CHANGING ROLE(S) OF THE PROFESSION OF ARCHITECTURE: BUILDING INFORMATION MODELING IN PRACTICE

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ABSTRACT

CHANGING ROLE(S) OF THE PROFESSION OF ARCHITECTURE: BUILDING INFORMATION MODELING IN PRACTICE

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This research is an inquiry on the roles undertaken by architects in the complex process of designing and realizing buildings. It focuses on the changing AEC context in Turkey and interprets these changes from the scope of Building Information Modeling (BIM), which claims the instrumentalization of a new mode of production of buildings. Reading BIM as a reflection of the increasing demands of AEC context on the architects' modes of operation, the thesis evaluates how the changing mode of production of buildings affects the roles of the profession of architecture.

Keywords: Profession of Architecture, Building Information Modelling, BIM, AEC, Architecture Engineering Construction Context

ÖZ

MİMARLIK MESLEĞİNİN DEĞİŞEN ROLLERİ: UYGULAMADA BİNA BİLGİ MODELLEMESİ

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Bu tez, binaların tasarımı ve inşaatını içeren karmaşık süreçte mimarların üstlendiği roller üzerine bir araştırmadır. Tezde Türkiye'de değişmekte olan Mimarlık-Mühendislik-İnşaat sektöründeki değişimler incelenmiş ve bu değişimler yeni bir yapı üretim biçimi olduğu iddiasıyla tanımlanan Yapı Bilgi Modellemesi (BIM) çerçevesinde yorumlanmıştır. Yapı Bilgi Modellemesi uygulamalarını güncel inşaat bağlamının bir yansıması olarak ele alarak, yapıların üretilme biçimlerindeki farklılıkların mesleki roller üzerine olan etkisi değerlendirilmiştir.

Anahtar Kelimeler: Mimarlık Mesleği, Bina Bilgi Modellemesi, BIM, Mimarlık-Mühendislik-İnşaat Bağlamı

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INTRODUCTION

The rapid changes in the way buildings are designed, constructed, and managed in the present day exert significant pressures on professionals practicing in the Architecture-Engineering-Construction (AEC) context. These pressures readily trigger changes in the practice of architecture: as clients' expectations from architects are altered, so are the tools and modes of production through which architects operate. In this respect, the changes in the AEC context imply new requirements, new modes of practice, and thus new professional roles for architects among professionals from other disciplines. As Thom Mayne of the architecture firm Morphosis explicitly points out, the profession of architecture has to adapt itself to change, or perish.[1]

This study aims to investigate the position of the profession of architecture within the process of Building Information Modeling (BIM) by investigating how BIM addresses the changes in the AEC context. Recent changes in the AEC context of Turkey are evaluated in comparison with the more established contexts in which BIM is widely adopted. In turn, the dissertation evaluates the implications of the changing AEC context on the practice of BIM, and identifies potential changes in the way architects are to be positioned within the growing complexity of the design process.

Over the last decade, the Turkish AEC context has attracted global attention in terms of scales and investments, partly being a reflection of the governmental efforts to position construction as the flagship national industry. By consequence, the practice of architecture in Turkey is increasingly being subjected to the pressures of the AEC

[1] Thom Mayne, "Change or perish," in *Report on Integrated Practice 1*, last accessed June 14, 2015. http://www.aia.org/aiaucmp/groups/aia/documents/document/aias076762.pdf .

context. The adoption of BIM in Turkey is yet to reach the levels of global counterparts, however the present demands of the Turkish AEC context already match the motives and claims of BIM for efficiency. In this respect, Turkish AEC context is of special interest for the dissertation, since its inferences on the profession of architecture can be put to test in prospective practice.

1.1 Scope of Research

The products of architecture comprise a vast literature spanning through centuries of research. The profession itself, however, has become a focus for scholarly research as late as the second half of the twentieth century. This is particularly interesting considering the fact that architecture is one of the oldest professions established. In his seminal volume titled *The Architect: Chapters in the History of the Profession*, Spiro Kostof presents that the title "architect" has mostly been a self-proclaimed status until the late 19th – early 20th centuries. In addition, he points out that the majority of the existing building stock is designed by non-architects. Consequently, he suggests a rather open-ended definition of the profession of architecture: "We are dealing with the profession of architecture, the specialized skill that is called upon to give shape to the environmental needs of others."[2]

The fluidity in the definition of the profession of architecture[3] renders it both hard and interesting to examine. The roles associated with the profession along its history cover diverse responsibilities in the conceptualization and production of buildings. The ancient master-builders of the antiquity, state architects of Rome employing several colleagues of several rankings, the grand masters of Renaissance, academy-trained practitioners of *école*s, the CEOs of architectural corporations in the corporate economy all undertook different duties and held varying ranks in the hierarchy of

[2] Spiro Kostof, "Preface" in *The Architect: Chapters in the History of the Profession,* Spiro Kostof (ed.). 2nd ed. (New York: The Oxford University Press, 2000), xviii.

[3] As indicated in Kostof's definition of the profession, the profession of architecture is framed according to the environmental needs of others. This interpretation renders the definition of the profession fluid in the sense that the profession continuously adapts itself according to the environmental needs brought forward by the socio-economic context.

building production. The changes in these roles that transformed the profession to newer states in the history of the profession are well documented and beyond the research intentions of this dissertation. What is more of concern to the present research are the causalities that make inquiries into the complex network of building production fruitful. The key literature on the role of the profession of architecture share the common ground of causality, linking the responsibilities of the architect with the socio-economic contexts in which building production processes take place. Within the scope of this thesis, a framework for establishing the relationships between the profession and the context has been constructed from critical reading of the three key sources on the role(s) of the profession: *The Architect: Chapters in the History of the Profession* by Spiro Kostof; *Architectural Practice: A Critical View* by Robert Gutman; and *Architecture: The Story of Practice* by Dana Cuff. Although these literature on the role(s) of the profession do not extend to speculate on the potential future of common-practice under BIM, they nevertheless provide an initial framework to be modified and used for further inquiries.

The profession's causal relations with the context point out that the role of the profession is once more subject to change, as the conditions in which the architect operates undergo wide-spread changes that occur more rapidly than ever. The situation is clearly explained by Dana Cuff in her Epilogue to *The Architect: Chapters in the History of the Profession*:

> Professional standards which tacitly and explicitly have governed the profession are under siege: computers have undermined the role of the author, the need for technical competence requires that firms collaborate, the market insures the success of aggressive entrepreneurs, generalist practices must be packaged for the media. To cope and thrive under such conditions, which fundamentally contradict traditional values, practitioners must reconsider the persistent but outdated notion of professionalism.
>
> This is already occurring as individual architects and firms respond to forceful new directions set by the context for work. The kinds of changes that are transpiring in piecemeal fashion within architectural practices will only proliferate in the coming decades. Both local politics as well as increasing

> global trade will undermine the current notions of professional licensure. Professional unity will be further challenged by the increasing diversity among practitioners who call themselves architects. Unless the profession's leadership consciously and creatively adapts to change rather than reasserts the typical resistance, the profession will be weakened by these changes.[4]

The thesis proceeds from the assumption that current BIM practice represents an important aspect of the profession's efforts to adapt the changing face of the socio-economic context of construction. This assumption is based on two points: The first emerges from the definition of the profession and the historical roles assigned to the architect: Historical survey of the profession's evolution points out that the mode of building production has always been conditioned by the relations of socio-economic context in which it operates. Referring back to Kostof's definition of the profession quoted earlier, architecture is conceptualized as the specialized skills that give shape to the environmental needs of others. Within the framework of this definition, neither the "others" nor their "environmental needs" can be held independent from the social and economic context in which they exist. As architecture is called upon to help the "others" with their "environmental needs", it is strongly related with the context of construction. The second point rises from recognizing that the claims associated with BIM workflow typically address long-existing complaints of the AEC industry. Although earlier research on linking a digital representation of a building with an information database are motivated at least partly by an enthusiasm for better design media, their goals are harmonious with the industry's concerns for speed and efficiency in design. Consequently, commercial BIM software in contemporary practice take pride in their potential to design and coordinate projects on time and budget.[5] Furthermore, BIM workflow particularly emphasizes effective collaboration

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[4] Dana Cuff, "Epilogue: Still Practicing" in *The Architect: Chapters in the History of the Profession,* 2nd edition, ed. Spiro Kostof. (New York: The Oxford University Press, 2000), 355-56.

[5] The white paper published by Autodesk titled "Building Information Modeling", which is one of the key grey literature in spreading the term BIM globally, states that "The application of building information modeling solutions results in higher quality work, greater speed and productivity, and lower costs for building industry professionals in the design, construction, and operation of buildings."

among design professionals, which is increasingly becoming a subject of debate as building programs become more complex.[6]

The emergence of ortographic drawings, parallel projections, construction documents, computer-aided-drafting, etc. all signify efforts to meet the changing demands made on architects and eventually lead to new roles for the profession. In the case of BIM, a new role for the profession has been a claim of the medium from the beginning and has quickly been adopted as a catchphrase for software developers as well as many practitioners.

1.2 Building Information Modeling

> As digital technology begins to filter into the everyday lexicon of the construction process, becoming the norm as opposed to the exception, it is initiating a sea change in the way buildings are planned, designed and built. At the centre of this process is building information modelling (BIM).[7]

Building Information Modeling, as the name indicates, refers to digitally modelling a building by constructing a database with information on the components that make up the structure. It is a process of planning, designing, building, and maintaining a building. In this sense, BIM extends beyond a common term for drafting software to define a certain mode of production of buildings.[8] In his introductory volume on BIM,

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Autodesk, *Building Information Modeling*, white paper, last accessed June 9, 2014. http://images.autodesk.com/apac_sapac_main/files/4525081_BIM_WP_Rev5.pdf .

[6] For instance, "National BIM Report 2014" published by Royal Institute of Brisith Architects (RIBA) notes that "For the design team, there are clear benefits of collaboration, visualisation, coordination and information retrieval. This readily translates into increased cost efficiencies and profitability." Richard Waterhouse, introduction to *NBS National BIM Report 2014*, (RIBA Enterprises, 2014), 3.

[7] Coren Sharples, "Unified Frontiers: Reaching Out with BIM", *Architectural Design* v.79, issue 2, (2009): 43.

[8] It should be noted that this argument is not to counter the efforts to popularize the term BIM as a common denominator for software similar to CAD. Rather, the point is that the term BIM defines a mode of production that is shared by all the BIM-software-induced design-build-maintain cycles. For further reference on BIM as a common term: Jerry Laiserin, "Comparing Pommes and Naranjas", in *The Laiserin Letter*, Issue No:15, 2002, last accessed June 4, 2014, http://www.laiserin.com/features/issue15/feature01.php .

Charles Eastman explains that BIM is "[…] an activity (*building information modeling*), rather than an object (as in *building information model*) […] BIM is not a thing or a type of software but a human activity that ultimately involves broad process changes in construction."[9] In other words, BIM implies a process of the constructing a design virtually by creating a database of information. This database contains information about materiality, geometric constraints, and various related information about a physical structure. It constitutes both the representations needed to design and communicate ideas, and the information needed to construct and maintain the building.[10] As such, the mode of production via building information modeling claims a unification of information that serves all the involved design parties (including the client):

> The big picture is that BIM will facilitate early integration of project design and construction teams, making closer collaboration possible. This will help make the overall construction delivery process faster, less costly, more reliable, and less prone to errors and risk.[11]

The challenge that BIM sets out for is covering the whole production process of buildings, spanning from conceptual design to facilities management of the constructed building in a single information model. For the architect, designing a building via information modelling promises a new mode of production much different from the conventional Computer-Aided-Drafting (CAD) systems. CAD systems –which appear to be the predominant medium in the practice of architecture in the present– work on drawings of buildings to communicate the designs to other design participants. BIM, on the other hand, proceeds by working on building

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[9] Chuck Eastman et. al., *BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors,* (New Jersey: Wiley and Sons, 2008), 286.

[10] Charles M. Eastman, *Building Product Models: Computer Environments Supporting Design and Construction*, (Boca Raton, Florida: CRC Press, 1999), 5-27. - Eastman identifies six individual phases in the life-cycle of a building: feasibility – design – construction planning – construction – operation & management – demolition planning. He explains that all of these stages indeed may be generated by and benefit from a single building product model.

[11] Chuck Eastman et. al., *BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors,* 286.

information *through* drawings.[12] That is to say, unlike CAD systems, drawings are not the end product but an intermediary medium in the BIM system. Hence the process emphasizes the production of a building more than the production of a drawing.

It should be underlined that these potential contributions of BIM to the mode of production of buildings are based mainly on the claims associated with research and software capabilities within BIM from 1970s onwards. One of the earliest research on creating a building information database, Building Description System (BDS) developed by Charles Eastman, emerged from the criticism of inefficiency in design and implementation of buildings due to redundancy and difficulty in managing information.[13] BDS involved the use of individual library items which were combined to make up a model of the design. In the case of both BDS and the later developed GLIDE, Eastman argues for the construction of a shared database which outlines similar abilities to current BIM platforms:

> The information describing a particular design effort is organized as a project database. It holds part and assembly information, data needed for engineering analyses and other information unique to the current project. The project database may refer to project independent data, that describes supporting information determined exogenously from any particular project. Typical contents of project independent data might be material properties and standard part catalogs. Multiple users access and extend the project database, each class of user interacting through a unique subschema or view of the database. From the project database, data is extracted and passed to a number of integrated or stand-alone application programs. An interface to independently implemented applications would consist of a mapping program that computes needed dependent data and formats it with other stored information to generate the proper input stream for the application, in character or possibly binary form. A number of reports also are generated, including

[12] Autodesk, *Building Information Modeling*, 3. It is explained that individual drawings are the goals in the case of CAD, but are rather intermediary tools in the case of BIM.

[13] Charles M. Eastman, "The Use of Computers Instead of Drawings In Building Design", *AIA Journal*, (March 1975): 46-50.

> intermediate and final drawings, specifications, and production information.[14]

Eastman expected a considerable amount of decrease in project costs by virtue of the high efficiency in drafting and analysis of building components, which forms one of the most important claims of BIM in the present context. While Eastman's criticism over the redundancy of drafting and inefficiency in the distribution of knowledge still holds correct in the present, the platforms developed through research at that time were not widely experimented on as a very limited number of people had access to the software and computers.[15] A commercially more viable alternative to conventional design processes was available only by 1982 when Gábor Bojár programmed ArchiCAD for use on personal computers and made the concept of "Virtual Building" available as a commercial entity in 1987. Meanwhile, similar platforms for designing by database building emerged and were introduced into the field of practice.[16] Still, these efforts could not gain much popularity in practice as they were slower and harder to operate when compared to CAD systems. Hence one can argue for the potentials promised by earlier BIM-like platforms, but not for a change in the role of the profession because they could not merge with practice on a larger scale.

In order to be able to argue for a change in the mode of production of buildings, one needs to consider the availability of tools to design professionals and a trend towards adopting new systems. In the case of BIM, such conditions began to emerge from the 2000s onwards. The white papers published by large-scale software vendors such as

[14] Charles M. Eastman, "System facilities for CAD databases", *Paper 1592,* Carnegie Mellon University Computer Science Department, (1979): 6, last accessed July 22, 2014. http://repository.cmu.edu/cgi/viewcontent.cgi?article=2591&context=compsci .

[15] As the focus of this thesis is on the adoption of BIM as a practice process, academic research on information modeling systems have been purposefully left out of this discussion. There is however a considerable body of research on design interfaces and software from the 1970s onwards. In the present context, research interests on the subject focus around interoperability and efficiency issues. Research on information modeling will be elaborated in the corresponding chapter in terms of its influence on the way BIM is experienced today.

[16] To provide some examples, RUCAPS by GMW Computers, GDS (continued as MicroGDS), Allplan (now marketed as Nemetschek Allplan Systems), and Vectorworks can be counted among relatively more adopted systems at the time.

Autodesk, Graphisoft, and Bentley Systems[17] displayed an inclination towards the new BIM platforms, which were backed by more organized efforts to promote respective software. The introduction of universal standards such as Industry Foundation Classes (IFC),[18] helped transforming BIM into a mode of production that could be distributed among multiple platforms (for multiple professions) rather than a single one, and as such made collaboration easier for design professionals. These among other advancements in turn created a rising interest on BIM especially in countries with large market economies such as United States and United Kingdom. The adoption of BIM in North America is reported to have increased from 28 percent in 2007 to 71% in 2012.[19] The UK Government has announced a nationwide policy stating that all public construction sector will be obliged to convert to BIM sectors by 2016.[20] The initial report on BIM published in 2011 by Royal Institute of British Architects' National Building Specification (NBS) in United Kingdom opens with the prediction that BIM will change modes of production in the AEC industry:

> Incorrectly seen as a technological solution to CAD integration, BIM places the effective use and exchange of 'Information' at its heart. As a result, BIM will have an impact on most areas of business management and operation. It will revolutionise methods of working and fundamentally redefine the relationships between construction professionals. It will challenge current thinking on contracts and insurance and

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[17] Autodesk, *Building Information Modeling*; Cyon Research, *The Building Information Model: A Look at Graphisoft's Virtual Building Concept*, white paper, 2003.

[18] Put very briefly, IFC denotes neutral and interchangeable file format specifications that enable the transition of information models among different platforms for use in different stages of production. IFC is important for practice through BIM, because it removes any dependence on specific software. In this respect, BIM becomes a mode of production, rather than a specific set of software.

[19] McGraw-Hill Construction, *The Business Value of BIM in North America: Multi-Year Trend Analysis and User Ratings, Smart Market Report*, 2012, 9, last accessed June 6, 2014. http://images.autodesk.com/adsk/files/mhc_business_value_of_bim_in_north_america_2007-2012_smr.pdf .

[20] HM Government, *Industrial Strategy: Government and Industry in Partnership*, white paper, last accessed June 6, 2014. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/34710/12-1327-building-information-modelling.pdf .

> most importantly, it will support the integration of the design and construction teams.[21]

NBS' 2011 survey on BIM adoption reports that 13 percent of survey attendees were either aware of BIM or already adopted BIM intheir practices. The 2014 survey reports an increase in the percentage up to 54 percent of BIM adoption among more than 1000 professionals. In the same survey, 92 percent of BIM users and 93 percent of non-BIM users agreed that adopting BIM requires changes in their workflow, practices and procedures.[22] Thus one can justify a trend of change in the way buildings are designed in the case of large-market economy countries.

Although the density with which BIM is employed as a mode of production in large-market economies may not be paralleled in developing economies, it can still be suggested that the adoption of BIM as a major mode of production is globally underway.[23] The condition in developing economies such as Turkey is not well documented, and the information available relies more on the claims of software vendors than actual data. As most of the cases examined in the thesis operate in Turkish construction context, it is important to assume the findings of reports such as NBS or American Institute of Architects (AIA) papers as hypothetical conditions and approach them through a critical lens. That being said, the demands of AEC industry (i.e. faster design processes, lower costs, and better performance of buildings) in Turkey are in concert with the claims of BIM on a global scale.

In brief, BIM brings forward an important set of claims that address the rising demands of the construction industry. The Autodesk white paper titled "Building

[21] Richard Waterhouse, "Putting the 'I' into the BIM", in *NBS National BIM Report 2011*, RIBA Enterprises, 2011, 3.

[22] Adrian Malleson, "BIM Survey: Summary of findings", in *NBS National BIM Report 2014*, RIBA Enterprises, 2014, 21.

[23] In the BIM seminar titled "*Şimdi Türkiye'de BIM Zamanı"* (Now is the time for BIM in Turkey) on June 4, 2013 in Ankara, Autodesk representatives along with BIM practitioners ERA Architecture express the increasing interest among design professionals in BIM and its benefits for the industry. Ali Hızıroğlu and Ekim Orhan İsmi, "ERA Mimarlık", lecture, *Şimdi Türkiye'de BIM Zamanı* from Autodesk, Ankara, 4 June 2013. http://www.yemetkinlik.com/etkinlik/autodesk-simdi-turkiyede-bim-zamani-semineri-189.html .

Information Modeling" summarizes these claims as "Higher Quality", "Greater Speed", and "Lower Cost", which cover a wide range of issues from various stages of the production of buildings.[24] Considered in light of reports and documentation, it appears that professionals confirm the validity of these claims to a degree and confirm a change in their design methods and responsibilities. Moreover an increasing number of institutions globally display efforts to encourage professionals to work via BIM.[25] Altogether, the tendency to adopt BIM points to a new mode of production of buildings, and implies new roles for design professionals.

1.3 Roles of the Profession

As has been discussed earlier, BIM is a mode of production that claims solutions to the shortcomings of the AEC industry. Correspondingly, much of the literature on BIM and its position in professional practice are based on the claims of BIM, so as to increase efficiency, coordinate collaborations better, and lower the costs associated with building production. As the conception of BIM readily suggests, this line of research focuses primarily on higher quality, greater speed, and lower costs in the production of buildings.

While this study benefits from the aforementioned track of research on BIM, its primary interest lies in the profession of architecture. Considering the promise of BIM as a new mode of production as its starting point, the dissertation aims to examine and evaluate the role of the architect in the design, construction and management cycles of buildings. In this respect, the thesis seeks to contribute to the understanding of the architect's responsibilities in BIM, and elaborate on potential future positions on this basis.

The literature on BIM in practice mostly foresee a more powerful position for the architect among other design professionals. By virtue of integrated practice, architects

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[24] Autodesk, *Building Information Modeling*, 5-6.

[25] Countries such as Australia, Norway, United Kingdom, Singapore, China, and Finland already display governmental efforts to encourage use of BIM in the AEC industry.

would have more control over the idea of the building, as they will be informed on any necessary compromises beforehand and take necessary action. At the peak of this discussion is the idea that BIM will signify a return to the role of the master-builder for architects.[26]

On the other hand, BIM also implies a mechanization of the design process and thus a decline in the role of the architect in the overall process. In his article titled “Four Arguments for the Elimination of Architecture (Long Live Architecture)”, Sanford Kwinter summarizes the concerns over the future of the profession.[27] Kwinter points out that the dependence on information, the increasing power of administrative apparatuses over the design, the concerns of the market-economy and over-emphasis on computational research all may result in a disengagement of the profession from the act of building. Correspondingly, Richard Foque refers to architecture as a process of "fractured design situation"[28] that may reduce the role of the architect to an "aesthetic building surgeon."[29]

These two different positions render the role of the profession under BIM as the focus of the dissertation. The thesis approaches the claims associated with BIM from the framework of the changing AEC context, and evaluates the roles of the profession in light of these changes.

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[26] To put briefly, Eastman’s two seminal volumes on BIM explain that easier access to information results in more power over the design of the building. A series of research supervised and conducted by Spiro Pollalis at Harvard University imply higher quality in building design via effective architect-led collaboration. There are also important contributions to this view from practicing professionals, such as Coren Sharples of SHoP Architects and Patrick Schumacher of Zaha Hadid Architects with his Parametricist Manifesto, explaining that design excellence and competence in the present context is highly dependent on the potentials provided by BIM. Perhaps being an overstatement, the Chief Construction Adviser of British Government, Paul Morrell, argues that BIM will transform the role of the architect back to that of the master-builder with complete control over the design and construction process. Morrell is particularly influential in UK Government’s decision to make BIM obligatory for all public construction sector.

[27] Sanford Kwinter, "Four Arguments for the Elimination of Architecture (Long Live Architecture)," in *The Stage of Architecture at the Beginning of the 21st Century*, Bernard Tschumi and Irene Cheng eds., (New York: The Monacelli Press, 2003), 94-95.

[28] Richard Foqué, *Building Knowledge in Architecture*, (Brussels: University Press Antwerp, 2011), 98.

[29] Foqué, *Building Knowledge in Architecture*, 96.

1.4 Research Framework and Literature Review

> Every building embodies what its designer believes about clients, buildings, society, and himself, yet every building is inevitably the product of activity, customs, tools, and circumstances over which he has little or no influence.[30]

From the initial design idea to ongoing inhabitance period, the life-cycle of a building is shaped by a wide range of factors. While the architect possesses at least a fraction of control on the production of buildings, it is certain that the context in which the buildings are produced, and the interactions between various design participants play a significant role in the production of buildings. Keeping this in mind, the thesis draws sources from multiple approaches and disciplines that are influential on the production of buildings, and interprets them under the scope of the profession of architecture. In other words, the thesis benefits from multiple sources on statistical information on the AEC context, history of professions, sociology of professions, information technologies, and field observations, which constitute different layers of the thesis under the common focus on the role of the profession of architecture in the production of buildings.

As the thesis' main focus is on the role of the profession, the research framework benefits mainly from literature on the profession of architecture. The research framework on the changing context is constructed with reference to *Architectural Practice: A Critical View*; *The Architect: Chapters in the History of the Profession*; and *Architecture: The Story of Practice*.

In *Architectural Practice: A Critical View*, Gutman offers insights on the changing context for architectural practice, and points out potential challenges that architects would have to consider to keep in tune with the changes. Gutman's book begins and concludes with what he identifies as "ten major conditions that form the context for architectural practice, and that have been undergoing significant transformations":

[30] Peter Millard, "Competence in Architectural Practice", *Perspecta*, Vol.19, (1982): 126.

> (1) the expanding demand for architectural services; (2) changes in the structure of the demand; (3) oversupply, or potential oversupply, of entrants into the profession; (4) the increased size and complexity of buildings; (5) the consolidation and professionalization of the construction industry; (6) the greater rationality and sophistication of client organizations; (7) the more intense competition between architects and other professions; (8) the greater competition within the profession; (9) the continuing economic difficulties of practice; and (10) changing expectations of architecture among the public.[31]

The ten trends Gutman points out inquire into the contextual forces that directly affect the profession of architecture. The chapters of the book comprise of descriptions of the ten trends Gutman identifies, and a discussion chapter on the challenges to architecture. Although the book was published in 1988, the trends are still relevant in the contemporary context with a few updates. In 2000, Dana Cuff revisits the ten trends and confirms their validity under the changing forces of the 21st century: digital technology, environmental and building sciences, and globalization. The four headings under which Cuff gathers the trends are: “Demand for Services” (referring to trends 1-2); “Bigness” (4-5); “Competitive Edge” (7-8); “Not in Your Back Yard” (6-10).[32] Cuff leaves out the oversupply of entrants into profession for it did not realize in the United States, and does not elaborate on the economic difficulties of practice.

The trends Gutman identifies, and the headings under which Cuff revisits them are both important for the dissertation for they refer to the context in which the profession of architecture is practiced. In this sense, they can be instrumentalized as categories to collect and evaluate data to assess the context-profession relationships for BIM. For this aim, Gutman’s identified trends and Cuff’s headings are reinterpreted in the dissertation under three main foci that are governing the changes in the AEC context: *The changes in demand; “Bigness” and the increasing complexity of buildings*; and *the competitive scene of architecture*.

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[31] Robert Gutman, *Architectural Practice; A Critical View* (New York: Princeton Architectural Press, 1988), 1.

[32] Cuff, “Epilogue: Still Practicing,” 345-357.

The changes in demand, examines the rising interest in the services provided by architects, the changing structures of clients, and new forms of demand. Demand for services, according to Gutman, are changing in two ways. The first is a rising demand for the services offered by architectural practices. Although this seems as a positive trend at the first glance, Gutman warns that this also implies greater competition in the market, and may "reduce the architect's role to the application of specialized expertise, and deny them coordinating and supervisory responsibilities."[33] The second way in which demand changes, according to Gutman, is the structure of the demand. He underlines that architects have to face new responsibilities formerly not assigned to them, such as maintenance cost estimates, post-occupancy evaluation, building diagnostics, interiors, facade architecture-imageability.[34]

Cuff adds the increasing complexity of buildings and program types to this discussion. From this point, she remarks demand for the idea of "perfect fit", which refers to architects specializing in a distinct type of building. Moreover, Cuff points out to the impact of globalization on "an expanding market for identity-conscious design" and concludes that "[i]n both public and commercial projects, creating identity through architecture is a fundamental function in a global economy."[35] In an interview with Sarah Whiting, Rem Koolhaas interprets these increasing demands from architecture as a latency of exploitation:

> Collectively, younger architects working for the dot.com economy are developing an emerging dot.com aesthetic. Because of the intensity of that work, the incredible and absurd speeds with which that architecture now has to be constructed, and the latency of the exploitation of architecture – both in terms of creating rapid but radical accommodations but also in terms of conveying the right kind of messages – It

[33] Gutman, *Architectural Practice; A Critical View*, 3.

[34] Ibid., 13.

[35] Cuff, "Epilogue: Still Practicing," 350-51.

> involves a breathlessness that makes it difficult to stand back from it, to articulate what it *is* exactly.[36]

In the current context, speed, efficiency and building performance hold an important place in the demands from the profession of architecture.[37] While BIM is not the only means to address these demands, it is certain that the demands from architects are in concert with the focuses of practice through BIM. In this respect, demand for services is an essential subject to test and understand whether BIM ignites a change or fits into the conventional structure of building production.

"Bigness" and the increasing complexity of buildings, elaborates on the conception of Bigness based on the manifesto by Rem Koolhaas,[38] motives for building bigger and more complex, and the implications of Bigness for the profession. Gutman explains that "[b]uilding complexity and scale emerged as major trends transforming architectural design and production with the rise of industrialism in the nineteenth century, but interest in them as characteristics governing practice is more recent."[39] He continues that the contemporaneous context introduced the need for a diversity of buildings designed specifically to perform in perfect harmony with their programs. Consequently, the complexity of designs have been increasing since early 19th century, and large-scale practices such as SOM have been gathering most of the contracts. While the building programs continue to grow in scale, Cuff notes that the scale of offices in the present context are not as emphasized as has been during the 80s and 90s. She remarks that "size of the firm is but one mechanism in a global economy,

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[36] Rem Koolhaas and Sarah Whiting, "A Conversation between Rem Koolhaas and Sarah Whiting," *Assemblage,* No.40, (Dec., 1999): 42.

[37] Construction Users Roundtable (CURT) report entitled "Collaboration, Integrated Information and the Project Lifecycle in Building Design" conclude with the remark that building owners will increasingly be demanding better coordination and faster and more capable project delivery with fewer errors in the near future. - Construction Users Roundtable, *WP1202: Collaboration, Integrated Information and the Project Lifecycle in Building Design, Construction and Operation*, white paper, last accessed June 2, 2013. http://www.curt.org/12_0_curt_publications.html

[38] Rem Koolhaas, "Bigness, or the problem of Large", *S,M,L,XL,* Second edition, (New York: The Monacelli Press, 1998), 497-99.

[39] Gutman, *Architectural Practice; A Critical View,* 34.

where information networks and commodification extend the reaches of even very small firms."[40]

Two important aspects to consider in terms of bigger and more complex buildings are efficiency in the design process, and potential for collaboration. The promise of BIM for efficiency in the design process may enable firms of various capabilities to undertake complex contracts. Furthermore, local and global architect-architect and architect-expert collaborations have already become a common practice, enabling the involvement of architects in works from various geographies and scales regardless of office size.

The competitive scene of architecture examines the structures of architectural practices, the way commissions are won, and the branding of architecture firms. In *Architectural* Practice, Gutman points out two kinds of competition that concern the profession of architecture: between fellow architects, and between architects and other professions. He reports that competition in the public and private sectors have increased since the second half of the 20th century parallel to the increase in the number of offices competing for contracts.[41] According to Gutman, the competition system, involving a jury selecting among designs submitted by various entrants, is also a sign of increased competitiveness within the profession. Furthermore, he points out that architects are also in competition with other professions (engineers, planners, interior designers, etc.), and that a considerable amount of the building stock is designed by non-architects.

In her reinterpretation of the situation, Cuff argues that the intensity of competition is an important factor leading to specialization within professions. She remarks that in the recent past, "[a]rchitects have had to retool to deal competently with such issues as brown fields, energy regulations, life-cycle costing, environmental remediation, and sustainability guidelines."[42]

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[40] Cuff, "Epilogue: Still Practicing," 351.

[41] Gutman, *Architectural Practice; A Critical View*, 70.

[42] Cuff, "Epilogue: Still Practicing," 353.

