

Araştırma Makalesi / Research Article

Mechanical Clocks in the Ottoman Empire: Technological Adoption and Cultural Transformation (16th–19th Centuries)

Osmanlı İmparatorluğu'nda Mekanik Saatler: Teknolojik Benimseme ve Kültürel Dönüşüm (16. ve 19. Yüzyıllar)

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DOI : [10.63556/ankad.v10i1.358](https://doi.org/10.63556/ankad.v10i1.358)

Geliş/Received: 21/10/2025

Kabul/Accepted: 21/01/2026

Abstract

This study examines the development of mechanical clocks in the Ottoman Empire on a century-by-century basis. It critically reassesses Kemal Özdemir's *Clocks from the Ottoman Empire to the Present Day* (1993) and Doğan Gündüz's *Time from Alaturka to Alafranga* (2015), along with the primary sources employed in these works. The study also aims to provide a holistic framework for evaluating the existing scholarship on the subject. Employing a combination of historical research methods and systematic literature review, this study seeks to identify the cultural and institutional factors that shaped the adoption and transformation of mechanical clocks within Ottoman society. In this context, the contributions of Mevlevi clockmakers—who played a significant role in the development of Ottoman horology—are analyzed, and the relationship between Mevlevism and clockmaking is examined. The study demonstrates that the diffusion of mechanical clocks in the Ottoman Empire cannot be attributed to a single cause but rather emerged through the interaction of multiple cultural and institutional dynamics. The philosophical dimensions of time perception related to mechanical clocks fall outside the scope of this study.

Keywords: History of Science; Galata Clockmaking Tradesmen; Mechanical Clocks in the Ottoman Empire; Mevlevi Clockmakers; Ottoman Court Clockmakers

Öz

Bu çalışma, Osmanlı İmparatorluğu'nda mekanik saatlerin gelişimini yüzyıllar bazında ele almaktadır. Araştırma, Kemal Özdemir'in *Osmanlı İmparatorluğu'ndan Günümüze Saatler* (1993) ile Doğan Gündüz'ün *Alaturka'dan Alafranga'ya Zaman* (2015) adlı eserlerini ve bu çalışmalarda kullanılan birincil kaynakları eleştirel bir yaklaşımla yeniden değerlendirmektedir. Çalışma ayrıca, konuya ilişkin bugüne kadar yapılmış araştırmaları bütüncül bir çerçevede incelemeyi amaçlamaktadır. Tarihsel araştırma yöntemi ile sistematik literatür taramasını bir arada kullanan bu çalışma, mekanik saatlerin Osmanlı toplumunda benimsenmesini ve dönüşümünü şekillendiren kültürel ve kurumsal faktörleri ortaya koymayı hedeflemektedir. Bu bağlamda, Osmanlı saatçiliğinin gelişiminde önemli bir yere sahip olan Mevlevi saatçilerin katkıları analiz edilmekte; Mevlevilik ile saatçilik arasındaki ilişki incelenmektedir. Çalışma, mekanik saatlerin Osmanlı'da yaygınlaşmasının tekil bir nedene indirgenemeyeceğini, aksine farklı kültürel ve kurumsal dinamiklerin etkileşimi sonucunda şekillendiğini ortaya koymaktadır. Mekanik saatlerin zaman algısına ilişkin felsefi boyutları ise çalışmanın kapsamı dışında bırakılmıştır.

Anahtar Kelimeler: Bilim Tarihi, Galata Saatçi Esnafı, Osmanlı'da Mekanik Saatler, Mevlevi Saatçiler, Osmanlı Saray Saatçileri

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Önerilen Atıf/Suggestion Citation

Demirhan Çavuşoğlu, H.M., (2026). Mechanical Clocks in the Ottoman Empire: Technological Adoption and Cultural Transformation (16th–19th Centuries), *Anadolu Kültürel Araştırmalar Dergisi*, 10(1), 174-192.

1. INTRODUCTION

Time is more than a physical process; it is also a driving force that shapes how societies function. From the earliest periods of human history, communities have sought ways to record and organize time, devising methods and tools that reflect both necessity and creativity. Such efforts have left a lasting imprint on the development of scientific thought and the structures of social life. Over centuries, the journey from agricultural calendars—designed to follow the rhythm of the seasons—to sundials, water clocks, and mechanical devices transformed the notion of time from an abstract idea into something measurable and standardized.

Within this wider historical frame, the topic of mechanical clocks in the Ottoman Empire has been a recurring subject of scholarly interest in Turkey during the Republican era. Early examples include Ülkümen's (1961) article *Saatçiliğimiz* and Tuzcular's (1977) study *Türk İskelet Saatleri*. Ülkümen's (1961) article makes significant contributions to the history of mechanical clocks in the Ottoman Empire, while Tuzcular (1977) focuses particularly on Mevlevi clockmakers. Dizer (1986) contributed with *İslam'da ve Osmanlılarda Saat*, which examined the subject in greater depth. A distinct contribution to the field came from Uluengin (2010: 17–36) with *Secularizing Anatolia Tick by Tick: Clock Towers in the Ottoman and the Turkish Republic*, which approached the subject from a social perspective.

The field took a significant turn with Özdemir's (1993) *Osmanlı'dan Günümüze Saatler*, which surveyed Ottoman horology from multiple perspectives and became a cornerstone for later research. Subsequent works built on this momentum: Gürbüz's (2011) *Saat Kitabı* offered a vivid narrative that questioned the mechanical perception of time, while Çakmut and Gürbüz (2012) coauthored *Topkapı Sarayı Saat Koleksiyonu – Dünyanın Kışkandığı Saatler*, providing a detailed account of the palace's distinguished collection. More recently, Wishnitzer's (2015) *Reading Clocks, Alla Turca: Time and Society in the Late Ottoman Empire* and Gündüz's (2015) *Alaturkadan Alafrangaya Zaman* combined historical perspective with meticulous analysis, adding further depth to the literature. More recently, Günergun's (2023) article "Timekeepers and Sufi Mystics: Technical Knowledge Bearers of the Ottoman Empire" examined timekeepers and Sufi mystics—particularly Mevlevi dervishes—as central actors in the transmission and practice of technical knowledge related to mechanical clocks in the Ottoman Empire.

While this existing body of work forms an essential foundation, the present study draws heavily on the structure, conceptual framework, and primary sources in Özdemir's (1993) research. Rather than merely repeating his conclusions, present study critically re-examines the same archival materials and supplements them with additional evidence, aiming to present a concise and interpretive account of how mechanical clocks became part of the Ottoman world. This research makes two significant contributions. First, spans centuries (15th–19th centuries), offering a structured view of technological change alongside cultural adaptation. Second, it applies a multidisciplinary perspective, combining the technological, social, cultural, and diplomatic dimensions of clockmaking.

