Building Craftsmen in Mamluk Society 648-923/1250-1517: The Professional *Muhandis* in Context

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Statement of Originality

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Abstract

This study examines the building craft in Cairo and other major cities during the Mamluk era (1250-1517). In contrast with much current scholarship, this study argues for the existence of a group of educated professionals, usually called *muhandisīn* (singular: *muhandis*) who were both familiar with the theoretical literature and involved in building construction. This group acted as the top professionals of the building craft. They were certified by the *qāḍī*'s court as authoritative experts in their profession and were represented in their society as respected figures.

The study also argues that as a part of this conception of the *muhandis*, we should move away from modern characterisations of the science of *handasah* as a sort of geometry. Mamluk authors saw *handasah* as an applied science which included subfields now seen as belonging to mathematics, geometry, mechanics, and physics. Treatises on the application of scientific concepts to the building craft circulated widely, including some specifically aimed at building craftsmen. Finally, this thesis argues that the theoretical knowledge held by educated *muhandisīn* aided them in producing plans and visual representations, gave them a position as legal experts, and distinguished them from masons and builders. In ninth/fifteenth-century Mamluk Egypt, this group of educated professionals at the top of the building profession likely became more prominent and developed a professionalised identity under the term *miʿmār*. The Mamluk *muhandis*' mastery of scientific literature on construction, visual representation, and distinct identity from ordinary masons and builders allow us to place the Mamluk *muhandis* on the same level as the Renaissance architect.

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List of Abbreviations

AJH	Arab Journal for the Humanities
BL	The British Library
DKM	Dār al-Kutub al-Miṣriyyah
DWQ	Dār al-Wathā'iq al-Qawmiyyah
DMWA	The Dictionary of Modern Written Arabic
ENL	Egyptian National Library = Dār al-Kutub al-Miṣriyyah (DM= Dār Kutub Mīqāt, DR= Dār Kutub Riyāḍah, ṬR= Ṭalʿat Riyāḍah)
EAL	Encyclopaedia of Arabic Literature
EI2	Encyclopaedia of Islam, Second Edition
EI3	Encyclopaedia of Islam, THREE
EL	Escorial Library
MSR	Mamlūk Studies Review
MWNF	Museum With No Frontiers
PUDL	Princeton University Digital Library
RC	Reading Certificate (a/b/c, fol. no = treatise/part/session, folio on whose margin the certificate was recorded, respectively, as appears in *Mu'jam al-Samā'āt al-Dimashqiyyah*)
TEI	Thesaurus of Islamic Epigraphy
WA	Wizārat al-Awqāf

For information between brackets:

bl. = built

c. = century

d. = deceased

fl. = flourished

pl. = plural

r. = ruled

s. = singular

Note on Transliteration

The system of transliteration used in this thesis is the International Journal of Middle East Studies (IJMES). However, I have added a distinction to the Arabic *alif maqṣūrah* (ى) that IJMES does not distinguish from the long *alif* (ā), and I have also distinguished the *tā' marbūṭah* (ة) from the short *alif* (a). Some Arabic words, like *qāḍī*, have not been given their accurate Arabic plural form (*quḍāh*), but a simplified English form (*qāḍī*s).

Constants					
ء ب ت ث ج ح خ د ذ ر	’ b t th j ḥ kh d dh r	ز س ش ص ض ط ظ ع غ ف	z s sh ṣ ḍ ṭ ẓ ʿ gh f	ق ك ل م ن هـ و ي ة	q k l m n h w y h
Vowels					
ى ـِيّ ـُوّ	á iyy (final ī) uww (final ū)	long آ ي و	ā ī ū	short ـَ ـِ ـُ	a i u

Note on Translation

Quotes of particular academic importance are provided in the text in both English translation and original Arabic. All translations into English, unless otherwise stated, are my own. When Arabic words may have not exact synonyms in English, the translation reflects the closest meaning.

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Introduction

Mamluk monuments and their aesthetic value have received considerable attention in academic scholarship, but comparatively little has been written about the human agents that produced these buildings. This remarkable dearth of knowledge about architects and builders is not limited to the Mamluk era, but is true for other periods in pre-modern Islamic history, as well as for medieval Europe. Although the last few decades have seen increased consideration of Mamluk architecture, these studies have generally remained limited to the domain of history of art and architecture. A great deal of scholarship about Mamluk architecture concerns artistic and technical aspects of construction, patronage, and the functional purposes of monuments. Only a few of these studies, in particular those of Doris Behrens-Abouseif and Nasser Rabbat, have begun to shed light on craftsmen and building professionals. This dissertation seeks to address this imbalance by focusing on the builders, masons, and carpenters that created works of Mamluk architecture and will focus particularly on the figure of the *muhandis* as a key professional craftsman. The central question posed here is whether the Mamluk-era *muhandis*, and his equivalent the *miʿmār*, can be understood as architects in the modern sense of the term.

Recent studies and papers on Mamluk architecture can be divided into four main categories, albeit four categories with unequal weighting. The first category considers the evaluation and interpretation of primary sources about Mamluk architecture, especially endowment deeds. The second category presents extant Mamluk buildings, complexes, and city plans as case studies. The third category emphasizes the characteristics and the artistic style of Mamluk architecture. Finally, the fourth category includes studies on the cultural and social context of Mamluk architecture. In this last category, only a few examples currently discuss Mamluk building professionals and craftsmen within a broad historical and social context.

One of the central questions surrounding these building professionals is the nature of their activities and knowledge, and to what extent they could be considered ‘architects’ as opposed to master builders. Leo Mayer traces academic efforts to uncover the role of Muslim artisans back to Max van Berchem (d. 1921), who in 1888 underlined the importance of epigraphy as an important source for the study of Muslim artisans. He was followed by Ulrich Thieme and Felix Becker, who in 1907 published

a biographical dictionary of artists that includes a number of Muslim master artisans.[1] In 1934, M. Aga-Oglu, E. Kühnel, and G. Wiet published their *Dictionary of Islamic Artists*; Mayer suggests that its section on the architects of the Near East, particularly of medieval Syria and Egypt, may be considered the most important early contribution to the academic study of Muslim artisans. This was the first time such a study had been undertaken and should be seen to mark the beginning of serious scholarly attention to so-called 'architects' of the late medieval Near East.[2]

Mayer, however, questions the use of the term 'architect' for this period. For Mayer, titles like 'architect' and 'engineer' are misleading since they are not direct equivalents of the most common terms used in Islamic sources: *bannā'*, *muhandis*, and *mi'mār*. Mayer defines an 'architect' as a man 'of good general education and theoretical knowledge, who can plan a house and make it stand', and finds that none of the three terms specifically describes such an individual.[3] This definition eliminates both patrons, who despite their planning ability did not construct the building themselves, and master masons - whether *bannā'*, *muhandis*, or *mu'allim* - who lacked theoretical knowledge. He examines extant monuments and suggests that the existence of multiple securities and buttresses as an extra measure of security indicates that they were built without theoretical calculations. Adding that *ḥisbah* (market inspection) manuals did not establish any real difference between an architect and a master mason,[4] Mayer concludes that the practically-skilled and theoretically-educated 'architect' figure did not exist in late medieval Egypt and Syria, but only master masons.

Following Mayer, Doris Behrens-Abouseif also doubts the existence of the Mamluk 'architect'. Behrens-Abouseif explains that the word 'architect' itself is a post-medieval term that emerged with the Italian Renaissance, and was not in use in neither medieval Islamic lands nor in Europe.[5] She does, however, point out that historical accounts of the Mamluk era associate the *muhandis* with technical aspects of the building profession, much more so than the other two terms she studies, the *shādd* and the *mu'allim*. Behrens-Abouseif, however, argues that the *muhandis* was a profession defined not by its technical nature, but by its link to the Mamluk Sultanate's court.

[1] L. A. Mayer, *Islamic Architects and Their Works* (Genève: Albert Kundig, 1956), p. 16.
[2] Mayer, *Islamic Architects*, p. 16.
[3] Mayer, *Islamic Architects*, p. 18.
[4] Mayer, *Islamic Architects*, p. 19.
[5] Doris Behrens-Abouseif, 'Muhandis, Shād, Mu'allim - Note on the Building Craft in the Mamluk Period', *Der Islam*, 72: 2 (1995), 308.

Citing al-Qalqashandī (d. 821/1418)'s definition of *muhandis al-ʿamā'ir* as the person in charge of the sultans' constructions, she views the *muhandis* as someone who occupied an official position in the court at the same level as chief physicians and ophthalmologists.[6] This, she argues, implies that he was in charge of supervising the building craft and its craftsmen. She also suggests that the absence of the *muhandis* from *ḥisbah* manuals means that the *muhandis* did not exist as a profession in urban markets, meaning that it must have been associated with the court of the ruler.[7]

When assessing the possibility of the *muhandis* acting as an equivalent to the modern architect, Behrens-Abouseif defines an architect as having two main characteristics: creativity as reflected in the independent design and theoretical knowledge of the building sciences. Investigating the first criterion, Behrens-Abouseif argues that the roles with which the *muhandis* was associated do not imply creativity. Mamluk chronicles show the *muhandis* as an engineer in the construction of bridges, canals, and dams, as well as a master mason or a foreman on the building site. Furthermore, Geniza documents present the *muhandis* as a land surveyor responsible for fixing lots' boundaries and estimating property values.[8] Endowment deeds show the *muhandis* and *miʿmār* as a maintenance man whose salary was as low as that of a plumber. [9] Further, patronage agency can be seen to have left the Mamluk *muhandis* with little room to develop independent designs. Behrens-Abouseif argues that Mamluk sultans and *shādd*s - the military officers in charge of supervising sultans' building projects, who likely acquired some technical knowledge - were closely involved in the design and even in technical aspects of their buildings. As further evidence, she notes that Mamluk sources say nothing about the *muhandis* as a distinct professional in charge of the design of buildings. The silence of the Mamluk chroniclers should not be interpreted as lack of interest in the building projects, but rather as indicating that such expectations did not exist for the *muhandis* profession.[10]

As for the second criterion – knowledge of building sciences – Behrens-Abouseif believes that the Mamluk *muhandis* acquired his technical skills through accumulated practical experience rather than theoretical education. Her evidence is the lack of literature aimed at the building craft and its craftsmen. She also points out that

[6] Behrens-Abouseif, 'Muhandis, Shād, Mu'allim', p. 293.
[7] Behrens-Abouseif, 'Muhandis, Shād, Mu'allim', p. 294.
[8] Behrens-Abouseif, 'Muhandis, Shād, Mu'allim', p. 294.
[9] Behrens-Abouseif, 'Muhandis, Shād, Mu'allim', p. 296.
[10] Behrens-Abouseif, 'Muhandis, Shād, Mu'allim', p. 308.

Mamluk architecture was 'rarely monumental' when compared to the grand monuments of the Ottoman Empire, for example. Mamluk buildings, therefore, required only qualified masons, practical experience, and some basic mathematics.[11] Behrens-Abouseif supports her point by stating that even the most outstanding achievements of Mamluk architecture – masonry domes – could be achieved through a process of gradual trial and error combined with practical experience; their distinctively excessive margin of safety also indicates a lack of theoretical calculations. She admits that al-Qalqashandī refers to the science of *handasah* and to its specialized literature, but does not view it as evidence for specialized building sciences. She instead associates *handasah* with mathematics and Euclidean geometry, which she does not view as sufficiently sophisticated to meet her definition of a creative architect. Therefore, she agrees with Mayer that the Mamluk architect did not exist, and the *muhandis* was no more than a master mason.[12]

This view is not universally shared, however. Contrary to Mayer and Behrens-Abouseif, Nasser Rabbat credits Mamluk *muhandis* with further qualifications. In his view, out of the several categories of the building craftsmen mentioned in primary sources, the Mamluk *muhandis* seems to be the closest to the architect as we understand the profession today: a professional craftsman with a wide range of technical and theoretical knowledge.[13] Rabbat employs the same pieces of evidence that led Mayer and Behrens-Abouseif to limit the role of the Mamluk *muhandis*, but rather interprets them as showing the *muhandis* to be a more professional and specialized artisan. Rabbat argues that the Mamluk *muhandis*' work as a surveyor would have required training in geometry and hydrography, acquired through both practical and educational channels. He also suggests that the *muhandis*' role in building bridges, canals, and aqueducts would necessitate a background in engineering. Rabbat, however, does agree with Mayer and Behrens-Abouseif that the Mamluk *mi'mār* was a mason.[14] In his conclusion, Rabbat is also careful to state that while his observations stem from engagement with primary material, the sources' limitations hinder any firm conclusions with regard to the Mamluk *muhandis*.

[11] Behrens-Abouseif, 'Muhandis, Shād, Mu'allim', p. 305.
[12] Behrens-Abouseif, 'Muhandis, Shād, Mu'allim', p. 308.
[13] Nasser Rabbat, 'Architects and Artists in Mamluk Society: The Perspective of the Sources', *Journal of Architectural Education*, 52: 1 (1998), 32.
[14] Rabbat, 'Artists in Mamluk Society', p. 32.

Yet recent studies on extant Mamluk monuments have begun to challenge the body of scholarship presented above and return time and again to a central question: how can we explain the sophistication and complexity of these structures without attributing some advanced understanding of geometric sciences to their builders? The modern structural analysis of several Mamluk domes carried out by Barbara Cipriani and Wanda Lau reveals that there are differences in dome construction that indicate the ability to adopt unique solutions from one dome to another, suggesting some innovation on the part of Mamluk professional builders. Cipriani and Lau catalogue and analyse 113 extant Mamluk domes, and choose three masonry domes for detailed structural analysis: the funerary complexes of Umm Sultan Shaʿbān (bl. 770/1369), Sultan Faraj b. Barqūq (bl. 801-11/1399-1407), and the emir (bl. 908/1502).[15] By employing a developed structural analysis software, Domex, they are able to explain the stability of the first and third domes, but fail to explain how the dome of Sultan Faraj b. Barqūq, about 14 m in diameter and height, safely stands.[16] Ahmad Wahby has studied the same group of domes, but focused on a geometrical analysis of the decorations on the domes' surface; from this, he identified knowledge of complex geometry as necessary for the design and construction of these domes, especially from the mid-seventh/mid-thirteenth century onwards.[17] Cipriani, Lau, and Wahby's observations, therefore, suggest the involvement of a specialist builder who had expertise in sophisticated spherical geometry.[18]

While this study focuses exclusively on the Mamluk context, it is also informative to consider that during the Mamluk period, the figure of the practically and theoretically skilled architect was emerging in other places, many of which had religious, political and commercial links with the Egyptian Sultanate. Archaeological excavations of buildings in ninth/fifteenth century Central Asia have uncovered fragmentary architectural drawings and geometrical drawing instruments that suggest

[15] Barbara Cipriani and Wanda W. Lau, 'Construction Techniques in Medieval Cairo: the Domes of Mamluk Mausolea', in *The Second International Congress on Construction History*, ed. by Malcolm Dunkeld Tutton and Michael (Exeter: Short Run Press, 2006), pp. 695-716 (p. 695).
[16] Cipriani and Lau, 'Construction Techniques', p. 714.
[17] Ahmed E. Wahby and Dina Montasser, 'The Ornamented Domes of Cairo: The Mamluk Mason's Challenge', in *Masons at Work*, ed. by Robert Ousterhout, Renata Holod, and Lothar Haselberger (Philadelphia: University of Pennsylvania: the Center for Ancient Studies, 2012), pp. 1-17 (p. 1).
[18] Wahby and Montasser, 'The Ornamented Domes', p. 10.

the use of preparatory sketches for Islamic monuments,[19] *madrasah* plans survive from a tenth/sixteenth century Uzbek context,[20] and some scholars have identified drawn modular grid plans that appear to correspond to the surviving arrangement of extant buildings in Samarqand.[21] Literary and artistic evidence also suggests the use of plans in a Central Asian context. A tenth/sixteenth-century miniature shows an architect presenting the Mughal emperor Bābur (r. 932-937/1526-1530) with a large plan,[22] and Iranian historical sources refer to the existence of treatises on the building craft, such as Rashīd al-Dīn Hamadānī's (d. 718/1318) seventh/thirteenth century work *al-Āthār wa al-Aḥyā'* (*Monuments and Living Things*), suggesting a connection between literate pursuits at the building craft at an early date.[23]

To the west, the Italian Renaissance also saw the connection of building and writing, as architect authors like Alberti (d. 1472), Filarete (d. 1469), and Palladio (d. 1580) produced theoretical treatises on architecture.[24] Alberti's mid-fifteenth-century *De Re Aedificatoria* (*On the Art of Building*), the Italian Renaissance's first theoretical treatise on building and the first such treatise to be printed, directly defines the figure of the practically and theoretically skilled architect: 'an architect is not a carpenter or joiner… the manual worker being no more than an instrument to the architect, who by sure and wonderful skill and method is able to complete his work…To be able to do this, he must have a thorough insight into the noblest and most curious sciences.'[25] Filarete, a contemporary of Alberti, also addressed the role of the architect, writing the *Libro Architettonico* (*Architectonic Book*) as guidelines for this newly envisioned role.[26] Italian Renaissance treatises on architecture generally broke with the existing tradition of characterising the architect as a master mason of modest status, placing him instead on the level of philosopher or scientist.[27] This view was not entirely new,

[19] Ronald Lewcock, 'Architects, Craftsmen and Builders: Materials and Techniques', in *Architecture of the Islamic World: Its History and Social Meaning*, ed. by George Michell (London: Thames and Hudson, 1978), pp. 112-143 (p. 131).
[20] Gülru Necipoğlu-Kafadar, 'Plans and Models in 15th- and 16th-Century Ottoman Architectural Practice', *Journal of the Society of Architectural Historians*, 45: 3 (1986), 233.
[21] Lewcock, 'Architects, Craftsmen and Builders', p. 132; Necipoğlu-Kafadar, 'Plans and Models', p. 233.
[22] Lewcock, 'Architects, Craftsmen and Builders', p. 132.
[23] Lewcock, 'Architects, Craftsmen and Builders', p. 133.
[24] Necipoğlu-Kafadar, 'Plans and Models', p. 224.
[25] Leopold D. Ettlinger, 'The Emergence of the Italian Architect during the Fifteenth Century', in *The Architect: Chapters in the History of the Profession*, ed. by Spiro Kostof (Berkeley ; London: University of California Press, 2000), pp. 96-123 (p. 98).
[26] Ettlinger, 'The Emergence of the Italian Architect', pp. 103-104.
[27] Rabbat, 'Artists in Mamluk Society', p. 36.

however, it deliberately echoed older traditions, such as that of Vitruvius (fl. 1st century BC), who defined architecture as a combination of theory and practice: he argued that a 'mere practitioner cannot give sufficient reasons for the forms he adopts', and the theorist 'grasps a shadow instead of substance'.[28]

Less explicit evidence of the rise of the architect is visible in the sixteenth-century Ottoman Empire, but the flourishing of complex architecture in the period suggests the existence of highly skilled builders with theoretical knowledge. During the service of the chief architect Sinān (d. 996/1588) to Sultan Suleymān the Magnificent (r. 926-974/1520-1566), several imperial building projects were completed, including military bridges, fortifications, and other non-military building projects. The unique style of Sinān's architectural masterpieces, which was influenced by the Byzantine Hagia Sophia, featured a massive central dome surrounded by small domes, half domes, and buttresses.[29] The structural complexity of these buildings may be seen as suggesting a high level of planning and theoretical sophistication. In the early eleventh/seventeenth century, the first Ottoman treatise on architecture, *Risāle-i Miʿmāriyye* (*Epistle on Architecture*), was written. It was composed by Caʿfer Efendī as a biography of the chief architect Muḥammad Āghā, Sinān's successor in the position.[30]

Given the emergence of theoretically and practically schooled building professionals in Central Asia, Asia Minor, and Europe, it does not seem unlikely that such a figure would also have been known in the Mamluk period. As has been noted in studies of Mamluk art, the Mamluk Sultanate was not isolated from surrounding Islamic and European regions, and similarities in styles of building and ornamentation provide evidence of professional interaction between Mamluk builders and their counterparts in other regions.[31] In fact, it might even be seen as surprising if only the Mamluk context lacked an 'architect' figure. By examining documentary and physical evidence, we can

[28] Ettlinger, 'The Emergence of the Italian Architect', p. 98.
[29] Bernard O'Kane, 'Sinān', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. IX:629a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/sinan-COM_1081> [accessed 10 September 2017].
[30] Lewcock, 'Architects, Craftsmen and Builders', p. 133; Cafer Efendi, *Risale-i Mimariyye: An Early Seventeenth-century Ottoman Treatise on Architecture* (Leiden: E.J. Brill, 1987), p. 3.
[31] Doris Behrens-Abouseif, 'Sicily, the Missing Link in the Evolution of Cairene Architecture', in *Egypt and Syria in the Fatimid, Ayyubid and Mamluk Eras,* ed. by D. De Smet and U. Vermeulen (Leuven: Uitgeverij Peeters, 1995), pp. 285-312; Doris Behrens-Abouseif, 'European Arts and Crafts at the Mamluk Court', *Muqarnas,* 21 (2004); J. Michael Rogers, 'Court Workshops under the Bahri Mamluks', in *The Arts of Mamluks in Egypt and Syria- Evolution and Impact,* ed. by Doris Behrens-Abouseif (Goettingen: Bonn University Press, 2012), pp. 247-266; Doris Behrens-Abouseif, 'Mamluk Perception of Foreign Arts', in *The Arts of the Mamluks in Egypt and Syria- Evolution and Impact,* ed. by Doris Behrens-Abouseif (Goettingen: Bonn University Press, 2012), pp. 301-318.

identify elements of the professional identity of the Mamluk *muhandis* that make him comparable to his contemporary counterparts.

To examine the Mamluk *muhandis*, this dissertation takes many different types of information into account, most prominently that drawn from literary sources. Though current Mamluk scholarship includes many studies on the literary output of the *ʿulamāʾ* and educated elites, only a small number of studies focus on poetry and literature written by and for the general public, which took different forms to those found in classical prose and poetry. To our knowledge, most popular literature is still unpublished and would require a significant collaborative effort to bring to the modern reader. When scholarship on Mamluk literature is narrowed down further to those studies which refer directly to craftsmen, it is unsurprising that only a few studies exist. However, those that do exist shed significant light on the activities of building professionals in the Mamluk era.

The Written Word by Konrad Hirschler shows that many craftsmen and tradesmen joined reading communities in Damascus during the sixth-seventh/twelfth-thirteenth centuries, among other non-scholar groups.[32] He argues that craftsmen's participation in reading circles was not temporary, but rather they frequently attended for a period of years.[33] Hirschler argues that craftsmen and tradesmen left behind many traces of their being active readers and recipients of the written word, including enough evidence to suggest different attendance patterns for different professions.[34] He also sheds some light on the motives of craftsmen for attending these sessions, including aesthetic appreciation and the desire to hear popular works such as *The History of Damascus*.[35] Furthermore, Hirschler suggests that craftsmen and traders' participation in reading sessions also produced authors who would compose material for popular audiences. In contrast to scholars who focused on scholarly texts, these new groups started not only to form their own popular forums of reading but also to compose popular anthologies and *maqāmah*s.[36]

The only study that focuses on anthologies and *maqāmah*s that refer to artisans and craftsmen in medieval Islamic history is Joseph Sadan's 'Kings and Craftsmen, a

[32] Konrad Hirschler, *The Written Word in the Medieval Arabic Lands: A Social and Cultural History of Reading Practices* (Edinburgh: Edinburgh University Press, 2012), pp. 37-42.
[33] Hirschler, *The Written Word*, pp. 54-57.
[34] Hirschler, *The Written Word*, p. 25.
[35] Hirschler, *The Written Word*, pp. 58-60.
[36] Hirschler, *The Written Word*, p. 186.

Pattern of Contrasts: On the History of a medieval Arabic Humoristic Form'.[37] Sadan first presents a short survey of this literary genre, known as 'artisanal literature', from the third/ninth century to the twelfth/eighteenth century. He explains that the earliest literary works depicting craftsmen typically took the form of a report about an event in which a group of craftsmen and tradesmen were asked to deliver a literary performance.[38] He identifies these works as primarily humorous, since they play on classical and colloquial forms, as well as the language used by different craftsmen, ethnicities, and linguistic registers, to humorous effect.[39] Sadan also focuses on the social, linguistic, and ethnic and cultural contrasts present in the works. He argues that in Muslim societies of the Middle Ages, craftsmen of all kinds were subjected to prejudice from other members of society because of the association of manual work with servants; as evidence, he cites the fact that most of the jokes in the texts he surveys were at the expense of the craftsmen. This attitude may have prompted craftsmen to look beyond traditional social conventions and develop their own unique system of ideals.[40] Craftsmen' participation in reading circles could be seen as one response to this social pressure: an attempt to establish a system of knowledge of their own.

Another important study that should serve as a foundation to our understanding of Mamluk literature and its relationship to broader development in society is Thomas Bauer's 'Mamluk Literature: Misunderstandings and New Approaches'. In this study, Bauer argues that there are five main stumbling blocks that have limited modern perceptions of Mamluk literature and society.[41] First, literature played a more important role in medieval Islamic societies than in their modern counterparts. This modern characterisation of literature, and particularly poetry, as unimportant has led to many literary works remaining unstudied and unedited, a steady decrease in the number of scholars dealing with Arabic literature, and scholars dealing with historical texts frequently overlooking poetic and literary sources. Second, literature and poetry became increasingly important as a means of social communication over time. In Mamluk society, poetry became an eminent means of communication among both the

[37] Joseph Sadan, 'Kings and Craftsmen, a Pattern of Contrasts: On the History of a Medieval Arabic Humoristic Form (Part I)', *Studia Islamica*, 56 (1982); Joseph Sadan, 'Kings and Craftsmen, a Pattern of Contrasts: On the History of a Mediaeval Arabic Humoristic Form (Part II)', *Studia Islamica*, 62 (1985).
[38] Sadan, 'Kings and Craftsmen (Part I)', p. 5.
[39] Sadan, 'Kings and Craftsmen (Part I)', p. 7.
[40] Sadan, 'Kings and Craftsmen (Part II)', pp. 90-93.
[41] Thomas Bauer, 'Mamluk Literature: Misunderstandings and New Approaches', *Mamluk Studies Review*, 9: 2 (2005), 108-118.

'ulamā' as well as the public. It is important to note here that the Mamluk sultans' unprecedented patronage of architectural projects, especially institutions of higher learning, enhanced the widespread use of literature and poetry among the public. Third, rhetorical devices taken from literature began to serve a social function as entertainment to the reader. Mamluk poets and authors were not expressing their own feelings, but helping the audience to interact with the literary work with their own emotions. Fourth, the criticism of Mamluk literature as conservative should be re-evaluated in the light of the characteristics of Arabic literature and culture. Finally, Mamluk literature should be considered within the conceptions and moral values of its age, rather than the value system of modern Western society. Taking these five obstacles into account allows us to reach a better understanding and analysis of Mamluk culture and society through literature.

Thesis Structure and Arguments

Building on the latest research in this field, I use a worker-centric approach that derives in part from Omniya Abdel Barr's recent thesis, entitled *L'art Urbain du Caire Mamlouk: Manières de Faire et Enjeux Sociaux* (*Urban Art of Mamluk Cairo: Methods of Making and Social Aspects*). Abdel Barr conducts a close analysis of the Sultan al-Mu'ayyad Shaykh Mosque (bl. 824/1421) by analysing the chain of operations on the construction site from top to bottom, including the *shādd al-'amā'ir*, the highest official representative to the sultan; the *nāẓir*, who sometimes could be replaced by the *shādd*; the *muhandis*, identified as a technical assistant; and other artisans and workers.[42] Her enumeration of this hierarchy generates questions about individual members of the workforce. If we imagine a pyramid with the *shādd al-'amā'ir* at the very top, and workers and unskilled labour at the base, we realise that the pyramid of our knowledge is oriented the opposite direction. Although relatively much is known about the people at the top of the pyramid, almost nothing has been written about those at the base. To address this imbalance, I examine a smaller pyramid; though I too begin at the top, I examine only those figures involved in practical building work, rather than including patrons or purely supervisory officers. This hierarchy is topped by the *muhandis*, the role presented in Mamluk documents as the most expert practical building professional.

[42] Omniya Abdel Barr, 'L'art Urbain du Caire Mamlouk: Manières de Faire et Enjeux Sociaux', (unpublished Doctorate of History, University of Provence Aix-Marseille I, 2015).

While it seems likely that the Mamluk *muhandis* occupied an architect-like position in society, none of the direct pieces of evidence connected to this figure in other contexts – the comprehensive building treatises of Italy, for example, or the architectural plans and models of Central Asia – survive from the Mamluk period. As a result, this thesis attempts to approach the topic from new angles and to integrate fragmentary pieces of evidence from various primary sources, including extant monuments, scientific treatises, deeds, ethical and legal literature, and *adab*, which collectively represent a body of evidence rarely considered in existing literature. While individually, these fragmentary pieces of evidence may not be seen as particularly informative, when considered together, they form a remarkably coherent whole. These pieces of evidence demonstrate a gradual professionalization of the building craft during the Mamluk period towards a practice informed by both practical experience and theoretical knowledge.

This dissertation argues that during the Mamluk period, there existed a group of educated professional builders with access to scientific literature and a sophisticated knowledge of mathematics, geometry, mechanics, and astronomy. The dominant theme is thus literacy among a small group of professional builders, generally known as *muhandisīn*, and also among other limited groups of building craftsmen. By re-examining existing primary sources and exploring textual sources new to this context, as well as approaching the topic from historical, legal, and literary perspectives, it will integrate a wide variety of literary and architectural sources to shed light on the professional identity of the Mamluk *muhandis*.

This thesis will also argue that the theoretical knowledge held by educated builders aided them in producing plans and acting as legal experts, as well as distinguishing them from simple masons, carpenters, and builders. This group, who comprised a small class of educated professionals at the top of the building profession, likely became more prominent in the ninth/fifteenth century. While it is challenging to find a distinct title to differentiate this group, professional builders, particularly given the seeming interchangeability of terms in historical accounts and the absence of a formal organizational structure of the building craft, primary sources from the Mamluk period present these craftsmen as belonging to the group known as *muhandisīn*. Therefore, although the figure of the educated professional builder may not have characterised all Mamluk *muhandisīn*, it likely applied to a significant portion of them.

As no English term conveys the different functions and variety of roles carried out by the *muhandisīn*, I will keep the Arabic terms used in the primary sources.

In an argument that departs from much modern understanding of the role of the *muhandis,* this dissertation also asserts that the Mamluk professional builder was recognized as an authoritative specialist and respected figure by both the ruling court and wider society. A closer reading of endowment deeds and building permissions from Mamluk Cairo reveals that some Cairene *muhandisīn* were employed by the *qāḍī*'s courts as expert witnesses providing a technical examination on which the Mamluk judge would base a decision relating to property cases. As the deeds show, these *muhandisīn* appear in supervisory roles. They are also well-trained in examining complex structures and are involved in enforcing building regulations, particularly in matters of protrusions into public pathways and overhanging buildings. Above all, records show that they also testified in courts as the experts in their field. Seen together, this range of documents presents an interpretation of the Mamluk *muhandis* and his equivalent the *mi'mār* that is distinctly different from the current perception of his role as a maintenance worker of low status.

The present thesis is divided into three main chapters, each of which approaches the topic from a different perspective: scientific, legal, and literary. Beginning with the most technical aspect of the identity of a Mamluk *muhandis*, Chapter One concerns scientific matters and a wide variety of scientific and historical sources. First, it discusses in further detail the findings of modern scholarship with regards to Mamluk *muhandis* and his theoretical training and qualifications. The chapter then outlines the historical and scientific context behind the science of *handasah* to demonstrate its connection to practical tasks and the ampleness of scientific treatises in Mamluk Cairo. Although Mamluk scientific literature has been widely studied and analysed within the history of science, its potential as a primary source for social history remains largely unexplored. Thanks to David King, who in a unique and especially valuable study sheds new light on the relation of astronomical sciences to the building of structures, we are beginning to see how this potential might be realised.[43]

[43] David A. King, 'Architecture and Astronomy: The Ventilators of Medieval Cairo and Their Secrets', *Journal of the American Oriental Society*, 104: 1 (1984); David A. King, 'al-Ṭāsa', in *Encyclopaedia of Islam, Second Edition*, ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. X:312b, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/al-tasa-SIM_7426> [accessed 17 September 2017].

One type of primary source utilized in the first chapter is the multi-volume Mamluk-era encyclopaedia, such as *Irshād al-Qāṣid* by Ibn al-Akfānī (d. 749/1348). In these works, astronomy and *handasah* are discussed in detail, showing the two to be both closely related. These encyclopaedias treat *handasah* as much more than mere geometry. In their different definitions, the science of *handasah* had under its umbrella as many as ten subfields, all of which were associated with scientific reference treatises, and five of which directly concerned the actual construction of buildings. We also know that several more scientific treatises aimed at craftsmen working in the building craft, such as those by al-Būzjānī (d. 388/998) and al-Jazarī (fl. late 6th/12th c.), circulated in Mamluk Egypt. Evidence of the use of these treatises may be found in the biographies of Mamluk *muhandisīn*, which show the existence of two major subgroups covered by the term *muhandis*: a subgroup consisting of scientists who studied the science of *handasah* and were never involved in building craft and another whose members were involved in practical building. It also exists in the survival of astronomical treatises, some of which provide step-by-step instructions on how to apply astronomical calculations to the setup and orientation of structures like wind catchers (*bādahanj*s) and *miḥrāb*s. These detailed and practically-oriented treatises clearly demonstrate the interface between theoretical knowledge and practical construction.

Material evidence from extant monuments - especially domes - further demonstrates the integration of some advanced understanding of select sciences into practical building work. A vast number of studies have considered the stylistic, structural, and spatial characteristics of extant monuments, and while certain elements of their arguments will be pertinent to this study of building professionals, detailed engagement with much of this literature and with discussions of individual buildings is beyond the scope of this thesis. However, the structural analysis by both Barbara Cipriani and Ahmad Wahby of monumental domes, the analysis which have been shaped by extensive first-hand access to some extant monuments, provide strong evidence for theoretical sophistication on the part of Mamluk builders.

In the final sections of Chapter One, I will explore evidence of plans and models found in chronicle and literary sources. An analysis of references in textual sources shows direct evidence of architectural plans and models as visual representation especially in the ninth/fifteenth century. I will also explore the idea that a certain subclass of educated builders began to gain a particular professional identity in the Mamluk period; these professionals were referred to under the term *miʿmār*.

Chapter Two, which consists of three sections, discusses the formal recognition of the expertise of Mamluk *muhandisīn* in an official and legal context. The first section, which discusses the role of *muhandisīn* in maintaining endowed properties and the ways in which their observations reflect their expertise as specialist figures, will focus on exchange and lease endowment deeds. These deeds, which are exceptionally rich in material, showcase the technical roles played by *muhandisīn* in the *qāḍī*'s court, as well as demonstrating the patterns of cooperation established between the different professionals and the judges. A majority of modern studies of endowment deeds focus on the artistic and structural analysis of Mamluk foundations as well as their functionality and patronage, giving little attention to professional builders and their role in this context; however, they have substantial potential to shed light on this aspect. The deeds used in this study, located in the archives of Dār al-Wathā'iq al-Qawmiyyah (DWQ) and Wizārat al-Awqāf (WA) in Cairo, date mainly from the eighth/fourteenth century to the early tenth/sixteenth century and include endowment deeds, assessment reports, exchange deeds, lease deeds, and building permissions. The *muhandis* as depicted in endowment deeds reflects various roles, including that of a supervisor in maintenance and restoration works. Their wages are variable, but do not necessarily indicate low status. This section will also outline the involvement of *muhandisīn* in private disputes through discussion of a contemporary Tunisian source which bears significant parallels to the process documented in Mamluk deeds.

The second section of the second chapter elaborates on the role of *muhandisīn* in the regulation of protrusions into public pathways during the Mamluk period. Public rights of way for main roads and side streets are covered in the legal literature known as *fiqh al-'umrān* (building jurisprudence), requiring judicial permissions for any ground-floor protrusion or higher-level projection into a public street to not exceed the allowed limits. This aspect of building regulations is primarily studied by modern legal scholars with a focus on the implications of city planning, hence neglecting the roles of building and surveying professionals in this context. Finally, the third section will highlight the ways in which builders and employers developed their own legal and ethical framework as an alternative way to regulate the affairs and disputes of the building craft in the absence of a formal guild.

In Chapter Three, the scope of the thesis will be broadened to consider building professionals and craftsmen as producers and consumers of literary culture, as well as their representation in literary works composed at the time. The chapter is divided into

two main sections. The first section aims to address their roles both in the consumption and production of literature to show that many artisans were literate, participated in intellectual life, and created a specific type of literary works that became popular under Mamluk rule. The appearance of literary works composed by Mamluk traders and artisans is a major mode of literary representation through which builders presented themselves to scholars, writers, and society at large. By looking at surviving reading certificates (*samāʿāt,* s. *samāʿ*), we can gain insight into the intellectual ambitions and pursuits of this group of practitioners. Reading certificates are the records of reading sessions in which a reader read a book aloud to an authorised scholar in front of attendees. The sessions were documented by a scribe on the margins of the work that was read in the session. The published collection of these certificates in *Muʿjam al-Samāʿāt al-Dimashqiyyah* (*Dictionary of Damascene Reading Certificates*) contains selected records that cover the period from the mid-sixth/mid-twelfth to the mid-eighth/mid-fourteenth century for sessions that took place in Greater Syria. Although they represent only a tiny fraction of social practice, they are rich in material for the social analysis of Mamluk society during the first half of the Sultanate. They show that literacy and learning were not limited to the educated *muhandisīn*, but that other craftsman, such as carpenters, masons, and plasterers, all found their way to scholarly circles.

The second section of Chapter Three concerns the ways in which builders were represented by Mamluk poets and authors. It first introduces the genre of 'artisanal literature', a type of literary production that focused on a broad group of artisans and workers, including builders, as the subject of their compositions. By the Mamluk era, this genre formed a mode of literary representation through which builders and other artisans were indirectly represented in society. Depictions of craftsmen and their activities were frequently used in writing on the theme of love, and they were often represented using the specific poetic style known as *dūbīt*s. In another literary style, *maqāmah*s, fictional building craftsmen were represented as 'speakers' in works ostensibly representing assemblies of workers of different trades and arts. Of particular interest to our study, a close analysis of excerpts from artisanal literature highlights key distinctions between the sub-crafts of the building profession in terms of responsibilities and skills, and provides an insight into the formation of professional identities. The literary works composed by educated writers of the period reflect the characteristics of each group of craftsmen and tradesmen, and as they employ specific

tasks and jargon, and were based on the actual daily activities and professional identities of these artisans.

Approaching the period through the analysis of literature, as guided by Joseph Sadan, Thomas Bauer, and Konrad Hirschler shows us that the role of the *muhandis* was seen as separate from those of masons and builders. This thesis takes Sadan's analysis, which approaches artisanal literature by combining linguistic analysis with consideration of broader social factors, a step further by applying this analysis of the literary and the social to the practical realities of working life. The quantitative approach taken by Hirschler in his consideration of new primary material – namely reading certificates – is similarly adapted here to shed some light on the reading activity of craftsmen. An analysis of surviving reading certificates, for example, shows increasing literacy rates among artisans and craftsmen, many of whom began to participate in intellectual life and established specific types of literary works that became popular in the first century of Mamluk rule. Such works provide especially vivid insight into the social image of the *muhandis*, builder, and carpenter, and reinforce the distinct identity of some of Mamluk *muhandisīn* as literate professionals differentiated from other sub-groups of the building craft practitioners. These approaches, as well as the revised perspective on Mamluk literature proposed by Bauer, present us with the opportunity to explore social and cultural topics in greater detail and provide us with new entry points into the much-neglected side of craftsmen's social and daily life experience. Embracing this view, this dissertation attempts for the first time to revisit popular literary works that depict building craftsmen and to trace a social and professional identity from these sources, which at times may provide more information than historical and documentary sources.

Within existing scholarship, this thesis represents an attempt to establish an intersecting point where different fields of knowledge - such as archaeology, science, legal texts, literature, and of course history - could meet; a point at which one might pool their collective knowledge to uncover something new about the Mamluk building profession. Dealing with social history requires defined explanatory paradigms and approaches in keeping with the kinds of sources available. It also allows us to incorporate literary, architectural, and legal studies into a cohesive whole to challenge existing views of the building craft and professionals.

Chapter 1:

Professional Aspects of the Building Craft

1.1 Introduction

Little is known to modern historians about Mamluk builders; they did not produce much written material of their own, and as a result, that which we do know about them has been extracted from references to practitioners of the building craft in legal documents, deeds, and chronicles, among other sources. However, we can also see that the buildings they created dealt with complex architectural problems, such as astronomical orientation and geometrical design, in a sophisticated way. Mamluk literary sources alone do not tell us much about builders of the period or other practitioners of the building profession. However, an integration of what we observe about Mamluk buildings with primary sources such as scientific treatises and references in literary sources suggests that at least some expert Mamluk builders had knowledge of geometry, mathematics, astronomy, and physics that enabled them to carry out imperial and non-imperial building projects.

Examining the literary sources, we also see significant interaction between literate production and the building craft. Mamluk chroniclers record the use of lifting and pulling machines and tools in building activities, and the literary record includes many treatises on building-related mechanical and astronomical principles. Such treatises would certainly have been available in Cairo during the period; Arabic texts on mechanics, mainly written in the Abbasid period by three third/ninth-century scholars known as Banū Mūsá b. Shākir,[44] flourished in Baghdad, and a few centuries later in Northern Greater Syria by Ibn al-Razāz al-Jazarī (fl. late 6th/12th c.),[45] were widely accessible, and are known to have been held in libraries such as al-Ashrafiyyah in Damascus.[46] A few surviving biographies suggest that some builders acquired their theoretical knowledge from treatises and that this provided a way for them to advance as experts in their craft.

The presence of models and plans at the building site also suggests a higher level of theoretical sophistication for *muhandisīn* than has formerly been acknowledged. As no surviving physical models or drawn plans from the Mamluk

[44] D. R. Hill, 'Banū Mūsā', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), pp. VII, 640a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/musa-SIM_5557> [accessed 13 April 2017].

[45] D. R. Hill, 'al-Djazarī', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), pp. XII, 266b, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/al-djazari-SIM_8506> [accessed 13 April 2017].

[46] Refer to the pages 45 and 163 for further detail.

period have been found so far, scholars have largely been sceptical about the use of building drawings in Mamluk Egypt, although there is a clear evidence that building models were produced in Central Asia during the same period. However, extant Mamluk buildings and supporting references in Mamluk literary sources suggest that building models and draft plans were prepared, providing greater scope for the combination of written and practical pursuits in building.

I do not argue that there was official educational training for the building profession during the Mamluk period. Some literate builders sought to advance their knowledge through reading, and biographical dictionaries include examples of *muhandisīn* who actively promoted their careers by studying the theoretical knowledge that the building profession required. Though formal architectural training only began under the Ottomans, this should not lead us to assume that there was no education or technical training at all during the Mamluk period. Architectural education under the Mamluks was probably more informal than under the Ottomans, perhaps mirroring the informality of their educational system in general.

This evidence suggests that rather than having one simple definition, the term *muhandis* referred to a spectrum of people involved in building-related pursuits, ranging from builders to pure theoreticians. This chapter aims to further develop Rabbat's analysis of the *muhandis* by using the available literary and documentary evidence to show that at least some *muhandisīn* had both theoretical knowledge and practical skills. These *muhandisīn* used their theoretical and practical expertise to create technically sophisticated buildings and monuments. It also argues that this group of *muhandisīn* may have been recognised as having a specific professional identity during the period, as evidenced by the emergence in the Mamluk context of the specialised term *mi'mār* to refer to those with both practical and theoretical knowledge. Due to the fragmented and scattered nature of the surviving evidence, many questions surrounding these builders remain open to debate. It may be that very few builders had theoretical knowledge, and for those who did, whether they acquired that knowledge from treatises or trained experience is less than clear. However, an evaluation of literary evidence alongside other sources makes a compelling case that at least some *muhandisīn* had both theoretical and practical knowledge and that treatises formed a part of the interaction between practical building and literate pursuits.

1.2 Current scholarship into the *muhandis* and theoretical knowledge

Modern scholarship into the term *muhandis* begins with Leo Mayer's 1956 *Islamic Architects and Their Works*, which suggests that the term referred to a sort of master builder without significant theoretical knowledge. Mayer argues that the terms used to refer to builders in Islamic sources, such as *bannā'* (بنّاء), *muhandis* (مهندس) and *mi'mār* (معمار), have no equivalent in European languages, and that translating them as 'architect' or 'engineer' would be misleading.[47] For Mayer, an architect is someone who, unlike a mason, has a 'good general education and sound theoretical knowledge.'[48] In his analysis, he searches the primary sources for terms referring to 'a man who can plan a home and make it stand', finding *bannā'* (بنّاء), *muhandis* (مهندس) and *mi'mār* (معمار). [49] Mayer found no evidence for theoretical knowledge among the *muhandis* professionals and postulates that as *hisba* manuals do not establish a difference between architect and mason (*bannā'*), there was no difference between the two. Consequently, he concludes that the term *muhandis* as used by chroniclers did not mean architect, but simply master mason.[50]

This characterization of the *muhandis* as a particularly skilled mason was largely adopted by later scholars with only minor adaptations. Behrens-Abouseif generally agrees that Mamluk *muhandis* lacked theoretical knowledge and primarily relied on practical experience, citing three contexts in which historical narratives portray *muhandis* as no more than master masons: engineering projects, royal foundations, and land surveys.[51] Following Mayer and in line with writing by Nasser Rabbat,[52] she notes that Mamluk chronicle accounts of building projects mention *muhandis* alongside masons and other building craftsmen, which may indicate that they were foremen on the building site.[53] Behrens-Abouseif and Nasser Rabat also suggest that the *muhandis* may have been a land surveyor rather than a theoretically sophisticated architect, arguing that in the Geniza documents, the *muhandis* was

[47] Mayer, *Islamic Architects*, p. 25.
[48] Mayer, *Islamic Architects*, p. 18.
[49] Mayer, *Islamic Architects*, p. 18.
[50] Mayer, *Islamic Architects*, p. 19.
[51] Behrens-Abouseif, 'Muhandis, Shād, Mu'allim', p. 308.
[52] Rabbat, 'Artists in Mamluk Society', p. 32.
[53] Behrens-Abouseif, 'Muhandis, Shād, Mu'allim', p. 294.

identified as a land surveyor who 'had to deal with fixing boundaries of lots and houses, and estimating values of houses and rents.'[54]

Mayer and Behrens-Abouseif also cite the low pay of *muhandis* at endowment foundations as evidence for a lack of theoretical knowledge among the group. Citing the provisions for a *muhandis*, marbler (*murakhkhim*), *mu'azzin* (مؤذن), and a doorkeeper (*bawwāb*) given in Sultan Qāytbāy's endowment deed, Mayer and Behrens-Abouseif conclude that the relatively low salary of the *muhandis*, marbler, and *mu'azzin* in comparison to the doorkeeper identifies the *muhandis* as a 'repairman' with minimal pay.[55] Behrens-Abouseif also argues that the absence of the *muhandis* from the market inspection manuals known as *hisbah* – which include other professions such as physicians, teachers, and preachers - indicates that *muhandis* did not belong to a 'common trade profession'. Instead, she argues that the designation *muhandis* was generally associated with a position at the Sultanate court, as all important civil projects fell under the patronage of Mamluk sultans and emirs.[56] She defines the *muhandis* as 'a master mason who acted as a contractor, engineer, and designer... a professional layman who rose from the ranks of the masons and was never detached from them.'[57] His theoretical knowledge, therefore, was likely minimal.

Not all scholars agree, however, that the *muhandis* lacked any theoretical knowledge whatsoever. Rabbat, for example, argues that the Mamluk *muhandis* had a role similar to the modern architect: a professional craftsman with the wide range of technical efficiency and theoretical knowledge that we associate today with a designer-engineer. He argues that the *muhandis* was primarily responsible for building bridges, canals, and aqueducts and that his responsibilities as a surveyor would likely have required either formal or apprenticeship training in geometry and perhaps hydrography.[58] Rabbat argues that *muhandis* being called to check the boundaries of properties, estimate rent values, and assess structural efficiency indicates a general societal recognition of the expertise of the *muhandis* in these areas.[59]

[54] Behrens-Abouseif, 'Muhandis, Shād, Mu'allim', p. 294., Rabbat, 'Artists in Mamluk Society', p. 32.
[55] Mayer, *Islamic Architects*, p. 25; Behrens-Abouseif, 'Muhandis, Shād, Mu'allim', p. 294.
[56] Behrens-Abouseif, 'Muhandis, Shād, Mu'allim', p. 294.
[57] Behrens-Abouseif, 'Muhandis, Shād, Mu'allim', p. 308.
[58] Rabbat, 'Artists in Mamluk Society', p. 32.
[59] Rabbat, 'Artists in Mamluk Society', p. 32.

1.3 Scientific aspects of the building profession

1.3.1 Building treatises

Our best indication of the function of the science of '*handasah*' – loosely translatable as 'geometric sciences' – comes from an eighth/fourteenth-century encyclopaedia of sciences written by Ibn al-Akfānī, an Egyptian scientist, and master of mathematics, geometry, astronomy, and medicine.[60] Ibn al-Akfānī was especially famous for his medical treatments and worked as the prime medical consultant for the entire al-Manṣūrī Bimāristān (hospital) before his death during the plague of 749/1348.[61] In his encyclopaedic treatise *Irshād al-Qāṣid ilá Asná al-Maqāṣid* (إرشاد القاصد إلى أسنى المقاصد, *Guiding Those Who are Bound for Dazzling Objectives*), he gives the most comprehensive account of the sciences, including legal, philosophical, and rational sciences, of the century.[62] However, it is rarely referred to by historians of architecture. Hasan Abd al-Wahhab, for example, mentions it briefly to support his thesis that there were treatises on geometry relevant to building works, but does not elaborate.[63]

According to Ibn al-Akfānī, *handasah* had several subfields related to building construction (Figure 1.1). Ibn al-Akfānī lists ten different sub-fields of *handasah*, five of which are relevant to the building profession; the other sub-fields he lists are *ʿilm al-manāẓir* (optics), *ʿilm al-marāyā al-muḥriqah* (burning mirror), *ʿilm al-binkāmāt* (horology), *ʿilm al-ālāt al-ḥarbiyyah* (building engines of war), and *ʿilm al-ḥiyal* (mechanical devices). For each of the building-related sub-fields, Ibn al-Akfānī provides a brief definition, its useful applications, and the essential treatises in the field:

1. The science of building vaults or vaulted structures (*ʿilm ʿuqūd al-abniyah* علم عقود الابنية) is the branch of geometry that deals with building structures, digging rivers, installing waterspouts, fixing leaks and setting up houses. According to Ibn al-

[60] Khalīl b. Aybak al-Ṣafadī, *Kitāb al-Wāfī bi-al-Wafayāt,* ed. by Aḥmad Arnā'ūṭ and Turkī Farḥān Muṣṭafá (Beirut: Dār Iḥyāʾ al-Turāth al-ʿArabī, 2000), pp. II, 20.

[61] al-Ṣafadī, *al-Wāfī*, pp. II, 21. Al-Manṣūrī Bīmāristān is located in Cairo and founded by the Sultan al-Manṣūr Qalāwūn (r. 678-689/1279-1290).

[62] Aḥmad b. ʿAlī Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah fī Aʿyān al-Miʾah al-Thāminah*, 4 vols (Beirut: Dār al-Jīl, 1993), pp. III, 280. According to Ibn Ḥajar al-ʿAsqalānī, this book is very precious and beneficial.

[63] Hasan Abd al-Wahhab, 'al-Rusūmāt al-Handasiyyah li-al-ʿImārah al-Islāmiyyah', in *al-Muʾtamar al-Thānī li-al-Āthār fī al-Bilād al-ʿArabiyyah,* (Cairo: Lajnat al-Thaqāfah bi-Jāmiʿat al-Duwal al-ʿArabiyyah, 1957), pp. 107-129 (p. 109).

Akfānī, this branch is of great benefit in building cities, fortresses, and houses as well as in agriculture:

> علم يتعرف منه أحوال أوضاع الأبنية و كيفية شق الأنهار، وتقنية القِنى، وسد البثوق، وتنضيد المساكن. ومنفعته عظيمة في عمارة المدن والقلاع والمنازل وفي الفلاحة.[64]

Works in this field referenced by Ibn al-Akfānī are a treatise by Ibn al-Haytham (ابن الهيثم) (d. 430/1039) and another treatise named *ʿUqūd al-Abniyah* by al-Karajī (d. 420/1029).[65] Neither treatise has survived.

2. The science of deriving the centre of mass (*ʿilm marākiz al-athqāl* علم مراكز الأثقال) aims to identify the point at which the sum of the distribution of mass in space is zero. This point, which is the centre of mass, is the point at which the object will follow the direction of an applied force without resistance. It is useful in finding ways to balance large objects with smaller ones. The primary treatise on this subject was written by Ibn al-Haytham:

> علم يتعرف منه كيفية استخراج مركز ثقل الجسم المحمول، والمراد بمركز الثقل حد في الجسم عنده يتعادل بالنسبة إلى الحامل. ومنفعته في كيفية تعادل الأجسام العظيمة بما هو دونها لتوسط المسافة.[66]

3. The science of measurement (*ʿilm al-misāḥah* علم المساحة) is the branch of *handasah* that aims to define the area of surfaces and volumes of objects using linear (x), square (x^2) and cubic (x^3) measuring units. It is of a great benefit in estimating land taxes and measuring buildings, among other uses. The fundamental treatises for this branch are those of Ibn al-Maḥallī al-Mawṣilī (d. 673/1274) and Archimedes.[67]
4. The science of water extraction (*ʿilm inbāṭ al-miyāh* علم إنباط المياه) deals with ways of finding underground water and extracting it. Irrigation is one of the purposes of this branch. Ibn al-Akfānī cites a treatise in this field by al-Karajī.[68]

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[64] Muḥammad b. Ibrāhīm al-Ansari Ibn al-Akfānī, *Irshād al-Qāṣid ilá Asná al-Maqāṣid: fī Anwāʿ al-ʿUlūm,* ed. by Abd al-Munim Muhammad Umar (Cairo: Dār al-Fikr al-ʿArabī, 1990), p. 192.

[65] Ibn al-Haytham (d. 430/1039), the famous polymath scientist who mastered mathematics, astronomy and optics. Moved to Cairo under Fatimid rule; for further detail see: J. Vernet, 'Ibn al-Haytham', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill), pp. III, 788a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/ibn-al-haytham-SIM_3195> [accessed 12 April 2017]. Al-Karajī (d. 420/1029) was a renowned Persian mathematician and geometer born in the city of Karaj in Persia who flourished in Baghdad; for further detail see: J. Vernet, 'al-Karadjī', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. IV:600a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/al-karadji-SIM_3903> [accessed 11 May 2017].

[66] Ibn al-Akfānī, *Irshād al-Qāṣid*, p. 195.

[67] Ibn al-Akfānī, *Irshād al-Qāṣid*, p. 196.

[68] Ibn al-Akfānī, *Irshād al-Qāṣid*, p. 197.

5. The science of pulling weights (*ʿilm jarr al-athqāl* علم جرّ الأثقال) is the field of *handasah* aimed at making machines that can pull or lift massive objects with small amounts of power. Ibn al-Akfānī notes that Hero of Alexandria (d. 70 CE) proved the possibility of moving a 100,000-pound object using only 500 pounds using the principles of this field:

> علم يتبين منه إيجاد الآلات الثقيلة. ومنفعته نقل الثقيل العظيم بالقوة اليسيرة، وقد برهن آيرن في كتابه في هذا العلم على نقل مائة ألف رطل بقوة خمسمائة رطل.[69]

For our study of *muhandis* and their theoretical knowledge, there are two important points to be made here. First, Ibn al-Akfānī saw *handasah* not simply as an abstract science of shapes and forms, but as a science meant to be applied to a number of practical pursuits, including moving objects, digging wells, and measuring structures. Second, scientific treatises on two of the construction-related branches of *handasah* – the science of vaulted structures (علم عقود الأبنية) and the science of measurement (علم المساحة) – were familiar and in circulation.

An example of a treatise written by a specialist in the science of *handasah* that seemingly provides a practical guide for building professionals is *What the Artisan Needs of Geometry* (*Mā Yaḥtāju ilayhi al-Ṣāniʿ min ʿIlm al-Handasah*), written in the fourth/tenth century by Abū al-Wafāʾ al-Būzjānī (d. 388/998).[70] Al-Būzjānī's work highlights issues generated by the complex geometrical shapes that craftsmen were expected to handle. The work does not elaborate on the theoretical background of geometry, but rather has a practical focus and explains in simple language how to produce geometric shapes for specific purposes. At the beginning of the book, al-Būzjānī outlines the work's purpose:

> Define the principles of the *handasiyyah* works that are widely used by craftsmen, avoiding explanations and proofs, so they may become easier for craftsmen to prepare with a more understandable method.

[69] Ibn al-Akfānī, *Irshād al-Qāṣid*, p. 198.
[70] Rebstock Ulrich, 'Abū l-Wafāʾ al-Būzjānī', in *Encyclopaedia of Islam, THREE*, ed. by Kate Fleet, et al. (Leiden: Brill, 2008), <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-3/abu-l-wafa-al-buzjani-COM_26295> [accessed 12 April 2017].

اثبات المعاني من الأعمال الهندسية التي يكثر استعمالها عند الصناع مجردا من العلل والبراهين ليسهل على الصناع تناوله و تقرب عليهم طريقته.[71]

The book deals with common problems including the connection of a perpendicular line to a flat plane, such as a wall, piece of land, or roof; the trisecting of angles; the sectioning of quadrilaterals and spheres (Figure 1.2); the construction of regular polygons; the transformation of polygons; and the inscription of polygons into circles and other shapes.[72] Holod argues that this work implies the existence of a genre of literature written for craftsmen. Bloom, on the other hand, views this book as a work produced in the context of the specific material and spiritual culture of the Abbasid era. According to Bloom, the book should not be understood as a handbook for builders and craftsmen, because the idea of reading a book to learn how to do something is quite modern. Bloom instead argues that a craftsman always learned by imitating his master.[73] The evidence provided by the treatise itself, however, suggests that it was primarily aimed at craftsmen, or at least the treatise claimed this.

This book by al-Būzjānī and other geometric treatises have been widely studied by modern scholars as representative of medieval treatises that focus on the geometrical construction of decorative structures.[74] Even though al-Būzjānī's treatise dates to before the Mamluk era, and was written in Central Asia in the fourth/tenth century, copies of this book were available in Mamluk Egypt; Dār al-Kutub in Cairo holds two copies, one of which was copied in Egypt in 831/1428.[75] This demonstrates that the work was known and of interest in Mamluk Egypt.

All of the fields of *handasah* had a connection to practical pursuits. For example, Ibn Khaldūn (d. 808/1406),[76] in his *al-Muqaddimah*, explains how building

[71] Abū al-Wafāʾ al-Būzjānī, *Mā Yaḥtāju ilayhi al-Ṣāniʿ min ʿIlm al-Handasah,* ed. by Sāliḥ Aḥmad ʿAlī (Baghdad: Jāmiʿat Baghdād, Markaz Iḥyāʾ al-Turāth al-ʿIlmī al-ʿArabī, 1979), p. 23.

[72] Renata Holod, 'Text, Plan and Building: On the Transmission of Architectural Knowledge', in *Theories and Principles of Design in the Architecture of Islamic Societies,* ed. by Margaret Bentley Sevcenko (Cambridge: Aga Khan Program for Islamic Architecture, 1988), (p. 3).

[73] Jonathan M. Bloom, 'On the Transmission of Designs in Early Islamic Architecture', *Muqarnas,* 10 (1993), 21.

[74] Alpay Özdural, *The Arts of Ornamental Geometry: a Persian Compendium on Similar and Complementary Interlocking Figures (Fī Tadākhul al-Ashkāl al-Mutashābihah aw al-Mutāwafiqah)* (Leiden: Brill, 2017); Alpay Özdural, 'Mathematics and Arts: Connections between Theory and Practice in the Medieval Islamic World', *Historia Mathematica,* 27: 2 (2000).

[75] David A. King, *Fihris al-Makhṭūṭāt al-ʿIlmiyyah al-Maḥfūẓah bi-Dār al-Kutub al-Miṣriyyah*, 2 vols (Cairo: al-Hayʾah al-Miṣriyyah al-ʿĀmmah lil-Kitāb, 1981), p. 240. Ms 366 DR.

[76] M. Talbi, 'Ibn Khaldūn', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), pp. III, 825a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/ibn-khaldun-COM_0330> [accessed 12 April 2017].

cisterns is related to the principles set out by Ibn al-Akfānī in the science of water extraction (إنباط المياه):

> There are other techniques of construction, such as the construction of wells and cisterns for running water. In the houses, large, well-cut marble basins are prepared. They have orifices in the middle to permit the water of the cistern to flow out. The water comes to the cistern from the outside through conduits bringing it to the houses.[77]

> إلى غير ذلك من بناء الجباب والصهاريج لسيح الماء بعد أن تُعد في البيوت القصاع الرخام القوراء المحكمة الخرط بالفوهات في وسطها لنبع الماء الجاري إلى الصهريج، يُجلب إليها من خارج في القنوات المفضية به إلى البيوت.[78]

Ibn Khaldūn also links what Ibn al-Akfānī described in the science of pulling weights to practical building craft:

> They [builders] also must know how to move heavy loads with the help of machines. Big blocks of large stones cannot be lifted into place on a wall by the unaided strength of workmen alone. Therefore, the builder must contrive to multiply the strength of the rope by passing it through holes, constructed according to proportions determined by *handasah* (*nisab handasiyyah*), of the attachments called *mīkhāl* (pulleys). They make the load easier to lift so that the intended work can be completed without difficulty. This can be achieved only with the help of principles of *handasah* (*uṣūl handasiyyah*) which are commonly known among men.[79]

> و كذلك في جر الأثقال بالهندام، فإن الأجرام العظيمة إذا شُيدت بالحجارة الكبيرة تَعْجَز قُدَر الفعلة عن رفعها إلى مكانها من الحائط. فيُتَحيّلُ لذلك بمضاعفة قوة الحبل بإدخاله في المعالق من أنقاب مقدرة على نسب هندسية يصير بها الثقيل عند معاناة الرفع خفيفا، فيتم المراد من ذلك بغير كلفة. وهذا إنما يتم بأصول هندسية معروفة متداولة بين البشر.[80]

[77] ʿAbd Al-Raḥmān b. Muḥammad Ibn Khaldūn, *The Muqaddimah: An Introduction to History (English)*, ed. by Franz Rosenthal, 3 vols (London: Routledge & Kegan Paul, 1958), pp. II, 361.
[78] ʿAbd Al-Raḥmān b. Muḥammad Ibn Khaldūn, *al-Muqaddimah (Arabic)*, ed. by Abdesselam Cheddadi, 3 vols (Casablanca: Khizānat Ibn Khaldūn, Bayt al-Funūn wa al-ʻUlūm wa al-Ādāb, 2005), pp. V, 151.
[79] Ibn Khaldūn, *The Muqaddimah (English)*, pp. II, 363.
[80] Ibn Khaldūn, *al-Muqaddimah (Arabic)*, pp. V, 152.

Here, we see an affirmation that specific elements of theoretical knowledge were necessary to carry out practical projects. These principles were described in treatises, and it may be that builders were expected to learn them from studying treatises. It is also possible that they were acquired through experience or apprenticeship. Nonetheless, we see here a strong statement that the theoretical *handasah* described in treatises was seen by contemporaries as relevant, and even necessary, for the practical parts of the building craft.

That particular individuals were expected to have both practical and theoretical knowledge is also visible from written sources. The court builder position called '*mu'allim al-mu'allimīn*' (معلم المعلمين) or '*muhandis al-'amā'ir*' (مهندس العمائر) was defined by al-Qalqashandī (d. 821/1418) as follows:[81]

> *Muhandis al-'amā'ir* is the [person] who in charge of building [projects] and planning these [buildings]. He is also in charge of the craftsmen of the profession. And, *handasah* is a known [field of] science [that] has separate treatises.
>
> مهندس العمائر و هو الذي يتولى ترتيب العمائر وتقديرها و يحكم على أرباب صناعاتها، والهندسة علم معروف فيه كتب مفردة بالتصنيف.[82]

Al-Qalqashandī's definition of this position in the Mamluk court shows that one particular type of *muhandis*, the *muhandis al-'amā'ir* مهندس العمائر, not *muhandisīn* in general, was expected to have both mastery of *handasah* science and practical expertise in the building profession. These specifications clearly separate the *muhandis al-'amā'ir* from a *muhandis* who only had abstract knowledge or a foreman.

A wide range of literature linking theoretical *handasah* with specific building practices exists and may have been used in the education of *muhandisīn* with both theoretical and practical knowledge. The connection between theoretical texts and applied practices may be seen clearly in surviving writings about pulling and lifting machines. The science of pulling weights (علم جر الأثقال) was a branch of *handasah*

[81] Al-Qalqashandī is a renowned scholar and chief secretary (*kātib al-sirr*) in the Mamluk chancery, and author of several treatises. For further information see: C.E. Bosworth, 'al-Ḳalḳashandī', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. IV:509a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/al-kalkashandi-SIM_3832> [accessed 6 December 2017].

[82] Aḥmad b. ʿAbd Allāh al-Qalqashandī, *Ṣubḥ al-Aʿshá fī Ṣināʿat al-Inshā*, 14 vols (Cairo: Dār al-Kutub al-Miṣriyyah, 1913), pp. V, 467.

sciences aimed at making machines that could move heavy objects with a small amount of power. References in Mamluk chronicles to the use of pulling and lifting machines to move heavy blocks and stones make it clear to that such devices were in common use at the time. One such narrative, cited by the chronicler al-Maqrīzī, states that during the 777/1375 construction of the *madrasah* of Sultan al-Ashraf Shaʿbān (r.764-78/1363-77) in Cairo, two massive columns from the remains of the al-Ḥijāziyyah Palace needed to be moved to the *madrasah*'s building site. Porters had tried to move the columns but failed, so Ibn ʿĀyid, who was in charge of the Sultan's fire ships (*raʾīs al-ḥarrāqah*), was called.[83] Ibn ʿĀyid, according to al-Maqrīzī's description, was able to move the two columns all the way to the building site in only a few days using mechanical techniques:

> Two very big columns were found under the rubble in al-Ḥijāziyyah Palace in Cairo. Then an order was given to pull them to the Sultan's building [site], but porters failed to pull them because they were very big. Ibn ʿĀyid, who was in charge of the Caliphate and Sultan's fire ships (*al-ḥarrāqah*),[84] was delegated to [pull the columns]. He made mechanical movements, and [the columns] were pulled using these movements all the way along Cairo Street to the Citadel in few days, to where the building site was. By the time the two columns reached the building site, the bigger one was broken into two.
>
> وُجد في قصر الحجازية من القاهرة عمودان عظيمان إلى الغاية تحت ردم، فرُسِم بسحبهما إلى عمارة السلطان، فأعيا العتالون أمرهما وعجزوا عن شحطهما لكبرهما، فانتُدِبَ ابن عايد رايس الخلافة، وإليه أمر الحراقة السلطانية لذلك، وعمل حركات هندسية، فانجرا مع تلك الحركات بطول شارع القاهرة إلى تحت القلعة حيث العمارة في عدة أيام، فلما وصل العمودان إلى العمارة انكسر أكبرهما نصفين.[85]

In this incident, it appears that mechanical techniques were applied in order to move these massive columns to their destination. Though Ibn ʿĀyid was not a *muhandis,* he was in charge of the Sultan's fire ships and was therefore likely familiar with the

[83] Zayn al-Dīn ʿAbd al-Bāsiṭ b. Khalīl Ibn Shāhīn al-Ẓāhirī al-Ḥanafī, *Nayl al-Amal fī Dhayl al-Duwal,* ed. by ʿUmar ʿAbd al-Salām Tadmurī, 9 vols (Beirut: al-Maktabah al-ʿAṣriyyah, 2002), pp. II, 98. He calls him Ibn ʿĀbid.

[84] al-Qalqashandī, *Ṣubḥ al-Aʿshá*, pp. V, 467. *Raʾīs al-ḥarrāqah* is the person who was in charge of Sultan's fire ships, but during the Mamluk period he was also called raʾīs al-khilāfah as a cutomary originated by Fatimids in Cairo.

[85] Taqiyy al-Dīn Aḥmad b. ʿAlī al-Maqrīzī, *Kitāb al-Sulūk li-Maʿrifat Dduwal al-Mulūk,* ed. by Muhammad Abd al-Qadir Ata, 8 vols (Beirut: Dār al-Kutub al-ʿIlmiyyah, 1997), pp. IV, 388.

handasah science known as *ālāt ḥarbiyyah*, which was dedicated to making and operating war devices or military equipment.[86] Here, *handasah* principles, designated by 'mechanical movements'.