The branding of the architecture firm is of a rather controversial nature, as overt branding is not seen proper among the sphere of architects. Rather, the branding of the architect is expected to follow his/her designs, which is the inverse of corporate logic in which designs follow branding.[43] However, branding is an ongoing debate in architecture, and given the increasing competition in the scene of architecture, it is becoming more important to obtain desired commissions and sustain the practice. [44]

In the case of BIM, inter and intra-competition imply different subjects. BIM is proven to increase efficiency in the design process, which contributes to in-time and on-budget delivery of projects. In countries such as the United Kingdom, working via BIM has already become an advantage in the competition among architects for public sector contracts, particularly owing to governmental efforts to promote the use of BIM. However, this advantage may be less strong or even non-existent in other countries, and governing authorities' inability to assess projects designed via BIM may even turn the situation upside down.

Shifting the focus to another direction, it is seen that popular BIM platforms continuously incorporate the new issues that architects retooled to deal with into their workflow. In this sense, one can speak of an advantage in competition among architects as the capabilities of software provide architects with specialized information. The ability to design and document these capabilities well naturally appears as an advantage for the practitioners. Furthermore, the performance of the finished building plays a role on the identity of the architectural firm, which, as Cuff explains, is an important issue for all firms to maintain their position among fellow competitors.

The competitive scene of architecture also refers to the economy of sustaining a practice. The increasing demands from architects, complexity of projects, and

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[43] Hedley Smyth and Sofia Kioussi, "Architecture Firms and the Role of Brand Management," *Architectural Engineering and Design Management*, 7, (2011): 205.

[44] Stephen Kiernan, "The Architecture of Plenty: Theory and Design in the Marketing Age," *Harvard Architecture Review 6* (1987): 107.

competition within the profession all have significant effects on profitability, which directly influences the economy of the architectural practice. In his related chapter, Gutman explains that the low profit margin typical for small firms, which make up 70% of all offices in the United States, often makes them vulnerable to fluctuations in the economic context.[45] Concordantly, in her comprehensive survey of 150 architectural firms practicing in Manhattan in 1970s, Judith Blau displays that architectural practices' success depends on various factors with economic conditions and firm size being two essential aspects of sustaining a practice.[46]

Surveys indicate that in the United States, the large firms (with more than 100 people, adding up to 2 percent of all offices) receive 30 percent of all architectural fees, while the remaining 70 percent is distributed among smaller firms making up 98 percent of offices in practice by 1992.[47] In her more recent evaluation, Cuff explains that firm-size has lost its significance as a means to getting more share of the market in the contemporary globalized economy, which at least partially is a result of digital technologies in architecture.[48] The implications of this argument for BIM is that, the claims of BIM (i.e. high quality, greater speed, lower costs) are all directly related with the economy of practice. In addition, the potential for direct collaboration in both local and global contexts render the size of the firm irrelevant with respect to the scale of the commission. These potentials have important connotations for the role of the profession.

Hence, Gutman's identification of the trends constituting the changing context for architectural practice present a valuable origin for the conceptualization of a framework to examine the changes in the present AEC context, and the position of BIM within. Another influential reference in the structure of this dissertation is *The*

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[45] Gutman, *Architectural Practice; A Critical View*, 78-85.

[46] Judith Blau, *Architects and Firms: A Sociological Perspective on Architectural Practice*, (MIT Press, 1987).

[47] Dana Cuff, *Architecture: The Story of Practice,* (Cambridge, Mass.: The MIT Press, 1992), 285.

[48] Cuff, "Epilogue: Still Practicing," 351.

Architect: Chapters in the History of the Profession, edited by Spiro Kostof. *The Architect* is one of the earliest scholarly research on the profession of architecture itself since Martin Shaw Briggs's *The Architect in History*.[49] The book departs from contemporaneous research by focusing on the profession and the practitioners, rather than the products of architecture. [50] This approach can be credited to the profession's state of crisis in the second half of the twentieth century as it was rapidly evolving from being the "Mother of the Arts" to a hired service for capital. The crisis indeed redirected attention to the identity of the profession from 1960 onwards, and University of California-Berkeley, where Kostof compiled and edited his volume, became an important center in this respect. The book compiles together a series of essays that cover different periods of the profession's state ranging from antiquity to architectural corporations in 1960s. An epilogue added to the book in 2000 by Dana Cuff elaborates on the reasons behind the changes in the profession in the 21st century.

The Architect is influential for the thesis in terms of the structure through which it is able to combine the different roles of the profession in a fluent unity. The basis on which the book is built lies on an understanding of architecture as a product of various contextual factors (economic, social, and political). Consequently, the essays read professional roles through the profession's relations with the context in which the profession is practiced. In her concluding remarks to Kostof's book, Cuff underlines the importance of the context-profession causality in evaluating the practice of architecture:

> The potential for the future of the practice of architecture is vast, as are the pitfalls of promoting the status quo. The most recent past of our profession does not give us much hope that we can avoid the pitfalls. But here is where Spiro Kostof's volume becomes invaluable: from the ancient Egyptians and

[49] Martin Shaw Briggs, *The Architect in History*, (Oxford: Clarendon Press, 1927).

[50] Dana Cuff explains: "… intellectual bearings were sighted upon the building in its human context: the city, the society, the cultural history, the inhabitant, the client, and indirectly then, the architect. Whereas the history of architecture favored the object and the development of its form, the Berkeley school was gathering interdisciplinary steam to reshape an understanding of buildings and their role in society." Dana Cuff, "Foreword", *The Architect: Chapters in the History of the Profession,* 2nd edition, (University of California Press, 2000), x.

> Greeks to nineteenth-century England and France, history demonstrates architecture's ambitious responses to widespread changes in the world.[51]

As Cuff explains, assessing the profession of architecture through its "ambitious responses to widespread changes in the world" provides an important starting point for constructing a research framework. However, tracking relations between the context and the profession would be too broad a goal for it would imply a vast variety of possibilities. Consequently, the individual chapters of *The Architect* follow a set of questions which serve as an intermediary medium to elaborate on the profession in relation to its context:

> How did architects get to be architects in any given period of history? How were they educated and trained? How did they find their clients and communicate with them? To what extent did they supervise the execution of their designs? What did society think of them (as against what they thought of themselves, which is another matter)? What honors and remuneration could they command?[52]

The significance of these questions for the present research lies in their potential to develop into a framework for assessment of the profession. The issues referred by the questions can be conceptualized into themes that frame and enhance the questions' reach, and point at a potential method of organization for a study on the profession of architecture. In the framework of the dissertation, the questions Kostof raises form important scopes for elaborating on the role of the profession. The professional domain of practice, its autonomy, and the concept of authorship under BIM are three scopes inferred from Kostof, and instrumentalized in the discussion on the changing roles of the profession of architecture.

The Architect examines the history of the profession up to 1960s. While the individual essays are influential in developing an understanding of the profession of architecture

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[51] Cuff, "Epilogue: Still Practicing," 357.

[52] Spiro Kostof, "Preface," in *The Architect: Chapters in the History of the Profession*, 2nd edition, (University of California Press, 2000), xviii.

in history, the volume also implicitly displays how to continue the inquiry on the roles of the profession.

Architecture: The Story of Practice by Dana Cuff, is another study that has been influential for the conduct of this dissertation. In *The Story of Practice*, Cuff examines the culture of architectural practice in US in the 1980s. Framing the occupational setting of the architecture firm as the culture of practice, Cuff investigates the underlying social and practice-related dynamics of the profession through fieldwork. In considering the architects reflections on their own actions in practice, Cuff introduces the conception of "espoused theory" with reference to Chris Argyris and Donald Schon,[53] who explain that professionals reflect their actions from the scope of an **"**espoused theory,**"** which constitutes of an idealized role of the profession. Their practical actions however, employ a "theory-in-use" that is based in the practical realities of the context. Cuff explains that the espoused theory accounts for the difference in what architects think they do, and what they do in reality, therefore the differentiation of the two sets is essential for the researcher. Based on experiences from fieldwork, *The Story of Practice* covers the professional beliefs and conflicts in the architectural office, the education of architects, and the professional milieu.

In addition to these three volumes, the dissertation benefits from other significant references on the professionalism of architecture. *Building (in) the Future: Recasting Labor in Architecture*, edited by Peggy Dreamer and Phillip G. Bernstein has been an important reference in understanding how the conventional conceptions of practice are evolving with respect to digital medium. The works of Magali Sarfatti-Larson have been influential in the dissertation in terms of defining the position of the architect with respect to the client, and in developing an understanding of architecture's struggle for legitimacy especially after its divorce from the technicalities of building. Concordantly, considering the client's potential motives for construction, Pierre Bourdieu's conception of forms of capital has contributed significantly in extending the scope of this thesis. In Bourdieusian view, capital is defined as desirable material

[53] Chris Argyris and Donald A. Schon, *Theory in Practice: Increasing Professional Effectiveness,* San Francisco: Jossey-Bass Publishers, 1974.

or symbolic entities that grant the possessor with status or power, and may flow through social, cultural or economic means. Within the thesis, this extended conception of capital has shed light on the social and cultural implications of the production and inhabitance of buildings in addition to the economy of construction and marketing in the changing context. *The Favored Circle: The Social Foundations of Architectural Distinction* by Garry Stevens has also been an important reference in understanding the interconnected relations between actors and the fields of activity in which they operate, and among themselves for gaining different forms of capital in Bourdieusian terms.

The evaluation of BIM is mostly founded on white papers and sectorial reports that display both the development and the increasing adoption of BIM in practice. Reports of the National Building Service in the United Kingdom, and American Institute of Architects and McGraw Hill SmartMarket reports in the United States have been especially helpful in developing a conception of BIM in wide adoption. The academic foundations of BIM within the structure of the dissertation, however, are based on research primarily lead by Chuck Eastman, mainly over the seminal volume titled *BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors*, and *Building Product Models: Computer Environments Supporting Design and Construction*. In these volumes, Eastman et al. explain the motives for the origination of BIM as well as defining its motives, and point out potential directions towards which BIM can further progress.

1.5 Method and Structure

How can the changes in the AEC industry be read in relation to recent developments in BIM? How do these changes effect the profession of architecture? The research motives of the thesis, summarized in these two questions, are focused around the changes in a social construct: the role of the profession within the greater context of building production. As the thesis aims to elaborate on a social phenomenon, its methodology mainly benefits from research methods of the social sciences for derivation, classification, and interpretation of data.

As with any research adopting research methods from the social sciences, "comparison" and "control" stand out as the two dominating factors to define a suitable methodology. To explain briefly, the factors of comparison and control indicate approaching the research subject from multiple angles, collecting data from multiple sources, and developing alternative explanations in order to increase the accuracy with which the research subject is explored and understood.[54] Such an approach to research design springs from "triangulation", a term coined by Norman Denzin to define receiving of information from various sources, later extended to cover methodology.[55] According to this extended view, triangulation aids research in relating different kinds of data revealed through different methods to overcome threats to validity.[56]

The thesis utilizes triangulation by employing a tripartite approach to inquiries on the role of the profession. Variety in research methods holds an essential place in the conduct of the research, as architects' *ethos*, practice habits, and archival records all provide different perspectives into the practice of architecture. In other words, what architects think they do and how they practice in reality are usually different from each other.[57] The profession of architecture holds an idealized vision of its practice, while it rarely is the case in reality. As explained by Chris Argyris and Donald Schon, professionals act through an "espoused theory" of an idealized role to justify their actions, but act according to a "theory-in-use".[58] Consequently, the *ethos* of architects holds an important focus in designing the methodological triangulation for the thesis:

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[54] Frank Bechhofer and Lindsay Paterson, *Principles of Research Design in the Social Sciences*, London; New York: Routledge, 2000, 10.

[55] Norman K. Denzin, *The Research Act: A Theoretical Introduction to Sociological Methods*, McGraw-Hill, 1978, 295.

[56] Bruce L. Berg, *Qualitative Research Methods for the Social Sciences*, (Boston: Pearson/Allyn and Bacon, 2000), 5; and Nigel G. Fielding and Jane L. Fielding, *Linking Data*, (Newbury Park, CA: Sage Publishing, 1986), 31.

[57] Cuff, *Architecture: The Story of Practice*; Gutman, *Architectural Practice; A Critical View*; and Blau, *Architects and Firms: A Sociological Perspective on Architectural Practice,* all refer to the gap between architects' beliefs and actions.

[58] Chris Argyris and Donald A. Schon, *Theory in Practice: Increasing Professional Effectiveness*.

Information gathered through three main approaches, examining what is archived, what is observed, and what is reflected. Each category offers different perspectives from different empirical realities of the same subject, and as such contribute to a thicker understanding of the subject under study.

Archival research targets the documentation of the recent changes in the context of practice and how the changes have been reflected on the statistics concerning the profession. Information is obtained from existing literature and archival records, including local and global sources such as sector reports released annually by TUIK (Turkish Statistical Institute), updates on the construction regulations, the annual McGraw-Hill Construction Report, NBS National BIM Report, and restricted-access databases with information on public-private tenders. Archival research contributes by providing relatively unbiased statistical information gathered from official records and by constructing a framework for discussions based on previous research.

A second source of information is fieldwork observation. Fieldwork observation seeks information on the less-observed aspects of practice which may be overlooked from the perspective of an espoused theory. The fieldwork spans over three projects of different scales and complexity. The first project, an approximately 150 square meters summer house in southwest Turkey that requires a minimum number of consultants and is subject to very few revisions up to construction. The second project is a 130000 square meter, 1028 unit housing complex conducted under a larger scale urban transformation scheme. The project introduces an intermediary level of complexity in terms of program and the design process. The third project is a 240000 square meter complex comprising of a shopping mall, two office towers and a 5 star hotel. The individual programs are integrated at various levels in section, and constitute a rather complex structure. The project involves a large number of consultants (engineers, fire-life & safety consultants, kitchen consultants, acoustics consultants, traffic consultants, facade consultants, lighting consultants, SPA consultants, etc.) and is subject to stricter control by the client. In each cases the author is a directly involved in the design team.

The third source of information is concerned with the practitioners' own descriptions of their professional roles. This approach inquires how practitioners interpret the context of building production and how they position the architect within. It also inquires how architects adapt themselves to changes in the context in which they operate. This approach proceeds over a series of semi-structured interviews with professionals.

Besides the introduction and the conclusion chapters, the research is conducted under three chapters. The second chapter of the study focuses on the changes in the AEC context. This chapter examines the changes in the demand that define and mobilize the context. Under three subheadings, the changes in demand, the increasing scales and complexity of buildings, and the increasing competition in the scene of architecture are investigated through comparisons of global trends and definitions with the local context of Turkey. The third chapter re-evaluates BIM with respect to the findings of the second chapter. Under three foci derived in the previous chapter, how (and whether) BIM addresses the changes in the industry are examined, and the potential motives for adoption of BIM, barriers to its use, and its implications on the AEC context are discussed. The fourth chapter, constituting the discussion of the thesis, evaluates the practice of architecture with respect to the changing conceptions of domain, autonomy, and authorship in BIM. The chapter concludes by pointing out potential directions for the prospective roles of the profession.

CHAPTER 2

THE CHANGING ARCHITECTURE-ENGINEERING-CONSTRUCTION CONTEXT

2.1 Changes in Demand

> "We are dealing with the profession of architecture, the specialized skill that is called upon to give shape to the environmental needs of others." [59]

Spiro Kostof's definition of architecture, as mentioned earlier, points out the essential factors of the profession: a demand initiated by others (the client, the architect himself/herself, or the context in general) according to their environmental needs, and a response by the skilled practitioner to provide a satisfactory answer. In this sense, demand holds a central role in the definition and evolution of the profession. Andrew Saint, one of the leading historians of the profession of architecture, acknowledges that the evolving definitions of the profession of architecture is an outcome of clients' expectations from architects and the pressures exerted on the profession of architecture.[60] In this sense, a stated spatial demand and an overseen design process for a proper solution are central to the practice of architecture. Thus it is important to

[59] Spiro Kostof, "Preface" in *The Architect: Chapters in the History of the Profession*, xviii.

[60] Andrew Saint, *The Image of the Architect,* (New Haven; London: Yale University Press, 1983), 66-68. Saint asserts that the changes in the definition of the profession are a result of the increasing complexity of building programs and stricter building regulations.

examine the current nature of demand that define the boundaries of the profession and project new opportunities for the future.

2.1.1 The Rise in Demand

Robert Gutman begins the first chapter in his *Architectural Practice: A Critical View,* with a rather bold statement: "The demand for the services of architects and architectural firms is expanding."[61] Gutman's remarks for the architectural practice in the United States in 1980s are grounded on a set of parameters he explains by considering the number of new graduates, the increase in the number of architectural offices, current offices hiring new staff, and an increased exposure of architecture in the public press. Although Gutman's book dates back to 1988, the current context appears to follow a similar pattern of expansion. To establish a common ground for comparison, recent statistics can be read in relation to statistical reports produced in 1982, which Gutman refers to in his book. Gutman notes that there are 12000 firms ranging from one employee to several hundred employees which are registered and are more representative of the direction the profession evolved in the United States in the early 1980s. He adds that the overall billings of these firms increased from 2 billion dollars to almost 6 billion dollars between 1972 and 1982.[62] More recently, statistics published by the United States Bureau of Census show that the number of registered architectural offices in the United States by the year 2002 is 23269, and the overall billings of architectural offices are over 25 billion dollars in 2002, and almost 30 billion dollars in 2009.[63] It is worth noting that the increase in both the number of new establishments and the overall billings are briefly interrupted during the economic crisis in 2008. However, sectorial reports of the American Institute of Architects

[61] Robert Gutman, *Architectural Practice: A Critical View,* 3.

[62] Robert Gutman, *Architectural Practice: A Critical View,* 4.

[63] U.S. Department of Commerce Census Bureau, *Architectural, Engineering, and Related Services: 2002*, PDF e-book, October 2004, last accessed May 24, 2015, https://www.census.gov/prod/ec02/ec0254i03.pdf .

display that the sector is regaining momentum.[64] Comparing these sets of information, it is seen that there is a continuous growth in the number of architectural practices, and investments in architectural design in the United States.

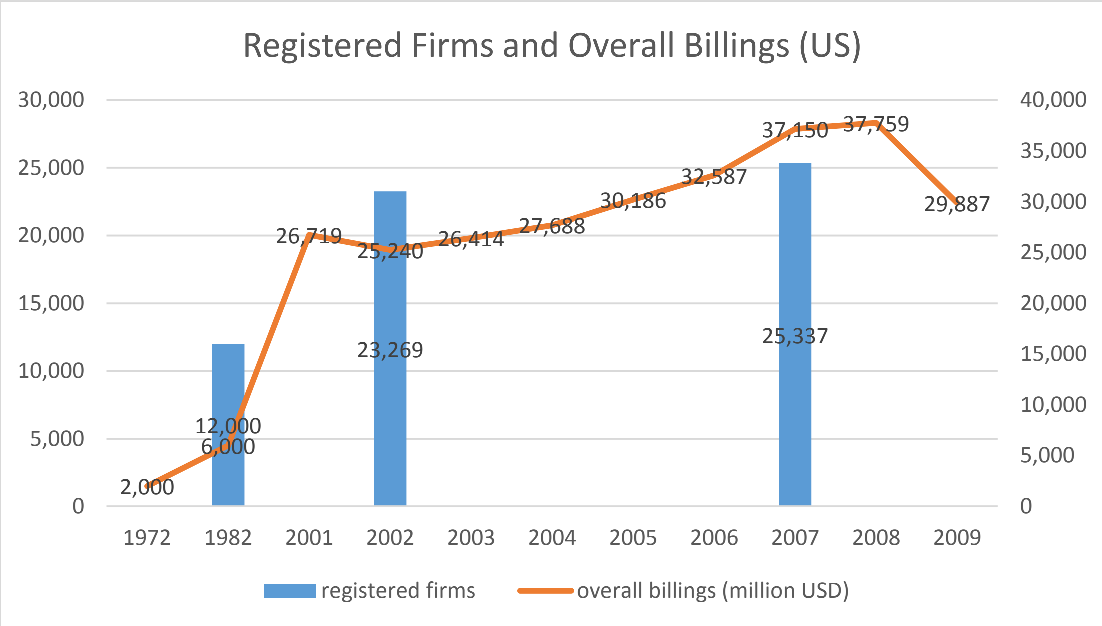

Figure 1. Registered Architecture Firms and Overall Billings in the United States. Produced by the author. Data: US Bureau of Census.

The local context of Turkey also follows a similar pattern. While Turkish Statistical Institute (TUIK) reports differ from their U.S. counterparts in their foci, the indicated results are not much different. Construction is one of the strongest industries in Turkey, and according to TUIK reports, construction production index for new buildings has increased by 22.7 percent, and construction industry turnover index by 47.4 percent from 2005 to 2012.[65] These figures display that number of constructions increased significantly in a relatively short span of 7 years. More importantly the increase in

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[64] The American Institute of Architects, *2012 AIA Survey Report on Firm Characteristics*, 2012. PDF e-book, last accessed May June 6, 2014. https://www.bsdsoftlink.com/manufacturers/2012_AIA_firm_survey_report.pdf .

[65] Turkish Statistical Institute, Central Dissemination System (MEDAS), 2015, last accessed June 20, 2015, http://www.tuik.gov.tr .

profitability has doubled the increase in the number of buildings produced, which indicates a certain rise in demand along with other factors that affect retail prices. Leaving numbers aside, these statistics show that both the rate of production of space and the market values of the produced spaces have increased (these findings also have indications on other factors such as competition in the industry, scale, complexity, and marketing, which are discussed later).

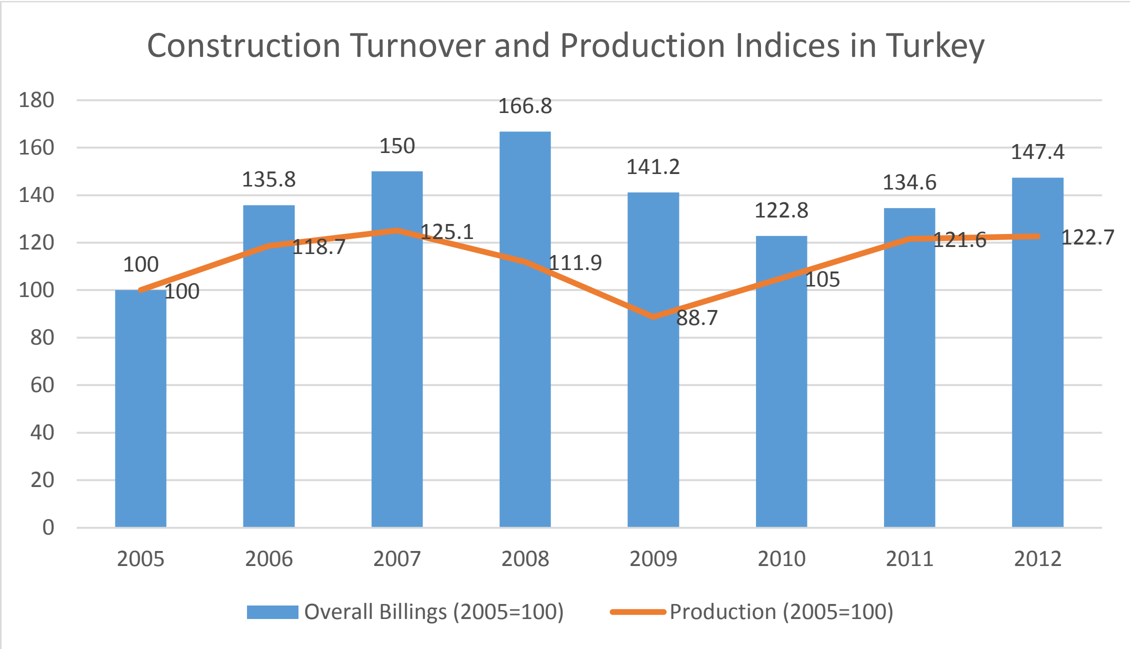

Figure 2. Construction Turnover and Production Indices in Turkey. Produced by the author. Data: Turkish Statistical Institute.

The growth of the construction industry is also reflected in the indices of Architecture and Engineering Services. TUIK statistics show that between 2005 and 2012, the turnover index of Architecture and Engineering Services has increased by 61.9 percent, payroll index has increased by 172 percent, work hours index has increased by 7.5 percent, and employment index has increased by 10.8 percent.[66] While these

[66] Turkish Statistical Institute, Central Dissemination System (MEDAS), 2015, last accessed June 20, 2015, http://www.tuik.gov.tr .

statistics do not provide information on Architecture services separately, the numbers can still be interpreted to display a heightened interest in the services offered by architects and higher employment rates for architects. Concordantly, the number of architects registered annually to Chamber of Architects of Turkey has increased from 1194 professionals in 2005 to 2393 professionals in 2014, adding up to a total of 46335 registered architects by 2015.[67]

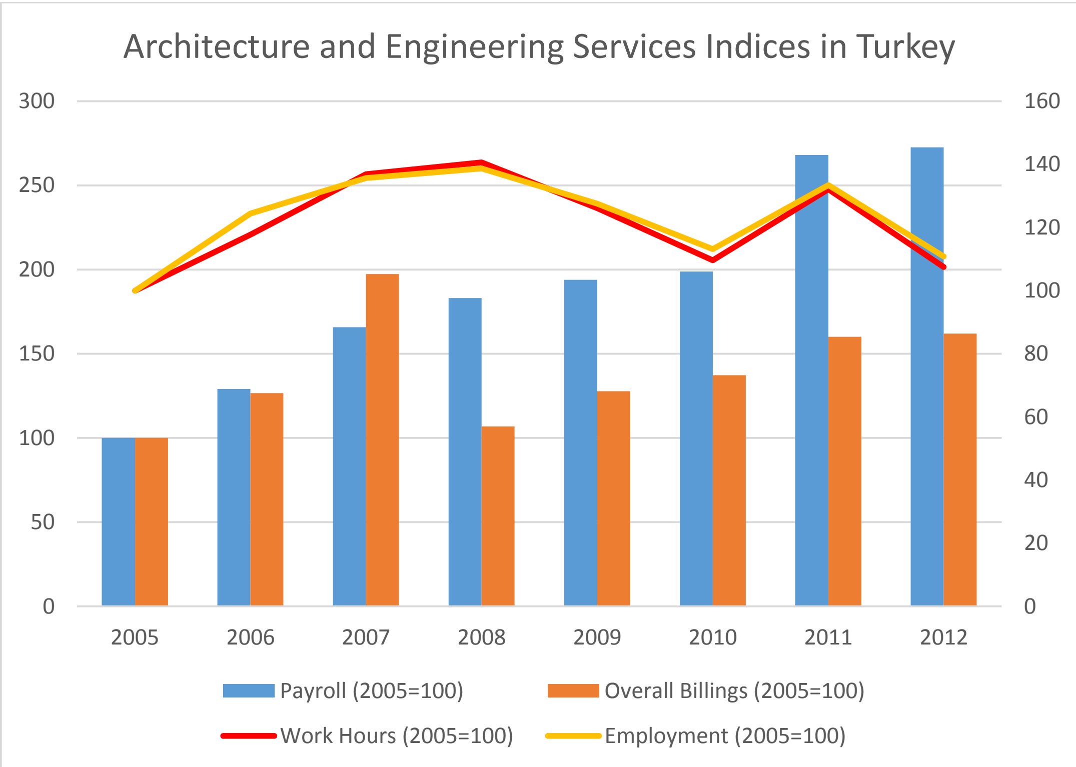

Figure 3. Architecture and Engineering Services Indices in Turkey. Produced by the author. Data: Turkish Statistical Institute.

In addition to the increase in staff hired in architectural firms and new offices, there is also a rise in the number of architecture schools and graduates that reflects the growth in the construction industry. Statistics show that while in 2005 there were 2137

[67] Chamber of Architects of Turkey, "Üye Dağılımı", last accessed June 20, 2015, http://www.mimarlarodasi.org.tr/index.cfm?sayfa=mop&sub=ud .

freshmen and a total of 10271 students enrolled in architecture and urban design schools, the numbers in 2014 indicate that there were 4107 freshmen, and a total of 19209 students.[68] While the the dramatic increase in the number of architecture students can be read as a result of economic and social political decisions in the current context ,[69] the figures still illustrate that more architecture graduates are introduced in the context every year.

In light of Gutman's explanations, the figures introduced so far point out an increase in demand and a higher level of interest in architecture as a profession in general. That being said, the increase in the demand for architectural services does not directly imply that the profession is elevated to a new status. What is rather more important in this respect is how the profession of architecture responds to changes in the demanding structure (clientele) and the form of demand. The following sections elaborate on the changes in demand with respect to changes in the client organizations and changing structures of demand, and interprets how the profession adapts itself to operate in an evolving context.

2.1.2 The Client

> I neither am nor will be obliged to tell your lordship or any other person what I intend or ought to do for this work; your office is to procure money, and to take care that thieves do not get the same; the designs for the buildings you are to leave to my care.[70]

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[68] T.C. Ölçme Seçme ve Yerleştirme Merkezi, *13. Öğretim Alanlarına Göre Lisans Düzeyindeki Öğrenci Sayıları*, PDF e-book, 2005, last accessed June 20, 2015, www.osym.gov.tr/dosya/1-43520/h/13un.pdf . and Yüksek Öğrenim Kurulu, *Eğitim Birimlerine Göre Öğrenci ve Öğretim Elemanları Sayıları, 2014-2015*, PDF e-book, 2015, last accessed June 20, 2015, https://istatistik.yok.gov.tr/yuksekogretimIstatistikleri/2015/2015_T3_v2.pdf .

[69] The dramatic increase in the number of architecture students can be assigned to at least two important contextual factors. First, current economic policies of Turkey are largely dependent on the construction industry, which creates more employment in the sector as well as rendering it more attractive to prospective students. Second, there is also a significant number of increase in privately owned universities between 2002-2015 period, and most of the newly founded universities feature departments of architecture in their early days.

[70] Dana Cuff, *Architecture: The Story of Practice*, 72. Quoted from: Giorgio Vasari, *The Lives of Painters, Sculptors and Architects*, trans. A. B. Hinds, (New York: Dutton, 1927, rev. ed. 1963), 304.

Michelangelo's letter to the cardinals in response to their remark that the lighting of St. Peter's Cathedral was inadequate displays a rather different relation between the architect and the patron than what architects are accustomed to in the present day. Although Michelangelo's authoritative response to the cardinals can partly be explained by him being a well-known artist-architect, the challenging demands of the cardinals are representative of the changing boundaries of the profession. It is seen along the course of history that the role and boundaries of the profession of architecture evolve according to clients' demands from architects. In this sense, both the structure of the client, and the structure of the demand affect the how architects practice architecture.

The earliest significant role that architects undertook is that of the master-builder. It is well-known that the master-builder in Ancient Egypt was in charge of both design and execution of public buildings and easily walked among the higher circles of the pharaoh and the priesthood. Similarly, in the Roman Empire, the architect Apollodorus is known to have been close to emperor Trajan in his ranking and audacity, even insulting the prospective emperor's design ideas for certain schemes (which, allegedly, ended in his execution later on when Hadrian rose to power).[71] These higher levels of autonomy and power are dependent on the architect's control over the production of buildings from initial design to the organization and supervision of the construction process. In this respect, as the client puts the architect in charge of the whole building process, architect's role as the master-builder becomes almost as powerful as the client himself/herself.

The separation of the architect from the construction site with the introduction of the ortographic set, on the other hand, brings about a different nature of demand that defines a different (and arguably less powerful) role for the profession. As the architect becomes able to communicate with the construction site remotely via drawings, his/her former duties of on-site management and directions are transferred to those working

[71] Kostof, *The Architect: Chapters in the History of the Profession*, 50.

on site. This implies a new client-architect relationship, as the architect becomes a member of a team answering to the client.

Aside from a few small-scale examples, the design and production of a building in the present day involves a team of professionals from various disciplines, including architects. While assigning the architect as the coordinator of other disciplines appears to be common practice, the roles assigned to architects still depend on the structure of the client. Different from former client bodies who represented a publicly acknowledged authority (the state, the church, aristocracy, etc.), the client in the present day may come from various social and economic backgrounds. Unlike the "powerful" clients of the past, the new clientele is subjected to a wider set of economic and social pressures and is monitored by higher authorities (the state, professional chambers, etc.). As the clients feel more pressure on themselves, unlike the king or the church commissioning a new building, they become less willing to promote architecture for architecture's sake.[72] The sources and effects of the pressures on the clients are various, however the most significant pressure factors can be examined under three foci: the growth of building regulations and conformity with authority; the increasing complexity and scale of buildings, [73] and the economic and social burdens associated with the previous factors.[74]

The first factor under focus is the authority governing the act of building. In order to obtain permissions to build and operate any structure, clients have to make sure that their projects conform to multiple local and global standards that are continuously updated and monitored by the authorities. While there are still non-architect designed buildings in the local context of Turkey (in the form of unlicensed constructions or architects illegally signing projects that they did not design), the law requires every

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[72] Cuff, *Architecture: The Story of* Practice, 74.