The study addresses several guiding questions: How were mechanical clocks first introduced into Ottoman society? Which factors encouraged their adoption? In what ways did elite patronage and institutional structures foster local clockmaking? How did religious communities, particularly the Mevlevi order, come to occupy a central position in this craft? And more broadly, what does the evolution of Ottoman clockmaking reveal about technology transfer and cultural adaptation in pre-modern Islamic contexts?

2. METHOD

This study applies a broad methodological framework, bringing together elements of historical analysis and perspectives from cultural studies. This approach makes it possible to explore, in a multifaceted way, the intricate processes of technological transfer and cultural adaptation within the Ottoman Empire.

2.1. Primary Source Analysis

This study systematically examines primary sources such as Ottoman archives, Taqī al-Dīn's works on clocks, Evliya Çelebi's *Seyahatname*, and contemporary European accounts. A significant portion of

these materials also appears in the works of Özdemir (1993) and Gündüz (2015). In addition, the research draws on Mevlevi diaries, as well as the studies of Gölpinarlı (1953) and Ünver (1964). All sources are compared within their historical contexts to construct accurate chronologies and identify patterns of development. The analysis applies established principles of historical source criticism to assess each source's authenticity, reliability, and potential biases.

2.2. Multidisciplinary Approach

The methodological framework draws upon perspectives from various fields such as the history of technology, cultural studies, religious history, and diplomatic history. By combining these viewpoints, the study offers a broader understanding of how technological advancements interacted with the social, cultural, and religious dynamics of Ottoman society. To explore how European clockmaking expertise was reshaped within Ottoman contexts, the research applies analytical models derived from studies on technology transfer.

2.3. Chronological Analysis Framework

The research organizes its findings chronologically, tracing the development of mechanical clocks in the Ottoman Empire from their initial arrival as diplomatic gifts from Europe to the maturation of local production. This temporal framework enables a systematic examination of technological progress while emphasizing the social and cultural factors that shaped the distinctive features of each period. The chronological approach also facilitates the identification of significant transitions and turning points in the history of Ottoman horology.

2.4. Limitations and Scope

This study is subject to several limitations. Because the study covers a broad chronological period, a comprehensive archival investigation of Ottoman records was not feasible. The available materials are predominantly drawn from elite-oriented sources, which may not fully capture the perspectives of ordinary artisans or everyday users. As the study is based primarily on Istanbul records, it is unable to reveal the impact of regional differences on clock production. The temporal breadth of the research necessitates a selective treatment of specific periods and developments.

Within this methodological framework, the analysis is structured chronologically: it begins with the introduction of mechanical clocks to the Ottoman Empire in the 15th century, proceeds to examine Taqī al-Dīn's scientific contributions in the 16th century, continues with the transition to indigenous production in the 17th and 18th centuries, and concludes with the 19th-century golden age of Ottoman horology. This organization enables a systematic review of technological progress while underscoring the social and cultural contexts that shaped the distinctive character of each era.

Ethics Committee Approval

The conceptual framework of this research, the collection of data, and the analysis and interpretation of data were conducted in full compliance with ethical guidelines. The ANKAD Journal Editorial Board bears no responsibility for any ethical violations that may arise. All responsibility lies with the author. I declare that this study has not been submitted for evaluation to any academic publication medium other than the ANKAD Journal. All rules specified in the "Higher Education Institutions Scientific Research and Publication Ethics Guidelines" have been complied with in this study. None of the actions listed under the heading "Actions Contrary to Scientific Research and Publication Ethics" in the second section of the guidelines has been carried out. This research has utilized publicly available primary sources. As the document analysis technique was used, it does not require approval from an ethics committee.

3. THE INTRODUCTION OF MECHANICAL CLOCKS INTO THE OTTOMAN EMPIRE AND 16TH CENTURY OTTOMAN CLOCKS

Belon (2022: 178) stated in 1547 that no clocks existed in the Ottoman territories, noting that the call to prayer from minarets determined time. A similar observation is found in Busbecq's letters from 1553, where he reported that the Ottomans had not yet adopted the use of clocks (Busbecq, 2002: 27). However, Ottoman sources presented a different picture. An event narrated in the *Künhü'l-Ahbâr*, written by Gelibolulu Mustafa Ali between 1592 and 1598, challenges this view (Dursun, 2015: 54). Ali recounts that during a banquet, the thief was exposed by the sound of the stolen clock, which suggests

that such devices were known in Ottoman society at the time. Moreover, Galata Court records from 1578 and 1599 list clocks as inheritance items (Galata Mahkemesi, 2011: 33/73; 2012: 35/95). This indicates that their use extended beyond the palace by the late sixteenth century. This contradiction between European observations and Ottoman sources reflects the selective nature of technological adoption in the Ottoman Empire. European travelers focused on public timekeeping mechanisms, while Ottoman sources revealed that clocks functioned primarily as luxury objects within elite circles before broader social penetration.

The exact date of the introduction of mechanical clocks into the Ottoman Empire remains uncertain, although the last quarter of the fifteenth century is considered the probable starting point. Following the 1479 peace treaty with Venice, Mehmed II requested a clockmaker and a skilled painter from the Venetian lord. It is unknown whether the clockmaker arrived. However, historical records confirm that Giovanni Bellini came to Istanbul. This suggests that it is likely a Western clockmaker accompanied him (Kurz, 2005: 26).

Ülkümen (1961: 16) supported the view that mechanical clocks were introduced in the late fifteenth century. According to Ülkümen, the expression *Frengî saat* “Frankish clock” in the Enderun Treasury register dated 10 Sha’ban 910 (15 January 1505) implies that mechanical clocks had reached the Ottoman Empire prior to this date and that the entry recorded in the register does not represent the first instance of their importation. In addition, the terminology reflected the Ottoman perception of these devices as distinctly European innovations.

The first mechanical science treatise also dates to Mehmed II’s reign. Alā al-Dīn al-Kirmānī wrote *Bedāyi’u l-‘A’ māl fī Şanāyi’i l-‘Hiyal* in Persian during the 9th/15th century² (İhsanoğlu et al., 2006: 16; Demir & Gökdoğan, 2023: 105; İzgi, 1997: 131). This represented the first known mechanical work in the Ottoman world dedicated to Mehmed II. The work included a clock section detailing forms, purposes, construction methods, and mechanical experiments.