Another reference from ninth/fifteenth century Mamluk Damascus describes a mechanical lifting machine called '*ṣārī wa dūlāb*' (صاري ودولاب) by Ibn al-Ḥimṣī (d. 934/1527). In 885/1480, during the restoration of the Umayyad Mosque (Figure 1.3) following the fire of 884/1479, the carpenter Muḥammad al-Kuffatī (محمد الكُفَّتيّ) used this device to lift up the beams of the Mosque's arches.[87] Ibn al-Ḥimṣī praised the carpenter for finishing the work in only one day and saving a large sum of money:

> Allah guided [the workers] to a person about whom they did not know, a carpenter, *shaykh*,[88] named Muḥammad al-Kuffatī from the suburb al-Ṣāliḥiyyah. He made a *ṣārī wa dūlāb* (spar and wheel) by which he lifted the Mosque's *awtār*[89] (beams) without difficulty. So, in one day he lifted [all the] beams of one *jamalūn*[90] (roof truss), and this was a great boon as he saved a large sum of money.
>
> ويسّرَ الله بشخص كان لم يُفطَن إليه، نجّار، شيخ، يدعى محمد الكُفّتي من الصالحية. عمل صاري ودولاب وشال فيه أوتار الجامع من غير مشقة، بحيث أنه في نهار واحد شال فيه أوتار جملون، وهذه نعمة عظيمة فإنه وفّر بذلك مال كبير.[91]

In 886/1481-2, one year later, Sultan Qāytbāy sent Muḥammad al-Kuffatī with other builders to restore the Prophet's Mosque in Medina.[92] It seems that he was called because the significance of his device was recognised. This device has been studied by Behrens-Abouseif, who argues that al-Kuffatī's hoist was a singular example at the time in the Mamluk Sultanate. She also argues that it was copied from a European model (Figure 1.4) and was not familiar to the local craftsmen, as evidenced by the fact that it

[86] Ibn al-Akfānī, *Irshād al-Qāṣid*, p. 200; al-Qalqashandī, *Ṣubḥ al-Aʿshá*, pp. I, 476.
[87] Aḥmad b. Muḥammad al-Anṣārī Ibn al-Ḥimṣī, *Ḥawādith al-Zamān wa Wafayāt al-Shuyūkh wa al-Aqrān,* ed. by Abd al-Aziz Fayyad Harfush, 3 vols (Beirut: Dār al-Nafīs, 2000), pp. I, 147.
[88] Perhaps master or simply old.
[89] Muḥammad Muḥammad Amīn and Laila 'Ali Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah fī al-Wathāʾiq al-Mamlūkiyyah 648-923/1250-1517* (Cairo: American University in Cairo, 1990), p. 120.
[90] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 30.
[91] Ibn al-Ḥimṣī, *Ḥawādith al-Zamān*, pp. I, 156.
[92] Ibn al-Ḥimṣī, *Ḥawādith al-Zamān*, pp. I, 176.

did not even have a specific Arabic name.[93] The device was called *ṣārī wa dūlāb* by Ibn al-Ḥimṣī,[94] and *hindām* by Ibn Khaldūn.[95]

Whatever its name, we have here an example of a Mamluk device that matches written treatise descriptions given by Ibn al-Akfānī and Ibn Khaldūn. This forms part of the literature linking objects described in chronicles as forming part of the practice of building to *handasah* treatises on 'the science of pulling weights'.[96] Works of this kind include Hero of Alexandria's (fl. 1st) treatise *In Lifting Heavy Objects* (في رفع الأشياء الثقيلة), which was translated into Arabic in Baghdad by Qusṭā b. Lūqā (قسطا بن لوقا) (fl. 3rd/9th c.) and was the primary work in the field.[97] This treatise became very popular and a reference work in this field and was thoroughly studied by Muslim scientists, especially Banū Mūsá b. Shākir (fl. 3rd/9th c.) and Ibn al-Razzāz al-Jazarī. Hero's treatise was available and of interest in Cairo; there are two surviving manuscripts of this treatise copied in Cairo during the tenth/sixteenth century. The first copy in 973/1565 by the Cairene astronomer Muḥammad b. Abī al-Khayr al-Ḥusnī (Figure 1.5).[98] The other copy was made in 1000/1591-2.[99]

The appearance of tools in treatises on geometry, *ḥisbah* manuals, and endowment deeds demonstrates that treatise writers were familiar with contemporary building practices and that they viewed tools and machines as applied examples of theoretical principles. For example, the plummet, or (*shāqūl* شاقول), was used in designs for mechanical devices provided by Ibn al-Razzāz al-Jazarī in his treatise *The Compiler of Knowledge and Useful Work of Ingenious Devices* (*al-Jāmiʿ bayna al-ʿIlm wa al-ʿAmal al-Nāfiʿ fī Ṣināʿat al-Ḥiyal*). The plummet was also used during construction works to set perfectly vertical walls, and in this context was more commonly known as the *mīzān* (ميزان).[100] Al-Būzjānī also mentioned plummets in his book *What the Artisan Needs of Geometry*, as did Ibn Khaldūn in his *al-Muqaddimah*. Ibn al-Ukhuwwah (d.

[93] Behrens-Abouseif, 'European Arts and Crafts ', p. 51.
[94] Ibn al-Ḥimṣī, *Ḥawādith al-Zamān*, pp. I, 156.
[95] Ibn Khaldūn, *al-Muqaddimah (Arabic)*, pp. V, 152.
[96] Ibn al-Akfānī, *Irshād al-Qāṣid*, p. 198.
[97] Ibn al-Akfānī, *Irshād al-Qāṣid*, p. 198.
[98] King, *Fihris al-Makhṭūṭāt*, pp. I, 538. Egyptian National Library Ms no. ṬR 123 (طلعت رياضة 123); David A. King, *A Survey of the Scientific Manuscripts in the Egyptian National Library* (Indiana: Eisenbrauns, 1986), p. 214.
[99] King, *Fihris al-Makhṭūṭāt*, pp. I, 249. Egyptian National Library Ms no. DR 668 (دار كتب رياضة 668)
[100] Ismāʻīl b. al-Razzāz al-Jazarī, *al-Jāmiʿ bayna al-ʿIlm wa al-ʿAmal al-Nāfiʿ fī Ṣināʿat al-Ḥiyal (published)*, ed. by Aḥmad Yūsuf Ḥasan (Aleppo: Maʿhad al-Turāth al-ʻIlmī al-ʻArabī, Jāmiʻat Ḥalab, 1979), pp. 570, 581.

729/1329),[101] in his *Maʿālim al-Qurbah fī Aḥkām al-Ḥisbah*, demonstrates knowledge not only of building practice, but also of contemporary professional standards:

> If a workman does not use instruments such as angles and weights and lines to ensure that the building will be true and without any departure from the perpendicular, then he will be responsible for any fault.[102]

> ومتى لم يستعمل من يبني من الصناع ما يصح به عمله من زوايا و موازين و خيوط و إن جرى فيما يعمله زيغ أو ميل أو انحراف عن الاستواء لزمه عيب ذلك.[103]

This seems to indicate that the use of these tools was standard and generally expected. It also demonstrates that treatise writers were aware not only of building theory, but how it applied to the use of tools, and also how those tools were expected to be put to use in the real world. The detailed practical content of these treatises may also suggest that they could have been used by artisans to learn about the theory behind common practices.

Lifting weights, using machines, and understanding tools were not the only contexts in which *handasah* was applied. Another substantive applied subfield of *handasah* was the science of water extraction, which would have been relevant to the construction of the *sabīl* (water fountain, سبيل),[104] *mayḍa'ah* (ablution basin, ميضأة)[105] and *ṣihrīj* (cistern صهريج).[106] These structures were parts of many public foundations and are mentioned in various endowment deeds from the Mamluk period, including those of Sultan Qalāwūn DWQ 15/2 (dated 685/1286),[107] Sultan al-Nāṣir Muḥammad b. Qalāwūn DWQ 25/4 (dated 725/1325),[108] and Sultan al-Nāṣir Ḥasan b. Muḥammad DWQ 40/6 (dated 760/1359), just to name a few.[109] The science of water extraction

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[101] Ibn al-Ukhuwwah is a Cairene scholar and author of market inspection manual (*ḥisbah*). See: Cl. Cahen, 'Ibn al-Ukhuwwa', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. III:960b, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/ibn-al-ukhuwwa-SIM_3398> [accessed 6 December 2017].

[102] Muḥammad b. Muḥammad b. Aḥmad al-Qurashī Ibn al-Ukhuwwah, *Kitāb Maʿālim al-Qurbah fī Aḥkām al-Ḥisbah,* ed. by Reuben Levy (Cambridge: E. J. W. Gibb Memorial, 1938), pp. English section, 95.

[103] Ibn al-Ukhuwwah, *Maʿālim al-Qurbah,* p. 235.

[104] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 62.

[105] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 118.

[106] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 73.

[107] al-Ḥasan b. ʿUmar Ibn Ḥabīb al-Ḥalabī, *Tadhkirat al-Nabīh fī Ayyām al-Manṣūr wa Banīhi,* ed. by Muḥammad Muḥammad Amīn and Saʿīd ʿAbd al-Fattāḥ ʿĀshūr, 3 vols (Cairo: Maṭbaʿat Dār al-Kutub, 1976), pp. I, 348.

[108] Ibn Ḥabīb al-Ḥalabī, *Tadhkirat al-Nabīh*, pp. II, 432.

[109] Ibn Ḥabīb al-Ḥalabī, *Tadhkirat al-Nabīh*, pp. III, 349.

would have been needed to build these structures in the first place by locating a water source, and also to ensure their continuous flow within adequately built structures as proposed by al-Akfānī and Ibn Khaldūn.

The newly published catalogue of the al-Ashrafiyyah Library in Damascus confirms the availability of works in *handasah* sciences to Mamluk audiences.[110] The library held Arabic translations of Euclidian geometry and corrections and contributions made by Muslim mathematicians and geometers such as Muḥammad b. ʿĪsá al-Māhānī (محمد بن عيسى الماهاني) (d. 252/866), Thābit b. Qurrah (ثابت بن قرة) (d. 288/901), and the aforementioned al-Būzjānī.[111] The catalogue, which dates to the 670s/1270s, is the earliest Arabic book catalogue currently known. Its collection is remarkably large and includes more than 2,000 books, many of which are multi-volume works. It was developed as a part of an educational institution attached to the Mausoleum of al-Malik al-Ashraf (d. 635/1237), at which teaching activities continued until the early ninth/fifteenth century. The comprehensive detailed analysis of this catalogue by Konrad Hirschler furnishes a historical and cultural background for the region and the period within which this library emerged and developed its collection, in the context of a 'reading revolution where the written word became increasingly central and spread to wider sections of society'.[112] Al-Ashrafiyyah's catalogue includes around 125 books on rational sciences, including mathematics, geometry, astronomy, mechanics, medicine, and pharmacology. Several are directly relevant to this project: *Majmūʿ fīhi Handasah* (مجموع فيه هندسة), a collection of treatises on geometry,[113] *al-ʿUqūd fī al-Ḥisāb* (العقود في الحساب), which Hirschler suggests may be al-Karajī's *al-ʿUqūd wa al-Abniyah* (العقود والأبنية للكرجي),[114] Euclid's treatise on the principles of

[110] This library was attached to the *madrasah* founded in Damascus by the Ayyubid ruler al-Ashraf Mūsá b. al-ʿĀdil (d. 635/1237). For further information see: ʿImād al-Dīn Ismāʿīl b. ʿUmar Ibn Kathīr, *Al-Bidāyah wa-al-Nihāyah*, 15 vols (Beirut: Maktabat al-Maʿārif, 1990), pp. XIII, 146; Muḥammad Muṭīʿ Ḥāfiẓ, *Dār al-Ḥadīth al-Ashrafiyyah bi-Dimashq: Dirāsah Tārīkhiyyah Tawthīqiyyah* (Damascus: Dār al-Fikr, 2001).

[111] See: J. Sesiano, 'Muḥammad b. ʿĪsā b. Aḥmad al-Māhānī', in *Encyclopaedia of Islam, Second Edition*, ed. by P. Bearman, et al. (Leiden: Brill, 2012), pp. VII, 405a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/muhammad-b-isa-b-ahmad-al-mahani-SIM_5356> [accessed 12 April 2017]; and: R. Rashed and R. Morelon, 'Thābit b. Ḳurra', in *Encyclopaedia of Islam, Second Edition*, ed. by P. Bearman, et al. (Leiden: Brill, 2012), pp. X, 428b, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/thabit-b-kurra-SIM_7507> [accessed 12 April 2017].

[112] Konrad Hirschler, *Medieval Damascus: Plurality and Diversity in an Arabic Library: The Ashrafiya Library Catalogue* (Edinburgh: Edinburgh University Press, 2016), p. 2.

[113] Hirschler, *The Ashrafiya Library Catalogue*, p. 343. Catalogue no. 1244a.

[114] Hirschler, *The Ashrafiya Library Catalogue*, p. 309. Catalogue no. 1163e, this book was previously mentioned in Ibn al-Akfānī's encyclopaedia of sciences.

geometry *Uqlīdis fī al-Uṣūl al-Handasiyyah* (اوقليدس في الأصول الهندسية),[115] and *Kitāb al-Ḥiyal* (*Book of Ingenious Devices*) by Banū Mūsá.[116]

We also have an example of an educational institution (*madrasah*) in Aleppo where *handasah* was a key part of the curriculum. The Madrasah al-Labūdiyyah, built in 664/1266 by Najm al-Dīn Yaḥyá al-Labūdī (d. 670/1271), remained active for around two centuries before being converted to *sabīl kuttāb* in 949/1542.[117] It was entirely devoted to the teaching of medical and *handasah* sciences (*Dār ṭibb wa handasah* دار طب وهندسة). Hasan Abd al-Wahhab has even suggested that it was devoted to the teaching of architectural sciences.[118] This is not likely, as there is no further evidence that specific teaching for building sciences existed in this *madrasah* at that time. Rather, the *madrasah* likely provided teaching in *handasah* and mathematics. This focus on *handasah* and mathematics - and not specifically building-related sciences - is apparent in the works produced by Najm al-Dīn al-Labūdī, the *madrasah*'s founder and administrator, which cover mathematics, algebra and Euclidian geometry, in addition to medicine.[119]

1.3.2 Biographies of *muhandisīn*

In Mamluk literary sources, we see that there appear to have been at least two major subgroups covered by the term *muhandisīn*: scientists who studied the science of *handasah* and were never involved in the building craft, and skilled workers who both studied *handasah* and were directly involved in the building profession. Mamluk large-volume biographical dictionaries, especially *'Uyūn al-Anbā' fī Ṭabaqāt al-Aṭibbā'* by the Syrian physician Ibn Abī Uṣaybiʿah (d. 668/1270), *al-Wāfī bi-al-Wayafāt* by Khalīl b. Aybak al-Ṣafadī (d. 764/1363), *al-Durar al-Kāminah* by Ibn Ḥajar al-ʿAsqalānī (d. 852/1449), and *al-Ḍaw' al-Lāmi'* by Shams al-Dīn al-Sakhāwī (d. 902/1497) include few biographies whose stories could be seen as evidence of some *muhandisīn* who began as builders and then acquired theoretical knowledge to increase their skill. This provides concrete examples of existing *muhandisīn* who had both theoretical and

[115] Hirschler, *The Ashrafiya Library Catalogue*, p. 262. Catalouge no. 862.
[116] Hirschler, *The Ashrafiya Library Catalogue*, p. 190. Catalogue no. 328.
[117] ʿAbd al-Qādir b. Muḥammad al-Nuʿaymī, *al-Dāris fī Tārīkh al-Madāris*, 2 vols (Beirut: Dār al-Kutub al-ʿIlmiyyah, 1990), pp. II, 106-108.
[118] Abd al-Wahhab, 'al-Rusūmāt al-Handasiyyah li-al-ʿImārah al-Islāmiyyah', p. 115.
[119] Aḥmad b. al-Qāsim Ibn Abī Uṣaybiʿah, *ʿUyūn al-Anbāʾ fī Ṭabaqāt al-Aṭibbā',* ed. by Muller, 2nd edn, 2 vols (Cairo: al-Maṭbaʿah al-Wahbiyyah, 1995), pp. II, 189.

practical knowledge and suggests that literate scientific learning was seen as beneficial and available for at least some active practitioners of the building craft.

Members of this group existed in the Ayyubid period, including Abū al-Faḍl Muḥammad b. ʿAbd al-Karīm al-Muhandis (أبو الفضل محمد بن عبدالكريم المهندس), a carpenter and *muhandis* who began as a mason but learned formal works (d. 599/1203). Ibn Abī Uṣaybiʿah (d. 668/1270), in his *'Uyūn al-Anbā' fī Ṭabaqāt al-Aṭibbā'*, states that Abū al-Faḍl was called *muhandis* because he mastered *handasah*- here clearly meaning a 'science':

كان يعرف بالمهندس لجودة معرفته بالهندسة وشهرته بها.[120]

Abū al-Faḍl was originally a carpenter (*najjār*) and stone carver (*yanḥat al-ḥijārah*), but sought to learn Euclidian geometry to refine the quality of his carpentry.[121] He then left his work as a craftsman and devoted himself to the study of other fields, including medicine (الطب), astronomy (النجوم), Ḥadīth (الحديث), and literature (الأدب):

> [Abū al-Faḍl al-Muhandis] was a carpenter and stone carver for a while, and people strongly desired to have his carpentry works. He manufactured most of the doors at al-Bīmāristān al-Kabīr, which was founded by al-Malik al-ʿĀdil Nūr al-Dīn b. Zinkī. He [then] sought to learn Euclid to improve the quality of [his] carpentry… until he carefully understood Euclid's book and solved all his problems… he also looked at the *Almagest*… [He] also studied astronomy and ephemerises. He met with Sharaf al-Dīn al-Ṭūsī [d. 606/1209],[122] a worthy scientist in *handasah* and mathematical sciences with no counterpart at that time, while al-Ṭūsī was visiting Damascus. [Abū al-Faḍl] read books to him and learned a lot from his knowledge. He also learned Ḥadīth in Alexandria… and studied literature and grammar.

[120] Ibn Abī Uṣaybiʿah, *ʿUyūn al-Anbāʾ*, pp. II, 190.

[121] Sonja Brentjes, 'Uḳlīdis', in *Encyclopaedia of Islam, Second Edition,* ed. by Th. Bianquis, et al. (Leiden: Brill, 2012), pp. X, 792b, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/uklidis-SIM_7694> [accessed 17 April 2017].

[122] Sharaf al-Dīn al-Ṭūsī is a teacher of the renowned scholar and scientist Kamāl al-Dīn b. Yūnus (d. 639/1242), who met ʿAlam al-Dīn Qayṣar Taʿāsīf, the following example of an educated building practitioner; and taught the renowned scientist Naṣīr al-Dīn al-Ṭūsī (d. 672/1274). See: Muḥammad b. Shākir al-Kutubī, *Fawāt al-Wafayāt,* ed. by Iḥsān ʿAbbās, 5 vols (Beirut: Dār Ṣādir, 1973), pp. III, 246-252; Aḥmad b. Muḥammad Ibn Khallikān, *Wafayāt al-Aʿyān wa Anbāʾ Abnāʾ al-Zamān,* ed. by Iḥsān ʿAbbās, 8 vols (Beirut: Dār Ṣādir, 1977), pp. V, 311-317.

كان في أول أمره نجارا وينحت الحجارة، والناس كثيرا ما يرغبون إلى أعماله و أكثر أبواب البيمارستان الكبير الذي أنشأه الملك العادل نور الدين بن زنكي من نجارته و صنعته... وقصد إلى أن يتعلم اوقليدس ليزداد في صناعة النجارة جودة... إلى أن حل كتاب اوقليدس بأسره و فهمه فهما جيدا... ثم نظر أيضا في كتاب المجسطي... واشتغل أيضا بصناعة النجوم و عمل الزيجات و كان ورد إلى دمشق ذلك الوقت الشرف الطوسي و كان فاضلا في الهندسة والعلوم الرياضية ليس في زمانه مثله فاجتمع به وقرأ عليه و أخذ عنه كثيرا من معارفه... وسمع شيئا من الحديث بالإسكندرية ... واشتغل أيضا بالأدب وعلم النحو.[123]

In this biography, the *muhandis* is described as coming from among the masons and carpenters, but also as being motivated to learn the science of *handasah*. He found that studying *handasah* would improve the quality of his works and help him advance in his profession. He seems to have been remarkably targeted in his approach, as he began with Euclidian geometry, which comprises the elementary principles of the science of *handasah*. Then he moved to the treatises of the *Almagest*, whose subject is the integration of mathematics, *handasah* and astronomy.[124] It seems that he was also eager to meet the renowned scientist and mathematician al-Ṭūsī to learn more about the science of *handasah*. This would seem to indicate that he perceived *handasah* as relevant to his work as a carpenter and that he saw treatises and books as a route to acquiring that knowledge.

Another Ayyubid *muhandis* involved in building was ʿAlam al-Dīn Qayṣar, known as Taʿāsīf (d. 649/1251), a professional *muhandis* who served the Ayyubid governor of Hama. According to al-Ṣafadī in his the biographical dictionary al-Wāfī, Taʿāsīf, '*al-muhandis al-fāḍil*' in *handasah* sciences, was known for his ingenuity in mathematics and *handasah* (*bāriʾ fī al-handasah wa al-ḥisāb*).[125] Taʿāsīf worked for a time at the Sultanate's court in Egypt before moving to Hama, where he received special care from its governor, al-Malik al-Muẓaffar, who gave him a teaching position at al-Madrasah al-Nūriyyah. Taʿāsīf was clearly involved in building projects, as he is known to have built several towers in Hama for the Ayyubid governor using mechanical devices (بنى له أبراجا و تحيل فيها بحيل هندسية) and built a watermill on the Orontes River.[126]

[123] Ibn Abī Uṣaybiʿah, *ʿUyūn al-Anbāʾ*, pp. 190-191.
[124] M. Plessner, 'Batlamiyus', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), pp. I, 1100a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/batlamiyus-COM_0105> [accessed 17 April 2017].
[125] al-Ṣafadī, *al-Wāfī*, pp. XXIV, 228.
[126] al-Ṣafadī, *al-Wāfī*, pp. XXIV, 229.

In the Mamluk period, we know of two figures who both studied the sciences and participated in building works. The biography of the Cairene Shihāb al-Dīn Aḥmad b. Abd Allah al-Sijīnī (d. 885/1480) shows that he received his religious education from Jalāl al-Dīn al-Maḥallī al-Shāfiʿī (d. 864/1459), Sharaf al-Dīn al-Subkī, and other Shāfiʿī and Ḥanafī scholars. He was also a companion of the renowned scholar Ibn al-Majdī for many years, during which time he received the foundations of his education in legal, geometric and astronomical sciences. Al-Sijīnī travelled several times to Mecca to perform the pilgrimage, with his first visit in 849/1445. Thereafter, he travelled to Medina and resided there for two years, conducting building works there and in other cities:

> [Al-Sijīnī] was keen to accompany Ibn al-Majdī [to learn from his knowledge] in *fiqh* (jurisprudence), *uṣūl al-ʿArabiyyah* (philology), *al-farā'iḍ* (inheritance), *al-ḥisāb* (mathematics), *al-misāḥah* (measurements), *al-jabr wa al-muqābalah* (algebra), *al-handasah*, *al-mīqāt* (timing), and all his other sciences. [Ibn al-Majdī was his primary teacher] so [al-Sijīnī] learned many of these sciences from him more than once. [Al-Sijīnī] made pilgrimage several times, the first time being in [8]49 (1446), and resided in Medina for about two years to adjust (*ḍabṭ*)[127] some buildings [there] and also to adjust buildings in other [cities].
>
> اشتدت عنايته بملازمة ابن المجدي في الفقه و أصول العربية والفرائض والحساب والمساحة والجبر والمقابلة والهندسة والميقات و سائر فنونه التي انفرد بها، وقصر نفسه عليه بحيث تكرر له اخذ كثير من هذه الفنون عنه غير مرة وكان جل انتفاعه به... وحج مرارا أولها في سنة تسع وأربعين وجاور بالمدينة نحو عامين لضبط بعض العمائر و كذا ضبط بعض العمائر في غيرها.[128]

Al-Sijīnī's teacher, Ibn al-Majdī (d. 850/1447), also mastered geometry and astronomy, as well as composing the treatise *Tuḥfat al-Aḥbāb fī Naṣb al-Bādahanj wa al-Miḥrāb* (*The Gift of the Loved Ones on Setting up Bādahanjs and Miḥrābs*), which will be treated more thoroughly in the section considering astronomy below.[129] In research by David King, he has been identified as a Mamluk astronomer of particular importance.[130]

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[127] *Ḍabṭ*, in the context of building works, may mean either 'maintenance' or 'supervision'.
[128] Muḥammad b. ʿAbd al-Raḥmān al-Sakhāwī, *al-Ḍawʾ al-Lāmiʿ li-Ahl al-Qarn al-Tāsiʿ*, 12 vols (Beirut: Dār al-Jīl, 1992), pp. I, 376-377.
[129] al-Sakhāwī, *al-Ḍawʾ al-Lāmiʿ*, pp. I, 300.
[130] David A. King, 'The Astronomy of the Mamluks', *Isis*, 74: 4 (1983), 553-554.

Another fifteenth-century *muhandis* involved in practical construction work was Wajīh al-Dīn ʿAbd al-Raḥmān b. Muḥammad al-Makkī (d. 826/1423), also known as Muhandis al-Ḥaram al-Sharīf (مهندس الحرم الشريف).[131] He also was known to have mastered *handasah* and construction:

> [He] was good and pious and served people by building works. He was an expert in *handasah* and *ʿimārah* (construction) and carried that out for many years. Then he retired.
>
> كان خيرا ديّنا يخدم الناس كثيرا في العمارات، وكان خبيرا بالهندسة والعمارة، وباشر ذلك مدة سنين، ثم ترك العمارة.[132]

Al-Makkī's biography is short and does not explain who his teachers were or where he learned the science of *handasah*. Having said this, however, it does emphasise that he was an expert in the science of *handasah* and the construction of buildings. This likely means that he was skilled in geometry, astronomy, and other sciences transmitted largely using treatises. There is no direct evidence that he studied specific treatises of astronomy and *handasah*, but here we still have two examples of fifteenth-century *muhandisīn* who served in the Hijaz and were involved in building projects.

The *handasah* sciences were also used by other non-builder craftsmen. The biography of Muḥammad b. Mukhtār al-Ḥanafī (d. 737/1363), a goldsmith active in Mamluk Cairo, also makes mention of the treatise of Banū Mūsá b. Shākir (fl. 3rd/9th c.) on building-related sciences. Ibn Mukhtār al-Ḥanafī, who was interested in learning how to make mechanical devices, is known to have studied geometry, mathematics, astronomy, and logic.[133] He also studied the books of Banū Mūsá, after which he was able to create the wondrous things for which he became popular. The historian Al-Ṣafadī met him at the Sultan's Citadel in Cairo and wrote the following:

> I [al-Ṣafadī] met him [Ibn Mukhtār al-Ḥanafī] more than once at al-Jabal Citadel… He was intelligent knows [the science of] *al-handasah* very well, in addition to astronomy and mathematics. He originally was a goldsmith (*ṣā'igh*), then studied the book *al-Ḥiyal* by Banū Mūsá.

[131] Give source for this information/his dates.
[132] Muḥammad b. Aḥmad al-Fāsī, *al-'Iqd al-Thamīn fī Tārīkh al-Balad al-Amīn,* ed. by Muḥammad Ḥamid al-Fiqī, 2nd edn, 8 vols (Beirut: Dār al-Risālah, 1986), pp. V, 404.
[133] Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah,* pp. IV, 254.

Thereafter, he [began] to create striking devices and present them to emir Sayf al-Dīn Qijlīs al-Nāṣirī, who rewarded him.

اجتمعت به غير مرة بقلعة الجبل ... وكان جيد الذهن يعرف الهندسة جيدا وله يد طولى في الهيئة والحساب، وكان في الأصل صائغا و تسلط على كتاب الحيل لبني موسى، فكان يصنع منها بيده أشياء غريبة و يقدمها للأمير سيف الدين قِجْليس الناصري فَراجَ عنده.[134]

Not all people involved with *handasah* were builders or craftsmen, however; some were pure theoreticians. We have several examples from the Mamluk era of scholars known to have mastered *handasah* as an abstract field of science who were never involved in the practical side of the building profession. One is the Shāfiʿī chief judge of Hama, Jamāl al-Dīn b. Wāṣil al-Ḥamawī (d. 697/1298), the Ayyubid historian and author of *Mufarrij al-Kurūb fī Akhbār Banī Ayyūb*. Ibn Wāṣil is known to have mastered various sciences: logic, *handasah*, theology (أصول الدين والفقه), astronomy and history. Abū al-Fidāʾ al-Malik al-Muʾayyad, the Hama governor and historian, states that he met with Ibn Wāṣil for help in solving problems of Euclidian geometry (أعرض عليه ما أحله من أشكال كتاب اقليدس وأستفيد منه).[135] Ibn Wāṣil studied these disciplines, taught them to students and also produced literature explaining various concepts.[136] Ibn Wāṣil also worked with ʿAlam al-Dīn Qayṣar Taʿāsīf, the professional *muhandis* aforementioned, on the production of a large wooden globe for the Ayyubid al-Malik al-Muẓaffar (d. 642/1244), indicating the link between *handasah* and *astronomy*.[137]

Muḥammad b. Muḥammad b. al-Ṣuffī (d. 775/1373) also mastered *fiqh* (فقه), Arabic grammar (النحو), mathematics, and the science of measurement (*misāḥah*), so much so that he led the field in his time. He also taught and gave legal opinions (الإفتاء):

اشتغل مدة تفقه و برع في النحو والحساب و أتقن المساحة حتى صار إليه المنتهى في معرفة ذلك و فاق أهل عصره وكان يُقصد للاشتغال عليه في ذلك و كان مأذونا له في الإفتاء و يفتي ويدرس في الفقه.[138]

Another significant figure, Ḥusayn b. ʿAlī al-Zamzamī (d. 821/1419) similarly studied legal sciences alongside mathematics, *handasah*, and astronomy, and became

[134] al-Ṣafadī, *al-Wāfī*, pp. V, 11.
[135] Ismāʿīl b. ʿAlī Abū al-Fidāʾ, *al-Mukhtaṣar fī Akhbār al-Bashar*, ed. by Muḥammad Zaynhum Muḥammad ʿAzab, 4 vols (Cairo: Dār al-Maʿārif, 1998), pp. IV, 50-51.
[136] al-Ṣafadī, *al-Wāfī*, pp. III, 71-72.
[137] Muḥammad b. Sālim Ibn Wāṣil, *Mufarrij al-Kurūb fī Akhbār Banī Ayyūb,* ed. by Jamāl al-Dīn Shayyāl, 5 vols (Cairo: Cairo University Press, 1953-1977), pp. V, 343.
[138] Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah*, pp. IV, 168-169.

something of an authority in Mecca for these disciplines. He learned astronomy from Jamāl al-Dīn al-Mārdānī (809/1406), a renowned Mamluk astronomer in Cairo:

> [He] sought education and learned the science of inheritance and mathematics... [al-Zamzamī] showed intelligence that made him one of the leading scientists in the fields of inheritance *(al-farā'iḍ*), mathematics (*al-ḥisāb*), algebra (*al-jabr wa al-muqābalah*), handasah, astronomy (*al-hay'ah wa al-falak*) and ephemeris (*al-taqāwīm*). He wrote treatises and was the authority for this science in the cities of the Hijāz, Mecca, Medina, and Yemen.
>
> طلب العلم واعتنى بالفرائض والحساب... و أخذ علم الفلك بالقاهرة عن الجمال المارداني و لم يزل في ازدياد ونباهة حتى صار إماما عالما فاضلا ماهرا من أعلم الناس بالفرائض والهيئة والحساب و علم الخطأين و الجبر و المقابلة والهندسة و الفلك والتقاويم و انتهت إليه رياسة هذا العلم ببلاد الحجاز مكة والمدينة واليمن و أَلَّفَ فيه.[139]

These examples show figures who studied *handasah* in a purely abstract way, as no evidence suggests that they were involved in the building craft. This does not change, however, the fact that *handasah* was a science with practical applications, and that many treatises written on the topic seem to have been aimed at providing practical knowledge.

1.3.3 Complexity of contemporary buildings

Written evidence suggests that *handasah* was a theoretically sophisticated discipline centred on building; physical evidence likewise suggests that building would have required a high level of theoretical sophistication. While modern scholarship views the *muhandis* as a master artisan, material evidence suggests that construction had to rely on the application of complex concepts from the fields of mathematics, geometry, astronomy, and physics. Archaeological findings and extant buildings in Cairo, which demonstrate attention to astronomical detail, geometrical complexity, and even questions of theology, suggest that the building craft was highly developed and

[139] al-Fāsī, *al-'Iqd al-Thamīn*, pp. IV, 205; al-Sakhāwī, *al-Ḍaw' al-Lāmiʿ*, pp. III, 151-152; for al-Mārdānī's biography see: Taqiyy al-Dīn Aḥmad b. ʿAlī al-Maqrīzī, *Durar al-ʿUqūd al-Farīdah fī Tarājim al-Aʿyān al-Mufīdah,* ed. by Mahmūd al-Jalīlī, 4 vols (Beirut: Dār al-Gharb al-Islāmī, 2002).

likely would have required planning models, or at least two-dimensional plans. Ahmad Wahby's study of extant Mamluk monuments concludes that the sophisticated geometrical ornaments on several Mamluk domes show that there must have been theoretical sciences involved in their preparation.[140] The following discussion aims to further develop Wahby's conclusion by examining literary evidence of theoretical knowledge being applied to building. While some of this knowledge may have been transmitted orally, it is highly complex, and the existence of a significant body of treatise literature on these principles suggests that treatises played a major, if not primary, role in the communication of knowledge on these topics.

In addressing his central question – identifying which artisans collaborated to apply the decorative geometrical patterns on the Cairene Mamluk domes – Wahby asks who among the participants in the construction industry during the Mamluk era acquired a knowledge of geometry (*al-handasah*).[141] In order to investigate this question, he analyses a few extant dome structures that mainly belong to the Circassian period: Aytmish al-Bajāsī's Mosque (bl. 785/1383), Īnāl al-Yūsufī's Madrasah (bl. 794/1392), Faraj b. Barqūq's Mausoleum (bl.801-811/1399-7), Barsbāy's Mausoleum (bl. 835/1431), Gānībak al-Ashrafī's Mausoleum (bl. 830/1426), Qāytbāy's Complex (bl. 879/1474), and Khayrbak's Mosque (bl. 908/1502). Wahby emphasises that from the mid-eighth/mid-fourteenth century to the early tenth/sixteenth century, the development of carved decorations on Mamluk stone domes increased in sophistication. That sophistication reached its climax in the use of elaborate complex geometrical patterns, especially interlacing stars. A detailed geometrical analysis of Barsbāy Mausoleum's dome shows a combination of a square grid at the base and a triangular one in the upper tiers with a gradual transformation from eight-pointed to six-pointed stars (Figure 1.6 -1.8). This demonstrates the advanced level of geometrical skills involved in constructing and assembling this dome. Applying the same geometrical analysis for other domes, Wahby argues for the presence of skilled geometers in designing and applying the sophisticated decoration, as such a level of sophistication could not have achieved by illiterate craftsmen without drafting.[142]

Wahby's analysis refers to an expert geometer, who he calls a *muhandis*. This person was not necessarily involved in the practical parts of the building work, but

[140] Wahby and Montasser, 'The Ornamented Domes', p. 1.
[141] Wahby and Montasser, 'The Ornamented Domes', p. 1.
[142] Wahby and Montasser, 'The Ornamented Domes', pp. 10-11.

would have prepared the drafted design using theoretical knowledge.[143] Wahby states that the *muhandis*' role was 'the only job that indicates professional experience as well as theoretical and practical knowledge of geometry, and consequently the ability to design and build, thus *muhandis* and *mu'allim* (designer and contractor respectively) were responsible for civil and architectural projects'.[144] This characterisation, however, is problematic, as here he associates the *muhandis* with exclusively theoretical tasks, while in other places, he assigns the *muhandis* a combination of theoretical knowledge and practical experience.[145] Other historical evidence suggests that the *muhandis* was involved also in practical work. Although Wahby concludes that the *muhandis* had a background in theoretical knowledge, his analysis does not enable him to clearly distinguish the *muhandis* from the *mu'allim* (master مُعَلِّم), identified by Mayer, Behrens-Abouseif, and Rabbat as a master mason or master builder.[146]

Regardless of whether the role of the *muhandis* was purely theoretical, Wahby uses his geometrical analysis to demonstrate that geometrical knowledge circulated widely in treatises on building. He refers to many treatises on spherical geometry by medieval scholars, the most important of which is al-Būzjānī's *What the Artisan Needs of Geometry*. This treatise was the first by a medieval mathematician to study the geometric constructions of ornamental patterns onto a sphere, as it uses the properties of Platonic and Archimedean solids and two-dimensional illustrations to demonstrate how a sphere can be tiled with integrated sophisticated polygons.[147]

Barbara Cipriani's geometrical analysis of two of the aforementioned domes, those in the funerary complexes of Faraj b. Barqūq (bl. 801-11/1399-7) and Khayrbak (bl. 908/1502), leads her to a similar conclusion. She suggests that the decorative pattern of Mamluk domes is based on a tiling pattern in which a unit is repeated until it forms a sphere. The tiling pattern for all Cairene brick-ribbed domes is based on the repetition of multiples of four: four, eight, sixteen, and thirty-two. For example, in the Khayrbak dome, the basic unit of design is repeated sixteen times to complete the sphere (Figure 1.9). Cipriani concludes that this likely indicates the repetition of a slice

[143] Wahby and Montasser, 'The Ornamented Domes', pp. 12-14.
[144] Wahby and Montasser, 'The Ornamented Domes', p. 13.
[145] Give page citations for examples of each of these contrasting definitions in Wahby's work.
[146] Mayer, *Islamic Architects*, p. 27. Muʿallim is a qualified builder or a foreman, mainly used in Western Asia, Egypt and North Africa, except Algeria.Rabbat, p. 31, defines it as a casual 8th/14th century translation of asaster.
[147] Wahby and Montasser, 'The Ornamented Domes', p. 10.

drawn ahead of time using geometrical calculations.[148] Regardless of whether the Mamluk domes were decorated and carved before assembly, as Cipriani concludes, or assembled then decorated *in situ*, as Wahby and Bouleau argue, it is apparent that these complex patterns indicate prior drafting based on geometric principles.[149] Mamluk historians have previously argued that even small-scale projects with sophisticated designs could not have been achieved without knowledge of geometrical principles.[150] Large-scale projects, such as mosques, schools, mausoleums, hospitals, aqueducts, and palaces, would then also have required knowledge of geometry and the other *handasah* sciences.

Analysing the structural framework of these domes, not just their outer ornaments, reveals further evidence. Structural analysis for several Mamluk domes carried out by Cipriani and Wanda Lau reveals that there are differences in dome construction that indicate the ability to adopt unique solutions from one dome to another, suggesting some innovation on the part of Mamluk professional builders. Cipriani and Lau catalogue and analyse 113 extant Mamluk domes, and choose three masonry domes for detailed structural analysis: the funerary complexes of Umm Sultan Shaʿbān (bl. 770/1369), Sultan Faraj b. Barqūq, and the emir Khayrbak.[151] By employing a developed structural analysis software, Domex, they are able to explain the stability of the first and third domes, but fail to explain how the dome of Sultan Faraj b. Barqūq, about 14 m in diameter and height, safely stands (Figure 1.10). The failure of a modern sophisticated analytical tool to explain the structural equilibrium of this dome raises a question how advanced the knowledge of dome construction was.[152]

1.3.4 *Bādahanj*: astronomical knowledge in practice

Buildings also demonstrate a connection between building works and abstract sciences via the use of astronomy for orientation. King's study of the relationship between astronomy and Mamluk architecture shows the importance of astronomical

[148] Barbara Cipriani, 'Development of Construction Techniques in the Mamluk Domes of Cairo', (unpublished Master's of Science, Massachusetts Institute of Technology, 2005), pp. 31-32.
[149] Bouleau's argument as cited and translated into English by Wahby, see: Wahby and Montasser, 'The Ornamented Domes', p. 15.
[150] Abd al-Wahhab, 'al-Rusūmāt al-Handasiyyah li-al-ʿImārah al-Islāmiyyah'; Lewcock, 'Architects, Craftsmen and Builders'; Bloom, 'Transmission of Designs'; Cipriani and Lau, 'Construction Techniques'; Wahby and Montasser, 'The Ornamented Domes'; Abdel Barr, 'L'art Urbain du Caire Mamlouk', pp. 105-106.
[151] Cipriani and Lau, 'Construction Techniques', p. 695.
[152] Cipriani and Lau, 'Construction Techniques', p. 714.

knowledge to architectural works in the context of the *bādhahanj* (باذَهنج), or wind-catcher, used in medieval Cairo.[153] Wind-catchers, whose original Persian name was Arabicised to *bādahanj* (بادَهنج) with variants *bādhahanj* (باذَهنج), *bādhāhanj* (باذاهنج), *bādāhanj* (باداهنج), and *bādhanj* (بادْهنج) (pl. *bawādahanj* بوادهنج), were ventilation openings on the roof of buildings used for lighting and circulating air through a building.[154] King emphasises that *bādahanj*s were not only set parallel to the axis of Old (Fatimid) Cairo for aesthetic purposes, but also for astronomical and geographical reasons (Figure 1.11). Using astronomical calculations, *bādahanj*s were erected on buildings to have their open side perpendicular to the direction of *qiblah*; the eastern side was closed to avoid bad winds, and the western side was open to catch favourable winds.[155] Their careful orientation demonstrates the application of astronomical knowledge to practical building work.

*Bādahanj*s were very common in Mamluk buildings in both residential and public structures (Figure 1.12). According to Cairene endowment deeds dated from the seventh/thirteenth to tenth/sixteenth century, they were present in most buildings, including famous imperial complexes and foundations that are still extant today.[156] ʿAbd al-Laṭīf al-Baghdādī, who visited Cairo around 596/1200, described them as follows:

> [The Egyptians] make the openings of their houses open to the agreeable winds from the north, and one sees hardly any houses without ventilators. These ventilators are tall and wide and open to every action of the wind; they are erected carefully and with much skill. One can pay between 100 and 500 dinars for a single ventilator, but small ones for ordinary houses cost no more than one dinar each.[157]

[المصريون] يجعلون منافذ منازلهم تلقاء الشمال و الرياح الطيبة، و قلما تجد منزلا إلا و تجد فيه باداهنج و باداهنجهاتهم كبار واسطة للريح عليها تسلط ويحكمونها غاية الإحكام، حتى أنه يقوم على

[153] King, 'Architecture and Astronomy', p. 111.
[154] For a discussion of the word *bādahanj* and its variants, see King, 'Architecture and Astronomy', p. 101. *bādahanj* drawn from Mamluk endowment deeds, see Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 19.
[155] King, 'Architecture and Astronomy', p. 109.
[156] For example, Deed WA 549j dated 858/1454: قاعة كبرى تحتوي أيوانا بصدره سدلة يعلوها بادهنج
[157] English translation is cited in: King, 'Architecture and Astronomy', p. 97.

عمارة الواحد منها مائة دينار إلى خمسمائة، وإن كانت باداهيجات المنازل الصغار يغرم على الواحد منها دينار.[158]

Wind-catchers still formed a part of the city's architecture three centuries later. When the Italian physician Prosper Alpin visited Cairo between 989/1581 and 992/1584, he observed the presence of wind-catchers on top of houses and drew an illustration for a ventilator in his treatise *Historiæ Ægypti naturalis pars prima*.[159]

For the *bādahanj* to be effective and functional, it had to be correctly oriented and structured relative to the altitude of the sun and the direction of winds. These and other relevant factors formed part of the field of astronomical studies. The main theoretical sources about properly setting up the *bādahanj* to catch favourable winds are astronomical tables. These tables, compiled by Mamluk astronomers, were originally used to determine time using the sun and set the times of the five daily prayers.[160] The most important table for building wind catchers was the one that displayed the altitude of the sun in degrees and minutes for each degree of solar longitude (corresponding to each day of the solar year) when the sun was in the direction of the *bādahanj* (Figure 1.13).[161] The entries of this table are expressed using the Arabic Abjad numeral system, which was standard for the entire corpus of astronomical tables. King concludes that the back of the *bādahanj* was intended to align with the direction of the winter sunrise.[162] The direction of the winter sunrise from Cairo, which is 117˚ 30′ east of north (E of N), is very close to the *qiblah* direction called *Qiblat al-ṣaḥābah*. 117˚ E of N was favoured until later times over the correct astronomically calculated *qiblah*, which is 127˚ E of N, in the tenth/sixteenth century. King cites a verse by the Mamluk poet Burhān al-Dīn al-Qīrāṭī (d. 781/1379) to support his estimation of the *bādahanj*s' alignment:

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[158] ʿAbd al-Laṭīf al-Baghdādī, *Kitāb al-Ifādah wa al-Iʿtibār fī al-Umūr al-Mushāhadah wa al-Ḥawādith al-Muʿāyanah bi-Arḍ Miṣr*, ed. by ʿAbd al-Raḥmān al-Shaykh, 2nd edn (Cairo: al-Hayʾah al-Miṣriyyah al-ʿĀmmah lil-Kitāb, 1998), p. 113.

[159] Prosper Alpini, *Historiæ Ægypti naturalis pars prima*, 2 vols (Lugduni Batavorum, 1735); As cited in: King, 'Architecture and Astronomy', pp. 97, note 94.

[160] King, 'Astronomy of the Mamluks', p. 535. The important astronomers according to King are:
- Abū ʿAlī Al-Marrākishī (worked in Cairo c. 1280)
- Shihāb al-Dīn Al-Maqsī (contemporary to al-Marrakishi in Cairo)
- Najm al-Dīn al-Miṣrī (contemporary to al-Marrakishi in Cairo)

Of astronomers specialized in spherical astronomy:
- Ibn al-Sarrāj (fl.14th Aleppo)
- Ibn al-Majdī (1425 in Cairo), the teacher of the aforementioned al-Sijīnī
- Ibn Abī al-Fatḥ al-Ṣūfī (fl. 1460 in Cairo)

[161] King, 'Architecture and Astronomy', p. 103.

[162] King, 'Architecture and Astronomy', p. 104.

> I see that the love of air has turned (the *bādahanj*) away from the *Qiblah* of Islam.[163]

Of the treatises and astronomical tables concerning *bādahanjs* produced in Mamluk times, three represent the period's most common variants. The works of Ibn Yūnus (d. 608/1211), an Ayyubid astronomer active in Cairo, seem to have been among the primary sources worked on and developed by Mamluk astronomers. A manuscript at the Biblioteca Ambrosiana in Milan, attributed to Ibn Yūnus and copied around 699/1300, describes how to determine the proper direction for setting the *bādahanj* (Figure 1.14):[164]

> To mark the direction of the *bādahanj*, first, establish the four cardinal directions, and then count from the east point southwards by the amount of the rising amplitude of [the sun at the first point of] Capricorn. Next, extend a line [from the centre] in this direction, and this will be the direction for the ventilator. Form a rectangle with another line, and set up the *maḥillah* on this rectangle (*rabbi'hu bi-khaṭṭ ākhar wa-aqimi l-maḥillah 'alā dhālika l-tarbī'*). A good procedure [for laying out the direction of the *bādahanj*] is to divide the front in ten parts and make the side five and one-half, according to the technical convention of the craftsmen. God Almighty grants success.[165]

> لمعرفة إخراج البادهنج استخرج الجهات الأربع ثم عد من نقطة المشرق طالبا الجنوب بمقدار سعة مشرق الجدي ثم مد عليه خطا هو خط البادهنج، ربعه بخط آخر وأقم المحلة على ذلك التربيع و أحسن مايكون أن تقسم وجهه بعد أجزاء مثلا وتجعل جنبه منها خمسة ونصف، هذا الذي وقع عليه الاصطلاح من أهل الصناعة و الله تعالى الموفق.[166]

More detailed instructions describing variations adopted in other Egyptian cities such as Alexandria, Damietta, and ʿAydhāb may be found in one of the treatises of Ibn al-Sarrāj (fl. 8th/14th-c. Aleppo). Ibn al-Sarrāj, recognised in the history of science as the inventor of variant astrolabes and quadrants, specialised in spherical astronomy and

[163] As cited and translated by King, see: King, 'Architecture and Astronomy', p. 104.
[164] Biblioteca Ambrosiana MS no. 281e, fol. 110v, as cited by King: King, 'Architecture and Astronomy', pp. 109, note 143. We will return back to the poet al-Qīrāṭī in Chapter Three as an example of a Mamluk poet who composed colloquial poetic verses on building craftsmen.
[165] Translation from King: King, 'Architecture and Astronomy', p. 109.
[166] King, 'Architecture and Astronomy', p. 128.

worked in Aleppo but is known to have visited Cairo. His manuscript, discovered in 1980s in the Chester Beatty Library, forms part of a larger treatise on astronomical instruments copied during the lifetime of its author.[167] In it, he describes how to find the correct orientation for the *bādahanj* based on the kinds of favourable and unfavourable winds. He also describes the four different types of *bādahanj*s known at the time (Figure 1.15-1.16):

> The ninety-first chapter [is] on knowing how to set up the *maḥillah* of the *bādahanj* and the names of the [various kinds] and the amounts [measured] on the horizon circle for that latitude which are [open] to favourable winds and [closed] to unfavourable winds. If you want to set up [the *bādahanj*], draw a full circle and divide it into four parts [by marking the cardinal directions]. Then draw a line from [the point corresponding to] the rising amplitude of Capricorn to [the point corresponding to] the setting amplitude of Cancer [that is, from winter sunrise to summer sunset] in that locality. This will be the *maḥillah* of the *bādahanj* [in] localities which are far from the sea.

> الباب (صا) [91][168] في معرفة وضع محلة البادهنج و أسمائه وقدر الهوا الطياب وقدر الهوا المفسود من قسمة دائرة الأفق لذلك العرض... فإذا أردت وضعه فهو أن تدير دائرة كاملة وتربعها و تمد خطا من سعة مشرق الجدي إلى سعة مغرب السرطان بتلك البلد فهو محلة البادهنج في البلاد البعيدة عن البحر المالح.[169]

These texts are of great importance, as they seemingly give practical directions for building wind-catchers alongside more scientifically sophisticated elements. These treatises are not general astronomical books, but rather describe and elaborate on specific building structures that required the completion of astronomical calculations.

A similar treatise by Abū al-Baqāʾ ʿAlī b. al-Qāṣiḥ (d. 801/1399) seems to be the first to explain the orientation of both the *bādahanj* and the *qiblah miḥrāb*. The manuscript was copied at the end of the eighth/fourteenth century and preserved in the Egyptian National Library MS DM 26 (دار كتب ميقات 26). According to King's analysis of this manuscript, part of it resembles the aforementioned treatise by Ibn al-Sarrāj,

[167] Chester Beatty Library, MS no. 102, as cited by King: King, 'Architecture and Astronomy', p. 109.
[168] According to Abjad numeral system, ص=90, and أ=1, so صا=91.
[169] King, 'Architecture and Astronomy', p. 129.

with a few differences.[170] Ibn al-Majdī, the aforementioned teacher of al-Sijīnī, also wrote a treatise called *Tuḥfat al-Aḥbāb fī Naṣb al-Bādahanj wa al-Miḥrāb* (*The Gift of the Loved Ones on Setting up Bādahanjs and Miḥrābs*).[171] In it, he differentiates between the orientation of the *bādahanj* at 117˚ 30′ E of N and the astronomically calculated direction of *qiblah* for *miḥrāb*s at 127˚ E of N. Zakariyyā b. Yaḥyá al-Bilbaysī (fl. Mid-ninth/fifteenth c.) was the only one to align the *bādahanj* with the *qiblah* of 117˚ E of N, or *Qiblat al-ṣaḥābah*, with the open side of the *bādahanj* perpendicular to the direction of the *qiblah*.[172]

Christel Kessler carefully studied several extant Mamluk monuments and analysed the direction of its *miḥrāb*s with regards to both *Qiblat al-ṣaḥābah* and the astronomical *qiblah*.[173] Emir Ulmās al-Ḥājib's mausoleum *miḥrāb* (bl. 730/1330) is oriented towards *Qiblat al-ṣaḥābah* (Figure 1.17).[174] Two other architectural examples were also oriented towards *Qiblat al-ṣaḥābah*, namely the funerary complex of Sultan Shaʿbān II (bl. 770/1368) (Figure 1.18) and the funerary complex of the emir Qānībāy al-Muḥammadī (bl. 816/1414) (Figure 1.19).[175] However, other examples feature the *miḥrāb* being oriented towards the astronomically calculated *qiblah*, including the mausoleum complex of the emir Shaykhūn (bl. 750/1349) (Figure 1.20)[176] and the mausoleum complex of the emir Khayrbak (bl. 908/1502) (Figure 1.21).[177] Regardless of which was more common, both orientations applied *handasah* and astronomy to orient the *miḥrāb* towards *qiblah*.[178]

Here, we have an entire genre of astronomical treatises on how to correctly align wind-catchers with the direction of the *qiblah*. While we cannot know precisely who read these works, their language seems to have been intended to give practical instructions. In any case, knowledge of the interaction between astronomy and building must have been widespread; *bādahanj*s were used in a wide variety of buildings and

[170] King, 'Architecture and Astronomy', p. 111.
[171] King, 'Astronomy of the Mamluks', pp. 553-554. According to King's classification for Mamluk astronomers, Ibn al-Majdī made important contribution to the field.
[172] King, 'Architecture and Astronomy', p. 112.
[173] King, 'Architecture and Astronomy', p. 114.
[174] Christel Kessler, 'Funerary Architecture within the City', in *In Colloque International sur l'Histoire du Caire*, (Cairo: Ministry of Culture of the Arab Republic of Egypt, 1972), pp. 257-267 (p. 266).
[175] Christel Kessler, 'Mecca-oriented Architecture within an Urban Context- on a Largely Unexplored Building Practice of Mediaeval Cairo', in *Arab Architecture: Past and Present*, ed. by Antony Hutt (Durham: The Centre for Middle Eastern & Islamic Studies, 1984), pp. 13-20 (p. 16).
[176] Kessler, 'Funerary Architecture', p. 261.
[177] Kessler, 'Mecca-oriented Architecture', p. 18.
[178] King, 'Architecture and Astronomy', pp. 114-115. King cites al-Maqrīzī to refer to two more orientations of mihrab in Egypt during the Mamluk period, but were not popular.

qiblah calculations were required for every mosque. This should suggest to us that theoretical knowledge formed an important part of the practice of building.

Revisiting Wahby's broader-scope definition of *muhandis*, it is evident from both their work on *bādahanj*s and other building features that some *muhandisīn* had theoretical training in geometry and other sciences, and that treatises existed connecting theoretical models with practical pursuits. It also seems that the *muhandis* worked on both civil and royal projects. Wahby's suggestion that the *muhandis* who worked on highly sophisticated buildings such as mosques also built more mundane civil projects is equally true for the Mamluk era.[179] For example, Shihāb al-Dīn Aḥmad al-Ṭūlūnī al-Muhandis (شهاب الدين أحمد الطولوني المهندس) (d. 802/1399) and his grandson al-Badrī Ḥasan b. al-Ṭūlūnī al-Muhandis (البدري حسن بن الطولوني المهندس) (d. 923/1517) held the title of *muhandis* and carried out building projects for both sultans and civilian patrons, including building the complex of al-Ẓāhir Barqūq (bl. 786-8/1384-6),[180] restoring al-Ḥaram al-Sharīf in Mecca in 801/1399,[181] building Sultan Khushqadam's mausoleum in Cairo (bl. 866/1462),[182] restoring Jāmiʿ al-Rawḍah in 886/1481,[183] and building the aqueduct of Banī al-Munajjā in 892/1487.[184] As the *muhandisīn* working on both civil and royal projects were the same, the application of theoretical principles on display in these more complex buildings should be seen to have permeated the entire building enterprise of the time.

1.4 Models

In modern building practice, one of the most theoretically sophisticated parts of construction is the preparation of preliminary plans and models. While Ottoman and Central Asian plans and models from the ninth and tenth/fifteenth and sixteenth centuries survive, no such examples are extant from the Mamluk period. Nevertheless, scholarship acknowledges working drafts or models were probably prepared before building. While the existence of architectural plans in the Mamluk period has not been

[179] Wahby and Montasser, 'The Ornamented Domes', p. 12.
[180] Muḥammad b. Aḥmad Ibn Iyās, *Badāʾiʿ al-Zuhūr fī Waqāʾiʿ al-Duhūr,* ed. by Muḥammad Muṣṭafá, 2nd edn, 6 vols (Cairo: al-Hayʾah al-Miṣriyyah al-ʿĀmmah lil-Kitāb: Markaz Taḥqīq al-Turāth, 1982), pp. I/2, 350, 372.
[181] Ibn Iyās, *Badāʾiʿ al-Zuhūr*, pp. I/2, 520.
[182] Ibn Iyās, *Badāʾiʿ al-Zuhūr*, pp. II, 390.
[183] Ibn Iyās, *Badāʾiʿ al-Zuhūr*, pp. III, 182.
[184] Ibn Iyās, *Badāʾiʿ al-Zuhūr*, pp. III, 240.

proven, the following close analysis of references in the literary sources shows direct evidence of architectural plans and models, especially in the ninth/fifteenth century.[185] The practice of drafting building drawings in earlier periods, the repeated use of the term '*rasama*' (drew) by Mamluk chroniclers in the course of describing building stages and events, and direct references to physical models all suggest that Mamluk builders did prepare plans and illustrative drawings for practical purposes.

According to Bloom, there are three different purposes of building drawings and models. First, they can be used to facilitate the manufacture of a particular detail or relationship between a set of parts before starting work on a full-scale object. An example of this comes from carpentry: a carpenter measures the space in which the object will fit and draws a sketch for the object to prepare in his shop. Second, drawings may also be used to give information about the building, its layout, and its structural elements, or give instructions for workers to follow in the case of the absence of the designer from the building site. Thirdly, drawings or models might be prepared for presentation purposes to give an idea of the look of the proposed project in order to secure a patron's approval before commencing construction.[186]

As Ronald Lwecock argues, 'there is ample evidence for us to be certain that most Islamic monuments were designed in drawing form before they were erected'.[187] He supports this claim using historical narratives and archaeological findings, emphasising that Muslim builders inherited drawing techniques from the ancient world, along with other technical skills and sciences. Additionally, he refers to ninth/fifteenth-century geometrical drawing tools and fragmentary drawings found in archaeological digs in Central Asia which suggest a familiarity with drawing skills. However, scholarship on Mamluk architectural drawing remains generally thin.

Some scholars suggest that Mamluk architecture did not involve drawing. Bouleau, for example, argues that patrons communicated their intentions for a foundation verbally, and that building works were entirely managed through cooperation between master builders and supervisors, who together defined the form and structure without drawn plans. This assumption is based on an analysis of Mamluk monuments in Cairo, which revealed no evidence of geometrical traces on the ground

[185] Lewcock, 'Architects, Craftsmen and Builders', p. 115; Necipoğlu-Kafadar, 'Plans and Models'.
[186] Bloom, 'Transmission of Designs', pp. 21-22.
[187] Lewcock, 'Architects, Craftsmen and Builders', p. 131.

floor or elevations.[188] Wahby challenges this argument, stating that the absence of material evidence does not exclude the possibility that drawing plans were in use. Instead, through his previously mentioned geometrical analysis of Mamluk domes, Wahby demonstrates that building practices in Mamluk Egypt must have included some formal preparation. He also explains that the absence of such drawings is due to the fact that, unlike the Ottoman foundations, which were state projects supervised and maintained by official institutions, Mamluk projects were more personal in their foundation and regulation. Mamluk projects were not so official as to require the filing of documents, and they were not executed in distant places that required official documentary communication of plans and designs. Furthermore, he draws attention to the fact that drawings were part of the trade's secrets and argues that since the building craft was mainly a family business, like many other Cairene trades of the time, its secrets must have been well protected and transmitted from one generation to another.[189]

Hasan Abd al-Wahhab's historical survey also examines the existence of drawn plans and models in the Islamic world. He cites historical narratives that show the presence of prepared plans either drawn on parchment, on paper, or on the ground using a gypsum mixture. These narratives come from as early as second/eighth century Baghdad, and as late as the early modern period in North Africa, and Mediterranean cities including Cairo. It is apparent through the examples cited by Abd al-Wahhab that these drawings and models were prepared before the building works commenced. These examples also varied in terms of their structural and functional purposes. They include city planning in Baghdad, the Ibn Ṭūlūn Mosque, a fortress in al-Andalus, and a bath in Hebron.[190]

One literary reference to architectural drawings mentioned in several modern studies comes from third/ninth century Egypt. Al-Maqrīzī cites al-Balawī, the biographer of Ibn Ṭūlūn (fl. 4th/10th c.), who reports a Christian prisoner showing off his drafting skills to the Egyptian ruler:

> Ahmad had the prisoner brought and said: come, what is it you say about building the mosque? The Christian prisoner replied: I will depict it

[188] Cited in: Wahby and Montasser, 'The Ornamented Domes', p. 13.
[189] Wahby and Montasser, p. 14.
[190] Abd al-Wahhab, 'al-Rusūmāt al-Handasiyyah li-al-ʿImārah al-Islāmiyyah', pp. 115-117.

out for the Prince, for him to see with his eyes, without columns but the two for the *miḥrāb*. Ahmad ordered the skins to be brought to him… and he depicted the mosque.

أحضره [السجين النصراني] فقال [أحمد بن طولون] له: ماتقول في بناء الجامع؟ فقال: أنا أصوره للأمير حتى يراه عيانا بلا عمد إلا عمودي القبلة. فأمر أن تُحضر له الجلود، فأُحْضِرَت، وصَوَّرَهُ له فأعجبه واستحسنه.[191]

Al-Balawī says that when Aḥmad b. Ṭūlūn wanted to build his mosque, he was told that it would require three hundred columns.[192] A prisoner heard about this problem and offered to build the mosque with only two columns for the *miḥrāb*. He was brought before Ibn Ṭūlūn, confirmed his proposal, and drafted drawings of the mosque.[193] The cited drawings would seem to have been architectural plans of some detail, as they would have needed to give a persuasive account of why only two pillars would be sufficient. Hasan Abd al-Wahhab cites this example briefly to support his argument for the existence of drawn plans as early as the second/eighth century.[194] Although Lewcock discusses this Tulunid example, his subsequent jump to tenth/sixteenth-century Ottoman plans leaves a wide gap that raises questions about architectural planning prior to the tenth/sixteenth century.[195]

A later example from Egyptian history, though again pre-Mamluk, is that of the fourth/tenth century Ikhshīdī Palace. When Muḥammad b. Ṭughuj al-Ikhshīd (r. 328-334/940-946) defeated the Abbasid army and took over Egypt, he called his minister Ṣāliḥ b. Nāfiʿ, asking him to move the arsenal and build a palace with an orchard on its place. Ṣāliḥ b. Nāfiʿ went to expert builders, who then planned '*khaṭṭū*' (خطوا) and created a model '*ṣawwarū*' (صوّروا) of the suggested imperial palace, which he brought to Ibn Ṭughuj, who praised it:[196]

[191] Taqiyy al-Dīn Aḥmad b. ʿAlī al-Maqrīzī, *al-Mawāʿiẓ wa al-Iʿtibār fī Dhikr al-Khiṭaṭ wa al-Āthār,* ed. by Khalil al-Mansur, 4 vols (Beirut: Dār al-Kutub al-ʿIlmiyyah, 1998), pp. IV, 38.
[192] ʿAbd Allāh b. Muḥammad al-Balawī, *Sīrat Aḥmad b. Ṭūlūn,* ed. by Muḥammad Kurd ʿAlī (Damascus: Maktabat al-ʿArabiyyah, 1939), pp. 181-182.
[193] The editor states that according to Coptic sources this prisoner is named Saʿīd b. Kātib al-Farghānī al-muhandis, who said to had built the Nilometer and cistern for Ibn Ṭūlūn. al-Balawī, *Sīrat Aḥmad b. Ṭūlūn,* pp. 181, fn. 181.
[194] Abd al-Wahhab, 'al-Rusūmāt al-Handasiyyah li-al-ʿImārah al-Islāmiyyah', p. 115.
[195] Lewcock, 'Architects, Craftsmen and Builders', p. 132.
[196] al-Maqrīzī, *al-Khiṭaṭ* pp. III, 318.

When he [Muḥammad b. Ṭughuj al-Ikhshīd] governed Egypt, he called Ṣāliḥ b. Nāfiʿ and said: 'I had in my mind that when I ruled Egypt, I shall move the arsenal to Dār Ibnat al-Fatḥ, and convert the arsenal at the island to an orchard and call it al-Mukhtār. So, go and mark (*khuṭṭ*) an orchard and palace and estimate the required costs. Ṣāliḥ b. Nāfiʿ accompanied a group of people who drew (*khaṭṭū*) the orchard and a house for slaves, another house for officers, a storage place for clothes and another storage place for food. Then, they made an image of it (*ṣawwarūhu*) and brought it to Ibn Ṭughuj who praised it, [and he] asked: what cost do you estimate? They replied: thirty thousand dinars, [he found it] too expensive and negotiated the budget until it reached five thousand dinars, then issued his order to start the building works.

أنه [طغج بن إخشيد] لما ملك مصر استدعى صالح بن نافع وقال له :كان في نفسي إذا ملكت مصر أن أجعل صناعة العمارة في دار ابنة الفتح وأجعل موضع الصناعة من الجزيرة بستانا أُسَميه المختار فاركب وخُط لي بستانا و دارا و قدر لي النفقة عليهما، فركب صالح بجماعة و خطوا بستانا فيه دار للغلمان و دار للنوبة وخزائن للكسوة و خزاين للطعام و صوروه وأتوا به فاستحسنه و قال :كم قدرتم النفقة؟ قالوا ثلاثين ألف دينار فاستكثرها، فلم يوالوا يضعون من التقدير حتى صار خمسة آلاف دينار فأذن في عمله.[197]

In this text, we see that plans were made in sufficient detail to make an estimate of the building's cost. Builders are not explicitly mentioned, but the context suggests that the drawings and models were made by people experienced in the building profession. This and the earlier Ṭūlūnī narratives are cited by al-Maqrīzī in his *al-Khiṭaṭ*.[198] It seems al-Maqrīzī himself was familiar with the process he describes, suggesting that even if his accounts may not reflect the realities of the third-fourth/ninth-tenth centuries, they did have something to do with his own contemporary context. Although we have no surviving architectural drawings or models, we do have the relevant terms that Mamluk chroniclers used to describe building projects.

[197] al-Maqrīzī, *al-Khiṭaṭ* pp. III, 318.

[198] Taqiyy al-Dīn al-Maqrīzī (d. 845/1342) is a Cairene scholar and historian, one of his primary works is the *al-Khiṭaṭ*, which deals with the topography of al-Fusṭāṭ and Cairo, and the history of Egypt in general. See: Franz Rosenthal, 'al-Maḳrīzī', in *Encyclopaedia of Islam, Second Edition*, ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. VI:193b, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/al-makrizi-SIM_4838> [accessed 6 December 2017].

Mamluk dictionary entries may help us understand the precise meanings of the terms *khaṭṭa* and *ṣawwara* used by al-Maqrīzī in the aforementioned Ṭūlūnī and Ikhshīdī examples. *Lisān al-ʿArab*, written by Ibn Manẓūr (d. 711/1311) who served in Mamluk Dīwān al-Inshā' in Cairo,[199] is known as the richest dictionary produced during the Mamluk period, making it a primary reference for terms' essential meanings and their shifts over time. Its definition of *khaṭṭa* (خَطَّ), has two meanings related to building works. It may mean the placement of an enclosure around the area where a project is expected to be built (*ikhtaṭṭa* اختطّ), or putting up a sign with an individual's name indicating that the location now belongs to a person who will build on it soon (*khaṭṭa* خَطَّ). Revisiting the Ikhshīdī example, it possibly means that the summoned builders marked the site and prepared drawings for the project to show the location of each structure within the palace premises. Ibn Manẓūr points that it may also mean that a group of lines (*khuṭūṭ* خطوط, s. *khaṭ* خط) have been drawn on a surface:

> [Someone] marked [a land] for himself: to put a written mark on it to announce that it has been chosen to build a house, from which *khiṭaṭ al-Kūfah* and *al-Baṣrah* were derived. Someone marked [*ikhṭaṭṭa*] [a piece of] land if he chose a place and enclosed it with a wall, plural is marks (*khiṭaṭ*). And the person may choose to mark and build his building on a land that does not owned [by any person].
>
> Line (*khaṭṭ*): the long track of an object, plural is lines (*khuṭūṭ*)… lined something to draw it with lines: [he] wrote it by a pen or anything else… and lining (*takhṭīṭ*) drawing lines.