[73] The direct implications of the increasing complexity of buildings on the profession of architecture are referred to in the "bigness and increasing sophistication of buildings" section of the thesis in detail.

[74] As Andrew Saint explains, the rising interest in architecture is associated with the growth of building regulations and the increasing complexity of building types, and both affect clients' routines of project development.

building to be designed by registered architects and engineers. The obligation to work with professionals as such, of course, is a legal obligation long in practice.[75] Rather, what is more interesting in this sense is the increasing number of regulations and standards a building has to conform to in the present day.[76] As the regulations a building must comply with multiply in content and number, clients become more inclined to reside with professionals to eliminate risks. In brief, the increasing number of regulations and standards that buildings are obligated to conform to imply a different kind of demand made from clients, which account for some of the pressures reflected on the other professionals working in the AEC industry.

The second factor is originated by the clients by means of larger scales of construction and the variety of functions that the buildings are expected to house. Statistical data presents a steady growth in the square meters produced per year (with the exception of the economic crisis in 2008) in comparison to the number of buildings constructed. While in 1992 a total of approximately 105000 projects share a total floor area of 38,4 million square meters with a floor area of 364,3m² per building-permitted, it can be observed that the ratio increases in the following years, with relative marks of 424,5m² (1997); 485,9m² (2002); 931,6m² (2007); 1116,8m² (2012); 1222,3m² (2014). Overall, it is evident that the average floor area per construction is rising, which implies a growth in the scale of buildings being constructed. As the buildings get larger, the architectural, structural and electromechanical systems and the various consultancies involved require higher degrees of attention and expertise in design and coordination.

In addition to the growth in scale, there is also an increasing variety in the combinations of functions to be housed. Two decades after Rem Koolhaas' elaboration

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[75] The first National Building Code of new Turkish State dates back to October 18th 1923, 11 days before the declaration of the Republic of Turkey.

[76] While the National Building Code presently in use dates back to 1985 (with occasional updates), there have been significant additions such as The Regulation Regarding the Protection of Buildings from Fire (2007), Shelter Regulations (1988), Specification for Structures to be Built in Seismic Zone (2007), etc. In addition, local and global franchises' may often require additional standards to be applied.

on the superimposed programs in the case of Downtown Athletic Club in Manhattan,[77] the coexistence of alternative programs has become a mainstream marketing strategy in the local context of Turkey, with almost every new housing project offering complementary programs to suit the new lifestyle requirements of prospective residents.[78] While it is commonplace for most housing projects to feature social and recreational programs such as swimming pools or business centers, some projects take their claims one step further to include programs like marinas or ski centers to draw public attention.

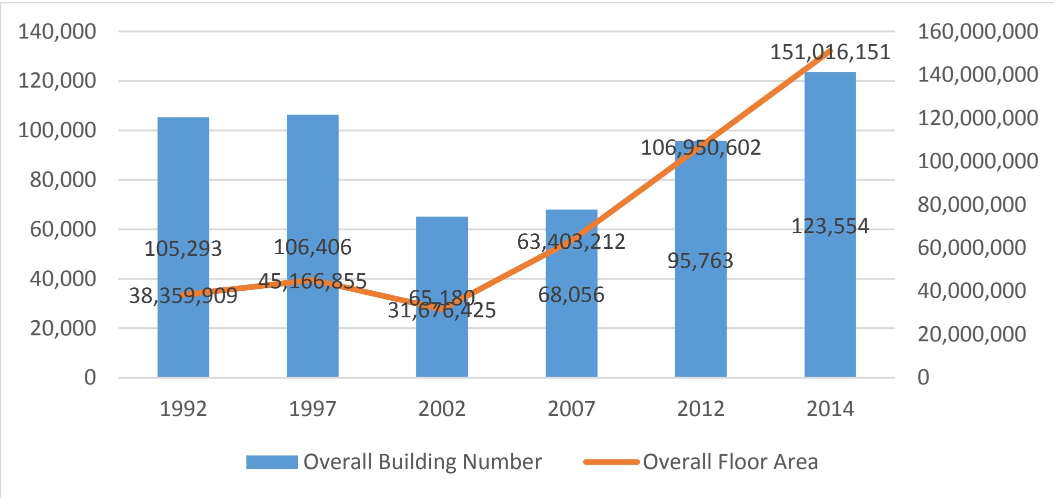

Figure 4. Overall Floor Areas and Building Numbers in Turkey, 1992-2014. Produced by the author. Data: Turkish Statistical Institute.

The newly introduced functions and the building scales in which the clients plan their operations imply significant expenditure levels and a much more complex administrative structure, bringing the third factor under focus. As buildings become larger and more complex, both investment costs and risks of building are escalated to a new level, rendering the client more cautious with the design process. The client in

[77] Rem Koolhaas, *Delirious New York: a retroactive manifesto for Manhattan*, (New York: The Monacelli Press, 1994), 152-59.

[78] The subject is discussed in detail under the title of "branding" later on in the thesis.

this respect has to consider a wider range of issues regarding the design and execution of projects:

> It is understandable that when such expenditure levels are commonplace, organization would press to achieve maximum precision in estimating the costs of construction and the experience of maintaining these facilities. They also must try to anticipate, before the building is constructed, the reactions of prospective tenants and users. The search for knowledgeable experts is forced upon them by the careful scrutiny all building projects receive now from local, state and federal authorities, to ascertain their conformity to building, environmental, safety, and health regulations.[79]

Thus it is seen that the clients have more motives to reside with professional services in the present context to manage the multiple design, construction and maintenance tasks. The dependence on professional services becomes more important if the building(s) to be constructed are being developed for large-scale commercial purposes, which involves careful financial management, compliance with local and international codes, and marketability along with the requirement for a design that is well-coordinated among various disciplines. More importantly, because much of the work associated with the act of building is now outsourced to individual professionals, the client body has to become more professionalized itself to be able to maintain control over the outsourced work. Consequently, it is common for institutional clients in the present to have design offices, technical offices and other consultants working in-house to control and direct the professionals to whom the design job is outsourced. In the present, it is common even for building maintenance firms to employ in-house architects who oversee that the outsourced design job conforms to institutional standards and is executed correctly.[80] The "professionalization" of clients in this sense increases their demands from the architects at various areas of expertise, and enhances their authority in the design process:

> The contemporary architectural client plays an active role with the practitioner, giving constraints, advice, and approval

[79] Gutman, *Architectural Practice: A Critical View*, 8.

> throughout the process, without which the appropriateness of the services is threatened. A frequent complaint among architects is registered against overly active clients who interfere in the process and prevent architects from doing their best work. As it turns out, there is some evidence that the best buildings have clients who are very active but also willing to step back at crucial points in the design process.[81]

In the seminal essay titled "Professions and Their Discontents", Robert Gutman explains that the patron –someone who appreciates the architect's work and supports him/her without too much intervention– has left its place to the client –someone who approaches the architect with requirements and schemes in mind and has to be persuaded on some aspects.[82] In the contemporary context, it is seen that the clients are enforced to become professional bodies themselves in order to manage the complexity of construction in the present day, hence the institutional client. In turn, they influence architects to become more professional in providing their services as well as answering a new set of demands made from them.[83] Clients as such notice the value in architectural design, yet have also become more demanding in the design, construction, marketing, and maintenance of structures.

2.1.3 New Forms of Demand

Up to this point, the growth in the demand for architectural services and the more-professionalized profile of clients are interpreted within the larger framework of AEC context specifically over examples and figures from the construction indices of Turkey. It is seen that both the growth in demand and the changing structure of clients influence the definition of the services expected to be provided by architects. While the various instances of demand would be too diverse to cover in a single study, the impact of the new forms of the demand can still be examined under titles covering

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[81] Cuff, *Architecture: The Story of* Practice, 171.

[82] Robert Gutman, "Professions and Their Discontents: The Psychodynamics of Architectural Practice," in *Architecture From the Outside In: Selected Essays by Robert Gutman,* Dana Cuff & Wriedt, John eds., Princeton Architectural Press, 2010, 56.

[83] Suha Jaradat et al., "Professionalism in digitally mediated project work," *Building Research & Information,* 41:1, (2013): 51-59.

clients' concerns during three phases of the realization of a building: pre-design, design, and post-design. "Pre-design" refers to the phase where the client decides to build a certain type of building and decides on an architect to work with, followed by all the relevant operations up to the signing of a contract between the two parties. "Design" denotes the phase where the architect gives shape to the spatial needs of the client. "Post-design" is the phase where the concerns regarding the building after the design process (such as design in relation to branding, or marketing) are taken into consideration. The following parts elaborate on the new forms of demand by examining demand during these three (not necessarily consecutive) phases.

Pre-Design Phase

While commissioning an architect is an obligation for the client demanding to erect a building in the present context, the notion of working with an architect for any building program is a relatively new practice in the long history of the profession. Even the design of commercial buildings has become a commission for the architects as late as the last decade of the 19th century in the United States, whereas the earlier repertoires of architects were confined to churches and church-related structures.[84] The design of then less-favorable structures such as warehouses or retail stores have become of interest to architects only in the late 19th and early 20th centuries.

The demand for architectural services in the present is dependent on a relatively wider set of concerns and is spread over various sets of programs, ranging from the basic need of housing to specialized service spaces such as laboratories or warehouses. The increasing complexity and scale of the buildings (matching the increasing complexities and scales of client bodies) along with aesthetic, economic and social concerns have resulted in a much varied range of spatial needs, and resulted in the commissioning of architects for a larger variety of designs. Overall, statistical data displays that architects services are demanded for over 19 different categories of buildings in Turkey, the most practiced category being housing (constituting 84% of new buildings permitted in

[84] Gutman, *Architectural Practice: A Critical View*, 17.

2014).[85] While the emphasis on housing can be read as a reflection of governmental policies to support construction industry as a means to secure long-term employment and economic stability, its indications for architects are a more competitive professional context and clients demanding to be distinctive from the large stock of housing being produced.[86] In the competitive market, even the most-basic program of housing can often be hybridized with imported programs to provide an advantage, which results in a higher demand for architectural services as well as challenges harder to complete. The range and densities of the buildings erected thus display that architects' services are demanded for multiple building programs on various levels. In addition, these findings display that architects now focus on more specific programmatic requirements and have to be in command of specialized knowledge across multiple platforms.[87]

Given the competitive environment in which architecture is practiced, the decisions leading to the choice of an architect is a rather important issue to elaborate on. The choice of an architect for a relatively small commission may of course depend on a variety of factors, some of which may be undebatable such as personal favors or being located close to the architect's office. On the other hand, the choice of architects in the case of large-scale projects, which forms the focus of this study, displays a more disciplined and traceable process. The institutionalized client, Gutman argues, relies less on personal acquaintances and more on testing whether the architects suit the

[85] The categories indicated in the building permit statistics tables cover housing, public space, hotels, short-term accommodations (other than hotels), offices, commercial buildings, communication buildings and stations, garages, industrial buildings, warehouses, entertainment venues, museums and libraries, educational institutions, healthcare facilities, sports facilities, commercial farms, religious buildings, restoration of older structures, and other structures. Turkish Statistical Institution, "Kullanma Amacına Göre Tamamen veya Kısmen Biten Yeni veya İlave Yapılar", last accessed June 20, 2015, http://www.tuik.gov.tr/PreTablo.do?alt_id=1055 .

[86] Out of 123554 building permits issued in 2014 in Turkey, 103662 belong to housing projects.

[87] One of the projects studied in the fieldwork features 851 home-office units to be operated in the manner of hotel rooms for travelling business people. The client's brief requests that all rooms be fully convertible to bedrooms or offices upon the request of the tenant. The designs also include specific convention and recreational areas as requested by the developer. The home-office blocks with the requested features are located on top of a shopping mall.

specific needs of the project. He briefly expresses the concerns of clients in deciding on architects in four questions:

> The readiness to interview a dozen or more offices simply indicates that clients are trying to identify the firms that are most likely to meet specific needs, or whose style of operations meshes best with the client's management and organizational style. There is a wide range of questions clients may have in mind. Does the firm have demonstrable capability for the project? Does the information presented in the firm's brochure correspond to the reality of the firm's organization and skills? What procedures does the firm adopt for making sure work will keep to schedule? Who are the individuals the clients will be dealing with in the architectural firm?[88]

As the investments and relative risks increase, clients tend to control their risks by carefully considering their choice of architects over a set of criteria. In light of Gutman's definition of clients' questions in mind, these criteria can be summarized as the ability to prove capability, consistency in promotional claims and reality, working procedures, and the capabilities of the prospective design team. Approvingly, a survey conducted by *Building Design and Construction* magazine in 1980 features 600 "mega-clients" with annual construction rates of minimum one million USD and questions their motives in deciding on architects for their projects. The survey points out that the reasons for which the clients hire architects are (in rank order): "ability to complete on budget and ability to make building function (both at 47 percent); ability to complete work on time (36 percent); and ability to work with owner staff (33 percent). Aesthetic quality ranked tenth on their list, along with fee amount (both at 21 percent)."[89]

The 1980 survey displays that the top concerns of these firms are related with financing of the construction process and management of the various phases a project undergoes. While these rational concerns of clients are also observed strongly in the present day, aesthetic quality can also be considered as an important factor of choice in the

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[88] Gutman, *Architectural Practice: A Critical View*, 20.

[89] Cuff, *Architecture: The Story of* Practice, 55.

competitive market. As illustrated earlier, the supply of buildings has reached a critical level in the case of Turkey, and clients are now looking for ways to stand out in the competition. The search for micro-scale “Bilbao Effect”s can be seen in the advertisements of new developments. Developers promote their buildings’ designs to create and market identities for their projects.[90] In this respect, the image of the project becomes a prominent factor for new investments, and places emphasis on the facades, interiors and imported programs in buildings. The increasing trend of branding buildings through architecture thus becomes a distinguishing factor for the client and provides new opportunities for architects.[91]

In addition to the forms of demand explored above, clients are also becoming increasingly more demanding in sustainability in design. *The 2008 Autodesk/AIA Green Index* whitepaper reports that “over four in ten architects (42%) say their clients are inquiring about green design specifications on 50% or more of their projects.”[92] A similar study for the local context of Turkey is yet to be published, however the number of buildings registered to the United States Green Building Council (USGBC) displays that a similar trend is present in Turkey.[93] The sharp increase in the number of USGBC registered buildings marks an increasing interest in sustainable design, and therefore rendering sustainability as an important factor in deciding on which architect to assign the commission.

Considering all of the different forms of demand examined above, clients often tend to side with safer design processes by seeking a perfect-fit between the design task and

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[91] It is worth noting that Robert Gutman expresses façade design and interior design as the rising new specializations for architects, which some firms had already begun to consider as their primary services in 1980s in the United States. While interior design is an established profession in Turkey like the United States, façade design has only recently become a major design service that is offered by specialized firms. The rising interest in “branding” designs and potential demand from architects is discussed later on under the post-design phase heading.

[92] Autodesk and The American Institute of Architects, *The 2008 Autodesk/AIA Green Index*, PDF e-book, last accessed June 20, 2015, http://images.autodesk.com/emea_nw_w_main/files/2008_autodesk-aia_green_index_report_final.pdf .

[93] US Green Building Council, “Directory”, last accessed June 20, 2015, http://www.usgbc.org/projects/list/?keys=turkey

the architect. In Cuff's words, "Clients generally prefer to hire architects who have experience with their particular building type, since this may reduce the risk of negative consequences."[94] Observations made in the fieldwork also support this argument. The hotel brand in one of the fieldwork projects required all project groups to be experienced in hotel projects (preferably of the same brand), and all teams were subject to approval by the worldwide organization of the brand. Pressures with the same concern (though under easier to achieve specifications) were placed on the design teams by the management firm for a shopping mall project. While the demand for a perfect fit between the design task and the architect is justifiable on client's behalf, it certainly leaves architects in the dilemma that they can hardly design a new type of building as they are expected to have experience on the type prior to the commission.

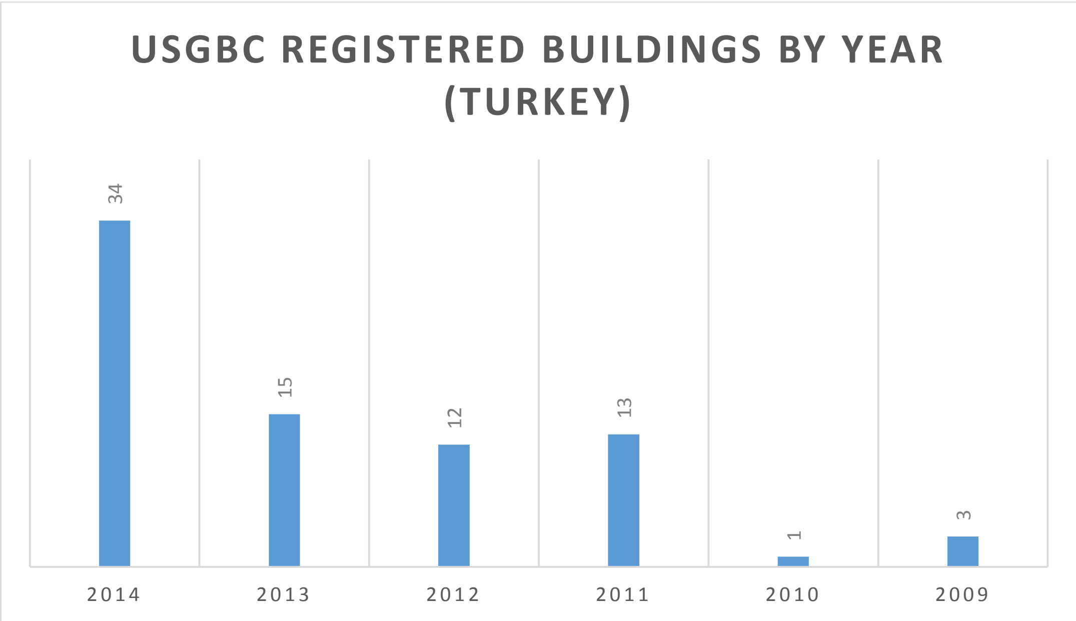

Figure 5. USGBC Registered Buildings By Year. Produced by the author. Data: United States Green Buildings Council.

[94] Cuff, *Architecture: The Story of* Practice, 103.

Design Phase

The generic services agreement published by Turkish Chamber of Architects lists the services to be provided by architects during the design phase as follows: (1) Preparation and Preliminary Works; (2) Preliminary Projects; (3) Design Development; (4) Construction Drawings; (5) System and Assembly Details; (6) Fabrication Details; (7) Specifications; (8) Quantity Analyses; (9) Cost Estimation.[95] While the list defines an overall frame for the services demanded from architects over decades, it leaves out the essential task of supervising coordination. As early as individual disciplines' separation from architecture within the larger frame of building design (such as structural or electromechanical design), architects have been expected to coordinate not only the various disciplines that work on the project, but also the needs and vision of the client in order to ensure consistency in the design.[96] Elaborating on future roles for architects, Graham Finney underlines the coordination as a key task to be undertaken:

> Architecture is an art of coordination as much as of creation. Architects not only synthesize the uses of diverse materials and technologies, they must reconcile often sharply conflicting positions as to the purposes to which a structure will be put. In arriving at a visible solution, the architect invariably forces his or her clients to make decisions and resolve conflicts, requiring them to consider not just the spatial and budgetary implications of their decisions, but the deeper values that space and budget embody.[97]

It is interesting to note that the task of coordinating all the involved parties is a task that is almost invisible prior to the design phase, however it occupies a considerable amount of time in the overall project schedules of architects. It is seen in fieldwork

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[95] Turkish Chamber of Architects, *Mimarlık Hizmetleri Sözleşmesi*, 2015, last accessed June 20, 2015, www.mimarlarodasiankara.org/_media/4/3276.doc .

[96] The March 21, 1985 issue of ENR quotes R. Bruce Patty explaining: "The architect is more of a generalist. Related professionals are the specialists. Most frequently it is the job of the architect to bring together all the disciplines." – "Architects Are Gearing up for Technological Literacy", *ENR*, March 21, 1985, 46; quoted from Gutman, *Architectural Practice: A Critical View,* 38.

[97] Graham S. Finney, "The Architect's Role," *Perspecta*, vol. 29 (1998): 69.

and relevant literature that coordinative tasks are thought of as *de facto* duties of architects, and are usually not even mentioned when clients' demands are listed. Although coordinative tasks grant the architect a superior position compared to those of the disciplines being coordinated, they also put the architect at least partially in charge of one of the most significant problems of the AEC sector. The AEC industry is known for lagging behind other industries due to lack of cooperation and poor information sharing, which, according to AIA's *Report in Integrated Practice,* adds up to a $15.8 billion extra costs annually in United States alone.[98] Consequently, the Construction Users Roundtable (CURT) report entitled "Collaboration, Integrated Information and the Project Lifecycle in Building Design" conclude with the remark that building owners will increasingly be demanding better coordination and faster and more capable project delivery with fewer errors in the near future.[99]

While the coordination of various design disciplines (engineers, consultants) is still considered as a duty of the architect, the coordination of the construction process on site is increasingly becoming an outsourced specialist service. Careful planning, management and supervision of the construction process can be considered as one of the most effective ways for clients to reduce construction and maintenance costs of buildings.[100] The emerging position of "construction manager" who undertakes these duties thus constitutes a new aspect of demand, which can be approached through different scopes: On the one hand, it is known that clients tend to modify projects during their construction, and they usually would like to maintain control over the construction process either via in-house construction managers or by hiring specialists for the task. In this approach, the client holds more power on the design since the

[98] Ian Howell, ed., *Report on Integrated Practice 9: International Developments,* (AIA Press: 2006).

[99] Construction Users Roundtable, *WP1202: Collaboration, Integrated Information and the Project Lifecycle in Building Design, Construction and Operation*.

[100] Gutman, *Architectural Practice: A Critical View,* 10. In addition, it could be noted that Mark Zuckerberg expresses Facebook Corporation's reason for assigning their campus designs to Frank Gehry Associates as being able to plan the construction process so well that the construction is completed ahead of schedule and under budget. Rachel B. Doyle, "Mark Zuckerberg Reveals How Frank Gehry Wooed Facebook", *Curbed National,* website, last accessed May 18, 2015, http://curbed.com/archives/2015/04/08/mark-zuckerberg-reveals-how-frank-gehry-wooed-facebook.php .

execution is overseen by him/her. On the other hand, the construction process can be monitored and controlled by architects who design the building (and with much ease if the right set of tools are used), resolving the need for a specialized construction manager.[101] In both scenarios, the management of the construction process leads to a new demand that architects can choose to answer, either as in-house employed specialists or as practices providing extended services.

A second and equally important aspect to consider is clients' demand for being able to anticipate the designs. A shared need reflected in the interviews with representatives of the construction firms is the availability of the design in media that are easier to understand, so that the design can be read correctly and interventions can be made more easily. It is observed that aside from a few small scale cases, every design undergoes multiple revisions requested by the clients (or other project participants) prior to, during, and after construction. A significant amount of labor is thus spent for revising designs. It may often be the case that revisions result in coordination problems, or be misrepresented to the client, resulting in the constructed form looking different than what has been imagined in the design process. Hence revisions constitute an important source of demand to consider, and proper management of revisions is another unmentioned duty expected to be fulfilled by architects.[102]

The temporal dimension of architecture constitutes a third aspect of the changing structure of demand. As Powerhouse Company managing partner Nanne de Ru explains, architecture by its nature is a slow profession that requires time to work on proper design and detailing.[103] On the other hand, as a chronic problem of the local AEC sector continuously mentioned by architects, clients are often in a rush in getting projects ready before they mature. It is almost common practice in Turkey that for

[101] Richard Garber, "Building Information Modelling", *The Digital Turn in Architecture 1992-2012: AD Reader*, ed. Mario Carpo, (Chichester: Wiley, 2013), 232-35.

[102] It is interesting that the generic services agreement of Turkish Chamber of Architects referred to earlier also does not mention any guides regarding revisions.

[103] Nanne De Ru, "Competitions in Architecture," lecture. Middle East Technical University Faculty of Architecture, May 9, 2014. – Nanne De Ru explains that Powerhouse Company realized three buildings in six years after 140000 hours of work with an average team of eleven people.

large-scale projects, a basic version of the project is designed and drawn for getting necessary construction permits, and a separate set of drawings continue to be worked upon as the construction progresses. In the end, the construction permit projects are revised with the updated ones. This double effort forces architects to spend time on work that is not used, as well as causing financial losses on the construction site in the form of construct-demolish-reconstruct routines, which arise due to limitations of time allocated for detailing.

Post-Design Phase

The concerns related with the post-design phase can be examined under two headings: branding and management. The term "branding" refers to the identity of the building and the notion of "cultural capital" surrounding its existence. "Management" refers to the concerns related with the life-cycle of a project and their impact on design. Although the former heading refers to the less-tangible realm of marketability, and the latter to the everyday operations to keep a building properly functioning, both influence the design before and after its realization.

Branding, as defined by brand expert Marty Neumeier, "is a kind of Platonic ideal – a concept shared by society to identify a specific class of things." [104] The term "branding" thus refers to the creation of an identity that is acknowledged by a group of people and is associated with a set of desired values. In the context of capitalist consumerism, branding inevitably becomes an effective tool to express and market a social status and a relative lifestyle. In defining the nature of branding in the contemporary socio-economic context, Anna Klingmann explains that:

> Due to cultural fragmentation and pluralism coupled with a fast-paced capitalist consumerism, Western societies are experiencing an exponential growth of insecurity, oscillating between a desire for belonging and profound disorientation. It is precisely within pluralistic societies that signals of identification take on critical importance. In a world in which

[104] Marty Neumeier, *The Brand Gap: How to bridge the distance between business strategy and design: a whiteboard overview,* (Berkeley, Calif.: New Riders, 2005), 2.

> social, economic, and political value systems are defined by continual change and movement, individuals are forced to create their own identities and find ways of signaling their place in the world. Social values and lifestyle, formerly defined by religion and nationhood, are increasingly transferred to the branding of products.[105]

Consequently, it can be argued that architecture is susceptible to branding, as owning a piece of architecture is a solid display of social status. Borrowing the term from Pierre Bourdieu, architecture becomes an "objectified cultural capital," a possession that psychologically grants a social status to its owner. Thus the acquisition of a building, or a part of a building, is often paired with belonging to a social network.[106] Concordantly, the marketing campaigns of new projects readily display a conscious investment on cultural capital through branding, as in the instance of a housing project in Istanbul being marketed with phrases "life beyond dreams" or "luxury beyond luxury", or a project in the shoreless capital Ankara being presented in the theme of a marina. In most instances, the introduction of projects to the public would be made by celebrities, consciously conveying the idea that owning the space means belonging to their network. Neumeier explains that the conventional assessment habit of comparing the pros and cons of products is no longer valid in the multiplicity of information. Rather, the choices of individuals are based on symbolic attributes:

> What does the product look like? Where is it being sold? What kind of people buy it? Which "tribe" will I be joining if I buy it? What does the cost say about its desirability? What are other people saying about it? And finally, who makes it? Because if I can trust the maker, I can buy it now and worry about it later. The degree of trust I feel towards the product, rather than an assessment of its features and benefits, will determine whether I'll buy this product or that product.[107]

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[105] Anna Klingmann, *Brandscapes*: *Architecture in the Experience Economy*, (Cambridge: The MIT Press, 2007), 56.

[106] Pierre Bourdieu, "The forms of capital", *Handbook of Theory and Research for the Sociology of Education*, ed. J. Richardson, (New York: Greenwood, 1986), 241-258.

[107] Marty Neumeier, *The Brand Gap: How to bridge the distance between business strategy and design: a whiteboard overview*, 2.

Assessing branding with respect to clients' demands from architects, it can be argued that architectural design is an effective agent in communicating the messages of branding. In this sense, the design of a building, or the designing architect himself/herself, may become a mediator of branding. Moreover, as the conception of "cultural capital" is experienced strongly by the end users, it can be said that the demand for branding is initiated not by developers/clients alone, but rather emerges as a societal expectation shared by developers and their potential clients. Observations in the fieldwork also yield the information that the branding of a housing project is further sustained after all sales are completed by founding authorities that control second hand trading of the units.[108]

Branding in this sense may take on different forms. In reporting the rising trends in the United States in 1980s, Gutman notes that "[a] corporate headquarters is now a 'giant architectural logo,' making the company conspicuous in the urban landscape. Fashionable interior design is justified on the grounds that it contributes to employee morale and aids recruitment."[109] Thus, the facades, interior designs, landscaping, or featured functions may all be underlined as amplified demands made by clients that answer part of their needs in the post-design phase.

The factor of facilities management constitutes another important factor in considering clients' expectations from architects. Although common practice in the local context of Turkey appears to favor lower initial costs over lower lifecycle costs, the global trend appears to be the other way round. The 2012 *SmartMarket Report* published by McGraw Hill Construction indicates that the interest in lower lifecycle costs for buildings is a rising trend in the United States:

> Increasingly, owners and project teams are embracing the view that design and construction is just the first part of the

[108] The second hand sales management team of the home-office blocks studied in the fieldwork were founded even before the construction was completed in order to ensure that the social status of the project would not decline by low-priced second hand sales.

[109] Gutman, *Architectural Practice: A Critical View,* 18.

> overall asset lifecycle, and that the people who will ultimately be responsible for the later phases should have input earlier.[110]

As noted earlier, the losses due to inefficiency in cooperation add up to a $15.8 billion extra costs annually in United States alone. Furthermore, the losses experienced in the maintenance of buildings add up to $9 billion USD.[111] Although in Turkey a similar research is yet to be undertaken, clients are increasingly becoming more interested in how the buildings will operate once they are occupied.[112] In this respect, information on the economic sustainability of structures appears as an important form of demand that architects are expected to answer.

2.2 "Bigness" and the Increasing Complexity of Buildings

> Beyond a certain scale, architecture acquires the properties of Bigness. The best reason to broach Bigness is the one given by climbers of Mount Everest: "because it is there." Bigness is ultimate architecture.[113]

A frequently referred aspect of the change in the AEC context is that of growing scales and increasing complexity of buildings. In his famous manifesto "Bigness, or the problem of Large", Rem Koolhaas points out the ongoing trend of building bigger and more complex (without a theory of Bigness), and states that "Bigness is ultimate architecture."[114] In his definition, Bigness is a unique mode of existence, bearing a potential for the reorganization of the social world and a richer "programmation".[115]

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[110] McGraw Hill Construction, *The Business Value of BIM in North America: Multi-Year Trend Analysis and User Ratings, Smart Market Report*, 64.

[111] Ian Howell, ed., *Report on Integrated Practice 9: International Developments.*

[112] The developer for the fieldwork project requested the facilities management firm to be present in the design meetings to provide consultancy on the efficiency of social infrastructure, operational systems and costs of maintaining the structure.

[113] Rem Koolhaas, "Bigness, or the problem of Large," 495.

[114] Rem Koolhaas, "Bigness, or the problem of Large," 494.

[115] Rem Koolhaas, "Bigness, or the problem of Large," 497-99.

Koolhaas further explains that Bigness is made possible by a set of conceptual and technological advances in the last century, which affected the way architects design and realize buildings. Keeping these elaborations in mind, this section of the thesis examines Bigness and the increasing sophistication of buildings in three parts, the first inquiring how "Bigness" and complexity can be defined, the second focusing on the potential motives behind building bigger and more complex, and the last elaborating on the consequences of Bigness in the AEC context.

2.2.1 Bigness

The emergence of the large scale and complex building brings along new rules of existence and coexistence, new modes of operation, new expressions, and new control mechanisms. In this respect, it can be argued that Bigness comes with its own culture distinguished from the conventional culture of practice.[116] In Gutman's words, the increasing sophistication of buildings at larger scales "is setting the standard for the skills architects must present to clients and the manner in which they organize and present these skills,"[117] altering the way architects practice and present their work. A decade later, Koolhaas identifies the condition of bigness implicitly over the case of the skyscraper in *Delirious New York*, from which he originates five theorems for a "Theory of Bigness" [118] in *S,M,L,XL*. While these five theorems may not necessarily be applicable to every building of large scales, they nevertheless provide an important framework to identify the practice of growing scales and the increasing sophistication of buildings.