During Bayezid II’s reign (1481–1512), interest in clocks persisted. As a result of his repeated requests to the West, Bayezid acquired mechanical clocks. He demonstrated such profound horological interest that he issued an order to find a clockmaker capable of replicating a specific clock in his possession. When no such artisan could be found within the Ottoman Empire, the clock was sent to Khorasan, another region within the Islamic world. By the end of the fifteenth century, the Iranian engineer Hāfiz Isfahānī³ (Muḥammad Mukhtār) understood the mechanism. He drew detailed plans and constructed two clocks—one portable and the other stationary (Nourbakhsh, 2008: 552; Mohebbi, 2025). This marked the first clock known with certainty to have reached the Ottoman palace (Gündüz, 2015: 53). Archival records indicate that the number of clocks in the palace increased substantially in the following years. In the Enderun Treasury registers dated 1519–1520 (BOA, TS. MA.d, 3-0002), clocks were listed alongside other valuable items, suggesting that by the early sixteenth century, mechanical clocks had become familiar objects within the Ottoman court.

During Sultan Suleiman's reign (1520–1566), horological interest further increased. Venetian craftsmen were aware of the Sultan's enthusiasm and produced custom clocks for Ottomans. Marino Sanudo mentioned a gold alarm ring made for the Ottoman court (Özdemir, 1993: 67). Western sources confirmed that Giorgio di Vicenza, a renowned automaton maker, created this piece for the Sultan. Another notable example involved the clock sent to Sultan Suleiman by King Ferdinand. This followed the Ottoman conquest of Hungary's capital in 1541. Ferdinand's ambassador presented the clock before the Sultan's departure from Budapest. The device was large enough to require twelve men for transport (Dizer, 1986: 10). It displayed time and indicated planetary movements through complex gear systems. Historian Hammer noted it came with a master and instruction manual (Hammer, 1992: V/252).

² Since the original manuscript of the work could not be accessed, no information could be obtained about the nature of the mentioned clock.

³ Isfahani was a painter and bookbinder in the palace of Sultan Hussein Baykara (873-911/ 1469-1505) in Iran. He wrote a book called *Natīfetü l-Devla*. In this book, he explains how to make clocks and other inventions. See, Nourbakhsh, Mohammad Reza (Farhad). “Iran’s Early Encounter with Three Medieval European Inventions (875-1153 AH/1470-1740 CE).” *Iranian Studies* 41/4, 2008, 549–58, 552. JSTOR, <http://www.jstor.org/stable/25597489>. Accessed 10 Oct. 2024

Historical sources indicated that Suleiman, possessing astronomical knowledge, scrutinized this machine (Cezar, 2021: II/1019).

Otto Kurz observed that Europeans answered "What do you give someone who has everything?" with clocks (Kurz, 2005: 28). This demonstrated the strategic diplomatic value of mechanical clocks. Following Austrian precedent, French diplomats also employed clocks. In 1547, the French King gifted Suleiman an expensive clock functioning as a tabletop fountain (Dizer, 1985: 10). Throughout the 16th century, France continued sending valuable clocks including fob watches and table clocks. By the mid-sixteenth century, in the Ottoman Empire, clocks were no longer a luxury reserved solely for the Sultan. During this period, it became common practice to present clocks as gifts to local administrators and bureaucrats. In a letter written in 1558, the French ambassador in Istanbul informed his colleague in Venice of the Sultan's persistent requests for clocks and his custom of carrying ten or twelve clocks with him while hunting (Kurz, 2005: 29). It is likely that the Sultan used these clocks as gifts for people in his entourage. This distribution reveals the mechanisms of technological dissemination throughout the Ottoman administrative hierarchy. The Sultan's practice of carrying multiple clocks for gift-giving indicates that clocks had become standardized instruments of imperial favor.

Murad III (1574–1595) was renowned for his fascination with mechanical timekeeping. After Selim II's death, Maximilian sent his ambassador to Murad III, intending to ensure the continuation of capitulations during the new Sultan's reign. The Ottoman Empire agreed to this request but delayed signing the agreement until enthronement gifts were received (Özdemir, 1993: 73, Hammer, 1992: VII/14). A delegation of fifty individuals, led by palace counselor Frederick of Bohemia, presented Murad III with thirty thousand ducats, six exquisitely crafted hanging clocks, and numerous valuable gifts. These clocks were considered the most precious timepieces to have reached the Ottoman Empire up to that point (Ahmed Rasim, 2017: II/366).

The circumcision ceremony held in 1582 for Prince Mehmed, son of Murad III, in the Atmeydanı provided crucial information for Ottoman horological history. Historical documents recorded that clocks among these gifts were primarily given by local guests. Among the Third Vizier Sivayuş Pasha's gifts were two alarm clocks and an alarm clock with a gold star for the prince. The Fifth Vizier, Mahmud Pasha, gifted a magnificent alarm clock to Sultan Murad III and a German clock to the prince (Özdemir, 1993: 69). These gifts demonstrated the central role of clocks for the Ottoman elite and their prevalence during this period. Another noteworthy aspect of the festival for horological history was the presentation of gifts to the Sultan by Istanbul's tradesmen and artisans and their participation in the parade. Among them was the group of clockmakers–*saatçiyân* (Ülkümen, 1961: 18). Historical records effectively described the clockmakers' parade and emphasized their punctuality

During Murad III's reign, the palace members' horological interest was crucial in forming the "clockmaker" class. Foreign ambassadors were known to bring clockmakers when presenting gifts to the Sultan. Protestant Pastor Schweigger, who came to Istanbul with the Austrian embassy in 1578, mentioned that valuable clocks gifted to the palace were piled in a room and left to deteriorate (Gürer, 2024: 739). While this statement expressed the palace's difficulty in finding master clockmakers, Dominico Yerushalmi, who served as palace physician to Murad III, made the opposite claim. He stated that specially trained palace pages were available to repair clocks whenever necessary, which seems more consistent with the Sultan's passion for horology (Kurz, 2005: 43).

Among the earliest archival records from this period in which the term "clockmaker" appears is a document pertaining to Clockmaker Hasan⁴, a statesman known for his close association with the Sultan (BOA, A. {DVNSMHM.d}, 25-3106, H. 27-08-982). Additional documents from the same period refer to Clockmaker Pervane, European Clockmaker Hüseyin and Clockmaker Sefer (Özdemir, 1993: 72). Archival evidence indicates that these masters employed two to four apprentices and that some European

⁴ Clockmaker Hasan is a very close confidant of Murad III. Clockmaker Hasan left the palace for a short time and served as governor of Diyarbakır, then returned to the palace again. After the return of the clockmaker Hasan, Murad III, who had a dream interpreted, understood from the interpretation of that dream that he would die. After the dream, the Sultan felt a slight pain in his stomach and retired to the Sinan Pasha Mansion and died the next day. See, Ülkümen, "Saatçiliğimiz", 19.

masters converted to Islam (Gündüz, 2015: 68, A. {DVNSMHM.d...}, 7-2413, H-09-05-976). The presence of clockmakers in the 16th-century Ottoman Empire extended beyond palace masters. This was revealed by German traveler Lubenau's writings from his 1580s Istanbul visit. Lubenau mentioned German, English, French, and Italian clockmakers residing in Galata (Gürer, 2024: 734).

