elde edilen herhangi bir tescilli çalışma için Tayin Edilen Tarafa inhisari olmayan alt lisans (Tayin Edilen Tarafın alt yüklenicilerine aynı şartlarda alt lisans verme hakkı dâhil) verecektir.

8.7. Tayin Eden Taraf Materyalde mevcut olan herhangi bir hakka sahip olması durumunda, madde 8.8 uyarınca Tayin Eden Taraf, Materyalde bulunan veya Materyalden İzin Verilen Amaçlar doğrultusunda elde edilen herhangi bir tescilli malın iletilebilmesi, kopyalanması, çoğaltılması ve kullanılması için Tayin Edilen Tarafa inhisari olmayan lisans (Tayin Edilen Tarafın alt yüklenicilerine aynı şartlarda alt lisans verme hakkı dâhil) verecektir.

8.8. Eğer madde 8.6 ve 8.7 uyarınca bir lisans verilmişse, verilen bu lisans aşağıdakiler için bir hak içermez:

8.8.1. Tayin Edilen Tarafın Sözleşme altındaki istihdamının sona ermesinin ardından İzin Verilen Amaçlar için ve Tayin Edilen tarafından üretilen veya teslim edilen malzeme ile ilgili olarak bu tür bir değişiklik veya değişiklik yapılması durumu hariç olmak üzere, Lisans ve / veya alt lisansın ilgili olduğu herhangi bir Materyali, Tayin Edilen Tarafın ya da bu tür tescilli ürüne sahip olan Tayin Edilen Tarafın yazılı izni olmadan tadil etmek veya değiştirmek; ya da

8.8.2. İşlerin herhangi bir uzantısı ile ilgili olan bir lisans ve/veya alt lisansın verildiği Materyalde bulunan herhangi bir tasarımı yeniden üretmek.

8.9. Bu Şartnamenin 8.3. ve 8.5. maddelerinin uygulandığı ölçüde, ne madde 8.4'te belirtildiği gibi verilen bir lisans/ alt lisans ne de söz konusu lisans veya alt lisans uyarınca ve buna uygun olarak İşlerle bağlantılı olarak başkaları tarafından hazırlanan Materyal ve/veya tescilli ürünlerin kullanımı herhangi bir üçüncü tarafın haklarını ihlal etmeyecektir.

9. Bilginin Aktarımı

9.1. Tayin Edilen Taraf, Bilgi Detaylarında ve Şartname içinde sorumlu olduğu belirtilen belgelerin transferinden sorumludur.

9.2. Tayin Eden Taraf, Tayin Edilen Tarafın tesliminden sorumlu olduğu bilgileri teslim etmek için gerek duyduğu bilgilerin transferinden sorumludur.

9.3. Tayin Edilen Taraf, eğer Ana Yüklenici ise, Tayin Eden tarafın makul ölçüde talep edebileceği bilgi ve yardımı sağlayacaktır.

9.4. Tayin Edilen Taraf, eğer Alt Yüklenici ise, İş kapsamında yükümlülüklerini yerine getirirken karşılaştığı öğrenilmiş dersleri (lessons learned) kaydetmesi için Tayin Eden Tarafı bilgilendirmelidir.

10. Mesuliyet

10.1. Tarafların Bilgi Modeli, Materyal veya içerdikleri herhangi bir özel çalışmanın bilgiyi üreten taraf ve üreten tarafın alt yüklenicileri dışında, alıcı taraflar tarafından İzin Verilen Amaçlar dışında herhangi bir amaçla değiştirilmesi, iletilmesi, kopyalanması veya kullanılmasından kaynaklanan diğer Tarafa karşı hiçbir mesuliyeti olmayacaktır.