Koolhaas' first theorem declares the autonomy of connected parts. The scales of mass that render a building big reach beyond the control of a single architectural gesture and grants autonomy to its individual parts, which are still committed to the greater whole.

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[116] The idea of culture of practice is defined by Dana Cuff as the totality of "organized systems of significant symbols, giving sense and meaning to experience." Cuff, *Architecture: The Story of Practice,* 112-13.

[117] Gutman, *Architectural Practice: A Critical View,* 31.

[118] Koolhaas, "Bigness, or the problem of Large," 499-500.

In other words, larger scales make it possible for different attitudes to coexist in larger scales. Concordantly, the second theorem states that by establishing connections via mechanical (rather than architectural) means – made possible by the elevator – issues of “composition, scale, proportion, detail are now moot.”[119] The spatial experience manifested in these two theorems may be exemplified in numerous cases. A common instance is the mixed-use complexes now being built intensely in metropolitan regions of Turkey, featuring various functions with different spatial qualities and experiences in the same structure.[120]

The third theorem expresses the independency of building envelope from the interiors. Consequently, the message conveyed by the exterior mass of a building may be completely different from the interiors, as the interiors are instable in their nature due to changing ownership and spatial needs. In this respect, borrowing the expression from Koolhaas, “honesty” in architectural gestures is lost. The façade serves as an urban object presenting an identity for the structure, while the interiors serve the chaotic nature of occupancy. The curtain wall, almost a characteristic of the large scale building, covers all spaces equally. An office space may thus look the same as fire-escape stairs on the exterior, as all facades may equally conceal interiors.

In his fourth theorem, Koolhaas states that the sheer size of the big building renders its impact independent of its quality. In this sense, size becomes the primary concern, rendering conventional notion of quality irrelevant. By convention, large-scale projects take pride in their Bigness, and forward their sheer size as an argument in their public presentations.[121] Reaching beyond superstructure projects, Bigness is

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[119] Koolhaas, “Bigness, or the problem of Large,” 499-500.

[120] The home-office blocks observed in the fieldwork provide an actual example, featuring 18 levels of home-offices on top of restaurants, two levels of a shopping mall, a fitness center belonging to the home-offices, and finally underground parking in respective order. As the connection between these parts is established by elevators, each different function occupies a different footprint and is planned accordingly.

[121] To provide an example, the controversial *Maslak 1453* project in Istanbul emphasizes the scale of the project, the length of the shopping street, and a forest belonging to the project in its TV commercials. The obsession with scale and complexity is also seen in the subtext of the commercials, in which the developer finds architectural projects not complex and innovative enough and pushes projects down the table.

manifested and publicized even in governmental campaigns through the announcement of urban-scale projects.[122]

The fifth and the last theorem is a sum of the other breaks, stating that all the breaks facilitated by Bigness further imply a break with the context. Rather than existing in context, the big building is in a state of coexistence with its context. A vivid example for such coexistence of the rapidly growing large scale buildings can be read from the silhouette of Istanbul – a series of disconnected structures highlighting themselves through scale among the urban fabric of the city.

Figure 6 - Silhouette of Istanbul. Wikipedia Commons, last accessed June 14, 2015, https://upload.wikimedia.org/wikipedia/commons/a/ae/Cruise_ship_and_Seabus_in_Istanbul.jpg .

While Turkish Statistical Institute output does not provide a classification of buildings in terms of bigness and complexity, it is possible to deduce statistical information from the indices at least partially. The first evidence of the increasing scales of construction

[122] For instance, *Kanal İstanbul* project, enthusiastically promoted by the government officials, is designed to create a 25m deep, 40km long water canal connecting the Black Sea to the Sea of Marmara with an estimated cost of 10 billion USD.

is the floor area per building number ratio, which has already been noted earlier as 364,3m² (1992); 424,5 m² (1997); 485,9 m² (2002); 931,6 m² (2007); 1116,8 m² (2012); 1222,3 m² (2014). As the figures illustrate, there is a notable growth in the average building size. Similar results are also seen in the statistics of buildings given permit between the years 2006 and 2014. Focusing on housing – constituting more than 80 percent of overall construction annually – the ratio of floor area reserved for housing to floor area reserved for common space displays a sharp increase from 11,17 percent to 28,74 percent in high-density projects (figure 7). This increase indicates a rise not only in the number of buildings with more than ten floors produced, but also in the percentage of space allocated for common functions, which is indicative of a tendency to include more imported programs in large-scale residential buildings.[123]

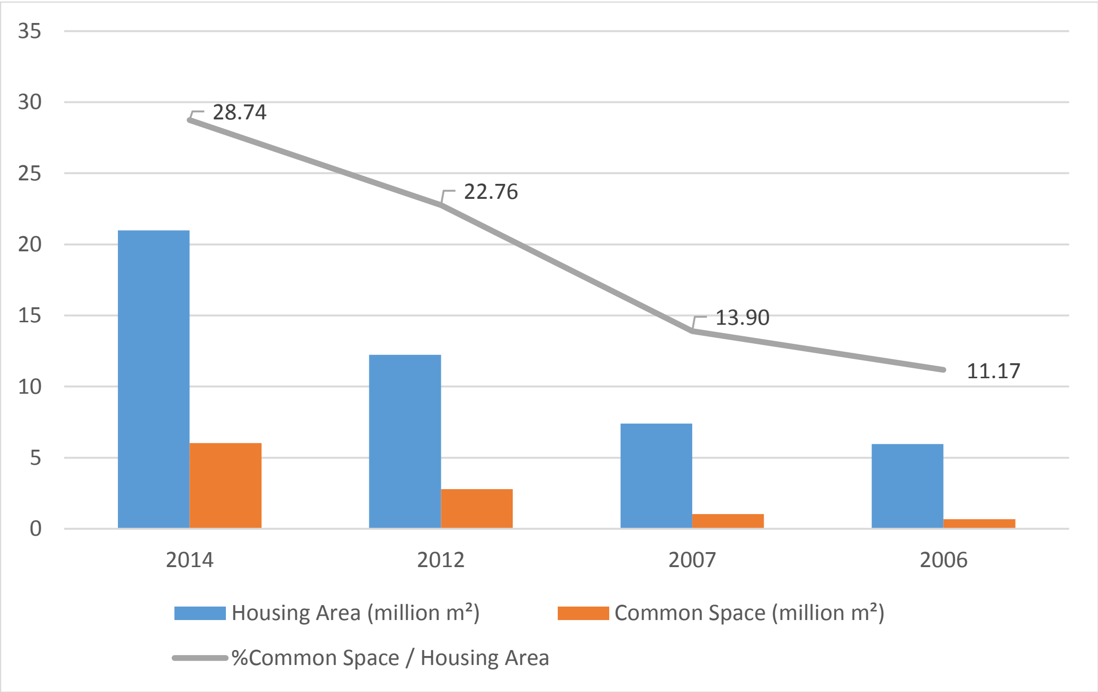

Figure 7. Common space / housing area percentage by year in Turkey. Produced by the author. Data: Turkish Statistical Institute.

[123] The sample range chosen is housing with more than 3 units and 10 floors, for housing constitutes the largest percentage of construction stock in Turkey. Detailed data is available only from 2006 onwards.

In general, the current AEC context of Turkey follows a path concordant with Koolhaas' theorization of Bigness by means of the growing scales and sophistication of construction undertaken each year. The following part focuses on the potential motives for the amplification of scale and complexity in order to identify the underlying parameters that lead to the contextual demand for Bigness.

2.2.2 Motives for Bigness and Complexity

> [I]ndustrial construction is also important from a public policy perspective, because this type of capital formation provides the essential underpinnings for long-term growth in output, employment, productivity and international competitiveness.[124]

Construction is one of the flagship sectors for the current economic context of Turkey, constituting over 4,5 percent of Gross National Product (GNP) with an overall turnover of 162,297,000,000 TRY (Turkish Liras) and an employment rate of 1,829,000 people (7,1 percent of all employment in Turkey) reported by the end of 2014.[125] Almost one third of the overall investment in construction (61billion TRY) is made on behalf of the government, mostly via TOKİ (*T.C. Başbakanlık Toplu Konut İdaresi* – Prime Ministry Housing Development Administration of Turkey), and the remaining amount (101 billion TRY) by developers in the private sector. Interestingly, the strategic planning of the growth of AEC sector is in parallel with Gutman's description of 1980s United States quoted at the beginning of this section. In both cases, the growth of the AEC sector can be read as a mechanism to overcome the chronic crises of capital by creating a demand to meet the oversupply of stock. As David Harvey explains in his lecture titled "Limits to Capital and the Anticapitalist Movement," capitalism tries to overcome crisis by providing loans and debiting individuals to encourage a demand

[124] Gutman, *Architectural Practice: A Critical View,* 33. Gutman quotes from "Industrial Construction in the United States", *Construction Review*, January-February 1986, 4.

[125] Turkish Statistical Institute, Central Dissemination System (MEDAS), 2015, last accessed June 20, 2015, http://www.tuik.gov.tr .

for housing and furnishing their interior with new commodities. This condition has two objectives: strengthening capital, and ensuring control over individuals who are indebted and thus coerced to fit in with the economic system.[126]

While Harvey warns that Turkey may be on the verge of facing the postponed crisis of 2007-2008, and that construction will eventually reach the point where no more housing can be produced,[127] the housing stock and the demand for housing continues to grow in the second quarter of 2015. Sectorial reports display that overall sales index of new housing has increased by 17 percent in the first half of 2015 compared to that of the first half of 2014, followed by a 7,46 percent increase in the unit prices for new housing projects.[128] The increasing supply and profitability imply that housing in particular is an attractive investment tool for developers, and partly explain the demand for the increasing scales and complexities of projects to standout in the growing competition.

The policies for urban regeneration form another interesting aspect of the motives for building bigger and more complex. Although the larger scales practiced under urban regeneration refer more to Bigness in the site plan than it does to the individual building, it is still worth examination as it is capable of providing privileges to bigger and more complex buildings. Briefly, the first article of the law defines its purpose as the refinement and renewal of zones under risk of disaster and other sites on which buildings that pose a risk are present, in consistency with the norms of science, art, wellness and security.[129] At the same time, the law aims to raise employment and production in the construction sector by encouraging the demand for new

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[126] David Harvey, "Limits to Capital and the Anticapitalist Movement", Lecture, 13 June 2012, METU, Ankara.

[127] David Harvey, "Dünyaca ünlü sosyal bilimci David Harvey: Seçim bitene kadar krizi maskeleyecekler", interview by Ömür Şahin Keyif, BirGün, 18.05.2015, last accessed June 12, 2015, http://www.birgun.net/haber-detay/dunyaca-unlu-sosyal-bilimci-david-harvey-secim-bitene-kadar-krizi-maskeleyecekler-81206.html .

[128] Association of Turkish Construction Material Producers, *Monthly Sectorial Report: June 2015*, 6, PDF e-book, http://imsad.org/docs/06_2015_ayerap_bulten.pdf .

[129] *Afet Riski Altındaki Alanların Dönüştürülmesi Hakkında Kanun*, Public Law, 11579, Mevzuatı Geliştirme ve Yayın Genel Müdürlüğü, 31 May 2012.

constructions, and thus complying with the general policy to keep construction sector active and growing.

That being said, two articles in the law are worth consideration as they directly affect the design and construction of new buildings. The first one – article 2, item 1 – provides the definition of the conception of “reserve building area”, which denotes the new settlement areas to be used in accordance with the law, assigned by governmental authorities. In practice, this article implies that buildings under risk can be redesigned and reconstructed in pre-assigned zones different than their original spot, leaving their original sites for revaluation. In theory, this article makes it possible to reprogram certain urban zones to an economically more “favorable” function and floor area ratio.

The second article under focus – article 6, item 6 – states that Ministry of Environment and Urbanization can approve special regulations and standards framing design operations of every scale in zones including those provisioned by special laws. This article provides both a soft spot and an opportunity by rendering the local building regulation less powerful in urban regeneration zone and providing flexibility in planning. As with every privilege, this article can be used or abused with important implications on the way urban environments and buildings are designed and constructed.

Overall, the two articles covered above pave the way for higher densities to be constructed, which allows for the practice of Bigness on relevant sites. Furthermore, they direct attention to the issue of land value, which is a motive by itself for bigger and more complex buildings. As the value of the land escalates, developers are inclined to use all of the allowed floor area ratio in order to render their investment profitable.[130] In this sense, land value acts as a justification for the growth of scale, which is a condition felt continuously stronger in Turkey.

In addition to the inferences made so far, the growth of clients constitutes another important factor fueling the construction of bigger and more complex buildings. As

[130] Gutman, *Architectural Practice: A Critical View*, 32.

institutional clients such as corporations or universities grow their operations and employment, they generate a need for larger buildings and more specialized spaces. Variations in sizes, design requirements, electromechanical requirements, and even the furnishing of spaces indicate an overall increase in the complexity of buildings.[131] Moreover, regulations may render certain complexities necessary in the design of the building, as in the case of specialized functions such as hospitals or research centers.

The last motive focused in this section is the technological sophistication reached in the present context. As Koolhaas explains in his manifesto, the use of technology renders the idea of Bigness possible. Advancements in materials, manufacturing technologies, digital design opportunities, building systems, all contribute to a degree of complexity that is unmatched before in the history of construction. Technological capabilities may become a motive for Bigness by themselves in particular cases with the attitude of the Mount Everest climbers quoted at the beginning of this section: "Because it is there."

On the one hand, the sophistication of technology allows architects to pursue new ideas previously impossible to realize. On the other hand, architects are increasingly becoming unable to command all the information required to build a complex structure by themselves, which results in an emphasized dependence on consultants.

2.2.3 Implications of Bigness for the Profession

In a research paper published in 1982, Peter Millard et al. point out "consultation" as the first of the four mastery areas for competence as an architect,[132] in which the architect is defined as a consultant on "technical, financial, procedural, and personal aspects of building" to fulfill the rising liability expectations of the society.[133] Millard

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[131] Gutman, *Architectural Practice: A Critical View,* 33.

[132] The four areas are defined as (1) consultation, (2) craft, (3) design, (4) meaning. Peter Millard, et al., "Competence in Architectural Practice," 124-25.

[133] "Architects function, now more than ever before, as consultants on technical, financial, procedural, and personal aspects of building. Rising expectations of their capabilities are codified in ever more extensive registration requirements, while the rising cost of professional liability insurance is one

explains that the architect has to be knowledgeable on multiple fields that lead to the erection of a building, serving as a consultant to his/her clients. While Millard's definition frames a role for the architect that has been dominant in the early 20th century, Kenneth Frampton points out a different formulation one decade later:

> One thing seems certain, that except for relatively small or prestigious commissions, the architect will have little prospect of maintaining control over every single aspect of the fabric. As we have seen, this is in part due to the increased technological character of building that today has attained such a complexity that no single practitioner can master all the processes involved.[134]

The difference in these two approaches to the architect's role in the design of buildings is striking. Whereas one defines the architect as the consultant, the other implies that the architect is obliged to work together with consultants. The difference between the two approaches lies in understanding the change in scale and complexity in buildings. In his study on collaborations in architectural design, Shiro Matsushima refers to the two reasons David Gann outlines for the separation of design and engineering professionals in the 1990s:

> First, the complexity of buildings and structures has increased with the introduction of new technologies and the need to accommodate flexible patterns of use, while reducing environmental impact. Roles of expertise had emerged in response to the need for new knowledge in these areas. Second, the use of information technology in design processes has been changing the ways in which design professionals work, providing possibilities to simulate and test design options and coordinate activities between different participants.[135]

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response of a society frustrated in those expectations." Millard, et al., "Competence in Architectural Practice," 124.

[134] Kenneth Frampton, *Studies in Tectonic Culture: The poetics of construction in Nineteenth and Twentieth Century Architecture*, (Cambridge, Mass.: MIT Press, 1995), 386.

[135] Shiro Matsushima, "Collaboration in Architectural Design: an IT Perspective," (D.Des. diss., Harvard University, Cambridge, Massachusetts, 2003), 3.

As underlined in Gann's explanations, the increasing scales of construction and the emerging complexities for various requirements (programs, legislations, specialty services, etc.) rendered building design as a collaboration process involving participants from various disciplines.[136] Koolhaas defines this collaborating group of professionals as a *team* – which, he explains, is a term not mentioned in the last 40 years of architectural polemic – and states that the bigness and its relative complexity can only be achieved by giving up control on behalf of the architect. The post-heroic status of the architect characterizes the design process of Bigness. [137]

The number of professionals involved in the design and execution of bigger buildings is yet another issue to discuss. In his research in 1988, Gutman notes that there may be as many as twenty-five different specialists working in the field according to AIA reports.[138] Furthermore, Tombesi's research in 1997 reveals that a complex building design process may require services from over 50 different domains of professional knowledge.[139] Adding the influence of other participants who are not involved directly but are of influence to some degree, the list grows even further, redefining the way in which buildings are designed.[140]

The position of the architect within the larger cycle of consultants remains somewhat ambiguous. While there are various handbooks and manuals published by the Chamber of Turkish Architects, these publications generally focus on the legal procedures of

[136] In a BIM seminar organized by software vendor Autodesk on June 4, 2013 (*Şimdi Türkiye'de BIM Zamanı* – Now is the time for BIM in Turkey), ERA Architects comment that in the present context, heavily-loaded architectural programs and the scale of buildings make it impossible for the architect to control the process single-handedly.

[137] Rem Koolhaas, "Bigness, or the problem of Large," 513-14.

[138] Gutman, *Architectural Practice: A Critical View*, 34.

[139] Paolo Tombesi, "Travels from Flatland: The Walt Disney Concert Hall and the Specialization of Design Knowledge in the Building Sector", (PhD diss., University of California Los Angeles, 1997), 18-19.

[140] Office for Metropolitan Architecture (OMA) Partner Shohei Shigematsu comments that the number of specialists involved in large scale projects may even compel the architects to look for a new definition for the profession. Shohei Shigematsu, video interview, accessed online, http://www.archdaily.com/206/ad-interviews-shohei-shigematsu-omaamo-ny/ .

getting building permits, or ethical guides. To date, a script providing an official opinion on architects' position within the team of experts is yet to be introduced. The resource closest to providing a definition is the governmental *Regulations for the Practice, Registration, and Professional Supervision of Architectural Services,* which briefly defines the tasks to be undertaken by architects under five categories: architectural design services; construction and management services; architectural consultancy services; education studies; other artistic studies. Among the five, the more open-ended category of architectural consultancy covers conventional expertise roles undertaken by architects such as consultancy (in general), feasibility studies, program studies, construction documents preparation, refereeing, expertise, and real estate valuation. The category titled "other artistic studies" groups together the activities of artwork selection, physical model construction, visualization and similar services.[141] These two categories can be read as an acknowledgement of the changing roles architects may take on during different design processes, and are accompanied by an additional note that new services can be executed in coordination with local and international regulations. Still, the position of the architect among the other consultants working on the project is not defined, and remains dependent on a set of well-defined (i.e. the architect's contract with the client) and undefined (i.e. personal favors and pop-up requests), and professional roles may be expanded or contracted according to mutual agreement.

The American Institute of Architects adopts a more business-inclined approach to the practice of architecture in collaboration. As Cuff underlines in *Architecture: The Story of Practice,* AIA acknowledges that except the smallest and simplest ones, projects involve a team of consultants (architects, engineers, interior designers, specialist consultants, construction managers, public agencies and clients) lead by a strong design leader.[142] The individual consultants are described as specialists serving the

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[141] *Türk Mühendis ve Mimar Odaları Birliği Mimarlar Odası Serbest Mimarlık Hizmetlerini Uygulama, Tescil ve Mesleki Denetim Yönetmeliği,* Public Regulation, T.C. Resmi Gazete, No:25833, 2 June 2005.

[142] Cuff, *Architecture: The Story of Practice,* 1992, 77.

architectural design, thus being under the coordination of the architect. This definition implies two trajectories for the architect to follow in the changing AEC context: the specialist consultant; and the design coordinator, both implying a generalist position for the profession.

Concerning architects' work, the AIA *Architecture Factbook* indicates that 49% of the total revenues of architecture design firms are generated from services other than architectural design, in other words, from providing consultancy on specialized knowledge fields.[143] It is observed in the work of architects that many details of the building to be constructed are designed via consultancy or left to be detailed by design-teams of specialist contractors. In this kind of practice, the architect is initially knowledgeable to some extent in the problems that will need solutions to realize the design, provides draft design solutions for the relevant problems and outsources detailing to consultants or design-teams working for specialist contractors. This mode of practice can be explained more clearly through an example from the fieldwork: Considering the curtain wall façade design of the high-rise office towers, the design team leader on behalf of the architecture firm is responsible for the initial design and selection of materials to be used and provides details in principle that she thinks will lead to the realization of the image created. The drawings are than transmitted to either façade consultants or the façade contractor (for this case, façade contractors were chosen to work on the detailing of the façade), and architects working for the contractor develop the principle details into shop-drawings according to the production specifications of their brand. The shop-drawings are then sent back to the architect to check if they are consistent with her initial design idea, and after a series of revisions the drawings are transmitted to the construction site. The same protocols are repeated over different aspects of design, such as façade cleaning systems, elevators and escalators, lighting design, furniture details, pool details, etc.

This kind of practice is wide-spread in the design stages of bigger and more complex buildings, as can be observed in the longer lists of credits for every building. Underlining Frampton's statement quoted at the beginning of this section, the architect is no longer able to possess the great variety of specialist knowledge involved in the design of buildings. Rather, s/he is forced

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[143] The American Institute of Architects, *Architecture Factbook – Industry Statistics*; 3rd Edition, (Washington: AIA Press, 1992).

to attain the role of the coordinator who makes sure that the design input from the various design participants are appropriate for the original design idea and work together harmoniously. Other disciplines are expected to stay consistent with the original design as much as possible, as Guy Nordenson, the structural engineer in charge for Steven Holl designed Kiasma Museum in Finland, points out:

> The technicians solve the problem given by the architect. Sometimes that means the structure has a particular tectonic "look" about it as conceived by the architect. At other times it will mean that the structure disappears behind the scenes. I remember one engineer friend telling me he saw his task as making an exposed structural detail work as the architect imagined it did, executing a specific mechanical script. Often the result is a great project. But, in all these cases, if uncovered, the facts will show that the script was driven by an architectural idea, not necessity nor engineering.[144]

In contemporary practice, although many participants of the design team may have a lead position according to the specific type of project (i.e. structural engineers in bridges, electrical engineers in Supervisory Control and Data Acquisition –SCADA– buildings, etc.), the main authority in the design process is generally observed to be the architect. This position of authority can be explained through two issues in practice. The first one is the ultimate power to be able to call a project off. As Dana Cuff explains, the client and the architect mutually possess the power to end a project, although ending a project does not end in favor of any party.[145] The second is the fact that clients approach architects for solutions to their spatial needs. To put it more clearly, the primary need of the client is space. Therefore it is much easier for the general client to describe their needs through space and comment on spatial solutions. Other services, such as electromechanical design, often require more specialized knowledge to be able to comment, and their control is usually assigned to the architect who is supposed to foresee prospective problems and report to the client.

In more complex projects, the clients may be inclined to seek an international architect with proven expertise on a specific building type in addition to local architects who make sure that

[144] Guy Nordenson, "Reading Structures", *Perspecta*, vol. 34, (2000), 36.

[145] Cuff, *Architecture: The Story of Practice,* 1992, 75.

the project complies with local codes.[146] As illustrated in the figure derived from one of the projects observed in the fieldwork, this approach involves a hierarchy in the design work with the international architect expected to confirm consistency and submit the construction drawings to the client's design-office for final control: (1) the client in Azerbaijan assigns the international architectural firm in the United Kingdom with the task of completing conceptual designs, (2) design development is outsourced to the primary design contactor in Turkey (which is a structural design firm); (3) the construction drawings and design coordination of individual buildings in the project are outsourced to a subcontractor architecture firm in Turkey; (4) the architecture firm outsources specific detailing of projects to another architecture firm and appoints the engineers together with the primary design contractor.

Global-local –or "glocal"[147] – collaborations of the nature described so far become more feasible with large scale and more complex projects. Developers who aim for Bigness and complexity may count upon international firms with different motives such as experience in a specific field or global reputation. Elaborating on American architectural design firms' overseas operations, Roger B. Williams and C. Richard Meyer remark that:

> Clients primarily look for project-type experience and firm reputation in a particular building type, such as retail, entertainment, medical, and office buildings. Projects that can afford to carry the cost of an overseas designer are by necessity rather large, and the reputation of the designer is expected to match.[148]

[146] Approvingly, Williams and Meyer explain that "access to designers from the foreign country can ease the transition for an American architect and eliminate many of the cultural, political, and economic risks." Roger B. Williams and C. Richard Meyer, "Practicing in a Global Market", *The Architect's Handbook of Professional Practice*, 15th Edition, (Wiley, 2013), 158.

[147] The term "glocal" is first coined by Japanese economists as *dochakuka*, meaning global localization. The English term "glocal" is usually associated with Roland Robertson, who explains that "[w]hile globalization *per se* refers to a *temporal* process, glocalization injects a spatial dimension in its emphasis upon the *necessarily* spatial distribution of that which is being globalized (Robertson 1995, cf. Brenner 1997)." In this respect, Robertson explains, globalization cannot occur if it's not adaptable to particular circumstances. In the case of architecture, even an exact replica of a building exported from a certain context needs to be adapted at least to the legislation and other contextual aspects (culture, economy) of the importing culture. For elaborations on glocalization from a sociological perspective, see: Roland Robertson and Kathleen E. White, *Globalization: Analytical Perspectives*, (London: Routledge, 2003).

[148] Roger B. Williams and C. Richard Meyer, "Practicing in a Global Market," 154.

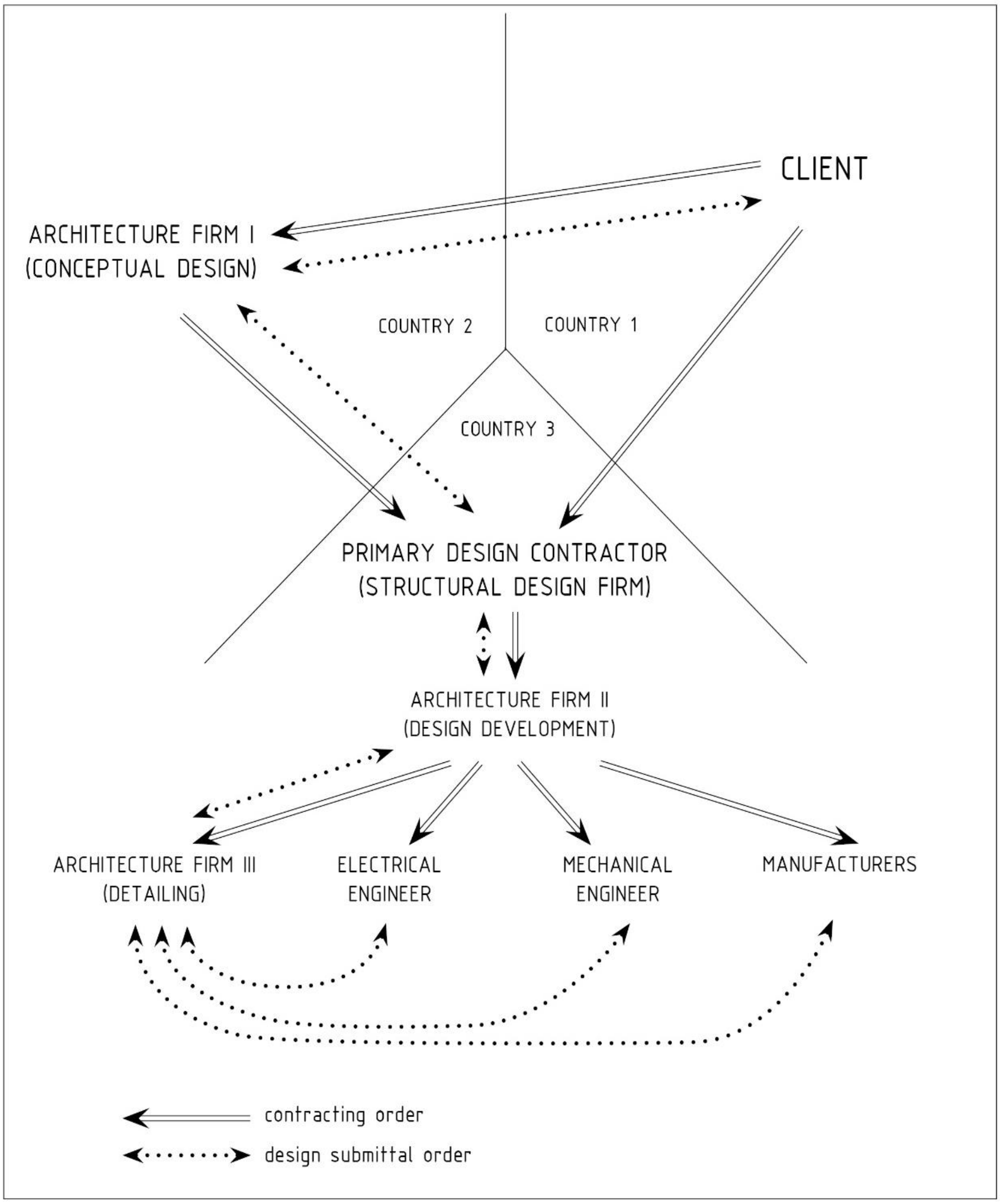

Figure 8. Design & contracting hierarchy in the global collaboration from fieldwork. Produced by the author.

Overall, it is observed that the increase in the scale and sophistication levels of buildings alter the internal organizations and the exterior network of the involved design teams. The connotations of the new kind of practice required to design bigger buildings are multifaceted, and effect a variety of disciplines. As Gutman enlighteningly notes, “the increased scale and complexity of projects have clearly had a major impact on how the profession defines its role in the building process, and therefore, on the kind of work people trained as architects do.”[149]

2.3 The Competitive Scene of Architecture

The growth in the number of graduates from architecture schools, the increasing need for architects and specialists due to greater complexity in buildings, and the governmental strategies to keep the AEC sector strong and functioning all lead to an increased level of interest in the services that architects offer. As with other professions, the increase in the interest results in an increased supply of architects and architecture firms, which in turn creates a more competitive scene for practicing architects. In addition, as discussed earlier, the design of a building involves more specialists as it gets more complex, leading to a competition between architects and other professions.

This part of the study evaluates the increasingly more competitive scene in which architects practice, considering the structure of the architectural practice, the way firms get their commissions, and the “branding” of architectural practices to standout in the competition.

2.3.1 The Architectural Practice

Architectural firms vary in their structures and routines as widely as their founders. As Dana Cuff explains in *Architecture: The Story of Practice*, architectural firms are founded according to the ideals and design approaches of the founders, who become

[149] Gutman, *Architectural Practice: A Critical View*, 42.

role-models for others in the firm in the following process of development.[150] In this respect, firms may develop and create their own culture in a variety of ways, ranging from one-person practices to architectural corporations, all having different advantages and concerns. In their influential taxonomy of architectural firms, Coxe et al. define three major types of architectural firms: [151]

(1) Strong-idea (brains) firms are organized to focus on innovation and/or expertise on singular projects, can adapt to the nature of the commission and depend on "star" figures to conclude a project. These may be typically small or one-man firms led by "role-model" founders, the presence of whom effects the way the firm operates and is reflected in the design habits of prospective colleagues in the firm.[152] Strong-idea firms are easier to found and manage, and by consequence they constitute a significant percent of architectural practices.

(2) Strong-service (gray hair) firms are organized to undertake complex commissions and provide effective solutions through expertise and reliability. Coxe et al. explain that these firms are equipped to provide complete services for clients, thus enabling clients to involve more in the process. Most firms getting the bigger and more complex commissions are founded around this approach. Statistically, these firms acquire a significant portion of the overall contracts and revenues (the largest firms constituting two percent of all practices in the United States collect up to 30 percent of all architectural fees).[153] According to organizational sociologist Judith Blau, these firms are more likely to survive economic instability due to their highly rationalized practice: "large scale, corporate affiliation, local projects, an aversion to using client networks, reliance on primarily corporate and government clients, and the use of outside consultants."[154]

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[150] Cuff, *Architecture: The Story of Practice,* 155-94.

[151] Weld Coxe et al., "Charting Your Course: Master Strategies for Organizing and Managing Architecture Firms," *Architectural Technology,* (May/June 1986): 52-53.

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[152] Cuff, *Architecture: The Story of Practice,* 159.