Another crucial aspect of Murad III's reign was the introduction of British-made clocks to the Ottoman palace. During Elizabeth I's reign, the British sought to employ clocks, as other European powers did, to secure Ottoman support in the Spanish wars. In 1583, Ambassador William Hareborne, representing the Turkish Company, came to the Ottoman Empire to obtain capitulation rights similar to those granted to the French. He brought precious gifts, including a valuable clock adorned with silver, gold, and precious stones (Yıldız, 2006: 923). Historical sources recorded that Murad III was greatly impressed by this magnificent automaton.

The evidence presented demonstrates that, contrary to some claims, mechanical clocks were widely used in the Ottoman Empire during the sixteenth century. Clocks were perceived as prestige instruments during this period. The court's horological interest transformed clocks into matters of prestige. Clockmaking developed into both an art and a profession.

3.1. Mechanical Clocks in Taqī al-Dīn's Work

Sultan Murad III's horological interest fostered scholarly engagement in clockmaking. The earliest records of Ottoman mechanical clock construction are attributed to Taqī al-Dīn al-Rāşid (d. 1585), a distinguished Ottoman scholar who made substantial contributions to astronomy and clockmaking. Taqī al-Dīn served as chief astrologer–*müneccimbaşı* during Sultan Selim II's reign. Initially, he conducted observations at Galata Tower. Subsequently, he established operations at the observatory constructed on the Tophane hills. There, he founded a library and built various astronomical instruments. Taqī al-Dīn systematically recorded his observatory observations in *Sidretü'l-Münteha*. The third section provides detailed descriptions of instruments he constructed within the observatory. The final instrument described relates specifically to a mechanical clock (Tekeli, 2002: 3). Additionally, the treatise *Alât-ı Rasadiye li Zic-i Şehinşâhiye*, authored by an unknown writer, describes Taqī al-Dīn's observation instruments (Tekeli, 2002: 3). This treatise systematically catalogs nine distinct observatory instruments. The final instrument described is again a mechanical clock. The work consistently emphasizes the mechanical clock's exceptional punctuality.

Taqī al-Dīn's comprehensive work *al-Kawâqib al-durriyya fî vaz'îl-benkâmâti al-devriyya* (1556) constitutes a landmark achievement in mechanical clockmaking literature. This treatise was published by Sevim Tekeli under the Turkish title *16. Yüzyılda Osmanlılarda Saat ve Taqī al-Dīn'in 'Mekanik Saat Kônstrüksüyönuna Dair En Parlak Yıldızlar' Adlı Eseri*. In his scholarly introduction, Tekeli observed that this valuable work constitutes the earliest documented treatise on mechanical clocks and clockmaking within the Islamic world. Although Tekeli's assessment was grounded in Taqī al-Dīn's explanation (Tekeli, 2002: 3), European scholars subsequently expanded upon this observation. Related scholarly sources indicate that Taqī al-Dīn authored the first comprehensive study providing detailed clockmaking methodologies in the 16th century. This achievement occurred both within the Islamic world and Europe (Gündüz, 2015: 60). Within this context, Taqī al-Dīn's work constitutes a pioneering achievement of universal value. It demonstrates both sophisticated technical knowledge and advanced engineering comprehension.

In his work's introduction, Taqī al-Dīn documented his extensive mathematical education. He mentioned reading all available mathematical books during his childhood. He systematically examined numerous works explaining mechanical instrument principles (Tekeli, 2002: 42). Subsequently, Taqī al-Dīn documented his observations of diurnal and nocturnal duration using various instruments. The most sophisticated and advanced instruments were mechanical clocks. Taqī al-Dīn observed that mechanical clocks accomplished numerous functions impossible with traditional astrolabes and dials. However, he noted that the concept of mechanical clocks being easier to measure was not widely accepted among Islamic societies. From Taqī al-Dīn's documentation, it becomes evident that initial mechanical clock information entered the Ottoman Empire through European sources. Nevertheless, Taqī al-Dīn employed these clocks primarily in astronomical observations.

Later in his work, Taqī al-Dīn referenced Ali Pasha with considerable praise, describing him as "The owner of the State and Nobility, worthy of all kinds of praise." Historical sources identify Ali Pasha as Semiz Ali Pasha (d. 972-973/1565), who served as Grand Vizier between 1561 and 1565. Taqī al-Dīn worked as a professor (*müderriş*) at Edirnekapı Madrasa during Semiz Ali Pasha's Grand Viziership. During this period, he benefited from Ali Pasha's personal library and clock collection. In his scholarly work, Taqī al-Dīn emphasized his systematic examination of Ali Pasha's mechanical clock collection. He meticulously examined each timepiece until he fully grasped their technical mechanisms (Tekeli, 2002: 43). This detailed account reveals the crucial role that elite patronage played in Ottoman technological development. Since Ali Pasha's clocks were probably European in origin, the physical source of Taqī al-Dīn knowledge was European clockmaking technology.

The book consists of two articles and a conclusion, providing comprehensive coverage of mechanical clockmaking. The first article concerns weight-driven clocks and consists of four sections (Tekeli, 2002: 53). Notably, in the first section, Taqī al-Dīn mentions pocket clocks as known and used timepieces. These emerged only with mainspring introduction (Tekeli, 2002: 90). Furthermore, in the fourth section, Taqī al-Dīn's statement about displaying elements other than minutes on clocks provides noteworthy information for horological history. Tekeli comments that Taqī al-Dīn was among the first to compartmentalize the minute (Tekeli, 2002: 15). The second article focuses specifically on spring-powered clocks. The article's beginning describes mainspring construction in detail (Tekeli, 2002: 115). The concluding section addresses arts required for clockmaking engagement (Tekeli, 2002: 118-120). When analyzed comprehensively, the book presents all information necessary for constructing clocks with the period's most advanced elements.

As mentioned, this mechanical clock treatise by Taqī al-Dīn constitutes the first and only work of its kind from that historical period. The book's sources are particularly interesting from multiple scholarly perspectives. In his work's introduction, Takī al-Dīn documented that he gained mechanical clock component knowledge by studying timepieces brought from Europe by Ali Pasha. Nevertheless, various theories about Taqī al-Dīn's possible additional sources have been proposed, especially in foreign literature.