خَطَّها لنفسه خطّا واختطها: و هو أن يُعَلِّم عليها علامة بالخط ليُعْلم أنه قد اختارها ليبنيها دارا، ومنه خِطَطُ الكوفة والبصرة. واختطَّ فلان خطة إذا تحَجَّر موضعا و خطَّ عليه بجدار و جمعها الخِطَطُ. والدار يَخْتَطُّها الرجل في أرض غير مملوكة ليتحجرها و يبني فيها.[200]

الخَطُّ: الطريقة المستطيلة في الشيء و الجمع خطوط...خطَّ الشيء يخُطُّه خطّا: كتبه بقلم أو غيره... و التخطيط: التسطير.[201]

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[199] J.W. Fück, 'Ibn Manẓūr', in *Encyclopaedia of Islam, Second Edition*, ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. III:864b, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/ibn-manzur-SIM_3284> [accessed 3 December 2017].

[200] Muḥammad b. Mukarram al-Afrīqī al-Miṣrī Ibn Manẓūr, *Lisān al-ʿArab*, 15 vols (Beirut: Dār Ṣādir, 1990), pp. VII, 288.

[201] Ibn Manẓūr, *Lisān al-ʿArab*, pp. VII, 287.

In the context of building, the drawn group of lines refers to a draft drawing showing the layout of the building either in a two-dimensional or three-dimensional sketch. It is not likely to be a detailed floor plan with a fixed grid as we might recognise from tenth/sixteenth-century Central Asian and Ottoman plans, but rather a kind of drawn plan in accordance with local sciences and knowledge.

The other term of interest here is *ṣawwara* (v. صَوَّرَ, n. *ṣūrah* صورة), which is frequently collocated with other two nouns: *hay'ah* (shape, هيئة) and *ṣifah* (mold, صفة). Ibn Manẓūr states:

> [I] formed something (*taṣawwartuhu*): imagined its form as it appeared to me. Forms (*al-taṣāwīr*): statues. Form (*ṣūrah*): in Arabic speech, could mean its literal meaning (superficial characteristic), and could also mean the actual shape/essence of an object or its character.
>
> تصورت الشيء: توهمت صورته فتصور لي. والتصاوير: التماثيل. الصورة: ترد في كلام العرب على ظاهرها و على معنى حقيقة الشيء و هيئته و على معنى صِفَتِه.[202]

Al-Fayyūmī, Cairene scholar and linguist (d. 770/1368),[203] defines *ṣūrah* as:

> The form: statue, its plural is forms (*ṣuwar*). Formed something: imagined its form and shape in mind so it is formed.
>
> الصورة: التمثال و جمعها صور، و تصورت الشيء مثّلتُ صورته و شكله في الذهن فتصوّر هو.[204]

Sawwarū in the cited narratives could likely mean one of three things based on the lexical meaning of the word *ṣūrah*. In al-Ikhshīdī's situation, it could mean drawn plans, or possibly top-view and side-view drawings that show on a flat surface how the building would look from different angles. It could also refer to a three-dimensional model of the palace and attached structures. In Ibn Tūlūn's Mosque example, it is clear that *ṣūrah* could not be interpreted as a three-dimensional model, given that the prisoner drew his plans on skins, clearly indicating a two-dimensional sketch.

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[202] Ibn Manẓūr, *Lisān al-ʿArab*, pp. IV, 473.
[203] Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah*, pp. I, 314.
[204] Aḥmad b. Muḥammad al-Fayyūmī, *al-Miṣbāḥ al-Munīr fī Gharīb al-Sharḥ al-Kabīr lil-Rāfiʿī,* ed. by ʿAbd al-ʿAẓīm al-Shinnāwī, 2nd edn, 2 vols (Cairo: Dār al-Maʿārif, 1977), pp. I, 350.

Another pre-Mamluk example shows that particular drawings could be created for craftsmen for the manufacture of structural elements. A draft of a palace door by Ibn al-Razzāz al-Jazarī in his work *al-Jāmiʿ bayn al-ʿIlm wa al-ʿAmal* suggests that the practice of drawing geometric shapes that together would form an architectural structure was present during the seventh/thirteenth century. Al-Jazarī's work originated in northern Greater Syria (Diyār Bakr), and two copies of his book are known to have been made during the Mamluk period, one in 715/1315 in Egypt or Syria[205] and the other in 755/1354 in Egypt,[206] suggesting that his book was of interest to Cairene students or practitioners. The relevant drawing was included in a section devoted to the manufacture of a palace double door (*miṣrāʿayn* مصراعين) (Figure 1.22). He provided detailed drawings to explain the structure of each of the three component parts of the door. The first section describes the outer frame of the door; it was 18 shibrs (4.50 m) high, and each of the two door panels was 6 shibrs (1.50 m) wide.[207] The middle of each door panel featured interlocking hexagonal and octagonal stars surrounded by a frame of inscribed text and had a floral pattern in the background. The second section explains the composition of the integrated geometrical shapes and the method of casting the suggested pattern. The third part shows the outer frame of inscriptions and the floral pattern in more detail. This section represents detailed technical drafts for an architectural element with clear, simple instructions for craftsmen to follow. For example, in the second part, Al-Jazarī describes how carpenters can make the geometrical shapes that fit together to form the middle area of the door (Figure 1.23). He provides the instructions as if he had made the door himself:

> Then I made iron nails, each one four fingers long, its top not flat but shaped like a small date kernel laid across the top of the nail. Then I took an impression of the hexagonal pattern in the sand, as the founders do in the foundry (*ālat al-ṣabb*). Then I lifted the pattern from the sand and into the impression of its underside I pushed twelve nails so that the date kernel at the top of each nail almost touched the sand, but with a narrow gap left between it and the sand. Then, I put the parts of the apparatus

[205] al-Jazarī, *al-Jāmiʿ (published)*, p. m(40).
[206] Ismāʿīl b. al-Razzāz al-Jazarī, *The Book of Knowledge of Ingenious Mechanical Devices (Kitāb fī Maʿrifat al-Ḥiyal al-Handasiyyah)*, ed. by Donald R. Hill (Dordrecht ; Boston: Reidel, 1974), p. 5. This manuscript is in the library of Topkapi Serai, Istanbul, no. 3606.
[207] Ismāʿīl b. al-Razzāz al-Jazarī, *al-Jāmiʿ bayna al-ʿIlm wa al-ʿAmal al-Nāfiʿ fī Ṣināʿat al-Ḥiyal (Topkapi MS 3742)* (Ankara: Kültür Bakanlığı, 1990), p. 327.

together again and poured the molten brass into the form, covering the heads of the nails so that it became a hexagonal star.[208]

ثم اتخذت مسامير من حديد طول كل مسمار أربع أصابع و رأسه ليس بموضوع بل كأنه نواة تمرة صغيرة معارضة على رأس المسمار. ثم ختمت المثال المسدس في الرمل على ما يصنع الصبابون في آلات الصب، و رفعت المثال من الرمل وغرزت في أثر ظهره من الرمل عند الزوايا اثنى عشر مسمارا حتى كادت نواة رأس كل مسمار تماس الرمل بل يبقى بينها و بين الرمل خلل قريب، ثم أعدت الآلة بعضها الى بعض وصببت الشبه المذاب في الآلة فتلبس على رؤوس المسامير و صار خاتما مسدسا.[209]

This example is cited by Hasan Abd al-Wahhab, though he was unable to identify the author of the manuscript at his time.[210] Hooman Koliji also cites this example in his discussion of the notion of repeated units, in which the repetition of a basic geometrical unit forms a larger pattern. Like Cipriani, Koliji concludes that craftsmen who were expected to manufacture this door would have already been familiar with repetitive patterns, as the drafts provided by al-Jazarī are only partial and represent part of a larger pattern left to the artisans' imagination.[211] Al-Jazarī's door design shows that plans and drawings could be made for decorations too. Interestingly, al-Jazarī's door drawing also shows also a top and frontal view of the knob, and a sketch of one of the abovementioned nails (Figure 1.24).[212] In other sections of the same book, there are drawings for devices with three-dimensional representations of the parts of the device (Figure 1.25).[213] Drafting from different perspectives may also have been paralleled in architectural drawings of buildings.

Moving to examples from the Mamluk period, we have references to drawings and models that were prepared for building purposes. Two of these come from the early tenth/sixteenth century and provide examples of drawings and models made by the *muhandisīn* al-Ḥaṣkafī and al-Ṣayyād. Putting these references in chronological order, I will begin with al-Ẓāhir Baybars' mosque, then move to the bath that was built under the supervision of emir Ayd Ghudī, al-Ḥaṣkafī's proposal for the Adana mosque, and Alexandria's enclosure drawn by al-Ṣayyād.

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[208] al-Jazarī, *al-Ḥiyal al-Handasiyyah*, pp. 192-193.
[209] al-Jazarī, *al-Jāmiʿ (published)*, p. 473.
[210] Abd al-Wahhab, 'al-Rusūmāt al-Handasiyyah li-al-ʿImārah al-Islāmiyyah', p. 121.
[211] Cipriani, 'Development of construction Techniques', p. 32; Hooman Koliji, *In-Between : Architectural Drawing and Imaginative Knowledge in Islamic and Western Traditions* (London: Routledge, 2016), pp. 146-147.
[212] al-Jazarī, *al-Jāmiʿ (Topkapi MS 3742)*, p. 332.
[213] al-Jazarī, *al-Jāmiʿ (Topkapi MS 3742)*, pp. 16, 133, 136.

Al-Maqrīzī states that in 665/1266, Sultan al-Ẓāhir Baybars al-Bunduqdārī (r. 658-676/1260-1277) went to the location where his proposed mosque was to be built in Cairo. Some other unidentified companions surveyed the site (measured, *qāsū* قاسوا) and presented the sultan with a drawing of how the mosque would look. Sultan al-Ẓāhir requested that the door of the mosque be the same as the one from his *madrasah*, built two years previously in Cairo:

> [On] Thursday 8th Rabīʿ al-Ākhar [665] (7th February 1264), the Sultan rode [his horse], and accompanied by his *khawāṣṣ* [mamluks], his minister al-Ṣāḥib Bahāʾ al-Dīn ʿAlī b. Ḥannā and judges, and went to Qaraqūsh Maydān. [The Sultan] discussed [the site] matters, measured it, set up its affairs and the matter of its construction. [He] issued instructions to endow the rest of the *maydān* (open space) to the benefit of the mosque. The shape of the mosque [was] drawn (*rusima*) before him, and he indicated that its door should be the same as that [of] al-Madrasah al-Ẓāhiriyyah, and [to build] a dome on [top of] its niche (*miḥrāb*) as large as [*Imām*] al-Shāfiʿī's Dome.
>
> لما كان يوم الخميس ثامن شهر ربيع الآخر ركب السلطان و صحبته خواصه و وزيره الصاحب بهاء الدين علي بن حنّا و القضاة ونزل إلى ميدان قراقوش وتحدث في أمره وقاسه و رتب أموره وأمور بنائه و رسم أن يكون بقية الميدان وقفا على الجامع و رُسِم بين يديه هيئة الجامع و أشار أن يكون بابه مثل المدرسة الظاهرية، و أن يكون على محرابه قبة على قدر قبة الشافعي.[214]

This narrative is cited by Abd al-Wahhab in his survey of Islamic architectural drawings without analysis.[215] The text suggests that an image was drawn and presented to Sultan al-Ẓāhir Baybars. It may also suggest that a combination of top and side views were provided, not just a horizontal distribution of spaces; the word '*hay'ah*' (shape) refers to the three-dimensional shape of an object, and in this example, the phrase '*hay'at al-jāmi'*' (the shape of the mosque) likely refers to portrayals of its height, width, and depth. This interpretation could be supported by the sultan's stipulation that the door be the same as his school's door, and the dome be as large as that of Imam al-Shāfiʿī. Another note regarding this text is that the verb 'drawn' (*rusima* رُسِمَ) is the passive form of the verb 'drew' (*rasama* رَسَمَ), so the drawing or model was likely made

[214] al-Maqrīzī, *al-Khiṭaṭ* pp. IV, 95-96.
[215] Abd al-Wahhab, 'al-Rusūmāt al-Handasiyyah li-al-ʿImārah al-Islāmiyyah', p. 116.

by an expert drafter and not the sultan himself.[216] The use of the word also invokes a particular connection to buildings, as Al-Fayyūmī's dictionary defines the term *rasama* as follows:

> [I] drew: for building a draw, [I] made a mark… mark: track, plural is *rusūm*.
>
> رَسَمْتُ: للبِناء رسما أَعْلَمْتُ... والرَّسْمُ: الأثر، والجمع رسوم.[217]

In the above narrative, this would seem to mean that (*rasama* رسم) indicated that an expert prepared drawings for the building project. Who this expert was is unclear; he may have been an expert draughtsman or a *muhandis*, or a builder with developed drafting skill. In any case, they would likely have been aided in their drawing by a theoretical knowledge of geometry and drafting.

Another example dating to the late seventh/thirteenth century is that of a bath in Hebron. The bath was built under the supervision of the emir ʿAlā' al-Dīn Ayd Ghudī al-Aʿmá (d. 693/1294), who supervised many building projects in Jerusalem and Hebron. He is credited with the flourishing of endowments and doubling the area's revenues. He was known to be very clever (*min adhkiyā' al-ʿālam* من أذكياء العالم), and when he drew the foundation of the Hebron bath, he spread gypsum over the floor to show his plan to the craftsmen:

> It has been said that: he [Ayd Ghudī] marked *(khaṭṭa)* a bath in the city of Hebron, peace be upon him, and drew (*rasama*) the foundation (*asās*) with his own hand and scattered lime [over the floor to show] artisans.
>
> يقال عنه: أنه خَطَّ حماما في بلد الخليل عليه السلام، ورسم الأساس بيده وذره بالكلس للصناع.[218]

As Abd al-Wahhab explains, the method mentioned here - scattering lime over the floor to form the outlines of the suggested plan - was used by Mamluk builders and remains in use today.[219] Ayd Ghudī was not an expert builder, but acquired building

[216] It is unlikely that the sultan drew the image himself as Behrens-Abouseif has intrepreted the text, see: Behrens-Abouseif, 'Muhandis, Shād, Mu'allim', p. 304.
[217] al-Fayyūmī, *al-Miṣbāḥ al-Munīr*, pp. I, 227.
[218] al-Ṣafadī, *al-Wāfī*, pp. IX, 272.
[219] Abd al-Wahhab, 'al-Rusūmāt al-Handasiyyah li-al-ʿImārah al-Islāmiyyah', p. 116.

experience during his supervision of *awqāf* and construction. Therefore, his drawn outline could be viewed as an attempt made by a supervisor who was largely exposed to the experience of construction, but was not a specialist. This difference between a specialist and non-specialist with regards to the visual representation of construction would be more visible in the following example. As for the lexical analysis for the terms employed in this text, the term *rasama* in this example likely refers to a floor plan giving a general idea about the distribution of spaces in the bath, as reflected in the word 'foundation' (*al-asās* الأساس). The use of the phrase 'with his hand' (*bi-yadihi* بيده) confirms that he himself made the drawing, and seemingly on site. This drawn outline was not necessarily the actual foundation outline to real scale, but could have been a draft of the design concept in smaller scale on site. In terms of the use of the term *khaṭṭa*, as previously discussed, it is likely to mean that emir Ayd Ghudī placed an enclosure around the land where the bath was to be built.

In the case of three-dimensional models, we have surviving reports of high-ranking builders directly involved in drafting and related practices. One such model was made by Yūsuf b. ʿAlī al-Ḥaṣkafī, *muʿallim al-sulṭān* in Aleppo (d. 934/1528). Al-Ḥaṣkafī's biography emphasises that he was of high reputation as an expert *muhandis* and builder who was able to create a 'model' of whatever he was asked to build for high-ranking people upon request (كانت له الدربة الحسنة في تصوير ما يريد عمارته من جامع أو دار ونحوهما لمن أراد ذلك من الأكابر).[220] He was also known for his considerable expertise in building grand projects with marvellous structures, including a tomb structure (*turbah*) for Ibn al-Ḥanbalī's grandfather and al-Nārinjah Mosque's *miḥrāb* under Ibn al-Ḥanbalī's grandfather's patronage:

> كانت له قدم راسخة في الهندسة والعمائر العظام، كالتربة التي أنشأها لجدي الجمال الحنبلي خارج باب المقام، فوضع له على بابها النقوش العجيبة و الصنائع الغريبة مع الفسقية المقلوبة على الطريقة الحسنة المرغوبة، وكالمحراب الذي أنشأه له أيضا بالمسجد المعروف قديما بمسجد النارنجة المجاور للصباغين الذي كانت له محكمة و هو محراب عجيب غريب.[221]

Al-Ḥaṣkafī modelled a mosque to be built on the site of the fortress at Adana, which was a cause of conflict and war between the Ottoman Sultan Bayazīd II b. Othman (r. 886-918/1481-1512) and Mamluk Sultan Qāytbāy (r. 872-901/1468-96).

[220] Muḥammad b. Ibrāhīm Ibn al-Ḥanbalī, *Durr al-Ḥabab fī Tārīkh Aʿyān Ḥalab,* ed. by Maḥmūd ʾAḥmad Fākhūrī and Yaḥyá Zakariyā ʿIbārah, 2 vols (Damascus: Wizārat al-Thaqāfah, 1972), pp. II, 595.

[221] Ibn al-Ḥanbalī, *Durr al-Ḥabab*, pp. II, 595.

Al-Ḥaṣkafī accompanied the Ḥanafī judge al-Muḥibb Maḥmūd b. Ajā to the fortress at Adana and prepared a model to estimate the cost of turning it into a congregational mosque:

> [Then,] Sultan Qāytbāy sent [a request] to Aleppo's governor to send al-Muḥibb Maḥmūd bin Ajā, the Ḥanafī chief judge in Aleppo, and *al-mu'allim* Yūsuf, the sultan's *mu'allim* there [in Aleppo] to the aforementioned fortress [Adana Fortress] to estimate how much money would be required to turn it into a congregational mosque, and he did so. Upon [the judge's] return from Adana, *al-mu'allim* Yūsuf prepared a model for the mosque (*ṣūrat al-jāmi'*) in a way that attracted attendees' wonderment and eyes. When [Qāytbāy] learned about it, he issued his orders [to start] the building work.
>
> فأرسل السلطان قايتباي إلى كافل حلب بأن يرسل المحب محمود بن أجا قاضي الحنفية بحلب إلى القلعة المذكورة، ومعه المعلم يوسف معلم السلطان بها، فينظر إلى كم تحتاج من المال لتكون جامعا ففعل. فلما عاد من أدنة صور له المعلم يوسف صورة الجامع الذي سيكون على أسلوب يعجب ناظريه ممن كانوا حاضريه، فلما وقف عليها برز أمره بالعمارة.[222]

The term 'form' (*ṣūrah*) here likely refers to a model assembled to give an impression of how the suggested mosque would look in three dimensions, which would have required mathematical care to be built correctly. The amazement of the attendees may suggest that the model was fairly accurate, as the more detail it featured, the more impressive it would have been. Crucially, however, this account contains an affirmation that it was the *mu'allim al-sulṭān* himself who prepared the model. In other examples, such as the aforementioned mosque of Sultan al-Ẓāhir Baybars, it is unclear who was charged with creating the model or building drawings. That it was Al-Ḥaṣkafī who modelled the building indicates that modelling and drafting was not exclusively the task of specialists, but rather was a skill acquired by high-ranking building professionals working on major projects.

Another example of the active involvement of builders in drafting also comes from the later Mamluk period, namely the reign of Sultan Qānṣawh al-Ghawrī (r. 906-922/1501-1516). As part of the preparations to reinforce Alexandria's fortifications

[222] Ibn al-Ḥanbalī, *Durr al-Ḥabab*, pp. II, 596.

with towers, expert builder al-Muhandis Ḥasan b. al-Ṣayyād drew an outline of the city of Alexandria with lime on the floor, which Sultan al-Ghawrī came to see:

> On Wednesday, 29th [Shaʿbān, 916] (30th November, 1510), the Sultan came down [from his citadel] and went towards al-Maṭariyyah to the mausoleum of al-ʿĀdil. The *muʿallim* Ḥasan bin al-Ṣayyād al-Muhandis drew (*khaṭṭa*) with lime on floor the frontiers of Alexandria city and the number of its towers and gates, and the shape of its walls, and its lighthouse that used to be there, as well as its length and width [of the city]. The Sultan came for this purpose, observed it then returned to his citadel on the same day.

> وفي يوم الأربعاء تاسع عشريه نزل السلطان و توجه إلى نحو المطرية عند تربة العادل، وكان المعلم حسن بن الصياد المهندس خَطَّ له بالجبس في الأرض صفة مدينة ثغر الإسكندرية و عدد أبراجها وأبوابها وهيئة سورها والمنار التي كان بها، و قدر عرضها و طولها، فنزل السلطان بسبب ذلك حتى تأملها و تفرج عليها ثم عاد إلى القلعة من يومه.[223]

This example, also cited by Abd al-Wahhab, shows another instance of a builder creating architectural drawings, albeit informal ones.[224] In depicting the fortifications, Ḥasan al-Ṣayyād may have made illustrative drawings from different angles; three terms that appear in this narrative, namely '*ṣifah* صفة', '*hay'ah* هيئة', and '*ṣūrah* صورة',[225] suggest drawings that used multiple perspectives. Drawings from different points of view would likely have helped create a mental image of the existing fortifications, allowing Sultan al-Ghawrī to decide on the areas in need of reinforcement and suggest positions for new towers to be built.

The available evidence, both written and physical, strongly suggests that building models and plans were used during the Mamluk period. These preparatory materials, which likely included both drawn drafts and built structures, would have required some level of theoretical knowledge and technical skill to produce. From the biographies of a few Mamluk builders, namely Al-Ḥaṣkafī and Ḥasan al-Ṣayyād, we can also see that builders were actively involved in the creation of plans and models.

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[223] Ibn Iyās, *Badāʾiʿ al-Zuhūr*, pp. IV, 196.
[224] Abd al-Wahhab, 'al-Rusūmāt al-Handasiyyah li-al-ʿImārah al-Islāmiyyah', p. 117.
[225] Ibn Iyās, *Badāʾiʿ al-Zuhūr*, pp. IV, 196. There is another interpretation for this text that it is ṣuwarihā (pl.) صورها not sūrihā سورها on the basis that it refers to the shape of towers and gates.

This indicates not only that models existed, but also that having technical skills in drafting plans for construction work was seen as part of the work of an expert builder.

1.5 *Mi'mār*

From the evidence provided by builders' biographies, the complexity of Mamluk buildings, and references to models in literary sources, it seems evident that a certain subclass of *muhandisīn* had both theoretical and practical building knowledge. This is not a category only visible in retrospect, but rather one identifiable in contemporary literature. Linguistic evidence suggests that these builders were recognised in the Mamluk period as having a particular professional identity. The use of the term *mi'mār* (معمار) to refer to a specific type of builder began to appear frequently in ninth/fifteenth century Mamluk sources. Modern scholarship has typically argued that the *mi'mār* was a low-status builder, or at most, a mason. However, here I propose that in the Mamluk context, the term *mi'mār* in Egypt described an expert whose title was interchangeable with *muhandis* until the end of Mamluk period. The appearance of the specific term *mi'mār* to refer to a builder with both theoretical and practical knowledge is evidence that these workers were seen as belonging to a professional identity separate from either common builders or theoretical scientists. The term *mi'mār* also appeared in other Islamic regions, and inscriptions on a few buildings in Greater Syria and Central Asia use this term before the ninth/fifteenth century.[226] While existing literature on the term *mi'mār* in Mamluk Egypt has tended to assume that the position was low-status, this section will re-evaluate this conclusion in light of available evidence from endowment deeds and literary sources.

Modern scholars, including Mayer, Behrens-Abouseif, Rabbat, and Wahby, have typically argued that the term *mi'mār* referred to a very low-status builder. According to Mayer, *mi'mār* is the lowest of the three terms used by primary sources to refer to builders: *muhandis* (مهندس), *bannā'* (بنّاء) and *mi'mār* (معمار). As evidence, he cites the aforementioned endowment deed of Sultan Qāytbāy, in which the *mi'mār* received a monthly payment of 200 dirhams, the same as the marbler (*murakhkhim*, مرخّم) and muezzin (مؤذن) and less than the doorkeeper (*bawwāb*, بوّاب).[227] The same evidence is used by Behrens-Abouseif to argue for the low status of the *mi'mār* in

[226] Mayer, *Islamic Architects*, pp. 25, 44, 85.
[227] Mayer, *Islamic Architects*, p. 25.

Mamluk society. She suggests that the *mi'mār* was essentially a repairman appointed to fix the foundation on regular basis.[228] This view is shared by Rabbat and Wahby.[229]

There are several problems with this low-status portrayal of the *mi'mār*. One is that Sultan Qāytbāy's endowment deed is only one document, and additional cases show that salaries were not even across foundations. The *mi'mār* appointed at the endowment foundation of Jamāl al-Dīn al-Ustādār in 852/1448 received 60 dirhams per month, the same as the marbler. Three decades later, in 909/1503, the same position at another endowment was entitled to as much as 675 dirhams per month, or three times the payment for the marbler at the same foundation.[230] In addition, we should take into consideration that the work of a *mi'mār*, carpenter, plumber, or marbler was part-time; a low salary might simply indicate that there was less work, not that the work was low-status. A foundation appointment would not have prevented these workers from taking outside work so long as they fulfilled their duties for the endowment. The deed used as evidence by Mayer and later scholars explicitly states that the *mi'mār* should attend the day of building works, implying that they did not attend on other days:

> [*Mi'mār*] has to attend the day of building [works] in the mentioned endowment to supervise craftsmen/artisans (*ṣunnā'*) and encourage them during work, and to prevent them from idleness.
>
> يحضر يوم العمارة في الوقف المذكور ليتعهد الصناع في العمل ويحثهم عليه.[231]

This indicates that the *mi'mār* neither lived permanently in the foundation, nor had to attend it every day, but needed to appear only on the days of building works. Moreover, it describes the role of the appointed *mi'mār* as primarily supervisory, suggesting a professional status above that of an ordinary mason or craftsman.

There are two main types of sources that include the term *mi'mār* in a ninth/fifteenth- century Mamluk context: literary sources and endowment deeds. Here, I have ordered them chronologically according to composition date, as in a few narratives, a later source simply retells an event recorded in an earlier source. In some of these cases, the same individual whose title was *muhandis* in the earlier source is called *mi'mār* in the later source, indicating a clear transition of meaning between these

[228] Behrens-Abouseif, 'Muhandis, Shād, Mu'allim', p. 294.
[229] Rabbat, 'Artists in Mamluk Society', p. 32; Wahby and Montasser, 'The Ornamented Domes', p. 12.
[230] WA 882q dated 909/1503.
[231] WA 886q.

two terms. However, in other cases, later copies retain the terms used in the earlier source. This perhaps is one reason for the coexistence of the terms *miʿmār* and *muhandis* in Mamluk sources from the mid-ninth/fifteenth century until the end of the Mamluk period.

In literary sources, the term *miʿmār* appears in the biographies of individuals involved in royal building projects. One example is the biography of al-Ḥujayj al-Miʿmār al-Ṣāliḥī (الحُجيج المعمار الصالحي) (d. 762/1360).[232] The earliest narrative recorded by Shams al-Dīn al-Shujāʿī (d. 745/1344) states that Sultan al-Malik al-Ṣāliḥ Ismāʿīl b. al-Nāṣir Muḥammad (r. 743-6/1342-5) ordered his *shādd al-ʿamāʾir* Āqjubā and his *muhandis* al-Ḥujayj to travel to Hama to see the Dahshah Hall built by Abū al-Fidāʾ, the governor of Hama, and to build a similar one at his citadel in Cairo. He then says that al-Ḥujayj was assigned to the building of al-Duhayshah Hall (قاعة الدهيشة) at Cairo Citadel:

> و فيها استجد السلطان الملك الصالح الدهيشة بالقلعة و كانوا عرفوا السلطان أن عماد الدين صاحب حماة عمر له دهشة بحماة ما عمل مثلها، فرسم لآقجبا شاد العمائر و الحجيج المهندس أن يسافروا و يعاينوها ويحضروا يعملوا مثلها.[233]

This narrative was later cited by al-Maqrīzī, and perhaps keeping to the language of his source, he also refers to al-Ḥujayj as *al-muhandis*:

> استجد السلطان بالقلعة عمارة جليلة و أقام آقجبا الحموي شاد العمائر و قصد بذلك محاكاة عمارة الملك المؤيد بحماة المعروفة بالدهشة فتوجه آقجبا و ابجيج[234] المهندس إلى حماة حتى عرفا ترتيبها.[235]

A later account by Waliyy al-Dīn al-ʿIrāqī (d. 826/1423) states that al-Ḥujayj al-Miʿmār al-Ṣāliḥī *muhandis al-sulṭān* died in 762/1360:

> وفيها [مات] بالقاهرة الحجيج المعمار الصالحي مهندس السلطان.[236]

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[232] Abdallah Kahil, 'The Architect/s of the Sultan Hasan Complex in Cairo', *Artibus Asiae,* 66: 2 (2006), 170. Al-Ḥujayj previously been known under the name of Ibjīj or Abjīj (ابجيج) due to misprint in the earliest publication of the Khitat and retained in the later editions.

[233] Shams al-Dīn al-Shujāʿī, *Tārīkh al-Malik al-Nāṣir Muḥammad b. Qalāwūn al-Ṣāliḥī wa Awlādihi,* ed. by Barbara Schäfer (Vīsbādn: Frānz Shtāynar, 1977), p. 273.

[234] Kahil explained in his article that al-Maqrīzī misspelled al-Ḥujayj's name as Ibjīj. Kahil, 'The Architect/s of the Sultan Hasan', p. 170.

[235] al-Maqrīzī, *al-Sulūk,* pp. III, 387.

[236] Walī al-Dīn Abī Zurʿah Aḥmad b. ʿAbd al-Raḥīm al-ʿIrāqī, *al-Dhayl ʿAlá al-ʿIbar fī Khabar man ʿAbar,* ed. by Sāliḥ Mahdī ʿAbbās, 3 vols (Beirut: Muʾassasat al-Risālah, 1989), pp. I, 78.

This is among the earliest available clear uses of the term *miʿmār* in Egypt to refer to a practitioner of the building craft. By the time this narrative was written, al-Ḥujayj was recognised as a *miʿmār*. Particularly notable is the fact that al-Ḥujayj is referred to as both a *muhandis* and *miʿmār*. It seems unlikely that *miʿmār* could refer to a qualification above *muhandis*, as being a *muhandis* employed by the sultan was already a very high-status position. The use of both terms may suggest, therefore, that *miʿmār* indicated a subtype of *muhandis* and an emerging special identity for expert builder *muhandisīn*.

Miʿmār was not the only alternative title used to refer to this special position: in other Mamluk literary sources, the terms *muʿallim al-sulṭān* (معلم السلطان), *muʿallim al-muʿallimīn* (معلم المعلمين), and starting from the second half of the ninth/fifteenth century, *muʿallim al-miʿmāriyyah* (معلم المعمارية), were also applied. The use of these titles was not fixed but varied from a chronicler to another, and could even vary within the treatises of the same chronicler. The most prominent example of the varying use of this term concerns the members of the al-Ṭūlūnī family,[237] who with only temporary interruptions were appointed to that position at the Sultanate court for more than a century. The members of the family were referred to as expert *muhandisīn* and carried out several royal building projects in Cairo and abroad. The last known member of the family, al-Shihābī Aḥmad b. al-Badrī al-Ṭūlūnī al-Muhandis (الشهابي أحمد بن البدري الطولوني المهندس), was among those who moved to Istanbul with the Ottoman Sultan Selim I (r. 918-26/1512-20). It is likely he was sent to build a *madrasah* similar to that of Sultan al-Ghawrī in Cairo.[238] Ibn Taghrībirdī (d. 874/1469), in his book *al-Nujūm al-Zāhirah*, refers to the title of the official position given to al-Badrī Ḥasan b. al-Ṭūlūnī (d. 923/1517) by Sultan al-Ashraf Īnāl in 857/1453 as '*muʿallim al-miʿmāriyyah*':

> Then, Sultan [al-Ashraf Īnāl] honoured a big group [of people/officers] with many positions, one of whom was al-Badrī Ḥasan b. al-Ṭūlūnī [who was] appointed *muʿallim al-miʿmāriyyah*.

[237] For further information on al-Ṭūlūnī family: Behrens-Abouseif, 'Muhandis, Shād, Mu'allim', pp. 296-299.
[238] Ibn Iyās, *Badāʾiʿ al-Zuhūr*, pp. V, 182, 229.

ثم خلع السلطان [الاشرف اينال] على جماعة كبيرة بعدة وظائف منهم البدري حسن بن الطولوني باستقراره معلم المعمارية.[239]

Ibn Taghrībirdī refers to the same al-Badrī Ḥasan in 866/1462 as '*muʿallim al-sultan*' (معلم السلطان):

> Sultan [al-Ẓāhir Khushqadam] honoured al-Badrī Ḥasan b. al-Ṭūlūnī *muʿallim al-sulṭān*.

وخلع [السلطان الظاهر خشقدم] على البدري حسن بن الطولوني معلم السلطان.[240]

This same event is rephrased by Ibn Iyās as the following:

> Sultan [al-Ẓāhir Khushqadam] honoured al-Badrī Ḥasan b. al-Ṭūlūnī *muʿallim al-muʿallimīn*.

و اخلع السلطان [الظاهر خشقدم] على البدري حسن بن الطولوني معلم المعلمين.[241]

Here, the term '*muʿallim al-miʿmāriyyah*' was used to refer to the same individual, al-Badrī Ḥasan, who was elsewhere referred to as '*muʿallim al-sulṭān*' and '*muʿallim al-muʿallimīn*' for the same occasion. The term '*muʿallim al-miʿmāriyyah*' also appears several times in Taghrībirdī's book *Ḥawādith al-Duhūr* for other individuals who held the same official position at the Sultanate court, including some who were not members of al-Ṭūlūnī family, including the emirs Ibn Iskandar al-Faysī[242] and Ibn al-Kuwayz.[243] In 854/1450, Ibn Taghrībirdī states that Sultan al-Ẓāhir Jaqmaq captured ʿAlī b. Iskandar al-Faysī '*muʿallim al-miʿmāriyyah*' (d. 873/1469):

قبض السلطان [الظاهر جقمق] على علي بن إسكندر الفيسي معلم المعمارية و سلمه إلى الوالي جاني بك... واستقر عوضه في المعلمية يوسف شاه العلمي.[244]

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[239] Abū al-Maḥāsin Yūsuf Ibn Taghrībirdī, *al-Nujūm al-Zāhirah fī Mulūk Miṣr wa al-Qāhirah*, 16 vols (Cairo: Maṭbaʿat Dār al-Kutub al-Miṣriyyah, 1929-1972), pp. XVI, 63.
[240] Ibn Taghrībirdī, *al-Nujūm al-Zāhirah*, pp. XVI, 267.
[241] Ibn Iyās, *Badāʾiʿ al-Zuhūr*, pp. II, 390.
[242] al-Sakhāwī, *al-Ḍawʾ al-Lāmiʿ*, pp. V, 192.
[243] al-Sakhāwī, *al-Ḍawʾ al-Lāmiʿ*, pp. X, 339.
[244] Abū al-Maḥāsin Yūsuf Ibn Taghrībirdī, *Ḥawādith al-Duhūr fī Madá al-Ayyām wa al-Shuhūr,* ed. by Fahīm Muḥammad Shaltūt (Cairo: al-Majlis al-Aʿlá lil-Shuʾūn al-Islāmiyyah, Lajnat Iḥyāʾ al-Turāth al-Islāmī, 1990), pp. I, 293.

In 856/1452, Ibn Taghrībirdī states that Yūsuf Shāh al-ʿAlamī Dāwūd b. al-Kuwayz (d. 876/1471) was appointed as '*muʿallim al-sulṭān wa kabīr al-miʿmāriyyah*' (معلم السلطان و كبير المعمارية) after the death of Abū Bakr al-Muṣāriʿ:

> Abū Bakr al-Muṣāriʿ died… and hold that after him Yūsuf Shāh al-ʿAlamī *muʿallim al-sulṭān wa kabīr al-miʿmāriyyah*.

و توفى أبو بكر المصارع... وتولى ذلك من بعده يوسف شاه العلمي معلم السلطان وكبير المعمارية.[245]

Later, Ibn Ṭūlūn (d. 953/1546) stated in his chronicle *Mufākahat al-Khillān* that during the events of 897/1492, Sultan Qāytbāy ordered his deputy in Damascus to accompany judges and '*miʿmār al-sulṭān*' (معمار السلطان) to check a cave for golden treasure:

> A declaration delivered to the deputy of the citadel of Damascus [including orders] to accompany a judge from each *madhhab* (school of law) and accepted witnesses, and [to also] accompany *miʿmār al-sulṭān* and masons (*ḥajjārīn*). [They] have to travel to the village Kafr Dānis to dig in a mountain there that has a treasure locked up in a cave.

ورد مرسوم إلى نقيب قلعة دمشق بأن يأخذ من كل مذهب قاضيا و شهود معتبرين وأن يأخذ معمار السلطان والحجارين وأن يسافروا إلى قرية كفر دانس وأن يحفروا في جبل هناك مغارة بها مطلب.[246]

By the late ninth/fifteenth century, the term *miʿmār al-sulṭān* (معمار السلطان) started to refer to the position that had previously been called '*muʿallim al-sulṭān*' (معلم السلطان)[247] or '*muhandis al-sulṭān*' (مهندس السلطان).[248] This is a clear indication that in that century, *miʿmār* came to designate the same set of duties and qualifications previously meant by the two other terms.

Other examples of this term come from two different chronicle accounts of the restoration of the al-Ḥaram al-Sharīf in Mecca in 826/1423. Quṭb al-Dīn al-Nahrawālī

[245] Ibn Taghrībirdī, *Ḥawādith al-Duhūr* pp. II, 390.
[246] Shams al-Dīn Muḥammad b. ʿAlī Ibn Ṭūlūn, *Mufākahat al-Khillān fī Ḥawādith al-Zamān,* ed. by Khalīl al-Manṣūr (Beirut: Dār al-Kutub al-ʿIlmiyyah, 1998).
[247] Ibn Taghrībirdī, *al-Nujūm al-Zāhirah*, pp. XV, 387.
[248] al-ʻIrāqī, *al-Dhayl ʻalá al-ʻIbar*, pp. I, 78.
Abū al-Maḥāsin Yūsuf Ibn Taghrībirdī, *al-Manhal al-Ṣāfī wa al-Mustawfī baʿda al-Wāfī,* ed. by Muḥammad Muḥammad Amīn, 13 vols (Cairo: al-Hayʾah al-Miṣriyyah al-ʿĀmmah lil-Kitāb, 1984), pp. II, 283.

(d. 990/1583), a historian from Ottoman Mecca, mentions that al-Miʿmār Jamāl al-Dīn Yūsuf al-Muhandis (المعمار جمال الدين يوسف المهندس) (fl. 820s/1410s) was a companion to the emir Muqbil al-Qudaydī al-Ashrafī (مقبل القديدي الأشرفي) *shādd al-ʿamāʾir*, who was sent to Mecca by Sultan al-Ashraf Barsbāy to restore al-Ḥaram al-Sharīf in 826/1423:[249]

> وكان مشيد العمارة الأمير مقبل القديدي الأشرفي والناظر عليها الخواجا علي الكيلاني تاجر السلطان و أحضر في العمارة شيخ الكعبة و القضاة الأربعة و ناظر الحرم الشريف و المعمار جمال الدين يوسف المهندس.[250]

The earlier version of this narrative by Najm al-Dīn b. Fahd (d. 885/1480), a historian from Mamluk Mecca, states:

> أُعلم بذلك مشد العمارة الأمير مقبل القديدي و الخواجا شيخ علي الكيلاني الناظر في العمارة فجمعت القضاة الأربعة و ناظر الحرم و حضر نائب البلد و جمال الدين يوسف المهندس و جاء بالصناع.[251]

We have here two versions of the same event, but using different language. The ninth/fifteenth-century account by Ibn Fahd gives Jamāl al-Dīn Yūsuf the title *muhandis*, while the later tenth/sixteenth-century account by al-Nahrawālī grants him the title *miʿmār*. Here, the term *miʿmār* appears almost interchangeable with the term *muhandis*, and as the rest of the narrative is the same, the change in terms seems attributable to the dates of composition, not a change in meaning within the narrative.

The term *miʿmār* also appears to indicate the same qualifications and responsibilities as the term *muhandis* in endowment deeds. In deeds from the mid-ninth/fifteenth century onwards, the *miʿmār*, appointed to the position of *miʿmāriyyah* (وظيفة المعمارية) in endowment foundations, appears to be responsible for the building works associated with maintaining the foundation. Endowment deed DWQ 106/17, written by Jamāl al-Dīn Yūsuf al-Ustādār in 852/1457, specifies that the administrator appoints a *miʿmār* (معمار) 'of quality and virtue' expert in the position's field to periodically check the foundations and carry out the regular responsibilities of artisans/craftsmen (*ṣunnāʿ*, صنّاع) and *miʿmāriyyah*:

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[249] al-Fāsī, *al-ʿIqd al-Thamīn*, pp. I, 85.

[250] Muḥammad b. Aḥmad al-Nahrawālī, *Kitāb al-Iʿlām bi-Aʿlām Bayt Allāh al-Ḥarām,* ed. by Hishām ʿAbd al-ʿAzīz ʿAṭā (Mecca: al-Maktabah al-Tijāriyyah, 1996), pp. 228, 232.

[251] Najm al-Din ʿUmar b. Muḥammad Ibn Fahd, *Itḥāf al-Wará bi-Akhbār Umm al-Qurá,* ed. by Fahīm Muḥammad Shaltūt, 5 vols (Cairo: Maktabat al-Khanjī, 1983), pp. III, 598.

> [The supervisor] also has to appoint a man of knowledge of *al-mi'māriyyah* position, and of quality and virtue, to be *mi'mār* in the mentioned *khānqāh* and the attached properties to [the *khānqāh*] and endowments. The mentioned *mi'mār* has to carefully look into the described locations periodically, and to supervise (…) building and restoring [works], and to encourage the superintendent to do the same, and to do what craftsmen (*ṣunnā'*) and *mi'māriyyah* do in endowments as is customary.
>
> و يرتب [الناظر] أيضا رجلا عارفا بوظيفة المعمارية ذا جودة و أمان وعفة يكون معمارا بالخانقاة المذكورة و ما هو منسوب إليها و للأوقاف على أن المعمار المذكور يتفقد الأماكن الموصوفة كل حين وينظر إليها و (...) على العمارة و الإصلاح و يحث المتحدث على فعل ذلك ويفعل ما يفعله الصناع والمعمارية على العادة بالأوقاف في مثل ذلك.[252]

Sultan Qāytbāy's endowment deed WA 886q dates to 879/1474, about two decades later, stipulates the appointment of a *mi'mār* to attend during building days:

> To pay for a man of virtue and honesty to be *mi'mār* in the aforementioned endowments. [He] has to attend the day of building [works] in the mentioned endowment to supervise craftsmen (*ṣunnā'*) and encourage them [the workmen] during work, and to prevent them from idleness, and whatever else is customary.
>
> و يصرف لرجل من الخير والأمانة يكون معمارا بالأوقاف المذكورة أعلاه يحضر يوم العمارة في الوقف المذكور ليتعهد الصناع في العمل و يحثهم عليه و يمنعهم من البطالة و غير ذلك مما جرت العادة به في ذلك.[253]

Here, we see the position of *mi'māriyyah* described as having the same duties assigned to the *muhandis* in other endowment deeds. In this deed, the *mi'mār*, who was a figure separate from the ordinary *ṣunnā'*, had to be able to monitor craftsmen during repair works to prevent them from idling (يتعهد الصناع في العمل و يحثهم عليه ويمنعهم من البطالة).[254] In deed WA 882q, the person who fulfilled this function was called a

[252] DWQ 106/17 dated 852/1448; published in Muhammad Abd al-Sattar Uthman, *Wathīqat Waqf Jamāl al-Dīn Yūsuf al-Ustādār: Dirāsah Tārīkhiyyah Āthāriyyah Wathā'iqiyyah* (Alexandria: Dār al-Maʿārif, 1983).
[253] WA 886q dated 879/1474.
[254] WA 886q.

muhandis. This is evidence that even outside a court context, the terms *mi'mār* and *muhandis* referred to the same group of people.

An explicit link between *muhandis* and *mi'māriyyah* is established in later endowment deed WA 882q, which pertains to Sultan Qānṣawh al-Ghawrī's 909/1503 foundation. This deed, quoted earlier in this chapter, stipulates that two *muhandisīn* be appointed to the position of '*mi'māriyyah*' (معمارية) at the foundation. Here, we see both terms appearing side-by-side in the same document, indicating that the change from *muhandis* to *mi'mār* was gradual during the ninth/fifteenth century. The holder of the *mi'māriyyah* position, whether a *mi'mār* or *muhandis*, had to have the same qualifications and carry out the same tasks, which required both theoretical and practical knowledge. According to the deed, the post-holder had to be 'an expert in the building craft and the fixing of its defects' (عارفين بالأبنية ماهرين في صناعتهما و قطع فرط عيوبها).[255] This clearly indicates that the terms *mi'mār* and *muhandis* both referred to the same group of experts.

The emergence of the term *mi'mār* to refer to people previously known as *muhandis* from the mid-ninth/fifteenth century onwards is a distinct shift and is visible in both literary and legal documents. As in many examples, *mi'mār* seems to have referred to as *muhandis* with both theoretical and practical knowledge, it may indicate that this doubly skilled subgroup of *muhandisīn* developed a distinct professional identity in the period. Such an interpretation invites further investigation, as the recognition of such a professional class would add considerably to our understanding of building practitioners in the period.

1.6 Conclusion

In modern scholarship, the term *muhandis* has primarily been associated with practical experience rather than theoretical knowledge. This conclusion was proposed by Mayer and was followed by later studies of the Mamluk *muhandis*, However, Behrens-Abouseif and Goitein do not affirm the theoretical knowledge of the *muhandis*, neither do they preclude it. As Behrens-Abouseif states, the positioning of *muhandis* before masons and builders in Mamluk narratives suggests the role of foreman. These

[255] WA 882q.

narratives do not describe the background of the *muhandis*, leaving the question of his theoretical knowledge largely open.[256]

By acknowledging the range of practitioners and skills implied under the general term *muhandisīn*, we see that a certain subgroup of *muhandisīn* had theoretical knowledge which they also applied to the building craft. For example, Shihāb al-Dīn al-Sijīnī and al-Makkī both mastered the science of *handasah* and did building works in the Hijaz and other cities. Al-Sijīnī's biography, in particular, indicates that he carefully studied *handasah* and astronomy and carried out building works in Medina and other cities. It is also possible that he participated in the building works himself as more than just a supervisor. In addition to these biographical accounts, further evidence from literary sources, also makes clear that some Mamluk *muhandisīn* had both theoretical and practical knowledge.

The absence of *muhandis* from *ḥisbah* treatises, cited by Behrens-Abouseif as evidence for the *muhandis*' menial status, is more likely explained by his status as a professional expert and not a craftsman. Behrens-Abouseif's argument that the *muhandis* was not mentioned in *ḥisbah* treatises because he was linked to the Sultanate court is also incomplete;[257] some *muhandisīn*, including al-Sijīnī, al-Makkī and al-Ḥaṣkafī, worked for individuals rather than the sultan. The omission of the *muhandis* from *ḥisbah* treatises implies that he was not an ordinary craftsman, who was expected to submit to the supervision of the *muḥtasib* (محتسب), but rather someone with more developed knowledge. One could perhaps compare the status of the *muhandis* to that of a scientist such as the astronomer, who is also not mentioned in the *ḥisbah* manuals. This status would not preclude the *muhandis* from working on material and practical pursuits; astronomers, who were not supervised by *muḥtasib*, were involved in the material production of astrolabes (اسطرلاب), clocks (ساعات), and other instruments for practical purposes, one of which was *bādahanj* (wind catchers). If the *muḥtasib* did not supervise the *muhandis*, or the astronomer, this does not necessarily mean that these professions did not exist as common trades, or that they were linked to the ruling court.

Theoretical treatises applying scientific concepts to the building profession existed and were available during the Mamluk period. According to Ibn al-Akfānī's eighth/fourteenth-century encyclopaedia of sciences, *handasah* includes 10 sub-

[256] Wahby and Montasser, 'The Ornamented Domes', pp. 12-13.
[257] Behrens-Abouseif, 'Muhandis, Shād, Mu'allim', p. 294.

branches, of which five - building vaulted structures, measurement and surveying, water extraction, and mechanical lifting – were building-related. For a few of these sub-branches, there were specific treatises that gave practical instructions for the application of theory to building practices, such as those by al-Būzjānī, al-Karajī and al-Jazarī. Astronomy was also applied to building structures, specifically for the *bādahanj* (wind-catcher) and *miḥrāb*. Correctly orienting these structures required sophisticated knowledge of both *handasah* and astronomy. There was an entire genre of treatises devoted specifically to orienting wind-catchers and the *miḥrāb*. It appears that these treatises were aimed at the designers of these structures, as specific instructions and information were given for this purpose. These structures were very popular and formed part of most of the public and private buildings. Many of these treatises were accessible and copied in Egypt during the Mamluk period, which indicates that they were of interest. Seen as a particularly poignant example of a wider principle, this strong interaction between theoretical and practical spheres should change our view of the Mamluk building profession as lacking a theoretical component.

Building plans also provide evidence of theoretical sophistication in period building works; however, by and large, modern research on Islamic building plans skip the Mamluk period due to a lack of material evidence. In Islamic Central Asia prior to the ninth/fifteenth century, the existence of building drawings is much clearer and supported with material evidence, and the same goes for the Ottoman Empire from the tenth/sixteenth century onwards. However, literary sources from the Mamluk period provide strong evidence for the existence of building plans. Mamluk narratives and dictionaries contain specific terms to describing the process of making a plan or a model of a building and contain accounts of plans and models, including the narratives of al-Ḥaṣkafī's model mosque and al-Ṣayyād city plan. Some of these examples have been mentioned before in secondary sources, but bringing them together here strongly supports the idea that the preparation of plans and models as part of the building process was routine, and, further, that Mamluk builders applied theoretical knowledge directly in practical building works.

Finally, the emergence of the term *mi'mār* in the late ninth/fifteenth century to refer to a certain type of *muhandis* may be interpreted as evidence that during this period, *muhandis* with both theoretical and practical knowledge began to develop their own distinct professional identity. These builders were separate from both the theoretical *muhandis*, who had mastered the abstract *handasah* sciences but had no

practical experience, but also from common builders without theoretical knowledge. Present in both chronicles and legal documents, this term would seem to indicate that a new term was needed to refer to this particular type of *muhandis*. Although further investigation into the reasons for the adoption of the term *mi'mār* is necessary, it does provide evidence for period recognition of these *muhandisīn* as a specific class of professionals, a topic which will be discussed at greater length in the following chapter.

1.7 Chapter 1 illustrations

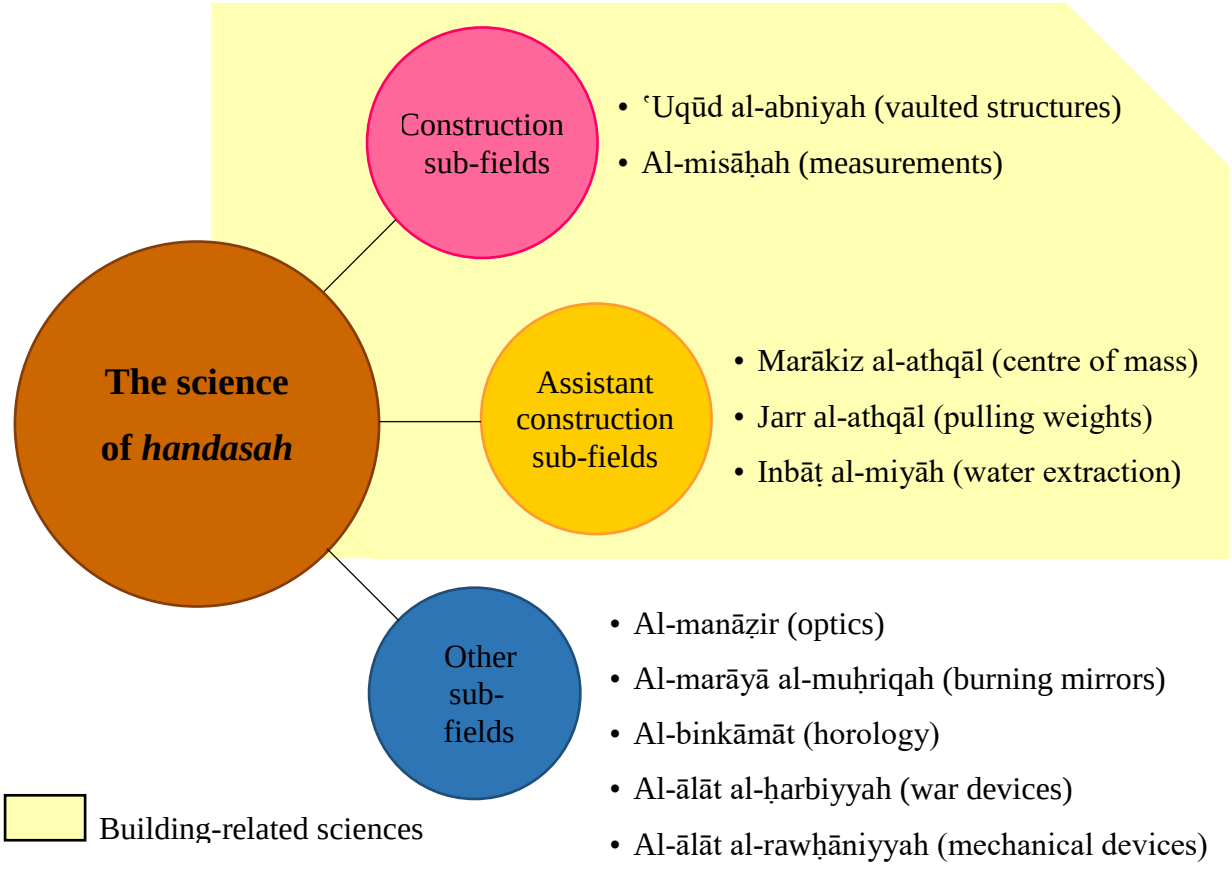
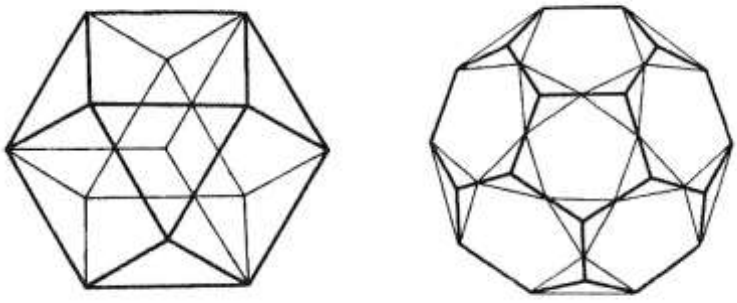


Figure 1.1: The sub-fields of the science of *handasah* according to Ibn al-Akfānī's encyclopaedia of sciences (8th/14th c.)



a b

Figure 1.2: Examples of sectioning a sphere into twelve equal parts which are equilateral triangles (a), and twelve equal-sided pentagons and twenty equal-sided hexagons (b) as appear in al-Būzjānī's treatise (Aya Sophia MS 2653, fols 67, 69, after Holod)

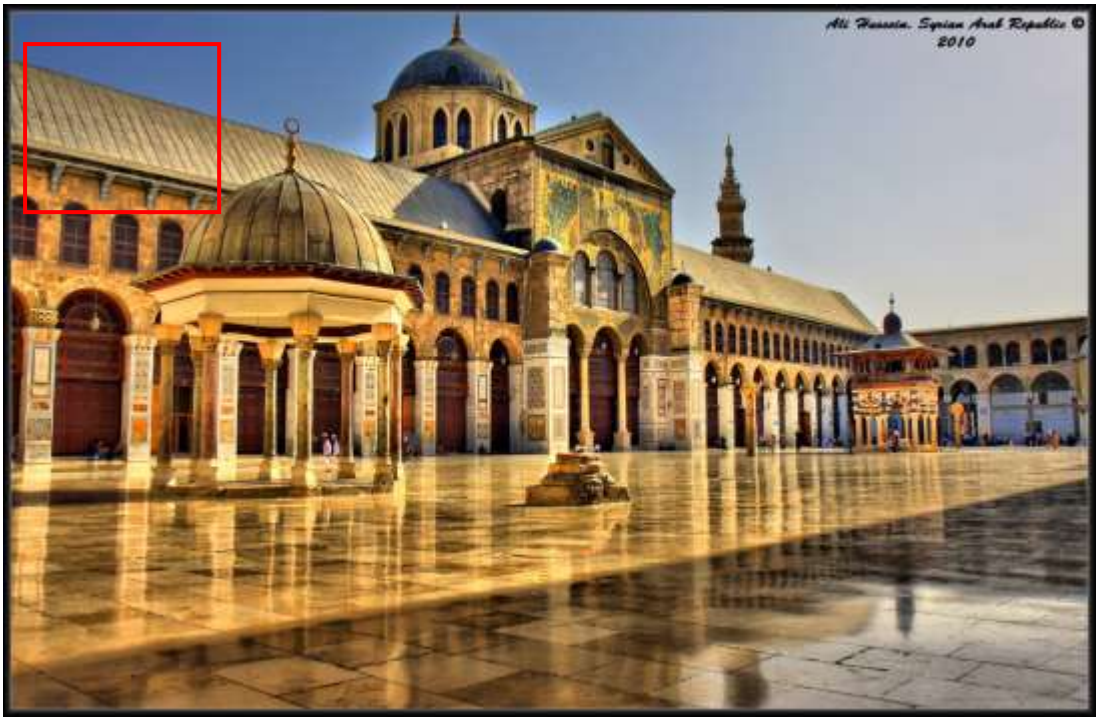
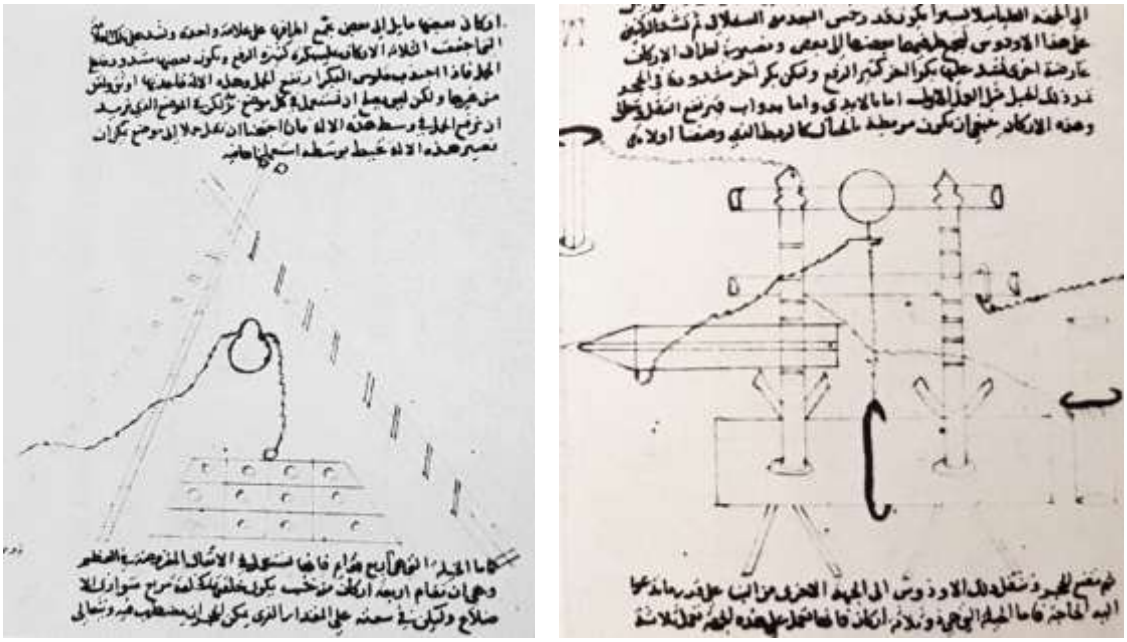
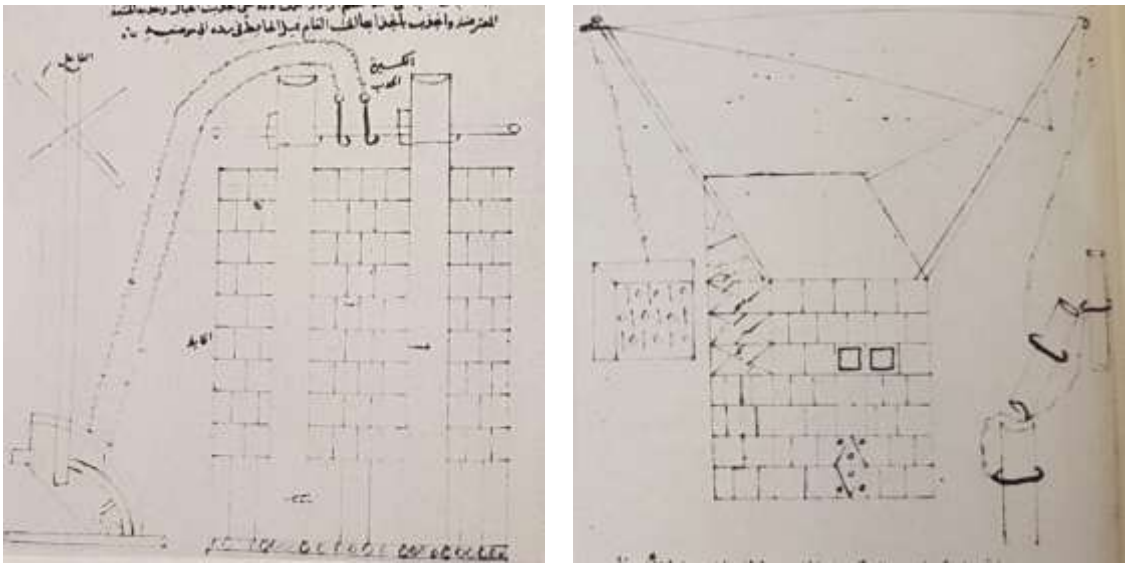


Figure 1.3: Umayyad Mosque, interior view shows the *jamalūn* structure (© Ali Hussein)

Figure 1.4: A reconstructed model for medieval hoist (after D. Behrens-Abouseif 2004)



a b



c d

Figure 1.5: Examples of drawing show lifting devices as appear in the Cairene copy of Hero's treatise, copied in 972/1565 (Egyptian National Library MS ṬR 123, a: fol. 15v, b: fol. 16r, c: fol. 24v, d: fol. 25r, after King 1986)

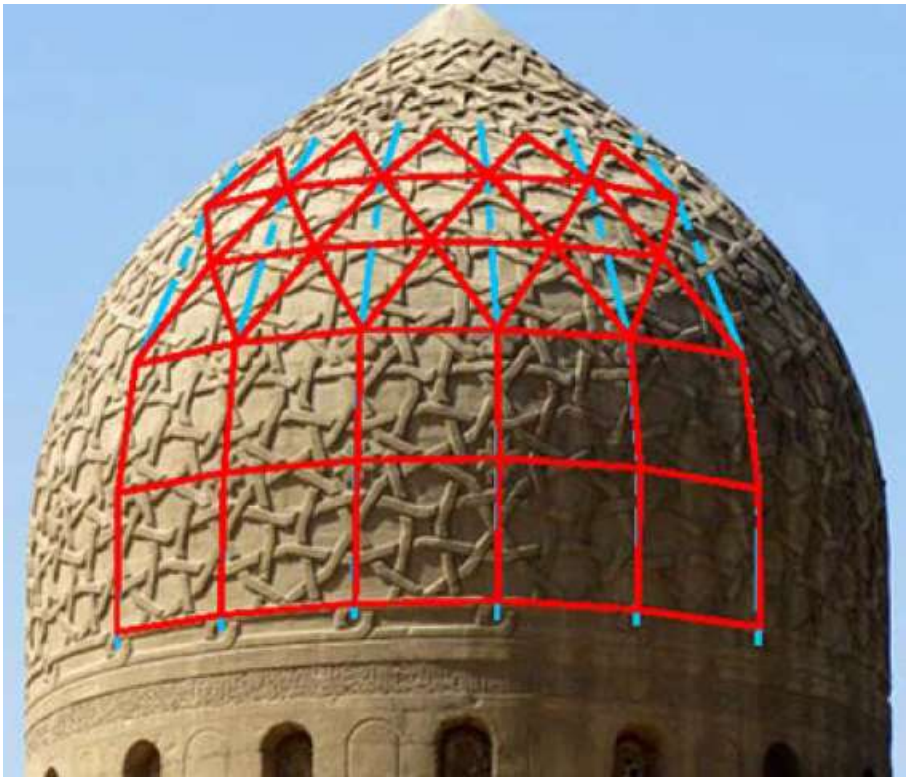


Figure 1.6: Sultan Barsbāy Mausoleum's dome (bl. 835/1431) geometrical pattern (after A. Wahby)

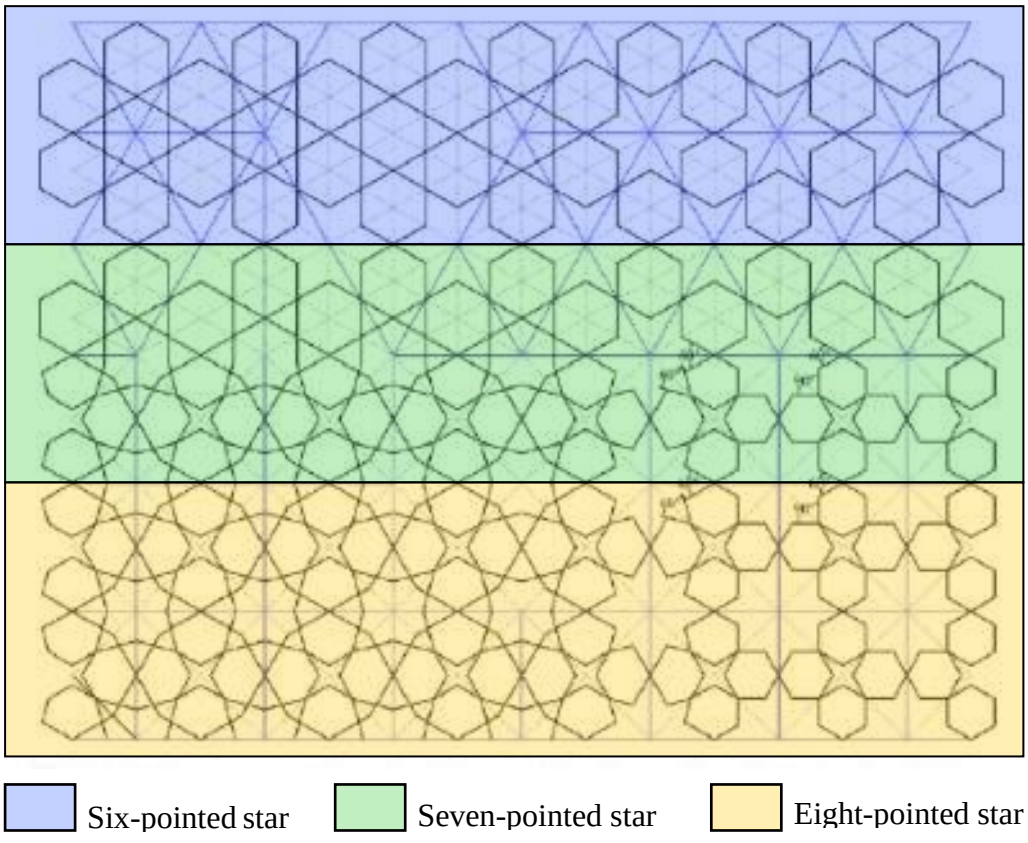


Figure 1.7: Detail from Sultan Barsbāy's dome shows gradual transformation from eight-pointed start at the base to six-pointed star at the top with a transitional seven-pointed star at the middle (after A. Wahby)

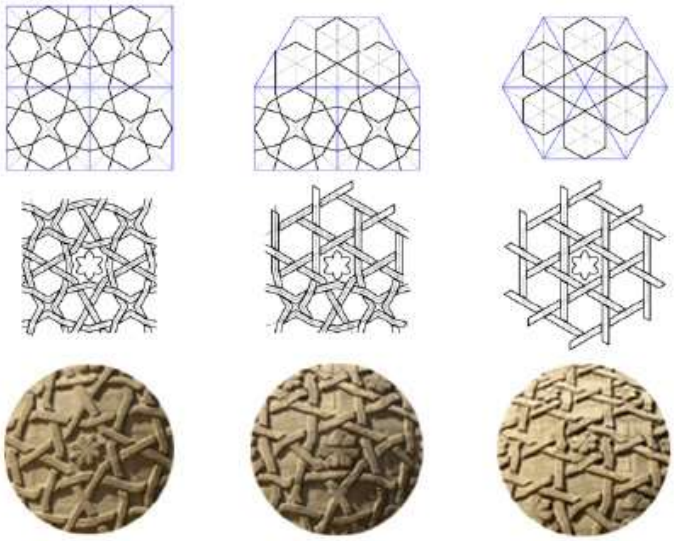


Figure 1.8: Detail of the star patterns employed in the gradual transformation, from left to right, eight-pointed, seven-pointed, and six-pointed (after A. Wahby)