[153] Cuff, *Architecture: The Story of Practice,* 155.

[154] Judith R. Blau, *Architects and Firms: A Sociological Perspective on Architectural Practice*, 124.

(3) Strong-delivery (procedure) firms are organized to deliver routine-services based on previous experiences of the same kind. These firms typically provide services on the same type of building and work on repeated design patterns. They are highly reliable in technical and economic aspects of the design and characteristically knowledgeable about construction schedules and procurement on a certain type of building.

These three types of firms, as noted by Coxe et al., do not necessarily imply that a firm type is superior or inferior, but rather points out the emphasis the firm places on a certain aspect of design. A strong-idea firm may undertake a complex commission, or a strong-service firm may place design innovation at the top priority. That being noted, the general practice of each type is characterized by a different aspect of practice, which may influence clients' decisions to work with a type of firm that fits their requirements. Consequently, each type has different design procedures and dispersal of duties. In this respect, it can be argued that the way an architecture firm operates (or is conceived to operate in the view of the clients) effects the type of commissions the firm acquires.

Regardless of the size and type of firm, a shared a set of factors characterize the profession of architecture, and distinguish its practice from equivalents such as law or healthcare. One of the most important factors, as referred to earlier, is that architects think according to an "espoused theory" of an idealized role to justify their actions, but act according to a "theory-in-use" rooted in the realities of the context.[155] In other words, research shows that what architects think they do and what they do in reality are different from each other. The gap between motives and actions account for many distinguished habits of the profession, the first and most important being architects' inclination to think of architecture as an art, and the architect as an artist. While this conception may be partly true as the design of a building requires artistic skills, the buildings designed should also be able to function properly according to a client-driven

[155] Chris Argyris and Donald A. Schon, *Theory in Practice: Increasing Professional Effectiveness*.

program and be efficient in its use of resources. In this sense, architects possess a "dual identity" comprised of an artist and a practical man/woman.[156]

The dual identity of architects provide explanations to many of the professions' seemingly contradictory aspects in term of practice economy. One such example is the low remuneration of the profession. Architecture is known to be less rewarding economically to practices, however architects are often highly motivated for new work as projects (even unrealized projects) are seen as works of art. Thus architects (more so in strong-idea firms) seek commissions not only for remuneration, but also for artistic satisfaction. Reflected in practice, this aspect implies a certain level of competition within the profession and yet lower rewards.[157] To provide an example, although Ministry of Environment and Urbanization annually announces reference prices for architecture and engineering services (in addition to chamber of architects' online minimum price program), most commissions are obtained through significant reductions from the lowest prices set by these criteria. The 1131 public tenders opened in 2014 for government issued architecture and design services jobs have been concluded at an average discount rate of 30.59 percent from the estimated service prices (the discount rates vary between 0 percent and 91 percent). The respective average discounts made in 2013, 2012, and 2011 in respective order are 21,14 percent, 43,91 percent, and 26,72 percent. It should be noted that governmental biddings are often run on a lowest-bidder-wins basis, and a similar research on bids for the private sector commissions is yet to be published. That being noted, the high levels of

[156] Robert Gutman, "Professions and Their Discontents: The Psychodynamics of Architectural Practice," 57.

[157] In the case of the individual architect, minimum gross wage of a new architecture graduate in 2015 has been announced by Union of Turkish Chambers of Engineers and Architects as 3000 Turkish liras, which is stripped to a sum of 1519,93 Turkish liras when net pay is considered. The net pay for a newly graduated physician or lawyer, on the other hand, are announced as 3570 and 4482 Turkish liras respectively for 2015, which are more than twice that of the architect. Union of Turkish Chambers of Engineers and Architects, "2015 yılı ücretli çalışan mühendis, mimar ve şehir plancısı asgari ücreti 3000TL olarak belirlendi", last accessed June 20, 2015, http://www.tmmob.org.tr/icerik/2015-yili-ucretli-calisan-muhendis-mimar-ve-sehir-plancisi-asgari-ucreti-3000-tl-olarak .

discounts in project biddings still indicate an increasing level of competition among architects.

While the compensation of services constitutes one aspect of practice economy for architectural offices, the routine operations of design constitute another. Regardless of the size of the office, architectural offices are mostly run in the form of open-office studios,[158] and the seats are usually occupied by trained-architects. This implies that even routine tasks not requiring architectural education are run by qualified architects. As Gutman explains, "one of the striking features of architectural work is that so much relatively tedious, humdrum work is done by persons with full architectural credentials, work whose equivalent in other professional fields is done by less qualified personnel."[159] The running of ordinary and repetitive tasks by architects may thus result in loss of both enthusiasm and time. As the buildings become bigger and more complex, the routine tasks required to complete the design documents extend to larger time-spans and change project schedules. While strong-service firms suffer less from over-qualification of personnel by the help of a wider range of personnel background, strong-design and strong-delivery firms often have to have architects complete seemingly underqualified tasks.

A third aspect to be examined is the idealized position of the architect spending most of the time on design work. As explained earlier, much of the time spent in architectural offices is allocated for coordination and redundant tasks, and except for institutionalized firms, architects have to spend almost 90 percent of their office time for non-design activities.[160] Especially in smaller-scale offices, architects have to do administrative work as well as working on designs. In addition, due to the entrepreneurial nature of the architectural practice, architects must seek new

[158] Robert Gutman, "Professions and Their Discontents: The Psychodynamics of Architectural Practice," 46.

[159] Robert Gutman, "Professions and Their Discontents: The Psychodynamics of Architectural Practice," 47.

[160] Robert Gutman, "Professions and Their Discontents: The Psychodynamics of Architectural Practice," 44.

commissions while continuing the ones at hand, which may be particularly time-consuming, and thus is handled by separate business development professionals in larger scale firms.

2.3.2 Architectural Commissions

The first principle of architecture, according to the widely quoted suggestion by 19th century American architect Henry Hobson Richardson, is "getting the job".[161] In a more competitive environment involving larger scales and complexity, getting the job becomes essential for firm survival. A higher level of competition is observed in the commissions of both private and public sectors, and firms have begun to invest more in business development as a means to acquire commissions. In the contemporary AEC context, architecture is a highly entrepreneurial profession:

> […] architecture is really more of an entrepreneurial profession than a liberal profession. The architect must go out into the community and seek work; he cannot expect to rely on people coming to him, as lawyers and physicians generally can. The challenge to the architect is to find a way of creating a desire on the part of the public to use his services in preference to the services of another type of building designer.[162]

In the general sense, architects may get commissions through various forms: personal acquaintance, private and public request for qualifications (RFQ) processes, and architectural competitions. Common to each is an increased level of competition and a matching level of ability on behalf of the clients to test the capabilities of architects and assign commissions. As explained earlier, the evolution of the patron into the client, and the client into an institutionalized profile also affect their evaluation of

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[161] In an interview published in New York Magazine, Philip Johnson comments on getting commissions, particularly in the case of Rem Koolhaas, by referring to Richardson: "the No.1 principle in architecture is to get the job!" – Philip Johnson, "Magic Johnson", interview by Peter Blake, *New York Magazine,* (3 June 1996): 33.

[162] Robert Gutman, "Architecture: The Entrepreneurial Profession," *Architecture From the Outside In: Selected Essays by Robert Gutman*, Dana Cuff & Wriedt, John eds., (Princeton Architectural Press, 2010), 36.

architects. In some certain situations, it may even be the case that the prospective tenant of a building requests to change the architect of the building even after signing the contract, with another firm who they think would better answer their spatial needs.[163]

The oldest form of getting commissions is by personal acquaintance, or friendship. As early as 1980s, however, it is reported that the increasing institutionalization of clients have resulted in a more conscious decision in the selection of architects, although friendship and personal acquaintance may still help to make the "short list".[164] That being said, the more emphasized financial risks associated with larger-scales of construction renders institutional clients ever more cautious, and they would like to make sure that the architects in contact are capable of completing the task.

An important amount of commissions for architects are assigned through competitions. Competitions for private sector commissions are mostly in the form of invited competitions, which is run amongst a certain number of preselected practices whose participation costs are reimbursed by the organizing client. On the other hand, governmental and public commissions are usually open nationwide or internationally, and constitute a considerable number of new opportunities for architects. There have been 145 competitions announced between the years 2000-2014, and the highest number of competitions open in a year was 2014 with a total of 17 competitions announced.[165] Statistics display that 23 percent of competitions announced for public and government commissions in 2014 were invited competitions that involved a pre-selection process, while the remaining 75 percent were publicly available. Restating in numbers, a total of 1031 projects have been submitted to 15 competitions.[166] As

[163] A recent well-known case is Two World Trade Center. Previously designed by Foster+Partners, the commission is now handed over to the firm BIG to be modified according to the new spatial needs of prospective tenants.

[164] Gutman, *Architectural Practice: A Critical View*, 57.

[165] Yarışmayla Yap: Türkiye'nin Yarışma Hareketi, "2014 Yarışma Raporu," PDF e-book, last accessed June 20, 2015, http://www.arkitera.com/files/haber/24354/yy_raporu_web.pdf .

[166] One of the seventeen competitions was cancelled, and one was not announced by the time this research was being conducted.

Gutman notes, most entrants of open competitions are young architects and/or small firms,[167] which indicates a new generation of competitors entering the scene. The sharp increase in the number of competitions opened from the year 2000 to 2014 is also indicative of an increasing interest in architectural design on behalf of the institutional clients and a higher level of competitiveness in the sector.

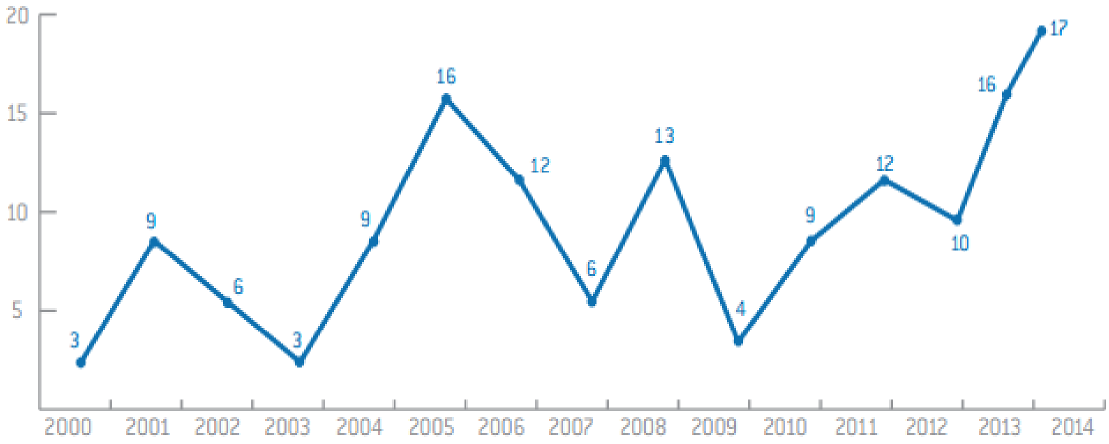

Figure 9. 2014 Yarışma Raporu. Yarışmayla Yap: Türkiye'nin Yarışma Hareketi, "2014 Yarışma Raporu," PDF e-book, last accessed June 20, 2015, http://www.arkitera.com/files/haber/24354/yy_raporu_web.pdf .

Another significant source of commissions for architects is the "request for qualifications" procedures, or in other words, the tenders open by private sector and the government. In the framework of this study, a total of 4160 public sector concluded tenders classified under architecture and engineering services between the years 2012 and 2015 were examined. The contracts signed through the tenders span across 31 categories of services ranging from urban design to service buildings. The examination of the tenders yields a total of 1524 firms that signed contracts as a result of 4160 tenders with an average contract value of 321,317 TRY, the highest and lowest contracts being 28,383,000TRY and 1,200 TRY respectively. 107 of all the contracts are valued under 15,783TRY, which is the upper limit set for direct procurement by the government and is generally seen as a value defining small-scale commissions. In

[167] Gutman, *Architectural Practice: A Critical View*, 70.

addition, 13 contracts value over 10 million TRY, and 173 contracts value between 1 million TRY and 10 million TRY have been noted.[168]

441 of the signed contracts were above the average contract value, and add up to a sum of 983,122,333TRY, while the sum of 3719 contracts under the average value add up to 353,558,610. In other words, the contracts valued above the average constitute to only 10.6 percent of all tenders, but collected 73.5 percent of all the billings. The ratio of higher billing commissions to lower ones is similar to the figures Gutman points out for the practice in 1988 in the United States,[169] as the few number of large-scale commissions (expectedly won by large-scale firms) constitute an important percentage of the overall billings. It should also be noted that the average discount rate for the top 13 contracts is only 2 percent, which is much less than the overall discount rate of 30 percent. These readings imply that a larger number of smaller firms compete for the bulk of smaller-scale projects by offering significantly reduced prices, whereas the more complex top billing projects are contracted by a fewer number of firms who are less-willing to compromise.

It should also be underlined that while there are 4160 different tenders noted, number of unique contract winner firms is only 1524. Certain firms focus on specific areas, such as healthcare facilities or dormitories, and gather more contracts of a similar program in the field (which implies a strong-delivery firm kind of approach). Furthermore, the fact that unique firm winner number is less than half of all tenders show that some firms rely mostly on public sector tenders, and keep entering new biddings as they see proper.

Overall, architects' major sources of commission in Turkey are examined under the three foci of personal acquaintance, competitions, and tenders. In each case, the increasing rate of competition seems evident.

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[168] The data is collected from *Kamu İhale Kurumu* (Public Procurement Authority), the official authority for announcing and archiving public tenders' information in Turkey.

[169] Gutman explains that 250 big firms collected 30 percent of the fees while the remaining 70 percent was shared among 11750 offices. – Gutman, *Architectural Practice: A Critical View,* 70.

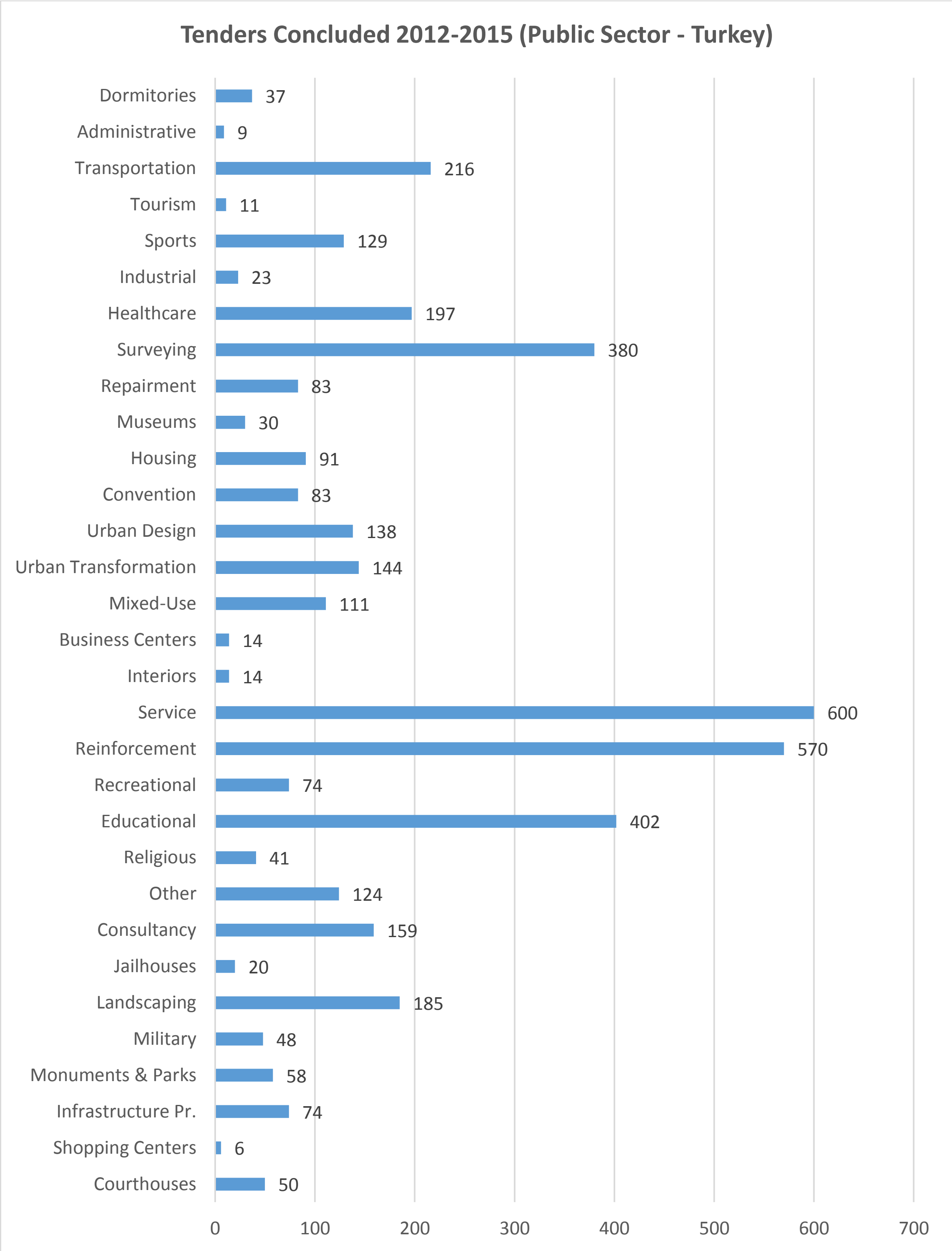

Figure 10. Public Sector tenders concluded between 2012 and 2015 in Turkey. Produced by the author.

2.3.3 Branding of the Architecture Firm

> Since the core service performed by all architects is essentially the same, differentiation must be achieved in the secondary, formal realm. Packaging, style, special optional features, brand names, and overall quality can all be manipulated to establish specific, identifiable position within the marketplace.[170]

Three decades ago, Stephen Kiernan noted in *Harvard Architecture Review* that the contemporaneous competition among architects required careful construction of architectural brands, similar to automobile brands in that "automobiles carry the brand name of their maker, so too do many self-consciously made buildings."[171] What Kiernan argued for was the branding of the architect, granting an identifiable position in the competitive marketplace of clients seeking identification through their buildings. Concordantly, Kiernan's suggestions are reflective of the period that witnessed the emergence of globalism, which marked a transition of the dominant power from local/governmental authorities to the private sector corporation. As Charles Jencks explains, the change of power in this sense implies the toppling down of the monument, and the emergence of the architectural icon. To be more specific, in a setting where contextual changes happen overnight, a monument can signify anything, which might be "an embarrassing change in sentiment."[172] An icon, on the other hand, is an "enigmatic signifier" that is self-referenced[173] and fits better with the consumerist culture, as exemplified in Frank Gehry's Guggenheim Bilbao and the famous "Bilbao Effect". Iconicity in this respect becomes a tool for the implication of power, which in practice is reflected as an act of branding.

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[170] Stephen Kiernan, "The Architecture of Plenty: Theory and Design in the Marketing Age," *Harvard Architecture Review 6* (1987): 107.

[171] Kiernan, "The Architecture of Plenty: Theory and Design in the Marketing Age," 107.

[172] Charles Jencks, "The iconic building is here to stay," *City: analysis of urban trends, culture, theory, policy, action,* 10:01, (2006): 3.

[173] Jencks, "The iconic building is here to stay", 4.

The demand for iconicity in architecture brings in mind the iconicity of architecture firms themselves. While Jencks deems architects who don't compete for iconic buildings with being of second rank in the eye of the clients,[174] those who do have risen to the ranks of "starchitect," who possess a large amount of press coverage, a strong culture of branding and a legacy. While the title of starchitect is on the higher-end of iconic architecture, the competition among architects for iconic buildings, and consequently for a better brand image, can generally be observed in national and local scenes on different levels as well. Designing the icon displays architects' competency in managing its complexity in technical solutions as well as its power to communicate a message to its context. As Sklair and Gherardi underline, "the icon is an investment also for the architectural firms that can increase their fees by selling not only the structure of the building, but also the identity of the city created by the icon."[175] Regarding practice economy and job satisfaction, the branding of architectural firm is therefore concordant with the branding of architectures.

In their elaborations on the branding of architecture firms, Smyth and Kioussi explain that "[t]he role brand management plays in architecture firms is equivalent to the role design plays in other businesses – brand supports design quality in the same way design supports brand in non-design firms."[176] In the case of architecture, commissions are secured through a combination of design quality, marketing, and business development. In turn, the assessment of design quality, defining the brand value of the architect, arises from (1) peer assessment, and (2) client assessment.[177] The increasing number of monographs (some of which are self-printed), more firms seeking press coverage in architectural and construction media, and increasing interest in architectural awards on behalf of architects are common behavior for architects who seek peer appraisal, and are also relevant for the AEC context in Turkey. Client

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[174] Jencks, "The iconic building is here to stay", 8.

[175] Leslie Sklair and Laura Gherardi, "Iconic architecture as a hegemonic project of the transnational capitalist class", *City: analysis of urban trends, culture, theory, policy, action,* 16:1-2, (2012): 66.

[176] Smyth and Kioussi, "Architecture Firms and the Role of Brand Management," *Architectural Engineering and Design Management,* 205.

[177] Ibid, 206.

assessment, as Smyth and Kioussi underline, is made via (1) reputation of the architecture firm including branding, which, as explained earlier, is dependent on the client's view about his/her motives for the commission and about the architecture firm; (2) client's contact with the firm, denoting how the client-architect relationship is experienced, and (3) design, covering the services offered through the long process leading to the realization of the building.[178]

The reputation of the architecture firm is an important denominator in deciding on who the commission will be assigned to. As discussed earlier, clients may even seek global recognition of architecture firms for specific types of buildings. In the case of bigger and more-complex buildings, firm reputation becomes more important as it grants a factor of trust in the client.

Client-architect relationship is another important factor, as the collaboration usually spans the entire design-build process. Especially for organizational clients, ease of communications with the architectural design team is observed to be an important factor of choice.

The assessment of design is the most open-ended one among the three criteria introduced. The quality of the design to be assessed by the client may depend on different factors according to the architecture firm's emphasis on practice (strong-idea, strong-service, or strong-delivery). As it lies in the core of the profession of architecture, design quality is *de facto* an important assessment criterion. As Kiernan puts it, all firms provide a similar core service, and the difference is to be sought in a secondary realm. While Kiernan suggests a formal language for an area of differentiation, however, one can list a variety of new enhancements in design services in the present context. The most frequently listed enhancements for the design as such are typically related with cost reduction on behalf of construction and facilities management. In this respect, sustainability, construction management, and building

[178] Smyth and Kioussi, "Architecture Firms and the Role of Brand Management," 206.

information modeling stand out as important factors that the firms use to enhance their design services.

Sustainability is a concept that increasingly attracts more attention from the clients. The 2008 Autodesk/AIA Green Index displays that "Client demand is the primary influencer pushing architects to 'build green'," and that clients are mostly driven by the reduced operating costs of sustainable buildings.[179] The rise in the number of buildings in Turkey registered to the U.S. Green Building Council, and the increasing rate of employment of BREEAM and LEED qualified architects in architecture firms are indicative of the trend to integrate sustainability in design into practice routines.

Construction management, as also discussed earlier, is a service that in most situations is not assigned to the architect, but rather handled by consultants or teams hired by the contractors. Advancements in computer technology, however, rendered it possible for architecture firms to plan construction sites ahead of schedules, and architecture firms may offer construction management services to clients as enhancements of the design process.

The final factor, Building Information Modeling, spreads over multiple aspects of the AEC context discussed so far, and makes claims to change the way architects practice to a more fluent process with better designer-designer and designer-client interactions. The Autodesk whitepaper titled "Staying Competitive" defines the main qualities of BIM as collaboration, productivity, and insight, and documents a list of advantages that contractors cite about BIM (see figure 11), and at least partially reflect architects' use of BIM to gain advantage in the competition. Overall, BIM is not as commonly in use by architects as conventional CAD systems, and most small to medium scale contractors are neither knowledgeable nor demanding in terms of implementing BIM workflow. The interest in BIM is rather reported by contractors of large-scale projects, who possess the necessary workforce to evaluate building information models and use them for construction. That being said, in each case, software vendors' claims of faster

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[179] Autodesk and The American Institute of Architects, *The 2008 Autodesk/AIA Green Index*, PDF e-book, last accessed June 20, 2015, http://images.autodesk.com/emea_nw_w_main/files/2008_autodesk-aia_green_index_report_final.pdf .

and more efficient design and construction certainly make a difference to architects' advantage by cutting off unnecessary and redundant tasks.[180] Consequently, some architecture firms recently have been promoting their firms by claiming capability of delivering projects through BIM.[181]

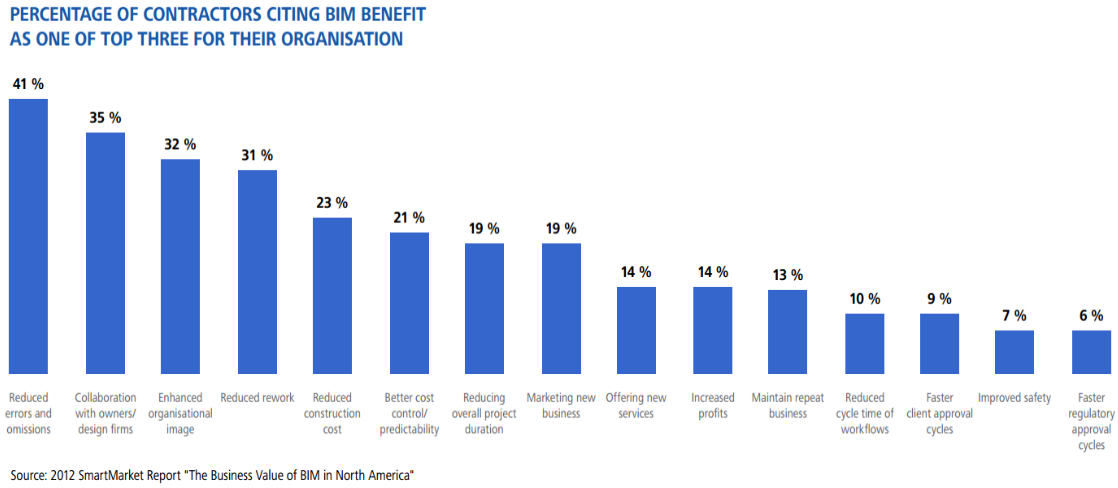

Figure 11. Percentage of contractors citing BIM benefit as one of top three for their organization (in descending order): "Reduced errors and omissions; collaboration with owners/design firms; enhanced organizational image; reduced rework; reduced construction cost; better cost control/predictability; reducing overall project duration; marketing new business; offering new services; increased profits; maintain repeat business; reduced cycle time of workflows; faster client approval cycles; improved safety; faster regulatory approval cycles." Autodesk, *Staying Competitive*, white paper, last accessed June 20, 2015, http://static-dc.autodesk.net/content/dam/autodesk/www/campaigns/test-drive-bim-q3/bds/uk/fy15-bim-

Overall, it is seen that the profession of architecture is witnessing a more competitive context in terms of commissions, services expected and delivered, and recognition in the architecture and construction spheres. Especially in the case of more complex assignments, the individual architect has been replaced by teams of architects and

[180] Robert Gutman, "Professions and Their Discontents: The Psychodynamics of Architectural Practice," 54. Gutman describes the absorbing and time-consuming group activities in architecture as one of the troubling routines of the profession.

[181] See, for instance, Dome+Partners, "BIM İle Yükselen Kusursuz Yapılar", 23 February 2015, http://www.dome.ws/TR/News/Bim-Ile-Yukselen-Kusursuz-Yapilar/1118/ .

consultants, yet in many cases the leading architect figure has been preserved to some degree. As explained earlier, the increasing complexity of buildings have resulted in the requirement for multiple fields of specialized knowledge, which in turn have led to the evolution of specialist consultant services for many aspects of design and construction. By consequence, architects are now competing with consultants from other disciplines as well as fellow architects for commissions.

The primary motive for conducting this part of the research has been to examine the changing aspects of the AEC context in Turkey, as it has been undergoing major transformations for at least a decade, and has been one of the prominent countries in which the investments in construction are getting ever higher. Having the opportunity to at least partly participate in the ongoing complexity and speed with which buildings are being designed, it was clear that an analysis and interpretation of the AEC context was needed both for defining the issues that are altering professional positions, and for elaborating on the prospective practice routines of the profession. That being said, an exhaustive analysis of the AEC sector is beyond the scope of this research, and the topics covered have been framed to cover the major areas that influence the way architects operate in the present context on complex commissions.

In the general sense, the experience of the changing AEC context of Turkey appear to be concordant with the experiences in the United States that began in the 1980s and are still continuing at an amplified scale. As deduced from statistical data on the field, the construction sector in Turkey has reached a significant but fragile crest, and the fragility itself renders it interesting to read and understand the current patterns of practice in order to meditate on the possible futures of the profession. Simultaneously, Building Information Modeling has begun to reach a wider sphere of architects, and reflects the concerns of the AEC context in its "claimed" modes of design and production. Originating from this view, the following chapter interprets the findings of this chapter with respect to the claims that come along with Building Information Modeling, and elaborates on their implications on the profession of architecture.

CHAPTER 3

BUILDING INFORMATION MODELING IN AEC CONTEXT

Architects' routines of design and production vary with respect to their approaches to design (i.e. strong-idea, strong-service, strong-delivery), their familiarity with technology or specific sets of skills, and their clients and commissions. From this perspective, it is evident that providing an exhaustive definition for the way architects operate is an impractical, if not impossible task. What can rather be examined and defined is an overall contextual framework that characterizes the demands from architects and sets standards for the practice of the profession (which, once again, are infinitely nuanced, but share a common mode of production).[182] That being noted, various research and reports on design and construction in different geographies show that the AEC context is on the verge of a transformation to change the way design routines are practiced overall, similar to the one when Computer Aided Drafting (CAD) had begun to replace the then-conventional routines of architectural design processes in the 1980s. In about three decades, CAD systems have become standard in the industry except a few select small-scale buildings, changed the mode of collaborations between design team members, and are being used by project teams as well as additional service providers (i.e. engineers, manufacturers, specialist consultants, printing centers, etc.) While CAD systems considerably increased the

[182] For instance, architects work routines via CAD vary from person to person and office to office. However, they share a common mode of production that relies on the working logic of CAD, which implies that individual nuances in the work routines overall end up in the production of information in a similar structure.

efficiency of the design-build processes, however, they still perform as a digitalized version of the drawing on paper and thus are limited in their ability to increase the efficiency of AEC industry.

The origins of Building Information Modeling are rooted in the concern for overcoming the inefficiencies in the AEC industry.[183] Dating back to 1970s, studies by Charles M. Eastman *et al.* on the Building Description System (BDS), which can be defined as an early ancestor of BIM, had been motivated by the idea to eliminate redundant drafting tasks, loss of information, and difficulty in coordination of projects.[184] Unlike the CAD systems that began to take the AEC industry over, BDS relied on a database of information on the components that made up a building, and created informational assemblies that could be shared among different users. In this respect, the abilities Eastman argued for are strikingly in line with the abilities of BIM tools in the present day:

> The information describing a particular design effort is organized as a project database. It holds part and assembly information, data needed for engineering analyses and other information unique to the current project. The project database may refer to project independent data, that describes supporting information determined exogenously from any particular project. Typical contents of project independent data might be material properties and standard part catalogs. Multiple users access and extend the project database, each class of user interacting through a unique subschema or view of the database. From the project database, data is extracted and passed to a number of integrated or stand-alone application programs. An interface to independently implemented applications would consist of a mapping program that computes needed dependent data and formats it with other stored information to generate the proper input stream for the application, in character or possibly binary form. A number of reports also are generated, including

[183] For a detailed report on the losses due to inefficiency in construction in the United States, see: Ian Howell (ed.), *Report on Integrated Practice 9: International Developments*.

[184] Charles M. Eastman, "The Use of Computers Instead of Drawings In Building Design," 46-50.

> intermediate and final drawings, specifications, and production information.[185]

What Eastman had envisioned in BDS (and later on in GLIDE[186]) for the AEC sector had been a database-led design process, which foresaw a considerable amount of reduction in the project costs. They hold an important place in the literature on BIM as they constitute a base for many of the ideas at operation in BIM tools in the present day. However, BDS and GLIDE had been available to a limited number of people and were much complicated for the average architect to operate. Commercially more viable digital platforms became available for architects only by 1982, through the first edition of ArchiCAD software coded by Gábor Bojár. Most importantly, Bojár's software worked on personal computers, which were available to a wider range of people. Becoming a commercial entity under the name "Virtual Building," the software promoted design through database-construction, and paved the way for other platforms that employed a similar method.[187] These systems all argued for more efficient design-build routines, yet they were still harder to operate and progressed slower than CAD systems.