These sources indicate that Taqī al-Dīn stayed with a mathematician in Rome for a certain period (Kurz, 2005: 47). George Saliba discovered a manuscript in Tunisia's National Library containing a note written by Taqī al-Dīn. In this text Taqī al-Dīn argued that referring to Italian sources would be more accurate. This information supports the hypothesis that Taqī al-Dīn possessed knowledge of Italian. Related sources suggest that **Taqī al-Dīn, being** familiar with Italian, gained knowledge about mechanics and the universe's mechanical perspective during his time in Italy (Ben-Zaken, 2024: 147). Additionally, scholarly sources suggest that Ben-Shushan-Davut el-Riyazi, a Jewish mathematician who fled from Venice to Thessaloniki in 1550, may have assisted Taqī al-Dīn in mechanical studies. He subsequently began working in Taqī al-Dīn's observatory (Ben-Zaken, 2024: 141).

Regardless of Taqī al-Dīn's specific sources, *al-Kawâqib al-durriyya* demonstrates conclusively that mechanical clocks were known in Ottoman lands when the book was written. These timepieces generated considerable scholarly interest, meriting a comprehensive treatise. This treatise constitutes not only the earliest documented work on mechanical clockmaking in the Islamic world but also a significant contribution to global horological literature of the 16th century.

4. CLOCKS IN THE OTTOMAN EMPIRE DURING THE 17TH AND 18TH CENTURIES

The prestige that clocks had gained at the Ottoman court during Murad III's reign continued throughout Mehmed III's reign (1595-1603). Toward the end of 1598, England, seeking renewal of capitulations, presented a magnificent gift to the new Sultan. This gift was an organ clock crafted by the English organ builder Thomas Dallam (Kurz, 2005: 41). At the Sultan's request, Dallam installed the organ clock in one of the harem pavilions. The mechanisms were shown personally to the Sultan and a large group of palace officials (Yıldız, 2006: 927). Before leaving Istanbul, Dallam relocated the organ clock to one of the palace's seaside pavilions, once again upon the Sultan's request. Ultimately, this magnificent clock met an unfortunate end. Ahmed I (1603–1617), after ascending the throne, considered figural representations inappropriate, including those placed in the palace. Upon entering the mansion in which the clock was located, he destroyed it with his bare hands (Yıldız, 2006: 929). The Sultan's action

prevented similar clocks from entering the palace. European ambassadors subsequently avoided sending automata decorated with figurines. After this date, figurines on clocks became rare (Gündüz, 2015: 81). Dallam's clock held an essential place in Ottoman horological history, both for its magnificent beauty and for its role in shaping the palace's subsequent clock preferences.

Historical documents from Murad IV's reign (1623–1640) indicated that clockmakers continued residing in Galata during this period. Most of these artisans belonged to a small community of Genoese Calvinist clockmakers. Since documents related to this community date from the early 17th century to the third quarter of the 18th century, Genoese clockmakers are considered to have remained influential in Ottoman territory for approximately a century and a half (Gürer, 2024: 734). Isaac Rousseau, father of the famous philosopher Jean-Jacques Rousseau, was among these Genoese clockmakers working in Galata. In his *Confessions*, Rousseau mentions that his father worked as a clockmaker in Istanbul after his brother's birth (Gürer, 2024: 743). The influence of these Genoese craftsmen who settled in Galata played an important role in establishing clockmaking within Ottoman society. The artisans engaged in clockmaking in Galata also employed some Ottoman subjects. However, these individuals were generally Christians. As Özdemir pointed out, this reinforced the idea that Turkish clockmakers were primarily trained at the Ottoman palace rather than in Galata (Özdemir, 1993: 79).

The *Ehl-i Hiref* organization managed the Empire's artistic activities at the Ottoman court. The artists and artisans who comprised this organization operated in accordance with the palace's demands and needs. The organization, which had begun at Edirne Palace during Mehmed II's reign (1451–1481) and continued at the old and new palaces after Istanbul's conquest, experienced significant development during Bayezid II's reign (1481–1512) (Uluskan, 2021: 851). The *Ehl-i Hiref* registrations from 964-965/1557 mentioned two clockmakers: Ahmed b. Karagöz and Halil bin Musa, along with two clockmaker apprentices: Mahmud Rum and İskender Rum (Yaman, 2008: 62). The 1004-1005/1596 registration from Mehmed III's reign recorded clockmaker Hüseyin Abdullah Saati (Akcan Ekici, 2013: 112). Additional 16th-century clockmakers included Bülbül and Yusuf Çelebi (Biçici, 2012: 152). These records indicate the existence of clockmakers among palace artisans, though they were not yet mentioned as an independent class within the *Ehl-i Hiref* organization. A crucial development occurred in 1671 when some classes were abolished and new ones were added. Among the new classes admitted into the organization were clockmakers. In registrations after 1082/1671, clockmakers and envelope makers were mentioned together under the names "Cemaat-i Saatçıyan" and "Zarfçıyan-ı Hazine-i Enderûn-ı Hassa"–Clockmakers' Guild and Enderûn Treasury Envelope Makers. The term "envelope makers" referred to artisans responsible for creating the cases that housed clocks. The relevant ledger records two individuals in this joint category. This combined class appears most frequently in seventeenth-century *Ehl-i Hiref* registers dated 1085/1675, when its membership increased from two to four. In 1677, the number fell back to two, and by 1690, only a single member remained (Akcan Ekici, 2018: 162).

The first recorded mention of clockmakers as an independent class within the *Ehl-i Hiref* organization appears in the ledger dated 1102/1691, under the title *Saatçıyân-ı Hassa* (Palace Clockmakers' Guild). Only one member, Abdurrahman, is listed, and he remained the sole representative of the guild until 1712 (Akcan Ekici, 2021: 160), serving as chief clockmaker from 1705 to 1712 (Özdemir, 1993: 113). Further evidence of seventeenth-century clockmaking activity is found in contemporary Ottoman price regulations (*narh* registers), which established fixed prices for certain goods to prevent market instability and maintain economic balance. The 1640 *Narh* register contains detailed entries on clocks and clockmakers, naming Gashber, Petro, Benjamin, Kiryo and Adem alongside recorded discount rates for various clock types. Terminology such as "clock," "moon-phase clock," and "single-handed clock" in the register indicates that these mechanical timepieces were already in use within the Ottoman Empire by 1640 (Kütükoğlu, 1992: 58).

The 1640 *Es'ar* register constitutes another valuable source for Ottoman economic and technological history. Serving not only as a price list but also as an inventory of goods and services, it records a group of tradesmen identified as *Saatçıyân*–Clockmakers and notes the payments received by Petro, Benjamin, Kiryo and Adem for their work (Yücel, 1992: 100). The document lists a variety of timepieces, including tower clocks, alarm clocks, pocket watches, wall clocks, hour-and-minute clocks, and moon-and-day

clocks. Collectively, these records shed light on both the diversity of clock types in circulation during the period and the artisans responsible for their production and maintenance (Özdemir, 1993: 109–111).