11. Bilgi Güvenliği İhlal Olayları Durumda Yaptırımlar

11.1. Tayin Eden Tarafın Sözleşmedeki ve Şartnamenin madde 11.2 ve 11.3'deki haklarına halel getirmeksizin:

11.1.1. Tayin Eden Tarafın, Tayin Edilen Tarafın bu Şartnamenin 4.8. maddesinde belirtilen şartları ihlal etmek üzere olduğunu düşünmesi halinde Tayin Edilen Tarafın bu sorunu düzeltmek için gerekli adımları atmasını, talebinde belirleyeceği makul bir süre içinde isteyebilir; ve

11.1.2. Eğer Tayin Edilen bu Şartnamenin 4.8. maddesini ihlal ederse, Tayin Eden Taraf, kendi takdirine bağlı olarak, talebinde belirttiği makul süre sonunda bu ihlalin sonuçlarını gidermek için cezai yaptırım uygulayabilir.

11.2. Eğer Sözleşme Tayin Eden Tarafın sözleşmeyi feshedebilme hakkı veren bir hüküm içeriyorsa, bu hükümler Tayin Edilen Tarafın aşağıdaki hallerden birinde bulunması durumunda gerekli görüldüğü ölçüde değiştirilecektir:

11.2.1. Tayin Edilen Taraf, bu Şartnamenin 11.1.1. ve 11.1.2. maddelerinin öngördüğü ölçüde davranmaması

11.2.2. Bu Şartnamenin 4.8. maddesinde bahsi geçen hassas bilgiler ile ilgili bir ihlali sonucunda cezai işlem uygulanmaması ve/veya sorunun giderilememesi

durumlarında Tayin Eden Taraf sözleşmeyi feshedebilecektir. Bu şekilde bir fesih işleminin sonuçları da Sözleşmede bahsedilen fesih hükümleriyle aynı olacaktır.

11.3. Eğer Sözleşme madde 11.2'deki gibi Tayin Eden Tarafın sözleşmeyi feshedebilme hakkı veren bir hüküm içermiyorsa, Tayin Eden Taraf bu Şartnamenin 11.2.1 ve 11.2.2. maddelerindeki haller durumunda sözleşmeyi feshedebilir. Böyle bir feshi takiben Tayin Edilen Taraf:

11.3.1. Sözleşme altında kendisinin ve altında çalışan diğer yüklenicilerin verdiği servis ve hizmetleri hemen sonlandıracaktır.

11.3.2. Fesih anından sonra gerçekleştirmiş olduğu hiçbir iş için bir ücret talep edemeyecektir.

11.3.3. Bilgi Ayrıntılarına uymak ve/veya bu Şartnamenin herhangi bir ihlali ile ilgili ortaya çıkan sorunu gidermek için ama bunlarla sınırlı kalmayan adımları atmak için Tayin Eden Tarafın vermiş olduğu tüm talimatlara uyacaktır.

12. Sözleşmenin Feshi

12.1. Sözleşmenin herhangi bir nedenle feshedilmesinden sonra bu Şartnamenin 1, 2,4.10,5,8,9.4,10,11.2 ve 11.3 maddelerindeki hükümler uygulanmaya devam edecektir.

13. Terimler

13.1. **Alt Yüklenici:** Ana Yüklenicinin işlerinin belirli kısımlarını yaptırmak için sözleşmesi bulunan kişi ya da kurum.

13.2. **Ana Bilgi Teslim Planı:** Teslim Ekiplerinin İş Bilgi Teslim Planlarının birleştirilmesiyle Bilgi Standardına uygun olarak Ana Yüklenici tarafından oluşturulan plan.

13.3. **Ana Yüklenici:** İşveren/İdare ile direkt sözleşmesi bulunan, İşi üstlenen yüklenici.

13.4. **Bilgi:** Verilerin iletişim, yorumlama veya işlemeye uygun, formüle bir şekilde yeniden yorumlanabilir temsili.

13.5. **Bilgi Ayrıntıları:** Bu Şartnamenin giriş sayfasında verilen tablo ve içerisinde belirtilmiş dokümanlar.

13.6. **Bilgi İhtiyaç Seviyesi:** Bilgi Ayrıntılarında tanımlanabilecek veya Bilgi Standardına uygun olarak sağlanabilecek bilginin kapsamını ve ayrıntı düzeyini tanımlayan çerçeve.

13.7. **Bilgi Modeli:** Geometrik bilgi, alfanumerik bilgi ve belgelerin herhangi bir kombinasyonunu içeren bir dizi yapılandırılmış ve/veya yapılandırılmamış bilgi.