An increased interest in database-led systems has been observed in the 2000s onwards, when software companies made easy-to-use platforms available for use on personal computers. Although ArchiCAD had been on the market for some time, the widespread popularization of BIM parallels Autodesk's whitepaper titled "Building Information Modeling"[188] published in 2002, which explained the advantages of Information

[185] Charles M. Eastman, "System facilities for CAD databases," 6.

[186] Charles M. Eastman and Max Henrion, "Language for a design information system,"research report, *Carnegie Mellon University*, 1976, last accessed June 2, 2014, http://repository.cmu.edu/cgi/viewcontent.cgi?article=3337&context=compsci .

[187] RUCAPS by GMW Computers, GDS (continued as MicroGDS), Allplan (now marketed as Nemetschek Allplan Systems), and Vectorworks can be counted among relatively more adopted systems at the time.

[188] Autodesk, *Building Information Modeling*, 7.

Models and concluded by the promise of increasing the quality and the efficiency of the AEC industry:

> Through the application of information technology to the problem of describing a building in software, they [digital databases created by Building Information Modeling] enable *higher quality* work, *greater speed*, and improved *cost effectiveness* for the design, construction, and operation of buildings.[emphasis original][189]

Two important characteristics render the post-2000 popularization of BIM significant: (1) the availability of BIM tools to design professionals; and (2) efforts to conceptualize BIM as a universal approach. Firstly, the interest of industry leader software developers made a variety of BIM tools available to professionals from various disciplines, which strongly resembles the beginning of the adoption of CAD tools in the 1980s. There have also been efforts to define and describe BIM to potential users through white papers by software developers such as Bentley Systems,[190] and Graphisoft.[191] Secondly, all major software developers have agreed that BIM is a process, and should not be reduced to a specific software. This conception of BIM is important in that it acknowledges a shared mode of production (Building *Information Modeling*) which can be exercised through different software. In other words, "BIM is a *process* to design, construct, and operate buildings that involves creating and using intelligent 3D models."[192] Standards such as Industry Foundation Classes (IFC) were also an important step towards widespread employment of BIM tools, for they

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[189] Autodesk, *Building Information Modeling*.

[190] Keith Bentley, *Does the Building Industry Really Need to Start Over?, white* Paper, (Bentley Systems: January 2003).

[191] Cyon Research, *The Building Information Model: A Look at Graphisoft's Virtual Building Concept.*

[192] Autodesk, *Staying Competitive*, white paper, 5, last accessed June 20, 2015, http://static-dc.autodesk.net/content/dam/autodesk/www/campaigns/test-drive-bim-q3/bds/uk/fy15-bim-[emphasis added].

presented a shared standard for exchange of information over different platforms. Coren D. Sharples, partner of the New York based firm SHoP Architects, underlines that BIM changes the way architects work by promoting "shared platforms of communication":

> Collaborative relationships with both builders and owners demand shared platforms of communication. Technologies that facilitate and promote such communication, such as building information modeling (BIM) and direct digital fabrication, are having a profound impact on the inner workings of the architectural office, both in terms of organizational structure and the nature of the labor force.[193]

Overall, BIM has been receiving a rising interest primarily in countries with strong market economies such as the United States or the United Kingdom. The adoption of BIM in North America is reported to have increased from 28 percent in 2007 to 71% in 2012.[194] The UK Government has announced a nationwide policy stating that all public construction sector will be obliged to convert to BIM sectors by 2016.[195] In addition, as explained earlier in the introduction, the 2011 survey by National Building Specification (NBS) of UK reports that 13 percent of all attendees (600 professionals) were aware and using BIM in their practices, while predicting a much higher percentage for the following years. The 2014 survey reports 54 percent of BIM adoption among more than 1000 professionals who participated (figure 12). Moreover, an increasing number of institutions globally display efforts to encourage professionals to work via BIM.[196] Consequently, the rather bold suggestion in the white paper

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[193] Coren D. Sharples, "Technology and Labor," *Building (in) the Future: Recasting Labor in Architecture*, Philip Bernstein and Peggy Dreamer eds., (New York: Princeton Architectural Press, 2010), 91. Kindle.

[194] McGraw Hill Construction, *The Business Value of BIM in North America: Multi-Year Trend Analysis and User Ratings, Smart Market Report*, 9.

[195] HM Government, *Industrial Strategy: Government and Industry in Partnership*.

[196] According to AIA's International Integrated Practice Report, Australia, Norway, United Kingdom, Singapore, China, and Finland already invest in governmental efforts to encourage use of BIM. It is recurrently stated in explanatory manuals that the transition from CAD to BIM will be a hard process, since designers and developers have to set aside their habits and adopt a new understanding of design. However, it is noted that the economic and temporal advantages to be gained by this transition makes

prepared by Cylon Research for Graphisoft appears to be valid: “The adoption of this technology [BIM] by the industry is not in question; it is a matter of ‘when,’ not ‘if.’”[197]

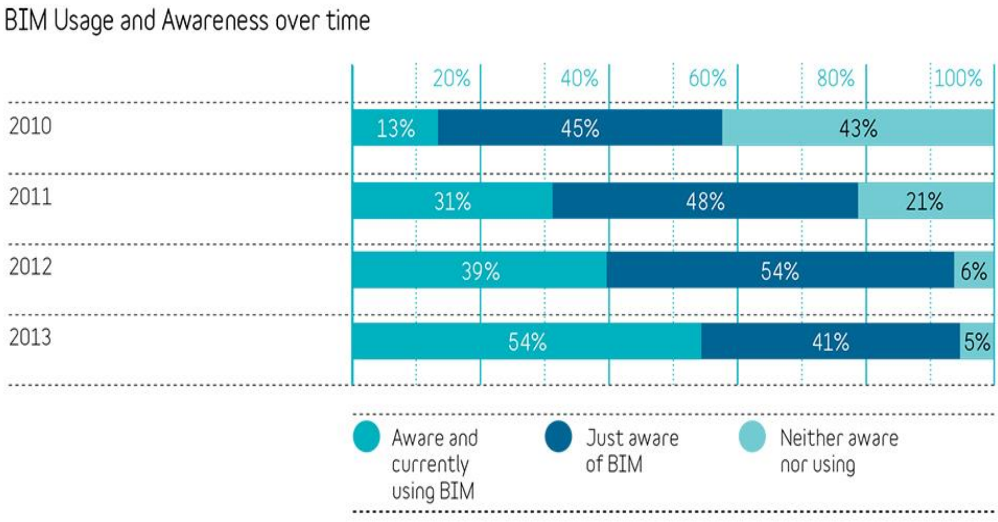

Figure 12. BIM Usage and Awareness over time. *NBS National BIM Report 2014*, (RIBA Enterprises, 2014), 13.

In light of these findings, the position of this research is that the roots of BIM stem from the characteristics and demands of the AEC context. Yet, as it changes the way architects work on their designs and provide services, BIM also affects the AEC sector and is capable of assigning new roles to the members of the design team.[198] It should be noted that the AEC context in Turkey in the present is dominated by conventional

it worth the effort. The UK Government has announced a nationwide policy stating that all public construction sector will be obliged to convert to BIM sectors by 2016:
HM Government, *Industrial Strategy: Government and Industry in Partnership*.

[197] Cyon Research, “The Building Information Model: A Look at Graphisoft’s Virtual Building Concept,” 9.

[198] Malleson, “BIM Survey: Summary of findings,” 21. Malleson reports that 92 percent of BIM users and 93 percent of non-BIM users agreed that adopting BIM requires changes in their workflow, practices, and procedures.

workflows with CAD tools. However, an increasing number of firms are adopting BIM in their practices, and the titles "BIM coordinator", "BIM manager" have become common in job descriptions. In addition, BIM tools are now being included in the curricula of leading universities, promising a fresh supply of BIM-literate new graduates to the industry. As in the overall adoption of CAD decades earlier, architects in particular are spearheading the transformation, who are followed by engineers and manufacturers. In this respect, meditating on prospective roles for the profession of architecture appears a much more valid task for the present, at the beginning of a potential transformation.

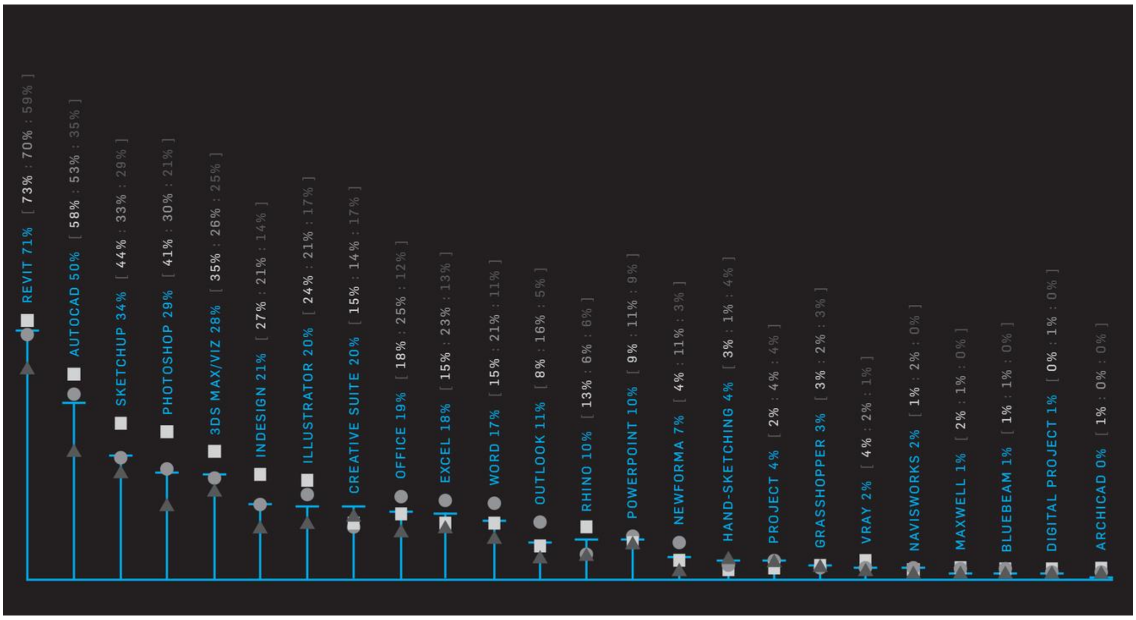

Figure 13. Requirements for working at the top 50 architecture firms. Black Spectacles LLC., last accessed June 14, 2014, http://images.adsttc.com/media/images/53c4/4862/c07a/809e/b700/0001/large_jpg/Black_Spectacle_Infographic_Final-01.jpg?1405372497 .

The following parts of the chapter interpret BIM with respect to the changes in the AEC context. The motives and promises of BIM are evaluated under the three foci examined earlier: the changes in the demand and the client structure, increasing scales and complexity of buildings, and the competitive scene of architecture.

3.1 Responding to the Changing Demand

Underlining Kostof's basic but comprehensive definition, architecture is the "specialized skill that is called upon to give shape to the environmental needs of others." [199] It has been argued in the earlier chapters that as the "needs of others" are altered, their demands from architects change. The changes in the AEC context can be read in parallel with the changes in the organizational structures of clients and their commissions. In this respect, it is justifiable that BIM addresses clients as much as (if not more than) designers. The original claims noted as "The Benefits of BIM" in Autodesk's white paper in 2003, *higher quality, greater speed,* and *lower cost,*[200] all address clients more than they do design teams. Concordantly, the white paper on Graphisoft's "Virtual Building" concept in 2003 remarks that BIM is beneficial enough for owners to outweigh the costs of early adoption, whereas it is "probably" beneficial enough for architects.[201] While it is unquestionable that BIM tools address many inefficiency problems experienced by design team members, it should be underlined that BIM as a process reaches beyond design to cover construction and life-cycle management of buildings. Therefore clients form an important input for the equation.

One of the hardest and the most important requirements on behalf of clients is understanding design schemes better. As the scales and complexity of buildings increase, so do the financial investments, eventually pressurizing the clients to monitor the design process more carefully and intervene where they see proper.[202]A project's

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[199] Kostof, "Preface" in *The Architect: Chapters in the History of the Profession*, xviii.

[200] Autodesk, *Building Information Modeling*, 5-6.

[201] Cyon Research, "The Building Information Model: A Look at Graphisoft's Virtual Building Concept," 9.

[202] Nima Norouzi et al., "The Architect, the Client and Effective Communication in Architectural Design Practice," *Procedia – Social and Behavioral Sciences* 172, (January 2015): 635-42.

"accessibility" by clients holds a significant place in the design process. Even clients with experience in construction cannot visualise designs through ortographic drawings as accurately as architects do, and they would often require three dimensional representations to get a feel of the designed space.[203] In addition, even three dimensional representations are insufficient in describing specific features, such as electromechanical or structural design. The inadequacy in communication may often result in costly revisions for both architects and their clients. Concordantly, Autodesk's recent promotional white paper notes "insight" as one of the three major aspects of BIM along productivity and collaboration, and notes that building information models lead to "more predictable building outcomes."[204] As the building is virtually constructed while it is being designed, architects become able to provide alternative presentations for clients and other team members according to their preferences.[205] On the one hand, the ability to express the project comprehensively to clients saves the architect from redundant revisions, and may lead to a better coordinated design process. On the other, it renders clients (and other parties) more active in the process, which may imply a reduction in the authority of the architect.

As referred to earlier under the discussion on the new forms of demand, *Building Design and Construction* survey of "mega-clients" report that their primary interests in choosing design firms are: "ability to complete on budget and make building function"; and "ability to complete work on time."[206] While these interests are raised

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[203] In one of the interviews conducted for the study, a BIM expert in a large-scale construction firm expressed that BIM forces architects to face their responsibilities by making the project available to clients and other design parties: "We could rather say that it [BIM] forces the architects to face their responsibilities. In the past, the architects could behave whimsically to hide mistakes by saying that 'this is the design, you need to comply with it.' If architects use these software in the present, they have to face the fact that the investor or the engineers will be able to visualize the project just as easily as the architects, being able to criticize project details such as ceiling heights or beam depths independent from the architects' influence. In a sense, we could say that BIM makes architects more 'accessible'." – Gurhan Ucaroglu, interview by author, telephone interview, 25 January 2015.

[204]Autodesk, *Staying Competitive*, 5.

[205] Malleson, "BIM Survey: Summary of findings," 21. Malleson reports that 83 percent of over 1000 participants agree that BIM improves visualisation, and 69 percent express that clients insist on adoption of BIM by architects.

[206] Cuff, *Architecture: The Story of* Practice, 55.

on behalf of the clients, they have important implications on the way architects practice from the framework of BIM.

Ability to complete on budget and on time are two of the most frequently noted failures of the AEC industry, being a recurrent phenomenon that is almost accepted in advance.[207] Both over-budget and over-time constructions may and often do result from inefficiencies in the design process, and constitute two of the major challenges addressed by BIM. In a typical BIM workflow, the building is designed via the construction of a database through which architects' auxiliary tasks (such as clash detection and quantity surveys) are simultaneously handled by software, leaving less room for error. Consequently, the ability to complete on time and within budget may easily become an important choice factor in determining an architect for the commission. In the widely published example of the new Facebook Corporation Headquarters, CEO Mark Zuckerberg surprisingly announces that working with Frank Gehry ended up costing much less than similar developments by virtue of Gehry's efficiency in planning and construction.[208] Similarly, Daniel Libeskind's Denver Art Museum project was completed in 2005 three months ahead of schedule, and no change orders were required during construction, providing the contractor with practical and financial advantages.[209] Considering that the average architectural design fees are around 4 percent of construction costs, it appears more logical for clients to invest more in architectural design for efficient planning and scheduling, and save more in the costly processes of construction.

[207] Barry B. LePatner, *Broken Buildings, Busted Budgets: How to Fix America's Trillion-Dollar Construction Industry*, (Chicago: University of Chicago Press, 2008).

[208] Rachel B. Doyle, "Mark Zuckerberg Reveals How Frank Gehry Wooed Facebook", *Curbed National*, website, last accessed May 18, 2015, http://curbed.com/archives/2015/04/08/mark-zuckerberg-reveals-how-frank-gehry-wooed-facebook.php .

[209] Richard Garber, "Building Information Modelling," 228.

3.2 Managing the Increasing Scale and Complexity

The design and implementation of a building involves a team of professionals that is continuously growing in number and diversifying in expertise. The increasing scales and complexity of buildings, the consequences of which have been examined earlier, imply significant changes in the way buildings are designed and constructed: more complex design and detailing; more drafting work; more consultants involved (hence more efficient collaboration routines); and as an overall multiplier, more risk on behalf of both the architect and the client.

Being in charge of the overall design of a building (excluding special constructions such as dams, roads, etc.), architects are expected to be knowledgeable on the many technical requirements of design and be able to foresee potential problems in advance.[210] In this respect, earlier confrontation of potential problems provides the architects with an important advantage. As the building is designed by creating a database that is developed as a three-dimensionally represented virtual building, architects (and other members of the design team) are enforced to face potential problems earlier, and come up with solutions at earlier design stages.[211] The frequently encountered problem of clashes between mechanical-electrical-structural systems, for instance, becomes more costly for all parties if corrected at late design phases (or during the construction phase). Research indicates that the efficiency of BIM is superior to conventional methods in coordination tasks such as detailing and clash detection.[212] Complex auxiliary tasks as such may become considerably time-

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[210] Cuff, *Architecture: The Story of* Practice, 77.

[211] Hasan Okan Cetin, director of the young architecture firm SMAG who design and deliver projects via BIM, comments that unlike conventional design routines, BIM prevents postponing of conflict solution, enforcing the architect to advance with practical solutions in the early stages of design. In this respect, less conflicts are experienced on the construction site, as number of call for information requests drop: Hasan Okan Çetin, interviewed by the author, Ankara, June 2015. Çetin's remarks are also reflected in the cases reported from the United States, showing a 47 percent drop in the number of RFIs and 54 percent drop in construction changes: Brittany K. Giel and Raja R. A. Issa, "Return on Investment Analysis of Using Building Information Modeling in Construction," *Journal of Computing in Civil Engineering*, (September 2013): 511.

[212] Fernanda Leite et al., "Analysis of modeling effort and impact of different levels of detail in building information models," *Automation in Construction*, 20 (2011): 601-09.

consuming, and their automation proves advantageous by allocating more time for actual design tasks.

	Ductwork		Electrical		Heating		Plumbing		Fire protection	
	CM	AT	CM	AT	CM	AT	CM	AT	CM	AT
Ductwork			10	44	0	NA	1	70	6	73
Electrical					0	NA	4	3	3	6
Heating							0	NA	4	NA
Plumbing									3	25
Fire protection										

CM = collected in coordination meetings, AT = identified through automatic clash detection.

Figure 14. Count of clashes between pairs of subcontractors. Fernanda Leite et al., "Analysis of modeling effort and impact of different levels of detail in building information models," *Automation in Construction* 20, (2011): 601-09.

Collaboration among the design team members constitutes a second important factor that is amplified in complexity with respect to the increasing sophistication of buildings. As the practice of BIM is based on the idea of collaboration, it progresses in the direction of universality (i.e. the aforementioned IFC standards are defined to the purpose of sharing design information across different platforms.) In other words, BIM is aimed to be adopted by the various members of the design team through platforms of their choosing, producing an information model that can be shared across platforms. Compared to conventional drawings, the information model provides a better-defined description of the prospective building, and individual participants (owner's in-house teams, consultants, contractors, and manufacturers) may be granted access to information as they require. As every member of the design team shares a common information model, collaboration between different members of the design team are made considerably easier. Considering that a project may have input from over 50 different design professionals, ease of communication and collaboration stand out as essential requirements of the changing AEC context.

The shared information model also reduces the redundant coordination tasks of the architect, allowing her/him to spend more time on design rather than checking errors. It is important to note that coordination tasks as such can eat up a lot of the design schedule especially in bigger and more complex buildings, and design firms often end up assigning a well-qualified architect with the sole purpose of coordinating members of the design team. From the perspective of the overall design process, being able to allocate more time on design tasks is an important benefit worth noting, as Richard Waterhouse mentions in his introduction to *NBS National BIM Report 2014*: “For the design team, there are clear benefits of collaboration, visualisation, coordination and information retrieval. This readily translates into increased cost efficiencies and profitability.”[213]

While the adoption of BIM by all design parties is more of a future objective than reality in the present context of Turkey, it has become the sector standard (and an obligation in state commissions) in more developed economies such as the United Kingdom. In the local AEC context, large-scale construction firms already employ BIM managers and operate via BIM, whereas smaller firms opt to work through the more conventional CAD systems. Adoption of BIM only by architects may still have its benefits, however, it is seen that in order for BIM to function as intended, it should be spread along the range of disciplines that contribute to the design of a building.[214]

The distributed design process of BIM raises new issues to discuss in the professional roles undertaken by the members of the design team. The ability of every design team member to work on the shared information model grants them with a more direct influence on the design process. In conventional routines, architects act as translators that express the project to the consultants, process consultants’ solutions according to the requirements and conceptual framework of the project, and deliver the design to the contractor in a legible way. A design process with comparatively equal design roles implies revised professional roles for architects, which has been foretold by some critics as the end of the profession, and by others as an elevated new status as the neo master-builder.[215]

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[213] Richard Waterhouse, introduction to NBS National BIM Report 2014, 3.

[214] Rizal Sebastian, “Changing roles of the clients, architects, and contractors through BIM,” *Engineering, Construction and Architectural Management* 18:2, (2011): 176-187, and Brittany K. Giel et al., “Return on Investment Analysis of Using Building Information Modeling in Construction,” 511-21.

[215] Sanford Kwinter, for instance, announces the elimination of architecture as a result of the mechanization of the design process: Sanford Kwinter, "Four Arguments for the Elimination of

3.3 BIM in the Competitive Scene

It has been examined earlier in the thesis that architectural scene is getting more competitive with respect to the changing demands, increasing sophistication, and more architects being involved in the competition. In this sense, sustaining professional practice becomes a task requiring considerable effort. In addition to its claims on increasing the efficiency of the design-construction-lifecycle management of buildings, BIM is also promoted on the grounds of granting advantage to architects in the competition among fellow colleagues and consultants from other disciplines. The Autodesk white paper titled “Saying Competitive” notes that “[c]ompetition is greater than ever and players in the building supply chain, from architects and engineers to general contractors and fabricators, are under pressure to deliver their projects faster with smaller budgets.”[216] This statement is quite alarming for the profession as it suggests that architects are required to work harder to secure lower remuneration, which is also reflected in the local AEC context of Turkey. In addition, as a result of stricter regulations, increasing complexity of buildings and more frequent client intervention, design of buildings has become a much more complex process. From this perspective, the advantages of BIM can be read as a compensation of the increasing pressure on the profession, which cannot be confronted as easily through conventional work routines.

The McGraw-Hill SmartMarket Report for 2012 marks the top BIM benefits for architects as “reduced document errors and omissions, market new business, offer new services, reduced rework, and reduced cycle time of specific workflows.”[217] Three of the top five benefits noted are focused on the betterment of architectural design services, while the

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Architecture (Long Live Architecture)," 94-95. On the other hand, the Chief Construction Adviser of British Government, Paul Morrell, argues that BIM will transform the role of the architect back to that of the master-builder with complete control over the design and construction process. Morrell is particularly influential in UK Government’s decision to make BIM obligatory for all public construction sector.

[216] Autodesk, *Staying Competitive*, 1.

[217] McGraw Hill Construction, *The Business Value of BIM in North America: Multi-Year Trend Analysis and User Ratings, Smart Market Report*, 20.

remaining two address business development aspects.[218] In this respect, it can be observed that BIM is seen both as a means to design more efficiently and as an opportunity to stand out in the competition. The ranking order of architects' selected benefits has not changed between 2009 and 2012, however the bullet of "reduced document errors and omissions" has made a 14 percent jump between the two years. The consistency in answers for 2009 and 2012 as such implies that the benefits listed in the earlier survey were verified by attendants after three years of test in practice.

The complexity of construction in the present context requires architects to combine information from different disciplines, ensure their compatibility with the architectural design, and keep the project up-to-date for the construction site. In addition, the design of a building necessitates a considerable amount of non-design work, such as delivery schedules, client liaison, cost estimation, or error checking. Also considering the pressing delivery times of projects in the contemporary context, projects become prone to error and change orders have become common in the design and construction phases. While request(s) for information (RFI) and change orders are usually considered as a standard question-answer process, it is observed that they constitute significant effort on behalf of the architects that is often not remunerated. In this regard, various research have shown that BIM is efficient as claimed in reducing the amount of error and omissions in projects, consequently reducing the number of change orders and RFI.[219] Both reducing error and omissions, and avoiding potential change orders are important for practice economy as they save time and effort on behalf of the architects.

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[218] In the case of engineers, the top priority is assigned to "repeat maintain business," followed by "market new business," which implies that there is a demand for engineers working via BIM in the case of North America: McGraw Hill Construction, *The Business Value of BIM in North America: Multi-Year Trend Analysis and User Ratings, Smart Market Report*, 20.

[219] Burcin Becerik-Gerber and Samara Rice, "The perceived value of building information modeling in the U.S. building industry," *Journal of Information Technology in Construction (ITcon)*, Vol. 15 (2010): 198-99, last accessed June 14, 2015, http://www.itcon.org/2010/15 and Atul Khanzode et al., "Benefits and lessons learned of implementing building virtual design and construction (VDC) technologies for coordination of mechanical, electrical and plumbing (MEP) systems of a large healthcare project," *Journal of Information Technology in Construction (ITcon)*, Vol. 13 (June 2008): 324-342, last accessed June 14, 2015, http://www.itcon.org/cgi-bin/works/Show?2008_22 .

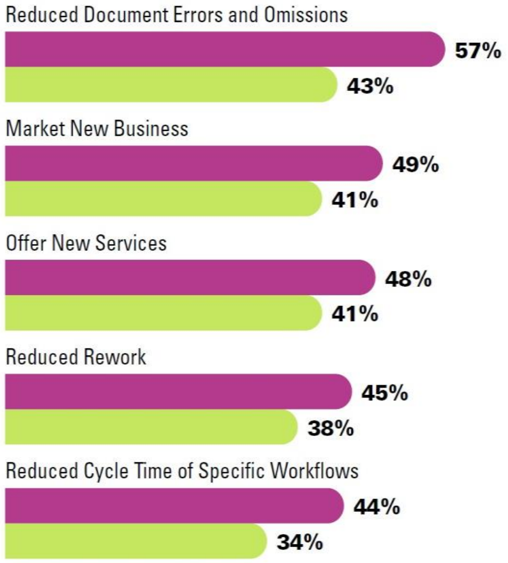

Figure 15. Top BIM benefits for architects. Green color shows replies in 2009, purple color shows replies in 2012. Architects are asked to grade both the value they believe they gain from BIM, and the difficulties they experienced. The percentages are gathered by dividing the value index by the difficulty index, indicating how "BIM activities are relevant to how hard they are to do." McGraw-Hill Construction, *The Business Value of BIM in North America: Multi-Year Trend Analysis and User Ratings Smart Market Report*, 2012, 20. http://images.autodesk.com/adsk/files/mhc_business_value_of_bim_in_north_america_2007-2012_smr.pdf .

Although client expectations are noted to surpass designer responses (in parallel with the increase in scales and complexities of buildings) since 1970s,[220] more accurate project delivery (with the reduction in the number of errors and omissions) can still be considered as an advantage in standing out among other competing practitioners. "Market new business" being the second most voted short-term benefit, and "maintain repeat business" being the first most voted long-term benefit for architects in McGraw-Hill report indicate that BIM is an important component of business development and branding in architecture. It has been noted earlier that branding follows design in

[220] Randy Deustch, *BIM and Integrated Design: Strategies for Architectural Practice*, (New York: Wiley & Sons, 2011). Kindle.

architectural firms, meaning that architects avoid overt branding and rather seek a professional identity through distinctive features of their work.[221] In this respect, accurate project delivery can be reflected as standard of a practice, and is therefore important in creating a strong firm identity that would communicate the required messages to potential clients.

The third article, “offer new services,” covers the new capabilities BIM promises to users. Among the most noted aspects are 4D and 5D BIM, facility-management planning, sustainability, and the capacity to outsource the information model for further services by consultants. 4D in BIM refers to the assigning of the information model to a temporal dimension by virtue of specific construction schedules, which may give the architect a louder say at the construction site by substituting the position of the construction manager. 5D in BIM refers to the assigning of cost estimation values to the information model, once again empowering the architect with accurate financial information about the project, which is among the top priorities of the clients. In both cases, using these capabilities of BIM reconnects the architect with some of the managerial duties of the master builder. However, clients may often choose to hire an external construction manager for these tasks, thus the execution of these duties is highly dependent on the choices of clients. In most of the large-scale commissions in Turkey, construction management is either outsourced to consultant firms or handled by in-house offices. However, more involvement in the management of construction schedules and site may easily lead to a more efficient design-build process and become more preferable for clients.

Sustainability and facilities management are trending topics in the case of BIM, United States, United Kingdom, France and Brazil being among the forerunners of

[221] Alper Kiremitçi, business development manager at Office for Metropolitan Architecture, explains “branding” of the architecture firm develops spontaneously through the firm’s services and quality: “ ‘Branding’ is often a term avoided by architecture firms, as the professional traditions of the field are such that firms avoid overt marketing, and the associated branding. OMA has been especially interested in branding as part of the service we offer clients, but one that we have not focused on developing for ourselves. However, given our prominent position within the design fields, OMA and Rem Koolhaas have become branded to an extent, due to our reputation.” - Alper Kiremitçi, interviewed by the author, Dubai, U.A.E, August 2015.

optimization of energy performance, facilities management, and waste management.[222] The advantage BIM provides in these aspects is the early involvement of consultancy. As the practicing engineer Christopher Northwood explains, construction waste management, carbon performance, and energy modeling are more effective when introduced earlier in the design phases, and further optimization can be run by outsourcing the BIM model to external programs via IFC.[223] While most of these services are not asked for by the clients in the Turkish AEC context, an increased interest in sustainable buildings is nevertheless observed in the number of LEED applicants from Turkey. Once again, the duty falls on architects to create extra values in their projects by providing these new services, and create an awareness in the clientele.

The fourth article, "reduced rework" refers to the iterative nature of the AEC context. Eastman et al. point out that 57 percent of activities in the design and construction of projects are waste or non-value added activities, which is marked relatively low (26 percent) in other manufacturing industries.[224] Consequently, reduced rework via less change orders and easier-to-conduct revisions provide an important advantage to increase the efficiency of design work. Similarly, the fifth article titled "reduced cycle time of specific workflows" indicate faster project workflows that save time otherwise lost in redundant tasks. Studies on the efficiency of building information modelling indicates an approximately 80-84 percent drop in the costs associated with drafting of projects,[225] while there is a productivity gain between 15-41 percent of time spent in

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[222] McGraw-Hill Construction, "Specialized BIM Activities for Sustainability," *Business Value of BIM for Construction in Global Markets SmartMarket Report*, 2014, 38.

[223] Christopher Northwood, "Digital Engineering", *National BIM Report 2013*, (RIBA Enterprises, 2013), 20-21.

[224] Dana K. Smith and Michael Tardif, *Building Information Modeling: A Strategic Implementation Guide for Architects, Engineers, Constructors, and Real Estate Asset Managers*, (New York: Wiley & Sons, 2012), 10.

[225] Rafael Sacks, "Evaluation of economic impact of three-dimensional modeling in precast concrete engineering," *Journal of Computing in Civil Engineering* 18 (2004): 301–12.

the production of drawings.[226] In this respect, "reduced rework" and "reduced workflow cycle times" both imply more time allocated for design activities by qualified architects, which can be regarded as an improvement after Gutman's remark that qualified architects perform many redundant tasks along with design duties in architectural practices.[227]

3.4 Evaluation: Motives, Barriers, and Implications

Overall, BIM in practice is seen to be consistent with the three benefits noted in the milestone white paper published by Autodesk in 2003: "higher quality, greater speed, and lower cost."[228] As examined so far, BIM workflow addresses the AEC context's most complained-about inefficiencies such as omissions and error, the amount of rework, incomprehensibility of projects by clients, high number of change orders, redundant work, and long project time-cycles. It has also been argued that all of these factors directly affect clients' interests as well as changing the way architects practice their profession. Consequently, BIM has been increasingly more adopted by clients in the forerunner countries, and is likely to be adopted by a wider clientele in Turkey in the near future.