Seventeenth-century Topkapı Palace records showed that courtiers' interest in clocks continued growing. The estate register of Turhan Valide Sultan, mother of Mehmed IV (1648-1687), recorded after her death in 1682, mentioned numerous clocks of different types (Özdemir, 1993: 81). The pendulum clocks among those left by Valide Turhan Sultan were particularly noteworthy in Ottoman horological history. Pendulum clocks, which had been introduced in Europe, in 1640 were adopted in the Ottoman Empire shortly thereafter, demonstrating a rapid embrace of technological innovation. Furthermore, Istanbul court records dated 1740 reveal that pendulum clocks had extended beyond the confines of the palace and were in use across the broader urban landscape during the 18th century (Bab Mahkemesi, 1740: 9, 383).

The 17th century marked a pivotal period for Ottoman clockmaking. In addition to a wide variety of clocks from European states, Turkish-made clocks began appearing in the Ottoman palace. The earliest dated Turkish clocks belonged to this century. During this period, when numerous valuable clockmakers were trained, the traditional astrolabe form continued in Turkish clocks (Tuzcular, 1977:72). Two of the most beautiful examples of this form were the hanging plate clocks in the Topkapı Clock Collection, produced by masters Şahin and Bulugat (Çakmut & Gürbüz, 2012: 33). These clocks exemplified fine craftsmanship and represented the successful adaptation of European mechanical technology to Ottoman aesthetic preferences. The Topkapı Museum clock collection contained an additional 17th-century example. Another important clock from the same period was a lantern wall clock signed "Abdurrahman" and a silver table clock by Mustafa Aksarayi (Dayıoğlu, 2010: 143).

A particularly remarkable Turkish clock dating to the end of the 17th century was the breast clock signed by Şeyh Dede and dated 1702 (Çakmut & Gürbüz, 2012: 34). Manufactured with three dials and a domed shape, this lunar-day clock was similar to clocks produced in Europe at the time. The fact that the clock displayed both Hijri and Rumi dates together held particular importance in the Ottoman horological context (Gündüz, 2015: 111). Another notable feature of Şeyh Dede's clock was that it represented the earliest known example of a clock crafted by a dervish. The skill of Mevlevi dervishes in clockmaking and the value they added to this field first manifested with Şeyh Dede (Günergun, 2021: 58).

During the 17th century, clocks began spreading not only within the palace but throughout the Ottoman Empire. While earlier references to clocks had been confined to Galata district court records, mentions of clocks increasingly appeared in judicial records from various parts of Istanbul and regions beyond the capital. Judicial records from this era provided crucial information regarding the earliest Muslim clockmakers operating outside the palace. A court document dated 1618 from Istanbul may be considered one of the earliest written sources referencing Muslim clockmakers (Maden, 2024: 157, 163, 167, 346; 76; Kuşu, 2009: 55). The document mentioned "Clockmaker Ahmet Bey" in the context of charitable donations. Additional names such as Clockmaker Ebu Bekir Ağa, Clockmaker Mustafa, and Clockmaker Mehmed, found in Istanbul court records from the late 17th century, indicated the increasing number of Muslim clockmakers during this period. Another notable development was the introduction of mechanical clocks into muvakkithane, the official Ottoman timekeeping institution (Gündüz, 2015: 151). By the end of the 17th century, the widespread use of mechanical clocks in these institutions had become evident.

The Clockmaker Organization, which had existed with one person in Ottoman salary registers between 1698 and 1711, expanded to two people after this date (Yaman, 2008: 160–161). Uzunçarşılı, in his study on Ottoman palace organization, mentioned the existence of two clockmakers among the artists forming the special Ehl-i Hiref organization in the mid-18th century (Uzunçarşılı, 1981: 463). Among the clockmakers of the Ottoman Empire during the 18th century were Abdurrahman Çelebi(BOA, TS.MA.d.2352, 1104/1692), Derviş Yahya, his student es-Seyyid Mustafa, Vidinli Mustafa, Zemberekçioğlu, and Edirneli İbrahim (Gürbüz, 2011: 49). As a result of Selim III's closeness to the Mevlevi order, members such as Osman, Kuru Ali, and Enderûnlu Zihni successfully produced numerous different clock examples, including English and Viennese clocks, as well as the first examples of skeleton clocks (Gürbüz, 2009: 98)

During the 18th century, British influence began manifesting in Ottoman clockmaking. With this influence, wall clocks and shelf clocks with alarms, primarily weight-driven, were produced (Tuzcular, 1977: 72-77). Palace records from the 18th century clearly indicated that the number of English clocks in the palace increased rapidly. One notable British clock was housed within the Topkapı Dagger, made by Mahmud I in 1741 to be sent to the Iranian ruler Nadir Shah. The dagger was returned because the Shah was killed in an internal rebellion. An English clock was placed under the hilt cover of the dagger, which was made of gold and decorated with diamonds and rubies (Yıldız, 2006: 944).

When 18th-century Ottoman clockmaking was evaluated as a whole, it became clear that English clock influence had increased in the palace, unlike previous periods. This marked a crucial shift in the sources and styles of clocks favored by the Ottoman court, reflecting broader changes in diplomatic relationships and technological preferences during this period.

4.1. Clocks in the *Seyahatname* - The Travels Book of Evliya Çelebi

One of the primary sources for seventeenth-century Ottoman history, the *Seyahatname*, provides valuable insights into the Ottoman Empire's timekeeping culture. Evliya Çelebi, the author, was the son of Derviş Mehmed Zilli Efendi, who served as the Imperial Palace's chief jeweler (Saray-ı Âmire). Educated at the Enderun School, Evliya Çelebi likely developed a particular horological interest through the professional and artisanal connection between clockmaking and jewelry during this period. Throughout the *Seyahatnâme*, Evliya Çelebi offered detailed descriptions of clock towers in cities he visited and made frequent references to various clock types. Clocks appeared not only as functional instruments but also as social prestige markers that were frequently exchanged as elite gifts. Notably, Evliya Çelebi recounted receiving valuable clocks from prominent statesmen on several occasions. These accounts suggest that clocks held symbolic and diplomatic value within Ottoman elite cultural practices.

The *Seyahatnâme* mentioned a wide range of clocks, including breast clocks, envelope clocks, jeweled clocks, engraved clocks, dial clocks, and diamond clocks (Evliya Çelebi, 2011, Vol. 7.2: 174-186). The diversity of these references showed not only the proliferation of clock technology in Ottoman society but also its aesthetic and cultural significance during the seventeenth century. This wealth of detail extended beyond clock type descriptions and symbolism to include Evliya Çelebi's vivid portrayals of individual clockmakers.