13.8. **Bilgi Standardı:** Zaman zaman değiştirilebilen veya değiştirilebilen mevcut TS ISO 19650 serisi.

13.9. **Bilgi Teslim Planı:** Ana Bilgi Teslim Planı ve İş Bilgi Teslim Planından ilgili Tarafın sorumlu olduğu bilgi teslim planı.

13.10. **BIM Uygulama Planı:** Sorumlu olduğu İşlerin bilgi yönetimi yönlerinin, Bilgi Ayrıntılarında belirtildiği gibi ve / veya Bilgi Standardına uygun olarak sağlandığı gibi Teslim Ekibi tarafından nasıl yürütüleceğini açıklayan bir plan.

13.11. **Birleşik Bilgi Modeli:** Birbirine bağlı ancak farklı bireysel Bilgi Modellerinden oluşan bir Bilgi Modeli.

13.12. **Detaylı Sorumluluk Matrisi:** Bilgi Standardına uygun olarak verilebileceği üzere, hangi bilgilerin üretileceğini, bilginin ne zaman değiştirileceğini ve kimin ve hangi paydaşın üretiminden sorumlu olduğunu belirten bir Sorumluluk Matrisi.

13.13. **Genel Kapsamlı Sorumluluk Matrisi:** Bilgi Modelinin her bir unsuru için tahsis edilmiş sorumluluğu ve Bilgi Ayrıntılarında tanımlanabilen ve / veya Bilgi Standardına uygun olarak sağlanabilen her unsurla ilişkili temel çıktıları içeren bir Sorumluluk Matrisi.

13.14. **Güvenlik Odaklı Maddeler:** Bu Şartnamenin 1.5, 4.8 ve 11. maddeleri

13.15. **Güvenlik Yönetim Planı:** Bilgi Ayrıntılarında tanımlanan belge (veya belgenin bir kısmı), içinde atıfta bulunulan tüm politikalar, protokoller, süreçler ve prosedürler de dahil olmak üzere, İşleri güvenlik odaklı bir şekilde yürütmek için güvenlik gereksinimlerini ortaya koyan doküman.

13.16. **İşveren/İdare:** Bilgi Ayrıntılarında tanımlandığı gibi Sözleşme kapsamında İşveren olarak belirtilen kurum.

13.17. **Bilgi Alışverişi Gereksinimleri:** Sözleşme ile bağlantılı olarak hangi bilgilerin ne, ne zaman, nasıl ve kim için üretileceğine ilişkin Tayin Eden Tarafın Bilgi Ayrıntılarında tanımlanabileceği ve / veya Bilgi Standardına uygun olarak sağlanabilecek bilgi gereksinimleri. (Bkz. ISO 19650 3.3.6)

13.18. **İş Bilgi Tesli Planı:** Bilgi Ayrıntılarında tanımlanabilen ve / veya Bilgi Standardına uygun olarak sağlanabilen, Tayin Edilen Tarafın yetkisi ve kontrolü altındaki herhangi bir Görev Ekibi için geçerli olabilecek bilgi ve teslim tarihleri programı.

13.19. **İşler:** Bilgi Ayrıntılarında açıklanabileceği gibi Sözleşmenin ilgili olduğu proje veya varlıkla ilgili olarak Teslim Ekibi tarafından yürütülen ve / veya gerçekleştirilecek iş ve / veya hizmetler.

13.20. **İzin Verilen Amaçlar:** Aşağıdakilerle bağlantılı olarak, yürütülen İşler ile ilgili herhangi bir amaç

a. İlgili Materyal için uygun olan Bilgi İhtiyaç Seviyesi
b. TS ISO 19650-2 uyarınca OVO Çözümü ve İş Akışı içerisindeki Materyal ve bilginin geçerli durum kodu (status code of information container)

c. TS ISO 19650-2 uyarınca Materyalin geçerli bilgi durumu (information state)
ç. İlgili Materyalin üretilme amacı

13.21. **Kişisel Veri:** Uygulanabilir Veri Koruma Dokümanında kullanıldığı anlamdaki kişisel veri.