Considering the workflow of architects, BIM is observed to present conveniences in the design process, which are discussed under the top five benefits: reduced document errors and omissions; marketing new business; offering new services; reduced rework; and reduced cycle time of specific workflows. While many of the implications of these benefits appear to be more efficient in the case of large-scale buildings, it is noted in various reports and research that adopting BIM is potentially beneficial for different firm types (strong-idea; strong-service; strong-delivery) and scales.[229] In light of

[226] Rafael Sacks and Ronen Barak, "Impact of three-dimensional parametric modeling of buildings on productivity in structural engineering practice," *Automation in Construction* 17 (2008): 439–49.

[227] Gutman, "Professions and Their Discontents: The Psychodynamics of Architectural Practice," 47.

[228] Autodesk, *Building Information Modeling*, 5-6.

[229] Stephen Hamil, "BIM and the small practice", *NBS National BIM Report 2014*, (RIBA Enterprises, 2014), 24-27; Eastman et. al., *BIM Handbook: A Guide to Building Information Modeling for Owners,*

earlier discussions in the study, it should be underlined that by being available to both small practices (who make up the bulk of the practicing architects) and large offices (who collect the higher share of billings), BIM may become a sector standard in the near future.

Architects' reasons for adopting BIM are varied, and have been discussed briefly in this chapter. As indicated in the relevant statistics and concordantly reflected in interviews, the reduction of errors and omissions seem to be the most influencing factor in adopting BIM. In addition, although BIM may increase the workload by enforcing architects to spend time tackling potential problematic parts of design earlier, the ability to deliver a more thoroughly detailed project is another motive for adopting BIM. Overall, a trend towards adopting BIM can be observed in the AEC industry, in particularly amplified levels where governmental efforts are spent on transforming local AEC contexts to BIM.

The barriers to BIM adoption also vary, "no client demand" and "lack of in-house expertise" being the two most often expressed reasons according to NBS survey, followed by a common concern on up-front costs.[230] In terms of demand, the local AEC context of Turkey is dominated by the ortographic set and the construction site by printed layouts, therefore architects are still required to deliver plans, sections, facades, and various detail sets to clients.[231] In addition, although a new generation of BIM-literate architects are now starting their careers, only a limited number of experienced BIM managers are available in Turkish AEC context, which constitutes a second important barrier. Overall, the barriers to adoption of BIM in the present are similar to the barriers to adoption of CAD experienced in

Managers, Designers, Engineers, and Contractors; and Robert Klaschka, ed., *BIM in Small Practices: Illustrated Case Studies*, (RIBA Enterprises, 2014).

[230] Malleson, "BIM Survey: Summary of findings," 19.

[231] In the local context, architects are legally required to submit deliverables to local municipalities for necessary permissions, which are composed of plans, sections, facades, and details in AutoCAD DWG format digital drawing, and a pre-determined number of printed copies.

the 1980s and 1990s, as both emerge from the "culture of the workplace." Quoting Coren Sharples:

> The culture of the workplace is probably the greatest barrier to innovation in practice – even more than the up-front cost of new technology. Management 'owns' and will defend prior investment decisions in software, training, standards, and practices and the workforce will protect their areas of expertise.[232]

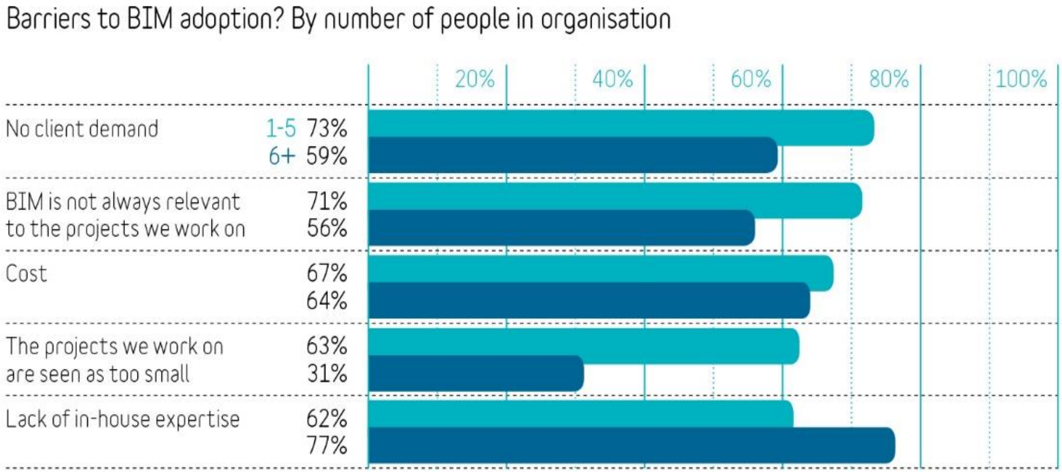

Figure 16. Barriers to BIM adoption. Adrian Malleson, "BIM Survey: Summary of findings", in *NBS National BIM Report 2014*, RIBA Enterprises, 2014, 19.

Adoption of BIM in the design, construction, and life-cycle management of buildings harbor important implications for the profession of architecture. In the ever growing complexity of buildings, architects have to collaborate with consultants from other disciplines as well as other architects, and as such have to operate in an ever more fragmented context. In this respect, the important discussion to elaborate on is how BIM is connected with the changing context and professional roles in the AEC context.

232 Sharples, "Technology and Labor," 91.

CHAPTER 4

DISCUSSION: ROLES OF THE PROFESSION UNDER BIM

> We developed the idea that the architect is a *specialist in nonspecialisation*. Building involves so many elements, so many techniques, and such different kinds of problems, that it is impossible to command all the requisite knowledge. What is required is an ability to interrelate diverse elements and disciplines. Because architects have a broad overview and are not constrained by concrete knowledge, they are able to connect various factors and maintain the synthesizing capacity of nonspecialisation. In this sense the architect is ignorant, but he is able to work with many people and coordinate the integration of a vast number of particulars. These are skills one can acquire only through experience. With them, we are able to face the new situations that accompany each project.[233]

The architecture-engineering-construction (AEC) context is rapidly changing. As examined in the previous chapters, the changes in the AEC context advance via changes in the structure and demand of clients, the scales and complexity of buildings, and an increasing rate of competition among architects and between architects and other specialists. AEC industry in Turkey –politically supported as one of the flagship industries in Turkish economy– has drawn international attention and shared the global concerns of construction in the last decade. Consequently, Turkish AEC context is seen to have changed according to the demands and capabilities of the actors in the industry, matching the billings and scales of foreign counterparts in more developed economies. While long-term sustentation of the growth in Turkish AEC industry is

[233] Alvaro Siza and Peéra Goldman, *Technology, Place and Architecture*, (New York: Rizzoli, 1998), 155. Cited in: Kenneth Frampton, “Seven points for the millennium: an untimely manifesto”, *The Journal of Architecture*, vol. 5, issue 1 (Spring 2000): 22. [Emphasis added.]

questionable, its pressures on the practice of architecture are recognizable and *on par* with the pressures on architects on the global scale.

By definition, a profession can be defined as a field of specialized knowledge that grants the practitioner with professional authority.[234] Alvaro Siza's definition of the profession of architecture as "specialism in nonspecialization" effectively captures the position of the architect practicing under the changing pressures of context and his/her evolution into a generalist position in the design team. According to Siza, the architect is "ignorant" in the sense that s/he does not possess comprehensive technical information directly, but is able to understand and coordinate information from different disciplines that collaborate in the making of a building. The "ignorance" of the architect in this sense is concordant with the historical split between the technical and aesthetic dimensions of architecture. As Magali Sarfatti-Larson explains, the profession of architecture in its historical roles can be defined through a relationship of *telos* and *techne* –"symbolic intention and materialization," the aesthetic and the technical qualities of building– exercised under the impact of patronage.[235] Larson states that the artistic, technical and social dimensions of architecture as such coexist and overlap along the course of the profession's history. However, as technicality had been strongly claimed by the established position of engineering, architecture increasingly aligned itself with the aesthetic dimension of construction. In other words, the architect's prioritization of aesthetics over the technicalities of building began with the architect being more aligned towards the *telos* of building, and separated from the *techne*.[236]

The change in the role of the profession becomes more emphasized through what Frampton explains as the shift of interest in production from the "what" to the "how"

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[234] Eliot Freidson, *Professional Powers* (Chicago: Universityof Chicago Press, 1986), 6.

[235] Magali Sarfatti-Larson, "Emblem and Exception: The Historical Definiton of the Architect's Professional Role," *Professionals and Urban* Form, Judith Blau, Mark E. La Gory and John S. Pipkin eds., (Albany: State University of New York Press, 1983), 53.

[236] Sarfatti-Larson, "Emblem and Exception: The Historical Definiton of the Architect's Professional Role," 58.

of construction.[237] According to Frampton, this shift emphasizes the separation of engineering from architecture, with the engineers being more concerned with the "how" and architects with the "what" factor of the design and construction of buildings.[238] However, the role of the profession of architecture faces the problem of legitimation if it is to be defended through aesthetics, which is comparatively harder to ground than the technicality of building. That being said, the increasing complexity of buildings in the present day necessitates a new professional structure, in which multiple consultants' technical contribution are required to be coordinated towards the accurate achievement of the initial conception. Being the mediator of *telos* with respect to the client, architects may thus specialize in coordinating the information of *how* to achieve *what* has been conceptualized, hence specialists in nonspecialization.

In *Architecture from the Outside In*, Gutman articulates a different position that portrays a concerning interpretation of architects' generalist approach. Gutman explains that the profession's competitive advantage is threatened by "the accelerating loss of responsibility to other groups in the building industry."[239] In addition, he underlines that the conception of architects as non-essential members of the design team may have significant consequences, therefore architects should be able to deliver solutions to more problems on behalf of their clients to secure their legitimacy.[240]

The potential contribution of Building Information Modeling (BIM) to the profession of architecture lies in the amalgamation of these two positions. As previously explained, BIM workflow advances through collaborative construction of a database, which involves early participation by design team members including the architect and the client. Being the originator of the "what" factor, the architect possesses an

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[237] Nilgün Fehim Kennedy, "The Ethos of Architects Towards an Analysis of Architectural Practice in Turkey" (PhD diss., Middle East Technical University, 2005).

[238] Kenneth Frampton, *Labour, Work and Architecture: Collected Essays on Architecture and Design,* (London & New York: Phaidon Press, 2002), 33.

[239] Robert Gutman, "The Designer in Architectural Practice", *Architecture From the Outside In,* Dana Cuff & Wriedt, John eds., (Princeton Architectural Press, 2010), 69.

[240] Ibid.

important position among the design team members, who work on the architect's initial vision from their own disciplinary frameworks.

In a conventional project workflow, the architect and the client agree on a scheme presented by the architect, and the architect translates other consultants' contributions to the design schemes of the building. While clients may ask for specific features to be worked on by consultants (such as a specific structural system or electro-mechanic requirements), the implementation of these features in the design is in control of the architect. Information from consultants arrives as packages that are checked for consistency and integrated into the design by the architect. The "how" factor is contributed by the consultants, and the architect is provided with finalized versions of individual stages. In this respect, the architect works with the somehow finalized versions of information packages rather than actively participating in their design processes. The coordinated design schemes of the whole are made available to design team members by the architect bringing them together. As Kimon G. Onuma summarizes in the *AIA Report on Integrated Practice:*

> Historically, architects have been seen as providing three basic services: they gather information; they process this information using a unique set of analytical problem-solving techniques; and they employ mastery of visual communication skills to relate complex physical solutions in a clear and understandable manner.[241]

According to Onuma, what is different for practice in BIM is not the essential services, but rather the way they are practiced. In BIM workflow the project is constructed in digital medium simultaneously by design team members. Consultants from various disciplines are able to contribute much earlier, and in legible forms that are integrated in the information model. A wall in the project, for instance, is not reduced to two lines representing a "wall", but is rather a factual parametric model with material and quantity information. From the scope of architects, the "how" factor of building is once more available, hence architects are better able to accurately develop design schemes

[241] Kimon G. Onuma, "The twenty-first century practitioner", *Report on Integrated Practice 6*, AIA, last accessed June 14, 2015, http://www.aia.org/aiaucmp/groups/aia/documents/pdf/aias076790.pdf .

as well as more easily coordinating the information contributed by various disciplines. Information in the design can be filtered and reported with respect to requirement, which makes the designs accessible to clients earlier on, and requests for revisions are minimized. In addition, architects are provided with new tools to contribute accurate information in the construction schedules, budget management, and facilities management of prospective buildings, thereby extending the range of services architects can provide.

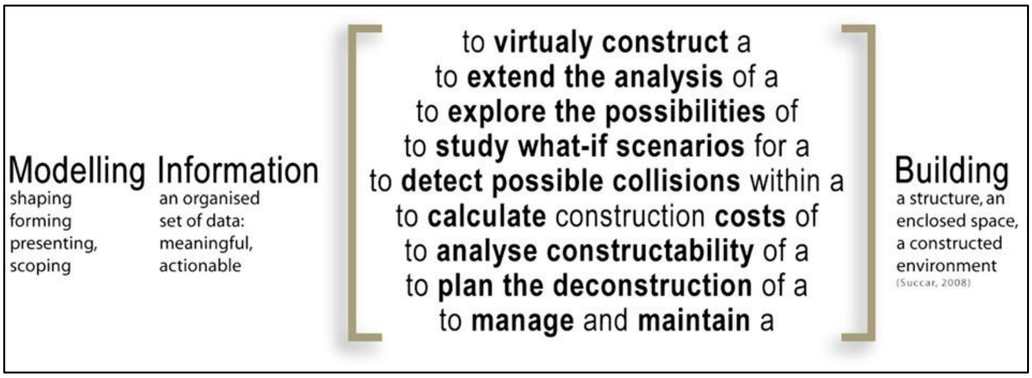

Figure 17. Common connotations of BIM. Bilal Succar, "Building information modelling framework: A research and delivery foundation for industry stakeholders," *Automation in Construction 18*, (2009): 359.

As previously examined, the AEC context is undergoing changes in its demands, products, and services. In turn, architects have to change the way they practice to fit in with the pace of change in the context. Thom Mayne briefly points out, "If you want to survive, you're going to have to change. If you don't change, you're going to perish."[242] The changing structures of clients (who seek a more active position in the design process) and the changes in demands are particularly pressurizing architects to be able to work faster and more efficiently. While conventional practices will probably continue to exist (to the extent that offices producing hand-drawings exist in the present day), it is seen in the preeminent economies that architects are increasingly

[242] Mayne, "Change or perish."

adopting new modes of production, namely BIM, to cope with the pressures of the industry.[243] Originating from the concern of increasing the efficiency of the design and construction processes, BIM and its connotations in practice are observed to address the requirements of the AEC context. Overall, the changing requirements from architects can be summarized under three inferences with respect to BIM:

(1) *Architects are required to provide more services with precision and in relatively shorter schedules.* The paces with which buildings are being constructed in the present leave little room for error and allow a shorter time-span. The increasing scale and complexity of buildings necessitate an increasing number of consultants to be involved in the design process, rendering coordination harder for architects. Moreover, a range of new services (i.e. construction scheduling, performance analysis, cost estimation, fabrication output) has merged into the repertoire of architects, making it essential to efficiently communicate information. In addition to enhanced design processes, architects now have the opportunity to expand their services to cover the construction and post occupancy conditions of buildings. All of these changes point out to a reconsideration of the *domain* of practice.

(2) *Architects are required to claim more responsibility for their professional actions; design needs to become accessible to clients*. Client structures are observed to have become more professionalized than ever before in the AEC context, and as such they require being more involved in the design process. As designs become more legible for clients, architects become subject to earlier and stricter auditing. This may be read as an opportunity to design buildings that are more consistent with clients' requirements, or as a burden of allowing clients excess authority over the design process. In either case, the matter-of-factness of the information model renders it accessible for clients, and architects' experience of *autonomy* in practice is altered.

[243] As previously examined, United Kingdom has declared BIM compulsory for public projects by 2016. Similar governmental efforts are also reported in Australia, Norway, Singapore, China, and Finland. NBS survey indicates that BIM adoption has changed from 13 percent to 54 percent of practices in the United Kingdom between 2010 and 2013. Similarly, McGraw-Hill Smartmarket Reports point out that BIM adoption in North America has increased from 28 percent to 71 percent between 2007 and 2012.

(3) *Architects are required to coordinate fragmentation and manage complexity*. As discussed earlier, buildings are attaining a level of complexity that transcends the abilities of a single practitioner. Through the involvement of numerous consultants, the design, construction and life-cycle management of buildings have become more fragmented processes than ever. Furthermore, the individual tasks that architects have to undertake by themselves may reach a certain complexity that requires a further fragmentation within the structure of the architectural practice.[244] The shared information model brings out new possibilities of collaboration in the fragmented design process, promising more efficient coordination of information via the integrated information structure. The architect, often providing the initial ideas and being in contact with the client, has to claim a role of leadership in the coordination of all design team members, yet s/he is a design team member himself/herself. Thus the position of the architect within the design team calls for a reconsideration of *authorship* in practice.

The domain of architectural practice, autonomy of practice within new modes of production via BIM, and the concept of authorship in the case of a shared information model thus stand out as three important scopes to be reconsidered with respect to the potential changes in the practice of architecture. The following sections discuss these changes under the three scopes of domain, autonomy, and authorship with respect to the practice of BIM. In turn, the implications of these changes on the professional roles of architects are elaborated under inferences from these discussions.

4.1 Domain of Practice

By definition, the profession of architecture is concerned with the design and realization of clients' environmental needs. The various roles architects have undertaken through the history of the profession are strongly related with the context

[244] Ali Hızıroğlu and Ekim Orhan İsmi, "ERA Mimarlık." Hızıroğlu explains that architects in the office are assigned individual roles such as the wall architect, the fenestration architect, façade architect, etc. On the one hand, specialization as such allows the architects to focus more deeply on the task at hand. On the other, it may result in a Fordist alienation from the totality for the architects undertaking these tasks.

in which the profession is practices.[245] Consequently, the domain of practice is iteratively redefined with respect to clients' requirements and extents of architects' knowledge and activity that contribute in the materialization of the solution.[246]

As Gutman explains in *Architecture From the Outside In*, the shrinkage in the domain of architecture had become a potential threat for the future of the profession.[247] Concordantly, Richard Foqué notes that the profession of architecture faces the risk of being reduced to the role of "aesthetic building surgeon"[248] if it becomes more separated from the specialist information required for the design and construction of buildings. The significance of BIM with respect to the domain of practice is the potential unification of design information in an integral database. The workflow of BIM makes design information available for architects in addition to expanding the range of services architects can provide:

> Other than producing fully coordinated production information, and their inherent abilities as a design visualization tool, the drivers for using BIM software hinge on the integrity of the underlying database. Critically this enables such software to act as a design repository able to interoperate with other specialist software to perform tasks beyond the ability of the BIM software – for example specialist analysis, detailed design, simulation (including the 4D animation of the construction programme against time) and evaluation (including the related 5D evaluation of expenditure against progress). Such software may be closely linked (via an API [application program interface]) or more loosely linked (via a data exchange file say) but the ability to 'round trip' the information is common, allowing BIM to act as the information integrator.[249]

[245] The internal and external relations of practice via BIM are elaborated under the conception of relational autonomy in the following section of the dissertation.

[246] Kostof, *The Architect: Chapters in the History of the Profession*, and Patrick Schumacher, *The Autopoiesis of Architecture: A New Framework for Architecture*, v1, (Chichester: Wiley, 2011).

[247] Gutman, "The Designer in Architectural Practice," 69.

[248] Foqué, *Building Knowledge in Architecture*, 96.

[249] Alastair Watson, "BIM – a driver for change," in *Computing in Civil and Building Engineering, Proceedings of the International Conference*, W. Tizani ed., (30 June-2 July, Nottingham, UK, Nottingham University Press), 139.

Architects can make well-informed design decisions easier and reduce potential errors in design by being able to access all the information that contribute to the making of buildings. In the big picture, the availability of information and automation in processing information point out a betterment of services provided by architects. In a typical BIM workflow, the building is constructed virtually prior to on-site realization, by virtue of which the design team can identify and solve potential problems earlier, attaining a higher standard of technical competency. As BIM renders designs stronger in the technical aspects, wide adoption of BIM systems overall imply more efficient design-construction-facilities management cycles. It has been discussed previously that the top requirements of clients in choosing architects are the ability to complete the design-build process in-time and on-budget, which rely heavily on the efficiency of technical solutions and coordination. Ensuring technical competency in this sense shifts emphasis to the spatial qualities of design, which may potentially become the determining factor in winning commissions. Consequently, it can be argued that BIM possesses the potential to re-shift the focus on the spatial qualities of design, securing architects a stronger position in the design process and the AEC context.

The domain of practice is also observed to have grown in terms of the services provided by architects. Becerik et al.'s survey conducted among well-established BIM practices in the United States shows that the range of services for which BIM is currently being used have expanded from the design process to cover the whole life-cycle of buildings (figure 18). Considering the tools and potential services now available to architects, it can be argued that architects are provided with the potential to have a stronger role in the post-design stages as well as the design process. A higher level of influence for architects as such implies greater accuracy between the designed and constructed buildings, and the ability to provide comprehensive services in design, construction and facilities management. Consequently, adoption of BIM potentially provides architects with a stronger position in the AEC context, and prevents the shrinkage of domain that critics warn architects about.

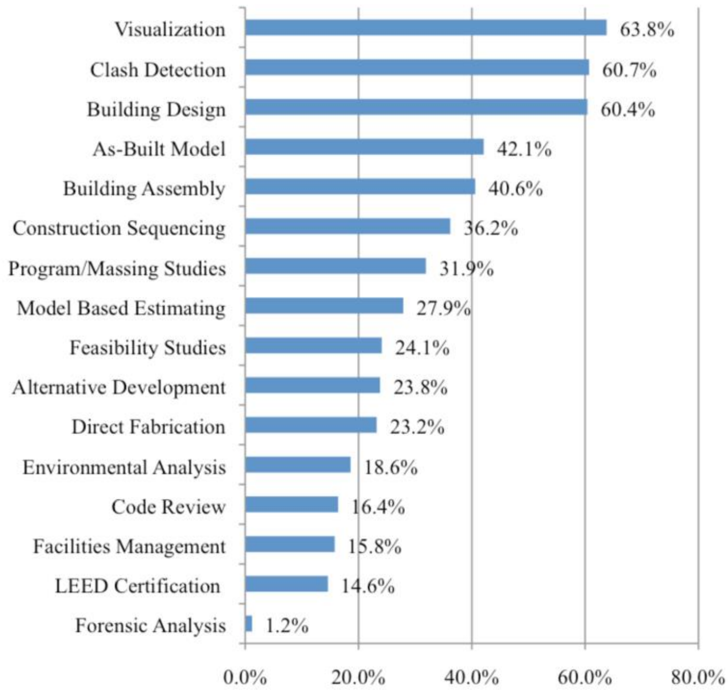

Figure 18. Range of uses of BIM. Becerik-Gerber B, Rice S, "The perceived value of building information modeling in the U.S. building industry", *Journal of Information Technology in Construction (ITcon)*, Vol. 15, (2010): 198-99, accessed online, http://www.itcon.org/2010/15

Overall, the adoption of BIM by the design team provides proven advantages both for clients and architects. The original claims of BIM, higher quality, greater speed, and lower cost have been confirmed on multiple case studies, [250] at least partially proving these claims to be accurate. In the ever-tightening schedules and demanding requirements of the Turkish AEC context, adoption of BIM may potentially secure the domain of practice by virtue of increased efficiency in design cycles. As discussed earlier, architects have been faced with an increasing complexity of buildings in the last decade, and are under pressure of stricter auditing as well as shorter project schedules. BIM, in this respect, compensates for the increasing complexity of

[250] Sacks and Barak, "Impact of three-dimensional parametric modeling of buildings on productivity in structural engineering practice," 439–49. Sacks and Barak report a 15-41 percent productivity gain in terms of hours required for project production. Leite et al., "Analysis of modeling effort and impact of different levels of detail in building information models," 601-09. Sacks, "Evaluation of economic impact of three-dimensional modeling in precast concrete engineering," 301–12.

managing the design as well as the shortening schedules. In addition, the coverage of new services by architects promise a stronger position not only in the design process, but also in the longer cycles of construction and facilities management.

In brief, BIM workflows imply an *expanded domain* for the practice of architecture. In addition, it is proven that automation of information models significantly reduce potential technical problems, establishing a standard for the technicalities of buildings. As more designs attain these standards via BIM, the focus of the AEC context shifts from technical aspects (the functioning of which are already secured) towards the spatial qualities of design. Consequently the spatial qualities of a design become more significant decision-factors for clients. In this respect, BIM implies a greater focus on the domain of practice of architecture, which appears essential to prevent a reduction in the professional role of architects in the AEC context.

4.2 Autonomy of Practice

> Can one 'fancy a painter unable to make pictures except when someone says to him: Paint now, paint this or that, and paint it thus and so.' Unfortunately, architects are almost always in this position, because as critic Van Rensselaer adds, 'architecture is not an art pure and simple. It has a practical side.' This may be one reason architects talk so much about 'autonomy'.[251]

The newspaper interview with the Mariana Van Rensselaer in 1890, at a time when American Institute of Architects had been spending efforts on a professional reform for architecture,[252] addresses the unresolved identity crisis of architecture: a profession with concerns over the aesthetics of construction, but at the same time one deeply rooted in the practical reality. As previously discussed, the profession of architecture locates itself as a mediator between the "what" and the "how" of building, the product of which becomes an expression of clients' power. Consequently, the practice of

[251] Gutman, *Architectural Practice; A Critical View*, 71.

[252] Sarfatti-Larson, "Emblem and Exception: The Historical Definiton of the Architect's Professional Role," 49.

architecture involves strong relations with the context, the client, and other professionals involved in collaboration, which have important implications on the autonomy of practice.

There are opposing views in the literature on autonomy of architecture. On the one hand, authors/practitioners such as Eisenman and Gandelsonas argue that architecture possesses its own values, experiences and reflections, hence a complete autonomy in its practice.[253] On the other hand, it has also been argued that architecture is a dependent profession by the very ties that connect it with clients, as Jencks remarks: "The architect today more than ever is dependent on collective patronage, whether this is by the state, local government or a committee of businessmen."[254] In her study on the *ethos* of architects in Turkey, Kennedy argues that architecture is not an autonomous discipline at all:

> In light of the forgoing, it can be said that there is no such thing as the sovereignty of architecture, except in the minds of architects, and that architecture is not an autonomous discipline. All these beliefs are chief components of the *ethos* of architects, which helps them ideologically to define themselves in professional terms.[255]

In both positions, the architect's relationship with clients stands out as an important factor of authority over the design process. Cuff explains that "[t]he ultimate authority or influence in the design process is the capability to call an end to the entire project. Both architect and client hold this power."[256] While Cuff underlines that architects' share the ultimate authority to end the project with clients, they also exercise interactive relations with other design collaborators at increasingly higher frequencies

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[253] Peter Eisenman, "The end of the classical: the end of the beginning, the end of the end", *Perspecta,* 21 (1984): 154–173, and Mario Gandelsonas, "Neo-functionalism and the state of the art", editorial, *Oppositions*, 5 (1975): 8, Rob Imrie and Emma Street, "Autonomy and the socialization of architects," *The Journal of Architecture,* 19:5, (2014): 723-39.

[254] Charles Jencks, *Modern Movements in Architecture,* (London: Penguin Books, 1985), 30.

[255] Fehim Kennedy, "The Ethos of Architects Towards an Analysis of Architectural Practice in Turkey."

[256] Cuff, *Architecture: The Story of Practice,* 75.

in the present day. Given the number of professionals that collaborate in the design team in the present complexity of building, the inter-relations within the design team becomes an important focus for any discussion on professional autonomy. Specifically, the shared design process of BIM has important implications on the interactions between design team members, which may be interpreted more properly from a non-dualistic approach that neither confirms absolute autonomy nor lack of it, namely a relational concept of autonomy.

As defined by political scientist John Christman, and later developed for the profession of architecture by Imrie and Street, "relational autonomy" describes "a free, self-governing agent who is also socially constituted and who possibly defines her basic value commitments in terms of interpersonal relations and mutual dependencies.[257] As the profession of architecture is continuously in dialogue with its context and the actors operating within it,[258] the freedom of agents in "being" and "doing" depends upon mutual appropriation and recognition.[259] Especially in the case of large scale and more complex projects, relational autonomy of the members of design team are strongly dependent on way the design team collaborates:

> In built environment projects, especially large complex ones such as those explored through the present data, professionals are highly interdependent. The degree of autonomy with which they operate is negotiated in the social setting of the project team. As these social contexts change, it becomes increasingly difficult to rely on institutionalized assumptions

[257] John Christman, "Relational Autonomy, Liberal Individualism, and the Social Constitution of Selves," *Philosophical Studies,* 117 (2004), 143.

[258] See Garry Stevens, *The Favored Circle: The Social Foundations of Architectural Distinction,* (Cambridge, Mass.: MIT Press, 1998), 68-112 cited in Bilge İmamoğlu, "Architectural Production in State Offices: An Inquiry into the Professionalization of Architecture in Early Republican Turkey", (PhD diss., TU Delft, 2010). - Borrowing the term from Bourdieu, Stevens examines architecture as a "field", which is "a mutually supporting set of social institutions, individuals and discourses". The field of architecture has subfields that extend into the physical realities of buildings as well as the conception of design, and both aspects embody different forms of capital and autonomies. As such, the profession is in constant struggle of autonomy.

[259] Tony Fry, *Design as Politics*, (Oxford: Berg, 2011).

> about who does what, whose view could override others, and who is responsible for what.[260]

The relational view of autonomy, in Imrie and Streets terms, "is positioned *in relation to* other (networks of) actors, their resources and systems of knowledge and practice."[261] As this definition of autonomy focuses on a living process rather than an end product it is specifically fruitful in the case of BIM. Rather than separating the architect from the design team for securing autonomy, or completely surrendering to over-dense interventions, it calls for an iterative process of communication that continuously acknowledges and adjusts the autonomies of design team members. The shared design process of the construction of information model is a considerably suitable medium for efficient communication between clients, architects and consultants. As the objectives and intentions are more efficiently communicated with a combined effort to reach a common goal, the architect may benefit from a better-informed level of autonomy. To be more specific, efficient appropriation and recognition between the architect, the client and consultants open up the possibility for exercising autonomy more productively in better-informed fields, rather than a false notion of autonomy that may potentially lead to rejection and rework.

Imrie and Street further point out that "[t]he possibility for architects to practice autonomously, or exercising a sense of self in the field, is interlocked with the languages, values and socio-cultural dispositions, of other project professionals involved in the development and design process."[262] Referring to conventional design processes, they explain that the architect is in a process of mutual appropriation and recognition with other professionals in the design team, the products of which are translated by the architect to the client. Considering BIM, the activity of translation is unrequired as the client bodies have direct access to filtered and legible information on design, to use the same metaphor, the client and the design team are able to co-

[260] Jaradat et al., "Professionalism in digitally mediated project work," 57.

[261] Imrie and Street, "Autonomy and the socialization of architects," 726.

[262] Ibid., 730.

author the project in the same language. Autonomy of the architect in this sense is more strongly related to the approach of the client, as s/he no longer translates some illegible form of information for the client. Consequently, the focus once again shifts to the design skills of the architect, who practices in an integrated information structure:

> the creation of the relationally autonomous architect is predicated on the dissolution of architecture as a delimited or disciplinary field, in which architects are exposed to, and integrated into, the totality of building cultures, or what Frank Lloyd Wright referred to as designing 'from the nature of construction'.[263]

4.3 Authorship in Practice

The introduction of information technologies in the AEC context have significantly altered the conception of authorship, as it has important implications on the structure of design collaboration. Borrowing Foqué's phrase, the contemporary collaborative design process can be defined as a "fractured design situation,"[264] distributing the design duties over multiple actors in the process of production. Concordantly, the post-industrial fragmented society rarely assigns a whole process to a single agent for temporal and economic concerns. Even small scale commissions in the present day are subjects of collaboration, and the number of the design team members expectedly grows with the increasing complexity and scale of building: architects, engineers, consultants (fire & life safety, traffic, façade, maintenance, acoustics, lighting, kitchen design, pool design, etc.), subcontractor design offices, translators, programmatic consultants, FF&E experts and contractors.[265] Furthermore, as Sharon Helmer Poggenpohl argues, "[c]ollaboration may involve inter-disciplinary, multi-disciplinary, inter-institutional or inter-national participation, each of which adds

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[263] Ibid., 735.