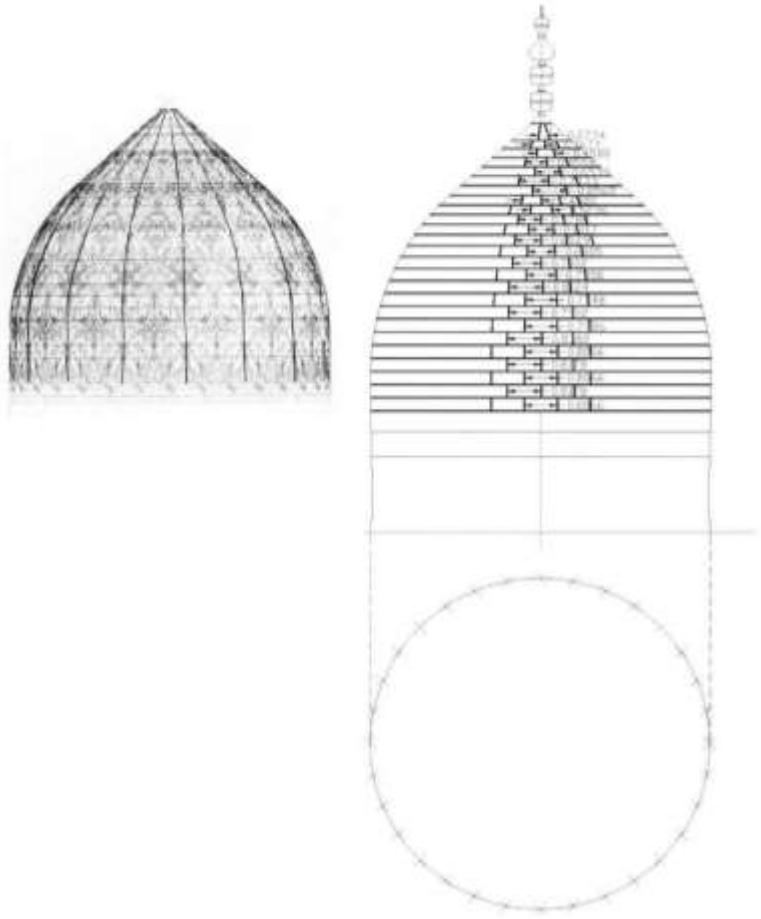


Figure 1.9: Graphical analysis of emir Khayrbak dome (bl. 908/1502) shows a repetition of a slice design (after B. Cipriani 2005)

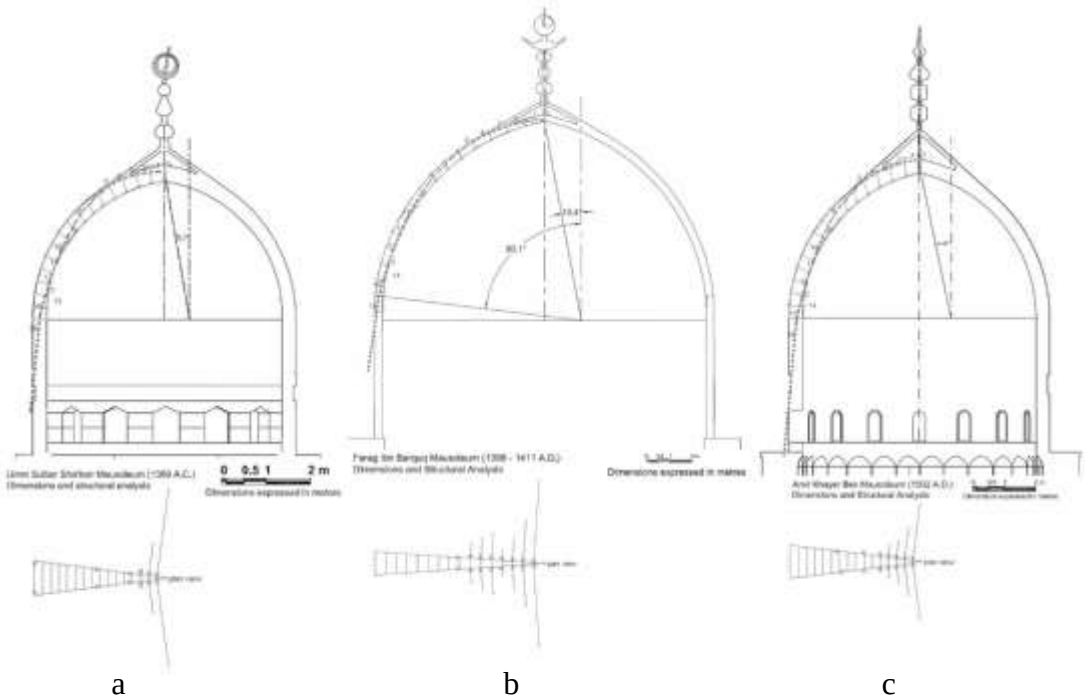


Figure 1.10: A structural analysis using Domex software shows the stability test result of the domes of: a. Umm Sultan Shaʿbān (bl. 770/1369), b. Sultan Faraj b. Barqūq (bl. 801-11/1399-1407), c. emir Khayrbak (bl. 908/1502) (after B. Cipriani 2006)

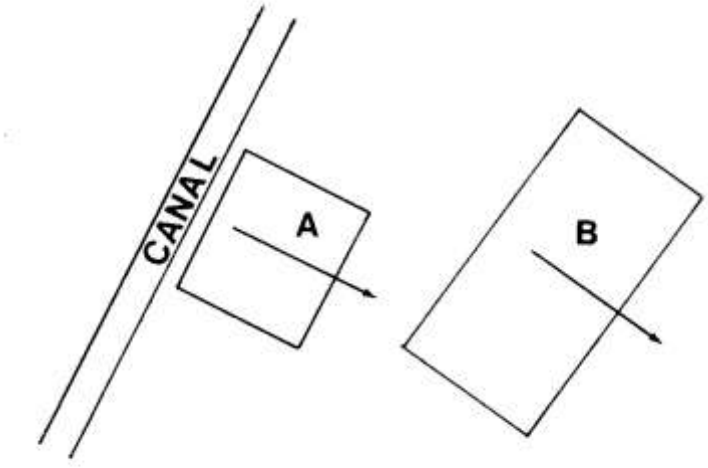


Figure 1.11: Orientation of the city of Miṣr towards *Qiblat al-ṣaḥābah* (117˚ E of N), and the city of Cairo towards the astronomical *qiblah* (127˚ E of N) (after King 1984)

Figure 1.12: *Bādahanj* on the roof of emir Qānībāy al-Muḥammadī's Mosque (bl. 816/1314) in Cairo (© Creswell Archive, Ashmolean Museum, neg. EA.CA.1157)

Figure 1.13: Mamluk astronomical table displays the altitude of the sun in degrees and minutes, represented in Arabic alphanumerical abjad, when it was in the direction of the *bādahanj* (after King 1984)

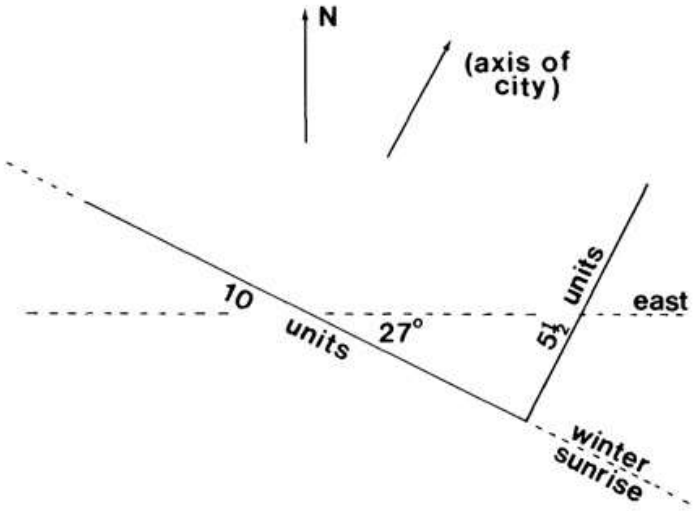


Figure 1.14: Deriving the direction of the *bādahanj* as instructed in an astronomical treatise attributed to the Fatimid astronomer Ibn Yūnus, copied in Cairo in 699/1300 (after King 1984)

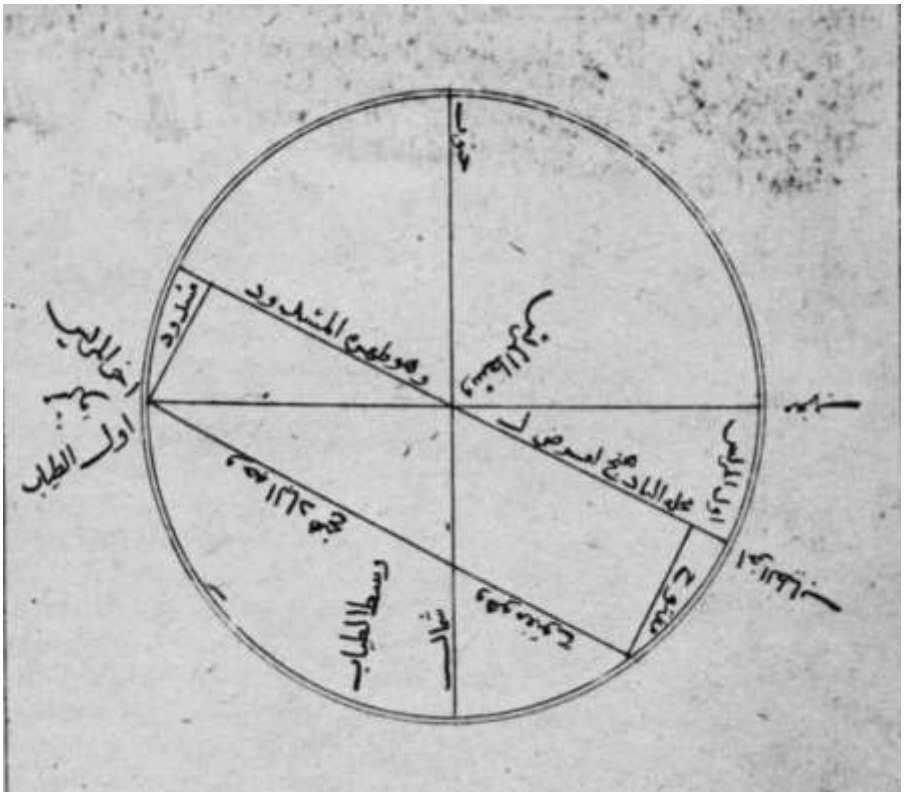


Figure 1.15: A diagram drawn in the 8th/14th century by Ibn al-Sarrāj in his astronomical treatise to lay out the *bādahanj* (Chester Beatty MS 102, fol. 52v, after King 1984)

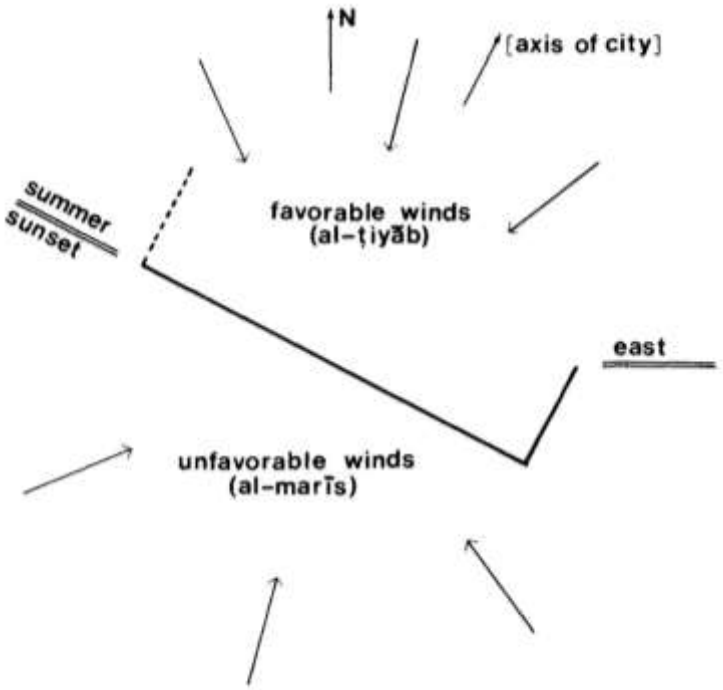


Figure 1.16: Orienting the *bādahanj* to catch the favourable winds and to avoid unfavourable winds as described by Ibn al-Sarrāj (after King 1984)

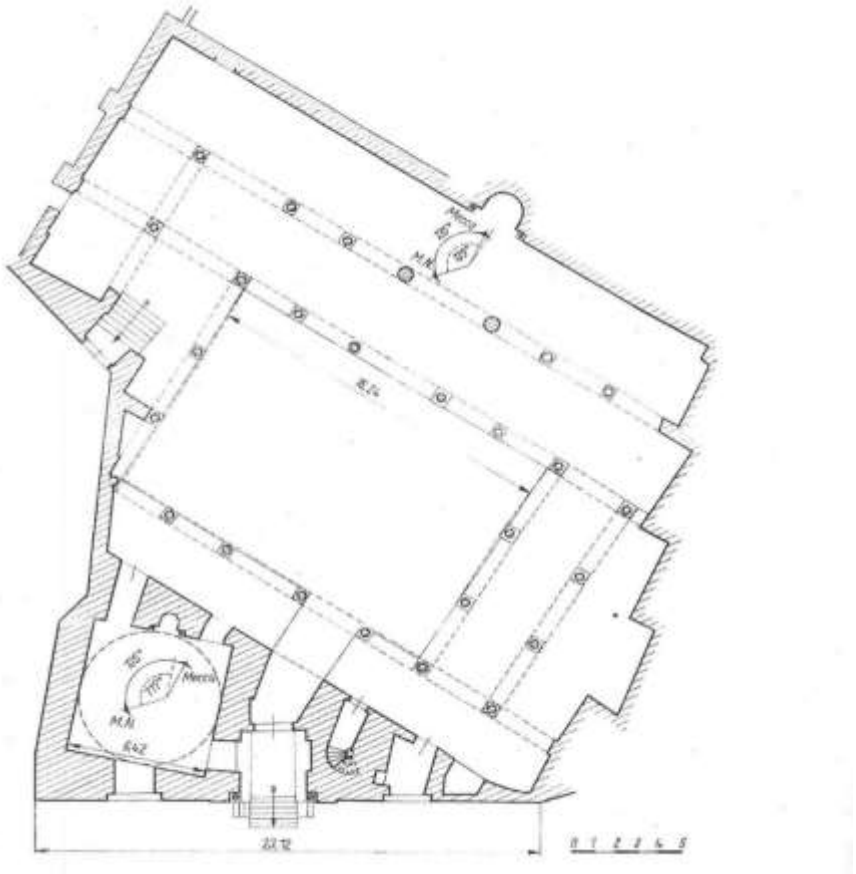


Figure 1.17: The *miḥrāb* of emir Ulmās al-Ḥājib Mausoleum (bl. 730/1330) was oriented towards *Qiblat al-ṣaḥābah* 117˚ E of N (after Kessler 1972)

Figure 1.18: Mausoleum complex of Sultan Shaʿbān II (bl. 770/1368) was oriented towards *Qiblat al-ṣaḥābah* 117˚ E of N (after Kessler 1984)

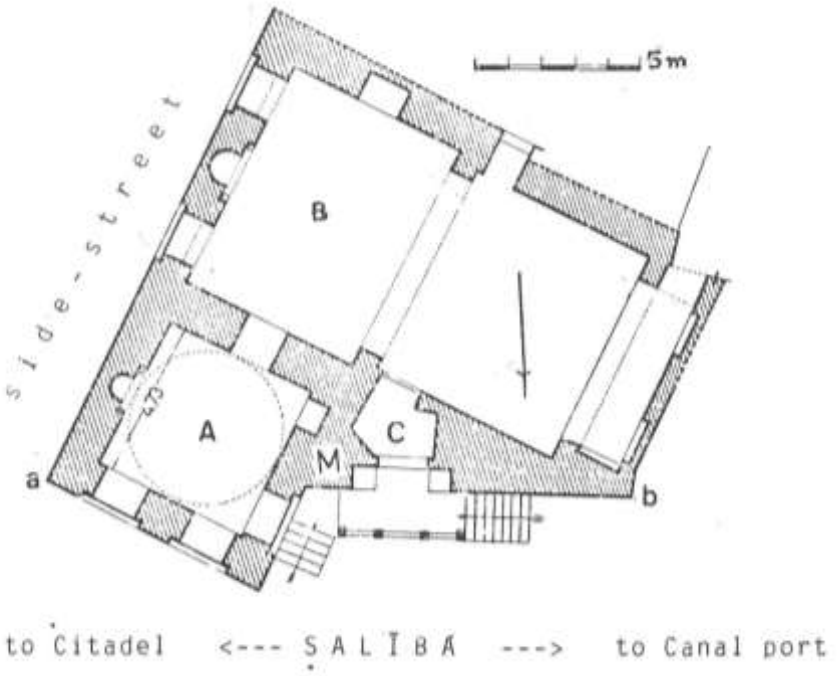


Figure 1.19: Mausoleum complex of emir Qānībāy al-Muḥammadī (bl. 816/1414) was oriented towards *Qiblat al-ṣaḥābah* 117˚ E of N (after Kessler 1984)

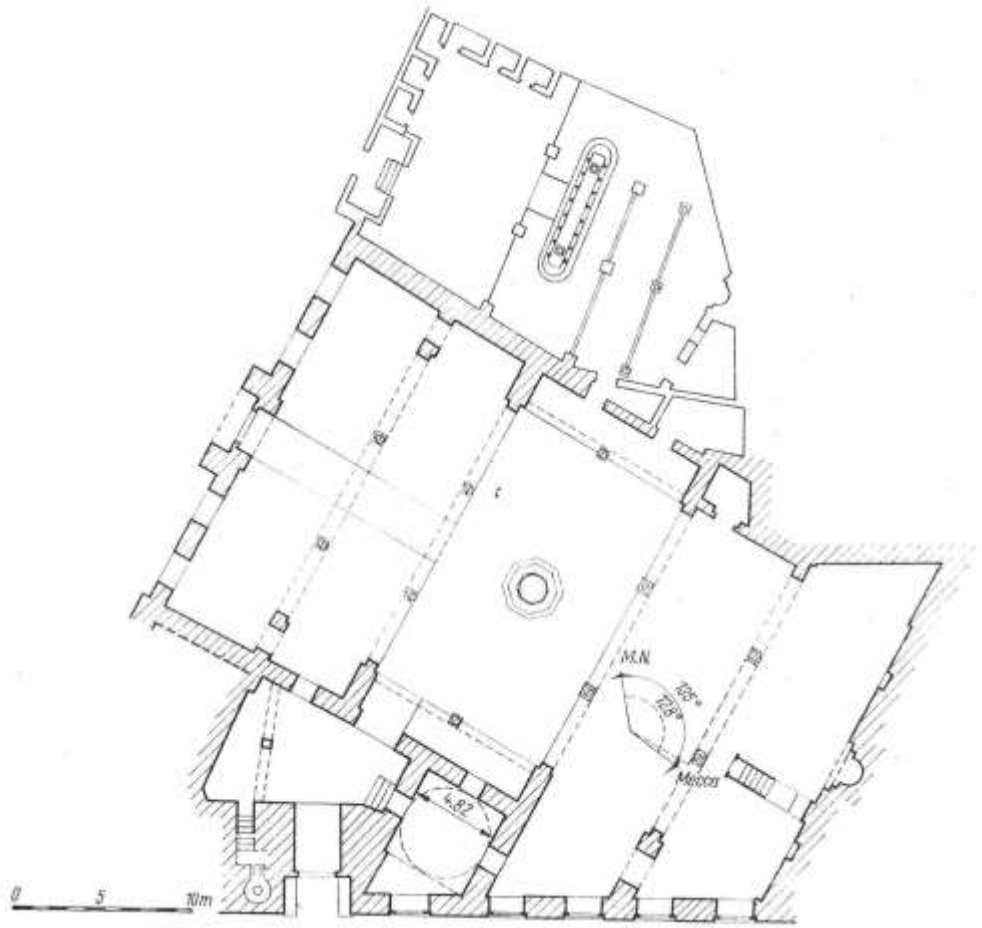


Figure 1.20: Mausoleum complex of emir Shaykhūn (bl. 750/1349) was oriented towards the astronomical qiblah 127˚ E of N (after Kessler 1972)

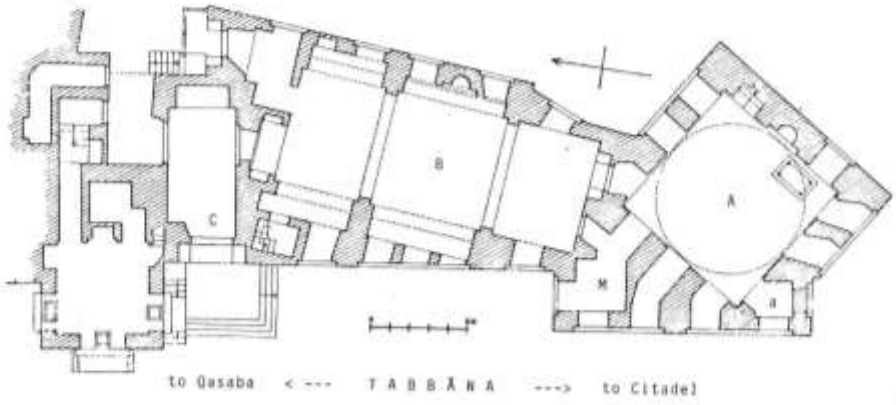


Figure 1.21: Mausoleum complex of emir Khayrbak (bl. 908/1502) was oriented towards the astronomical *qiblah* 127˚ E of N (after Kessler 1984)

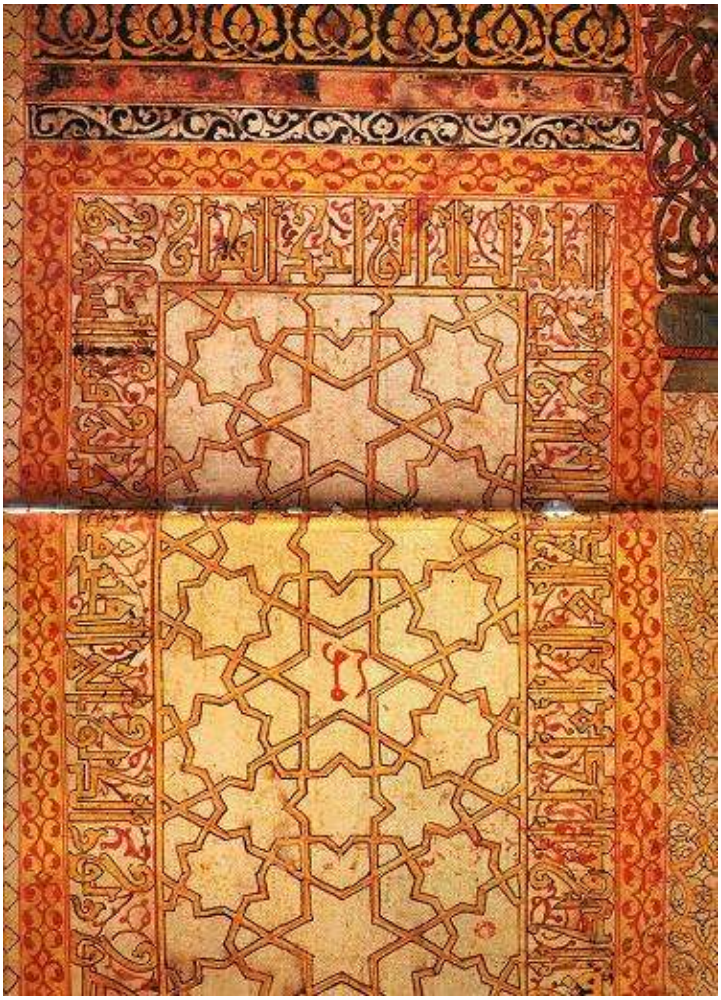


Figure 1.22: A design of a palace door designed by al-Razzāz al-Jazarī (Topkapi MS 3742, pp. 328-329)

Figure 1.23: Detail of the geometrical pattern employed in the middle part of the door by al-Jazarī (Topkapi MS 3742, p. 331)

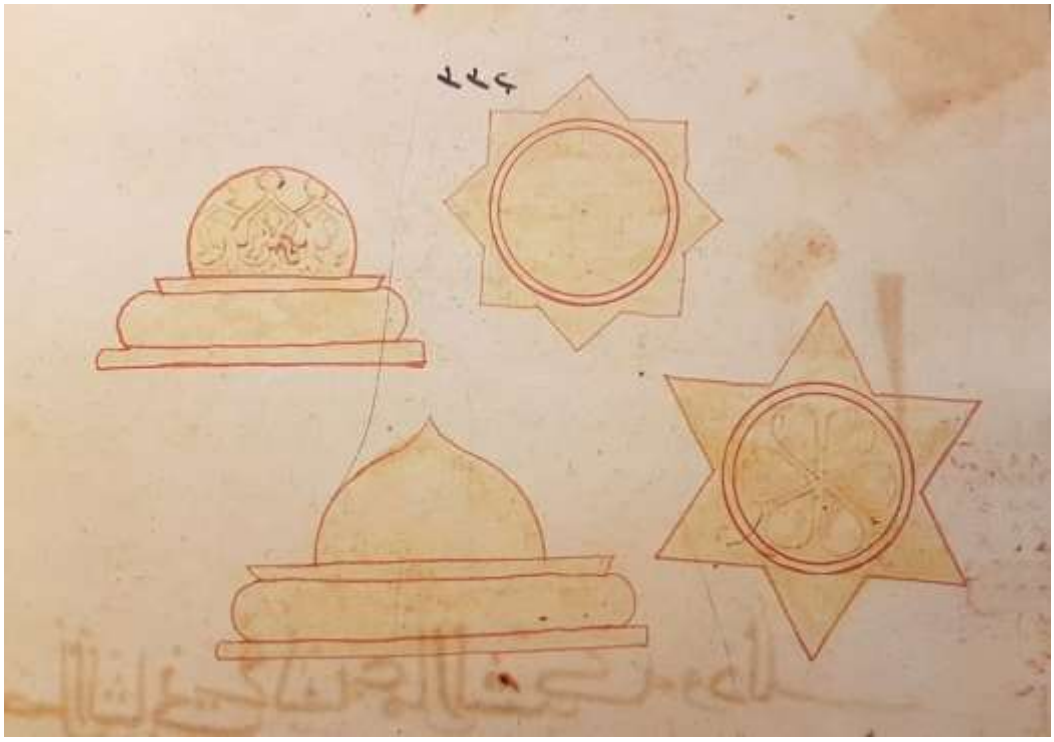
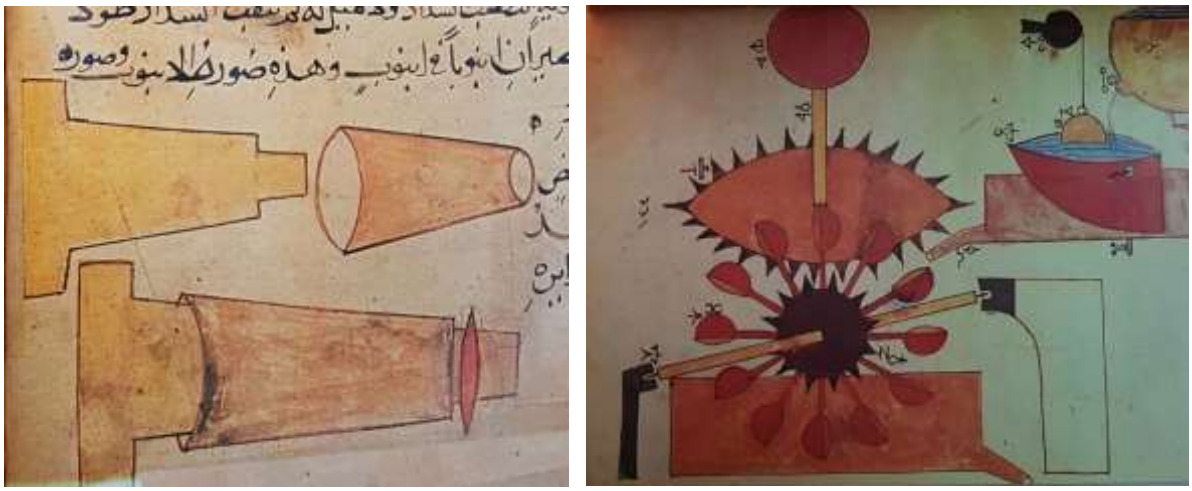


Figure 1.24: A detail drawing shows the top, side, and front views of the door knob (Topkapi MS 3742, p. 332)



a b

Figure 1.25: Examples of mechanical devices appear in three-dimensional drawings (Topkapi MS 3742, a: p. 16, b: p. 133)

Chapter 2:

The *Muhandis* in the *Qāḍī*'s Court

2.1 Introduction

As has been established in the previous chapter, the term *muhandisīn* referred to a broad category of builders, whose professional roles fluctuated in different contexts and for different purposes. It included people skilled in the theoretical science of *handasah*, as well as those with both practical and theoretical knowledge. Besides being employed to work on building planning and construction, *muhandisīn* also worked for Mamluk judges as expert witnesses in building-related cases. For both private and endowed properties (*awqāf*), they assessed structures, estimated restoration and maintenance expenses, appraised properties, and measured the endowed shares of lands and foundations.

Modern scholarship on Mamluk legal documents is fairly well-developed, but to date has not significantly addressed the role of the *muhandis* in the legal process. However, it is apparent from legal and literary sources that *muhandisīn* were involved in many building-related proceedings. *Muhandisīn* were appointed to maintain endowment foundations, preserve the rights of public use of main roads against structural projections and protrusions, and resolve private disputes over buildings. This chapter explores each of these functions of *muhandisīn* employed as experts at the *qāḍī*'s court. It aims to provide insight into the institutional roles and social place of those *muhandisin* who demonstrate both theoretical and practical knowledge.

The primary sources for this chapter come in the form of surviving Mamluk endowment deeds. These deeds are currently divided into two main collections in Cairo: the first collection is available at Dār al-Wathā'iq al-Qawmiyyah (DWQ), the National Archive of Egypt, and the other is located at Wizārat al-Awqāf (WA), the Ministry of Endowments. Both collections include many exchange deeds, several examination reports, and a few leasing contracts, all of which are of interest here, as they demonstrate the role of professionals in the system as well as the overall framework of the process. *Fatāwá* collections by Ibn Taymiyyah (d. 728/1328), Taqiyy al-Dīn al-Subkī (d. 756/1355), and Jalāl al-Dīn al-Suyūṭī (d. 911/1505) allow us to link the legal guidelines on projections into public pathways to their actual application during the Mamluk period. Reading these deeds and *fatāwá* alongside Mamluk chronicles and biographical dictionaries also provides historical context to our understanding of the building craft.

The first section of this chapter will discuss the role of *muhandisīn* in maintaining endowed properties. The record of their employment for maintenance in

endowment deeds provides information on their social status, as their salaries relative to other building professionals are recorded. These deeds also provide insight into the daily activities of some *muhandisīn* and reveal that while some were employed on a project-by-project basis, others were hired as salaried professionals. The section also discusses the involvement of *muhandisīn* in endowment exchange proceedings. The employment of *muhandisīn* by judges appears as early as 858/1454, in the earliest surviving Mamluk endowment exchange deed, DWQ 112/18.[258] The exchange of endowments was not popular in Egypt until 778/1376, when a group of emirs petitioned the Ḥanafī chief judge to allow them to exchange their endowments for better ones.[259] Despite the failure of their petition, the exchange of endowed properties became increasingly popular and was permitted by judges of the four schools of law in order to raise an endowment's revenue for its beneficiaries. The roles of the *muhandisīn* employed by judges in property cases were also recorded in documents recording maintenance and surveyance, and these will also be discussed in this section. However, as exchange and lease endowment deeds are exceptionally rich in material, they will be the main focus of the first section of this chapter, showcasing the technical roles played by *muhandisīn* in judicial courts, as well as to show the patterns of cooperation established between the different professionals. Exchange and lease deeds will be also utilized to highlight the overall steps and timeline of the process that involved both judges and *muhandisīn* working together.

This first section will also discuss the involvement of *muhandisīn* as expert witnesses in cases involving private disputes over buildings. While there is no direct surviving evidence of this type of employment from the Mamluk period, a treatise written by the Tunisian builder Ibn al-Rāmī (fl. 8th/14th c.) details private incidents and disputes with remarkable parallels to the processes and procedures that appear in Mamluk *waqf* documents. The similarity between the cases described in his treatise and those documented in Mamluk sources suggests that the roles played by Mamluk and Tunisian *muhandisīn* were similar and that both were likely employed in private disputes as well as endowment cases.

[258] Muḥammad Muḥammad Amīn, *Fihrist Wathāʾiq al-Qāhirah ḥattá Nihāyat ʿAṣr Salāṭīn al-Mamālīk* (Cairo: Institut Français d'Archèologie Orientale, 1981), p. 25.
[259] Muḥammad Muḥammad Amīn, *al-Awqāf wa al-Ḥayāh al-Ijtimāʿiyyah fī Miṣr, 648-923 H/1250-1517 M: Dirāsah Tārīkhiyyah Wathāʾiqiyyah* (Cairo: Dār al-Nahḍah al-ʿArabiyyah, 1980), p. 342.

The second section of this chapter elaborates on the role of *muhandisīn* in the regulation of protrusions into public pathways during the Mamluk period. Public rights of way for main roads and side streets are covered in the legal literature known as *fiqh al-ʿumrān* (building jurisprudence), which required judicial permissions for any ground-floor protrusion or higher-level projection into a public street beyond allowed limits. In cases where permission was not acquired, projections could be demolished; in one particularly notable event, Sultan Qāytbāy (r. 872-901/1468-96) issued an order to demolish all illegal projections in Cairo's streets, causing significant destruction and widespread outcry. Modern studies discuss the process of regulating and demolishing projections through the lens of Islamic law, rather than in its historical context. However, by integrating legal and historical documents and treatises, it is possible to place this practice in a historical setting. Three main actors - the judges, the *muhandisīn*, and the Sultan – were involved in these regulations, as the chief *qāḍī*'s court judges delegated *muhandisīn* to examine the premises and measure existing projections.

Finally, a third section will highlight the legal and ethical framework that regulated the relationship between builders and their employers. In the absence of a formal guild to regulate the affairs and disputes of the building craft, ethical guidelines presented an alternative way to resolve disputes. These guidelines, which were proposed by *ḥisbah* books and legal scholars, aimed to regulate the relationship between builders and their employers by outlining the rights and duties of both parties. This ethical and legal framework was not comprehensive, and its standards may have ideals rather realities. However, the existence of this literature suggests that the roles of builders were professionalised in the period, and its emphasis on morality suggests that they were seen as upholding certain standards of conduct within society.

This chapter uses a historical reading of Mamluk literary and legal texts to shed light on the broader professional, practical, and social contexts of the *muhandis.* Their appointment as experts in courts suggests social recognition of the *muhandis* as a figure of defined knowledge and status. Though previous studies have tended to approach the aforementioned evidence – works on rights-of-way, endowment foundations, and ethical literature – from a legal standpoint, an examination of them as historical documents highlights the social agency of the *muhandis.*

2.2 Endowed properties

In the Mamluk period, judges were responsible for the assessment of endowed properties. Whether the purpose of this assessment was *tarmīm* (restoration), *istibdāl* (exchange) or *ījār* (leasing), judges were supported by building professionals in reaching their decisions. The relationship between judges and building professionals in the context of endowment buildings is well documented, and the process of regulating the building-related affairs of endowed properties can be followed in detail. From available endowment deeds, legal records, and literary sources, we can identify a general system that governed the assessment process. First, the petitioner, usually the beneficiary, submitted his request to the chief judge. The request was then forwarded to a deputy, who delegated *muhandisīn*, in some cases accompanied by witnesses, to assess or evaluate the property. The delegated *muhandisīn* included their evaluation in a report and submitted it to the deputy judge. The deputy judge then re-examined the petition and looked at the professionals' report before deciding whether or not to proceed with the request.

Though the four schools of law varied somewhat in their treatment of foundations, it appears that since the seventh/thirteenth century all four made a distinction between private (*waqf khāṣṣ*) and public endowments (*waqf ʾāmm*) and that they were stricter with private endowments.[260] Private endowments, which were founded by individuals using their own funds, were required to strictly follow the stipulations defined by their founders.[261] Endowments funded from the public treasury (*bayt al-māl*), which began to appear in the seventh/thirteenth century, could be funded directly, as in the case of rulers' foundations, or indirectly, as in the cases of the Mamluk emirs who used public funds for their foundations.[262] These public foundations managed their affairs according to the rules and principles of public benefit (*maṣāliḥ al-muslimīn*), even if this led them to go against the stipulations laid down by their

[260] Adam Sabra, *Poverty and Charity in Medieval Islam: Mamluk Egypt 1250-1517* (Cambridge: Cambridge University Press, 2000), p. 71; Jalāl al-Dīn Abd al-Rahman al-Suyūṭī, *al-Ḥāwī lil-Fatāwī fī al-Fiqh wa ʿUlūm al-Tafsīr wa al-Ḥadīth wa al-Uṣūl wa al-Naḥw wa al-Iʿrāb wa Sāʾir al-Funūn*, 2 vols (Beirut: Dār al-Kutub al-ʿIlmiyyah, 1983), pp. I, 155.

[260] Sabra, *Poverty and Charity*, p. 71.

[261] al-Suyūṭī, *al-Ḥāwī lil-Fatāwī*, pp. I, 155.

[262] al-Suyūṭī, *al-Ḥāwī lil-Fatāwī*, pp. I, 156-157.

founders.[263] However, as is visible from the surviving endowment deeds, both public and private endowments required judicial approval to undertake any restorations, exchanges or leases.

2.2.1 Maintenance

To date, there is only one modern study of maintenance and repair in Mamluk endowment deeds. In that study, Dina Bakhoum notes that the *waqf* deeds of Sultan al-Manṣūr Qalāwūn (r. 678-89/1279-1290), Sultan al-Ashraf Barsbāy (r. 825-41/1422-1438), and Sultan Qānṣawh al-Ghawrī (r. 906-22/1501-6) stipulated that their foundations should be kept in good order and repaired regularly.[264] She points out that in order to ensure the continued fruitfulness of the endowed property, the endowment's supervisor (*al-nāẓir*) had to spend some of the *waqf*'s revenue on maintenance. Citing examples from the Fatimid era, Bakhoum further shows that on some occasions, especially before Ramadan, judges did order the surveying of endowed properties, especially public endowments, to see if they needed maintenance.[265]

When an endowment's revenue was collected and the necessary expenditures ranked, the endowment supervisor was responsible for giving first priority to maintenance, regardless of whether or not this was stipulated by the founder.[266] This principle is clearly stated in a *fatwá* (legal opinion) written by the judge Jalāl al-Dīn ʿAbd al-Raḥmān b. ʿUmar al-Bulqīnī (d. 824/1421) in the margin of the endowment deed WA 610j (dated 697/1298):

> Maintenance has priority over all expenditures, and if the supervisor [allowed the foundation to become] dilapidated and spent the revenue while

[263] Abū Zakariyyā Yaḥyá b. Sharaf al-Nawawī, *Fatāwā al-Imām al-Nawawī al-Maʿrūf bi-Kitāb al-Manthūrāt wa ʿUyūn al-Masāʾil al-Muhimmāt,* ed. by ʿAbd al-Qādir Aḥmad ʿAṭā, 2nd edn (Beirut: Muʾassasat al-Kutub al-Thaqāfiyyah, 1988), p. 86.

[264] Dina Ishak Bakhoum, 'The Waqf System: Maintenance, Repair, and Upkeep', in *Held in Trust: Waqf in the Islamic World,* ed. by Pascale Ghazaleh (Cairo: American University Press in Cairo, 2011), pp. 179-196.

[265] Bakhoum, 'The Waqf System', p. 184.

[266] Aḥmad b. ʿUmar al-Shībānī al-Khaṣṣāf, *Aḥkām al-Awqāf* (Cairo: Maṭbaʿat Dīwān ʿUmūm al-Awqāf al-Miṣriyyah, 1904), p. 320; Ibrāhīm b. Mūsá b. Abī Bakr al-Ḥanafī al-Ṭarābulusī, *al-Isʿāf fī Aḥkām al-Awqāf* (Beirut: Dār al-Rāʾid al-ʿArabī, 1981), p. 60; al-Ṭarābulusī, *al-Isʿāf*, p. 60.

> the waqf needed maintenance, [he] must pay what he has unlawfully spent.[267]

This *fatwá* was likely added to the margin of the deed at a later date because the beneficiaries of this endowment were concerned about or affected by negligent maintenance. Whatever the case, its inclusion shows that judges were concerned with the maintenance of endowed properties and saw it as an important undertaking.

Two options were available to keep a foundation in order and well-functioning: either to spend endowment revenues to hire craftsmen as needed for specific repairs, or to employ specialist craftsmen, such as a *muhandis*, carpenter, marbler, and plumber, on a permanent basis. The first option was more common for both individuals' and emirs' endowments, including those of sultans. Examples from archival deeds include the endowments of Aḥmad al-Naḥḥās (WA 713j, dated 786/1384), one of Sultan al-Ẓāhir Faraj b. Barqūq's endowments (DWQ 51/9, dated 788/1386) (Figure 2.1), and the emir al-Sayfī Qijmās al-Isḥāqī's deed (WA 670j, dated 873/1468).[268] The second option was mostly found at large complexes and foundations, such as that of Amīr Ustādār Abū al-Maḥāsin Yūsuf, dated 852/1448, who stipulated the permanent appointment of a marbler and a professional builder (*mi'mār*) for his foundation.[269] In Sultan Qānṣawh al-Ghawrī's complex (Figure 2.2), which consisted of a *khānqāh*, mausoleum (*qubbah*), *sabīl-kuttāb*, mosque (*jāmi'*), and *madrasah*, appointments included two *muhandisīn*, two marble men, two plumbers (*sabbāk*), and one carpenter (*najjār*).[270]

In a few cases, both options were combined. In these endowments, the founder both employed craftsmen to look after the foundation and specified that as much revenue as needed should be spent on maintenance. For example, in 881/1477, Amīr Ākhūr al-Nāṣirī Muḥammad b. al-Zaynī Musāfir stipulated that the endowment supervisor should do whatever was required to keep the endowment's four different buildings, located below Zuwaylah Gate, in good condition:

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[267] Aḥmad b. ʿAlī Ibn Ḥajar al-ʿAsqalānī, *Inbāʾ al-Ghumr bi-Anbāʾ al-ʿUmr,* ed. by Ḥasan Ḥabashī, 4 vols (Cairo: al-Majlis al-Aʿlá lil-Shuʾūn al-Islāmiyyah: Lajnat Iḥyāʾ al-Turāth al-Islāmī 1969), pp. III, 259; al-Sakhāwī, *al-Ḍawʾ al-Lāmiʿ*, pp. IV, 106-113.

[268] Further examples: one of Sultan Qāytbāy's endowments DWQ 187/28, dated 884/1479 and al-Zaynī Yāqūt al-Kamālī's deed DWQ 204/33, dated 893/1488.

[269] DWQ106/17 dated 852/1448.

[270] WA 882q dated 909/1503. Further examples: emir al-Sayfī Azbak al-Atābikī min Ṭuṭukh who stated to appoint a marbler and a plumber, deed DWQ 198/29 dated 890/1486; emir Azdumur min ʿAlī-Amīr Dawādār who stated to appoint a plumber and a carpenter, deed DWQ 241/38 dated 908/1503.

So, the supervisor in charge of these mentioned endowments could use their revenue for any permissible aim. He should start with building works and repair, and spend the revenue to keep [the endowment] extant and beneficial even if the revenue is all spent. After that, any sums that remain should be spent each month [on the primary use of the endowment].

على أن الناظر على هذه الأوقاف المذكورة والمتولي عليها يستغل جميع ما يتحصل من ريعها بسائر وجوه الاستغلالات الشرعية فيبدأ من ذلك بعمارتها ومرمتها وعمل مصالحها وما فيه بقا عينها و دوام منفعتها ولو أنفق في ذلك جميع غلتها و مافضل بعد ذلك يصرف منه في كل شهر...[271]

At the same time, the deed also allocates 1200 dirhams to fixed expenditures for water wheel maintenance, inclusive of a carpenter's salary:

To spend [of the revenue] in each year of the Arabian years described above, a sum of new *fils* [totalling] one thousand and two hundred dirhams, half of which is six hundred dirhams, or its equivalent in money on that day, for the purpose of maintaining the wooden waterwheel that is set up at the head of the specified well, located in the road…to be spent on the cost of pottery buckets, coronas, spikes, the carpenter's wage and the waterwheel driver's wage…

ويصرف منه ايضا في كل سنة من السنين العربية الموصوفة اعلاه ما مبلغه من الفلوس الجدد الموصوفة اعلاه الف درهم واحدة و مايتا درهم نصفها ستماية درهم او ما يقوم مقامها من النقود يوم ذلك في مصالح ادارة الساقية الخشب المركبة على فوهة البير الما المعين الكاين بدرب... يصرف ذلك في ثمن قواديس فخار أو طوانس و أكلال و ثمن مسمار و أجرة نجار وأجرة سواق وغير ذلك.[272]

Similarly, Sultan Qāytbāy's endowment deed directs the supervisor to combine the revenues of all his alienated properties, giving priority to the maintenance of the assigned charitable foundations (Figure 2.3).[273] He provides for the employment of a professional builder (*miʿmār*), a marbler, and a plumber on a permanent basis, to be paid monthly salaries:

[271] 'Waqf Deed DWQ 183/42', (Cairo: Dār al-Wathāʾiq al-Qawmiyyah: Ḥujaj umarāʾ wa salāṭīn, 2 Dhū al-Qaʿdah 881/15 February 1477).
[272] 'DWQ 183/42', p. 20.
[273] 'Waqf Deed WA 886q', (Wizārat al-Awqāf al-Islāmiyyah: Daftar khānah, 24 Jumādá al-Ākhar 879/4 November 1474), (p. 121).

To pay for a man of piety and honesty [who] would be *mi'mār* at the endowments mentioned above, to attend the day of building work at the mentioned time to supervise the craftsmen, to encourage them [to work] and prevent [their] idleness and so forth as customary. He should be paid every month of *al-ahillah* (lunar) months, an amount of *fils* that is described above [equal to] two hundred dirhams, half of which [is] a hundred dirhams, or whatever money is equivalent at the payment [time] with no more on top of that… and to pay for a man of virtue and faith [who] would be *murakhkhim* (a marbler) at the above-mentioned endowment, to be responsible for the restoration required for its marble and work for it as is customary for marble men in this regard, in every month of the crescent months an amount of *fils* which described above [equal to] two hundred dirhams, half of which [is] a hundred dirhams, or whatever money is equivalent… and pay for a plumber to carry out whatever is needed to restore the pipes, downspouts, water courses at the above-mentioned roofed endowments in Cairo and the desert...

ويصرف لرجل من أهل الخير والأمانة يكون معمارا بالأوقاف المذكورة أعلاه يحضر يوم العمارة في الوقت المذكور ليتعهد الصنّاع في العمل ويحثهم عليه ويمنعهم من البطالة و غير ذلك مما جرت العادة به في ذلك في كل شهر يمضي من شهور الأهلة من الفلوس الموصوفة أعلاه مايتا درهم نصف ذلك ماية درهم أو ما يقوم مقام ذلك من النقود عند الصرف من غير زيادة على ذلك... ويصرف لرجل من أهل الخير والدين يكون مرخما بالوقف المذكور أعلاه على أن يتولى ترميم ما يحتاج إلى ترميمه في رخامها وعمل مصالح ذلك على عادة المرخمين في ذلك في كل شهر يمضي من شهور الأهلة من الفلوس الموصوفة أعلاه مايتا درهم نصفها ماية درهم أو ما يقوم مقام ذلك... ويصرف لرجل سباك يتولى عمل مايحتاج إليه من ترميم أقصاب وميازيب ومجاري مياه بالأوقاف المسقّفات المذكورة التي بالقاهرة المحروسة وبالصحراء.[274]

In this example, Sultan Qāytbāy emphasized the importance of appointing craftsmen to look after his foundation. He also defined the roles and tasks of each craftsman. All were to be known for their honesty and piety; he repeats these characteristics for each position. Specifically, the *mi'mār* should appear at the foundation at times of maintenance and restoration to supervise workers and encourage them to work, in addition to other supervisory responsibilities which are absent from

[274] 'WA 886q', p. 133.

the assigned tasks to both the marbler and the plumber. The proposed marbler, besides having good character and carrying out routine maintenance, was also to restore broken parts to keep the marble in good condition. On the same basis, the plumber had to regularly check all water pipes and courses to make sure they remained functional and in proper condition. They were also to carry out regular repairs in order to keep the endowment functioning (Table 2.1).[275] The craftsmen's role in maintaining endowed foundations was essential and significant, and endowment deeds often took this into consideration.

Table 2.1: Salaries of different building craftsmen appointed at endowed foundations

Craft	Salary (dirham)	Date	Foundation (endowments of)	Source
Muhandis/miʿmār	60	852/1448	Emir Yūsuf al-Ustādār	DWQ 106/17
	200	879/1474	Sultan Qāytbāy	WA 886q
	675	909/1503	Sultan al-Ghawrī	WA 882q
	400	911/1505	Sultan al-Ghawrī	WA 883q
Carpenter	60	895/1490	Sultan Qāytbāy	DWQ 210/49
	150	908/1503	Emir Azdumur	DWQ 241/38
	150	909/1503	Sultan al-Ghawrī	WA 882q
	150	911/1505	Sultan al-Ghawrī	WA 883q
Marbler	60	852/1448	Emir Yūsuf al-Ustādār	DWQ 106/17
	200	879/1474	Sultan Qāytbāy	WA 886q
	300	890/1485	Azbak al-Atābikī	DWQ 198/29
	200	909/1503	Sultan al-Ghawrī	WA 882q
	200	911/1505	Sultan al-Ghawrī	WA 883q
Plumber	150	879/1474	Sultan Qāytbāy	WA 886q
	300	890/1485	Azbak al-Atābikī	DWQ 198/29
	150	908/1503	Emir Azdumur	DWQ 241/38
	200	909/1503	Sultan al-Ghawrī	WA 882q
	400	911/1505	Sultan al-Ghawrī	WA 883q

We also have a unique surviving inspection report assessing Sultan al-Ẓāhir Baybars' (r. 658-76/1260-77) endowed properties in order to estimate the cost of restoration. This demonstrates another role played by craftsmen, specifically the *muhandis*, in endowment foundations: that of expert witnesses. The deed (DWQ 126/20, dated 865/1461) consists of eleven attached sheets that form a long roll. In general, its script is clear and legible; however, the beginning of the roll is missing and the left margin is damaged. The surviving part is rich in content and reveals the involvement of a judge and four professional builders in the assessment. It lists the

[275] Refer to the pages 75 and 76 for further analysis.

administrative steps to be followed and includes technical details regarding the restoration of the endowments, which appear to have no parallel in other surviving Mamluk documents. This deed has not yet been published and is rarely mentioned in modern scholarship, though Doris Behrens-Abouseif refers to it briefly while discussing the foundations of Sultan al-Ẓāhir Baybars.[276]

In this document, we see *muhandisīn* undertaking complex evaluations of the repairs required in a set of buildings, drawing on a range of skills. This assessment was prepared for five different locations within the city of Cairo, with each location representing a part of the Sultan's endowments. The first location was below Zuwaylah Gate (Bāb Zuwaylah). It included two *qaysāriyyah*s, one large and one small, each comprising several residential units (al-Rabʿ al-Ẓāhirī) and shops with storerooms below.[277] The second location was at *khiṭṭ* Ḥārat al-Rūm.[278] This building's function was not specified in the assessment, but appears from the description to be a hall. The third location was Qaysāriyyat Quraysh, of which Sultan Baybars endowed his share, which was 3⅔ shares (*sahm*) out of twenty-four, or nearly one-eighth of the total property. The fourth location was a building that included shops, storerooms and a few first-floor apartments, of which Sultan Baybars endowed twelve shares, making up half of the building's twenty-four shares. The last building, which was below al-Naṣr Gate (Bāb al-Naṣr), had the same components as the fourth location.[279] The description given for these structures implies that at the time the deed was written, they were largely derelict.

As the first section of the deed is missing, it is not clear who submitted the assessment request. It could be assumed, however, that it was the beneficiaries of these endowments. Since the endowments seem to have been significantly damaged, it seems unlikely that they were generating much revenue. As in other surviving deeds, the request was submitted to the chief judge, who forwarded it to a deputy. Since the purpose of this request was to assess Sultan Baybars' endowments and estimate their restoration expenses, the deputy judge then delegated four professional builders to perform an inspection: Abū Bakr b. Muḥammad al-Muhandis, known as Ibn Qaysūn;

[276] Doris Behrens-Abouseif, *Cairo of the Mamluks : A History of the Architecture and its Culture* (London: I. B. Tauris, 2007), p. 43.
[277] 'Maḥḍar Kashf DWQ 126/20', (Cairo: Dār al-Wathāʾiq al-Qawmiyyah: Ḥujaj umarāʾ wa salāṭīn, 8 Rabīʿ al-Ākhar 865/20 January 1461), pp. darj 1-7).
[278] al-Maqrīzī, *al-Khiṭaṭ* pp. III, 16.
[279] 'DWQ 126/20', pp. darj 7-8.

Aḥmad b. ʿAlī al-Muhandis, known as Ibn al-Rasūl; Ibrāhīm b. ʿAbd Allah b. Yūsuf, known as Ibn Ukht (sister) Yūsuf; and Ibrāhīm b. Ḥasan al-muhandis. They were accompanied by two witnesses whose names were documented at the end of the deed on the right margin, beside the names of these delegated *muhandisīn*.

According to the deed's descriptions, the delegated *muhandisīn* had practical knowledge: they were acquainted through experience with different types of buildings and their defects, as well as with land and its measurement (*'min al-muhandisīn wa ghayrihim min arbāb al-khibrah bi-al-ʿaqārāt wa ʿuyūbihā wa al-arāḍī wa dharʿihā wa al-abniyah wa ikhtilāfihā, al-mandūbīn li-dhālik min Majlis al-Ḥukm al-ʿAzīz bi-al-Diyār al-Miṣriyyah'*).[280] The role of these professional builders was to go to the five described locations and estimate their repair costs.

First, they went to the location with two *qaysāriyyah*s, known as al-Rabʿ al-Ẓāhirī. The *muhandisīn* started by describing the exterior façades, then moved to the shops and storerooms of the ground floor and the apartments of the upper floor. They noted the elements to be demolished, rebuilt, and repaired:

> The staircase is defective (*maʿīb al-binā'*), the side wall (*janb*)[281] is inverted (*maqlūb*), defective and about to fall down. The aforementioned wall needs to be entirely demolished from the top down. [Also,] to suspend [work at] the four storerooms located on the mentioned [southern] side, which are adjacent to the staircase's wall on the right and the left. [The storerooms] need to be demolished and rebuilt with polished stones (*faṣ*[282] *ḥajar naḥīt*[283]), red brick (*ṭūb aḥmar*), mud (*ṭīn*), lime (*jīr*), and crystal gypsum (*jibs zujājī*), and other building equipment (*ālāt al-ʿimārah*) to its original upright (*qāyim al-mīzān*) position.
>
> السلم معيب البنا والجنب المذكور مقلوب البنا معيب آيل للسقوط يحتاج إلى هدم الجنب المذكور من علوه إلى سفله إلى الأرض الموجودة و تعليق المخازن التي في الحد المذكور وعدتها أربعة و هي المجاورة لمدار السلم المذكور و يمنه ويسره و شد ما يحتاج إلى شده و هدم ما يحتاج إلى هدمه و إعادة ذلك

[280] 'DWQ 126/20', p. darj 1.
[281] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 30.
[282] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 86.
[283] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 33.

بالبنا بالفص الحجر النحيت و الطوب الأحمر و الطين والجير و الجبس الزجاجي وغير ذلك من آلات العمارة على ماكان عليه أولا على قايم الميزان.[284]

The shops of the western façade (*al-ḥadd al-gharbī*) had protrusions (*kharajāt*, s. *kharjah*), partitions (*ḥawājiz*, s. *ḥājiz*) and supportive structures, buttresses (*aktāf*, s. *kitf*), and walls (*ajnāb*, s. *janb*) that also needed to be demolished and rebuilt:[285]

> On the western side, [there are] shops that have partitions below the [higher] projections. Some [of these partitions] need repair (*marammāt wa iṣlāḥ*), and others need to be demolished and rebuilt properly (*al-binā' al-mutqan*) to their original upright position. Inside the aforementioned shops, [there are] defective buttresses and walls, some of which need repair and others need to be demolished and rebuilt to their original state. The shops are [also] in urgent need of buttresses below the inverted (*munakkasah*) *rawāshin*[286] (s. *rawshan*, protruding slabs of higher floors) that extend from the second floor before they fall down, using the equipment described above (*mu'an*, s. *ma'ūnah*).

و في الحد الغربي حوانيت بها حواجز سفل الخرجات بعضها محتاج إلى مرمات والإصلاح و بعضها محتاج إلى الشد و الهدم والإعادة بالبنا المتقن على ماكان عليه أولا، وبداخل الحوانيت المذكورة سفل الطباق أكتاف و أجناب معيبة بعضها محتاج إلى الترميم والإصلاح و بعضها إلى الشد و الهدم و البنا و إعادة ذلك بالبنا على ماكان عليه أولا، ويحتاج إلى إقامة بنا أكتاف سفل الرواشن المنكسة المحطوطة إلى سفل الدور الثاني و إلى تدارك ذلك قبل سقوطه على حين غفلة بالمؤن الموصوفة أعلاه.[287]

Generally, the shops and storerooms seem to have been abandoned and in need of considerable repair:

> The mentioned shops and storage rooms need several repairs to the interior and exterior structures. Most of [the rooms] are abandoned (*khāliyah min al-sakan wa al-iskān*), largely covered (*mahūl*) with dust, and lack doors. At the two mentioned *Qaysāriyyah*s, there are damaged *masāṭib*[288] (s. *masṭabah*, built-in benches) that need rebuilding with ash

[284] 'DWQ 126/20', p. darj 1.
[285] Definitions of these terms are drawn from Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Mi'māriyyah*, p. 30.
[286] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Mi'māriyyah*, p. 58. Protruded slabs of higher floors.
[287] 'DWQ 126/20', p. darj 2.
[288] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Mi'māriyyah*, p. 106.

(*ramād*), lime (*jīr*) and stone, and to be tiled to protect the underlying structure. They also need to locate the underlying sewage pipes (*sarāb*, pl. *asribah*)[289] and bring them to the surface, and to move the waste to the al-Kīmān (s. *kawm*, piles of trash)[290] for the benefit of the apartments.

وبالمخازن المذكورة والحوانيت مرمات متفرقة باطنا وظاهرا و غالبها مهول بالاتربة خالية من السكن والإسكان و غالبها بغير أبواب عليها، وبالقيساريتين المذكورتين مساطب خراب تحتاج الى البنا بالرماد و الجير والحجر والتبليط حفظا و صونا لما تحت ذلك من البنا، ويحتاج الى افتقاد السراب المبني في تخوم الأرض وكسحه الى ظاهر الأرض ونقل ذلك الى الكيمان نفعا للمساكن.[291]

Finally, the building experts went through all thirty-three apartments on the upper floors one by one, defining the parts that needed restoration. For example, they identified the damaged walls, tiling and buttresses at every apartment, some of which just needed repair, while others required rebuilding:

As for the mentioned quarter located on top of the aforementioned shops on the first floor, the first apartment, residence of al-Rabʿiyyah, has defective front wall and lacks tiles, and needs to be demolished and rebuilt, and to cover its floor with tiles. The second apartment, known as the residence of Umm Turfah, has cracks on the front wall, and the corridor and hall are without tiles. Its sitting bench needs construction and repair, and to be covered. Also, inner of *al-ḍiʿf*? (double?) (sic) needs repair and fixing. The third apartment, the residence of Yaḥyá al-Jawkhī, has defective buttresses that need repair and construction, and also need partitions (*ghurūd*, s. *ghard*) and tiles, to repair of the front wall, including the door.

وأما الربع المذكور الذي هو علو الحوانيت المذكورة و هو الدور الأول، من ذلك أوله طبقة سكن الربعية به واجهة معيبة خالية من البلاط يحتاج إلى هدم واجهتها و إعادتها بالبناء و إلى تبليط أرض ذلك. والطبقة الثانية تعرف بسكن أم ترفة واجهتها معيبة بالشرخ والدهليز ودور القاعة بالطبقة بغير بلاط و كرسيها يحتاج إلى البنا و الإصلاح وكذا ستر الكرسي و بطون الضعف محتاجة إلى المرمة و الإصلاح. والطبقة الثالثة سكن يحيى الجوخي بها أكتاف معيبة تحتاج إلى المرمة والإصلاح بالبنا والغرود والبلاط وإلى مرمة الواجهة والباب.[292]

[289] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 63.
[290] al-Maqrīzī, *al-Khiṭaṭ* pp. II, 171. Located beyond the eastern border of Cairo.
[291] 'DWQ 126/20', p. darj 3.
[292] 'DWQ 126/20', p. darj 3.

All the *muhandisīn* and witnesses then went to the other four locations and made similarly detailed descriptions of the status of the structures, along with recommendations for their repair and restoration. They estimated that the repairs would cost 3,000 Ashrafī gold dinars.[293] The *muhandisīn* explained that these expenses would be spent on building materials (*mu'an wa aṣnāf 'imārah*), including wood, brick, stone, lime, and gypsum, as well as workers' wages (*ujar*), installing sewage pipes, and moving all waste to the trash yard (Kīmān) beyond the city boundary. They also emphasized that leaving the endowments in their current condition would be problematic, as some parts had already fallen down or were in imminent danger of collapse, significantly affecting the endowments' revenue production:

> The estimate of the budget required for restoration and repair of the entire mentioned endowed properties, including the co-owned (*mushā'ah*) shares, is 3,000 dinars, half of which is 1,500, al-Ashrafī gold dinars, weighed and in circulation in Egypt – may God guards and protects it – the weight of each gold dinar equals to 1 1/8 silver dirham. [This sum] is to be spent on building supplies (*mu'an*), bricks, equipment, wood, and on removal of building waste, both that which is currently in the property and that which would be generated during the building works and restoration, and to move all waste to al-Kīmān (the trash yard). This estimate [could] increase or decrease as prices of materials could rise or be cheaper; every day [price] is bringing about a matter. If [the endowments were to be] left at their current state, damages would get worse, and what is about to fall down would fall like the structures that had already fallen down. This would increase the damage to the endowment and fail to generate revenue for its beneficiaries. This is what the inspection denotes with regards to all locations listed above.
>
> و تقدير مايحتاج إليه لعمارة الأماكن المذكورة الجارية في الوقف المذكور عن الكامل من ذلك و عن الحصص المشاعة للعمارة والإصلاح و المرمات ما جملته من الذهب الطيب الأشرفي الوازن المتعامل به بالديار المصرية حرسها الله تعالى و حماها وصانها ثلاثة آلاف دينار نصف ذلك ألف دينار واحدة و خمس ماية دينار زنة كل دينار من ذلك درهما واحدا وثمن درهم بصنج الفضة، يصرف ذلك في ثمن مؤن و آجر وأصناف عمارة وأخشاب و نقل أتربة مما ذلك حاصلا بالأماكن المذكورة وما يتجدد بذلك عند الشد

[293] al-Maqrīzī, *al-Sulūk*, pp. VII, 130.: coined by Sultan Barsbāy in 829/1426.

و الهدم و المرمات و كسح قنى و ذلك جميعه إلى الكيمان و التقدير في ذلك يزيد وينقص و أسعار الأصناف تعلو أو ترخص و كل يوم هو في شأن... و إن تُرِكَ ذلك على حالته التي هو بها الآن تزايد به الضرر و الخراب و سقط ماهو مايل ذلك إلى السقوط، نظير ماسقط قبل تاريخه فيحصل بذلك غاية الخلل والضرر للوقف المذكور ولمستحقي ريعه شرعا. هذا ما دل عليه الكشف في جميع الأماكن المذكورة أعلاه.[294]

Their full report and repair cost estimate are included in the judicial document. Here, we see the combination of practical skills and abstract knowledge required in the work of these delegated *muhandisīn*: not only did they need the practical experience to identify the necessary repairs, they were also expected to have enough general knowledge of pricing, estimation, and mathematics to produce a statement of how much the repairs would cost. It also appears that the *muhandisīn* signed their own names in the margin of the document to affirm their statement, indicating at least some level of literacy.[295]

What happened after the assessment is not stated in the document. The endowments may have been repaired using revenue money; if that money was not sufficient, they may have been exchanged. The deed also lacks a detailed breakdown of how the estimated 3,000 dinars were to be spent. It neither specifies how much money was to be allocated to each location nor how much workers would be paid, either for the whole project or *per diem*. It also does not specify the amounts of building material required. However, this document represents only the judge's summary of the builders' findings, and these expenditures may have been more thoroughly explained in the experts' original report.[296]

The document clearly demonstrates that *muhandisīn* were involved in the maintenance process, and that their involvement required both practical knowledge and some literate skill, and that they were considered experts in a court context. When combined with other documents, it also sheds light on the relationship between judges and professional builders. Three of the four *muhandisīn* who worked on this case are also mentioned in other deeds: Aḥmad b. ʿAlī al-Muhandis, known as Ibn al-Rasūl, and Ibrāhīm b. ʿAbd Allah b. Yūsuf, known as Ibn Ukht Yūsuf, worked together on at least two other assessment cases, as they appear together in exchange deeds WA 694j (dated 873/1469) and WA 685j (dated 875/1471). Ibrāhīm b. Ḥasan's name appears in at least

[294] 'DWQ 126/20', p. darj 10.
[295] 'DWQ 126/20', p. darj 11..
[296] This procedure of summarising the experts' report in the final deed is identified through reading several endowment deeds, especially exchange deeds.

three more assessments for exchange deeds, including WA 549j (dated 858/1454), WA 537j (dated 858/1454) and DWQ 125/20 (dated 864/1460),[297] which will be discussed below. This suggests that certain *muhandisīn* had particularly strong ties with the courts and that their professional credibility led to their repeated selection as surveyors in property-related cases.

2.2.2 Exchange and lease

From at least the ninth/fifteenth century, Mamluk *muhandisīn* were employed as expert witnesses by judges in the exchange and leasing of endowments. Surviving endowment deeds include a significant number of exchange deeds (*istibdāl*),[298] as well as several lease (*ījār*) deeds, both of which involved *muhandisīn* as a part of the legal process. In these documents, *muhandisīn* can be seen to perform material assessments, produce written reports, and appraise properties using general knowledge of building markets and material availability.

The exchange process began when an endowed property, intended to produce a regular stream of rents for its beneficiaries, ceased to produce its expected income due to damage, disrepair, or other factors. In such cases, the beneficiaries could request that the property be exchanged with another property of equivalent value. The process began with a request submitted by the beneficiaries or the supervisor (*nāẓir*) of the endowed property. In this request, the beneficiaries detailed the location of the endowed (*mawqūf*) property, and briefly outlined the problems justifying their request for an exchange; the reasons for exchange ranged from material damage to the takeover of the property by influential individuals (*tawālat ʿalayhi aydī dhuwī al-shawkah*). They then stated their specific aim, which was usually to exchange the endowment for an equivalent property or share in another property.

The deputy judge would then delegate two or more *muhandisīn* to examine the endowment, who prepared a detailed report including their observations about the property and recommendations for its repair. They submitted their report to the official record and signed as expert witnesses before the judge. The *qāḍī*'s decision to exchange the endowment either for money or for an equivalent property was documented in a

[297] Published in Amīn, *Fihrist*, pp. 463-480.: Amin published this deed DWQ 125/20 in this book.
[298] *Istibdāl*: exchange or sale of an alienated (*mawqūf*) property that is no longer profitable in order to allow the endower to substitute for it another lucrative estate.

separate deed, which included a summary or extracts of the submitted professional report.