Evliya Çelebi's detailed and imaginative narrative style was evident in his writings on clocks and clockmakers. While describing Hezargrad city, he mentioned a blind clockmaker named Mehmed Efendi. According to Çelebi, Mehmed Efendi was said to have been blind from birth yet was a highly skilled master clockmaker. Çelebi recounted that all of Mehmed Efendi's tools were arranged to his right and left, including his hammer, bellows, tongs, and other clock repair instruments. When a clock was brought to his desk for repair, Mehmed Efendi would first smell it briefly before opening it. He then examined its interior, placed a piece of leather on his knee, and methodically removed each component. These included the pear-shaped gear, pendulum, pressure pump, and spring, setting them aside. He would then straighten any bent parts and repair broken ones (Evliya Çelebi, 2012, Vol. 3.2: 408).

The level of technical detail Çelebi provided in describing inner workings of clocks suggested that he was familiar with such mechanisms. This supported the interpretation that, as a court jeweler's son, he was knowledgeable about clock components and their function. Evliya Çelebi's accounts were not limited to professional clockmakers but also praised clockmaking skills among ruling class members.

Another clockmaker mentioned in the *Seyahatnâme* was Abdal Han, Khan of Bitlis. Çelebi stated that Abdal Han was an excellent clockmaker with numerous skills. According to Çelebi, Abdal Khan could make gold-plated clocks, clocks with prayer beads, zodiac clocks with day and month indicators, and alarm clocks. He was also skilled in making clocks placed in rings (Evliya Çelebi, 2010, Vol.4.1: 148). Beyond his technical skills, Abdal Khan's involvement in clockmaking showed the extent to which this craft had penetrated various levels of Ottoman society, including the provincial elite.

The most interesting information about clocks and clockmaking in the *Seyahatnâme* was in the lines where it was explained that clockmaking was a profession dating back to the Prophet Yusuf. Evliya

Çelebi in the second volume of his *Seyahatnâme*, stated that Prophet Joseph, who was thrown into prison, made a wooden clock to perform his prayers on time (Evliya Çelebi, 2017, Vol. II: 502). From this point of view, he emphasized the difficulty and sanctity of the clockmaking profession and revealed the value and place of clocks and clockmaking in Ottoman society. The belief system that placed professions on a sacred ground was an essential way of thinking that shaped Ottoman artists and craftsmen.

The *Seyahatnâme* served as a crucial primary source for understanding social and cultural dimensions of clockmaking in 17th-century Ottoman society. Evliya Çelebi's observations demonstrated that clocks had become integral to Ottoman material culture, serving not only practical functions but also symbolic roles as markers of status, craftsmanship, and technological sophistication. The detailed descriptions of clockmakers and their techniques provided valuable insights into technical knowledge and artisanal practices that characterized Ottoman horology during this formative period.

5. 19TH CENTURY OTTOMAN CLOCKMAKING AND MEVLEVI CLOCKMAKERS

The 19th century represents the most productive period of Turkish clockmaking (Tuzcular, 1977: 72). During this period, skeleton clocks continued to be made by Mevlevi clock masters. Skeleton clocks first appeared in France in the late 18th century. They began to be produced in the Ottoman Empire before England (Tuzcular, 1977: 73). Skeleton clocks display their entire mechanical parts within glass cases. They are made in the form of a covered Mevlevi coin. These clocks, without envelopes, were made by placing them on four-legged wooden or metal tables. They were signed and sometimes dated by their craftsmen themselves. The transfer of clockmaking mastery from father to son, from master to apprentice, brought a special influence to Turkish clockmaking.

Most clockmakers known to have lived during Mahmud II's reign (1808–1839) belonged to the Mevlevi order. These include Esseyid el-Hac Dürri, Ahmed Gülşenü'l-Mevlevi, Ahmed Eflaki Dede and his son Hüseyin Haki. The influence of the Mevlevi order on 19th-century Ottoman clockmaking can be easily understood from the life stories of the clockmakers who produced the period's most beautiful clocks. However, it is not easy to explain how this connection between clockmaking and the Mevlevi order was established.

To explain the relationship between Mevlevi practice and clockmaking, one can first consider the order's affinity for handicrafts. The Mevlevi practice has been influential in Ottoman lands since its emergence in the 13th century. Most of those who gathered around Mevlana Celaleddin Rumi were craftsmen or workers (Gölpınarlı, 1983: 249). This also influenced those who joined the Mevlevi order after him.

People in Mevlevi lodges were not only engaged in prayer, dhikr, and sema. Since worship in Islam is seen as "anything that pleases Allah," working and being useful to one's surroundings is also considered an important form of worship in Mevlevi thought (Derman, 1983: 17). Mevlana's teaching that people should earn their living by working with their own hands led to the emergence of numerous artisans under the Mevlevi order.

Süheyl Ünver, the important Ottoman history researcher, defines Mevlevi practice as a "civilization" in his article titled "Mevlevilik Medeniyeti". In his formulation, the Mevlevi lodges, which were important institutions of this civilization, sometimes existed as fine arts academies. They sometimes functioned as conservatories and sometimes as Faculties of Literature. Ünver also notes that Mevlevi dervishes, who were interested in handicrafts continued their education and training in painting, ornamental carving, engraving and calligraphy. They worked in the room of a dervish master who was also interested in any of these handicrafts (Ünver, 1964: 38). As of the 19th century, clockmaking was also included in these handicrafts.

Ünver's statements have been supported by Abdülbaki Gölpınarlı, who conducted extensive research on the Mevlevi order. Gölpınarlı emphasized the strong connection between the Mevlevi order and art with the following words: "Mevlevi practice was a path that embraced the fine arts. For this reason, this path produced some of history's most advanced masters, particularly in poetry and music." Scholarly studies on the Mevlevi order reveal that individuals initiated into the path received fine arts training under the guidance of experienced dervishes'. In this way, the Mevlevi people enriched themselves spiritually

while developing their belief system and became experts in at least one art form (Sergen, 1991: 174). The names that shaped Ottoman clockmaking in the 19th century were trained in the Mevlevi order.

While trying to explain the bond between Mevlevi practice and clockmaking, after revealing the Mevlevi dervishes' bond with handicrafts, it is also necessary to question their interest in clocks and clockmaking. The underlying reason for this curiosity may be the interest of the whirling dervishes in the hour and minute hands that also revolve around themselves. The curiosity mentioned can be explained by the location of the Galata Mevlevihane.