[264] Foqué, *Building Knowledge in Architecture,* 98.

[265] Matsushima, "Collaboration in Architectural Design: an IT Perspective."

complexity to the process."[266] Hence the information that contribute in the making of a building becomes fragmented along various participants, and the design process becomes, in Foqué's terms, fractured. By consequence, collaboration involves diverse interaction among participants:

> 'What' they [design professionals] are doing is quite diverse - negotiating the scope and constraints of their work, sharing knowledge and expertise, combining and negotiating disjoint knowledge, performing productive activities, working together, developing their own knowledge and working in their own best interests as well as allowing actionable entry to others.[267]

Conventionally, collaboration in the design and construction of buildings begins with the client expressing environmental needs that are translated into a project proposal by the architect. The following stages involve communication among design team members by transfer of packages of information that reflect a certain "frozen" instant of an individual aspect of the project. The sharing of these packages are accompanied by verbal or written communication and coordination meetings. This dominant mode of collaboration is vulnerable to potential loss of information due to the numerous transmittals and the high number of accumulated information packages. In addition, the resulting packages have to be translated back into the architectural project via "invisible" time consuming coordination tasks by a member of the design team, [268] usually being the architect, which are then submitted to clients. As such, the design process is fragmented, and the participants in design team are even contractually separated from each other.[269] Although the impact of the client is inevitable in the

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[266] Sharon H. Poggenpohl, "Practicing Collaboration in Design", *Visible Language* 38, no.2 (2004): 138.

[267] Poggenpohl, "Practicing Collaboration in Design," 142.

[268] Jaradat et al., "Professionalism in digitally mediated project work," 54.

[269] Howard W. Ashcraft, "Furthering Collaboration," *Building (in) the Future: Recasting Labor in Architecture*, Philip Bernstein and Peggy Dreamer eds., (New York: Princeton Architectural Press, 2010), 148. Kindle.

fragmented design process, architects claim the primary authorship of projects that fall in the interest range of the profession.

The changing AEC context globally increases the complexity of design and construction, and inevitably requires more actors to be involved in the lifecycles of buildings. In her elaborations on the changing practice of architecture, Peggy Dreamer identifies two responses of the profession to the increasing complexity of the AEC context: "a need for and access to both shared knowledge and shared risk and responsibility. It is in these two modes of response that we can see the shifting nature of design."[270]

Dreamer explains the first response, the need for shared knowledge, as a necessity for the increasingly complex design processes, and as an imperative for innovation on behalf of the architect. Given the vast diversity of specialisms now required for the design and construction of buildings, architects have to give up their dominant place in the pyramidal hierarchy of the design process. Concordantly, Mario Carpo explains that although architects (like most authors) neither like anonymity nor collective authorship, architectural design is information, and information is permanently drifting:

> digitality (particularly in the recent web 2.0 participatory climate) goes counter to most humanistic and modern notions of authorship and intellectual ownership. Unlike a building, which is a physical object, architectural design is pure information. And –as we now know full well– all digital information is inherently variable and permanently drifting: inevitably destined to be edited, copied, morphed, and transmogrified by unpredictable actors and networks, often without the author's consent.[271]

In this sense, the architect becomes a co-author in the design process rather than the translator. In addition, the architect shares co-authorship with an extended range of

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[270] Peggy Dreamer, "Design and Contemporary Practice", *Architecture From the Outside In,* Dana Cuff & Wriedt, John eds., (New York: Princeton Architectural Press, 2010), 82.

[271] Mario Carpo, "The Craftsman and the Curator," *Perspecta 44: Domain,* (2011): 87.

contributors, including those with little influence in the conventional processes (such as manufacturers). The multi-layered information structure bound and translated by the architect gives way to integrated information available to all design team members. In Dreamer's words, "all players can be considered designers, just with different areas of expertise. In this, the architect is now manager of design standards, and no longer the original auteur."[272]

The second response of the profession to the changes in the context is shared risk and responsibility. As the shared information model opens up new potentials of developing projects collaboratively, the sharing of design expertise can be further extended to sharing of risks and responsibilities by the architect, contractor, and client.[273] While clients have been active in the authoring of projects overtly or hidden, legitimizing their role in the authorship is a progressive step for the practice of architecture.[274] In brief, sharing risk and responsibility also implies the legitimation of the clients' claim on co-authorship of projects, delimiting architects' claims of total authorship.

The focus then becomes what new status of authorship the architect will exercise in the shared design processes via BIM. Carpo underlines that in the endless design and feedback cycles, and ever increasing complexity of architectural design, the usefulness of a tool to bring together all required design specialists cannot be questioned.[275] However, he points out that BIM technologies imply two different directions for the future of the profession of architecture:

> BIM technologies can in theory allow architects to extend their control, or at least their supervision to all aspects of

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[272] Peggy Dreamer, "Design and Contemporary Practice," 83.

[273] Ibid.

[274] Robert Gutman, "Architects in the Home-Building Industry," *Professionals and Urban* Form, Judith Blau, Mark E. La Gory and John S. Pipkin eds., (Albany: State University of New York Press, 1983), 220. Gutman explains the legitimacy of the authorship of clients as a progressive step that will be imitated by other professions in the future: "The requirement imposed on architects, that they share authority and responsibility with clients and users, probably represents the progressive model that most disciplines and professions will be forced to imitate in coming decades."

[275] Carpo, "The Craftsman and the Curator," 88.

> design and construction. This could create the new figure of a digitally empowered master-builder, and bridge the gap between conception and execution that Alberti posited at the beginning of the modern age. At the same time, oddly, BIM technologies could support the exact opposite of this authorial model, and enable and foster a fully participatory design environment, where the architect becomes the generic author of families of evolutionary and, in a sense, 'genetic' objects – no longer really an author but rather a curator who brings to life, solicits, elicits, moderates, and curbs, when necessary, ideas and contributions arising from a variety of participants.[276]

As mentioned earlier, critics such as Sanford Kwinter interpret this prospective situation as a threat to the profession, which may be signaling its end. Kwinter warns that as the profession of architecture becomes disengaged from the act of "building", architects will have to undertake roles that are outsider to the act of building.[277] However, the co-authorship of the information model can also be seen as the acknowledgement of a situation already at hand. To be more specific, absolute authorship by the architect is already irrelevant in complex commissions. OMA Associate Shohei Shigematsu comments that the demand for rapidly dispersed extensive knowledge necessitates the involvement of various experts in the design process. The architect's position then changes from the team leader to a team participant.[278] Keeping this in mind, early recognition of the position of co-author on behalf of the architect may open up new possibilities for innovation, and an increased control over the project for the architect by undertaking a new role, such as the *designer* and *curator* of the information model:

> … architects will lose some of their traditional mastery over the formation of specific objects, but gain new authority as the designers and curators of more or less open parametric models, or generic objects.[279]

[276] Ibid., 91.

[277] Kwinter, "Four Arguments for the Elimination of Architecture (Long Live Architecture)," 94-95.

[278] Shohei Shigematsu, video interview, (2008), last accessed October 18, 2010, http://www.archdaily.com/206/ad-interviews-shohei-shigematsu-omaamo-ny/ .

[279] Carpo, "The Craftsman and the Curator," 91.

4.4 Inferences on the Roles of the Profession

> A user should be able to define, inspect, modify and analyze different designs, and these operations should be executable in a natural and convenient manner. High-level extensions to the system should be possible for such purposes as automatic detailing, selection and layout of parts, analysis and evaluation. Both interactive use and the application of large, pre-defined programs should be allowed. It may be desirable to interface the integrated database with external analysis packages, which will involve selection and reformatting of data. In addition, it should facilitate convenient output, in such forms as engineering drawings, parts list and the results of analyses. Many of these requirements may be unique to particular design professions or organizations and such facilities will have to be capable of being tailored to a variety of professions and organizational environments.[280]

Almost 40 years after Eastman and Henrion published their objectives for GLIDE, the vision they outlined is available to practitioners. The main difference between the BIM and its ancestor does not lie in the capabilities of software. Rather, the difference lies in the design, construction and management processes they promise. After four decades, the AEC context –with its architects, clients, engineers, specialist consultants, manufacturers, fabricators, and many other design participants– bears the potential of integrated practice, covering the whole life-cycles of buildings without limiting it to any specific discipline. The significance of this capability is akin to the dominance of CAD which took over the context in the 1980s, and not a far-fetched goal given the rapid appropriation of CAD from stationery shops to construction sites. Potential change in the roles of the architect in this respect is a hypothesis to be tested over time. That being said, the implications of BIM on the subjects of domain, autonomy, and authorship in practice indicate a series of transformations in the way the profession is practiced and the roles it undertakes:

From drawing to building virtually: The conventional representations of buildings via drawings are being replaced by virtually built information models that embody the conditions of a projected reality. The need for interpretation of conventional

[280] Eastman and Henrion, "Language for a design information system," 11.

representations is thus eliminated as the virtual building in its matter-of-factness is more easily legible for clients. Consequently, architects are required to provide solutions to potential conflicts at earlier stages of design, rather than postponing for later. In this respect, designs are required to be more accessible for clients, and architects are obliged to take more responsibility for their designs.

From conventional collaboration to collective production: Collaboration in the conventional sense is conducted by transferring and coordinating specific "frozen" instances of work among the design participants. While this mode of collaboration may continue to be practiced for some time, the pressing requirements for speed and efficiency in design rather necessitate a collective mode of production, in which the design team works simultaneously on a shared information model. The collective production can be expanded to include participants such as contractors and fabricators, who are less-likely to efficiently participate in conventional collaboration routines (as they are mainly concerned with the design process and not as much with production). Briefly, the fractured design situation is replaced by a collective one, in which architects potentially have more control over contributions of the members of the design team ranging from early design to post-construction stages.

From multi-layered information to integrated information: The information from various disciplines that contribute in the conventional design processes form an additive multi-layered structure that is utilized via superposing layers. On the other hand, as the information models are built simultaneously by design team members, they promise an integrated body of information,[281] in which information is available to every member of the design team instantaneously. The integrated information structure is utilized not by adding new layers, but rather by filtering required information from the information model. The availability of integrated information, the "how" factor of design, to architects makes the coordination of the input from

[281] Larry Rexton Barrow, "Cybernetic architecture: Process and form. The impact of information technology," (D.Des. diss., Harvard University, Cambridge, Massachusetts, 2000). Barrow points out the role of Gehry Office in utilizing IT.

various disciplines easier as well as ensuring that they are better-informed for decision making.

From translation to co-authorship: In conventional workflows, architects translate information arriving from the various design participants into a consistent multi-layered design scheme, which is then presented to clients. BIM, on the other hand, is co-authored rather than translated: design progresses collectively through the shared information model, created in a single "language" that is legible to the client as well as other members of the design team. In this mode of production, architects are no longer required to undertake the translation of specialist knowledge to clients, but rather operate as co-authors –or editors– of the shared information model.

From generalism to specialism in nonspecialization: Architects are required to be partially knowledgeable at least to some degree in various disciplines in conventional design processes, taking on a generalist position for the profession. Working through a shared information model, however, introduces the *nuance* that architects should rather be knowledgeable on how to bring specializations together effectively than being knowledgeable in them. In Siza and Goldman's words, architects should be able to "connect various factors and maintain the synthesizing capacity of nonspecialisation," and "face the new situations that accompany each project." [282] From this scope, architects are required to specialize in deciding on how individual specializations fit with the specific requirements of projects, and how efficiency in their contributions can be ensured.

From separation to relational autonomy: The increasing number of professionals involved in the process of design-construction-facilities management, practiced via BIM, points out a break with the traditional dualisms of autonomy (autonomy vs. dependence) for the architect, and rather implies appropriation and recognition of every team member in a relational view of autonomy. As the multiple design team members are mutually better-informed about each other and their position in the team, the exercise of autonomy promises more efficient practices. In the case of the architect,

[282] Siza and Goldman, *Technology, Place and Architecture*, 155.

practice through BIM may either increase or decrease the relational autonomy with respect to the client, but definitely eliminate a false notion of autonomy that potentially causes rework and stress.

From architect (prospective neo-master builder) to designer-curator: In light of the changes in the AEC context and the tasks architects undertake, one is inclined to think that a total transition to BIM may assign the architect the role of master-builder once again. That being said, the position of this dissertation is that new potential roles to be undertaken by architects do not directly imply the position of the master builder for various reasons. Firstly, architects work for clients, and are under continuous auditing and intervention, whereas the master-builder works for "patrons" and experience a lower level of intervention by patrons once the commission is given. Consequently architects and information models are much more accessible to clients than the schemes of the master-builder, whose visions are not fully legible to patrons but are rather to be understood through interpretation. Secondly, architects are required to work with a wide range of consultants due to the increased complexity of buildings. Master-builder, on the other hand, is a generalists who both design projects and leads the construction site according to his vision. Commanding the scale of knowledge required to design, construct and maintain a building in the present context is an impossible task for any single practitioner. What is rather possible in this respect is managing information and design parties to facilitate a collective production process. Thirdly, relational autonomy exercised by the master-builder is dependent on a lower level of interaction due to lesser number of people involved in the process, lower levels of intervention by patrons, and much simpler contextual pressures. On the contrary, contemporary practice of architecture depends on a variety of actors contributing in various stages of the life-cycle of buildings.

It can be argued overall that the titles and responsibilities of architects may manifest themselves in numerous ways. What seems certain, however, is that architects have to re-position themselves within new modes of collaboration triggered by shared information and shared responsibilities. As examined over practice of BIM in established contexts, involvement of a wider range of participants in the design process increase the satisfaction with projects as well as the reliability of architects. In the case of Turkish AEC context, the increased interest in adoption of BIM may potentially compensate for the increasing pressures on the profession of architecture, and actually increase the autonomy of the profession by virtue of technical competency and design quality.

CHAPTER 5

CONCLUSION

The primary motive for this study is understanding the potential position of architects in the collective production networks made available by BIM. To this end, the study examines the changes in the AEC context, investigates how BIM is in tune with the changes, and examines how architects operate via BIM to respond to the self-alterations of the AEC context.

The changes in the AEC context have mainly been inquired over cases from developed economies, where BIM is widely adopted and its practice has been put to test for periods long-enough to be reported and evaluated. That being said, Turkish AEC context has also been given a special focus for three reasons. Firstly, Turkish AEC industry is globally recognized for its scale and complexity of developments. Secondly, although piecemeal practice of BIM is becoming common, wide adoption of BIM across disciplines is yet to take place, which renders it particularly interesting because any elaboration on the role of architecture in BIM would provide a framework for actual practice, and thus become available for testing. Thirdly, the study is conducted in Turkey, and the observations and interviews mainly reflect the local AEC context of Turkey.

The main contribution of the study to the literature on the profession of architecture is providing a base for understanding the prospective changes in professional roles with respect to the domain, autonomy, and authorship issues in practice. Through causal links with the contemporary design-build-manage processes, the profession of architecture is repositioned in the collective production process of buildings. Another contribution is the comparative analysis of Turkish AEC context with its more established BIM practicing counterparts by identifying links between the actors and demands within the AEC industry.

The main investigations of the study are conducted under three chapters, which focus on how the AEC context is changing, how BIM is related to the AEC context, and consequently what roles the profession of architecture undertakes and may undertake in the future.

The second chapter of the study investigates the changing AEC context. The chapter is structured over three foci inferred from Gutman's definition of the context for the practice of architecture explained in *Architectural Practice; A Critical View*. Under the first focus, the changes in demand are investigated in terms of the rise in demand, the client structures, and new forms of demand made from architects. Based on statistical information presenting construction indices of the last decade in Turkey, it is seen that there is an increase in the overall billings and square meters produced. In addition, statistics show that while the payroll in architecture and engineering services increased, the overall billings of firms are stable, which points out to an overall drop in the remuneration of architects. It is also observed that schools of architecture are drawing more students each year, which implies a further competitive context prospectively. Overall, the examinations in the section indicate that the AEC context is likely to exert more pressure on the profession in the near future.

The second focus of the chapter is the structure of clients. It is noted that while the pressures on clients increase in forms of legislation and monitoring, clients still tend to increase the scale of their operations, which may be interpreted as a result of the governmental policies to boost construction. Another important inference of the section is the professionalization of clients: as investments get bigger and more risky, client structures tend to become more professional and demanding.

The third focus of the second chapter is the new forms of demand, which are evaluated under the three phases of pre-design, design, and post-design. It is underlined that large-scale clients tend to press architects to complete projects on-time and on-budget, while aesthetic quality appears as a lower rated aspect. It is argued that coordination of design is a considerably high time-consuming task, which is not included in the contracts of architects but rather accepted as a standard service by convention. The section also examines the demand for branding architecture for higher market value. In brief, the section points out to relatively new services asked of architects in the various design stages.

The third chapter of the study focuses on situating BIM within the AEC context. The chapter first explains the origins of BIM, and elaborates on the utilization of BIM in different geographies. The publicized features of BIM are interpreted from the scope of the changing AEC context by identifying how they are linked to the demands and requirements of the context. The chapter concludes by evaluating the motives for adopting BIM, barriers to BIM adoption, and briefly points out some of the implications of BIM on the practice of architecture.

The fourth chapter aims to position the profession of architecture within practice via BIM. The chapter first evaluates the profession of architecture in its historical position between clients' objectives and their realization. The generalist position of the profession at present is evaluated as a result of architects losing control of the technicalities to engineers, and aligning themselves with the aesthetic dimension of construction. It is seen and concluded that the profession is at risk of a legitimation crisis if it remains mainly preoccupied with aesthetics and keep on losing responsibility to other disciplines. Building over a comparison of conventional and BIM workflows, three foci of interest with respect to the changing context and BIM are inferred: domain of practice, autonomy of practice, and authorship in practice.

The domain of practice investigates the delimitations of the professional services provided by architects via BIM. It is observed that BIM is being used for a variety of different services that contribute to the design and construction of buildings, ranging from visualization to forensic analysis. An important contribution of BIM with respect to the domain of practice is the betterment of the standard technical solutions of buildings, which render spatial qualities of design as the distinguishing factor for buildings. This shift in focus grants the architect higher creative power in the design process.

Another essential aspect to be meditated on in the case of BIM is the autonomy of practice. By definition, the profession of architecture is strongly connected with its clientele. In addition, the complexity of buildings in the present involve a number of design professionals from different disciplines, with whom the architect has to collaborate effectively. This complex network of collaboration conducted via the information model is interpreted over a relational view of autonomy, in which the freedom of agents in "being" and "doing" depends upon mutual appropriation and recognition.[283] The section concludes by noting a decreased autonomy in the practice of architecture in BIM.

The third aspect under focus is authorship in practice. The section investigates authorship under two foci borrowed from Peggy Dreamer: shared knowledge, and shared risk and responsibility.[284] Within the framework of these two foci, the position of the profession in terms of authorship is seen to have transformed from the role of the translator, –who translates design between client and design professionals– to that of the co-author –who works on the shared information model with other design team members. The decreased claim on authorship, however, can be interpreted as the acceptance of a situation already present in the design process. At present, both clients and other design team members are observed to share authorship of projects with architects. From this perspective, what is valuable in terms of BIM workflow is the early acknowledgement of the situation so that a potential for new design roles may arise.

The implications of BIM on the domain, autonomy, and authorship aspects of practice can be summarized through a set of transformations identified under seven titles in the discussion chapter: (1) "from drawing to building virtually," as representations of parts of buildings are being replaced by digital construction of them prior to on-site realization; (2) "from conventional collaboration to collective production," as the revise-and-pass-on routines of design professionals are being transformed into

[283] Fry, *Design as Politics*.

[284] Dreamer, "Design and Contemporary Practice," 82.

spontaneous collective design processes; (3) “from multi-layered information to integrated information,” for information in BIM processes is stored as a unified whole within virtual buildings, rather than layers of knowledge available only to certain experts, (4) “from translation to co-authorship,” as design team members including clients do not need translation of designs if they have access to the building information model; (5) “from generalism to specialism in nonspecialization,” because the ability to manage information increasingly gains importance over the seemingly impossible task of knowing-it-all; (6) “from separation to relational autonomy,” as exercise of autonomy in isolation is not possible, and the professional boundaries and relations among the design team define the extents of autonomy for each participant; and finally (7) “towards the role of designer-curator,” which, in light of the first six titles, summarizes the conclusion of this thesis for prospective roles architects may undertake in the near future.

The position of this thesis is that practice under BIM does not necessarily imply the role of neo-master-builder, as commonly argued for in the case of BIM. Rather, the intensive sharing of knowledge and responsibilities call for a supervisory position for architects among co-authors. As the formerly separated boundaries of design professionals begin to dissolve in a shared design process, their responsibilities and influence on collaborators are altered. In practice via BIM, the collective design process brings along both advantages and disadvantages for architects with respect to their professional domain, autonomy, and claim of authorship (figure 19). Considering the domain of practice, while BIM is likely to render design quality as the distinguishing factor, –and architects as the distinguishing design participants– it also enforces more work and more responsibility for architects by necessitating early confrontation of potential design problems in higher levels of detail. In terms of autonomy, practice of BIM is leading to a better-informed relational autonomy, in which architects perform in relation to other design participants and position themselves accordingly. On the other hand, clients and other design professionals become likely to interfere in architects’ work, decreasing architects’ level of autonomy in practice. In terms of authorship, BIM stands out as a multi-authored process, decreasing architects’ role in the authorship of buildings. However, early recognition of the obligatory status of co-authorship paves the way for potential new roles for architects in coordinating the shared design process.

Two skills appear to be essential for architects in the prospective practice of architecture via BIM: the ability to design, which lies at the core of the profession since its birth; and the ability to manage large amounts of information efficiently, which is gaining importance as the information required to design, construct, and maintain buildings continuously grows. A prospective inference for the role of the profession of architecture can thus be based on these skills, which lead to the position defined as the *designer-curator*. As design quality becomes more emphasized, architects' ability as proficient designers will gain importance, hence the *designer*. Concordantly, in the ever more complicated network of information, architects will be required to identify and manage relevant information and put it to use in a theme they oversee, hence the *curator*.

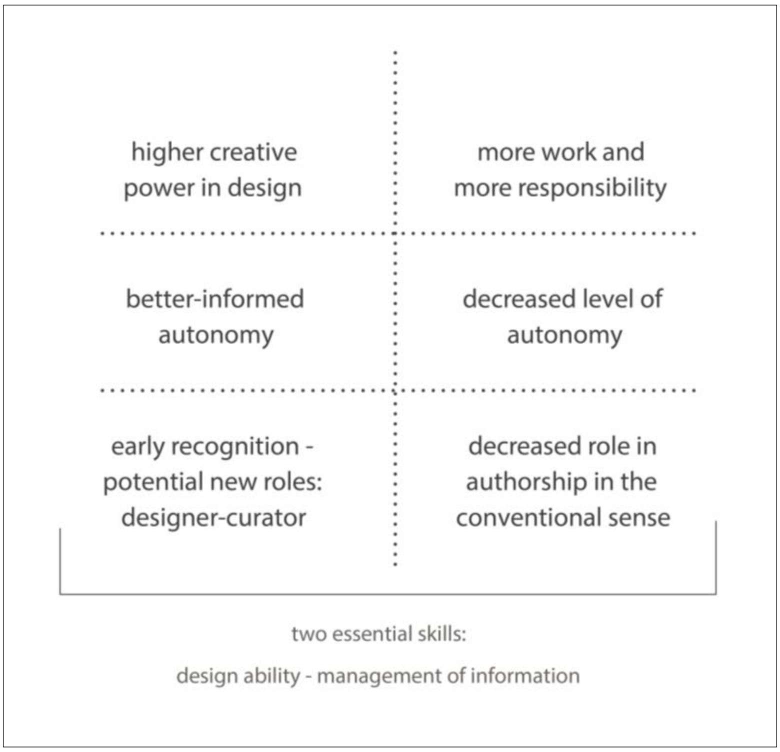

Figure 19. BIM: Advantages and disadvantages for the profession. Produced by the author.

Reflecting back on the Turkish AEC context, it can be argued that the transformation towards a collective design process, as pioneered by BIM, happens at a slower pace compared to the more developed economies referred to in the thesis. The role of the profession as designer-curator, however, can still be considered as a valid destination for two reasons: (1) architects have to work on more complex buildings in shorter timespans, and (2) architects are at the center of a highly competitive market in terms of both production and marketing. Especially in housing projects, which constitute the majority of new buildings at present, architectural design has become an important marketing tool that draws clients' attention over the value of design at least to some degree. In addition, the scales and functional programs of buildings already necessitate participation of various experts, who have to be coordinated and checked for consistency by architects. It should be noted that architects already have to consider these issues whether they work via BIM or not. What is significant about practice via BIM is the acknowledgement that design is increasingly becoming a collective process, and the consequent adoption of a mode of production that better suits this new condition. While the AEC context in Turkey can be seen to lag behind more developed contexts in terms of budgets, time allocated for design, and institutional support for efficiency, the scale and complexity required in new projects readily match their foreign counterparts. In addition, project schedules are observed to be much shorter, projects offer lower remuneration compared to practice in more developed contexts, and pressures on architects and other design participants are stronger. In this respect, adoption of BIM can be read as a compensation for the ever-increasing pressures on the profession, although its primary benefits are enjoyed by clients rather than architects. Still, ironically for the exact same reason, wide adoption of BIM and the implied role of designer-curator are not distant concepts for practice of the profession in Turkey.

Since this study focuses mainly on the practical side of the profession, its framework and reach are limited, and do not provide an exhaustive examination of the changing roles of architecture. In this respect, the study would be enhanced by further research on subjects that have not been inquired in this scope.

Evaluation of professional education under BIM and its relations with the changing AEC context stands out as an important subject for consideration in future research. The design studio, which forms the basis of architectural education, is an idealized vision of architectural practice. The problems introduced in the design studio are specifically designed with educational concerns, and often do not carry the complexity and groundlessness of design problems in practice. The evaluators of students' designs are typically architects, sharing a common background with students, which is significantly different from clients in practice. In addition, design problems at school are generally tackled by the student alone, whereas in practice a design process involves many participants in collaboration. The necessity and workload of coordinating and checking information from other disciplines is often overlooked and neglected. Consequently, a potential problem of designing via BIM in professional education is the adoption of software but not the mode of production that it necessitates. A more appropriate utilization of BIM in professional education may be introduced by encouraging multi-disciplinary design teams to work on studio assignments, in which information would be shared across design participants and its management would be exercised in addition to conventional design tasks. Such a revision in the studio, however, implies significant changes in the conduct of architectural education as well as education routines of other disciplines, and has to be well-coordinated among faculties to ensure efficiency. The conception of a collective learning process as such necessitates a reconsideration of the architectural design studio in terms of epistemology as well as its relation to practice. Concordantly, the *ethos* of architecture in a shared learning process forms an important subject to focus on. Hence, reconsideration of architectural education in the framework of BIM workflow constitutes a rather promising research area. This study contributes to the formulation of this research area by identifying a causal framework between BIM and the AEC context, upon which further research can be conducted.

While this study focuses on the prospective roles of architects practicing via BIM, it has been argued that design processes include contributions by multiple professionals from different disciplines. Consequently, the domain of architecture is intertwined with domains of other professions. In this respect, the professional roles of other domains that participate in the design, production and management of buildings are important factors to examine under the scope of practice via BIM. Research on the professional roles of other disciplines would therefore strengthen the understanding of the complex structure of the collective design processes in BIM, and would certainly enhance the inferences of this thesis.

It should be underlined that methods of practice in architecture are as diverse as the habits of practicing architects. Keeping the diversity in the practice of architecture in mind, the thesis has focused on the general factors that define the role of the profession, studied under the foci of domain, authorship, and autonomy of practice. While there can still be numerous instances of practice habits, it can be inferred that the profession of architecture is being directed towards a new mode of practice that is more pressurizing in terms of scale and complexity and more difficult in managing effective collaboration, but it also promises a heightened interest in design quality and bring along new responsibilities for architects. In this sense, the profession of architecture does not appear to be on its way to extinction, but is rather experiencing a period of transition in which its duties are re-programmed. More importantly, this period of transition is observed to be demanded and facilitated by forces other than architecture itself such as the clients and governing bodies. In this sense, BIM is not necessarily the initiator of change, but rather a means to adapt to the changing conditions within the AEC context. As explained earlier, BIM changes the way architects operate in the design process, however these changes have both positive and negative connotations. The significance of the adoption of BIM as a primary mode of production, therefore, lies in understanding the changing dynamics of practice, and taking position to adapt the profession to new demands. In this respect, BIM can be understood as an acknowledgement of the changes in practice, and it can be conceptualized a tool of adaptation for architects to switch foci and take more responsibility in the design, production, and management of buildings.

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Surname, Name: Özkoç, Onur
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EDUCATION

Degree	Institution	Graduation Year
Ph.D.	METU Department of Architecture	2015
M.Arch	METU Department of Architecture	2009
B.Arch	METU Department of Architecture	2006
High School	TED Ankara College	2002

PROFESSIONAL EXPERIENCE

Year	Institution / Firm	Position
2014-Present	METU Department of Architecture	Part-Time Instructor
2011-Present	Motto Architecture	Partner
2009-2014	METU Department of Architecture	Res. Asst.
2005-2008	TVNRS Media Design	Partner

ACADEMIC EXPERIENCE

Year	Course
2013-Present	Studio critic and jury member in “Arch 301 Architectural Design III” and “Arch 302 Architectural Design IV” at METU.
2009-Present	Jury member in “Arch 101 Basic Design”, “Arch 102 Introduction to Architectural Design”, “Arch 301 Architectural Design III”, “Arch 302 Architectural Design IV”, and “Arch 401 Architectural Design IV” at METU.

2013	Res. Asst. at “Arch 203 Digital Media in Architecture I”
2012-2013	Res. Asst. at “IS100 Introduction to Information Technologies and Applications.”
2009-2013	Studio critic and jury member in “Arch 201 Architectural Design I” and “Arch 202 Architectural Design II” at METU.

AWARDS

Year	Award
2015	World Architecture Community 20+10+X Awards 20th Cycle: NorthGate Ankara
2015	World Architecture Community 20+10+X Awards 19th Cycle: TSHF 90th Ann. Capital Polygon Complex
2014	1st Prize at Invited Competition: Turkish Shooting and Hunting Federation 90th Ann. Capital Polygon Complex
2013	Honorable Mention at National Competition: Izmir Development Agency Headquarters
2013	Purchasing Award at National Competition: Adıyaman Center for Active Living
2012	Equivalent 1st Prize at Invited Competition: TÜMAŞ Headquarters, Ankara

PROJECTS

Year	Project
2015	NorthGate Ankara Mixed Use Complex, Hotel, Shopping Mall, and Housing
2015	Urban Regeneration Housing Complex and Social Facilities in Sakarya, Turkey
2015	Datça Karahan Family House

2015	Urban Regeneration Housing Complex and Social Facilities in Kütahya, Turkey
2015	Design of the Macro Series Ceramic Tiles for Serra Ceramics
2014	Housing and Social Facilities the Ministry of Gas in Turkmenistan
2014	Competition Entry for Turkish Shooting and Hunting Federation 90th Ann. Capital Polygon Complex
2013	Competition Entry for Izmir Development Agency Headquarters
2013	Competition Entry for Adıyaman Center for Active Living
2013	Yalın Evler Housing, Ankara, Turkey
2012	Competition Entry for TÜMAŞ Headquarters, Ankara

OTHER WORK

Year	**Project**
1999-Present	Guitarist and Composer for Dreamtone and Dreamtone&Iris Mavraki's Neverland
2006-2014	Graphic Design – METU Architectural Design Studios Journal
2013	Graphic Design – "Bozkırdan Yeşile Eymir Gölü" Exhibition
2008-2014	Graphic Design – METU Faculty of Architecture Graduate Catalog
2009-2013	Designer and Webmaster – METU Materials Conservation Laboratory Website
2009-2013	Webmaster – METU Department of Architecture Website
2014	Designer and Webmaster – METU Monuments Lab Website

FOREIGN LANGUAGES

Turkish (mother tongue), English (fluent), German (beginner)