In this context, the role of *muhandisīn* was to measure and evaluate the property and its material structures, estimate the cost of restoration and provide an assessment of the property's value. One example is the *istibdāl* deed WA 549j, dated 858/1454, in which *muhandisīn* checked structural elements such as floors, walls, and roofs. In this deed, the *muhandisīn* ʿAlī b. Muḥammad al-Muhandis and Ibrāhīm b. Ḥasan al-Muhandis examined an endowed hall that was subject to an exchange request, listing the parts of each structure that needed repair and noting the extent of the repair required. They even specified the required materials, wood or brick, as necessary:

> The hall in question has a roof, dependences (*marāfiq*, s. *mirfaq*), and rights (*ḥuqūq*, s. *ḥaqq*) that have faulty structures and tiling (*al-balāṭ*). It is necessary to support the roof with wood and remove the faulty [parts], and for those to be rebuilt with tiles and baked clay (*ājurr*). At the sitting place (*majlis*) of the mentioned hall, there are two damaged buttresses (*kitfān*, s. *kitf*) that need to be demolished and rebuilt to their original position.
>
> للقاعة المذكورة سطح ومرافق و حقوق معيبة البنا والبلاط و السقوف، يحتاج إلى حمل السقوف على الأخشاب و هدم المعيب وإعادته بالبنا والبلاط والآجر، وبمجلس القاعة المذكورة كتفان[299] معصران يحتاجان إلى شدهما و هدمهما وإعادتهما بالبنا على ما كانا عليه أولا.[300]

Similarly, *istibdāl* deed 685j (dated 875/1471) includes an excerpt from a report written by Aḥmad b. ʿAlī b. Muḥammad al-Muhandis and Ibrāhīm b. ʿAbd Allah b. Yūsuf al-Muhandis, two professional *muhandisīn*. The report describes the damage they observed as follows:

> A staircase leading to two apartments has damaged (*mufashshakhah* and *sāqiṭah*) partitions and panels (*ajnāb*, s. *janb*)… toilet room (*mirḥāḍ*) with damaged panels… a staircase needs to be fixed and restored… the two *īwān*s opposite one another, open courtyard (*dūr qāʾah*), and built-in cabinets (*khurastānāt*, s. *khurastān*) have damaged parts that need to be

[299] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 93.
[300] 'Istibdāl Deed WA 549j', (Cairo: Wizārat al-Awqāf al-Islāmiyyah: Daftar khānah, 12 Jumādáa al-Ākhar 858/8 June 1454), (p. darj 2).

removed and rebuilt to their original condition… in the lobby (*dihlīz*), [there is] a staircase leading to a passage with seats (*aghānī*, p. *aghāniyyāt*) that needs to be structurally fixed and restored.

سلم يصعد من عليه الى طبقتين بها غرود[301] وأجناب[302] مفشخة ساقطة... مرحاض[303] به أجناب مفشخة... سلم يحتاج إلى إصلاحه وترميمه... إيوانين[304] متقابلين و دور قاعة[305] وخرستانات[306] يحتاج إلى هدم المعيب الذي بها وإعادته على ماكان عليه أولا...بالدهليز[307] سلم يصعد منه إلى أغاني يحتاج الى إصلاحه وترميمه بالبنا.[308]

Both texts provide detailed descriptions of the structures and required repairs that demonstrate practical knowledge and experience. The language used is technical and specific and addresses both surface-level and structural features of the buildings, as well as their connection to the overall design of the property. The fact that the *muhandisīn* distinguished those elements needing full rebuilding from those needing only repair indicates a high level of practical experience, as do the specifications for particular materials. This was knowledge not available to the judge without the help of the *muhandisīn*, requiring their employment as trusted expert witnesses.

As expert witnesses, *muhandisīn* were also expected to estimate repair and restoration costs. Unfortunately, the deeds do not provide a breakdown of costs for specific parts of the repair, but rather only state the estimated overall cost of the restoration. In this case, the *muhandisīn* estimated the restoration expenses for the property at 300 dinars, to be spent on buying building material such as wood and brick, workers' wages for building, cleaning wastewater pipes and removing building waste. Similarly, the *muhandisīn* estimated the restoration cost for the property described in deed WA 685j at 150 dinars without further explanation of specific expenses.[309]

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[301] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 83.
[302] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 30.
[303] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 104.
[304] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 17.
[305] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 50.
[306] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 40.
[307] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 49.
[308] 'Istibdāl Deed WA 685j', (Cairo: Wizārat al-Awqāf al-Islāmiyyah: Daftar khānah, 9 Shaʿbān 875/30 January 1471), (p. darj 2).
[309] For example see: 'WA 549j', p. darj 2:.
وتقدير ما يحتاج إليه المكان المذكور بسبب العمارة والترميم لما ذكر أعلاه من الذهب الأشرفي الطيب الوازن السالم من عيب مثله ثلاثة ماية دينار، نصفها ماية دينار وخمسون دينار، يُصرف ذلك في ثمن مؤن وأصناف عمارة و أخشاب و أجرة و نقل أتربة و كسح أقنية.

Also see: 'WA 685j', p. darj 2:.
وأن تقدير مايحتاج إليه العمارة الضرورية ما جملته من الذهب الأشرفي معاملة تاريخه ماية دينار وخمسون دينار يُصرف ذلك في ثمن مؤن و أجر و نقل أتربة.

Repair expenses would vary depending on the size of the property and the kind of building work required. What precisely it was spent on is not recorded in the legal documents; the breakdown of a general budget for building material and labour wages in an exchange deed might have been explained in the original report submitted to the judge, who then may have summarised or partially cited it in the final exchange deed.

Expert *muhandisīn* were also expected to determine the endowed property's market value, which could be used to buy an equivalent property or a share in a property that would be held according to the same conditions as the original endowment, as in DWQ 221/35 (dated 902/1497).[310] Alternatively, a market valuation could be used to exchange one property directly for another of the same value. In exchange deed DWQ 249/39 (dated 910/1505), the delegated *muhandisīn* appraised two buildings near the city of Cairo at 1100 dinars.[311] Indeed DWQ 261/41 (dated 912/1507), the *muhandisīn* evaluated a residential property at 1900 dinars.[312] This appraisal took into consideration the property's condition, including any reported damages, as well as its location and size.[313] As the property's condition could be expected to change over time, the exchange was presumably expected to occur within a relatively short amount of time.

Another task undertaken by *muhandisīn* in their role as professional witnesses in endowment cases was to identify shareholders in the endowed property as a part of assessing its market value. Endowed shares were precisely described by the founder in the endowment deed, and *muhandisīn* were needed to connect these written descriptions with the physical realities of the property. In deed WA 537j (dated 858/1454), the share in question, which was to be exchanged for a share in a different property, was an unmarked part of a hall. While there was no physical partition to enclose it, *muhandisīn* were able to identify the share and assess its value based on the description recorded in the endowment deed. The *muhandisīn* were expected to also examine the property for which it was to be exchanged to decide on a total value:

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[310] 'Waqf Deed DWQ 221/35', (Cairo: Dār al-Wathāʾiq al-Qawmiyyah: Ḥujaj umarāʾ wa salāṭīn, 25 Dhū al-Hijjah 902/23 August 1497).

[311] 'Istibdāl Deed DWQ 249/39', (Cairo: Dār al-Wathāʾiq al-Qawmiyyah: Ḥujaj umarāʾ wa salāṭīn, 2 Dhū al-Qaʿdah 910/5 April 1505), (p. darj 12).

[312] 'Istibdāl Deed DWQ 261/41', (Cairo: Dār al-Wathāʾiq al-Qawmiyyah: Ḥujaj umarāʾ wa salāṭīn, 16 Dhū al-Qaʿdah 912/29 March 1507), (p. darj 7).

[313] For example, in deed WA 673j, muhandisīn state that the total valuse including the current damage:قيمة الوقف الحاضر وما هو مشتمل عليه من الخراب. See: 'Istibdāl Deed WA 673j', (Cairo: Wizārat al-Awqāf al-Islāmiyyah: Daftar khānah, 26 Rabīʿ al-Awwal 879/9 August 1474), (p. darj 2).

[*Muhandisīn*] went to the two above-described properties, one of which is the hall (*Qā'ah*) and its rights (*ḥuqūq*) that is located at Bayn al-Qaṣrayn Street, at Bashtāk Palace. The hall is known as Bujās' Hall, his [endowed] share is a half and a quarter [of 24 shares], or 18 shares (*ashum*, s. *sahm*), in the hall endowed by Bujās al-Nūrūẓī, mercy on him. And the other property is the hall and its rights that is located at al-Khurunshuf Street in Cairo. The share of one-third and one-eighth [of 24 shares], or 11 shares, and an addition of four parts, an eight-ninths part, a three-quarters of one-ninth part [3/4 x 1/9], and a ninth of one-ninth [1/9 x 1/9] part out of 23 parts, form one full share of 24 shared shares at the mentioned hall and its rights, [the shares] belong to al-Sayfī Burdbak Amīr Dawādār al-Malakī al-Ashrafī.

و ساروا إلى حيث المكانين الموصوفين أعلاه أحدهما القاعة وما هو من حقوقها الكاينة بخط بين القصرين داخل قصر بشتاك المعروفة بقاعة المرحوم بُجاس الجاري بها حصة مبلغها النصف والربع ثمانية عشر سهما شائعا غير مقسوم في القاعة وما هو من حقوقها في وقف المرحوم بُجاس النوروزي رحمه الله، والثاني منها جميع بناء القاعة وما هو من حقوقها سفلا وعلوا الكاين ذلك بخط الخرنشف بالقاهرة المحروسة الجاري من ذلك حصة مبلغها الثلث والثمن أحد عشر سهما كاملة وزيادة على ذلك أربعة أجزاء كاملة، ثمانية أتساع جزء، ثلاث أرباع تسع جزء، تسع تسع جزء، من ثلاث وعشرين جزءا هي السهم الكامل من أربعة وعشرين سهما كاملة شائعا ذلك في جميع القاعة المذكورة وما هو من حقوقها في ملك... السيفي برد بك أمير دوادار الملكي الأشرفي.[314]

Here, one property was significantly smaller than the other, and the *muhandisīn* were required to assess both in order to estimate the difference between the two properties' values. The final proposal involved the exchange of Burdbak's Hall for the endowed shares of Bujās' Hall plus an additional 20,000 *fils*. The new property was then endowed according to the same stipulations, clauses, and expenditures that were originally defined by the endower.[315]

The combination of these roles indicates the expertise required from the delegated *muhandisīn*. In providing detailed descriptions of properties, defining

[314] 'Istibdāl Deed WA 537j', (Cairo: Wizārat al-Awqāf al-Islāmiyyah: Daftar khānah, 12 Jumādá al-Ākhar 858/8 June 1454), (p. darj 2).

[315] See: 'WA 537j', p. darj 2. As documented in the exchange permission, the judge states:
أذن أيد الله أحكامه [القاضي علي بن أحمد الميموني الحنفي]... في استبدال جميع الحصة... داخل قصر بشتاك المعروفة بقاعة المرحوم السيفي بُجاس النوروزي بجميع الحصة... في المكان الكائن بخط الخرنشف و زيادة ذلك ما بلغ من الفلوس الجدد الموصوفة عشرين ألفا لتصرف في مصالح الوقف كما شرح في محضر الكشف المذكور و توقف الحصة المستبدلة على حكم شرط الواقف المذكور في الحال والمآل و التعذر والامكان و الاستحقاق والنظر على الوجه الشرعي.

damaged structures and required restoration work, and estimating the market value of properties and endowment shares, *muhandisīn* had to draw from a wide range of different fields in order to complete their reports. The fact that judges' decisions primarily relied on their expert testimony is further evidence of a marked distinction between *muhandisīn* and ordinary builders, and one that emphasised the status and knowledge of the *muhandisīn*. Not only was their role as experts explicitly stated in their delegation statement and confirmed again in their signed reports, it was also seen by the judges as significantly exceeding that of normal builders. [316]

It appears the *muhandisīn* usually identified two main reasons for an exchange of endowed properties: poor maintenance or fire. Deeds WA 549j and WA 685j, for example, both mention structural damage, and the latter specifically refers to structural damage in explaining why it should be exchanged or restored, should its revenue cover the cost:

> The mentioned hall and apartment (*riwāq*, pl. *arwiqah*)[317] are abandoned because of the aforementioned [damaged structures], they would not be utilized unless restored.
>
> و أن القاعة المذكورة و الرواق خاليين من السكن والإسكان بسبب ماذُكر أعلاه لن يُنتفع بهما إلا بعد عمارتها.[318]

The *muhandisīn* in exchange deed WA 75j (dated 911/1506) identified the reason of exchange as fire damage leading to partial collapse:

> The [judge] delegated few *muhandisīn* of full experience and sufficient knowledge as being testified. [They] went to examine the property described below and found that it is partially burnt, while some structures remain (*ma'ālim*, *rusūm*). The remaining portion of the building has decreased in revenue, and parts of it of liable to fall down.

[316] This statement is cited almost in all deeds that included delegated *muhandisīn*, just to name a few: DWQ 125/20, WA 718j, DWQ 249/39 and WA 549j.
[317] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Mi'māriyyah*, p. 57.
[318] 'WA 685j', p. darj 2.

ندب [القاضي] لذلك جمع من المهندسين ذوي الخبرة التامة والمعرفة الكافية بما يشهد قرينه وساروا الى حيث المكان الاتي وصفه فيه فشاهدوه قد احترق بعضه و بقي بعض من معالمه و رسومه و باقيه نقص ريعه و ضعفت غلته و تداعى للسقوط بعضه.[319]

Yet another reason for exchange was given in deed DWQ 130/21 (dated 866/1461): the endowed land fell under the power of Arab tribes in Jerusalem and the beneficiaries were unable to collect revenue from it.[320] In other cases, such as that of deed DWQ 261/41, dated 912/1507, a combination of material damage and change in jurisdictional authority was given as a reason for exchanging the endowed property. Here, four *muhandisīn* were delegated by the deputy judge Abū al-Wafāʾ Muḥammad b. al-Jawharī al-Ḥanafī to examine a residential property located below Zuwaylah Gate in Cairo. They were ʿAlī b. Muḥammad b. ʿAbd al-Qādir al-Muhandis, Muḥammad b. Muḥammad, and two other *muhandisīn*, whose names are illegible as the right margin has been worn away. Their report, which involves a detailed examination of the property, reports the decline in revenue was caused by structural damage and by the illegal usurpation of the surrounding area. It is remarkable that this was reported by the *muhandisīn*, as one would typically expect the endowment's supervisor or judge to be responsible for investigating such developments.[321]

As expert witnesses, *muhandisīn* went beyond simply evaluating the condition of the property in terms of damage and monetary value, and also offered recommendations regarding the exchange of the property. For example, they might suggest the sale of the endowment for money, rather than recommending a direct exchange of the property for another of similar market value. In deed WA 549j, the *muhandisīn* ʿAlī b. Muḥammad, known as Abū al-Ḥasan al-Muhandis, and Ibrāhīm b. Ḥasan al-Muhandis recommended exchanging the endowed property for one that would generate sufficient revenue and be more accessible. It seems that the judge accepted

[319] 'Istibdāl Deed WA 75j', (Cairo: Wizārat al-Awqāf al-Islāmiyyah: Daftar khānah, 22 Dhū al-Hijjah 911/15 May 1506); published in: Amīn, *Fihrist*, p. 488.

[320] 'Istibdāl Deed DWQ 130/21', (Cairo: Dār al-Wathāʾiq al-Qawmiyyah: Ḥujaj umarāʾ wa salāṭīn, 21 Rabīʿ al-Awwal 866/23 December 1461).

[321] For example see: 'DWQ 261/41', p. darj 7:.
وقد كشف المهندسون المندوبون لكشف المكان المذكور وتقويمه بين يدي سيدنا الحاكم المشار له أعلاه [القاضي النائب أبو الوفاء محمد الحصري الجوهري الحنفي] المكان المذكور فيه وشاهدوه و أحاطوا به علما و خبرة نافية للجهالة وأقاموا شهادتهم ذلك أنهم شاهدوا المكان المذكور أعلاه بالوصف الذي عليه الآن بعد الكشف التام فوجوده قد تدمر بناؤه و قل ريعه و نقصت غلته و ضعفت أجرته و توالت عليه أيدي ذوي الشوكة والمتجوهون يعجز عن خلاص الأجر منه وفات غرض واقفه و تعذر كامل استغلاله و صرفه ي مصرفه الشرعي و دعت الضرورة إلى استبداله بما يكون خيرا منه للوقف ومستحقيه و أكثر ريعا و أوفر أجرة وأسهل تناولا.
The same statement also appears in: 'Waqf Deed DWQ 256/40', (Cairo: Dār al-Wathāʾiq al-Qawmiyyah: Ḥujaj umarāʾ wa salāṭīn, 30 Rabīʿ al-Awwal 912/19 August 1506), (p. darj 2).

their advice, as he gave his permission for an exchange to be organised with an equivalent property. The exchange eventually took place with a smaller property and an additional payment to account for the difference in value. In another case, as appears in deed WA 685j, the *muhandisīn* advised selling the property for money, which could then be used to buy another. In DWQ 261/41, rather than stating a preferred option, the *muhandisīn* offered both alternatives instead.[322]

Here, it is apparent that the final decision would be made by the judge, though he would take into account the *muhandisīn*'s recommendations. As some surviving deeds show, the beneficiaries also had the option of requesting one alternative over the other. In these cases, the judge would often approve the request where possible, provided it did not violate the endowment's rules. In the aforementioned deed WA 549j, the judge approved the beneficiaries' request for an equivalent property, while in other cases, the decision was left to the judge's discretion. No matter whether the solution was suggested by the beneficiary or determined by the judge, however, the available solutions remained either a direct exchange of property or sale for a sum of money to be used in buying a new endowed property.[323]

It seems that the *muhandisīn* summoned as experts in cases of exchange were often employed locally. A comparison between endowments in Cairo and elsewhere reveals that if the endowed property was located outside Cairo, the judge, even if based in the city, would typically accept reliable expert witness recommended by a local judge. A partially surviving exchange deed, WA 673j (dated 879/1474), refers to a case heard by a Cairene judge about an endowed property located in Alexandria. The titles of the three *muhandisīn* sent to examine the property are also different from those recognized in Cairene documents: *al-rāyyis* Muḥammad b. Aḥmad b. Khalaf *al-muhandis fī al-ʿamā'ir*, his nephew *al-rāyyis* Muḥammad b. Ḥasan b. Aḥmad b. Khalaf *al-muhandis fī al-ʿamā'ir* and Muḥammad b. Ibrāhīm *al-najjār fī al-naqī* (a carpenter

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[322] For example see: 'WA 549j', p. darj 4:.
و أن الحظ والمصلحة لجهة الوقف في استبدال الحصة الوقف ... لمن يرغب في استبدالها بما هو أنفع لجهة الوقف المذكور و أيسر استغلالا و أدرّ غلة.

Also see: 'WA 685j', p. darj 2:.
و أن الحظ والمصلحة والغبطة لجهة الوقف و مستحقي ريعه شرعا في استبدال ذلك بمبلغ يشترى به عقار أو حصة من عقار بما هو أنفع من ذلك و أدرّ ريعا و يوقف ذلك على جهة الوقف.

And: 'DWQ 261/41', p. darj 7:.
و دعت الضرورة إلى استبداله بما يكون خيرا منه للوقف ومستحقيه و أكثر ريعا و أوفر أجرة و أسهل تناولا، أو بمبلغ يُشترى به ما يكون موصوفا بما ذُكر و يُوقف ذلك على حكم الوقف المذكور أعلاه في سائر أحواله وشروطه.

[323] 'WA 549j', p. darj 1; 'DWQ 261/41', p. darj 2; 'Istibdāl Deed DWQ 125/20', (Cairo: Dār al-Wathāʾiq al-Qawmiyyah: Ḥujaj umarāʾ wa salāṭīn, 27 Dhū al-Hijjah 864/12 October 1460), (p. darj 3); published in: Amīn, *Fihrist*, p. 472.

with expertise in pinewood).[324] Specifically, *al-rāyyis* (head) and *muhandis fī al-ʿamā'ir* are titles that do not appear in surviving Cairene deeds. In another example, in the abovementioned case of lands located in Jerusalem, DWQ 130/21, the judge accepted the testimony of a reliable expert witness handled by a local judge in Jerusalem.[325]

Occasionally, in cases where either or both parties in the exchange process – the *mubaddil* and *mustabdil* – were high-ranking military officials with close ties to the court, the *qāḍī* would appoint *muhandisīn* attached to the royal court. In deed DWQ 256/40 (dated 912/1506), for example, three *muhandisīn* were involved in a property exchange, two of whom are identified as being employed at the Sultanate Court: Aḥmad b. ʿAlī b. Aḥmad al-Muhandis at the Sultanate's Court (*bi-al-khidmah al-sharīfah*)[326] and Yūsuf b. Ibrāhīm b. ʿAbd Allah al-Muhandis at the Sultanate's Court (*bi-al-khidmah al-sharīfah*).[327] According to this deed, the endowed property was first transferred from the emir al-Sayfī Jānībak to al-Sayfī Khāyirbak al-Khāzindār,[328] and then again from the latter to al-Sayfī Ṭūmānbāy, emir *shādd sharāb khānāh*.[329] The title here (emir *shādd sharāb khānāh*) implies that he was a highly ranked emir and offers a possible explanation as to why the expert *muhandisīn* were delegated from the Sultanate Court.

The *muhandisīn* delegated in endowment exchange cases were never alone and typically varied in number between two and four. At least two *muhandisīn* were always delegated, as two was the minimum standard number of witnesses brought before the *qāḍī* in all Islamic transactions, and the exchange of endowments was no exception. Some rare cases, however, employed up to seven *muhandisīn*. An evaluation of twenty-one exchange deeds shows that the majority of cases involved two or three delegated *muhandisīn*,[330] with the judge delegating four *muhandisīn* in a few cases[331] and seven *muhandisīn* in deed WA 75j (dated 911/1506). This unusually high number of *muhandisīn* was not required by the property's size, as it was not unusually large, and neither was it representative of the preference of an individual judge: the same chief

[324] A carpenter expert in imported pinewood: Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 41.
[325] 'WA 673j', p. darj 2.
[326] The Sultanate Court: al-Qalqashandī, *Ṣubḥ al-Aʿshá*, pp. XII, 185.
[327] 'DWQ 256/40', p. darj 2.
[328] Ibn Iyās, *Badāʾiʿ al-Zuhūr*, pp. V, 108.
[329] al-Qalqashandī, *Ṣubḥ al-Aʿshá*, pp. IV, 21.
[330] For example, deeds DWQ 112/18 (dated 858/1454) and WA 886q (dated 879/1474).
[331] For example, deeds DWQ 125/20 (dated 864/1460) and DWQ 261/41 (dated 912/1507).

judge, ʿAbd al-Barr b. al-Shuḥnah al-Ḥanafī (d.921/1515),[332] and his deputy judge Abū al-Wafāʾ Muḥammad al-Jawharī al-Ḥanafī delegated two *muhandisīn* in another case[333] and four *muhandisīn* in another.[334] Instead, it seems that this case required especially detailed investigation due to fire damage, as the deed is one of several to examine a burnt property. The evidence above suggests that the number of *muhandisīn* could be increased at the judge's discretion and in accordance with the particular details of the case.

This select group of exchange deeds also reveals a tendency for *muhandisīn* to work in regular partnerships, documented in multiple deeds. Two unrelated *muhandisīn* worked together in three cases (DWQ 112/18, WA 549j and WA 537j, all dated 858/1454): ʿAlī b. Muḥammad b. Aḥmad al-Muhandis known as Abū al-Ḥasan and Ibrāhīm b. Ḥasan al-Muhandis. Another pair appears in two cases three years apart (WA 436j and WA 745j, dated 900/1495 and 903/1498 respectively): Muḥammad b. Muḥammad b. Raslān al-Muhandis, known as Jaqmaq, and Muḥammad b. ʿAbd al-Qādir b. ʿAlī al-Muhandis, known as Ibn al-Ṣayyād. Interestingly, a further two *muhandisīn* worked together on three cases over ten years (DWQ 126/20, WA 694j and WA 685j, dated 865/1461, 873/1469 and 875/1471 respectively): Aḥmad b. ʿAlī b. Muḥammad al-Muhandis, known as Ibn al-Rasūl, and Ibrāhīm b. ʿAbd Allāh b. Yūsuf al-Muhandis, known as Ibn Ukht Yūsuf.

Familial relationships also appear in several cases, with two examples of brothers who worked together on the same case. In the first, ʿAlī b. Muḥammad al-Muhandis, known as Ibn al-Faqīh, had three sons - Ismāʿīl, ʿAbd al-Qādir and Ḥasan - who worked together to evaluate three shops in *sūq al-Warrāqīn* (paper-maker market), as appears in WA 373j, dated 914/1508. Another two brothers, Muḥammad and Aḥmad, the sons of ʿAlī b. Aḥmad al-Muhandis known as al-Ṣaḥrāwī, worked together with a third *muhandis* from the court, Yūsuf b. Ibrāhīm al-Muhandis, as mentioned in deed DWQ 256/40. Similarly, the father Muḥammad b. ʿAbd al-Qādir b. ʿAlī al-Muhandis and his son Muḥammad, both known as Ibn al-Ṣayyād, were appointed *muhandisīn* at the Sultanate court and delegated by a judge in deed DWQ 249/39. In the case of the

[332] Najm al-Dīn Muḥammad b. Muḥammad al-Ghazzī, *al-Kawākib al-Sāʾirah bi-Aʿyān al-Miʾah al-ʿĀshirah,* ed. by Khalīl al-Manṣūr, 3 vols (Beirut: Dār al-Kutub al-ʿIlmiyyah, 1997), pp. I, 220-222; ʿAbd al-Ḥayy b. Aḥmad Ibn al-ʿImād al-Ḥanbalī, *Shadharāt al-Dhahab fī Akhbār man Dhahab,* ed. by Maḥmūd al-Arnāʾūṭ, 10 vols (Beirut: Dār Ibn Kathīr, 1986), pp. X, 141-144.
[333] WA 505j.
[334] DWQ 261/41

endowed property in Alexandria, both Muḥammad b. Ḥasan b. Aḥmad b. Khalaf al-Muhandis and his uncle Muḥammad b. Aḥmad b. Khalaf al-Muhandis were delegated to examine the property.

The timelines of the endowment exchanges detailed in the surviving deeds show three main stages to the process, of which the first two involved the participation of *muhandisīn*. First came the examination of the endowed property and submission of an official report: at this stage, there might not be an available property of equivalent value, or a buyer ready to purchase the property outright, but an assessment of the building's material state and needs would have been prepared by *muhandisīn*. The second stage was the judge's permission for the exchange, which as noted above, took into account the recommendations of the *muhandisīn*. If the endowed property were to be exchanged with an equivalent property, then that property too would need to be described and documented: see, for example, deed WA 549j. If the endowed property were to be exchanged for cash, then the judge could approve the deal almost immediately. For example, in deed DWQ 125/20, the examination report was documented on 4th Dhū al-Qaʿdah 864/20 August 1460, and the judge gave his permission on 11th Dhū al-Qaʿdah 864/27 August 1460, about a week later.[335] Finally, the exchange was documented. In some cases, such as WA 549j, this took place on the following day, while in others, it could take place as long as six weeks later. [336]

Muhandisīn were also employed as surveyors prior to the lease of an endowment, as they played a crucial role in examining the property and assessing its rental value.[337] Surviving lease endowment deed WA 718j, dated 711/1311, gives insight into the kind of details taken into account in this context. Divided between two individuals, the endowed share of the property, designated to be a *funduq*, consisted of eight of twenty-four shares. As the *funduq*'s land included an endowed share, the lease required evaluation by *muhandisīn* and permission from a judge. The remaining land would also be rented for the *funduq*, but it would then follow the regular procedure of renting private properties. In this case, the judge appointed *muhandisīn* to measure the

[335] 'DWQ 125/20', p. darj 3; published in:Amīn, *Fihrist*, p. 474.
[336] 'DWQ 125/20', p. darj 3; published in:Amīn, *Fihrist*, p. 476.
[337] While *muhandisīn*'s valuation was essential in leasing endowments, their valuation for private lease was not necessary as evidenced in a private lease deed dated 791/1389, WA 701j. In this private tenancy, there is no mention of the involvement of *muhandisīn*, but rather the owner and tenant arranged a direct lease based on a mutual agreement.

land and determine its rental value for the proposed period of lease, which was thirty years. The evaluation report, dated 7th Rabīʿ al-Ākhar 711/22 August 1311, states:

> This [contract was drawn up] after the writing of a report by honest witnesses expert in real estate and its evaluation, who were delegated by the honoured judicial court of the Egyptian lands. They went to the location and examined it and measured the aforementioned area and the excluded area. They said that the rental value of all the *funduq*'s area, excluding the area of the shops and their benches, to be leased with the option of constructing any building on the land, or adding additional floors, or digging foundations and watering wells, for the period of complete 30 consecutive years, is 27,000 weighted *nuqrah*[338] dirhams, nine hundred *nuqrah* dirham each year, and this is the market value at this time.
>
> وذلك بعد اكتتاب محضر يتضمن مسير العدول شهود القيمة أرباب الخبرة بالعقار وتقويمه المندوبين لذلك من مجلس الحكم العزيز بالديار المصرية إلى حيث المكان وكشفوه و حرروا الذرع المذكور بأعاليه و ذرع المستثنى منه، وقالوا أن القيمة عن أجرة أرض الفندق بكماله خلا المستثنى منه و هو أرض الحوانيت و مساطبها لمن يرغب في استئجارها ليبني عليها ما أراد بناؤه و يعلي ما أراد تعليته و يحفر الأساسات و آبار القنى للأداء على الوجه الشرعي لمدة ثلاثين سنة كوامل متتالية ما مبلغه عن جميع المدة المذكورة من الدراهم النقرة سبعة وعشرون ألف درهم نقرة بالصنجة في سلخ كل سنة من سني هذه المدة تسع ماية درهم نقرة و أن ذلك أجرة المثل يومئذ.[339]

Permission was issued around six weeks later, on 22nd Jumādá al-Awwal 711/5 October 1311, with a defined tenant and separate lease value for the endowed shares. The judge relied on the *muhandisīn*'s evaluation of the entire twenty-four shares to deduce the rental value of the endowed shares. As the judge explains in the rental deed, two individuals, Abū al-Ḥajjāj and Ibn Malakshū, held a total of 7 ⅝ endowed shares, with the former holding 3 ⅓ shares and the latter 4 ½ shares. The judge then defined the overall rental value. As it appears in the deed, this rent was fixed and not subject to change until the end of the lease term. It defined the value of the endowed portion of land and the amount to be paid by the individuals, as well as giving the amounts for the entire rental period and for each year.[340]

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[338] The dirhams of silver:copper ratio of 2/3:1/3. See: al-Qalqashandī, *Ṣubḥ al-Aʿshá*, pp. III, 443.
[339] 'Idhn Ijār Deed WA 718j', (Cairo: Wizārat al-Awqāf al-Islāmiyyah: Daftar khānah, 22 Jumādá al-Awwal 711/5 October 1311), (p. darj 1).
[340] 'WA 718j', p. darj 1.

While legal scholars recommended the standard lease period for endowed properties to be one year for buildings and three years for agricultural land,[341] longer lease periods were permitted if immediate payment was required for the benefit of the endowment.[342] Scholars recommended these standards for the benefit of the endowment, as leasing at a fixed rate over a longer period would not account for inflation over time, and there was a continued risk that control of the land might forcefully be taken by others. These concerns appear in the clauses stipulated by the endowment's founder, who stated that the supervisor should not lease the property for more than a year at a time.[343] Similarly, Sultan al-Ashraf Barsbāy allowed supervisors to lease the endowments for up to two years, but clearly emphasised that properties were not to be leased to disreputable tenants nor to those known to have significant power (ولا لِمُتَجَوِّهْ ولا لأحد من أرباب الشوكة ولا لمشهور بسوء المعاملة).[344]

Muhandisīn were employed as expert witnesses, not only in cases involving endowed properties, but also in private disputes. While the procedures governing judicial rulings in private cases are not documented as endowment-related procedures are, the lack of surviving documentation does not rule out the existence of similar procedures for private building disputes, as described by Ibn al-Rāmī (fl. 8th/14th c.) in his *al-Iʿlān bi-aḥkām a-bunyān*. Ibn al-Rāmī, as an expert builder at the judicial court in Tunis, tells of his involvement in several private property disputes. These incidents strongly suggest that *muhandisīn* were employed to provide the judge with a professional, objective evaluation that would inform his judgement. Here, Ibn al-Rāmī writes of a dispute raised to chief judge by an owner and prospective buyer over the condition of a house. Ibn al-Rāmī writes that, after inspection, his report confirmed that the house was sufficiently damaged as to invalidate the sale, recommending the return of the property to the original owner and the money to the buyer. Once again, the owner appealed the decision, claiming that during the buyer's brief occupation he had demolished a large part of the house and as such the house now offered insufficient

[341] al-Khaṣṣāf, *Aḥkām al-Awqāf*, p. 205; al-Ṭarābulusī, *al-Isʿāf*, p. 68.
[342] al-Ṭarābulusī, *al-Isʿāf*, p. 68.
[343] 'Waqf Deed WA 610j', (Wizārat al-Awqāf al-Islāmiyyah: Daftar khānah, 18 Shaʿbān 697/30 May 1298); 'Waqf Deed WA 938q', (Wizārat al-Awqāf al-Islāmiyyah: Daftar khānah, 4 Jumādá al-Ākhar 823/15 June 1474); 'Waqf Deed DWQ 224/36', (Cairo: Dār al-Wathāʾiq al-Qawmiyyah: Ḥujaj umarāʾ wa salāṭīn, 1 Shaʿbān 903/24 March 1498).
[344] 'Waqf Deed DWQ 3390 Tarikh', (Cairo: Dār al-Wathāʾiq al-Qawmiyyah: Ḥujaj umarāʾ wa salāṭīn, 15 Jumādá al-Ākhar 827/14 May 1424).

compensation. Ibn al-Rāmī again submitted a second report in keeping with the owner's story, and the judge ruled that the buyer would have to keep the house, with the original owner paying a sum equal to the original defective part but not that of the demolished part.[345]

While the cases outlined above occurred in Tunis under the Mālikī madhhab, the process may have been similar in ninth/fifteenth century Mamluk Cairo. In Tunis examples, a petition or a complaint was raised to the judge who delegated Ibn al-Rāmī to examine the property and provide him with technical report, upon which the judge was able to rule. The outline of such a process was present in the management of Mamluk Cairo endowments in the course of maintenance, exchange, and lease. The similarity between both processes in Tunis and Cairo likely suggests the existence of similar involvement of Cairene *muhandisīn* in building-related disputes between individuals. What Ibn al-Rāmī's narrative adds to the process seen in Mamluk Cairo is the vivid image of actual actions and background scene for the professional reports and judicial decisions that appear in Mamluk documents. The technical information was only available to the judge through the testimony of the *muhandis*, whose expertise allowed judges to assume the role of trusted experts within the courts.

2.3 Protrusion into public pathways

Muhandisīn also appear in a different, more general legal context: jurisprudence related to the regulation of protrusions into public pathways. In medieval Islamic law, *fiqh al-ʿumrān* (building jurisprudence) was a specialized subfield devoted to legal opinions on building-related issues and disputes. As explained by Akel Kahera and Omar Benmira, these included the effects of opening a window, changing the function of a property from private to commercial and vice versa, the erection of new spatial

[345] The story as Ibn al-Rāmī narrates:
نزلت هذه عندنا بتونس في رجل اشترى دارا فوجد فيها عيبا، فتداعيا الى القاضي الفقيه ابي عبدالله بن الغماز قاضي الجماعة. فسألنا النظر في ذلك فكتبنا وثيقة متضمنها أنه عيب يوجب الرد، فحكم بينهما القاضي برد الدار، ثم قام البائع على المشتري فيما انهدم من الدار بعد شرائه، وتحاكما في ذلك عند القاضي المذكور. فقال: ينظر أهل البصر الهدم، هل يسير أو كثير؟ فكتبنا وثيقة نصها: (الحمدلله يقول من يضع اسمه عقب تاريخه أنه عاينت العيوب المشهود بها في البصر وشهدت بها و بأنها أقدم من أمد التبايع المذكور فيه و أنها توجب الرد) ثم طلب بعد ذلك معاينة ما أُحدِث بالدار المذكورة فيه من الهدم الكثير المذكور و الحادث فيها بعد الشراء المذكور و أن قيمة العيب كذا وكذا. ثم شهدنا و حكم بالقيمة ولم يرد الدار بالعيب لفوات المبيع بالهدم الكثير.
For the full story and further detail incluiding the conversation with the judge, see: Muḥammad b. Ibrāhīm Ibn al-Rāmī al-Bannāʾ, *al-Iʿlān bi-Aḥkām al-Bunyān,* ed. by Farīd Bin Sulaymān (Tunis: Markaz al-Nashr al-Jāmiʿiyyah, 1999), pp. 102-111.

dividers, visual intrusion by minaret balconies or rooftops, the optical or auditory harm that might be caused by any of these or similar actions or structures, and public and private rights of way.[346] During the Mamluk period, these regulations were widely known and generally followed.

The majority of legal opinions regarding building jurisprudence can be found within larger collections of legal opinions called *fatāwá*. Separate works dedicated to building regulations and disputes are rare, and very few such works are known from the medieval Islamic period. One such text, *al-Qaḍā' fī al-Bunyān* (*Judgment of Building*) by the Egyptian historian Ibn ʿAbd al-Ḥakam (d. 257/871) has unfortunately not survived.[347] Two Andalusian treatises from the third/ninth century, *al-Jidār* (*The Enclosure*) and *al-Bunyān wa-al-Ashjār wa-al-Miyāh* (*Building, Planting, and Water*), have not survived, but were cited in later works, namely *al-I'lān bi-Aḥkām al-Bunyān* (*The Announcement of Building Regulations*) by Ibn al-Rāmī (fl. 8th/14th c.), a Tunisian expert builder who worked for the *qāḍī* court in Tunis.

Just to give one example of building-related issues that caused auditory harm, as cited by Ibn al-Rāmī in his treatise, a dispute raised to chief judge Ibn ʿAbd al-Rāfiʿ in the early eighth/fourteenth century by a neighbour who complained that a newly erected stable behind his house caused significant noise disruption.[348] The judge delegated Ibn al-Rāmī to look into the claim, and he subsequently confirmed the neighbour's account. While the judge originally approved the neighbour's claim on the basis of this evidence, on appeal the stable's owner explained that the building offered his main source of income, and the judge instead resolved to allow the man to speak with Ibn al-Rāmī about structural amendments that would reduce the noise. Ibn al-Rāmī advised the stable's owner to construct a barrier wall according to the following instructions (Figure 2.4):

> A wall with a foundation depth of the height of a man (approx. 2 meters) in front of the neighbour's wall through which the noise was transmitted. This wall is to be constructed 5 *shibr*s (approx. 1.25 meters) above the ground level, and it should be 2 *shibr*s (approx. 0.50 meters)

[346] Akel I. Kahera and Omar Benmira, 'Damages in Islamic Law: Maghribi Muftis and the Built Environment (9th-15th Centuries C.E.)', *Islamic Law and Society*, 5: 2 (1998), 144-154.
[347] Lutf Allah Qari, 'Jawlah maa al-Kutub al-Turāthiyyah al-Maṭbūʿah fī fiqh al-ʿUmrān'2010) <http://www.tourath.org/ar/content/view/2066/1/> [Accessed 16 February 2017].
[348] Ibn al-Rāmī al-Bannāʾ, *al-Iʿlān*, p. 65.

> thick. There should be also a cavity between the two walls (between the proposed and the existing wall of the neighbour's house) of half a *shibr* (approx. 0.12 meters) for the full height of the proposed wall.[349]

In this case, the significance of Ibn al-Rāmī's involvement in the neighbours' dispute appears in the structural solution he suggested to resolve the auditory noise. Drawing on his experience, Ibn al-Rāmī advised specific layout and dimensions for the barrier wall to isolate the noise from the neighbour. The dispute was resolved to the advantage of both neighbours on the basis of Ibn al-Rāmī's examination and recommendation for a proper barrier.

From Mamluk Cairo, we have a commentary by the Egyptian Ḥanafī scholar Qāsim b. Quṭlūbughā al-Sūdūnī (d. 879/1474) on an earlier work, *al-Ḥīṭān*.[350] The work, authored by al-Murjī al-Thaqafī (fl. 4th/10th c.), was also expounded upon by two later scholars: the Ḥanafī chief judge Muḥammad b. ʿAlī al-Dāmghānī (d. 478/1085)[351] and the jurist ʿUmar b. ʿAbd al-ʿAzīz b. Māzah al-Bukhārī (d. 536/1141).[352] Ibn Quṭlūbughā's contribution added little to the earlier text, but referred to some new questions raised during his time. He also emphasized that the reason behind his contribution was a debate between jurists on the details of cases regarding walls between neighbours. He, therefore, gathered the legal opinions concerning roads, walls, and doors discussed primarily by al-Murjī al-Thaqafī and updated them with new cases of his own time.[353]

Building jurisprudence did not differ much between geographical regions, principally varying in its details between the four schools of law: Ḥanafī, Mālikī, Shāfiʿī, and Ḥanbalī. The four schools were in consensus on the three primary principles of building law: main roads should have a minimum width of 7 cubits; public pathways should be kept clear of obstructions, and harm and the reciprocation of harm should be

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[349] Besim Selim Hakim, *Arabic-Islamic Cities : Building and Planning Principles*, 2nd edn (London: Kegan Paul International, 2008), p. 33.

[350] al-Murjī al-Thaqafī, *Kitāb al-Ḥīṭān: Aḥkām al-Ṭuruq wa al-Suṭūḥ wa al-Abwāb wa Masīl al-Miyāh wa al-Ḥīṭān fī al-Fiqh al-Islāmī,* ed. by Muḥamad Khayr Ramaḍān Yūsuf (Beirut: Dār al-Fikr al-Muʿāṣir, 1994).

[351] Muḥammad b. Aḥmad al-Dhahabī, *Siyar Aʿlām al-Nubalāʾ,* ed. by Shuʿayb al-Arnāʾūṭ, 3rd edn, 25 vols (Beirut: Muʾassasat al-Risālah, 1985), pp. XVIII, 485.

[352] ʿAbd al-Qādir b. Muḥammad Ibn Abī al-Wafāʾ al-Qurashī, *al-Jawāhir al-Muḍiyyah fī Ṭabaqāt al-Ḥanafiyyah,* ed. by ʿAbd al-Fattāḥ Muḥammad al-Ḥulw, 2 edn, 5 vols (Cairo: Hajr lil-Ṭibāʿah wa al-Nashr wa al-Tawzīʿ, 1993), pp. II, 649; IV, 312.

[353] al-Thaqafī, *al-Ḥiṭān*, p. 8.

avoided.[354] Even though the third principle seems very general and not restricted to public roads, it was essential and primary to this topic; several legal opinions were fundamentally established using it.[355] In the context of protrusions into public pathways, for example, it meant that even if a projection conformed to the first two principles, it had to be removed if it caused harm to an adjacent building.

Modern scholars have generally studied *fiqh al-ʿumrān* in the context of Islamic law, seeking to understand how Islamic law regulated the development of Islamic cities. A few studies aimed to add historical context to this field to show its impact on urban planning and pattern of urban expansion. In one such study, Hasan Abd al-Wahhab's survey of Cairo's development since its foundation by the Fatimid military leader Jawhar al-Ṣiqillī in 358/969 emphasizes the principles that affected its layout as well as the role of the *muḥtasib* (market inspector) in keeping the city and its pathways within the principles explained in Islamic law.[356]

Abd al-Wahhab notes that at least in theory, Islamic principles barred the construction of any ground-level protrusion that could interfere with the street alignment. For example, in Islamic law, the cross-street bridge structures known as *sābāṭ* (pl. *sābāṭāt* and *sawābīṭ*)[357] were to be placed high enough to allow a man riding a horse or camel to pass underneath (Figure 2.5). He cites Ibn al-Ukhuwwah's (d. 729/1329) *Maʿālim al-Qurbah* and al-Nuwayrī's (d. 733/1333) *Nihāyat al-Arab* to show that the *muḥtasib* was responsible for ensuring that people did not violate these rules, and also had the right to remove any infringing structure.[358]

Abd al-Wahhab also refers to the efforts made by the emir Dawādār Yashbak min Mahdī (d. 885/1480)[359] to widen Cairo's main streets and demolish offending structures, such as *sābāṭāt*,[360] *rawāshin* (s. *rawshan*, protruding window),[361] and *masāṭib* (s. *masṭabah*, seats).[362] He also mentions a ruling from the Shāfiʿī judge Fatḥ

[354] Hakim, *Arabic-Islamic Cities*, p. 19.
[355] Kahera and Benmira, 'Damages in Islamic Law', pp. 131-132.
[356] Hasan Abd al-Wahhab, *Takhṭīṭ al-Qāhirah wa Tanẓīmuhā mundhu Nashʾatuhā* (Cairo: Matābiʿ Dār al-Nashr li-al-Jāmiʿāt al-Miṣriyyah, 1957), pp. 6-7.
[357] Ibn Manẓūr, *Lisān al-ʿArab*, pp. VII, 311; Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 60.
[358] Abd al-Wahhab, *Takhṭīṭ al-Qāhirah*, p. 6.
[359] al-Sakhāwī, *al-Ḍawʾ al-Lāmiʿ*, pp. X, 272.
[360] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 60.
[361] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 58.
[362] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 106.

al-Dīn al-Sūhājī (fl. late 9th/15th c.) authorising this demolition, which will be discussed at greater length later in this chapter.[363]

Muhammad Abd al-Sattar ʿUthman also discusses *fiqh al-ʿumrān* and the rights of public streets and refers to the same emir Yashbak's actions to remove violating structures.[364] ʿUthman agrees with Abd al-Wahhab that the *muḥtasib* held some responsibility for maintaining public streets and keeping them clear of obstructions. He also cites Ibn al-Ukhuwwah, who assigned the *muḥtasib* the right to prevent protrusions into public roads and to demolish illegal structures.[365] ʿUthman also mentions that permission to extend a building upwards was required if one wanted to build additional floors.[366] Abd al-Latif Ibrahim's study briefly refers to two surviving building permissions, the former of which will be analysed further below: a Mamluk permission, dated 902/1496, for building one floor with projections on top of an existing building (DWQ 220/35), and an Ottoman permission dated 923/1517 (DWQ 286/44).[367] Both of these studies, however, focus on the legal aspects of these cases, rather than what they reveal about the duties and status of the people involved in them.

Laila Ibrahim approaches the topic of building law from a different perspective. In 'Residential Architecture in Mamluk Cairo', she focuses on the principles that lay behind the design of living units for elites and the general public in medieval Cairo. Within this context, she touches on the rights of public pathways as explained by Islamic law, citing the aforementioned *fatāwá* collection by Ibn al-Rāmī. Ibrahim highlights that the high price of land and lack of space not only forced buildings upwards, but also led to narrow lanes only narrowed further by the addition of projections to the upper levels of the buildings on either side. She also explains that although the streets were narrow in comparison to the size of both the population they served and the height of buildings on both sides, they were not actually narrower than the streets of other medieval Islamic cities. Projections on the walls added to the impression of narrowness; each successive floor was built on brackets projecting out from the floor below, *rawāshin*. People also built *sābāṭāt* across side streets, alleys, and

[363] Abd al-Wahhab, *Takhṭīṭ al-Qāhirah*, pp. 12-13.
[364] Muhammad Abd al-Sattar Uthman, *al-Madīnah al-Islāmiyyah* (Kuwait: al-Majlis al-Waṭanī lil-Thaqāfah wa al-Funūn wa al-Ādāb, 1988), p. 190.
[365] Ibn al-Ukhuwwah, *Maʿālim al-Qurbah*, p. 78.
[366] Uthman, *al-Madīnah al-Islāmiyyah*, p. 189.
[367] Abd al-Latif Ibrahim, 'Silsilat al-Dirāsāt al-Wathāʾiqiyyah: al-Wathāʾiq fī Khidmat al-Āthār: al-ʿAṣr al-Mamlūkī', in *Dirāsāt fī al-Āthār al-Islāmiyyah,* (Cairo: Arab League Educational, Cultural and Scientific Organization (ALECSO), 1979), pp. 394-481 pp. 421-422).

cul-de-sacs, which were supposed to be constructed according to the regulations in *ḥisbah* books, although these were not always respected.[368]

In *Arabic-Islamic Cities*, Besim Hakim comments mainly on Ibn al-Rāmī's treatise and compares the principles it included with extant medieval structures in Tunis and other Islamic cities. He notes that as the exact length of a cubit varied according to the school of law used. Permissible road widths - defined as being at least 7 cubits - actually ranged between 3.22 and 3.50 metres.[369] On the basis of material evidence, Hakim also argues that general principles of building regulations were applied even where there is no documentation. For example, jurists seemed to agree that a person riding a camel or horse should be able to safely pass beneath a *sābāṭ*; this would translate to a height of around 7 cubits (Figure 2.6).[370] By analysing extant structures in a number of Arab cities according to Islamic law, Hakim confidently concludes that these regulations were indeed applied in the real world, especially where there was *sābāṭ* over a street.[371]

However, some illegal projections were built, and their construction required court regulation. According to all four schools of law, if a protrusion could cause harm, it should be demolished regardless of its size. If it did not cause harm, opinions on what to do about it varied between the schools of law. If the street was less than 7 cubits wide, then the projection was to be demolished, but if it was wider, it could be retained.[372] Court regulation may be required even before any new protrusion was built; the strict Ḥanbalī school of law held that even in situations where no harm has yet been done, the owner still had to acquire prior permission from the ruler, Sultan, or judge to build any protrusions.[373]

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[368] Laila 'Ali Ibrahim, 'Residential Architecture in Mamluk Cairo', *Muqarnas,* 2 (1984), 47.

[369] Hakim, *Arabic-Islamic Cities*, p. 20.

[370] Aḥmad b. ʿAbd al-Ḥalīm Ibn Taymiyyah, *al-Ikhtiyārāt al-Fiqhiyyah min Fatāwá Shaykh al-Islām b. Taymiyyah*, ed. by ʿAlī ibn Muḥammad al-Baʿlī and Muḥammad Ḥāmid al-Faqī (Beirut: Dār al-Maʿrifah, 1950), pp. 135-137.

[371] Hakim, *Arabic-Islamic Cities*, p. 24.

[372] Hakim, *Arabic-Islamic Cities*, p. 25.

[373] Aḥmad b. ʿAbd al-Ḥalīm Ibn Taymiyyah, *Majmūʿ Fatāwá Shaykh al-Islām Aḥmad b. Taymiyyah,* ed. by ʿAbd al-Raḥmān b. Muḥammad Ibn Qāsim, 37 vols (Riyad: Maṭābiʿ al-Riyāḍ, 1961), pp. XXX, 399-407. Ibn Taymiyyah cites a legal opinion states that if an owner wanted to build a building in a wide street in a way that the new building would not cause harm to the public use, it could be permissted by the ruler's permission; Abu Hamid al-Maqdisī al-Shāfiʿī, *al-Fawāʾid al-Nafīsah al-Bāhirah fī Bayān Ḥukm Shawāriʿ al-Qāhirah fī Madhāhib al-Aʾimmah al-Arbaʿah al-Zāhirah,* ed. by Āmāl ʻUmarī (Cairo: Wizārat al-Thaqāfah, Hayʾat al-Āthār al-Miṣriyyah, 1988), p. 22.

There was another factor that affected a decision to remove or keep the protruding structure: the limit of a building's *fināʾ*. The term '*fināʾ*" is used both for the interior courtyard of a house and the exterior space immediately adjacent to the house's exterior wall or walls. This exterior space was defined to be between 4 and 6 *shibrs* (1.00 and 1.50 m).[374] This *fināʾ* could be used for daily temporary use by the residents of the house, but they did not have the right to occupy the space for extended periods of time, and nor could they enclose it. It was clearly stated that no built structures were allowed at the ground floor level on this exterior adjacent space. However, protrusions at higher levels into the street, such as windows or extended roofs, were allowed if they did not exceed the *fināʾ*s limit, violate the principle of harm, or infringe the minimum street width.[375] Their regulation involved both the acquisition of judicial permissions and, in some cases, legal mandates for their destruction. Both involved the evaluation of the protrusions in question by trained builders such as *muhandisīn*, as will be discussed further below.

Although the legal literature discussed above forms the basis for most modern scholarship on building regulations, Mamluk Cairo provides a range of other primary sources, such as documents, *fatāwá* collections, and literary works, which shed light on the figures involved in the actual regulation of protrusions into public streets. One such work is a Mamluk treatise on Cairo's streets, written by the Egyptian Shāfiʿī scholar Abū Ḥāmid Muḥammad b. Khalīl al-Maqdisī (d. 888/1483) and entitled *al-Fawāʾid al-Nafīsah al-Bāhirah fī Bayān Ḥukm Shawāriʿ al-Qāhirah fī Madhāhib al-Aʾimmah al-Arbaʿah al-Ẓāhirah* (*The Precious Impressive Benefits in the Statement of the Rule Regarding Cairo's Streets According to the Conspicuous Doctrines of the Four Imams*). It is a unique source on the subject, as no other similar treatise survives.[376] It is cited briefly in a few modern studies, particularly that of Abd al-Wahhab and other studies of Islamic urban planning, but has not received sufficient attention from Mamluk historians.[377]

[374] Hakim, *Arabic-Islamic Cities*, p. 29.
[375] Hakim, pp. 27-29.
[376] Contrary to what is mentioned in the introduction of the edition of this manuscript (al-Fawāʾid al-nafīsah al-bāhirah), the author Muḥammad b. Khalīl al-Maqdisī is cited in al-Sakhāwī's *al-Ḍawʾ*, and he deceased in 888/1483 not in 893/1488. See:al-Sakhāwī, *al-Ḍawʾ al-Lāmiʿ*, pp. VII, 234.
[377] Khalid Muhammad Azab, *Takhṭīṭ waʿImārat al-Mudun al-Islāmiyyah* (Qatar: Ministry of Awqaf and Islamic Affairs- Department of research and Islamic 1997), p. 90; Jamāl al-Ghīṭānī, *Muntahá al-Ṭalab ilá Turāth al-ʿArab: Dirāsāt fī al-Turāth* (Cairo: Dār al-Shurūq, 1997), pp. 129-132; Atif Abd al-Dayim Abd al-Hayy, 'al-ʿImārah al-Islāmiyyah min al-Qīmah ilá al-Athar', in *First International*

The treatise gives a history of Cairo's development from its Fatimid founding up to al-Maqdisī's time and highlights the city's open spaces and main roads, particularly the development of *al-qaṣabah* (Bayn al-Qaṣrayn Street) and the buildings lining it. It also discusses opinions from the four schools of law pertaining to Cairo's streets, giving special attention to the aforementioned principles of minimum street width, minimum extension height, and protrusion into public streets.[378]

The treatise was written in response to a debate that developed in Cairo in 882/1477 regarding Emir Yashbak al-Dawādār's order to remove all illegal protrusions in the city. Al-Maqdisī wanted to gather the legal opinions of the four schools of law to evaluate whether or not Yashbak's actions were justified by Islamic law, and if so, to what extent:

> In early 882 (1477), there happened some remarkable incidents…[One] of which was the demolition of the shops and houses which had been recently built within the enclosure (*ḥarīm*) of *madāris* (schools), *jawāmiʿ* (congregational mosques), *masājid* (mosque) and protruded into pathways preventing public use. There was a consensus that this demolition improved the main road of Cairo, Bayn al-Qaṣrayn, and other streets: it widened and lightened streets, and its paths and squares became wider. Cairo had needed it for more than a hundred years until God guided his slave Yashbak al-Dawādār to this virtue. However, this action [of demolition] caused disturbance to the people, was carried out with brutality, and extended to the demolition of endowments assigned for the benefit of orphans, shops, and other [buildings]. They [Yashbak and his emirs] were so determined as to employ judges to rule in favour of the demolition of these [protruding buildings]. During these actions, there occurred an exchange between me [Abū Ḥāmid al-Maqdisī, the author] and a few scholars about the legality of this demolition and the legally allowed amount [of protrusion]. So, I have compiled these pages that explain the injunction of law (*ḥukm sharʿī*) and its repercussions according to the four schools of law.

Conference: Al-ʿImārah wa al-Funūn al-Islāmiyyah al-Māḍī wa al-Ḥāḍir wa al-Mustaqbal, (Cairo: League of Islamic Universities, 2007), pp. 2-30 (p. 6).

[378] al-Maqdisī al-Shāfiʿī, *al-Fawāʾid al-Nafīsah*, p. 23.

فقد وقع في أوائل سنة اثنين وثمانين بالقاهرة المحروسة حوادث عجيبة... فمنها هدم الحوانيت والبيوت الحادثة بحريم المدارس والجوامع والمساجد البارزة في الشوارع المانعة للناس من تمام الارتفاق، فانصلح بذلك قصبة بين القصرين من القاهرة وغيرها من الشوارع بالانفاق، فاتسعت أقطارها وأضاءت وصارت سبلها و رحابها واسعة. وقد كانت مدينة القاهرة محتاجة إلى ذلك من أكثر من مائة سنة حتى ادخر الله تعالى لعبده يشبك الدوادار أجر هذه الفعلة الحسنة. غير أن هذا الأمر لما طال بالناس وتفاحش خطبه و تعدى إلى هدم أملاك أوقاف لأيتام كثيرة و إزالة حوانيت و غيرها، ثم اشتد عزمهم في ذلك حتى استعملوا قضاة للحكم بهدم ما هنالك. ثم وقع كلام بيني وبين بعض فضلاء الفقهاء في البحث عن جواز ذلك أم امتناعه و ما القدر المأذون فيه شرعا من ذلك. فجمعت هذه الأوراق المشتملة على بيان الحكم الشرعي في ذلك على مذهب الأئمة الأربعة و ما وقفت عليه من السنة المتبعة، وما يتعلق بالمسألة وتوابعها.[379]

According to al-Maqdisī, Cairo's exponentially increasing population resulted in right of way violations affecting wide areas of Cairo, and these protrusions had hindered public use for more than a century.[380] However, the demolition campaign was very extensive, demolishing shops, houses, and even endowed properties at the cost of owners and endowment beneficiaries. The campaign was approved by the judge Fatḥ al-Dīn al-Sūhājī, who ruled that protruding structures could be destroyed. After discussing many aspects of the relevant jurisprudence, al-Maqdisī concluded that the emir Yashbak's actions - i.e. removing problematic structures, including endowed properties – were lawful according to the four schools of law.[381]

In support of the demolition campaign, al-Maqdisī cited an earlier example of a judge who gave permission to remove a harmful protruding structure. In that case, the emir Jamāl al-Dīn al-Ustādār (d. 812/1409)[382] brought witnesses before the Ḥanafī chief judge Kamāl al-Dīn ʿUmar b. al-ʿAdīm (d. 811/1408)[383] to argue that Bashtāk Palace was causing harm to the public use of Bayn al-Qaṣrayn street, and asked the judge's permission to demolish the palace.[384] The judge heard the petition and granted the permission. While no demolition was carried out in this case, the example shows judges' ability to authorise the demolition of structures harming public use as early as the late eighth/fourteenth century.

[379] al-Maqdisī al-Shāfiʿī, *al-Fawāʾid al-Nafīsah*, pp. 11-12.
[380] al-Maqdisī al-Shāfiʿī, *al-Fawāʾid al-Nafīsah*, p. 14; Ibrahim, 'Residential Architecture', pp. 49-50.
[381] al-Maqdisī al-Shāfiʿī, *al-Fawāʾid al-Nafīsah*, p. 26.
[382] Ibn Taghrībirdī, *al-Nujūm al-Zāhirah*, pp. XIII, 95.
[383] Ibn Taghrībirdī, *al-Nujūm al-Zāhirah*, pp. XIII, 171.
[384] al-Maqdisī al-Shāfiʿī, *al-Fawāʾid al-Nafīsah*, pp. 17-18. al-Maqdisi seems cited this narrative from al-Maqrizi; al-Maqrīzī, *al-Khiṭaṭ* pp. II, 70; III, 128-129. This Palace was built by the emir Sayf al-Dīn Bashtāk al-Nāṣirī (d. 742/1341), then transferred to the Sultan Ḥasan b. Muḥammad b. Qalāwūn (d. 762/1361), who endowed it for the benefit of his sons: Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah*, pp. II, 38-40.

Further accounts of Qāytbāy's project can be found in Mamluk chronicles, which state that the sultan began to remove all the disorderly structures that obstructed streets in the cities of Miṣr and Cairo.[385] Ibn Iyās says that in 882/1477, Qāytbāy ordered his emir Yashbak al-Dawādār to acquire a ruling from the Shāfiʿī judge Fatḥ al-Dīn al-Sūhājī to demolish all structures that contravened the limit of acceptable protrusion into public spaces:

> In Ṣafar, 882/May 1477, Emir Yashbak al-Dwādār began to widen roads, streets and alleys. He ordered the Shāfiʿī deputy judge Fatḥ al-Dīn al-Sūhājī to issue a ruling to demolish the illegal buildings (*abniyah*), quarters (*rubūʿ*), shops (*ḥawānīt*), cross-bridges (*sābāṭāṭ*), projections (*rawāshin*) and benches (*maṣāṭib*) that protruded to the streets and were set up in the market. Demolition continued until the beginning of 883/1478, which aided the widening of pathways, but came at the cost of the group of people whose quarters and shops were demolished. Furthermore, three-quarters located in al-Muwāziniyyīn that belonged to Khūnd Shaqrā, the daughter of Sultan al-Nāṣir Faraj, were demolished, one of which was beyond Zuwaylah Gate. Cairo came into disorder because of all this destruction, especially at places overlooking streets, and people were filled with extreme hatred towards the *qāḍī* Fatḥ al-Dīn al-Sūhājī for his ruling that illegal structures should be demolished.

[صفر 882] شرع الأمير يشبك الدوادار في أمر توسيع الطرقات و الشوارع والأزقة فأمر القاضي فتح الدين السوهاجي أحد نواب الشافعية بأن يحكم بهدم ما وُضِع في الشوارع والأسواق بغير طريق شرعي من أبنية وربوع وحوانيت وسقايف ورواشن ومصاطب و غير ذلك. واستمر الحال في أمر الهدم حتى دخلت سنة ثلاث وثمانين و ثمانمائة، فحصل بذلك بعض نفع في توسيع الطرقات، ولكن حصل غاية الضرر لجماعة من الناس بسبب هدم ربوعهم و حوانيتهم، وهُدِم لخوند شقرا ابنة الملك الناصر فرج ثلاثة ربوع في الموازنيين، أحدهم كان تجاه جامع الصالح خارج باب زويلة، فاضطربت أحوال القاهرة و كثر الهدم في الأماكن ولاسيما المطلة على الشوارع و حصل على القاضي فتح الدين السوهاجي غاية المقت من الناس بسبب حكمه لهدم الأماكن.[386]

[385] Miṣr, formerly al-Fusṭāṭ, the capital of Egypt in early Islamic centuries until Fatimids founded a new capital, al-Qāhirah, thereafter al-Fusṭāṭ known as Miṣr al-Qāhirah then reduced to Miṣr. For further information see: J. Jomier, 'al-Fusṭāṭ', in *Encyclopaedia of Islam, Second Edition*, ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. II:957b, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/al-fustat-SIM_2409> [accessed 6 December 2017].

[386] Ibn Iyās, *Badāʾiʿ al-Zuhūr*, pp. III, 127.

Chronicles provide additional detail on the people involved in the demolition campaign, some of whom were builders. In his report on the Cairene demotion campaign, the historian Ibn Shāhīn al-Ẓāhirī (d. 920/1514) stated that Sultan Qāytbāy employed expert builders, accompanied by deputy judges of the four schools of law, to examine the locations listed in the demolition order.[387] While no more is known about these builders, their involvement shows the reliance of the *qāḍī* on professional builders. Even such a large-scale demolition campaign was not random or unmeasured, but involved the employment of building professionals to help carry out legal mandates.

Abū Ḥāmid al-Maqdisī's account shows that even when a protruding structure had not yet been built, some Ḥanbalī scholars still required the owner to acquire prior permission from the ruler, Sultan, or judge to build the protrusion.[388] He also emphasized that the violation of public streets was a serious offence and that legal opinions, especially Ḥanbalī ones, were very strict regarding the removal of any protrusions that caused harm to public use, even the protrusions of mosques.[389] Indeed, Ḥanbalīs were so strict that they insisted that if the plaster layer on a wall was particularly thick and protruded outwards, then the wall should be pushed back to allow the plaster to align with the street.[390] After presenting information on the condition of Cairo's streets and the relevant legal opinions, al-Maqdisī concluded that the emir Yashbak's actions - i.e. removing problem structures, including endowed properties – were lawful according to the four schools of law.[391]

Further research reveals that emir Yashbak's demolition of protruding structures was triggered by the Shāfiʿī scholar and Egyptian historian Jalāl al-Dīn al-Suyūṭī (d. 911/1505).[392] The event, as narrated by al-Suyūṭī in his treatise *al-Jahr bi-Man' al-Burūz 'alá Shāṭi' al-Nahr* (*The Overtness to Prevent Protrusions to the Riverbank*), began in the second half of the ninth/fifteenth century when a man dug the foundations for a ground floor protrusion on the side of his house facing the Nile

[387] Ibn Shāhīn al-Ẓāhirī al-Ḥanafī, *Nayl al-Amal*, pp. VII, 194.

[388] Ibn Taymiyyah, *Majmūʿ Fatāwá*, pp. XXX, 399-407.Ibn Taymiyyah cites a legal opinion states that if an owner wanted to build a building in a wide street in a way that the new building would not cause harm to the public use, it could be permissted by the ruler's permission; al-Maqdisī al-Shāfiʿī, *al-Fawāʾid al-Nafīsah*, p. 22.

[389] al-Maqdisī al-Shāfiʿī, *al-Fawāʾid al-Nafīsah*, p. 26.

[390] Aḥmad b. ʿAbd al-Ḥalīm Ibn Taymiyyah, *Mukhtaṣar al-Fatāwá al-Miṣriyyah*, ed. by Muḥammad b. ʿAlī al-Baʿlī and Aḥmad Ḥamdī Imām (Cairo: Maṭbaʿat al-Madanī, 1980), p. 324.

[391] al-Maqdisī al-Shāfiʿī, *al-Fawāʾid al-Nafīsah*, p. 26.

[392] E. Geoffroy, 'al-Suyūṭī', in *Encyclopaedia of Islam, Second Edition*, ed. by P. Bearman, et al. (Leiden: Brill, 2012), pp. IX, 913a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/al-suyuti-COM_1130> [accessed 6 April 2017].

riverbank.[393] Although the house was originally aligned with the street, the addition of the 16-cubit projection, which was itself attached to a 20-cubit projection built ten years previously, extended a total of 36 cubits (approximately 17.28 m) beyond the original wall of the house.[394] The projection, therefore, extended over a part of the riverbank that was utilised as public pathway when the Nile was not in full flood. This violated Shāfiʿī law, which stated that protrusions were only allowed as long as they did not obstruct public streets or riverbanks.[395]

Al-Suyūṭī argued that the owner should be prevented from continuing to build the projection, and even ordered him to demolish the existing building work. Instead of responding, the owner announced to the public that al-Suyūṭī had issued a legal opinion stating that all of al-Rawḍah's houses should be demolished.[396] The treatise under discussion was al-Suyūṭī's attempt to defend himself against this accusation. He emphasized that his opinion only concerned the demolition of illegal protrusions, and cited as precedent a case from a few decades earlier when the renowned jurist Jalāl al-Dīn al-Maḥallī (d. 864/1459)[397] ruled that the protrusion towards the riverbank of a house built by the emir Aybak al-Khāṣṣakī[398] was illegal.[399]

This treatise, which included citations of Prophetic traditions and legal opinions on protrusions, was attached to al-Suyūṭī's report on the aforementioned protrusion case to the Shāfiʿī chief judge. In it, he argued that granting permission for protrusions into public pathways was against the Shāfiʿī madhhab and Islamic law in general.[400] The chief judge acknowledged that no such permissions should be issued, and sent a missive to his deputies forbidding the construction of any building protruding beyond the allowed limits. Though the judge intended to prosecute the particular owner mentioned in the case for violating the public right of way, al-Suyūṭī advised him that it would be

[393] al-Suyūṭī, *al-Ḥāwī lil-Fatāwī,* pp. 133-134. It is included in his fatawa collection al-Ḥāwī lil-fatāwá.
[394] Al-Suyūṭī states that he means the legal cubit (al-dhirāʿ al-sharʿī), which is equivalent to 48cm in modern standard Islamic measurement: Ali Muhammad Ibrahim al-Umari, 'al-Maqādīr al-Sharʿiyyah wa Dhabṭuhā bi-al-ʿAlāmāt al-Ṭabīʿiyyah', *Jordan Journal of Islamic Studies,* 3/1: 1 (2007), 228.
[395] al-Suyūṭī, *al-Ḥāwī lil-Fatāwī,* p. 1/134.
[396] Al-Rawḍah is an island in the Nile in the southern part of Cairo. For further information see: O. Weintritt, 'Rawḍa', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. VIII:463b, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/rawda-SIM_6255> [accessed 6 December 2017].
[397] Jalāl al-Dīn Abd al-Rahman al-Suyūṭī, *Ḥusn al-Muḥāḍarah fī Tārīkh Miṣr wa al-Qāhirah,* ed. by Muḥammad Abū al-Faḍl Ibrāhīm, 2 vols (Cairo: ʿIsá al-Bābī al-Ḥalabī, 1967), pp. I, 443; al-Sakhāwī, *al-Ḍawʾ al-Lāmiʿ*, pp. VII, 39-41.
[398] Muhammad Ahmad Dahman, *Muʿjam al-Alfāẓ al-Tārīkhiyyah fī al-ʿAṣr al-Mamlūkī* (Damascus: Dār al-Fikr, 1990), p. 66. Khāṣṣakī: a private guarder (*ḥāris khāṣṣ*). Unable to identify him.
[399] al-Suyūṭī, *al-Ḥāwī lil-Fatāwī,* pp. I, 134.
[400] al-Suyūṭī, *al-Ḥāwī lil-Fatāwī,* pp. I, 145.

more appropriate and effective to issue a general ruling prohibiting any protrusion on the Nile riverbank, citing a century-old case in which the Shāfiʿī chief judge Taqiyy al-Dīn al-Subkī (d. 756/1355)[401] also ruled against the practice in general rather than an individual in particular. The chief judge followed al-Suyūṭī's advice and issued a general ruling prohibiting any protrusion on the Nile riverbank without exceptions. According to al-Suyūṭī's account of events, the Ḥanbalī and Mālikī chief judges then followed suit. Thereafter, al-Suyūṭī reported the whole affair to the Sultan Qāytbāy, who ordered that existing protrusions be demolished and thereafter prohibited. [402]

These sources demonstrate that *qāḍī*s not only authorized the demolition of illegal projections, but also were approached to issue permits for building projections into the public road prior to actual construction. Both types of judicial regulation are mentioned in historical narratives and legal treatises no earlier than the ninth/fifteenth century, and it may be that their appearance was a response to the failure of general rulings to regulate rights of way. Whatever the reasons, it is clear and evident that by the end of the ninth/fifteenth century, the process of obtaining judicial permission before building protrusions was in practice, and that to identify and rule on illegal projections, judges employed professional builders to examine the buildings in question. Given the relationships between judges and particular experts discussed in the first section, it seems likely that these builders would have been those employed in other court cases; they would have had the practical knowledge, literate skills, and legal connections required to produce and present such assessments for a variety of different dispute types.