13.22. **Materyal:** Herhangi bir paydaş tarafından bir Bilgi Modeli üretmek için temin edilmiş bilgi ve dokümanlar da dahil olmak üzere Alt Yüklenici ve/veya Ana Yüklenici ve/veya Tayin Edilen Taraf ve/veya Tayin Eden Taraf ya da İşler ile ilgili herhangi bir yüklenici tarafından üretilmiş ve sağlanmış fiziksel ya da elektronik ortamda bulunan geometrik modeller ve Bilgi Modelleri dahil olmak üzere bütün çizimler, hesaplamalar, şartnameler ve diğer tasarım ve malzemeler.

13.23. **Ortak Veri Ortamı:** Yönetilen bir süreç aracılığıyla her bilginin (information container) toplanması, yönetilmesi ve yayılması için herhangi bir proje veya varlık için mutabık kalınan bilgi kaynağı.

13.24. **OVO Çözümü ve İş Akışı:** Ortak Veri Ortamı ve Ortak Veri Ortamının bir parçası olarak kullanılacak süreçler ve bu süreçleri destekleyecek teknoloji

13.25. **Proje Bilgi Standartları:** Bilgi Ayrıntılarında tanımlanabilen veya belirtilebilen İşler için Görevlendiren Tarafın gerektirdiği özel bilgi standartları.

13.26. **Proje Bilgi Üretimi Yöntem ve Prosedürleri:** Bilgi Ayrıntılarında tanımlanabilen veya belirtilebilen İşler için İşveren/İdarenin gerektirdiği özel bilgi üretim yöntemleri ve prosedürleri.

13.27. **Risk Kaydı:** Bilgi Ayrıntılarında tanımlanabilen ve / veya Bilgi Standardına uygun olarak sağlanabilen bilgilerin zamanında sunulmasıyla ilgili riskleri içeren bir risk kaydı.

13.28. **Şartname:** Bilgi Ayrıntıları dahil olmak üzere bu şartname.

13.29. **Sorumluluk Matrisi:** Bilgi yönetimi işlevlerini ve proje veya varlık bilgi yönetimi görevlerini veya uygun şekilde bilgi çıktılarını belirten belge.

13.30. **Sözleşme:** Bilgi Ayrıntılarında belirtilebileceği üzere, bu Protokolün dahil edildiği anlaşma.

13.31. **Taraflar:** Tayin Eden Taraf ve Tayin Edilen Taraf.

13.32. **Taslak BIM Uygulama Planı:** Ana Yüklenici tarafından ihale teklif belgelerine dahil edilmiş olan BIM Uygulama Planı

13.33. **Tayin Eden Taraf:** Bilgi Ayrıntılarında belirtildiği üzere Sözleşme altında Tayin Edilen taraf ile sözleşme yapan işveren.

13.34. **Tayin Edilen Taraf:** Bilgi Ayrıntılarında belirtildiği üzere Sözleşme altında Tayin Eden Tarafından sözleşme yapılan taraf (Ana yüklenici veya Alt Yüklenici)

13.35. **Teslim Ekibi:** Tayin Edilen Tarafın parçası olduğu Ana Yüklenici ve Alt Yüklenicilerinin oluşturduğu ekip

13.36. **Veri Koruma Dokümanları:** Taraflardan herhangi birine ve/veya Sözleşme ile bağlantılı olarak Taraflardan herhangi birinin haklarına, sorumluluklarına ve/veya yükümlülüklerine uygulanabilir olduğu sürece:

a. Kişisel Verileri Koruma Kanunu (KVKK),

b. Taraflardan herhangi birine ve/veya Sözleşme ile bağlantılı olarak Taraflardan herhangi birinin hakları, sorumlulukları ve/veya yükümlülükleri için geçerli olan Kişisel Verilerin işlenmesi, gizliliği ve/veya kullanımına ilişkin diğer geçerli yönetmelik/yasa/kanunlar,
c. Bu tür yasaları uygulayan herhangi bir yasa; ve
ç. Yukarıdakilerin herhangi birini değiştiren, genişleten, yeniden yürürlüğe koyan, konsolide eden veya değiştiren herhangi bir yasa.

14. Ekler

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