Surviving permission deeds confirm that the process of issuing judicial permission for building protruding structures was indeed practised. There are two surviving building permission deeds in the Mamluk endowment deeds collection; one is located at the Egyptian Ministry of Endowments collection (WA 401j, dated 906/1500), and the other at the National Archive collection (DWQ 220/35, dated 902/1496). The existence of this pair of documents suggests that it was indeed necessary to acquire permission from a judge before building or rebuilding a structure that included a protrusion, a practice that remained in effect after the fall of the Mamluk

[401] J. Schacht and C.E. Bosworth, 'al-Subkī', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), pp. IX, 743b, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/al-subki-SIM_7116> [accessed 6 April 2017].

[402] al-Suyūṭī, *al-Ḥāwī lil-Fatāwī*, pp. I, 145.

Sultanate.[403] The range of surviving approvals confirms that the owner, and not the builders, had to submit a petition to the chief judge to acquire building permission. The chief judge would then forward the petition to one of his deputies to investigate. The deputy judge would delegate *muhandisīn* to check the location and nature of the work and to take measurements, and the *muhandisīn* would issue a report on the case. The judge would then analyse their report alongside the owner's submitted request before issuing his decision. Depending on the circumstances, the judge could either grant permission or reject the request.

Permission WA 401j, dated 906/1500 (Figure 2.7), was submitted by Zayn al-Dīn Muḥammad b. Barakāt b. ʿĪsá al-Aqfuhsī to the Shāfiʿī chief judge Abū Yaḥyá Zakariyyā al-Anṣārī (d. 926/1520).[404] Muḥammad b. al-Uqfuhsī had acquired two adjacent buildings with windows and projections overlooking the main road and was requesting permission to replace them with a single large house with the same projections and additional upper floors. After describing the nature and location of the relevant buildings, Muḥammad b. al-Aqfuhsī asked that the building be checked by expert *muhandisīn* and requested permission to begin his building works:

> In the name of God, the *mamlūk* (slave of God) Muḥammad b. ʿĪsá al-Uqfuhsī kisses the earth before the chief judge and states that he legally bought two adjacent buildings located in Khiṭṭ al-Wazīriyyah. One of the two buildings has a projection into the pathway consisting of windows overlooking the pathway, and the other building has slabs that project into the pathway. The *mamlūk* wanted to demolish both buildings and rebuild one new building [on their location] with projecting slabs and windows as in the original state, and to build additional floors according to necessity. He asks for a permission from the judge for a [building] inspection by *muhandisīn*, and then permission to carry out the necessary procedures.

بسم الله المملوك محمد بركات بن عيسى الاقفهسي يقبل الأرض بين يدي سيدنا ومولانا قاضي القضاة شيخ مشايخ الإسلام [أعز][405] الله بوجوده الانام و ينهى انه ابتاع من بائع شرعي بطريق شرعي

[403] DWQ 286/44, dated 923/1517.

[404] E. Geoffroy, 'Zakariyyāʾ al-Anṣārī', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), pp. XI, 406a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/zakariyya-al-ansari-SIM_8094> [accessed 6 April 2017].

[405] The original eroded but it is suggested through a comparison with other similar texts, since a typical format was used for a great number of documents with slight differences between them.

بنآين متجاورين كاينين بخط الوزيرية و باحدهما خرجة بارزة الى جهة الطريق السالك بها طاقات وشبابيك مطلة على الطريق السالك وبالبنا الثاني رواشن بارزة على الطريق وقصد المملوك هدم البنائين المذكورين وتنظيفهما واعادتهما بناً واحد بالبنا الجديد المتقن واخراج الرواشن المذكورة والطاقات على ما كان عليه أولا والتعلية على ذلك حيث شاء وسؤاله من الصدقات العميمة اذن كريم لاحد السادة النواب بالكشف عن ذلك بالمهندسين والاذن للمملوك في تعاطي ذلك وفي تعاطي ما يجوز له فعله شرعا والنظر في ذلك على الوجه الشرعي.[406]

Following the petition's submission, the chief judge al-Anṣārī forwarded the petition to his deputy Abū Bakr al-Ubshīhī, who delegated *muhandisīn* to check the location of the structure and report its current projections with their parameters and measurements. The *muhandisīn* visited the two buildings and recorded detailed observations; for example, they noted that parts of the buildings' façades were built in limestone, and others in brick. They also took measurements, recording that the buildings' respective doors projected onto the building land (*dhirāʿ al-ʿamal*) in front of the façade around 5/6 cubit (60 cm).[407] There was an extended projection on the western side called *muḍaʿʿaf* (doubled),[408] which extended outwards 1 1/3 cubits (approx. 96 cm). They also noted that the front façade was inclined and not aligned with the street. The western edge protruded 2/3 cubits (approx. 48 cm) over the western neighbour's boundary, recessing by 4 karats (approx. 12 cm)[409] compared to the eastern boundary. After adding the *muhandisīn*'s report to the petition and studying the case, the judge issued permission to carry out the process of rebuilding the structure within the approved limits.

The other surviving building permission, DWQ 220/35 (dated 902/1496), seems to have been submitted by the emir Ansbāy min Baybars al-Nāṣirī and shows the same procedures as seen in the first document discussed above. Emir Ansbāy was seeking permission to build an additional floor on his building located below Zuwaylah Gate. When the chief judge Abū Yaḥyá Zakariyyā al-Anṣārī received this request, he forwarded it to his deputy judge, who delegated four *muhandisīn* to examine the

[406] 'Idhn Binā' WA 401j', (Cairo: Wizārat al-Awqāf al-Islāmiyyah: Daftar khānah, 19 Muḥarram 906/15 August 1500).

[407] al-Qalqashandī, *Ṣubḥ al-Aʿshá*, p. 3/446.: the measuring cubit of building land (dhirāʿ al-ʿamal) is equivalent to three shibrs; al-Umari, 'al-Maqādīr al-Sharʿiyyah', p. 230.: according to modern standard Islamic measurement, each shibr equals 24 cm. So, the building cubit is equivalent to 72 cm.

[408] Amīn and Ibrahim, *al-Muṣṭalaḥāt al-Miʿmāriyyah*, p. 108.

[409] al-Umari, 'al-Maqādīr al-Sharʿiyyah', p. 228.: the cubit has 24 karats. For dhirāʿ al-ʿamal, each karat is equivalent to 3 cm in modern standard Islamic measurements (72÷24=3 cm).

existing building and its projections. They did so, concluding that building a higher floor on the building would not harm the neighbours' buildings or the public use of the pathway.

These permissions demonstrate that *muhandisīn* were a necessary part of the process for issuing protrusion permissions, which were at least in theory a regular part of the building craft. Nevertheless, al-Suyūṭī's aforementioned report on the rampant violations of these rules and Sultan Qāytbāy's subsequent campaign to remove all infringements show that this procedure was not sufficiently effective. Sometimes, permissions were given to buildings that did not fulfil the legal requirements; Shāfiʿī judges, in particular, appear to have issued permissions for buildings that obstructed public rights of way. Regardless, various pieces of evidence, including the surviving permissions and the accounts of references to permissions granted before Sultan Qāytbāy's demolition campaign, suggest that judicial involvement in the regulation of protrusions was common.

While I have not found permissions among the surviving *fatāwá* or documents for buildings without protrusions, it is noteworthy that in the foundation descriptions given in endowment deeds, the majority of buildings have extensions, such as *rawāshin*, *ajniḥah*, *ṭāqāt* (windows or openings towards the street), and gutters, all of which were considered projections. This suggests that, at least by the early tenth/sixteenth century, the evaluation of protrusions for legal permission cases was widespread, and would have represented a body of work in which *muhandisīn* were routinely involved.

2.4 Ethical framework

One common element of the appearances of *muhandisīn* in legal literature is their designation as trustworthy figures of authority. The nature of this characterisation varied according to document and purpose; in Sultan Qāytbāy's endowment deed, for instance, the good character of the *muhandis* was explicitly emphasized, while in maintenance reports, the *muhandis*' expertise was suggested by the dependence of the judge on their testimony and the *muhandis*' obligation to sign for their declaration. Given that trust in *muhandis* and their expertise was needed for judgements to be reached on building-related cases, it makes sense to suppose that *muhandisīn* were seen in society as a defined professional group with some level of internal regulation. Such

a characterisation may be seen as emerging from the ethical literature regulating the building craft. Although ethical literature makes no mention of *muhandisīn* specifically – as noted in Chapter One, *hisbah* manuals do not include *muhandisīn* – the guidance it does provide shows that during the Mamluk period, both building professionals and employers were seen as having well-defined sets of duties and responsibilities.

While the later Ottoman guilds operating in Cairo in the mid-tenth/mid-sixteenth century offered a set of rules that defined the rights and duties of participating members, provided appropriate training and qualifications, and resolved disputes within the profession, Mamluk Cairo had no such institutions.[410] In the absence of official guilds to organise the building craft until the end of Mamluk era, the profession was regulated by legal and ethical guidelines. These included Islamic law and social norms. While we do not find comprehensive guidelines for all aspects of the craft and its subfields, or are able to identify the extent to which these guidelines were practised, existing conventions did provide a set of rules and legal mechanisms for setting up contracts and resolving disputes. They also set recognisable standards for conduct among builders, which would have been important for defining the profession and their role in society more generally.

In modern scholarship, *hisbah* manuals have studied for a variety of reasons, yet little attention has been given to their impact on the regulation of the building profession. Maya Shatzmiller, for example, uses *ḥisbah* treatises to analyse the division of subfields and the workforce behind medieval craftsmanship,[411] while Aḥmad Ghabin considers *ḥisbah* treatises to explore the responsibilities of *muḥtasib* in their daily activities,[412] arguing in particular that the conventions set out in the *ḥisbah* treatises were practiced in reality.[413] This is, however, extremely difficult to prove; as no independent evidence of their application survives, all statements on actual practice must be somewhat speculative.

According to legal sources and *fatāwá* collections, there had to be a contract (*ʿaqd,* pl. *ʿuqūd*) between the employer and the builder before work could start. This *ʿaqd* (contract) would determine the specifics of the job, including working times, wage

[410] Guilds started to appear in Egypt since mid-sixteenth century, not earlier: Suraiya Faroqhi, *Artisans of Empire: Crafts and Craftspeople under the Ottomans* (London: I.B. Tauris, 2012), p. 73.
[411] Maya Shatzmiller, *Labour in the Medieval Islamic World* (Leiden: E.J. Brill, 1994), pp. 210-213.
[412] Aḥmad Ghabin, 'The Role of the Muslim Institutions in Architectural Activity in Medieval Islam: The Case of Hisba and the Muhtasib', *al-Majmaʿ,* 5 (2011), 4-5.
[413] Ghabin, 'The Role of the Muslim Institutions', p. 6.

payment, and food provisions. Ibn Taymiyyah (d. 728/1328) explained that the *ʾuqūd* (s. *ʾaqd*) could take three distinct forms: written (*ṣīghah*), oral (*qawl*) or actionable (*fiʾl*).[414] Remuneration could take two forms: *juʾālah* or *muʾājarah*. In *juʾālah* (offer of reward), the total payment (*juʾl*) for finishing the job would be determined from the outset, and the builder would not receive payment unless the job was completed and regardless of how long it took him.[415] In *muʾājarah* (hire), on the other hand, the builder was paid a daily wage (*ujrah*).[416] As a total duration for the work would not be specified, the total payment would not be defined in advance. *Muʾājarah* may have been more common practice on construction sites, as questions concerning daily wages appear in several *fatāwá*.[417] In cases where more than one builder or craftsman was hired for building work, legal literature did not usually specify whether responsibility to complete the contract included all workers involved or only the head craftsman. Having said this, however, one *fatwá* question tells of two builders hired to set up a well, with the contract naming not one but both of them.[418] From this, it seems likely that in small construction projects several builders were contracted, whereas larger projects would be contracted to a single, master builder, who would assume responsibility for his team.

Regardless of the kind of contract between owner and builder, however, there were certain additional considerations that had to be taken into account, including times of work, payment and whether the owner would provide food.[419] Regular working times were typically from early morning (*ghuduww*) until the evening (*masāʾ*),[420] with the builders excused to pray, as prayer times were not included in the contract.[421] Their hours also allowed for a reasonable break for food; however, this would be monitored to ensure that builders did not prolong their break unnecessarily.[422] Ibn al-Ḥājj (d. 737/1336)[423] highlights the significance of working at a reasonable pace. Although

[414] Ibn Taymiyyah, *Majmūʿ Fatāwá*, pp. XXIX, 5-7.
[415] Ibn Taymiyyah, *Majmūʿ Fatāwá*, pp. XXIX, 104; Abū Yaḥyá Zakarīyā b. Muḥammad al-Ansāʾrī, *Kitab ʿImād al-Riḍā* (Aden: Maṭbaʿat Fatāt al-Jazīrah, 1941), p. 45.
[416] Ibn Taymiyyah, *Majmūʿ Fatāwá*, pp. XXIX, 104.
[417] Ibn al-Rāmī al-Bannāʾ, *al-Iʿlān*, p. 177; Aḥmad b. Yahyá al-Wansharīsī, *al-Miʿyār al-Muʿrib wa al-Jāmiʿ al-Mughrib ʿan Fatāwá Ahl Ifrīqiyyah wa al-Andalus wa al-Maghrib,* ed. by Muḥammad Ḥajjī, 13 vols (Rabat: Wizārat al-Awqāf wa-al-Shuʾūn al-Islāmiyyah, 1981), pp. VIII, 229.
[418] Ibn al-Rāmī al-Bannāʾ, *al-Iʿlān,* p. 177.
[419] Tāj al-Dīn ʿAbd al-Wahhāb b. ʻAlī al-Subkī, *Muʿīd al-Niʿam wa Mubīd al-Niqam* (Beirut: Muʾassasat al-Kutub al-Thaqāfiyyah, 1986), p. 100.
[420] Ibn al-Ukhuwwah, *Maʿālim al-Qurbah,* p. 234.
[421] Muḥammad b. Muḥammad al-ʿAbdarī al-Mālikī al-fāsī Ibn al-Ḥājj, *al-Madkhal*, 4 vols (Cairo: Maktabat Dār al-Turāth, n.d.), pp. IV, 198; al-Subkī, *Muʿīd al-Niʿam,* p. 100.
[422] Ibn al-Ḥājj, *al-Madkhal,* pp. IV, 197.
[423] Muḥammad b. Muḥammad b. al-Ḥājj, Mālikī scholar originally from Fes but flourished in Cairo. For further information see: Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah,* pp. IV, 237.

ethical literature insisted on avoiding time-wasting, an overly quick pace in building was not recommended either. According to Ibn al-Ḥājj, although prolonging building work was to be avoided, rushed building work would result in poor quality, and so a moderate pace was recommended.[424]

Fatāwá also present some practical questions regarding builders' wages in case of disagreement. For example, one *fatwá* cited by Ibn al-Rāmī discusses the case of a property owner who hired a builder to build a specified wall, only for the newly erected wall to fall down before completion. Under a *mu'ājarah* contract, the builder would receive his wage, and not be obliged to rebuild the wall. Under a *ju'ālah* contract, however, he would not receive his wage unless he completed the wall.[425] In another case, an owner hired two builders to build a well, but after some time spent digging the well, one of the builders fell ill, and the other completed the job. The question was whether the first builder should receive an additional wage for completing the part of the contract his colleague had been unable to complete. In this case, the opinion of the *muftī* was that the builder's ill health terminated his portion of the contract, so that the part undertaken by his partner was voluntary and not deserving of an additional wage.[426] Opinions were divided over the impact of a *force majeure*, such as rain, hindering the building work. In one example, the builder could expect to receive the wage for the time that he worked, but not for the rest of the day, while another stated that he should receive the full wage for that day as the rain was beyond his control.[427] Here, we see that guidelines created clear expectations for both builders and their employers, and specified particular responsibilities for each.

Guidelines also provided standards to be followed for the duration of the building work. Some, particularly those by Ibn al-Ḥājj al-Fāsī (d. 737/1336) and Tāj al-Dīn al-Subkī (d. 771/1370), are remarkably thorough, and even discuss technical details related to building equipment and material. Primarily, they outline expectations for the employer, supervisor (*muḥtasib*), and builder, beginning with the contract and extending through project completion. According to Ibn al-Ukhuwwah (d. 729/1329) and al-Nuwayrī (d. 733/1333), the *muḥtasib*'s job was, at a minimum, to prevent the violation of Islamic law, maintain minimum standards of craftsmanship, and prevent

[424] Ibn al-Ḥājj, *al-Madkhal*, pp. IV, 196.
[425] Ibn al-Rāmī al-Bannāʾ, *al-Iʿlān*, p. 178.
[426] Ibn al-Rāmī al-Bannāʾ, Ibn al-Rāmī al-Bannāʾ, *al-Iʿlān*, p. 177.
[427] al-Wansharīsī, *al-Miʿyār* pp. VIII, 229.

the workers from cheating his employer.[428] Other ethical literature, such as Ibn al-Ḥājj al-Fāsī's (d. 737/1336) treatise *Al-Madkhal* and Tāj al-Dīn al-Subkī's (d. 771/1370) *Muʿīd al-Niʿam wa Mubīd al-Niqam*, took a wider scope and aimed to optimise the standard of builders' professional work.

As discussed in *ḥisbah* and ethical treatises, builders had to both consider general principles and meet technical standards while working. Generally speaking, the builder was ethically obliged to give the owner honest advice about how the property should be built. He was also obliged to be moderate in his use of building material, neither using it wastefully nor cutting corners in a way that would negatively affect the quality of the building. For example, Ibn al-Ḥājj explained that some builders would ask for more building material than actually required, thereby wasting the owner's money. Similarly, if an owner borrowed wood beams for scaffolding and a builder cut off part of that wood, he would have to reimburse the owner and offer an apology.[429] Ibn al-Ḥājj stipulated that builders should be honest and upfront when estimating the quantity of material required for the building work, neither asking for too much nor making an impracticably low initial estimate with the intention of slipping in requests for more material once the work was underway.[430] Both Ibn al-Ukhuwwah and Ibn al-Ḥājj condemn incorrect initial estimates. According to them, low initial estimates may push an owner to seek loans to finish his property. Had he known the true cost of the work, he might have postponed it until he had sufficient funds.[431]

Builders were expected to use suitable equipment and techniques corresponding to the type and location of the building. They were required to use tools such as the *mīzān* (pl. *mawāzīn*, plummet) and *khuyūṭ* (s. *khayṭ*, thread) to set accurate horizontal and vertical planes. If a builder failed to use these tools and produced a work with defects, such as inclined floors or walls, they were his responsibility to fix without additional pay.[432] Builders were also expected to examine the construction location and decide on the proper materials to use. For example, they were advised not to use gypsum for building on marshy lands, as it would likely collapse. If using bricks, builders were

[428] Ibn al-Ukhuwwah, *Maʿālim al-Qurbah*, p. 7; Shihāb al-Dīn Aḥmad b. ʿAbd al-Wahhāb al-Nuwayrī, *Nihāyat al-Arab fī Funūn al-Adab*, 33 vols (Beirut: Dār al-Kutub al-ʿIlmiyyah, 2004), pp. VI, 255.
[429] Ibn al-Ukhuwwah, *Maʿālim al-Qurbah*, p. 235.
[430] Ibn al-Ḥājj, *al-Madkhal*, pp. IV, 196.
[431] Ibn al-Ukhuwwah, *Maʿālim al-Qurbah*, p. 235; Ibn al-Ḥājj, *al-Madkhal*, pp. IV, 196.
[432] Ibn al-Ukhuwwah, *Maʿālim al-Qurbah*, p. 235.

responsible for determining the proper ratio of mud (*ṭīn*) and lime (*jīr*) for the brick mix, as well as watering the bricks properly.[433]

The use of plaster and gypsum was particularly highly regulated. For example, the ethical literature stipulates that builders should not accept bribes (*rishwah*) or gifts (*hadiyyah*) to use raw or poor-quality gypsum in the building without reporting this to the owner.[434] Ibn al-Ukhuwwah explains that properly prepared gypsum can be recognised by is its colour, as it turns yellow when it is baked in the oven before crushing. Another sign of quality is if it dries quickly after being mixed with water. Plasterers (*mubayyiḍūn*, s. *mubayyiḍ*) were advised not to mix excessive amounts of lime (*jīr*) into the plaster, as this could cause the plaster layer to fall off the wall more quickly than usual.[435] Al-Subkī adds that the plasterer should check the wall for holes made by birds or other animals before applying plaster, because plastering over such holes would constitute two ethical violations: killing a bird and adding a defect to the building work. Plasterers were also obliged to report and fix any visible flaw that might indicate weakness in the wall before beginning their work, as concealing it could cause injury or even death.[436] As for painters, they were advised to apply three layers of paint, allowing each layer to dry in the sun for a reasonable time. Ibn al-Ukhuwwah states that many painters applied only one or two layers of paint, and their work was easily damaged with the least exposure to water or moisture.[437]

It is worth noting that despite their focus on craftsmen's performance, these treatises on *ḥisbah* and ethics were unlikely to have been read by most builders. Nonetheless, the fact that such ethical literature was written clearly suggests that expectations for professional conduct existed for both builders and employers and that these expectations were formal enough that recording them was a possible and worthwhile pursuit.

Employers were advised to seek honest and trustworthy builders, as this would save them trouble in the future. However, if no such workers could be found, the owner was instructed to be present or to appoint someone to supervise the workers. According

[433] Ibn al-Ḥājj, *al-Madkhal*, pp. IV, 197.
[434] Ibn al-Ukhuwwah, *Maʿālim al-Qurbah*, p. 235.
[435] Ibn al-Ukhuwwah, *Maʿālim al-Qurbah*, p. 236.
[436] al-Subkī, *Muʿīd al-Niʿam*, p. 100.
[437] Ibn al-Ukhuwwah, *Maʿālim al-Qurbah*, p. 237. In the same manner, Ibn al-Ukhuwwah concerns some technical-related issues in the construction work to be carried out by carpenters, sawyers (*nashshārīn*, s. *nashshār*), builders, *jabbāsīn* (s. *jabbās*, related to gypsum), and *jayyārīn* (s. *jayyār*, related to lime).

to the literature, this was because although some workers will give the appearance of working hard while the owner is present, they chat amongst themselves when he is away, delaying the job's completion.[438] For Sultanate projects, superintendents (*shādd al-ʿamā'ir*) were advised to treat their builders and workers well.[439] Al-Subkī advised superintendents not to overwork their builders, to provide the agreed wages and meals, and to allow them to pray at prayer times. He also condemned superintendents who did not do these things, especially when building religious foundations such as mosques and *madāris* (s. *madrasah*).[440]

This framework shows the level to which both employers and practitioners of the building craft were represented in legal and ethical literature. Mamluk builders were regulated by a system of binding contracts that specified the responsibilities of both builders and owners, as well as by the standards of professional conduct detailed in both *ḥisbah* and ethical treatises. These standards were not specific to particular subfields of the building craft, but were rather concerned with professionalism in a broader sense. Although the details of this regulatory system may not have been unique to the Mamluk period, these sources show that Mamluk scholars expected certain norms to be applied to the builder's work and his relationship with his employer, which reflects contemporary interest in the uniform and ethical conduct of building professionals. This likely contributed to the recognition of the *muhandis*, among other building professionals, as a defined figure that could be relied upon in an expert context, such as the legal cases discussed earlier in the chapter.

2.5 Conclusion

One of the most prominent roles available to a *muhandis* in Mamluk Egypt was that of an expert witness, who would be summoned to the judicial court to give a professional opinion in a building case. These expert *muhandisīn* were chosen on the basis of their expertise and reliability, and met the accepted criteria for specialised witnesses. Employing expert witnesses was a part of Islamic judicial practice not limited to either the Mamluk period or building-related litigation, but we have seen here

[438] Ibn al-Ḥājj, *al-Madkhal*, pp. IV, 197.
[439] al-Qalqashandī, *Ṣubḥ al-Aʿshá*, pp. IV, 22.
[440] al-Subkī, *Muʿīd al-Niʿam*, p. 100.

that *muhandisīn*, as part of a broad spectrum of professional roles, came to fulfil the function of expert witnesses in Mamluk courts.

There were three main contexts in which professional builders worked with judges: managing endowed properties to maintain endowment revenue, evaluating properties for exchange cases, and keeping public pathways free of illegal projections. As far as can be told from the surviving endowment deeds, the professional role of *muhandisīn* within the context of endowment management was primarily to provide technical assessments for structures and estimate their repair costs. For example, the repair report by four *muhandisīn* on the endowed properties of Sultan al-Ẓāhir Baybars included descriptions of the damaged parts of both the exterior and interior structures, as well recommending specific repair or rebuilding works. In exchange cases, *muhandisīn* provided an estimate of an endowment's market value so it could be exchanged with an equivalent functional property, and *muhandisīn* also provided estimates for endowment rentals. They may have even been involved in disputes between individuals over private buildings, as they were in Tunis, although we do not have any direct evidence of this from the Mamluk period. The role of *muhandisīn* in the courts implies that they had a strong professional identity and a broad range of knowledge. Producing assessment reports such as those found in the surviving records would have required practical skills, general knowledge, numeracy, and likely literacy. It appears that this expertise was respected by judges, as the reports of the *muhandisīn* were essential to the decisions reached in these cases.

Muhandisīn were also involved in maintaining public rights of way, both in the issuing of permissions for protrusions and in demolishing illegal structures. Maintaining public streets and pathways was a subfield of Islamic jurisprudence called *fiqh al-ʿumrān*, which when evaluated historically alongside chronicle accounts, shows that pathways were regulated using a system of judicial permissions that involved *muhandisīn*. Judicial regulation of projections into public pathways took two forms: permission to build projections and authorization of demolishing existing projections. References to the topic in legal and historical accounts indicate that judicial permission to build protrusions was required as early as the mid-eighth/fourteenth century. The fact that only two Mamluk permissions survive, along with the number of illegal structures already built by the time of Sultan Qāytbāy's 882/1477 demolition campaign, suggests that this process might not have been particularly efficient or necessarily followed.

Finally, the professional status of builders was regulated by a framework of Islamic law and advisory ethical literature which provided guidelines for the builder/employer relationship and maintained accepted standards. This literature guided the creation of contracts and settling of disputes, as well as outlining the specific responsibilities of both the builder and employer. Although no ethical advisory literature specifically devoted to practitioners of the building craft exists, relevant sections are present in larger ethical treatises aimed at craftsmen of different crafts and trades, especially those by Ibn al-Ḥājj al-Fāsī (d. 737/1336) and Tāj al-Dīn al-Subkī (d. 771/1370).

The present chapter shows the Mamluk *muhandis* to be a professional builder whose experience and authority in the profession allowed him to become an active member in the legal world. This challenges the portrayal found in some modern scholarship of the *muhandis* as little more than a surveyor or overseer, as in exchange and repair cases, the *muhandis* was trusted as an expert witness and important figure in the judicial decision. Their employment in other judicial cases, such as building permissions, and the ethical literature surrounding the profession also suggest that they held a professionalised role in society. The extensive participation of *muhandisīn* in the legal sphere contributes to our more complete picture of their role in society; far from being a simple craftsman, the *muhandis* could be someone skilled in theoretical and practical knowledge, recognised by the wider system as an expert in his field.

2.6 Chapter 2 illustrations

Figure 2.1: Exterior view of the complex of Sultan al-Ẓāhir Faraj b. Barqūq (bl. 788/1386)

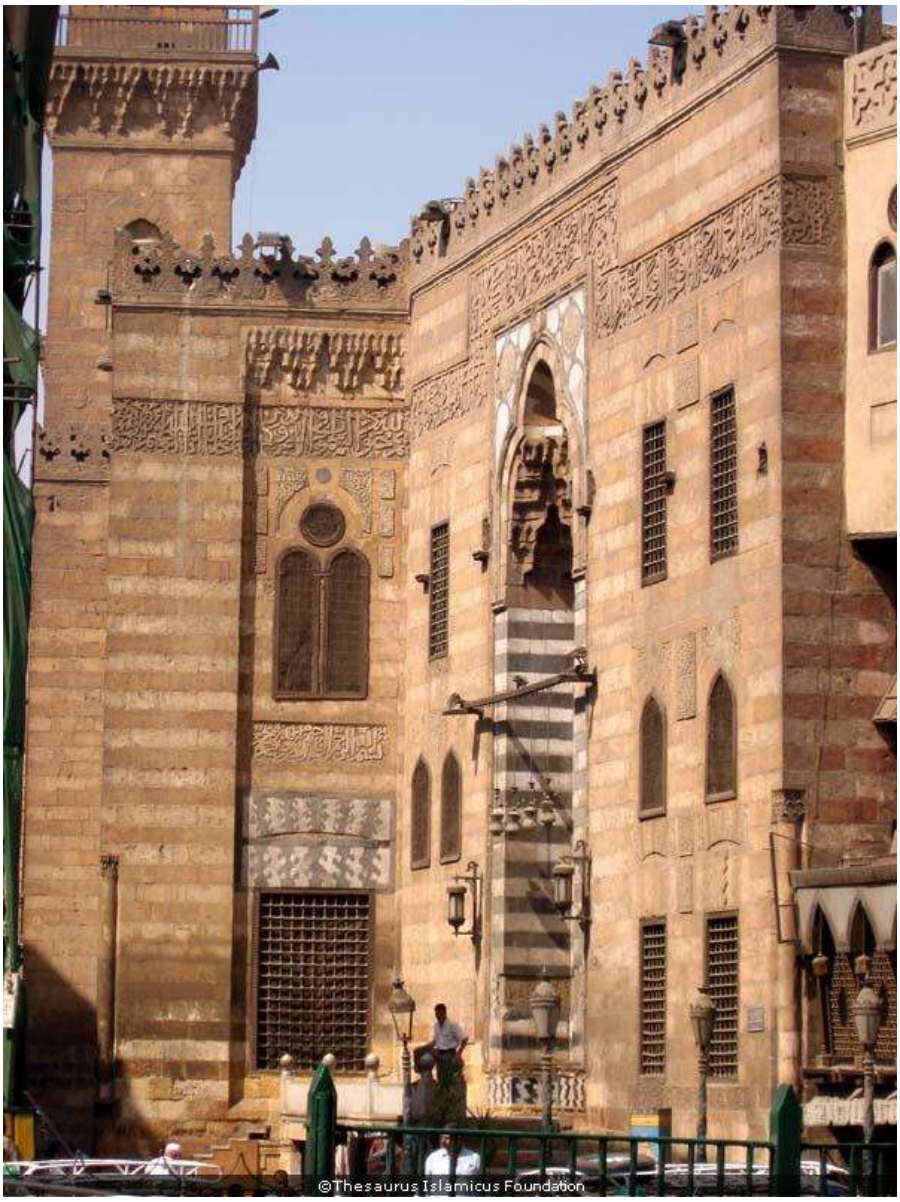

Figure 2.2: Exterior view of the complex of Sultan Qānṣawh al-Ghawrī (bl. 909/1504) (© Thesaurus Islamicus Foundation)

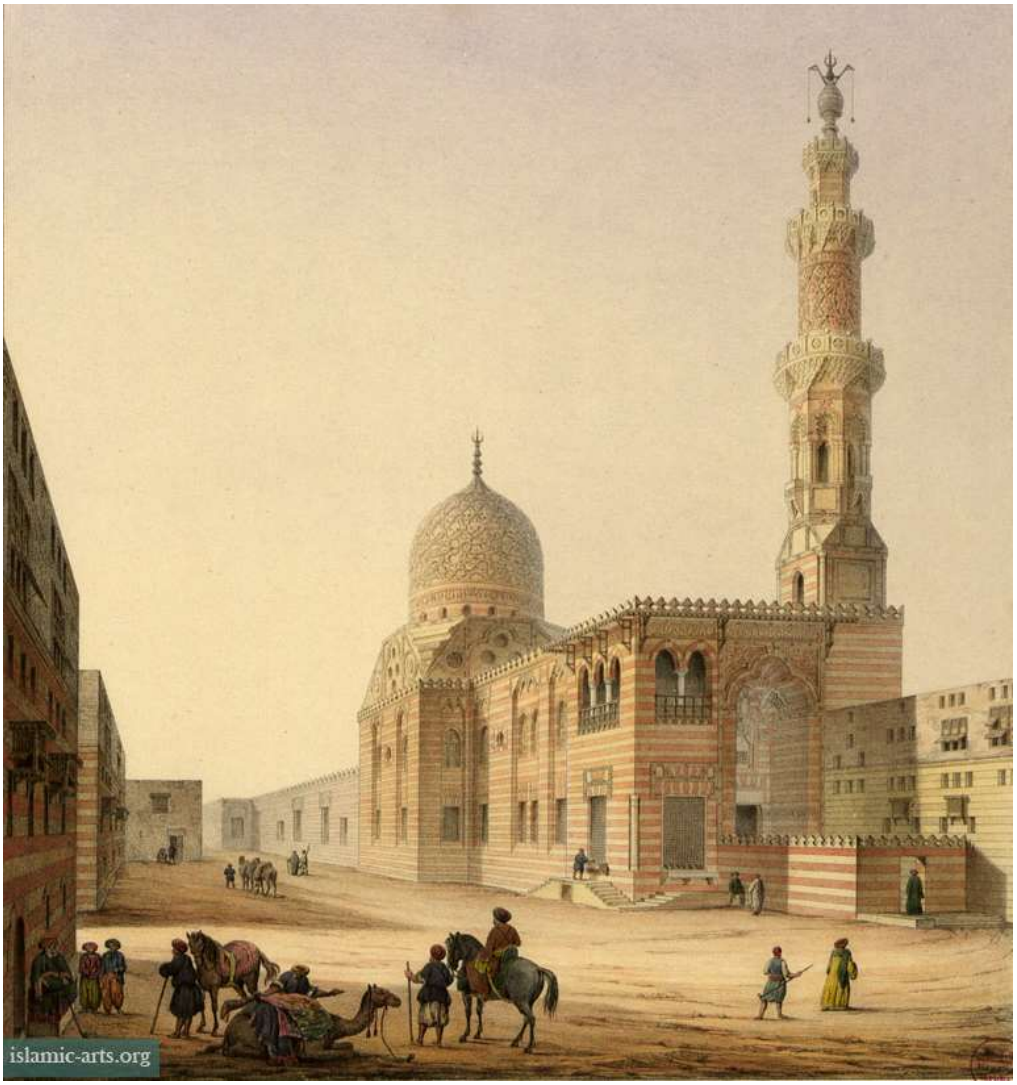

Figure 2.3: The complex of Sultan Qāytbāy (bl. 879/1474) in Cairo's Nineteenth Century desert (© Islamic-arts.org, sketch by Pascal Coste 1818-26)

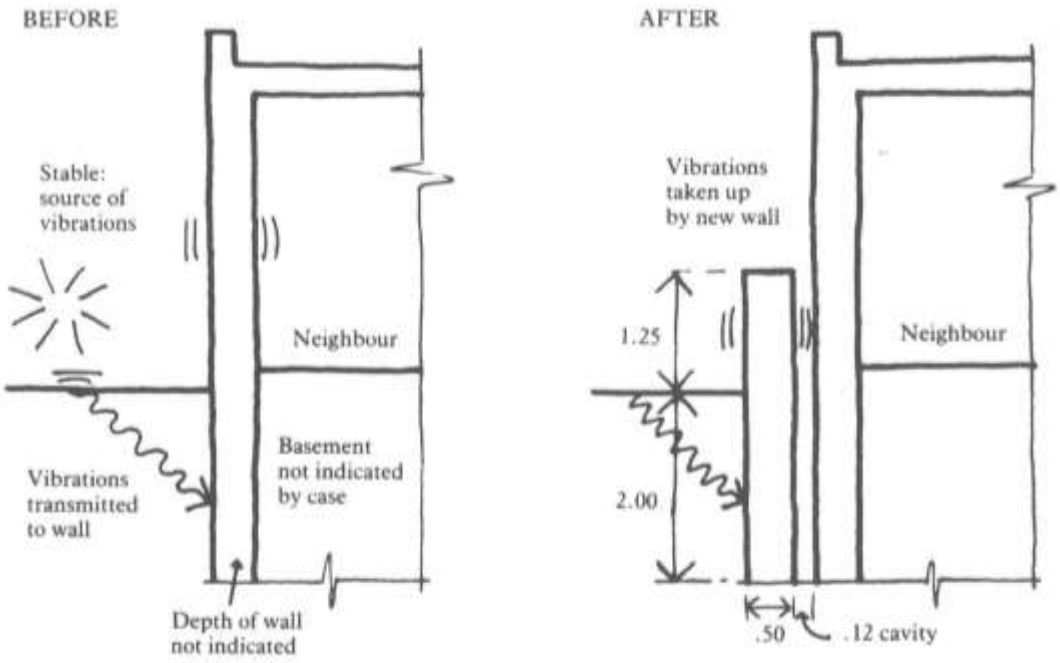

Figure 2.4: Ibn al-Rāmī's instructions to build a barrier wall to remove the auditory harm. Left: the situation before upon the complaint, right: after implementing Ibn al-Rāmī's solution (after B. Hakim 2008)

Figure 2.5: Cross-street bridge known as *sābāṭ*. Left: adjacent to mosque emir Qijmās al-Isḥāqī (bl. 884-6/1479-810, right: near Bāb Zuwaylah (after Laila Ibrahim)

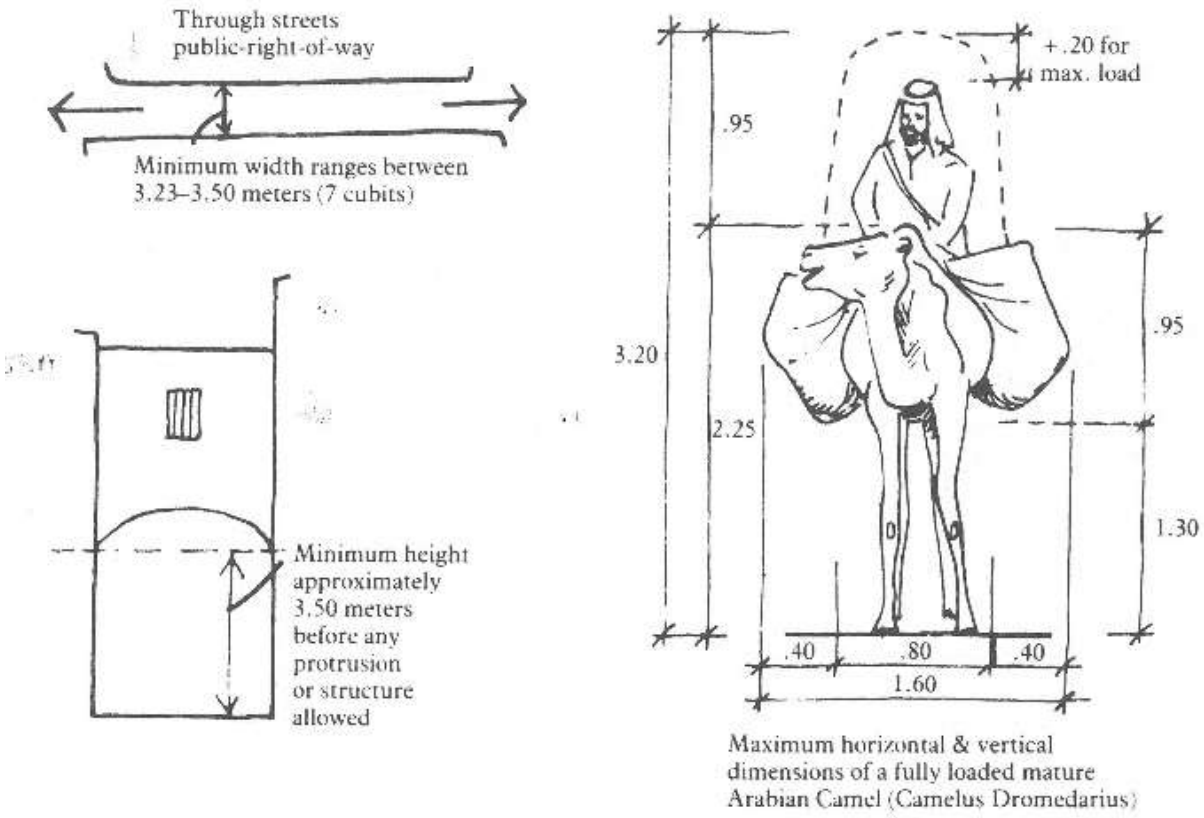

Figure 2.6: The minimum legal allowance of 7 cubits for street's width and *sābāṭ*'s height to allow a fully loaded camel with a rider to safely pass through (after B. Hakim 2008)

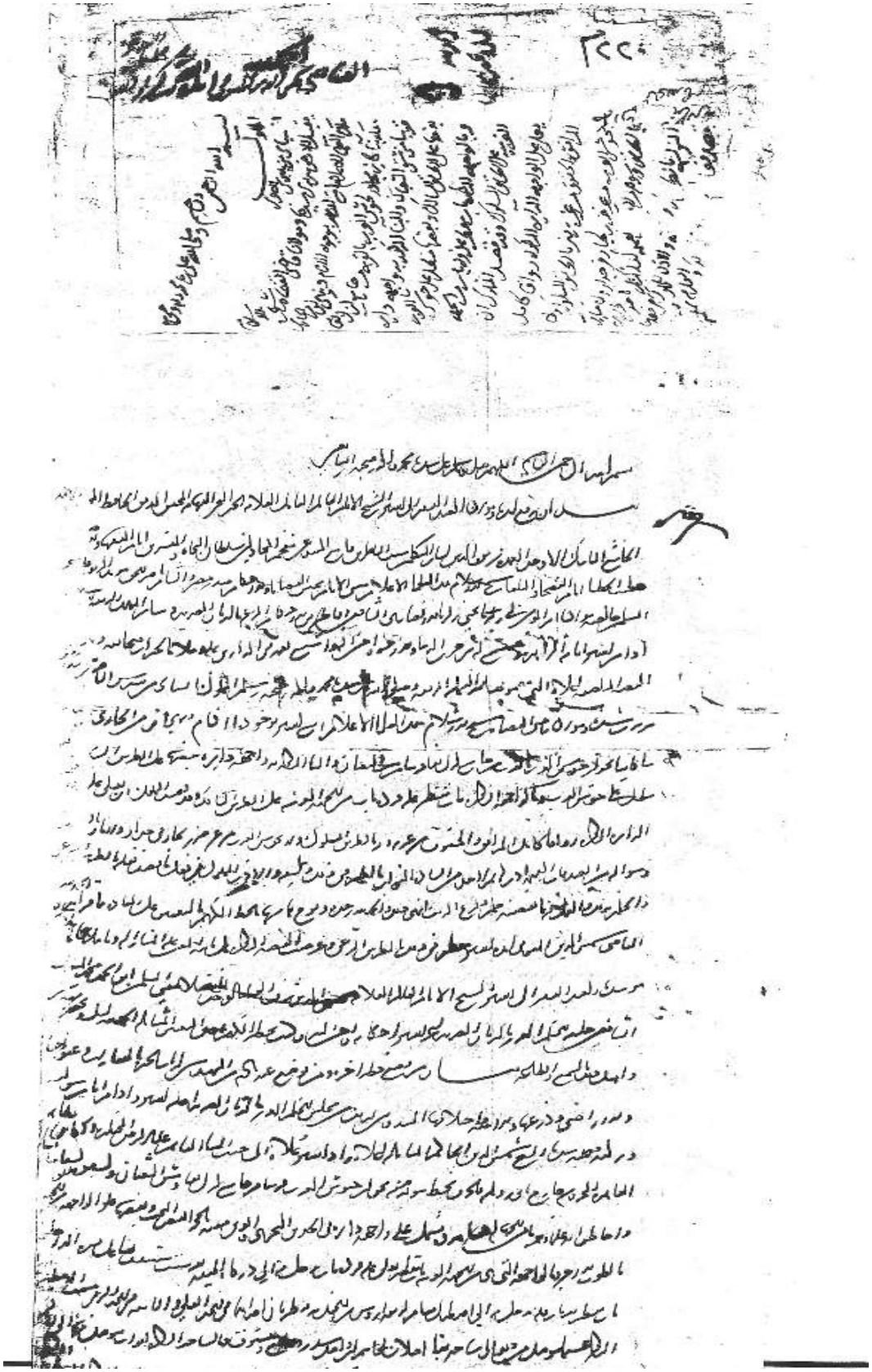

Figure 2.7: Building permission WA 401j (dated 906/1500). The petition is attached at the top of the *qāḍī*'s ruling

Chapter 3:

Literary Representation of Building Craftsmen

3.1 Introduction

In the previous chapters, it has been argued that a thin layer of professionals existed at the top of the building profession who drew on both practical and theoretical construction knowledge and acted as authoritative figures representing the profession in broader social and legal contexts. This conclusion has largely been drawn from legal sources as well as chronicle evidence. We can also understand the rise of this educated professional class from another perspective that provided in literary sources. These sources not only provide more information about the knowledge and activities of Mamluk builders, but also place this educated class in their social and cultural context, as well as shedding light on the way their professional identity was formed and perceived in society at large. The aim of this chapter therefore is to represent a broader social and cultural context of building craftsmen of variant specialities, one member of whom is the character of *muhandis,* taking into account that building craftsmen were likely subject of literary material than the *muhandisīn*.

In recent years, scholars have pointed out that Mamluk literature is in need of more attention, as an exploration of its social and cultural context could lead to a better understanding of Mamluk society. Thomas Bauer, in his article 'Mamluk Literature: Misunderstandings and New Approaches', refers to the neglect of Mamluk literature by Western scholarship, arguing that a Western perception of literature – which sees Mamluk literature as a stagnant, conservative, and derivative body of work – is inapplicable to Arabic literature in general and Mamluk literature in particular.[441] He notes that as Western scholars using this model have largely lost interest in Mamluk literature, Mamluk scholarship is short on studies that analyse Mamluk literature, especially popular literature, within its historical and cultural context. Examined this way, we can see that the 'conservatism' of Arabic literature was one of its distinctive features, and rather than indicating stagnation, these references to the past were a way of preserving inherited ideas and saying new things about them.

Even within scholarship on Mamluk literary sources, the predominant focus has been on the literary production of *'ulamā',* and only a few studies have focused on poetry and popular literary production. Even fewer have addressed Mamluk literature about craftsmen or composed by artisans. Although modern studies have typically

[441] Bauer, 'Mamluk Literature', p. 112.Thomas Bauer, 'Mamluk literature: Misunderstanding and New Approaches', *Mamluk Studies Review*, 9/2 (2005), p. 112.

focused on major literary figures and elites, using literature to learn more about the wider public – the same public to which the craftsmen belonged and provided various services – may be a very useful tool to establish a better understanding of medieval Mamluk society.

This chapter focuses on literary representations of building craftsmen during the Mamluk period. It aims to approach builders and craftsmen from a literary perspective, addressing their roles both in the consumption and production of literature. Building craftsmen's participation in literary circles as readers and authors suggests that many were literate; some were even recognized by scholars in literary circles. The literary works that take artisans in general, and builders, in particular, as their subject matter also provide a window onto the formation of the social identity of builders, and their profession-specific use of jargon and puns gives a vivid guide to the distinct responsibilities and skills of different building craftsmen. As a great number of Mamluk literary works remain unpublished and unstudied, it is possible that the examples to be analysed below may not be entirely representative of typical literary production. However, they do clearly demonstrate the potential of literary sources to shed light on the professional identity of building craftsmen.

The chapter is divided into two main sections. The first section of the chapter aims to show that many artisans were literate, participated in intellectual life, and created a specific type of literary works that became popular under Mamluk rule. Some Mamluk tradesmen and craftsmen, such as Abū al-Ḥusayn al-Jazzār, Sirāj al-Dīn al-Warrāq, and Ibrāhīm al-Miʿmār, even created their own literary compositions; their works were popular in the Mamluk period and were copied several times over the following centuries. The appearance of literary works composed by Mamluk traders and artisans is a major mode of literary representation by which builders presented themselves to scholars, literati (*udabāʾ*), and society at large. Other artisans, as evidenced by the surviving reading certificates studied by Hirschler, participated in reading and learning circles. By looking at these reading certificates, we can gain insight into the intellectual ambitions and pursuits of this group of practitioners. They show that literacy and learning were not limited to the educated *muhandisīn*, but that other craftsmen, such as carpenters, masons, and plasterers, all found their way to scholarly circles. Craftsmen's attendance patterns, which reflect a tendency to come as groups rather than individually, also indicate that participation in reading circles was a socially formative activity rather than just a personal pursuit.

The second section of this chapter concerns the ways in which builders were represented by Mamluk literati. It first introduces the genre of 'artisanal literature', a type of literary production that focused on a broad group of artisans and workers, including builders, and surveys the development of this genre up to the Mamluk period. By the Mamluk era, this genre constituted a mode of literary representation by which builders and other artisans were indirectly represented in society. Depictions of craftspeople and their activities were used by literati writing on the theme of love and were often represented using the specific poetic style known as *dūbīt*s (couplets in sets of two to four verses). In another literary style, *maqāmah*s, fictional building craftsmen were written as 'speakers' in works ostensibly representing assemblies of workers of different trades and arts. In such works, each participant in the literary assembly 'spoke' a short prose section followed by one couplet employing the jargon of his craft. I argue here that the literature about artisans and by artisans reached its peak during the Mamluk period, both in terms of the variety of works and their popularity. This rise in the consumption and production of literature should be understood in light of the rise of literacy among the general urban public, which included artisans, and taken to represent general social perceptions of the place of the builder in society.

Last but not least, this section aims to closely analyse excerpts from artisanal literature to highlight distinctions between the sub-crafts of the building profession in terms of responsibilities and skills, and to provide insight into the formation of professional identities. The literary works composed by educated literati reflect the characteristics of each group of craftsmen and tradesmen, and as they employ specific tasks and jargon, seem likely to have been based on the actual daily activities of these professions. Even though their primary aim was to entertain, these works can serve as a window onto social perceptions of different crafts in the period. In particular, these excerpts give us a more precise understanding of the different strata within the building profession, and separation between builders in general and the *muhandisīn*, whose cultured education was emphasised.

3.2 Literacy and intellectual activity among builders

In his *The Written Word in the Medieval Arabic Lands*, Hirschler discusses in detail the 'popularisation' of writing and reading practices in Mamluk society. This

popularisation of knowledge transmission manifested itself both in the wide spread of reading sessions and the penetration of the colloquial (*ʿāmmī*) dialect into classic (*faṣīḥ*) Arabic literature. During this process, practices of writing and reading were transformed, and learning shifted from a primarily oral system to a written one.[442] Hirschler argues that from the sixth/twelfth century onwards, the number of learning institutions in Egypt and Syria increased and moved to target a wider segment of the population. Before this period, primary education for children was largely limited to members of the elites, as parents had to pay to maintain the school and to contribute to teachers' salaries. From the sixth/twelfth century, however, endowed *madrasah*s and *sabīl kuttāb* emerged on a larger scale, becoming available to a larger proportion of the urban population.[443] Although it may be impossible to put an exact figure on the number of endowed primary schools during the Mamluk period, their number seems to have been significant. Preserved endowment deeds indicate that forty-six schools were endowed in Cairo between 683/1284 and 922/1516. A large number of schools whose endowment deeds have not survived are mentioned in literary sources, and so it seems very likely that there were well over a hundred primary schools in ninth/fifteenth century Cairo.[444] This represents a significant increase from earlier periods.

A change in the teaching curriculum that accompanied this expansion was the trend of acquiring writing and reading skills alongside Quran recitation.[445] We can see from *ḥisbah* manuals from sixth/twelfth-century Syria and eighth/fourteenth-century Egypt that equal emphasis was placed on recitation, reading, and writing.[446] As further proof of the emphasis on reading-writing skills, Hirschler cites the curriculum described in the endowment deeds of emir Ṣirghitmish (dated 757/1356), Sultan al-Nāṣir Ḥasan (dated 760/1359), and Sultan Qāytbāy (dated 879/1474), which includes these skills.[447] He also supports his view by citing endowment deeds from the eighth/fourteenth century, which specified that writing material such as paper, quills, and inkpots should be provided to students (Figure 3.1).[448]

Hirschler argues that reading in primary schools extended to treatises in the fields of law, history, and philology, which were outside the curriculum. There is also

[442] Hirschler, *The Written Word*, p. 82.
[443] Hirschler, *The Written Word*, p. 99.
[444] Hirschler, *The Written Word*, p. 105.
[445] Hirschler, *The Written Word*, p. 84.
[446] Hirschler, *The Written Word*, p. 84.
[447] Hirschler, *The Written Word*, p. 85.
[448] Hirschler, *The Written Word*, p. 86.

evidence that schools in Cairo and Syria began to develop small libraries of works for teachers and students to read. One such piece of evidence is the endowment deed of Sultan Faraj b. Barqūq (dated 801-813/1399-1411), which describes a bookcase of three meters high and almost one and a half meters wide, with a depth of around one-half meter.[449] According to Hirschler's count, there were twenty-five school libraries in Alexandria, sixteen in Qūṣ, five in Edfū, and three in Aswān, besides a few libraries in small towns such as Isnā, Asyūṭ, Ikhmīm, al-Fayyūm, Bulbays, and al-Maḥallah.[450] From the seventh/thirteenth century onwards, there were also local libraries attached to major endowments such as hospitals, mausoleums, and *ṣūfī* lodges to serve adult readers beyond the boundaries of Mamluk Cairo.

As indicated by the surviving al-Ashrafiyyah Library catalogue,[451] which contains around 2,096 titles, works found in Mamluk libraries included Arabic literature and poetry (1,015 entries, or 48.5% of the titles listed in the library's collection), religion and theology (421 titles, 20%), linguistics (194 titles, 9.5%), medicine and astronomy (130 entries, 6%), history and political thought (160 titles, 7.5%), philosophy including mathematics and logic (50 titles, 2.5%), and miscellaneous treatises (126 entries, 6%).[452] From this catalogue it is apparent that literature and poetry made up almost half of the library's collection. This profile, Hirschler suggests, can be taken to suggest library users' reading interests. For example, the al-Ashrafiyyah library held fifteen copies of al-Ḥarīrī's *maqāmat*,[453] and forty-six titles, many with multiple copies, by al-Thaʿālibī, whose literary works on artisans will be discussed in the following section.[454] It also included popular epics (*siyar*, s. *sīrah*) such as *Sīrat ʾAlī al-Zaybaq* and *Sīrat Ibn Yazn*.[455] Libraries were a common space shared by scholarly and popular works.

There is direct evidence that artisans and traders participated in reading sessions held by scholars in Mamluk cities, as is recorded in surviving reading certificates (*samāʾāt*, sing. *samāʾ*). Reading certificates are the records of reading sessions in which a reader (*qāriʾ*, pl. *qurrāʾ*) read a book aloud to an authorised scholar (*musammiʿ*, pl.

[449] Hirschler, *The Written Word*, p. 90.
[450] Hirschler, *The Written Word*, p. 135.
[451] Refer to the page 45.
[452] Hirschler, *The Ashrafiya Library Catalogue*, pp. table 3.1, p. 106.
[453] Hirschler, *The Ashrafiya Library Catalogue*, pp. 296 (1095); table 1093.1093, p. 1109.
[454] Hirschler, *The Ashrafiya Library Catalogue*, pp. table 3.4, p. 113. Three of al-Thalibi's treatises in al-Ashrafiyyah Library are poetic works: Ashʿār wa akhbār p.162 (122), Ẓarāʾif wa laṭāʾif p. 242 (716), and Aḥsan mā samiʿtu p. 407 (1537), which includes poems on artisans.
[455] Hirschler, *The Written Word*, p. 169.

musammiʿīn) in front of attendees (*mustamiʿīn*, s. *mustamiʿ*). The sessions were documented by a scribe (*kātib*) on the margins of the work that was read in the session. The record includes details of the location where the session took place, including its time and date, followed by the names of the authorised scholar, the reader/s, list of attendees, and the name of the authorised scribe.[456] There were two main purposes to these reading sessions. One was for the reader to gain a scholarly certificate (*ijāzah*) testifying that the reader 'read properly' to an authorised scholar; in this case, a separate reader, authorised scholar, and listeners had to be present at the event. The other purpose could be to certify that an attendee 'listened' to the book as read aloud by a scholar.[457]

Over four thousand Mamluk-era certificates survive. They are a rich source provide details on about 50,000 attendees, including information such as their affiliations, professions, and domestic relationships.[458] In his study of the *Muʿjam al-Samāʿāt al-Dimashqiyyah*, a collection of Damascene certificates from 550/1115 to 750/1349,[459] Hirschler divides the sessions into 'scholarly' and 'popular' ones on the basis of the professional identity of the prominent attendees and the total number in attendance at any given session. For example, the majority of attendees at scholarly sessions were scholars, and the total number of people who attended these sessions was relatively low. Furthermore, the scholarly sessions that took place in scholars' residences were characterised by fairly regular attendance, with each participant attending 75% of sessions on average.[460] Popular reading sessions, on the other hand, were attended by different social groups at central places such as the Umayyad Mosque in Damascus, with more occasional attendance by each individual attendee.[461] Hirschler categorises the participants of reading sessions of both kinds into six groups: scholars, craftsmen and traders, military men, dependents (slaves and clients), children, and non-

[456] Stefan Leder, Yāsīn Muḥammad Sawwās, and Maʾmūn Ṣāgharjī, *Muʿjam al-Samāʿāt al-Dimashqiyyah al-Muntakhabah min Sanat 550 ilá 750 H / 1155 ilá 1349 M* (Damascus: Institut Français de Damas, 1996), pp. 10-11. This is the ideal (full model) format for the reading certificates, however there are variations where the *qāriʾ* (reader) and the *musammiʾ* (authorized scholar) are the same individual, or even in some cases the same individual plays the role of three: *qāriʾ*, *musammiʾ*, and *kātib*.

[457] In this case, the reader, authorised scholar, and even scribe could be the same person.

[458] Leder, Sawwās, and Ṣāgharjī, *Muʿjam al-Samāʿāt*, p. 13.

[459] The published corpus of reading certificates in *Muʿjam Al-Samāʿāt* is another group of certificates different from those documented on the margins of *The History of Damascus*, and studied by Hirschler in his *The Written Word*.

[460] Hirschler, *The Written Word*, p. 37.

[461] Hirschler, *The Written Word*, p. 37.

scholars not included in the other groups.[462] The participation of artisans will be the focus of the following analysis, which will examine their attendance patterns, social status, and reasons for participating in reading sessions.

Hirschler's analysis of these Damascene reading certificates, which are documented in the margins of the *Tārīkh Madīnat Dimashq* (*The History of Damascus*), shows that craftsmen and traders mainly participated in the popular sessions, while a small minority, presumably pursuing scholarly careers, also participated in the more scholarly sessions.[463] Popular sessions mostly took place on Fridays, Mondays, and Thursdays; all of these days were probably preferred for their religious associations,[464] but Friday was definitely the most preferred day, as almost half of the popular sessions took place on that day.[465] This day was also most convenient for artisans, as it would not have disrupted their professional activities. For example, ʿUthmān al-Ṭayyān, a craftsman specialising in clay (*ṭayyān*), attended twenty-one reading sessions from 560/1165 to 564/1168, seventeen of which were on Fridays (Figure 3.2).[466] Similarly, Muḥammad al-Najjār, a carpenter, attended six of his thirteen visited sessions between 575/1180 and 578/1183 on Fridays (Figure 3.3).[467]

Other features of the attendance pattern of artisans were the frequency of attendance and the length of participation. In the examples of al-Ṭayyān and al-Najjār, we see a tendency towards partial attendance; they often either arrived late or left before the end of the session. Al-Ṭayyān was only partially in attendance for six of his twenty-one reading sessions of *The History of Damascus*.[468] Al-Najjār was present for only part of the reading session in six of thirteen instances.[469] It is also apparent in their documented sessions that they did not participate on a regular basis. Al-Ṭayyān attended twenty-one sessions over four years, with an average attendance of four to five sessions per year. Similarly, al-Najjār attended thirteen sessions over four years, making his average attendance between three and four sessions a year.

It is interesting to compare these craftsmen's attendance patterns to those of fur and silk traders. Ibrāhīm al-Farrā', a furrier, attended nine full sessions in 560/1165,

[462] Hirschler, *The Written Word*, p. 34.
[463] Hirschler, *The Written Word*, p. 35.
[464] On these days, the gates of paradise were said to be opened; Hirschler, *The Written Word*, p. 39.
[465] Hirschler, *The Written Word*, p. 39.
[466] Hirschler, *The Written Word*, p. 54.
[467] Hirschler, *The Written Word*, p. 56.
[468] Hirschler, *The Written Word*, p. 54.
[469] Hirschler, *The Written Word*, p. 56.

attending only one partially.[470] Yūsuf al-Ḥarīrī attended thirteen sessions in 562/1166, all in full.[471] Another feature that distinguished these craftsmen from the traders is their choice of sessions. According to Hirschler, al-Farrā' attended nine consecutive sessions for a particular part of *The History of Damascus* that interested him, as did al-Ḥarīrī.[472] Al-Ṭayyān and al-Najjār, on the other hand, attended sessions seemingly at random; this may have been because they were not in a position to commit to consecutive sessions.[473] While these two individuals may not be representative, they did exist, and provide one example of a way in which historical artisans engaged with literacy and learning.

According to Hirschler, craftsmen tended to participate in reading sessions as a group rather than as individuals, and they often brought family members and children along. A good example is a reading session held in 633/1236 at the Muẓaffarī Mosque in Damascus; the session included the *ḥadīth* collection *al-Mi'ah al-sharīḥiyyah* and another three books.[474] Of the 338 attendees, Hirschler identifies twelve as artisans and traders, including a *farrā'* (furrier), a *naḥḥās* (coppersmith), a *nashshār* (sawyer), a *ṣawwāf* (wool trader), a *ṭaḥḥān* (miller), a *zajjāj* (glazier), a *khabbāz* (baker), a *ḥajjār* (mason), two *khayyāṭīn* (tailors), and two *najjārīn* (carpenters).[475] This broad distribution of professions was repeated in other sessions. For example, the participants of a reading session that took place in 721/1321 at the same mosque included an *ʿaṭṭār* (perfumer),[476] *dallāl* (broker), *khayyāṭ* (tailor) and his son, *labbān* (milk seller) and his cousin of the same profession,[477] and a *najjār*.[478] As Hirschler highlights, popular reading sessions in public locations attracted people from a wide variety of professions

[470] Hirschler, *The Written Word*, p. 55.
[471] Hirschler, *The Written Word*, p. 57.
[472] Hirschler, *The Written Word*, p. 55.
[473] Hirschler, *The Written Word*, p. 54.
[474] 3757/8/1, fol.110a-113b; see: Leder, Sawwās, and Ṣāgharjī, *Muʿjam al-Samāʿāt*, p. 85.
[475] Hirschler, *The Written Word*, p. 44. The names as cited by Hirschler are: ʿAbd al-ʿAzīz b. Ibrāhīm al-Farrā', ʿĪsá b. ʿAlī al-Naḥḥās, Muḥammad b. Aḥmad al-Nashshār, Aḥmad b. ʿUmar al-Ṣawwāf, ʿAbd al-Qādir b. Aḥmad al-Ṭaḥḥān, Muḥammad b.ʿUmar al-Zajjāj, ʿAlī b. Muḥammad al-Khabbāz, ʿUmar b. al-Muslim al-Ḥajjār, Muḥammad b. ʿUthmān al-Khayyāṭ, Muẓaffar b. Ṣādiq al-Khayyāṭ, Aḥmad b. Muẓaffar al-Najjār, and ʿAbd al-Muḥsin b. ʿAlī al-Najjār.
[476] ʿAṭṭār was not limited to selling perfume, but also spices and herbs, sometimes is known as druggist. A. Dietrich, 'al-ʿAṭṭār', in *Encyclopaedia of Islam, Second Edition*, ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. I:751b, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/al-attar-SIM_0858> [accessed 16 May 2017].
[477] Labbān could be milk seller or brick maker.
[478] Hirschler, *The Written Word*, p. 44. The names as cited by Hirschler are: Muḥammad b. Ismāʿīl al-ʿAṭṭār, Shujāʿ b. ʿAbd al-Raḥmān al-Dallāl, Ibrāhīm b. Muḥammad al-Khayyāṭ with his son Muḥammad, Ḥasan b. ʿAlī al-Labbān and his cousin Muḥammad b. ʿUthmān al-Labbān, Muḥammad b. Zakariyyā al-Najjār.

and backgrounds. However, some of this variation in professions may also be seen in sessions held at scholars' residences. Two reading sessions held at scholars' homes in 664/1266 included attendees such as a *laḥḥām* (butcher), a *khabbāz* (baker), a *nassāj* (weaver), a *sammān* (butter merchant), two *najjārīn* brothers, and four *khayyāṭīn*.[479] These examples reflect the collective social and intellectual interaction of artisans and traders, and their shared interest in participating in popular and scholarly reading circles.

Another piece of evidence about artisans available from reports of reading sessions is the seating order of the attendees, which reflected their social and cultural status. Hirschler explains that the seating order of scholarly sessions was based on educational level. According to his understanding of the literary sources, student scholars arranged themselves in a semicircle in front of the authorized scholar, with the 'most advanced' student facing him.[480] In the popular sessions, the seating circle was extended to accommodate further groups. His analysis reveals a pattern of seating order which, although not written out as formal rules, seems to have been generally followed and reflected in the register of participants.[481] For example, in a reading session that took place in the 560s/1160s, the fifty attendees arranged themselves in two circles, of which the inner circle facing the reader had nineteen educated scholars and highly ranked members of the military elite, while the outer circle accommodated various other groups including minor scholars and craftsmen.[482] From this and many other sessions, Hirschler concludes that attendees were seated according to social norms and that artisans and traders gathered close to each other within the outer circle below the learned scholars and ranked officers.[483]

Hirschler also compares scholarly and popular reading sessions, finding indications that the participation of craftsmen in reading sessions could be semi-ritualistic, but occasionally appears to have been driven by intellectual pursuits. In the aforementioned *ḥadīth* reading session, the participation of artisans and traders could be understood as a form of ritual practice, similar to participation in the communal

[479] Hirschler, *The Written Word*, p. 45. The names as cited by Hirschler are: Aḥmad b. Abī al-Nūr al-Laḥḥām, Yusuf b. ʿAlī al-Khabbāz, Abū Bakr b. Ibrāhīm al-Nassāj, Muḥammad b. Bahrām al-Sammān, ʿAlī b. Aḥmad al-Najjār and his brother Qāsim, Aḥmad b. Ghassān al-Khayyāṭ, ʿAbd al-ʿAzīz b. ʿAbd al-Ḥalīm al-Khayyāṭ, ʿUthmān b. Aḥmad al-Khayyāṭ, and Muḥammad b. Aḥmad al-Khayyāṭ.
[480] Hirschler, *The Written Word*, pp. 46-47.
[481] Hirschler, *The Written Word*, p. 48.
[482] Hirschler, *The Written Word*, p. 49.
[483] Hirschler, *The Written Word*, p. 51.

Friday prayer.[484] However, when artisans attended reading sessions of other genres, especially historical works, they may well have been motivated by wider intellectual interest. *The History of Damascus* was a broad history of Damascus and its hinterland, and Hirschler suggests that its aesthetic quality and readers' interest in specific parts of the book could have motivated non-scholars, including craftsmen, to participate. He notes that the reading sessions of this book led by the author himself, Ibn ʿAsākir (d. 571/1176), attracted more attendees of the group of artisans and traders than sessions led by other scholars.[485] The aforementioned ʿUthmān al-Ṭayyān and Muḥammad al-Najjār, unusually enough, attended a few consecutive reading sessions on *The History of Damascus*, which may indicate an interest in specific parts of the book.

In another interesting literary example not cited by Hirschler, we have a practicing *muhandis* who participated with his sons and grandchildren in several reading sessions in the second half of the seventh/thirteenth century, Ibrāhīm b. Ghanā'im al-Muhandis (fl. 670s/1270s). The published collection of reading certificates in *Mu'jam al-Samā'āt* shows several sessions in which the father, his two sons, Muḥammad (d. 733/1333) and Aḥmad (d. 747/1347), and their nine children participated in reading sessions, in some of which the son Muḥammad acted as authorised scholar and scribe.[486] In 681/1282, Ibrāhīm b. Ghanā'im and his son Muḥammad, aged 16 years old,[487] attended a popular reading session of a *ḥadīth* collection with another 120 attendees at al-Muẓaffarī Mosque in Damascus.[488] The group of reading certificates of *Mu'jam al-Samā'āt* does not show other sessions attended by the father Ibrāhīm. The son Muḥammad, however, was an educated scholar who actively participated in thirty-eight popular and scholarly reading sessions, of which he was the authorized scholar in seven.[489] Of the thirty-eight sessions, he accompanied his younger brother Aḥmad to nine sessions,[490] and four of his children –

[484] Hirschler, *The Written Word*, p. 51.
[485] Hirschler, *The Written Word*, pp. 42, 58.
[486] Leder, Sawwās, and Ṣāgharjī, *Muʿjam al-Samāʿāt*, pp. 129-130: 3818/3812/3818, fol. 3171b.
[487] According to his biography cited by Ibn Ḥajar al-ʿAsqalānī, Muḥammad was born in 665/1267. See: Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah*, pp. III, 291. In 861/1282, the other son Aḥmad was about 4 years old. See: Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah*, pp. I, 95.
[488] Leder, Sawwās, and Ṣāgharjī, *Muʿjam al-Samāʿāt*, pp. 160, 492: 1039/1035/1035, fol. 1060a. Jāmiʿ al-Muẓaffarī is also known as Jāmiʿ al-Ḥanābilah, its building began in 598/1202 and completed in 610/1213 by emir Muẓaffar al-Dīn, governor of Arbil. See: 'Jami' al-Hanabila', in *Archnet*, (2014) <https://archnet.org/sites/3722> [accessed 21 August 2017].
[489] Leder, Sawwās, and Ṣāgharjī, *Muʿjam al-Samāʿāt*, pp. 492-493.
[490] The reading sessions in which Muḥammad b. Ibrāhīm accompanied his brother Aḥmad are (bold sessions are where more than one family member attended): 3818/3/18, fol. 45a; 3818/3/3, fol. 37b; 3818/3/15, fol. 43b; 3757/8/40, fol. 129b; **1088/14/21, fol. 231b**; 1231/2/14, fol. 55a; 3775/4/2, fol.

Zaynab, Aḥmad, ʿAbd al-Raḥmān, and Muḥammad – to several.[491] Ibn Ḥajar al-ʿAsqalānī mentions that Muḥammad b. Ibrāhīm b. Ghanāʾim was an advanced scholar in that he transmitted knowledge to scholars like ʿAlam al-Dīn al-Birzālī (d. 739/1339), the renowned scholar Shams al-Dīn al-Dhahabī (d. 748/1348), the chief judge ʿIzz al-Dīn b. Jamāʿah (d. 767/1366), and Ibn Rāfiʿ al-Salāmī (d. 774/1372).[492] Muḥammad's son, ʿAbd Allah (d. 769/1367), was also an advanced scholar.[493] Even though Muḥammad and his son ʿAbd Allah were famous in their scholarly circles, each of them was known as the son of (*ibn*) al-Muhandis, the title of his father Ibrāhīm.[494] Here, we see that a son of a *muhandis* could become a scholar, bridging the social divide.

In his *Dhakhāʾir al-Qaṣr*, Ibn Ṭūlūn mentioned this *muhandis*, Ibrāhīm b. Ghanāʾim, as responsible for building the marvellous al-Ablaq Palace in Damascus for Sultan al-Ẓāhir Baybars, which he also identified as one of the Wonders of the World (*min ʾajāʾib al-dunyā*). Ibn Ṭūlūn also confirmed that he read Ibn Ghanāʾim's signature on a marble panel at the northern gate;[495] Ibn Ghanāʾim's signature still survives today on the portal of the Sultan al-Ẓāhir Baybars' Madrasah in Damascus (bl. 676/1277).[496] The fact that Ibn Ghanāʾim participated in reading sessions while he worked on Sultanate projects indicated that builders could be both professionally active and involved in intellectual activities.

This same collection of reading certificates also includes reading certificates for another *muhandis*, six masons, four sawyers (*nashshārīn*), sixteen lumberjacks (*khashshābīn*), four painters, and twenty-five carpenters, a few of whom participated in

43b; 3828/9/9, fol. 133b; 3774/11/18, fol. 138b. See:Leder, Sawwās, and Ṣāgharjī, *Muʿjam al-Samāʿāt*, pp. 167-168. In Aḥmad b. Ibrāhīm b. Ghanāʾim's biography by Ibn Ḥajar al-ʿAsqalānī, he refers to the brother Muḥammad's supported in scholarly circles. See: Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah*, pp. I, 95.

[491] Leder, Sawwās, and Ṣāgharjī, *Muʿjam al-Samāʿāt*, pp. 314, 195, 367, 557. The reading sessions in which Muḥammad b. Ibrāhīm accompanied his children are as the following: Zaynab (2131/2/13, fol. 53b; 3823/22/6, fol. 236b; 3818/10/7, fol. 147b; 3838/-/27, fol. 149b), Aḥmad (1139/1/5, fol. 4b; 3774/11/9, fol. 123a; **955/9/73, fol. 197a**), ʿAbd al-Raḥmān (**1088/14/21, fol. 231b**; 3818/12/2, fol. 169b; 3777/21/6, fol. 318b; 3759/9/4, fol. 112b), Muḥammad (**955/9/73, fol. 197a**).

[492] Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah*, pp. III, 291-292.

[493] Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah*, pp. II, 282.

[494] Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah*, pp. I, 95, 241; II, 282; III, 291.

[495] Shams al-Dīn Muḥammad b. ʿAlī Ibn Ṭūlūn, *Dhakhāʾir al-Qaṣr fī Tarajum Nubalāʾ al-ʿAṣr*, ed. by Nada Abd al-Razzaq al-Jilawi (Amman: Dār Zahrān, 2014), p. 782.

[496] Mayer, *Islamic Architects*, p. 71; *Répertoire Chronologique d'Epigraphie Arabe*, 17 vols (Cairo: Institut français d'archéologie orientale, 1931-82), pp. XII, 230: no. 4744; for more information and photos see: Verena Daiber, 'Madrasa al-Zahiriyya', Museum With No Frontiers, (2017) <http://www.discoverislamicart.org/database_item.php?id=monument;ISL;sy;Mon01;18;en> [Accessed 22 August 2017]; also see Madrasa al-Ẓāhiriyya in: 'Thesaurus of Islamic Epigraphy', Fondation Max van Berchem, (2017) <http://epigraphie-islamique.org> [Accessed 22 August 2017].

more than one session. The other *muhandis* whose name appears in *Muʿjam al-Samāʿāt* is Ibrāhīm b. Aḥmad b. Khalīl al-Ḥajjār al-Muhandis (fl. late 7th/13th c.).[497] He attended two reading sessions of *ḥadīth* collections held at the same al-Muẓaffarī Mosque in 699/1300 and 700/1300, in which the previously mentioned scholar ʿAlam al-Dīn al-Birzālī, a student of Muḥammad b. Ibrāhīm b. Ghanāʾim, acted as the session's reader.[498] The compound surname 'al-Ḥajjār al-Muhandis' likely indicates that he was involved in the building profession. Similarly, this collection of reading certificates includes twenty-five names of carpenters, three of whom were members of one family; one session in 696/1297 was attended by a father, Zakariyyā b. Ismāʿīl b. Yūnus, and his two sons, Muḥammad and Aḥmad.[499] The sons' surnames appear as al-Najjār, not 'son of al-Najjār', seemingly indicating that all three were carpenters. The fact that carpenters and other members of relatively low-status building professions such as that of mason, sawyer, plasterer, and painter appear in these reading certificates indicates that participation in intellectual activities was not limited to educated professionals or *muhandisīn*, but formed part of the social activity of building craftsmen in general.

In Hirschler's view, an increasing awareness of popular interest in reading sessions eventually led to the emergence of a popular literature aimed at the wider public rather than scholars.[500] According to him, two distinct features characterized popular anthologies like selections of poetry, prose, and rhymed prose, namely their content and the social context of their production and consumption. Unlike scholarly anthologies, the content of popular anthologies was a 'broad mixture' of what the author assumed to be of interest to his readers. It was, therefore, possible to include a variety of poetry and prose, including both religious and popular texts. The social context in which popular anthologies were consumed is also reflected in their production. Non-scholarly authors of such anthologies are by and large absent from the biographical dictionaries, indicating that their work was not seen as of note to the scholarly community or to scholars' identity.[501] However, the fact that they did compose popular words that still survive today suggests the emergence of a popular literature 'that turned the passive participation of non-scholarly groups as readers into their active

[497] The two sessions are: 955/9/29, fol. 188a; 1178/22/1, fol. 227a. See: Leder, Sawwās, and Ṣāgharjī, *Muʿjam al-Samāʿāt*, p. 150.
[498] Reading session: 1178/22/1, fol. 227a. See: Leder, Sawwās, and Ṣāgharjī, *Muʿjam al-Samāʿāt*, p. 71.
[499] Leder, Sawwās, and Ṣāgharjī, *Muʿjam al-Samāʿāt*, pp. 174, 310, 520.
[500] Hirschler, *The Written Word*, p. 186.
[501] Hirschler, *The Written Word*, p. 188.

participation as authors'.[502] The encyclopaedic and broad scope of these anthologies suggests that they were aimed at non-scholar readers, as they would have appealed to someone with basic education but little interest in detailed and elaborated knowledge.[503] Hirschler proposes that this audience included craftsmen and traders who pursued intellectual activities to enhance their social identity in the eyes of non-scholars.

3.3 Literary works by artisans

Besides public reading sessions, in which craftsmen of variant professions and trades participated, the previously discussed spread of learning institutions eventually led to the rise of literacy among the public. This included artisans, from among whom artisan poets came. Mamluk craftsmen composed poems and prose of different styles in both classical style and the colloquial dialect, with a tendency towards the latter. This allowed artisans to represent themselves directly to their society and to get involved in literary circles.

As previously mentioned, the Mamluk era witnessed an increase in the number of craftsmen-literati, and their literary works were popular and widely circulated. Artisans like Abū al-Ḥusayn al-Jazzār (The Butcher) (d. 679/1281),[504] Mujāhid b. Sulaymān al-Khayyāṭ (The Tailor) (d. 672/1273), Sirāj al-Dīn al-Warrāq (d. 695/1296), Naṣīr Al-Ḥammāmī (d. 712/1312), and Ibrāhīm al-Miʿmār (d. 749/1348) were involved in the same circles as literate scholars and elite poets like the historian Khalīl b. Aybak al-Ṣafadī (d. 764/1363). Muḥammad Sallām, a modern scholar of Arabic literature, groups Mamluk poets into generations, each consisting of literati who competed and exchanged their talent. According to him, the first generation of Mamluk poets were al-Jazzār, al-Ḥammāmī, al-Warrāq, the clerk and historian Ibn ʿAbd al-Ẓāhir (d. 692/1293),[505] and Ibn Dāniyāl (d. 710/1310).[506] The following generation was formed

[502] Hirschler, *The Written Word*, pp. 188-191.
[503] Hirschler, *The Written Word*, p. 187.
[504] He is Yaḥyá b. ʿAbd al-ʿAẓīm known as Abū al-Ḥusayn al-Jazzār.
[505] J. Pedersen, 'Ibn ʿAbd al-Ẓāhir', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. III:679a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/ibn-abd-al-zahir-SIM_3034> [accessed 24 August 2017].
[506] Muḥammad Zaghlūl Sallām, *al-Adab fī al-ʿAṣr al-Mamlūkī*, 2 vols (Cairo: Dār al-Maʿārif, 1971), pp. II, 133. Sallam gives each generation a period of fifty years in average, and he devides them geographically as well into Egyption and Shāmī generations; for more information on Ibn Dāniyāl see: J.M. Landau, 'Ibn Dāniyāl', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. III:742a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/ibn-daniyal-SIM_3122> [accessed 4 May 2017].

by the intellectual leader Ibn Nubātah (d. 768/1366)[507] and his followers, namely al-Miʿmār, Burhān al-Dīn Ibrāhīm al-Qīrāṭī (d. 781/1379),[508] Ibn Abī Ḥajlah (d. 776/1375),[509] and ʿAbd al-Raḥmān b. Makānis (d. 794/1393).[510] Sallām's grouping of Mamluk poets into generations complements Hirschler's view that the literature produced by non-scholars, especially artisans, was consumed and exchanged among the public and elites alike, as such mutual influence would have required circulation.

Al-Jazzār, al-Ḥammāmī, and al-Sarrāj al-Warrāq belonged to the same generation and were known as the 'Witty Trio' (*al-ẓurafā' al-thalāthah*), as they were the leaders of a trend towards amusement and humor in poetry. Al-Jazzār, whose surname means 'the butcher', was professionally a butcher like his father and family, but discovered his literary talent at an early age and was also a leading poet.[511] He was eager to create ties with literati, such as the renowned scholar and historian Ibn al-ʿAdīm, to improve his poetry; Al-Ṣafadī stated that every time Ibn al-ʿAdīm came to Cairo, al-Jazzār accompanied him until he left (كان إذا قدم مصر يلازمه أبو الحسين الجزار).[512]

Al-Jazzār's contact with elites and his poetic talent was perhaps what reserved him an entry in the biographical dictionaries of the time. He appears in a few, including *al-ʿIbar fī Khabar man Ghabar* by al- Dhahabī, al-Ṣafadī's *al-Wāfī bi-al-Wafayāt*, Ibn Taghrībirdī's *al-Nujūm al-Zāhirah*, and *Shadharāt al-Dhahab*.[513] His biography in al-Dhahabī's dictionary is very brief and lacks the details of his life, instead simply stating that al-Jazzār's poetry was very popular (*shiʿrih sā'ir mashhūr*).[514] Al-Ṣafadī's biographical dictionary similarly focuses on al-Jazzār's poetry, citing excerpts in different styles of al-Jazzār's poetry to describe different individuals and comparing al-Jazzār's poetic style to that of others.[515] Ibn Taghrībirdī's entry for al-Jazzār also states

[507] J. Rikabi, 'Ibn Nubāta', in *Encyclopaedia of Islam, Second Edition*, ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. III:900a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/ibn-nubata-SIM_3325> [accessed 24 August 2017].

[508] Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah*, pp. I, 31; Ibn Taghrībirdī, *al-Manhal al-Ṣāfī*, pp. I, 89.

[509] Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah*, pp. I, 329.

[510] Sallām, *al-Adab fī al-ʿAṣr al-Mamlūkī*, pp. II, 133; for his biography see: Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah*, pp. II, 348; and: Ibn Taghrībirdī, *al-Nujūm al-Zāhirah*, pp. XII, 131.

[511] Bauer, 'Mamluk Literature', p. 120.

[512] al-Ṣafadī, *al-Wāfī*, pp. XXII, 260.

[513] Muḥammad b. Aḥmad al-Dhahabī, *al-ʿIbar fī Khabar man Ghabar,* ed. by Abū Hājar Muḥammad al-Saʿīd b. Basyūnī Zaghlūl, 4 vols (Beirut: Dār al-Kutub al-ʿIlmiyyah, 1985), pp. III, 341; Ibn Taghrībirdī, *al-Nujūm al-Zāhirah*, pp. VII, 345; Ibn al-ʿImād al-Ḥanbalī, *Shadharāt al-Dhahab*, pp. VII, 636.

[514] al-Dhahabī, *al-ʿIbar*, pp. III, 341.

[515] Al-Ṣafadī cites his poetry in around twenty-five biographies of scholars and elites, for few examples see:al-Ṣafadī, *al-Wāfī*, pp. IV, 132; VIII, 185; XI, 300; XII, 180; XVIII, 180.

that he was a well-known poet who exchanged poetry with his peers (*lahu mufāwaḍāt (mukātabāt) ma'a shu'arā' 'aṣrih*). Further, he cites al-Ṣafadī' as saying that none of al-Jazzār's contemporaries could compete with his talent except al-Sarrāj al-Warrāq, and that together they inspired the poets of their time.[516]

The second member of the 'Witty Trio' was Sirāj al-Dīn al-Warrāq, ʿUmar b. Muḥammad. Besides being a copyist and manufacturer of paper, he worked as a secretary (*kātib darj*) for emir Sayf al-Dīn Isbāslār (d. 679/1280), governor of Miṣr.[517] He produced many large volumes of poetic literature; both the scribe and historian Ibn Shākir al-Kutubī (d. 764/1363) and al-Ṣafadī state that his compositions filled fifteen large volumes.[518] His poems are rhetorically masterful and eloquent and deal with complaint, love, and courtship. The subjects of his poems include patrons who rewarded him insufficiently, as well as his friends, food, and even ceremonies such as the opening ceremony of Sultan al-Ẓāhir Baybars' *madrasah* in 662/1263.[519] Al-Warrāq's literary style utilized rhetorical devices, particularly and extensively puns (*tawriyah*).[520] Al-Warrāq was known as a master of *tawriyah*, and often punned on both his surname, al-Sarrāj, and his craft, al-Warrāq (papermaker or bookseller). Al-Ṣafadī states that he was told that half of his poems would be neglected if he was not employing his surname and craft.[521] His companions al-Jazzār and al-Ḥammāmī also utilized their surnames in puns.[522]

The third member of the Witty Trio was Naṣīr b. Aḥmad b. ʿAlī al-Ḥammāmī (d. 712/1312), who managed (*iktirā'* or *ḍamān*) public baths (*ḥammāmāt*, s. *ḥammām*). His biographies in the works of al-Ṣafadī, Ibn Ḥajar al-ʿAsqalānī, and al-Suyūṭī show that his rhetorical talent made him a renowned poet in spite of his modest education.[523] He composed and exchanged poems with his contemporaries, including al-Warrāq, al-Jazzār, and Ibn Dāniyāl, well-known for his popular shadow plays.[524]

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[516] Ibn Taghrībirdī, *al-Nujūm al-Zāhirah*, pp. VII, 345.
[517] al-Ṣafadī, *al-Wāfī*, pp. XXIII, 33-34.
[518] al-Kutubī, *Fawāt*, pp. III, 140; al-Ṣafadī, *al-Wāfī*, pp. XXIII, 33.
[519] Sallām, *al-Adab fī al-ʿAṣr al-Mamlūkī*, pp. II, 157.
[520] Magdi Wahba and Kāmil al-Muhandis, *Muʿjam al-Muṣṭalaḥāt al-ʿArabiyyah fī al-Lughah wa al-Adab*, 2 edn (Beirut: Maktabat Lubnān, 1984), p. 126.
[521] al-Ṣafadī, *al-Wāfī*, pp. XXIII, 34.
[522] Taqiyy al-Dīn Abū Bakr b. ʿAlī Ibn Ḥijjah al-Ḥamawī, *Khizānat al-Adab wa Ghāyat al-Arab*, ed. by ʿIṣām Shaʿītū, 2 vols (Beirut: Dār wa Maktabat al-Hilāl, 1987), pp. II, 48.
[523] al-Ṣafadī, *al-Wāfī*, pp. XXVII, 64; Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah*, pp. IV, 393; al-Suyūṭī, *Ḥusn al-Muḥāḍarah*, pp. I, 569.
[524] Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah*, pp. IV, 394; Ibn Ḥijjah al-Ḥamawī, *Khizānat al-Adab*, pp. II, 48-50.

The intellectual and social interaction present between the members of the first generation was replicated in the following generation, whose literary leader was Ibn Nubātah. Ibn Nubātah was viewed by his contemporaries as a gifted and an incomparable litterateur who was the leading poet of his age. However, few of his poems have been edited or published, and hardly any scholarly studies have been done on his work. In one of these few studies, Thomas Bauer calls Ibn Nubātah 'the solitaire of his age'.[525] This echoes the period testimony of his student, al-Ṣafadī, who admired 'the excellence of his [Ibn Nubātah's] poetic compositions', and 'the astonishing quality of his topics'.[526] Bauer emphasizes that Ibn Nubātah's life and contributions are best understood in light of his social network.[527] At a young age, Ibn Nubātah's father brought him to *ḥadīth* scholars, of whom the most influential was Ibn Daqīq al-ʿĪd (d. 702/1302). As a boy, Ibn Nubātah learned poetry from the works of Ibn ʿAbd al-Ẓāhir, al-Warrāq, and al-Ḥammāmī. Due to his young age, Ibn Nubātah had no chance to learn directly from Ibn ʿAbd al-Ẓāhir, but had direct contact with al-Warrāq and exchanged poems with al-Ḥammāmī.[528] Bauer argues that despite his Cairene origins, when Ibn Nubātah formed his independent literary personality, he found that the proper place to publish his sophisticated and refined literature was Greater Syria. The ranks of eloquent literati were strong in Greater Syria, in contrast to Egypt, where popular literature flourished.[529] Nevertheless, Ibn Nubātah's literary compositions were spread and exchanged among his colleagues and friends not only in Damascus, but also in Cairo.[530] Among these friends was ʿAlā' al-Dīn b. Faḍl Allāh al-ʿUmarī (d. 769/1368); he worked as *kātib al-sirr* at the Cairo Chancery for about thirty-three years and actively patronized poets like al-Miʿmār and al-Qīrāṭī, who was seen at his age as the closest student and true successor of Ibn Nubātah.[531]

This was the context within which the artisan poet Jamāl al-Dīn Ibrāhīm b. ʿAlī al-Miʿmār grew and was inspired. Writing about al-Miʿmār with regards to the building profession is more problematic than it might seem. On one hand, his sobriquet 'al-Miʿmār' would seem to indicate his involvement in the profession, as does the over-

[525] Thomas Bauer, 'Ibn Nubātah al-Miṣrī (686–768/1287–1366): Life and Works Part I: The Life of Ibn Nubātah', *Mamluk Studies Review*, 12: 1 (2008), 1.
[526] al-Ṣafadī, *al-Wāfī*, pp. I, 234.
[527] Bauer, 'Ibn Nubātah Part I', p. 9.
[528] Bauer, 'Ibn Nubātah Part I', pp. 11, 13.
[529] Bauer, 'Ibn Nubātah Part I', p. 15.
[530] Bauer, 'Ibn Nubātah Part I', p. 14.
[531] Ibn Taghrībirdī, *al-Manhal al-Ṣāfī*, pp. I, 90; Bauer, 'Ibn Nubātah Part I', pp. 10, 24.

representation of different building professionals in his compositions. As will be discussed below, the poet Shams al-Dīn al-Nawājī (d. 859/1455)[532] collected al-Miʿmār's verses on a broad range of building craftsmen, including the *muhandis*, builder, carpenter, mason, adobe-maker, tile-maker, plasterer, and painter.[533] On the other hand, neither his admittedly short biographical entries by Mamluk chroniclers nor surviving primary sources and inscriptions refer to his active involvement in the building craft. Similar to al-Jazzār and al-Warrāq, al-Miʿmār's biography by his contemporary al-Ṣafadī, and later chroniclers like Ibn Ḥajar al-ʿAsqalānī and Ibn Taghrībirdī, is quite short and mainly tells about his literary compositions without reference to his profession.[534] Most, if not all, scholarship done on al-Miʿmār has focused on stylistic analysis of his literary output. Occasional attempts to describe his social life and profession have not reached definitive conclusions due to the sources' silence on this subject.[535]

According to the available sources, al-Miʿmār was a popular colloquial poet, famous for his employment of puns. Al-Ṣafadī's biographical dictionary states that al-Miʿmār wrote welcoming poetic verses for him when he visited Cairo in 745/1344, indicating that al-Miʿmār corresponded with Mamluk literary elites.[536] Al-Miʿmār's *dīwān* includes images drawn from daily life, as well as criticisms of oppressive

[532] I. Kratschkowsky, 'al-Nawādjī', in *Encyclopaedia of Islam, Second Edition*, ed. by Th. Bianquis, et al. (Leiden: Brill, 2012), p. VII:1039b, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/al-nawadji-SIM_5856> [accessed 5 May 2017].

[533] New Jersey, Princeton University Digital Library (PUDL), Islamic Manuscripts Collection Garrett no. 14L, (fols 52v-53v, 61v).

[534] Khalīl b. Aybak al-Ṣafadī, *Aʿyān al-ʿAṣr wa Aʿwān al-Naṣr*, ed. by ʿAlī Abū Zayd, 6 vols (Damascus: Dār al-Fikr, 1998), pp. I, 146; al-Ṣafadī, *al-Wāfī*, pp. VI, 111; Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah*, pp. I, 49; Ibn Taghrībirdī, *al-Manhal al-Ṣāfī*, pp. I, 188.

[535] For Arabic studies see: Abdulla Ahmad Al-Muhanna, 'Ibrāhīm al-Miʿmār: The Poet of the Masses in the Mamluk Era', *Arab Journal for the Humanities*, 15: 58 (1997); Mahmud Fuad Muhammad, 'Dīwān Jamāl al-Dīn Ibrāhīm al-Miʿmār: Taḥqīq wa Dirāsah', (unpublished Master of Arts, al-Zaqaziq University, 1996); Hussein Abd al-Aal al-Lahibi, *Dīwān Jamāl al-Dīn Ibrāhīm b. ʿAlī al-Miʿmār: Dirāsah wa Taḥqīq* (Najaf: Ḥawḍ al-Furāt, 2014). For Western studies see: Thomas Bauer, 'Ibrāhīm al-Miʿmār: Ein dichtender Handwerker aus Ägyptens Mamlukenzeit', *Zeitschrift der Deutschen Morgenländischen Gesellschaft*, 152 (2002); Thomas Bauer, 'Die Leiden eines ägyptischen Müllers: Die Mühlen-Maqāme des Ibrāhīm al-Miʿmār (st. 749/1348)', in *Ägypten-Münster: Kulturwissenschaftliche Studien zu Ägypten, dem Vorderen Orient und verwandten Gebieten*, ed. by E. Graefe, et al. (Wiesbaden: Harrassowitz, 2003), pp. 1-16; Thomas Bauer, 'Das Nilzaǧal des Ibrāhīm al-Miʿmār: ein Lied zur Feier des Nilschwellenfestes', in *Alltagsleben und materielle Kultur in der arabischen Sprache und Literatur: Festschrift für Heinz Grotzfeld zum 70. Geburtstag*, ed. by Thomas Bauer and Ulrike Stehli (Wiesbaden: Harrassowitz, 2005), pp. 69-88; Hakan Özkan, 'The Drug Zajals in Ibrahim al-Mi'mar's Diwan', *Mamluk Studies Review*, XVII (2013). The academic English editing and translation is currently in progress under supervision of: Thomas Bauer, Anke Osigus, and Hakan Özkan.

[536] al-Ṣafadī, *al-Wāfī*, pp. VI, 111.

emirs[537] and complaints about social inequities.[538] He also describes people and objects within a theme of romantic love, which tends in many cases towards vulgar erotica,[539] all with humorous effect.[540] According to chroniclers of his time, his *dīwān* was popular and circulated widely; they were so well-known, in fact, that Ibn Taghrībirdī explicitly stated that he did not need to include excerpts from them in his biographical dictionary because they were so popular.[541]

Confusingly, al-Ṣafadī mentions that al-Miʿmār's sobriquet was variously defined as al-Ḥā'ik (weaver), al-Ḥajjār (mason), and al-Miʿmār (professional builder).[542] Some other chroniclers, like Ibn Shākir al-Kutubī and Ibn Taghrībirdī, followed his lead and cited al-Ṣafadī's statement that his surname was said to be al-Miʿmār or al-Ḥajjār (*qīla al-Miʿmār wa qīla al-Ḥajjār*).[543] Others, like Ibn Ḥajar al-ʿAsqalānī and Ibn Iyās, refer only to his title as al-Miʿmār,[544] and it is under this surname that he was commonly known. It is on this basis that Hirschler and Özkan assume his involvement in the building craft.[545] Indeed, al-Miʿmār himself employed his title as *miʿmār* over any other suggested titles. For example, he says:

قل للذين تفاخروا بنظامهم دعوى ولم يرعوا لذلك ثبوتا

هلا اقتدوا بنظام معمار اذا شاد البيوت وكلل الياقوتا [546]

Tell who are proud of their compositions
this is claim without proof

Why did they not take after the *miʿmār*'s composition
when he built houses/composed verses and crowned [them] with ruby

Here, al-Miʿmār appears to be delivering a message to poets who claim poetic talent without evidence to imitate his stylistic composition. He does this by comparing himself

[537] Al-Muhanna, 'Ibrāhīm al-Miʿmār', pp. 44-47.
[538] Al-Muhanna, 'Ibrāhīm al-Miʿmār', pp. 25-26; Özkan, 'The Drug Zajals', p. 213.
[539] Al-Muhanna, 'Ibrāhīm al-Miʿmār', pp. 60-61; Özkan, 'The Drug Zajals', p. 214.
[540] Al-Muhanna, 'Ibrāhīm al-Miʿmār', pp. 56-57.
[541] Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah*, pp. I, 49; Ibn Taghrībirdī, *al-Manhal al-Ṣāfī*, pp. I, 192.
[542] al-Ṣafadī, *Aʿyān al-ʿAṣr*, pp. I, 146; al-Ṣafadī, *al-Wāfī*, pp. VI, 111.
[543] al-Kutubī, *Fawāt*, pp. I, 50; Ibn Taghrībirdī, *al-Manhal al-Ṣāfī*, pp. I, 188.
[544] Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah*, pp. I, 49; Ibn Iyās, *Badāʾiʿ al-Zuhūr*, pp. Ia, 527.
[545] Hirschler, *The Written Word*, p. 191; Özkan, 'The Drug Zajals', p. 213.
[546] Al-Muhanna, 'Ibrāhīm al-Miʿmār', p. 16.

to the builder of houses: as ‘house’ and ‘stanza’ are the same word in Arabic, the word [*bayt*] could either mean ‘build houses’ or compose verses. Even poems about al-Miʿmār written after his death employ building jargon. An elegy for the poet composed by al-Miʿmār’s friend al-Qīrāṭī, for example, says:

مُذْ عَمَرَ المعمار دار البِلى رمى بيوتَ النظمِ بالنقضِ

فياله من شاعرٍ مَيْت بكت عليه طوبة الأرض [547]

Since al-Miʿmār thrived/constructed (*ʿamara*) the home of decomposition

[he] created houses/stanzas of poetry with rubble (*naqḍ*)

Alas, he is a dead poet

the mud-brick of the earth cried for him

Al-Qīrāṭī here represents his friend al-Miʿmār employing building terminology. However, neither his verses nor al-Miʿmār’s provide any additional detail about which sub-group of the building profession the poet belonged to. He was called both *miʿmār* and *ḥajjār* (mason) and, during this period, the term *miʿmār* could mean many things; as discussed in Chapter One, although the term *miʿmār* had taken on the meaning of professional builder or *muhandis* by the ninth/fifteenth century, its earlier uses were many and varied. These sets of verses show that at this time, namely the first half of the eighth/fourteenth century, the term *miʿmār* was in use, but its fourteenth-century meaning may not have corresponded exactly with its later significance.

The literary works composed by artisans comprised a range of literary forms and styles and were widely cited in later works, including both prose and poetic anthologies. It is worth mentioning that the poets highlighted in this section are only those whose names were most frequently cited and commented on within the field of artisanal literature. Many more artisanal and other professional sobriquets are mentioned in the chronicles and literary anthologies as names of Mamluk *udabāʾ*.

[547] Ibn Iyās, *Badāʾiʿ al-Zuhūr*, pp. Ia, 527.

3.4 Literature about artisans

Mamluk literary representations of artisans and traders, including practitioners of the building profession, may be divided into two main styles. In the first style, artisans and their activities were described in the third person using rhymed poetic couplets. In the second style, artisans and practitioners of various crafts and trades appeared as active characters, appearing to speak for themselves while employing their profession's jargon and referencing the trade's tools. In this section, I will present these modes of literary representation in more detail, with a brief background on pre-Mamluk literature about artisans. I will also provide analysis of some examples from Mamluk literature to illustrate the range and intensity of literary production by the end of the ninth/fifteenth century. A few examples of interest will be analysed further later in this section by providing a close reading illuminating the literary identity of key practitioners of the building craft: the carpenter, the builder, and the *muhandis*.

3.4.1 Early works about artisans

Although the Mamluk period saw an increase in the number of literary works describing artisans, tradesmen, and officials, craftsmen had been a subject of literature since the foundational work of al-Jāḥiẓ (d. 255/869).[548] Only one modern study of Arabic literature on artisans exists, namely Joseph Sadan's two-part paper 'Kings and Craftsmen, a Pattern of Contrasts'. In it, he surveys the main literary works produced from the third/ninth century to the early modern period (twelfth/eighteenth century).[549] He names al-Jāḥiẓ's *Epistle on the Crafts of the Masters* (*Risālah fī Ṣinā'āt al-Quwwād*)[550] as the earliest literature on craftsmen and points out that this epistle 'stands out in its construction, style and aim';[551] it is here considered a foundational work to the entire genre of literature about craftsmen.

In the work, which seems to have been written for the Abbasid court, Al-Jāḥiẓ presents a performance by craftsmen he supposedly witnessed. The performance begins with a challenge posed to a group of craftsmen and workers of different professions,

[548] Charles Pellat, 'al-Djāḥiẓ', in *Encyclopaedia of Islam, Second Edition*, ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. II:385a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/al-djahiz-SIM_1935> [accessed 26 April 2017].
[549] Sadan, 'Kings and Craftsmen (Part I)'.
[550] ʿAmr b. Baḥr al-Jāḥiẓ, *Rasā'il al-Jāḥiẓ*, ed. by ʿAbd al-Salām Muḥammad Hārūn, 2 vols (Cairo: Maktabat al-Khānjī, 1964), pp. I, 379-393.
[551] Sadan, 'Kings and Craftsmen (Part I)', pp. I, 11.

including a stableman, physician, teacher, farmer, tailor, baker, cook, and carpenter; the challenge was to describe a battle in which the Muslims gained such a crushing victory over their enemies that 'any weapon thrown into the air leaped to the corpse of the dead', a figure of speech indicating a large number of dead. The treatise's fictional participants were asked to begin with unrhymed prose to describe the battle, then to compose a short poem according to the rules of metre (*baḥr*) and rhyme (*qāfiyah*) of classical Arabic. While the subject of the prose was to be the battle, the poetic verses were to be written in the style of poetry about love and pain upon separation (*ghazal*).[552] All of the compositions are characterized by an alternation between classical love vocabulary and terminology drawn from the professions of the 'participants'. For example, the stableman (*sā'is*) describes the war using language related to horses:

أن يهدم الصد من جسمي معالفه فإن قلبي بقت الوجد معمور

إني امرء في وثاق الحب يكبحه لجام هجر على الاسقام معذور

عال بجل نبيل من وصالك او حس الرقاد فان النوم ماسور

أصاب حبل شكال الوصل يوم بدا ومبضع الصد في كفيه مشهور

لبست برقع هجر بعد ذلك في اسطبل ود فروث الحب منثور[553]

When the mangers of my body are destroyed by distance,
my heart with the forage of love-agony is heaped

I am a man encased in the harness of love; there restrains me,
a bridle of separation, to sickness tied

Console me with a coverlet – so noble – of your loving nearness,
or with a good slumber, for sleep has been forbidden

The binding robe struck at that nearness, in the day that it appeared,
with the scalpel of separation unsheathed in his hands

[552] Sadan, 'Kings and Craftsmen (Part I)', pp. I, 12.
[553] ʿAmr b. Baḥr al-Jāḥiẓ, 'Risālat Dhamm al-Quwwād', *Lughat al-Arab*, 9: 1 (1931), 27-28.

Then I put on the blinkers of separation,

in a stable of love in which dung droppings of love were scattered[554]

The purpose of this epistle, as stated by al-Jāḥiẓ in the preface and epilogue, was to communicate that education should be general and broad, since if a person confines himself to the limited knowledge of his profession, he loses the ability to see outside the narrow world of his trade or craft. This is demonstrated by the epistle's various fictional tradesmen, each of whom renders the descriptive part of the battle and the love-theme of the poetic verses through the own objects and materials of his profession. This message seems to have been specifically directed at the Abbasid Caliph al-Muʿtaṣim (d. 227/842), suggesting that the Caliph's children should broaden their education to different fields of knowledge, because were they to confine themselves to only one domain of knowledge, they would be incapable of answering if asked about another.[555] Yet educational advice seems not to have been the sole purpose of this epistle. Sadan suggests that this *risālah* also acted as a piece of literary entertainment aimed at a wider audience beyond the Abbasid court. He argues that the patterns of contrast embodied in the work, both between the different tradesmen and between the poetic love themes and descriptive prose, are a fertile source of entertaining humour.[556]

In Sadan's view, al-Jāḥiẓ's originality, ability to interweave moral messages and entertainment, and depth of perception made him not only a classic litterateur who 'moulded the character of Arabic *adab* (literature)', but also the founder of a literary genre about crafts and trades. His achievement encouraged later generations to follow his footsteps.[557] Between the third/ninth and sixth/twelfth century, the genre continued to develop, and many similar works were produced by Arabic literati on crafts and trades.[558] However, their structure underwent a change, as members of the court – originally al-Jāḥiẓ's audience – became literary figures in their own right. Later literati

[554] Sadan, 'Kings and Craftsmen (Part I)', pp. 13-17.
[555] al-Jāḥiẓ, 'Risālat al-Quwwād', p. 27.
[556] Sadan, 'Kings and Craftsmen (Part I)', pp. I, 6.
[557] Sadan, 'Kings and Craftsmen (Part I)', pp. I, 20.
[558] Sadan cites eleven works composed during the period between al-Jāḥiẓ and the Mamluk era: two works by ʿAbd Allah b. al-ʿAbbās b. al-Faḍl and ʿAlī b. Hishām, contemporary to al-Jāḥiẓ; an anonymous commentary (*dhayl*) to al-Jāḥiẓ's *Risālat Dhamm al-Quwwād* assumed from the late 4th/10th to the early 5th/11th century; a work by Hilāl al-ʿAskarī (d. 395/1005); two works by Abū Ḥayyān al-Tawḥīdī (d. 414/1023); two works by al-Thaʿālibī (d. 429/1038); one work by al-Ḥuṣarī (d. 453/1061); a work by Ibn ʿAbd al-Barr al-Namarī (d. 463/1071); and a work by al-Rāghib al-Iṣfahānī (d. 502/1108). Sadan, 'Kings and Craftsmen (Part I)', pp. I, 21-29.

began to give the caliph a role in narrative events; in these works, he is a character who invites the participants to come forward and perform.[559] Later, this genre evolved to present the caliph as a visitor to the group of artisans, who had assembled in a park during their free time; the caliph would ask a question that each artisan had to answer while employing his specialist profession's vocabulary.[560] Another change in content was a change in the identity of the participants, as they came to represent new social categories, and not necessarily or solely artisans or tradesmen.

A further turn in the artisanal literature began with al-Thaʿālibī (d. 429/1038),[561] who, rather than presenting artisans as active narrators, made them the subjects of his poems.[562] He worked in the *ghazal* genre of Arabic literature, which describes the beauty of young men and women, originated around two centuries earlier with the work of Abū Nuwwās (d. 199/815);[563] with al-Thaʿālibī and his followers, artisans and tradesmen became subjects of *ghazal*. Sadan highlights this change to differentiate between two kinds of literature on craftsmen. While poems in al-Jāḥiẓ's epistle are put in the mouths of the artisans, who play 'roles' in the work, poems of the other kind are presented as written about artisans, 'describing' them.[564] However, relatively few other authors followed this model, and before the seventh/thirteenth century, most works on artisans appear to have adapted al-Jāḥiẓ's model with little variation.[565]

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[559] Appears in the work by al-Iṣfahānī: Sadan, 'Kings and Craftsmen (Part I)', pp. I, 38.

[560] Appears in a manuscript suggested to might be based on an earlier source belongs to the fourth/tenth century: Sadan, 'Kings and Craftsmen (Part I)', pp. I, 36-37.

[561] Everett K. Rowson, 'al-Thaʿālibī', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. X:426a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/al-thaalibi-SIM_7504> [accessed 1 August 2017].

[562] Sadan, 'Kings and Craftsmen (Part I)', p. 28.: the two works by al-Thaʿālibī on artisans are Khāṣṣ al-khāṣṣ and Aḥsan mā samiʿtu, which is cited above as included in the Ashrafiyyah Library catalogue.

[563] Ewald Wagner, 'Abū Nuwās', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. I:143b, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/abu-nuwas-SIM_0241> [accessed 1 August 2017].

[564] Sadan, 'Kings and Craftsmen (Part I)', pp. 9, 28. Sadan cites eleven works composed during the period between al-Jāḥiẓ and the Mamluk era: two works by ʿAbd Allah b. al-ʿAbbās b. al-Faḍl and ʿAlī b. Hishām, contemporary to al-Jāḥiẓ; an anonymous commentary (*dhayl*) to al-Jāḥiẓ's *Risālat Dhamm al-Quwwād* assumed from the late 4th/10th to the early 5th/11th century; a work by Hilāl al-ʿAskarī (d. 395/1005); two works by Abū Ḥayyān al-Tawḥīdī (d. 414/1023); two works by al-Thaʿālibī (d. 429/1038); one work by al-Ḥuṣarī (d. 453/1061); a work by Ibn ʿAbd al-Barr al-Namarī (d. 463/1071); and a work by al-Rāghib al-Iṣfahānī (d. 502/1108). For further information see: Sadan, 'Kings and Craftsmen (Part I)', pp. 21-29.

[565] In Sadan's 'Kings and Craftsmen', almost all the cited examples prior Mamluk era had a connection with al-Jāḥiẓ's epistle and were formulated on his model except al-Thaʿālibī, who founded a new turn in artisanal literature. This connection appears to be either contemporary works to al-Jāḥiẓ's and imitated his model such like those by ʿAbd Allah b. al-ʿAbbās b. al-Faḍl and ʿAlī b. Hishām, or direct citation as in the anonymous commentary to al-Jāḥiẓ's epistle and al-Iṣfahānī's work, or later imitations to al-Jāḥiẓ's model with little variations such as in al-ʿAskarī, al-Ḥuṣarī, al-Namarī, and one of al-Thaʿālibī's works. Refer to footnote ([564]).

3.4.2 Mamluk literature on artisans: general characteristics

This situation changed considerably during the Mamluk era. During the Mamluk period, artisanal literature was liberated from direct imitations of al-Jāḥiẓ's model and developed in two significant directions, each enriched by Mamluk literati who gave the fields distinct characteristics. One direction was the creation of humorous descriptions of practitioners of different crafts, trades, and jobs in the *ghazal* model pioneered by al-Thaʿālibī. Works in this format were composed by literati like al-Ṣafadī, al-Qīrāṭī, Muḥammad b. Aḥmad al-Ibshīhī (d. 850/1446),[566] al-Nawājī (d. 859/1455),[567] Shihāb al-Dīn Aḥmad al-Ḥijāzī (d. 875/1471) (Figure 3.4),[568] and Muslim al-Shāfiʿī (fl. 10th/16th c.). In another development, literary compositions took the model of role-playing in a performance, as originated by al-Jāḥiẓ, but involved a larger number of characters, a wider range of professions, and variant settings where the supposed occasion took place (*maqam,* literally means the place where people gather and sit). Both routes of development witnessed the intrusion of colloquial dialect at the expense of classical expressions, and thus found their way to a wider audience.

Artisanal literature in the Mamluk era is characterized by an abundance of works, the use of colloquial language, and broad popular appeal. The employment of colloquial dialects became a common feature of artisanal literature during the Mamluk period. The spread of colloquial language was a matter of concern for some Mamluk literati, including Ṣafiyy al-Dīn al-Ḥillī (d. 749/1348) and al-Ṣafadī.[569] In response, they wrote treatises aiming to correct common linguistic and grammatical mistakes, such as *Aghlāṭī* (*My Mistakes*) by the former and *Taṣḥīḥ al-Taṣḥīf wa Taḥrīr al-Taḥrīf* (*Correcting Alteration and Liberating the Corruption*) by the latter.[570] These grammatical and linguistic mistakes, which included syntax errors, misspellings, or failure to use proper collocations and connotations, were known as *laḥn*.[571]

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[566] J.-C. Vadet, 'al-Ibshīhī', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. III:1005a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/al-ibshihi-SIM_3467> [accessed 5 May 2017].

[567] Kratschkowsky, 'al-Nawādjī'.

[568] al-Sakhāwī, *al-Ḍawʾ al-Lāmiʿ*, pp. II, 147-148.

[569] W.P. Heinrichs, 'Ṣafī al-Dīn ʿAbd al-ʿAzīz b. Sarāyā al-Ḥillī', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. VIII:801b, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/safi-al-din-abd-al-aziz-b-saraya-al-hilli-COM_0966> [accessed 11 May 2017].

[570] Charles Pellat, 'Laḥn al-ʿĀmma', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. V:605b, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/lahn-al-amma-SIM_4613> [accessed 24 May 2017].

[571] Wahba and al-Muhandis, *Muʿjam al-Muṣṭalaḥāt al-ʿArabiyyah*, p. 316.

Colloquialisms and errors are visible in the work of poets such as Ibrāhīm al-Miʿmār; for example, in one poetic verse, he wrote حفظتُ اليانسون كما يقولوا ('I reserved anise according to what they have said'). The verb *yaqūlū* here is conjugated incorrectly, as it omits the letter *nūn* from the masculine plural present-tense form of the verb *yaqūl*, which supposed to be written *yaqūlūn* (يقولون).[572] In another verse, al-Miʿmār writes *mītīn* (ميتين, two hundred) instead of the correct *mi'atayn* (مئتين) or *mā'atayn* (مائتين).[573] Colloquial terminology may also be found in other forms of literature, such as al-Bulbaysī's (fl. 746/1345) *maqāmah*,[574] where terms like *ʾuqqāl* were used instead of *ʾuqalā'* (plural adjective of *ʾāqil*, meaning wise), and *ʾalashān*, which is a colloquial dialect of *li-ajl*, which means 'for'.[575] These mistakes were not limited to these literary works, rather reflected *laḥn* of the common speech among the public and elites alike.

It has been argued in modern scholarship that as the early period of the Mamluk Sultanate saw the rise of Turkish-speaking elites, there was an accompanying shift in patronage which affected the type of literature produced.[576] The political and social changes associated with the rise of Mamluk Sultanate led to the increasing patronage of works written in a hybrid Arabic that mixed classic and colloquial forms. According to Margaret Larkin, the Mamluk elite generally ceased to provide patronage for classical poetry, which had formerly reached a golden age under the Abbasid court. Further, Larkin explains that even the patronage provided by the sons of emirs (*awlād al-nās*)[577] during the Mamluk period was not as vigorous and consistent as in earlier periods.[578] As the sponsors and consumers of poetry changed at the court level, so did the role of poetry in society. Ahmad al-Jammāl argues that the Qalāwūnid sultans, for example, favoured the *zajjālūn*, or poets who composed colloquial poems (*zajal*),[579] to

[572] Aḥmad Ṣādiq Jammāl, *al-Adab al-ʿĀmmī fī Miṣr fī al-ʿAṣr al-Mamlūkī* (Cairo: al-Dār al-Qawmiyyah lil-Ṭibāʿah wa al-Nashr, 1966), p. 186.
[573] Jammāl, *al-Adab al-ʿĀmmī*, p. 189.
[574] Al-Bulbaysī's *maqāmah* will be of especial attention below.
[575] London, The British Library (BL), Oriental Manuscipts MS ADD 19411/III, fols 47v-73r (fols 61v, 68v).
[576] Ibrāhīm al-Dasūqī Jād al-Rabb, *Ibn Makānis wa al-Shiʿr fī ʿAṣr al-Mamālīk* (Cairo: Markaz al-Nashr li-Jāmiʿat al- Qāhirah, 1990), p. 32.
[577] Meloy John Lash, 'Awlād al-Nās', in *Encyclopaedia of Islam, THREE,* ed. by Kate Fleet, et al. (Leiden: Brill, 2007), <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-3/awlad-al-nas-SIM_0234> [accessed 11 May 2017].
[578] Margaret Larkin, 'The Dust of the Master: A Mamluk Era "Zajal" by Khalaf al-Ghubari', *Quaderni di Studi Arabi,* 2 (2007), 11.
[579] G. Schoeler and W. Stoetzer, 'Zadjal', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), pp. XI, 373a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/zadjal-COM_1373> [accessed 1 May 2017].

such an extent that the *zajal* almost supplanted classical Arabic poetry (*fuṣḥá*) in popularity. Larkin believes this is an exaggeration, but agrees that the rigid boundary between eloquent and colloquial poetry became more permeable during the Mamluk era.[580]

There are several examples of poets who composed works in mixed colloquial and classical Arabic and enjoyed the patronage of the Mamluk sultans. One such poet, and one whose work on artisans will be discussed at greater length in the following section is Ibrāhīm al-Miʿmār (d. 749/1348), whose poems – according to Sallām – were favoured by Sultan al-Nāṣir Muḥammad b. Qalāwūn (3rd rule 709-741/1310-1341). Sallām shows that al-Miʿmār was close to Sultan al-Nāṣir, who enjoyed al-Miʿmār's humour and popular style.[581] However, al-Miʿmār supposedly did not deliberately seek out the proximity and support of sultans and emirs.[582] Another colloquial poet favoured by several Mamluk sultans was Khalaf al-Ghubārī (fl. 740s-800s/1340s-1390s), an eminent representative of Mamluk popular poets. Al-Ghubārī was well-educated in religious studies, especially *ḥadīth* and *fiqh*, and was known for his eloquent poetry.[583] He composed an entire *dīwān* of colloquial poems praised by sultans, emirs, and the public alike, and his works circulated widely.[584] Excerpts of his *dīwān* which concern events from the reign of Sultan al-Ashraf Shaʿbān (r. 764-778/1363-1377) and al-Ẓāhir Barqūq (r. 784-791/1382-1389) were cited and credited by the Mamluk chronicler Ibn Iyās (d. 930/1524). He appears to have played the role of the Sultanate's official poet, as he recorded major events; however, he made them into popular literature, not into eloquent poetry as was common previously.[585] It appears that by the Mamluk period, colloquial literature was favoured over classical forms by Mamluk elites as well as the general public.[586]

Another feature that characterized Mamluk artisanal literature was the extensive use of puns (*tawriyah*), particularly in plays on words from professional jargon. In Arabic literature, *tawriyah* is specifically defined as a rhetorical device where a word has two meanings: its first meaning, the near meaning (*maʿná qarīb*), is employed to

[580] Jammāl, *al-Adab al-ʿĀmmī*, p. 175; Larkin, 'The Dust of the Master', p. 12.
[581] Sallām, *al-Adab fī al-ʿAṣr al-Mamlūkī*, pp. I, 336. Abdulla Al-Muhanna is sceptical about Sultan al-Nāṣir Muḥammad b. Qalāwūn's patronage to al-Miʿmār as none of available Mamluk sources refer to this patronage. See: Al-Muhanna, 'Ibrāhīm al-Miʿmār', pp. 21-22.
[582] al-Ṣafadī, *al-Wāfī*, pp. VI, 111; Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah*, pp. I, 49.
[583] Larkin, 'The Dust of the Master', p. 13.
[584] Jammāl, *al-Adab al-ʿĀmmī*, p. 175.
[585] Ibn Iyās, *Badāʾiʿ al-Zuhūr*, pp. Ib, 184-187, 261; Larkin, 'The Dust of the Master', pp. 13-14.
[586] Larkin, 'The Dust of the Master', p. 13.

hide the second, which is a further meaning (*maʿná baʿīd*).[587] The use of *tawriyah* reached its peak during the Mamluk period, especially with Egyptian literati such as Sirāj al-Dīn al-Warrāq, Abū al-Ḥusayn al-Jazzār, Nāṣir al-Dīn Al-Ḥammāmī, and Ibrāhīm al-Miʿmār, who frequently employed *tawriyah* in their popular literature as discussed earlier in this chapter.[588] For example, al-Jazzār satirized *nāẓir al-zakāh* (*zakāh* collector) as follows:

I said leave it…that is all I have
he rightly replied me

I cannot leave it because I am
zakāt's collector and the quota is secured

قلت فاترك... فما لي سواه قال لي والمقال منه صواب
ليس لي أن أفوت عنه لأني ناظر في الزكاة و هو نصاب[589]

In the last hemistich, al-Jazzār is using a pun on (نصاب). The near meaning of this term is the minimum amount liable for *zakāh* (نِصاب, *niṣāb*), while its further meaning is swindler (نَصّاب, *naṣṣāb*).[590] If (نصاب) is interpreted with its near meaning, the last line means 'the quota is secured'. With its far meaning, however, the line may be read as 'the swindler is secured'. In this manner, *tawriyah* was employed in a wider range of contexts, as will be discussed below.

3.4.3 Poetic *dūbīts*

As discussed above, literary representations of artisans during the Mamluk period fell into two major categories: poetic couplets in the mode of al-Thaʿālibī and literary assemblies in the tradition begun by al-Jāḥiẓ. The first style, couplets, falls into the genre of descriptive poetry. This genre included verses describing people of different names, ethnicities, jobs, or even deformities (*ʾāhāt*, s. *ʾāhah*) using the tools and tropes of conventional literary types such as love poetry (*ghazal*), riddles (*lughz*,

[587] S.A. Bonebakker, 'Tawriya', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. X:395a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/tawriya-SIM_7460> [accessed 22 May 2017].
[588] Ibn Ḥijjah al-Ḥamawī, *Khizānat al-Adab*, pp. II, 43.
[589] Jammāl, *al-Adab al-ʿĀmmī*, p. 83.
[590] Jammāl, *al-Adab al-ʿĀmmī*, p. 83.

pl. *alghāz*), and drinking verses (*munādamah*).[591] Most descriptive poetry took the form of short poems (epigrams) of two verses (*abyāt*, s. *bayt*), though they could include three or four. The two-verse epigram became very popular in the Mamluk period and was usually called a couplet (*dūbīt*, or *dūbayt*).[592] The literary style of these couplets shows a distinct tendency towards the use of colloquial dialects.

The historian and intellectual al-Ṣafadī was a leading writer of his age.[593] Besides his well-known biographical dictionary, *al-Wāfī bi al-Wafayāt*, he produced many literary works and epigrams.[594] His epigrams were assembled into two collections, one of which is *al-Ḥusn al-Ṣarīḥ fī Mi'at Malīḥ* (*The Pure Beauty of One-hundred Handsome Boys*).[595] Al-Ṣafadī introduces this collection by explaining that he read existing works about young men by al-Thaʿālibī and others, but did not find any that suited his taste, and so decided to compose his own collection describing one hundred handsome men. He states that earlier compositions described only a limited number of men and that collections that attempted to increase the number decreased in eloquence; taking on the challenge of describing one hundred men was, therefore, a way for the author to showcase his 'humble talent' (Figure 3.5).[596]

Al-Ṣafadī groups the handsome men he describes into classes: those with official positions, such as emirs and judges,[597] scholars like jurists (*faqīh*) and

[591] Muḥammad ʿAbd al-Majīd Lāshīn, *al-Ṣafadī wa Āthāruhu fī al-Adab wa al-Naqd* (Cairo: Dār al-Āfāq al-ʿArabiyyah, 2005), p. 254. This trend of descriptive poems evolved during the Mamluk period to include plants, animals, names (*asmā'*), adjectives (*ṣifāt*), tools, activities, abstract concepts (such as honesty, truthfulness), even natural phenomena.

[592] Wahba and al-Muhandis, *Muʿjam al-Muṣṭalaḥāt al-ʿArabiyyah*, p. 170. The term *dūbīt* consists of two parts: *dū*, two; and *bayt*, a verse of two hemistiches (*shuṭūr*, s. *shaṭr*).

[593] Everett K. Rowson, 'Two Homoerotic Narratives from Mamluk Literature : al-Safadi's Law'at al-Shaki and Ibn Daniyal's al-Mutayyam', in *Homoeroticism in classical Arabic literature*, ed. by J. W. Wright and Everett K. Rowson (New York: Columbia University Press, 1997), pp. 158-191 (p. 161).

[594] For further information on muwashshaḥ see: G. Schoeler, 'Muwashshaḥ', in *Encyclopaedia of Islam, Second Edition*, ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. VII:809a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/muwashshah-COM_0826> [accessed 1 September 2017].

[595] The other epigrams collection is al-Rawḍ al-bāsim: Franz Rosenthal, 'al-Ṣafadī', in *Encyclopaedia of Islam, Second Edition*, ed. by P. Bearman, et al. (Leiden: Brill, 2012), pp. VIII, 759a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/al-safadi-SIM_6437> [accessed 28 April 2017].

[596] London, The British Library (BL), Oriental Manuscripts MS Or 3776/1, fols 1r-24r (fol. 2r). In his *al-Ḥusn al-ṣarīḥ*, al-Ṣafadī lists few names of poets who composed collections on the same topic and style before his lifetime. They are: Muḥammad b. al-ʿArabī (d. 656/1258), Muḥyī al-Dīn b. Qarnāṣ (d. 674/1275), Sayf al-Dīn b. Qazal al-Mushidd (d. 656/1258), Bahā' al-Dīn Abū al-Maḥāsin al-Shawwā' (d. 635/1237), Badr al-Din Yūsuf al-Dhahābī (d. 680/1281)Mujīr al-Dīn Muḥammad b. Tamīm (d. 684/1285), and Muḥammad b. al-ʿAfīf al-Tilmisānī known as al-Shābb al-Ẓarīf (d. 688/1289).

[597] BL, MS Or 3776/1, fols 3r-3v.

grammarians (*naḥawī*),[598] persons with physical deformities such as humpbacks (*aḥdab*) and one-eyed men (*aʿwar*),[599] persons of particular beauty like graceful men (*rashīq*) and the beauty mark (*khāl*),[600] ethnic groups such as Bedouins (*badawī*) and Kurds,[601] and craftsmen, such as carpenters (*najjār*) and shoemakers (*iskāfī*).[602] For most of the described men, al-Ṣafadī composes two verses; sometimes he writes three,[603] and rarely one.[604] All share the theme of love. An example is his couplet on a carpenter:

I loved a carpenter of whose adorable beauty
suns and moons are jealous

I am proud when people say
he left with his beloved carpenter

أَحْبَبْتُ نَجّارا بَديعَ جمالِهِ مِنْهُ الشُموسُ تَغارُ والأقْمارُ

فَخْري بِه بين البَرِيّةِ أَنَّهُمْ قالوا غَدا و حَبيبَهُ النَّجّارُ[605]

Although an artisan does appear in this couplet, al-Ṣafadī's focus is on the beauty of the carpenter; he does not here employ the profession's jargon or terminology.

While al-Ṣafadī composed love *dūbīts*, al-Ibshīhī gathered collections of particularly notable rhetorical statements on various topics in literature and history, for edification and entertainment. Al-Ibshīhī's *al-Mustaṭraf fī Kull Fann Mustaẓraf* (*A Quest for Attainment in Each Fine Art*) is a comprehensive collection of pious anecdotes and entertaining stories; it includes different poetic styles, including both classical and colloquial ones.[606] Preece and Collison have noted the encyclopaedic quality of this work, as it covers a wide range of topics, including religion, conduct, law, spiritual qualities, labour, natural history, music, food, and medicine.[607] Margaret

[598] BL, MS Or 3776/1, fol. 5r.
[599] BL, MS Or 3776/1, fols 9r-9v.
[600] BL, MS Or 3776/1, fols 12r-13r.
[601] BL, MS Or 3776/1, fol. 15r.
[602] BL, MS Or 3776/1, fols 21r-21v.
[603] BL, MS Or 3776/1, fols 12v, 20r.
[604] BL, MS Or 3776/1, fols 22r-22v.
[605] BL, MS Or 3776/1, fol. 21r.
[606] Muḥammad b. Aḥmad al-Ibshīhī, *al-Mustaṭraf fī Kull Fann Mustaẓraf*, 2 vols (Beirut: Dār wa Maktabat al-Ḥayah, 1992), pp. I, 7-8.
[607] Warren E. Preece and Robert L. Collison, 'Encyclopaedia: The Arab world', in *Encyclopædia Britannica,* (Encyclopædia Britannica, inc.), <https://www.britannica.com/topic/encyclopaedia/History-of-encyclopaedias> [accessed 5 May 2017].

Larkin believes that this collection was meant as a reference work for the literate public.[608]

In this work, al-Ibshīhī includes two sections on crafts and trades: one is moral and ethical, while the other is a compilation of verses composed by literati describing artisans and traders. The first section begins with highlighting the value of labour (*ʿamal*), whose effect lasts even after the death of its maker, and the virtue of earning money (*kasb*) from one's own effort.[609] For both *ʿamal* and *kasb,* al-Ibshīhī cites traditions and poetic verses that go back to the age of the Prophet Muḥammad and his companions. Then he goes on to explain that craftsmen and traders should do their work in an honest and trustworthy manner, warning them of the consequences of doing the opposite and giving examples from prophetic traditions of cheating goldsmiths and tailors.[610] Al-Ibshīhī's purpose here is to emphasise the value of doing manual crafts in a trustworthy manner.

The other section is similar in content and style to al-Ṣafadī's *dūbīt*s, and follows the same order; like the seating arrangements of reading groups, it places officials and scholars first and plays on themes of love and admiration. Rather than composing new verses, however, al-Ibshīhī collects the works of earlier poets such as Ibn ʿArabī (d. 638/1240), al-ʿAfīf al-Tilmisānī (d. 688/1289), Ibn Dāniyāl, and al-Qīrāṭī.[611] The number of the professions he describes is also limited and comes to about half the number found in al-Ṣafadī's compilation. Even though al-Ibshīhī does not include practitioners of the building craft specifically, he includes other professions, such as tailors.

The most interesting and richest example of the descriptive mode of representation is also the latest chronologically: it is the *dīwān* by Shams al-Dīn al-Nawājī, *Marāti' al-Ghizlān fī Waṣf al-Ghilmān al-Ḥisān* (*Pastures of Gazelles: On Beautiful Young Men*). Al-Nawājī was a scholar who held official positions in several Cairene *madāris* to teach *ḥadīth* and wrote several treatises of rhetorical and poetic literature that would appeal to both elite and popular taste, the most famous of which

608 Larkin, 'The Dust of the Master', p. 16.
609 al-Ibshīhī, *al-Mustaṭraf,* pp. II, 48-49.
610 al-Ibshīhī, *al-Mustaṭraf,* pp. II, 51-52.
611 al-Ṣafadī, *al-Wāfī,* pp. III, 109-114; al-Ibshīhī, *al-Mustaṭraf,* pp. II, 259-265; A. Ateş, 'Ibn al-ʿArabī', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. III:707b, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/ibn-al-arabi-COM_0316> [accessed 11 May 2017].

was *Ḥalbat al-kumayt*, a collection of poems describing wine and drinking.[612] One of his treatises is of interest here, namely *Marāti' al-Ghizlān*, which is a comprehensive collection of *dūbīt*s composed by al-Nawājī and his peers on the beauty and love of young men. This treatise is very important to the field of artisanal literature, as it shows the popular appeal of this kind of literature. As it is only available in manuscript, however, it has been largely overlooked by modern scholarship.[613]

In this section of artisanal *dūbīt*s, al-Nawājī cites about eighty-six poets and literati, most of whom were active during the Mamluk period.[614] *Marāti' al-Ghizlān* is divided into five sections (*abwāb*, s. *bāb*), all of which contain love poetry (*ghazal).* The first section includes a description of men's names and nicknames, for example, Ibrāhīm, Khalīl, Qāsim, and the like.[615] The second section includes *dūbīt*s describing the beauty of ethnic groups, officials, and officers such as the caliph, sultan, *dawādār*, and the Persians.[616] The third section is on artisans and craftsmen such as butchers, grinders, cooks, and building craftsmen (Figure 3.6).[617] The fourth and fifth sections, respectively, relate to men who do certain activities, such as the drinker and chess player, and who have certain characteristics, such as a beauty spot or long hair.[618] Al-Nawājī's *Marāti' al-Ghizlān* is similar in structure to al-Ṣafadī's *al-Ḥusn al-ṣarīḥ*, and he even includes some of al-Ṣafadī's *dūbīt*s in his collection.[619] However, in contrast to the rhetorical style of *al-Ḥusn al-Ṣarīḥ*, it uses a more colloquial dialect alongside some classical language.[620]

Of particular relevance is the fact that *Marāti' al-Ghizlān* compiles *dūbīt*s on a larger number of practitioners of building crafts, from *muhandis* down to porter (*'attāl*), than any other anthology on the topic (Figure 3.7). Many other anthologies, in fact, cite al-Miʿmār's *dūbīt*s on building practitioners, but they included no more than a couple

[612] al-Sakhāwī, *al-Ḍawʾ al-Lāmiʿ*, pp. VII, 229-232.
[613] Richardson believes that al-Nawājī's anthology was a model to his contemporary Shihāb al-Dīn al-Ḥijāzī (d. 875/1471), who collected and composed anthologies on women and men named *al-Kunnas al-Jawārī fī al-Ḥisān min al-Jawārī* (*Retrograde Running Stars: On Beautiful Young Women*) and *Jannat al-Wildān fī al-Ḥisān min al-Ghilmān* (*The Paradise of Youths: On Beautiful Young Men*), respectively. Both anthologies on women and men are part of al-Ḥijāzī's larger collection: Rawḍ al-ādāb wa mir'āt wujūh al-aḥbāb. See: Kristina L. Richardson, 'Literary Networks in Mamluk Cairo', in *Difference and Disability in the Medieval Islamic World: Blighted Bodies*, (Edinburgh: Edinburgh University Press, 2012), pp. 36-71 (p. 53).
[614] PUDL, Garrett no. 14L, fols 32v-74r.
[615] PUDL, Garrett no. 14L, fols 2v-14r.
[616] PUDL, Garrett no. 14L, fols 14r-32v.
[617] PUDL, Garrett no. 14L, fols 32v-74r.
[618] PUDL, Garrett no. 14L., the fourth section fols 74r-97r, and the fifth section fols 97v-187v.
[619] For example, PUDL, Garrett no. 14L, fols 35r, 42r, and 48r.
[620] PUDL, Garrett no. 14L, fol. 51v.: *fī malīḥ bayyā' khiyār* (on a handsome sells cucumber).

of such. *Marāti' al-Ghizlān* includes the figures of the professional builder (*muhandis*), builder (*bannā'*), plumber (*sabbāk*), mason (*ḥajjār*), carpenter (*najjār*), wood-cutter (*khashshāb*), sawyer (*nashshār*), tile-maker (*muballiṭ*), painter (*dahhān*), adobe-maker (*ṭawwāb*), plasterer (*mubayyiṭ*), wheel-driver (*'ajjāl*),[621] labourer (*fā'il*), and porter (*'attāl*).[622] Although the last three workers would not have been involved exclusively in the building craft, the fact that their *dūbīt*s are grouped with those of other building workers suggests that they formed part of construction teams.

The descriptions of particular crafts in *Marāti' al-Ghizlān* mention only a few tools and materials; by and large, the theme of these couplets is love and yearning, so they are limited in their portrayal of craft knowledge. However, the scope of the professions they represent is particularly notable. For example, the poems include not only the figure of the carpenter, but three specific subtypes of the carpentry craft: the *khashshāb* (lumberjack), *najjār* (carpenter), and *nashshār* (sawyer).[623] The poems contain references to various trade-related terms, including tree branches (*ghuṣn*), *naqiyy* wood, and, most interestingly, cutting trees. Al-Nawājī includes Ṣalāḥ al-Dīn b. al-Zayn Labbaykum's (fl. 750s/1350s)[624] couplet on the lumberjack (*khashshāb*), referring to the uprooting of trees:

لله خشّاب كبدر الدجى قد شيب الأبيض من مفرقي[625]

My God! A *khashshāb* like a full moon
whitened my hair from its roots

Al-Nawājī also cites couplets by the renowned polymath Ibn al-Wardī (d. 749/1349)[626] on the carpenter. Here we find terms like tree branch, *'ūd* (wooden stick), and cutting wood (*qaṭ' al-aghṣān*). The sawyer who appears in the poetic couplets shares with the carpenter the activity of sawing branches.[627] Here, we see an acknowledgment that these trades were related, but at the same time, literate knowledge

[621] *'Ajjāl*: the person who drives wheels (*'ajal*) to move objects, especially heavy and bulky ones. It was not exclusive to the building craft, but was utilized in the craft to move blocks and building material from a place to another. al-Maqrīzī, *al-Khiṭaṭ* pp. IV, 268.
[622] PUDL, Garrett no. 14L, fols 42v, 52v-54r.
[623] PUDL, Garrett no. 14L, fol. 54r.
[624] al-Maqrīzī, *al-Sulūk*, pp. IV, 228.
[625] PUDL, Garrett no. 14L, fol. 54r.
[626] al-Ṣafadī, *al-Wāfī*, pp. XXIII, 46.
[627] PUDL, Garrett no. 14L, fol. 54v.

of the specific differences between these sub-fields of the building profession. Al-Nawājī also includes a couplet by Ibrāhīm al-Miʿmār specifically on builders:

لله بنّاء كبدر الدجى كأنه غُصن النَّقى حين ماس

قد هد ركن بالجفا وصيّر القلب ضعيف الأساس[628]

By Allah, a builder like a full moon in darkness
he looks like a smooth branch when touched

[He] demolished a corner/stacking with [his] harshness
and weakened the heart's foundation

When al-Miʿmār describes the beauty and charm of a builder, he intersperses the verse with references to his profession: demolition (*hadd*), corner (*rukn*), and foundation (*asās*). Some of this knowledge may have derived from first-hand experience; as discussed above, al-Miʿmār may well have been a professional builder himself. Al-Nawājī's inclusion of the couplet represents the transmission of this literature by and about artisans to a wider audience.

Interestingly, al-Nawājī also cites Ibrāhīm al-Miʿmār's *dūbīt* on the *muhandis*, which contrasts with the depiction he gave of the builder in interesting ways. In general, representations of the *muhandis* in literary works, whether in couplets or *maqāmah*s, which will be discussed further below, were not as frequent as those of carpenters or builders. Here, al-Miʿmār emphasises the education of the *muhandis*:

بروحي أفدي والفوائد مهندسا بديع البها لا صبر لي بوادعه

إذا رمت قربا زادني منه جفوة و إن رمت وصلا صدني بذراعه[629]

I sacrifice my soul and heart to a *muhandis*
his beauty is gorgeous, I cannot stand his farewell

If I sought closeness, he farther avoids me
and, if I sought linking (*waṣl*), his arm (*dhirāʿ*) averted me

[628] PUDL, Garrett no. 14L, fol. 52v.
[629] PUDL, Garrett no. 14L, fol. 52v.

This couplet includes some building terms not found in the above poems, and ones particularly closely linked to the science of *handasah*. These include *waṣl* and *dhirā'*; *waṣl*, used here to present an image of emotional attachment or unity, is a reference to the professional activity of linking structures to connect fixtures or pipes,[630] while *dhirā'*, in a building context, meant a measuring unit or lever arm.[631] Interestingly, *dhirā'* could also mean the pivot of a scale; justice, often signified by the scale and balance are metaphor for justice, would also appear in al-Bulbaysī's *maqāmah* section on the *muhandis*.

More references to *handasah* principles appear in another set of love couplets cited by al-Nawājī. These verses, written by the scholar and litterateur al-Nafīs al-Qurṭusī (d. 603/1206), are on a teacher of astronomy and *handasah (mu'allim 'ilm al-hay'ah wa al-handasah*):[632]

و ذي هيئة يَزهى بوجهٍ مهندسٍ أموت به في كل يومٍ و أبعث

محيط بأشكال الملاحة وجهه كأن به اقليدٍ لي يتحدث

فعارضه خط استواء و خاله به نقطة و الصدغُ شكلٌ مثلث[633]

A person whose countenance/astronomy is well-structured (*muhandas*)
makes me die every day and live

His face is surrounded (*muḥīṭ*) by shapes (*ashkāl*) of handsomeness
as if he was Euclid speaking to me

His gait traces an equator (*khaṭṭ istiwā'*), his beauty spot
has a point (*nuqṭah*), and his temple is a triangle

This poetic representation of the teacher explicitly employs subjects and elements of both the astronomical and *handasah* sciences, such as circumference (*muḥīṭ*), forms, equator, and point. The reference to Euclid also makes the connection to geometry very

[630] Hans Wehr and J. Milton Cowan, 'A Dictionary of Modern Written Arabic (DMWA)', (Wiesbaden: Harrassowitz, 1979), (p. 1258), <http://ejtaal.net/aa/#hw4> [accessed 24 May 2017].
[631] Wehr and Cowan, 'DMWA', p. 356.
[632] Ibn Khallikān, *Wafayāt al-Aʿyān*, pp. I, 164-167; al-Ṣafadī, *al-Wāfī*, pp. VII, 47-48.
[633] PUDL, Garrett no. 14L, fol. 24r. The couplet is also cited by; Ibn Khallikān, *Wafayāt al-Aʿyān*, pp. I, 167; al-Ṣafadī, *al-Wāfī*, pp. VII, 48.

clear. Besides providing a creative description of beauty, these verses emphasise how closely astronomy and *handasah* were intertwined, particularly in their shared use of geometry. This is a literary expression of the real connection between the disciplines presented in Chapter One, which listed the biographies of many scholars, some of whom were involved in the building profession, who studied both sciences. Additionally, comparing the two sets of couplets, we see here again the two dimensions of the field of *handasah*: theoretical and practical. Ibrahim al-Miʿmār's couplet describes measurements in a practical context, namely construction, as well as *waṣl*. The second, by al-Qurṭusī, is about the science of *handasah* as a theoretical and geometrical pursuit. Both dimensions were present in Mamluk biographical dictionaries, which include several biographies of scientist *muhandisīn* and a few of practicing *muhandisīn*.

This collection of poetic verses represents a more diverse range of building craftsmen than can be found in any other primary source. Neither chronicles nor *ḥisbah* manuals, or even ethical treatises, refer to such a range of building practitioners. For example, *Maʿālim al-Qurbah* by Ibn al-Ukhuwwah includes builders, carpenters, sawyers, painters, plasterers, and labourers, but does not refer to plumbers, masons, or tile-makers.[634] Similarly, when chroniclers narrate building projects and events, they only refer to a few building practitioners, such as *muhandisīn*, masons, and builders. For example, when al-Maqrīzī's chronicle narrates the opening ceremonies of Sultan al-Ẓāhir Barqūq's *madrasah* in 788/1386, it states that the sultan rewarded the building supervisors, *muhandisīn*, and builders, and does not refer to other members of the building team.[635] Al-Nawājī's high level of specificity about building practitioners in his literary representation may reflect developing professionalization of the craft and its members in the ninth/fifteenth century, as it certainly indicates an interface between the educated literary tradition and the building craft.

3.4.4 *Maqāmah*s

The second mode of literary representation of artisans was the genre called '*maqāmah*' (pl. *maqāmāt*), which means assembly (*maqām*) or session. This type of literature takes the form of a fictional assembly of people of different crafts, trades, and

[634] Ibn al-Ukhuwwah, *Maʿālim al-Qurbah*, pp. 234-237.
[635] al-Maqrīzī, *al-Sulūk*, pp. V, 187.

services, each of whom speaks with a unique literary voice. Mamluk *maqāmah* diverged from the classical form; in the classical style, exemplified by Badīʿ al-Zamān al-Hamadhānī (d. 398/1008)[636] and his successor in the field Abū Muḥammad al-Qāsim al-Ḥarīrī (d. 516/1122),[637] the *maqāmah* took the form of a series of written short narrations, each made up of rhymed prose (*sajʿ*) alternated with verses. Such works were typically characterized by two main features: a narrative focusing on the adventures of a single hero and an eloquent writing style.[638] The Mamluk *maqāmah* on artisans, on the other hand, took the form of an assembly; they are set in one specific occasion and involve a group of artisans and traders enjoying entertainment and drinking wine.

Mamluk *maqāmahs* on artisans show a few formal changes that make them distinct from al-Jāḥiẓ's *Risālah*, whose 'assembly' style might otherwise be said to resemble. One of these changes is the declared purpose of the works. As previously discussed, al-Jāḥiẓ directed his work at young people, most likely the caliph's children, and created it to underline the importance of acquiring broad knowledge. However, his work also has an entertaining element; within the story, al-Jāḥiẓ has the Caliph responding to the assembled artisans with laughter. Mamluk *maqāmahs* focuses more squarely on this goal of entertainment, as they were written to be performed at social gatherings. Mamluk *maqāmahs* also have a different structure; unlike al-Jāḥiẓ's work, which presents the craftsmen's verses as a compilation of speeches delivered at different times, the Mamluk works present all craftsmen as delivering their speeches during a single assembly. Also, while the overall theme of al-Jāḥiẓ's work is a battle, Mamluk *maqāmahs* are more about self-expression; as Bauer notes, they use rhetorical devices to describe not major events, but daily life experiences.[639] This shift towards simpler subject matter is also reflected rhetorically. In al-Jāḥiẓ's *Risālah*, both prose and verse are delivered in Classical Arabic, while Mamluk *maqāmahs* uses colloquial dialects extensively, with classical style appearing in only a few expressions. These

[636] Régis Blachère, 'al-Hamadhānī', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. III:106a, <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/al-hamadhani-SIM_2654> [accessed 1 August 2017].
[637] Jaakko Hämeen-Anttila, 'al-Ḥarīrī', in *Encyclopaedia of Islam, THREE,* ed. by Kate Fleet, et al. (Leiden: Brill, 2016), <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-3/al-hariri-COM_30326> [accessed 1 August 2017]; Carl Brockelmann and Charles Pellat, 'Maḳāma', in *Encyclopaedia of Islam, Second Edition,* ed. by P. Bearman, et al. (Leiden: Brill, 2012), p. VI:107a.
[638] Brockelmann and Pellat, 'Maḳāma'; Julie Scott Meisami and Paul Starkey, *Encyclopedia of Arabic literature (EAL)*, 2 vols (London ; New York: Routledge, 1998), pp. II, 507.
[639] Bauer, 'Mamluk Literature', p. 111.

changes may reflect shifts in social context. For example, chronicle evidence suggests that Mamluk craftsmen and tradesmen gathered for many social and intellectual occasions, such as reading circles, so the idea of a craftsmen's assembly would have been familiar. The mixture of vernacular and eloquent language may also indicate mixed social and professional standing within the work's expected audience, as the different styles would appeal to the tastes of an audience made up of various social classes.

This typical combination of structure and content appears in Mamluk literary works composed by Muḥammad b. Mawlāhum (fl. late 7th/13th c.),[640] Jamāl al-Dīn Muḥammad b. Isḥāq al-Yaghmūrī (d. 679/1280),[641] Sharaf b. Asad al-Miṣrī (d. 738/1337),[642] Muḥammad b. Muḥammad al-Bulbaysī, and Ibn Makānis. Even though the works of al-Bulbaysī and Ibn Makānis are the only Mamluk 'artisanal assembly' works to have been edited, many more examples of the genre exist unpublished. For example, *Munādamāt al-Ṣunnā'* (*Artisans' Drinking Companionship*) and *al-Maqāmah al-Mukhtaṣarah fī al-Khamsīn Marah* (*The Concise Maqāmah on Fifty Women*),[643] a particularly interesting work about fifty craftswomen, both by Ibn Mawlāhum,[644] still exist in manuscript (Figure 3.8), as does the anonymous *al-Mufākharah fī Ādāb al-Mu'āsharah* (*Proudness in the Etiquette of Companionship*).[645] Other similar works are also mentioned in Mamluk primary sources, though they have not apparently survived, including *al-Iṭṭilā' 'alá Munādamat al-Ṣunnā'* (*Having Access to Artisans' Drinking Companionship*) by al-Yaghmūrī[646] and a *maqāmah* on 1200 crafts – including 200 feminine crafts – by Sharaf b. Asad al-Miṣrī (d.738/1337).[647]

It is worth highlighting that Mamluk authors seem to have seen Ibn Mawlāhum's work on crafts as a model. Ibn Mawlāhum's *maqāmah* seems to have been the first of its kind in Mamluk history, and many subsequent works of the genre

[640] Meisami and Starkey, *EAL*, pp. I, 349-350.
[641] al-Ṣafadī, *al-Wāfī*, pp. II, 241.
[642] al-Ṣafadī, *A'yān al-'Aṣr*, pp. II, 512-518.
[643] There is a version in the British Library Oriental collection as a part of a humorous anthology including Ibn Mawlāhum's *maqāmah* and al-Bulbaysī's *al-Mulaḥ*: MS Or ADD 19411, fols 73r-88r; see: Sadan, 'Kings and Craftsmen (Part II)', p. 115. While Ibn Mawlāhum's *Maqāmah* has survived in a collection, his other work (*Munādamāt al-Ṣunnā'*) may have not survived.
[644] See: British Museum: Department of Oriental Printed Books and Manuscripts, *Catalogus Codicum Manuscriptorum Orientalium qui in Museo Britannico Asservantur*, 5 vols (London, 1838-1871), pp. II, 514-515.
[645] The British Library MS Or ADD 19411, fols 20r-47r; see: Sadan, 'Kings and Craftsmen (Part II)', p. 117.
[646] al-Ṣafadī, *al-Wāfī*, pp. II, 241.
[647] al-Ṣafadī, *A'yān al-'Aṣr*, pp. II, 512-518.

followed its style in aiming to include fifty artisans as a sign of literary achievement. For example, al-Bulbaysī refers to fifty crafts in the introduction to *al-Mulaḥ wa al-Ṭuraf min Munādamāt Arbāb al-Ḥiraf* (*The Pleasantries of Craftsmen's Drinking Companionship*), and Ibn Makānis wrote a similar literary work on fifty-four craftsmen, *Muḥāwarah bayn Ahl al-Ḥiraf* (*A conversation Between Craftsmen*).[648]Al-Bulbaysī even states that he was asked to compose a work similar to that of Ibn Mawlāhum on fifty crafts.[649] Notably, when al-Ṣafadī talks about the works of both al-Yaghmūrī and Ibn Sharaf al-Miṣrī, he refers to Ibn Mawlāhum's work as a special contribution to the field which inspired subsequent literati.[650]

As al-Bulbaysī's work is the earliest surviving Mamluk *maqāmah* on artisans to include building craftsmen, it merits particular attention here. To my knowledge, there are at least two surviving copies of this manuscript; one is at the Escorial Library, and the other is housed at the British Library.[651] The Escorial Library's copy (MS 499) is a separate treatise, not part of a compilation, and the front cover indicates that the work was originally composed by al-Bulbaysī in 746/1345 and copied in 849/1445 by Muḥammad Abū Bakr Yaḥyá directly from the autograph.[652] This copy comes in forty folios with a very clear handwriting and diacritics, and is in remarkably good condition, with only a few smudges.[653] A modern edition of the text is available and is based on the Escorial copy. However, it has been misread in several places and includes errors that affect the meaning of the text. Characters with dots such as b (ب), g (ج) and sh (ش), have been mistaken with particular frequency; for example, *wiḥish* وحش (bad) is distorted in the edition into *wi-husn* وحسن (beautiful), *minajjar* منجّر (carpented) is

[648] BL, MS ADD 19411/III, fol. 50v; ʿAbd al-Raḥmān ʿAbd al-Rāziq Fakhr al-Dīn Ibn Makānis, *Muḥāwarah bayn Ahl al-Ḥiraf,* ed. by Amīnah Muḥammad Jamāl al-Dīn (Cairo: Dār al-Hidāyah, 1997).

[649] Muḥammad b. Muḥammad al-Bulbaysī, *al-Mulaḥ wa al-Ṭuraf min Munādamāt Arbāb al-Ḥiraf,* ed. by Amjad Mamdūḥ al-Fāʿūrī and Muḥammad ʿAbd al-Qādir Khuraysāt (Irbid: Muʾassasat Ḥamādah lil-Dirāsāt al-Jāmiʿiyyah wa al-Nashr wa al-Tawzīʿ, 2009), p. 26.

[650] al-Ṣafadī, *al-Wāfī,* pp. II, 141; al-Ṣafadī, *Aʿyān al-ʿAṣr,* pp. II, 513. Al-Ṣafadī states that he owned a copy of al-Yaghmūrī's *al-Iṭṭilāʿ ʿalá munādamat al-ṣunnāʿ*, and that he read Ibn Mawlāhum's composition on crafts.

[651] Joseph Sadan, 'al-Bilbaysī', in *Encyclopaedia of Islam, THREE,* ed. by Kate Fleet, et al. (Leiden: Brill, 2010), <http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-3/al-bilbaysi-COM_23478> [accessed 7 May 2017]. Sadan refers to three versions of this manuscript as mentioned in three catalogues: two of them refer to one source that is the Escorial Library version Ms 499, which seems two records of the same versions of this manuscript: Hartwig Derenbourg, *Les Manuscrits Arabes de l'Escurial* (Paris: E. Leroux, 1884), pp. I, 337.

[652] Madrid, El Escorial Library (EL), Arabes Codices 499, (fol. 1).

[653] Compare, for example, *al-Mulaḥ wa al-ṭuraf,* p. 69 and Escorial Ms 499, fol. 22v; p. 76 and MS fol. 26v.

distorted into *minḥabbar* منحبّر, and *yinsann* ينسنّ (sharpening) is distorted into *yinashshin* ينشّن (shooting).

The British Library copy (MS Or ADD 19411/III) comes as a part of a larger manuscript that compiles several earlier works (Figure 3.9). The compiler is anonymous and no date is mentioned; there are dated readers' signatures ranging 1036/1626 to 1249/1833,[654] so the manuscript may have been copied at any time between 746/1345, the composition date of al-Bulbaysī's work, and 1036/1626, the earliest signed date. The compiler introduces his collection with the following:

> هذا كتاب نفيس أودعت فيه من الحكايات العجيبة ما يُستَجلب بها الأفراح و من النُّكَت الهزلية ما تُذهِب الهموم والأتراح، وما قصدت بذلك إلا تسلية الأخوان لان ادخال السرور على المؤمن من الاحسان، فلله عندي جانب لا أضيعه و للهو عندي و الخلاعة جانب.[655]
>
> It is a precious book I have put in marvellous anecdotes that bring gladness and farcical jokes and removed worries and sorrows. My purpose is to amuse my brothers because bringing delight to believers is considered kindness, which is a part of my life I never lose, along with pastimes and profligacy.

In this volume, al-Bulbaysī's *al-Mulaḥ wa al-Ṭuraf* occupies twenty-six folios, 47v-73r, and is written in a clear hand. It includes some slight differences from the Escorial Library copy, including the addition of 'al-Anṣārī' to al-Bulbaysī's surname.[656] Its introduction also includes a reference to Ibn Mawlāhum's treatise on fifty crafts, a reference not found in the Escorial copy.[657]

It should be noted that the name 'al-Bulbaysī' may well have been a pseudonym; although the Escorial Library copy identifies the work as composed by al-Bulbaysī in 746/1345,[658] Mamluk biographical dictionaries of the eighth/fourteenth century say nothing about a person named Muḥammad b. Muḥammad b. ʿAlī al-Bulbaysī. Instead, they refer to a Muḥammad b. Isḥāq al-Bulbaysī (d. 749/1348), who is discussed by Tāj al-Dīn al-Subkī (d. 771/1370) in a lengthy biography that mentions two legal

[654] For example: 'Read it carefully…, 1063[/1652]' and 'Read it with patience…, 1249[/1833]'. See: British Library, MS ADD 19411, fol., 133.
[655] British Library, MS ADD 19411, fol. 2v.
[656] British Library, MS ADD 19411, fol. 47v.
[657] It is not clear which of Ibn Mawlāhum's works (on fifty craftswomen or fifty craftsmen) that al-Bulbaysī refers to.
[658] EL, 499, fol. 1.

commentaries on *al-Tanbīh* and *al-Ḥāwī al-Ṣaghīr*.[659] Neither al-Subkī nor any of the other Mamluk chroniclers, such as al-Isnawī (d. 772/1370)[660] and Ibn Ḥajar al-ʿAsqalānī (d. 852/1448),[661] say anything about *al- Mulaḥ wa al-Ṭuraf min Munādamāt Arbāb al-Ḥiraf* as one of his contributions. Ḥajjī Khalīfah provides what seems to be the earliest mention of *al-Mulaḥ wa al-Ṭuraf* in his index, but he adds no information about the author except the name that appears on the book cover.[662] Later literary indices, such as *Hadiyyat al-ʿĀrifīn*,[663] attribute *al-Mulaḥ wa al-Ṭuraf* and two additional books to Muḥammad [ibn Ilyās] b. Muḥammad b. ʿAlī al-Bulbaysī, who died in 887/1482. This error is repeated in most of later scholarship, except *Muʿjam al-Muʾallifīn* by ʿUmar Kaḥḥālah, as many attribute *al-Mulaḥ wa al-Ṭuraf* to the later Muḥammad b. Ilyās al-Bulbaysī, as well as confusing him with the jurist Muḥammad ibn Isḥāq al-Bulbaysī. The modern editor of *al-Mulaḥ wa al-Ṭuraf* also falls into this confusion, attributing this work to the jurist Muḥammad b. Isḥāq al-Bulbaysī.[664] Further, he classifies the book as one of the legal puzzles (*alghāz fiqhiyyah*) which the jurist al-Bulbaysī was known to use in his teaching of jurisprudence. In fact, the content of the book has little to nothing to do with the law. Given the absence of any identification of an al-Bulbaysī with *al-Mulaḥ wa al-Ṭuraf* in contemporary biographical dictionaries, it seems likely that the name is either a pseudonym or later misattribution. Accordingly, the work's real author is unknown and may have been either a scholar or a commoner who wrote popular literature. In any case, *al-Mulaḥ wa al-Ṭuraf* was a central work of artisanal literature and merits detailed discussion here.

The British Library volume also includes several other works, of which two are of relevance to our discussion. One is the anonymous *al-Mufākharah fī Ādāb al-Muʿāsharah*.[665] We do not know its composition date, but it refers to ʿAlam al-Dīn Sunjur al-Maṣrūrī, governor of Cairo. There were two emirs that held this name and

[659] Tāj al-Dīn ʿAbd al-Wahhāb b. ʿAlī al-Subkī, *Ṭabaqāt al-Shāfiʿiyyah al-Kubrá* (Cairo: ʿĪsā al-Bābī al-Ḥalabī, 1964), pp. V, 227-229.
[660] ʿAbd al-Raḥīm b. al-Ḥasan al-Isnawī, *Ṭabaqāt al-Shāfiʿiyyah,* ed. by ʿAbd Allāh al-Jubūrī, 2 vols (Baghdad: Riʾāsat Dīwān al-Awqāf, 1970), pp. I, 295-296.
[661] Ibn Ḥajar al-ʿAsqalānī, *al-Durar al-Kāminah,* pp. III, 382.
[662] Muṣṭafā ibn ʿAbd Allāh Kâtib Çelebi, *Kashf al-Ẓunūn ʿan Asāmī al-Kutub wa al-Funūn,* 6 vols (Beirut: Dār al-Fikr, 1999), pp. IV, 369.
[663] Ismail Pasha al-Baghdadi, *Hadiyyat al-ʿĀrifīn: Asmāʾ al-Muʾallifīn wa Athār al-Muṣannifīn*, 2 vols (Istanbul: Wakālat al-Maʿārif, 1951-1955), pp. II, 155.
[664] al-Bulbaysī, *al-Mulaḥ edited*, pp. 11-12. Sadan and Hirschler have briefly referred to this mistaken attribution by the editor of al-Bulbaysī's maqāmah. See: Sadan, 'al-Bilbaysī'; Hirschler, *The Written Word*, pp. 192, fn. 153.
[665] British Library, MS ADD 19411, fols 20r-47v.

governed Cairo; one, surnamed al-Ṣāliḥī, died in 695/1296, and the other, surnamed al-Ashrafī, died in 735/1335, so the mention of either suggests that the text perhaps was written between the late seventh/thirteenth and early eighth/fourteenth century. The second work of relevance in this collection is the previously mentioned *al-Maqāmah al-Mukhtaṣarah fī al-Khamsīn Marah* by Ibn Mawlāhum on fifty craftswomen.[666] From these texts and the introduction, it seems that the compiler of the volume saw works on artisans as part of a larger, primarily entertaining literary project.

Al-Mulaḥ wa al-Ṭuraf is set using a literary framing device in which a rich man is sitting with his household members and slave girls when a friend comes to invite him to an evening pleasure gathering. At this gathering, many craftsmen and tradesmen assemble and make their speeches. The order in which al-Bulbaysī presents the participants' speeches loosely reflects groups of related crafts and trades, although as the table shows (Table 3.1), these groupings are not always consistent. As is typical in other literary works of the genre, the first speaker is the judge. He is followed by other attendees representing, in order, food-related trades, medicine, academia and book-related crafts, cloth and fabric trades, metal crafts, and manufacturing crafts including building. Each 'participant' delivers a short prose piece that employs the terms of his craft to describe a complaint or cause of suffering before calling the drink-bearer (*sāqī*) and concluding with two verses on the topic of love, again employing the terms of his profession. They all follow the same pattern until the final sermon, when a corpse washer preaches repentance to the attendees.

Although al-Bulbaysī mentions fifty crafts and trades in his introduction, he skips four in the actual body of the work:[667] litterateur (*adīb*),[668] grammarian (*naḥawī*), orator (*khaṭīb*) and master artisan (?, *rayyis*). The four omitted participants are situated between the blind flutist (*mushabbib a'má*) and the muezzin in the list of attendees and form a group of intellectual and educated professions. It is possible that he forgot or neglected to write these sections; however, it may also be that the skip visible in the manuscripts was due to a copyist's error or the loss of pages from the original manuscript.

[666] British Library, MS ADD 19411, fols 73r-88r.
[667] al-Bulbaysī, *al-Mulaḥ edited*, pp. 25-27.
[668] The *adīb* appears in the BL version, fol. 56v.

Table 3.1: The sequence of participants in al-Bulbaysī's *maqāmah*

1	judge (*qāḍī*)	17	robeman? (*khula'ī*)	33	money changer (*ṣayrafī*)
2	butcher (*jazzār*)	18	shepherd (*rā'ī*)	34	spice dealer (*'aṭṭār*)
3	cook (*ṭabbākh*)	19	fisherman (*ṣayyād*)	35	nut seller (*nuqalī*)
4	poultry-seller (*dajājī*)	20	sailor (*nūtī*)	36	confectioner (*ḥalāwī*)
5	physician (*ṭabīb*)	21	stranger?[669] (*bayyāt*)	37	seller of kitchen apparatus (*maṭābikhī*)
6	drink seller (*sharābī*)	22	overseer of gardeners (*khawlī*)	38	professional builder (*muhandis*)*
7	fruit seller (*fakkāh*)	23	carpenter (*najjār*)*	39	builder (*bannā'*)*
8	singer (*mughannī*)	24	hospital attendant (*māristānī*)	40	miller (*ṭaḥḥān*)
9	blind flutist (*mushabbib a'má*)	25	snake charmer (*ḥāwī*)	41	kneader (*'ajjān*)
10	muezzin (*mu'adhdhin*)[670]	26	astrologer (*munajjim*)	42	furnace man (*farrān*)
11	janitor (*qayyim*)	27	incense merchant (*bukhūrī*)	43	baker (*khabbāz*)
12	copyist (*nāsikh*)	28	cloth merchant (*bazzāz*)	44	chandler (*shammā'*)
13	papermaker (*warrāq*)	29	tailor (*khayyāṭ*)	45	glassmaker (*zajjāj*)**
14	children tutor (*mu'allim al-kuttāb*)	30	ironsmith (*ḥaddād*)**	46	corpse washer (*ghāsil*)
15	bookseller (*kutubī*)	31	coppersmith (*naḥḥās*)**		
16	worker (*'āmil*)	32	goldsmith (*ṣāyigh*)**		

* Directly related to the building profession
** Associated with the building craft

Al-Bulbaysī, like other literati of the period, states that he composed this *maqāmah* as a piece of entertainment and amusement to enliven night gatherings:

وضعت مقامة حسنة الترصيع، بديعة التسجيع، يرتاح إليها أهل المحاضرة، وتطيب بها أوقات أهل المسامرة، تُدهش محاسنها الأذهان والألباب.[671]

I have composed a *maqāmah* of pretty adornment (*tarṣī'*) and amazing assonance (*tasjī'*) which attendees will enjoy, which will bring delight to the people who spend the night together, its beauties astonish intellects and minds.

[669] Wehr and Cowan, 'DMWA', p. 103. Bayyāt is defined as a pupil of boarding school, but the bayyāt's speech conveys that he was a rich man before being confiscated by the city's governor.
[670] Is replaced by the litterateur in BL version, fol.56v.
[671] EL, 499, fol. 2v; al-Bulbaysī, *al-Mulaḥ edited*, p. 26.

The author explains here that in order to make his work more pleasant, he added rhetorical devices such as homeoptoton (*tarṣīʿ*), a rhetorical strategy in which a series of phrases or sentences bear the same sentence structure and end with the same syllable or letter,[672] and assonance (*sajʿ*)[673] to emphasize the rhymed effect. He also states that he is going to end his *maqāmah* with a sermon to atone for the prohibited pleasure. He says:

جمعت فيها من بين نثر ونظم، وهزل وجد ما يُغني عن معارضة الساعي المجد، وختمتها بموعظة حسنة تصبو إليها القلوب والأرواح، لتكون كفارة لما أودعتها من المداعبة والمزاح.[674]

I have combined between prose and verse, jesting and earnest to be free from being argued by a serious hardworking man. I have ended it with a pretty sermon to which hearts and spirits would incline, and to atone whatever jest I have put in.

Thus, al-Bulbaysī presents his scenes of wine and pleasure, then ends with the last participant, the corpse washer, who in his turn tries to preach to people and remind them of the afterlife and of penitence, a common trope in Mamluk literature.[675]

Of al-Bulbaysī's proposed participants, three are directly related to the building craft: the *najjār*, the *muhandis*, and the *bannāʾ*. A close analysis of their 'complaints' reveals what was considered the common characteristics of their craft, their tools, and their jargon. Together, they create a caricature of craft identity that demonstrates how different social groups of builders were seen and defined by their society.

The prose complaint attributed to the carpenter, for example, is rich in building jargon:

أرى كل واحد السّعة بيعمل له باب ريح يدخل منه ويخرج وأنا والله يا أخي مالي بكم طاقة، والله بتمسحوا عليّا الخشب وِحِشْ واثقبتوا في راسي رَوزَنة، وقَوْسُكم قوس قوي عليّا وكل واحد ينفَشّ في صاحبه

672 Rhymed phrases and sentences as a whole, all sentences employ the same rhyme and sentence structure: Wahba and al-Muhandis, *Muʿjam al-Muṣṭalaḥāt al-ʿArabiyyah*, pp. 95-96.

673 Chris Baldick, 'Assonance', in *The Oxford Dictionary of Literary Terms (4 ed.)*, (Oxford: Oxford University Press, 2015), <http://www.oxfordreference.com/view/10.1093/acref/9780198715443.001.0001/acref-9780198715443-e-100> [accessed 2 July 2017]. The repetition of identical or similar vowel sounds in the stressed or unstressed syllables of neighbouring words; Wahba and al-Muhandis, *Muʿjam al-Muṣṭalaḥāt al-ʿArabiyyah*, p. 98.

674 al-Bulbaysī, *al-Mulaḥ edited*, p. 27; EL, 499, fol. 2v.

675 Rowson, 'Two Homoerotic Narratives', pp. 164-169. For example: Rowson analyses the way al-Ṣafadī followed to justify his work.

و هو قاعد مربّع وقفاه منجّر، يقطع ويُوصِل ويدخل بروحه حُشَيْوات في كل شي وما أنتم بأصحاب نُقرة حتى تحلوا العقد، فكونوا عقّال لجل يعموكم بالنخل ويشيلوكم سقيفة.[676]

I see everyone now makes a ventilation shaft (*bāb rīḥ*) to come through in and out. By God, my friend, I cannot stand a small opening (*ṭāqah*). You are badly scraping the wood on me, and drilling a hole (*rawzanah*) in my head. Your compass (*qaws*) is very hard on me, every one of you is puffing on his friend while he is sitting cross-legged (*murabba'*) with sawed (*munajjar*) nape, taking apart and reconnecting. Everyone puts himself in everything as a tiny filling (*ḥushaywāt*), while he does not have a hammer (*nuqrah*) to break up the knot in the wood (*'uqdah*). Be rational so people shade you with palm (*nakhl*) and carry you on a palanquin (*saqīfah*).

This section begins with a pun: although the near meaning of *bāb rīḥ* is the building-related 'ventilation shaft', its further meaning has to do with his complaint. When the builder says that everyone makes a ventilation shaft (*bāb rīḥ*) into something big enough for a human to move through, he is suggesting that people make mountains out of molehills; they make things out to be bigger than they are at a time he cannot even stand little things (small opening, *ṭāqah*). In the following lines, when he refers to imperfect/rough sawing and drilling a hole, he is once again using puns to describe the imperfections of both carpentry and people. The carpenter continues to render his complaint with reference to tools and terms of his craft, such as the compass (*qaws*, also meaning a bracket or arch), well-planed (*munajjar*), wood fillings (*ḥushaywāt*, s. *ḥashwah*), hammer (*nuqrah*), wood knot (*'uqdah*), palm leaves (*nakhl*), and roof (*saqīfah*). The lines of wisdom with which he concludes his speech are a pun about building a roof. He advises people to be rational and behave so others may show them respect and kindness: 'shade you with palm and carry you on a palanquin' is probably a metaphor for showing respect. His poetic lines are equally focused on building:

أما تَنْجُروا عنّا الشّقاق وتَنْشُروا جميلكم أو ترتقوا سُلَّم الثُّقا

و لوذوا بِذِي العَرض النَّقي ورَوّحوا نفوسكم يوما من الكَدِّ والشَّقا[677]

[676] EL, 499, fol. 22v.
[677] EL, 499, fols 22v-23r.

Have not you planed (*tanjurū*) the dissension off us and spread/saw (*tanshurū*)
your gratitude, or climbed the ladder of piety?

Resort to pure (*naqiyy*) dignity and for a day
get rid of craftiness and misery

Here, good religious behaviour is cast in building terms as 'climbing the ladder of piety', and the reduction of bad conduct is described using the verb 'to plane off' (*tanjurū*). The term *naqiyy*, here used to indicate purity, was a technical term for pine or other high-quality wood. As discussed in the second chapter, one of the experts who examined an endowment property located in Alexandria was a carpenter known to be specialized in *naqiyy* wood.[678] All of this language demonstrates familiarity with the materials of the building craft, as well as facility with twisting language to new meanings.

Ibn Makānis, in his *Muḥāwarah bayn Ahl al-Ḥiraf*, presents a similar account of a carpenter. His carpenter, a specialist making locks, begins his speech by saying:

أنقر كل واحد منكم ضبُّه، وأي من اتقلق منكم نجرناه بعلقة، خليتوا في قلمي غصة و بابكم ما يحمل رفصة.[679]

Everyone taps/beats (*unqur*) his lock/front teeth (*ḍabb*), and if anyone moved/shook (*talaqlaq*) we would fix/whittle him (*najjarnāhu*). You left a lump (*ghaṣṣah*) in my throat/handwriting (*qalamī*) while your door does not stand a kick (*rafṣah*).

The carpenter refers to many craft tools, such as the adze (*qadūm*), saw (*minshār*), jack plane (*fārah*), and mucilage or adhesive solution (*ghirā'*). The sentence 'everyone taps/beats his lock' clearly refers to the production of wooden locks, with the double meaning of remaining silent and shutting one's mouth. This is followed by 'if anyone moved he would be whittled', which refers both to fixing a faulty lock and beating up a person who spoke when he should not have. Here, we see once again the language of

[678] 'WA 673j', p. darj 2.
[679] Ibn Makānis, *Muḥāwarah*, pp. 49-50.

a craft – in this case particularly reminiscent of Ibn al-Ukhuwwah's *hisbah* descriptions of lock-carpenters – being used in puns to express different ideas.[680]

In general, the carpenter's speech by al-Bulbaysī reflects tools and activities like making doors and windows, sawing wood panels, applying patterns and designs using a compass, and making roofs of palm wood. The use of the compass (*qaws*) is elementary in the carpentry work which includes geometrical patterns and designs. In our first chapter, when we introduced scientific treatises relating to carpentry, we have seen that al-Būzjānī dedicates the first chapter of his *What a Craftsman needs of Geometry* to introducing the three primary tools of designing geometrical shapes: ruler (*misṭarah*), compass/arch (*qaws*), and right angle (90˚ angle, *kūnyā*). All three are needed in order to correctly draw circles and other geometrical forms.[681]

It is noticeable that in the context of endowments, the carpenter mainly appears as a craftsman appointed to maintain the waterwheel (*sāqiyah*). For example, Sultan Qāytbāy's endowment deed DWQ 210/49, dated 895/1490, states:

> [The administrator should] spend sixty dirhams every month on a carpenter as a payment for repairing the waterwheel and noria as is customary.
>
> ويُصرف لرجل نجّار رسم اصلاح الساقية والناعورة يتولى ماجرت به العادة في مثل ذلك في كل شهر ما مبلغه ستون درهما.[682]

Similarly, Sultan al-Ghawrī stipulates in his endowment deed, dated 26th Muḥarram 909/20th July 1503, the administrator should assign an expert in the carpentry of waterwheels (*najjār 'ārif bi-nijārat al-sawāqī*) and defines his role as to regularly maintain the waterwheel and its machinery parts.[683] The specialization in the construction and maintenance of waterwheels, combined with the literary representations that focuses on specializations in making doors, roofs, and locksmiths, suggests that the carpentry profession has had its own sub-crafts and specialists.

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[680] Ibn al-Ukhuwwah, *Maʿālim al-Qurbah*, p. 236.
[681] al-Būzjānī, *Mā Yaḥtāju ilayhi al-Ṣāniʿ*, pp. 25-34.
[682] 'Waqf Deed DWQ 210/49', (Cairo: Dār al-Wathāʾiq al-Qawmiyyah: Ḥujaj umarāʾ wa salāṭīn, 15 Dhū al-Qaʿdah 895/29 October 1490), (p. 13).
[683] WA 882q, dated 909/1503, as cited in: Raʾfat Muḥammad Muḥammad al-Nabrāwī, 'Maskūkāt al-Mamālīk al-Jarākisah fī Miṣr', (unpublished Doctorate of History, Cairo University, 1981), pp. 481-482.

Another member of the building craft represented in al-Bulbaysī's *al-Mulaḥ wa al-Ṭuraf* is the builder (*bannā'*). Like the carpenter, he delivers his complaint using the language of his profession. He complains that people commit immoral actions while they claim that they are doing good, and also that they interfere with pious acts undertaken by others. Therefore, they are in need of a leader who will chastise and punish them. As with the carpenter, he concludes his prose with a piece of advice: if a person wants to enter paradise, they should take the path that is right and proper. He also suggests that he is willing to help them at his own expense:

> والله ضاع منكم الكل ميزان العمل وعملتوا في الشر مُقاولة و مُوايمتكم مُوايمة النحس، وتقول فيكم فاعل خير قراري إلا كُلكم جَوّالة في الشر، قد خرجتم عن الطريق كنكم رواشن، وكم نبني وتهدوا وكلما طلعنا مستقيم جيتونا عرض كيف أنتم مزروعين في قصرية، والله ما لكم إلا من يستعملكم في الطوب والطين ومتى اتكاسلتوا سَفَقكم بنصف طوبة في وجوهكم فما فيكم من يأوى إلى ركن شديد، وإذا دخلتم أنتم الجنة شيلوا الأسقالة فعلى شان قصركم أهد خُصّي.[684]

> By God, you all lost balance/scale (*mīzān*) of work, and concluded a contract (*muqāwalah*) with evil; your concord (*muwā'amah*) is ill-omened. You claim that some of you are well-established (*qarārī*) do-gooders while you are wickedly roaming about; you turned away/stuck out as if you were (*kinkum*) protruding windows (*rawāshin*). However many times we build (*nabnī*), you destroy (*tahuddū*), and every time we go straight up (*ṭala'nā*) you go sidways (*'arḍ*) as though you were planted in a pot. By God, you deserve someone to employ you with work in brick (*ṭūb*) and mud (*ṭīn*), and when you show idleness, he should hit your faces with half a brick, with none of you finding refuge in a strong support/tight corner (*rukn shadīd*). If you enter paradise, carry the scaffold (*al-asqālah*), as because of your palace I will ruin (?) my hut (*khuṣṣī*).

Then he delivers the verses:

ابن خيرا ولا تهد بناء بجميل تراه في الجو عالي

إن عمران ذا الوجود خراب فاتضع فيه لاتروم العوالي[685]

[684] BL, MS ADD 19411/III, fols 68r-v.
[685] BL, MS ADD 19411/III, fol. 68v.

Build goodness, as a structure built by kindness is never ruined
you will see it high up in the sky

Constructing this existence is destruction
be humble, do not aim for haughtiness

Again, we see the employment of craft-based puns in both the prose section and poetic couplet; terms like scale/plummet (*mīzān*), contract (*muqāwalah*), protruding window (*rawāshin*), brick (*ṭūb*), support/corner (*rukn*), and scaffold (*asqālah*) are references to building tools and principles that we have previously discussed in the context of contracts, legal documents, and endowments.[686] The puns, as before, give a new cast to these building words: *rawāshin* means not only a protruding window, but also to turn away, and *rukn* indicates not only a corner, but also means strong personal support or protection. The puns also give some information about social perceptions about different kinds of building work: the connection of work with mud and mud-brick (*ṭūb*) with obstinate sinners, for instance, would seem to indicate that mud work was considered a particularly lowly job.

Similar to the carpenter's language, the prose associated with the builder tends to be colloquial. He uses several vernacular terms such as *qarārī*, which is a colloquial term that means deep and thorough,[687] and *kinkum*, a vernacular term diverted from *kannakum* (as if you are). The poetry is somewhat less colloquial. The similes the builder employs include material objects such as bricks, scuttles, scaffolding, and the like. This is contrary to the elevated language and rhetoric style used by the *muhandis* as we will see below.

In Ibn Makānis' *maqāmah*, the portrayal of the builder refers to other aspects of the builder's profession, such as plastering (*talyīs*), laying foundations (*asās*), and contains a reference to a mixing instrument (*ma'jan*):

اتليستوا فينا وحش وقلبكم اقسى من الحجر، وتنظروني ضعيف الأساس فتعاملوني بذراعكم وخرجتوا عن الحد، ولم أزل منكم مغلوب و حالي معكم يبكي الطوب... غيري يقع بِمَطْلَب و أنا وقعت بِمَعْجَنَة.[688]

[686] Ibn al-Ukhuwwah, *Maʿālim al-Qurbah*, p. 235.
[687] Socrates Spiro, *An Arabic-English Dictionary of the Colloquial Arabic of Egypt* (Beirut: Librarie du Liban, 1999), p. 480.
[688] Ibn Makānis, *Muḥāwarah*, p. 49.

You determined/plastered us badly, and your heart is harder than stone. You see me as having a weak foundation, so you treat me with your arms/cubit and exceed the limit, you always vanquish me and make mud-brick cries on me… everyone else gets what he demands/treasure (*maṭlab*) while I am beaten in a mixer (*maʿjanah*).

In this prose, the builder speaks about plastering, a sub-craft of the building profession whose practitioner, called *mubayyiḍ* or *ṭayyān*, appears in Ibn al-Ukhuwwah's *ḥisbah* manual and al-Subkī's ethical treatise as a separate craftsman,[689] However, Ibn al-Ḥājj, in his *al-Madkhal*, adds this sub-craft to the builder (*bannāʾ*)'s job.[690] As for the mixing instrument (*maʿjanah*), the builder's speech does not explain much about it, but it presumably is a part of his equipment.[691] In any case, the merging of the plasterer's work with the builder's in this case suggests that Ibn Makānis saw them as two elements of the builder's craft rather than two separate professions.

The third member of the building profession represented in al-Bulbaysī's *maqāmah* is the *muhandis*. As noted above, the appearance of the *muhandis* in literature was relatively rare, and al-Bulbaysī's is the only *maqāmah* to include a section dedicated to the figure. The *muhandis*' speech, unlike that of the carpenter, is distinctive and reflects a higher register of Arabic. He says:

أرى كل واحد السّعة بيقعد لي قاعدة نحس ويبني على غير أساس بلا ترتيب والتقدير يزيد وينقص، فلا تتعدوا الحدود تخرجوا عن القياس، ويبرز كل واحد على صاحبه ظلم، والظلم إن دام دمّر والعدل إن دام عمّر، وموضع تاكلوا منه لا تدعوا عليه بالخراب، ومن لا يؤسس على التقوى بنا على جرف هار.[692]

I see everyone at the moment is setting up an ill-omened base (*qāʿidah*) and building without a proper foundation (*asās*), and is not properly ordered (*bi-lā tartīb*). The estimate (*taqdīr*) increases and decreases. So do not exceed the limits/boundaries (*ḥudūd*), and do not exceed the measurement (*qiyās*). [I see] everyone bringing himself forward/protruding (*yabruz*) at the expense of his friend. Were injustice to last, it would destroy (*dammar*), while if justice lasted, it would be

689 Ibn al-Ukhuwwah, *Maʿālim al-Qurbah*, p. 235; al-Subkī, *Muʿīd al-Niʿam*, p. 100.
690 Ibn al-Ḥājj, *al-Madkhal*, pp. IV, 197; Al-Subkī comments on decorating with gold (tadhhīb) in his advice to the builder: al-Subkī, *Muʿīd al-Niʿam*, p. 100.
691 Wehr and Cowan, 'DMWA', p. 694.
692 EL, 499, fols 31v-32r.

constructive (*ʿammar*). Never wish desolation (*kharāb*) upon a place where you subsist; and if devotion is not your foundation, you are building on a crumbling cliff.

Then he delivers the verses:

إن ترتيب ذا الصلاح عجيب ما تعدى من الحدود قياسا

فإذا ما أردت تبني فسارع وبفعل الجميل دُكّ أساسا[693]

The order of a pious person is wondrous
his measurement never exceeds the limit

If you wanted to build then hurry up
and ram (*dukk*) your foundation by courtesy

Again, the *muhandis* employs the jargon of his profession to convey a complaint using double meanings. He begins by describing the act of building without a proper foundation, an obvious metaphor for disarray and instability. The *muhandis* then refers to limits and measurements as the metaphorical criteria which distinguish between proper and improper manners. The reference to exceeding boundaries (*yabruz*) uses the legal term for the protrusion of buildings, recalling the reinforcement of public pathways discussed in detail in the second chapter. Here, we see the use not only the use of language referring to tools of the building trade, but also to jurisprudence and other legal literature surrounding building.

The *muhandis*' speech, here represented by al-Bulbaysī, also reflects aspects of the more abstract and educated skills of these professionals, discussed at greater length in Chapter 1. In al-Bulbaysī's work, the *muhandis* is in charge of laying out buildings' foundations according to measurements (*qiyās*) and limits (*ḥudūd*), employing terms like order (*tartīb*) and estimate (*taqdīr*). This echoes statements by Ibn al-Akfānī and al-Qalqashandī; Ibn al-Akfānī states that *ʿuqūd al-abniyah* (vaulted structures) is the branch of *handasah* which deals with laying out the order of buildings (*awḍāʿ al-abniyah*) and setting up houses,[694] and Al-Qalqashandī states that *muhandis al-ʿamāʾir* is in charge of setting up buildings and surveying them (*tartīb al-ʿamāʾir wa*

[693] EL, 499, fol. 32r.
[694] Ibn al-Akfānī, *Irshād al-Qāṣid*, p. 192.

taqdīrihā).[695] We can also see parallels between the representation of the *muhandis* by al-Bulbaysī and the role played by the *muhandis* in Mamluk endowment documents. Al-Bulbaysī's expression 'the estimate increases and decreases' (*al-taqdīr yazīd wa yanquṣ*), for example, echoes very closely the endowment documents in which a *muhandis* appears as a surveyor and assessor. The inspection report of Sultan al-Ẓāhir Baybars DWQ 126/20 (dated 865/1461), for example, cites the *muhandisīn*'s repair estimate as 3,000 dinars, '*al-taqdīr fī dhālik yazīd wa yanqus*'.[696] The *muhandis*' 'complaint' therefore not only provides literary reinforcement for Chapter 1's conclusion that the *muhandis* was a builder with both theoretical and practical building skills, but also suggests that societal recognition of the roles and duties of the *muhandis* extended beyond the building profession into the popular and literary spheres.

Especially when considered in connection with the couplets on the *muhandis* and teacher in al-Nawājī's collection, the representations of the *muhandis* by al-Bulbaysī emphasises a higher degree of education. The language used in the poems is in a higher register than that used in the carpenter and builder sections, as it is eloquent and literary with minimal colloquial terms. This elevated tone is even evident in the *muhandis*' similes; even though the poems refer to physical features such as the foundation, protrusion, and limit, they are employed to describe higher concepts like justice and order. This linguistic repertoire suggests that the *muhandis* was seen as having more education and expertise than other building professions; descriptive colour is added to their poems with the use of colloquialisms, but to his by using educated and elegant figures. The elevated status of the *muhandis* is also signalled by the material of his complaint: where the carpenter and builder complain about poor treatment, the *muhandis* complains about inappropriate manners of some people. The *muhandis* is not only eloquent in his speech, but also sophisticated and superior in his view of society at large, while the builder is preoccupied with more immediate concerns.

A comparison between the representation of the builder and *muhandis* in artisanal literature reveals both similarities and differences. There are certain aspects of the building profession, such as *asās* (foundation), *dhirāʿ* (cubit/lever arm), *ḥadd* (limit), and *burūz* (protrusion), that appear in the representations of both the builder and the *muhandis*. However, while both refer to laying the foundation of a building, they

[695] al-Qalqashandī, *Ṣubḥ al-Aʿshá*, pp. V, 467.
[696] 'DWQ 126/20', p. darj 10.

differ in the way they employ this term. The builder uses the term 'foundation' to describe how people look down on him as a person of weak foundation, a descriptive metaphor for improper treatment. The *muhandis*, on the other hand, uses the term 'foundation' as a normative standard or judgement. From the *muhandis*' perspective, the quality of the foundation sets up the end result: if the foundation is proper, so is the result. Similarly, the employment of the term 'limit' (*ḥadd*) differs between the builder and *muhandis*. The builder uses this term to describe people who exceed limits, while the *muhandis* employs the same term 'limit' in advisory theme to advise people not to exceed the limits so as to not go away from the proper norms (*qiyās*). The same goes for the use of term of *burūz* or *rawāshin*, which is an example of protruded structures. The builder keeps on using the descriptive theme against the advisory and thoughtful theme which dominates the *muhandis*' prose and poetic verses.

It is also notable that the builder is present in more literary works, such as *maqāmah*s and couplets, than the *muhandis*. An examination of the major surviving artisanal literature, namely two *maqāmah*s and two poetry anthologies,[697] reveals that the builder is represented in both *maqāmah*s and one of the couplet collections, while the building *muhandis* – a category that omits the teacher of astronomy and *handasah*– is represented in one of the *maqāmah*s and one of the two couplet collections. This parallels the pattern observed in *ḥisbah* manuals, where builders were present and the *muhandis* absent. However, chronicles, endowment deeds, and judicial permissions referred more frequently to the *muhandis* than to the common builder, or *bannā'*. Overall, it seems that Mamluk *muhandisīn* were recognised more frequently in formal and legal contexts, while builders appeared more commonly in literary and ethical sources.

3.5 Conclusion

Many social and cultural changes occurred under the Mamluk Sultanate, and these affected artisans' representations in and interaction with the literary world. The growth in the number of *madāris* and learning institutions starting from the late seventh/thirteenth century encouraged the spread of reading and learning, an expansion

[697] The *maqāmah*s by al-Bulbaysī (*al-Mulaḥ wa al-ṭuraf*) and Ibn Makānis (*Muḥāwarah bayn Ahl al-Ḥiraf*); and the anthologies collections by al-Nawājī (*Marāti' al-ghizlān*) and al-Ḥijāzī (*Rawḍ al-ādāb*). These works might be not the ideal representation to the Mamluk period, but they at least are the recognized surviving works.

supported by the increasing number of local libraries. This led to a rise in literacy across societal strata and included craftsmen. We can see evidence of artisanal literacy in reading certificates, which provide information about the practices and participation patterns of artisans and craftsmen in reading groups. Craftsmen's interest in scholarship and their attendance in reading circles shows the degree to which artisans, including builders, saw themselves as part of a reading society, and also demonstrates that they sought and received access to a variety of texts. This provides direct literary evidence of the previously expressed argument that some building professionals were literate, and had both the skills and the ambition to integrate texts into their professional life. Some artisans were even authors themselves and engaged actively with the literate and scholarly worlds. Poetic *dīwān*s by al-Jazzār, al-Sarrāj al-Warrāq, and al-Miʿmār, for instance, were of variant lengths and rhetorical styles, but shared a common tendency towards colloquial language and seem to have been directed at a broad popular audience.

Literature about artisans and craftsmen, including building practitioners, also reached a peak during the Mamluk period. Mamluk literary works on craftsmen, which share a common root in the work of al-Jāḥiẓ, appear to have developed into two distinct types, each using different tropes and styles. In the first type, craftsmen were the subject of *ghazal* poems written by literati. Literary works of this type, such as al-Ṣafadī's *al-Ḥusn al-Ṣarīḥ*, al-Ibshīhī's *al-Mustaṭraf*, and al-Nawājī's *Marāti' al-Ghizlān*, use only superficial elements of the building craft; these couplets are dominated by the theme of love and do not focus on building as a pursuit. In the other type, the *maqāmah*, the artisans were cast as narrators, and deliver short speeches combining prose and *dūbīts* using the jargon of their profession. To the best of our knowledge, there are three Mamluk surviving *maqāmah*s involving artisans: one on craftswomen by Ibn Mawlāhum, which still exists only in manuscript, and two *maqāmah*s on craftsmen by al-Bulbaysī and Ibn Makānis, which have been edited. These literary works represented crafts in more detail and involved highly detailed elements of their professional work and language.

A close reading and analysis of examples of these literary works on artisans show the rich information which these sources bring to historical examination. Looking at the depictions of building professionals, particularly the carpenter, builder, and *muhandis*, in both poetry and prose sheds light on the daily activities and public perception of these craftsmen. The representations of the carpenter and builder, for

example, use colloquial language, as well as jargon that reflects the practical aspects of their tools and activities. Representations of the *muhandis*, in contrast, use both more classical Arabic and deals with more elevated concerns, such as balance and justice. The picture that emerges from these representations is of the carpenter and builder as relatively simple and low-status figures, while the *muhandis* appears as a respected and cultivated individual. This literary representation of the *muhandis* as more cultured than other building craftsmen seems to support the image of *muhandis* represented in Mamluk chronicles and documents as an authoritative and respected figure in the profession, and shows that the professional identity of the *muhandis* as a member of a particular sub-type of the building profession was publicly recognised.

3.6 Chapter 3 illustrations

Figure 3.1: A group of children in a writing session at school as depicted in *al-Ḥarīrī Maqāmāt*, 654/1256 (© The British Library MS OR 1200, fol. 156v, after K. Hirschler 2012)

	Part	Date	Day	Total number of participants**
1*	1	9 I 560	Thursday‡	69 (31)
2*	5	23 I 560	Thursday‡	75 (22)
3	92	14 XII 560	Friday	37 (2)
4	94	21 XII 560	Friday	37 (0)
5	96	28 XII 560	Friday	48 (0)
6	98	6 I 561	Friday	49 (0)
7	232	23 V 562	Friday	46 (0)
8	235	30 V 562	Friday	47 (0)
9*	237	6 VI 562	Thursday	40 (3)
10	238	7 VI 562	Friday	42 (0)
11	261	4 VIII 562	Friday	36 (0)
12	263	25 VIII 562	Friday	48 (0)
13	268	10 IX 562	Friday	58 (0)
14	270	17 IX 562	Friday	60 (0)
15	286	7 XI 562	Friday	49 (2)
16	289	14 XI 562	Friday	48 (0)
17*	319	23 II 563	Friday‡	61 (37)
18	325	21 III 563	Friday	73 (0)
19*	326	28 III 563	Friday‡	73 (34)
20*	327	2 IV 563	Monday‡	73 (34)
21	411	13 I 564	Friday	37 (0)

Key to symbols used in Tables 2.3–2.6:
* Partial attendance.
** In brackets: number of participants who attended partially.
‡ The reading was spread over two or more sessions on different days; the day of the week refers to the last session.

Figure 3.2: Attendance of ʿUthmān al-Ṭayyān in reading sessions of *The History of Damascus* (after K. Hirschler 2012)

	Part	Date	Day	Total number of participants**
1	234	2 IX 575	Thursday‡	29 (& others)
2	235	4 IX 575	Saturday‡	21 (0)
3	236	7 IX 575	Monday‡	26 (& others)
4	268	1 IV 576	Monday‡	18 (& others)
5	286	11 X 576	Friday‡	23 (1)
6*	288	27 X 576	Monday‡	19 (4)
7	289	9 XI 576	Friday‡	20 (0)
8*	325	18 XII 577	Friday‡	30 (17)
9*	326	20 XII 577	Monday‡	45 (33)
10*	328	5 I 578	Monday‡	43 (28)
11*	329	9 I 578	Friday‡	51 (29)
12*	332	14 II 578	Friday‡	52 (36)
13*	374	28 XII 578	Friday‡	36 (26)

Figure 3.3: Attendance of Muḥammad al-Najjār in reading sessions of *The History of Damascus* (after K. Hirschler 2012)

Figure 3.4: *Rawḍ al-Ādād* by al-Shihāb al-Dīn Aḥmad al-Ḥijāzī; the second section is on crafts and trades (9th/15th c, © The British Library MS ADD 19489, fols 68v-69r)

Figure 3.5*: Al-Ḥusn al-Ṣarīḥ* by al-Ṣafadī (1079/1668, © The British Library MS Or 3776/1, fols 1v-2r)

Figure 3.6: Al-Nawājī's *Marāti' al-Ghizlān*; the third section is on crafts and trades (889/1484, © Princeton University Digital Library MS Garrett no. 14L, fols 32v-33r)

Figure 3.7: Al-Nawājī's *Marāti' al-Ghizlān*; the dūbīts on building craftsmen (889/1484, © Princeton University Digital Library MS Garrett no. 14L, fols 52v-53r)

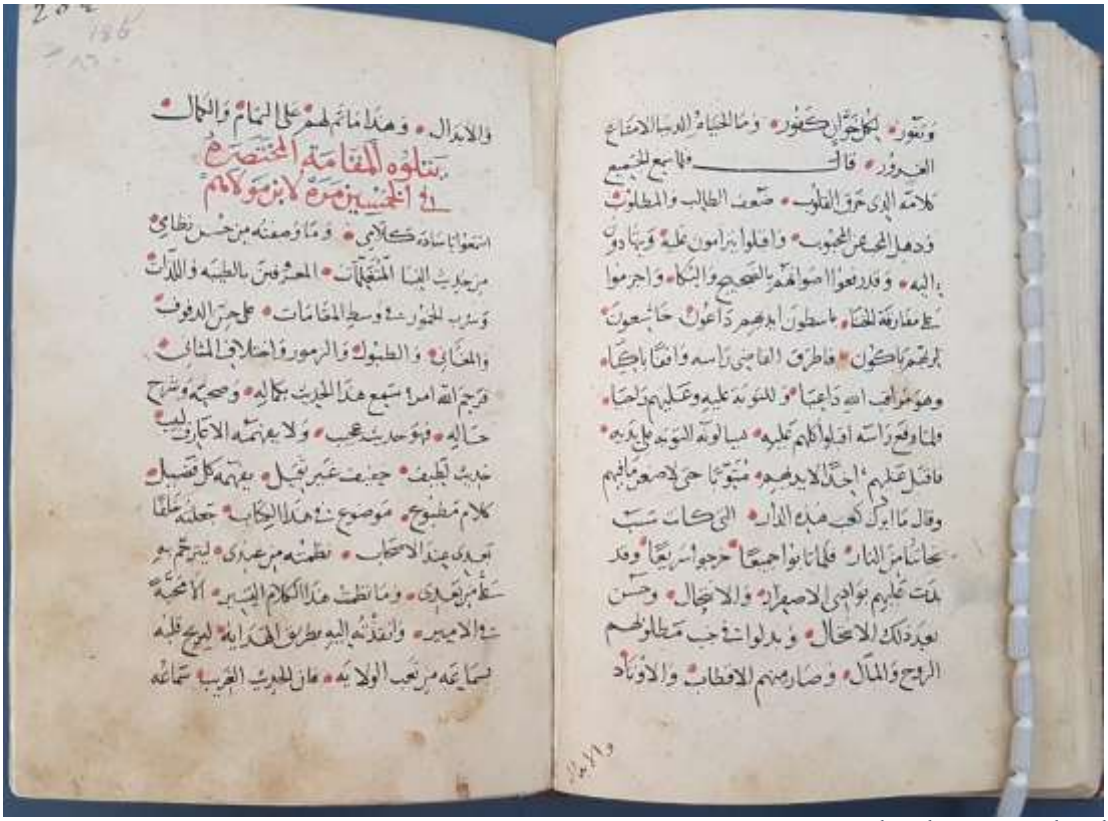

Figure 3.8: Ibn Mawlāhum's *maqāmah* on fifty craftswomen (copied between the 8th/14th and the 11th/17th century, © The British Library MS ADD 19411, fols 72v-73r)

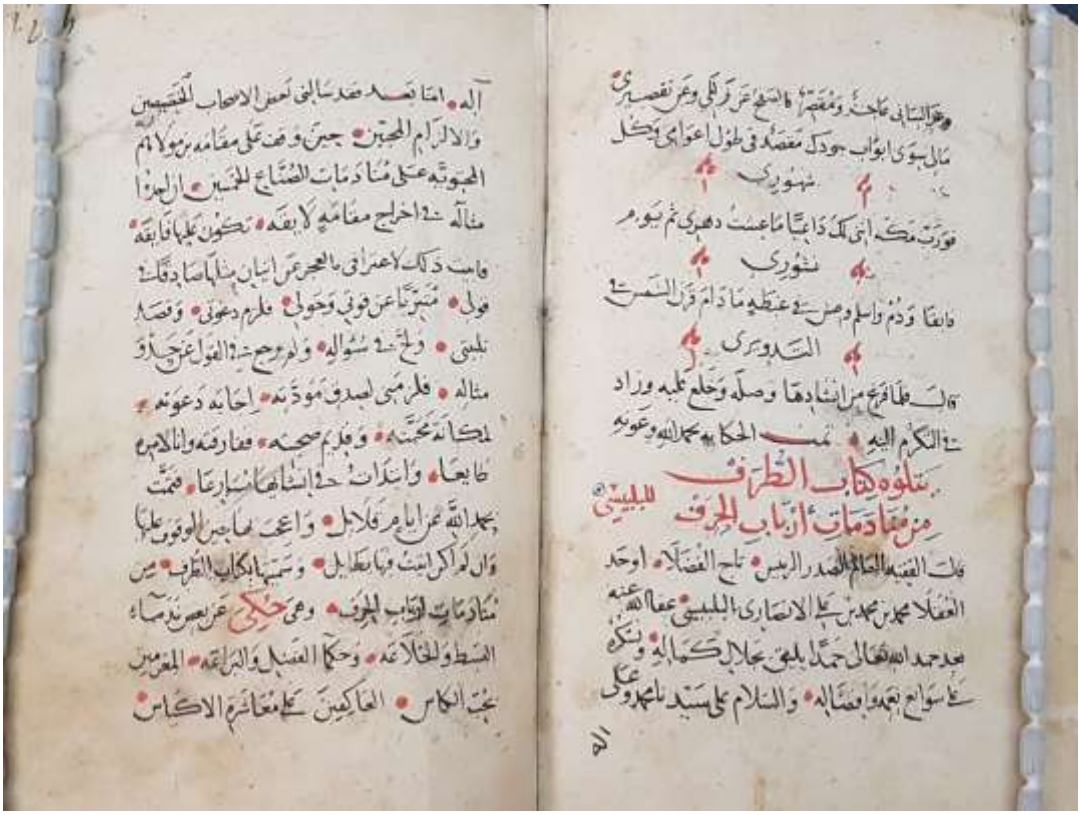

Figure 3.9: Al-Bulbaysī's *al-Mulaḥ wa al-Ṭuraf* (copied between the 8th/14th and the 11th/17th century, © The British Library MS ADD 19411, fols 42v-43r)

Conclusion

The various approaches and perspectives on the Mamluk *muhandis* presented in the preceding chapters provide strong evidence for the existence of a group of learned *muhandisīn* who were both familiar with the theoretical literature and actively involved in building construction. This group, who acted as the top professionals of the building craft, were certified by the *qāḍī*'s court as authoritative experts in their profession and were represented in their society as respected figures. Their role, therefore, could be considered comparable to that of the figure of the Renaissance architect.

This thesis has argued that, contrary to existing characterisations of the *muhandis* as little more than an expert builder or building supervisor, a group of Mamluk *muhandisīn*, in fact, possessed a wide range of theoretical and practical knowledge drawn from both experience and literate learning. By doing so, it also expands the limited picture of the science of *handasah* generally given by modern scholars; rather than being restricted to geometry as was previously thought, scientific treatises likely show that Mamluk authors like Ibn al-Akfānī and al-Qalqashandī thought of *handasah* as an applied science which included subfields related to mathematics, geometry, mechanics, and physics. Treatises on the application of these scientific concepts to the building craft are very likely circulated widely and seem to have been specifically aimed at building craftsmen.

The existence of scientific treatises concerning and directed at the building profession suggest that building, at least at the micro-level, was considered to fall under the science of *handasah* rather than being an unlearned or entirely separate pursuit. This connection has largely been missed by modern scholarship, resulting in Mamluk learned building practices being overlooked as a whole. As there was no independent field of learned knowledge devoted exclusively to the building craft, some modern scholars have concluded that Mamluk building involved no such literate element, and therefore that the building profession exclusively relied on practical expertise. Indeed, unlike medieval Europe, Mamluk Egypt - and likely Islamic lands in general – seem did not develop a separate field devoted to building sciences, and period treatises pertaining to building fell under many of the different sub-fields of *handasah*. However, they shared a theoretical focus, and when these treatises are brought together, they may

be seen as representing a field comparable to architecture in both its practical orientation and theoretical sophistication.

This thesis has also argued that the theoretical knowledge held by a group of educated *muhandisīn*, which appears in architectural, legal, and literary evidence as well as the surviving treatises mentioned above, aided them in producing plans and visual representations and acting as legal experts. It also separated them from normal masons and builders. The professionalisation of this group during the Mamluk period can be seen reflected in the adoption of the term *mi'mār* to refer to those *muhandisīn* at the top of their profession that had both theoretical and practical knowledge. Having these features of scientific literature concerning the construction, visual representation, and distinct identity from ordinary masons and builders allow us to place the Mamluk *muhandis* at the same level of the equivalent architect who emerged in the Italian Renaissance.

This thesis has also re-examined the role of the *muhandis* and *mi'mār* in endowment deeds. Earlier scholarship largely characterised the *muhandis* and *mi'mār* as craftsmen appointed to repair and maintain these foundations. By examining a wider range of endowment documents covering variant functions and purposes, and therefore drawing a more complete image of *muhandis* and *mi'mār* in this context, this thesis revealed their role as professional and supervisory figures distinct from labourers. The *muhandisīn* who worked at endowments and were summoned to the *qāḍī*'s court were considered professionals and authoritative experts at the top of the building profession, not ordinary repair workers and surveyors.

These findings, drawn from the legal, literary, and architectural evidence, should alter our perception of the structure of the building craft in Mamluk Egypt. The lack of evidence of formal building-related education in the Mamluk period led some scholars to assume that construction lacked a taught scientific element. However, it seems instead that theoretical knowledge was likely transmitted via a system of informal education that included the teacher-student relationship, as seen in the example of the scientist Ibn al-Majdī and his student the *muhandis* al-Sijīnī. A similar informality was also reflected in the absence of guild-like institutions. However, these should not lead us to believe that the building craft lacked sophistication and professionalism; just as the place of formal schooling was occupied by treatises and personal relationships, the regulatory role of the guild was filled by ethical and legal guidelines devised by jurists and preachers. This alternative framework of an informal

legal and ethical system aimed to regulate and maintain the practices of building craftsmen.

Overall, it seems that a considerable amount of current scholarship on the Mamluk building profession has been influenced by its Western perspective. Attempts to analyse and judge Mamluk building professionals through the lens of medieval European culture, whose values and traditions differed significantly from those of Mamluk culture, have caused important aspects of the building profession and its practitioners to be missed. To enhance our understanding and gain a complete image of the building craft in Islamic lands, particularly Mamluk Egypt, it should be evaluated according to its own cultural activities and traditions. The use of all available sources, including legal and literary ones, and the piecing together of fragmentary bits of evidence also adds nuance and depth to our current understanding of the building craft and its organization. Sources not previously used to understand the building craft - reading certificates, for instance - are extremely rich in material on building craftsmen, and requires further research and cooperative efforts to reveal their full potential. The same is true for Mamluk literary compositions about craftsmen, of which the majority remain in manuscript, awaiting academic-historical analysis. Integrating different kinds of sources allows us to approach the building profession from many perspectives and sketch a replete picture of its people and nature, situating it more clearly within a medieval Islamic context.

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