The Galata Mevlevihane was founded during Bayezid II's reign (Göyünç, 1991: 354). The Galata district was an area frequently visited by Genoese and Venetian merchants long before the Ottomans conquered Istanbul (Zarcone, 2007: 58). Also, as previously mentioned, a resident community of clockmaking tradesmen was formed in Galata by the 16th century. Based on this, it can reasonably be assumed that the clockmakers of Galata influenced the Mevlevi dervishes.

As mentioned before, the observatory established by Taqī al-Dīn in 1577 was close to the Galata Mevlevihane. A possible relationship that Taqī al-Dīn established with the Mevlevi dervishes may explain the roots of the Mevlevi dervishes' interest in clocks (Günergun, 2021: 362).

The Galata district has welcomed numerous foreigners throughout Ottoman history. It was a stopping point for European merchants who entered the Empire for trade. The Galata Mevlevihane became a center of attraction for foreigners. Attending sema performances at the Galata Mevlevihane became a prestigious activity among Europeans. Various European travelers who visited Istanbul at different times wrote about their impressions. They mention the sema performances at the Galata Mevlevihane and the enchanting atmosphere in their memoirs (Pardoe, 1967: 44). From these writings, it is understood that foreigners could easily enter the Mevlevihane.

In this case, it does not seem like an unfounded claim that the dervishes of the Mevlevihane communicated with foreign clockmakers who came to Galata. The number of Europeans settling in Galata and Pera increased during Abdulhamid II's reign. These people, whose numbers grew and who frequently visited the Mevlevihane, may have influenced the Mevlevi dervishes in Galata (Zarcone, 2007: 60). This situation can be cited as a good reason for the interest in clocks among the Mevlevi clockmakers who left their mark on Ottoman clockmaking in the 19th century.

The most important of the Mevlevi clock masters mentioned above is Ahmed Eflaki Dede. Eflaki Dede was born in 1808 as the son of Kırımızâde Ali Efendi, one of the Halveti sheikhs. He spent his childhood in Tekirdağ and went to Istanbul after completing his education there. He completed his trial at the Yeni Kapı Mevlevihane and became a dervish master. During these years, he also learned clockmaking and horology (Erdoğan, 2002: 333).

Eflaki Dede was the first timekeeper-*muvaqqit* of Mahmud II's Tomb (Turan, 2022: 29). He occasionally went to Grand Vizier Fuat Pasha's mansion and adjusted the clocks there (Erdoğan, 2002: 333). There was also a skeleton clock made by Ahmed Eflaki Dede at the First International London Exhibition held on May 1, 1851 (BOA, İ.DH.234-14106, 1267/1850). Archive documents support that the material requested by Eflakî Dede, who then went to Paris to increase his professional knowledge, was sent by the Ottoman Empire (Solak, 2022: 34, BOA, A.}AMD], No.33-80. H-02-02-1268). One of the important clocks of Eflaki Dede, who is known to have eleven clocks, is in the Topkapı Palace Museum. Another is in the Dolmabahçe Clock Museum. Eflaki Dede also has a compass at the Konya Mevlana Museum.

Hüseyin Haki, Ahmed Eflaki Dede's son, is also a clockmaker like his father. Hüseyin Hâki combined the skeleton clock with the traditional shelf-top weight-driven clock. The wall clock with the appearance of a Mevlevi coin, made by Hüseyin Hâki in 1839, was one of the favorite works of Ottoman horology (Özdemir, 1993: 128).

Mehmed Şükrü, a student of Eflaki Dede, has three clocks in the Topkapı Palace museum (Çakmut & Gürbüz, 2012: 36). The signed clock, dated 1853, of Mehmed Şükrü, who lived during the reigns of Sultan Abdülmecid, Sultan Abdülaziz and Sultan Abdulhamid II, is one of the most interesting examples of the skeleton clock type. The clock has two hour dials and a seconds dial. One of the two clock dials shows Turkish time and the other shows Western time. The balance adjustment of the clock, which was

designed to make it more sensitive to weather conditions, took its place as an innovative attempt in clockmaking (Tuzcular, 1977:75).

Other important clockmakers of the period are Mustafa Refik and Süleyman Leziz. Both names have valuable clocks in the Palace clock collection. Süleyman Leziz was known as the clockmaker of Sultan Abdülaziz (Tuzcular, 1977: 75). He continued working as a palace clockmaker during Abdülhamid II's reign and was appointed the clockmaker of the Hırka-i Saadet Department in 1889 (Özdemir, 1993: 127–129).

The valuable clockmakers of the Ottoman Empire did not only live within Istanbul's borders. One of them is Clockmaker Mustafa Efendi from Kütahya (Mustafa Fehmi Çaldemir, 1875-1935), whom we know from Süheyl Ünver's writings. Mustafa Efendi, like numerous others, was a Mevlevi. Mustafa Efendi, who did his military service in Edirne, was permitted to stay in the Mevlevihane at night. Before moving to the Mevlevihane, he learned clockmaking from a clockmaker he met in Edirne. In Ünver's words, Mustafa Efendi's master was a clockmaker who did not assemble clock parts but manufactured each piece himself. Mustafa Efendi followed in his footsteps and became the master of clocks, each piece of which he meticulously made himself. Ünver states that the exact number of clocks made by Mustafa Efendi is unknown, but there are eight known important clocks (Ünver, n.d.: 51).

While individual clockmakers like Mustafa Efendi exemplify the spread of horological expertise beyond the imperial center, this broader interest in timekeeping was also reflected at the highest levels of Ottoman governance. Sultan Abdulhamid II became the Ottoman ruler most closely associated with a deep fascination for clocks. During his reign, remarkable clocks were crafted not only by Mevlevi clockmakers but also by artisans from diverse religious and ethnic backgrounds.

The widespread construction of clock towers throughout Anatolia during this period was closely linked to the Sultan's fascination with timekeeping as well as broader reforms in the Ottoman time system. One of the most prominent figures contributing to this development was Mustafa Şem'i İpek (BOA, TS.MA.e.1297-145, 1343/1924), a leading clockmaker of the era who produced mechanisms for various of these towers. Today, several clocks attributed to Şem'i İpek remain operational, showcasing the technical skill and enduring legacy of late Ottoman craftsmanship (Özdemir, 1993: 131).

When discussing the clockmakers of Sultan Abdulhamid II's reign, another critical figure that should be emphasized is Johan Meyer. He was educated in Berlin, Germany. Meyer, who became the chief clockmaker of the Yıldız Palace in 1876, had a special place in Ottoman clockmaking. The "Hamidiye clocks" made by Meyer had a special design that displayed the Turkish and Western clocks used together during the period on a single dial. In 1878, Meyer opened the Meyer Clockmaking Company and his customers were primarily court member (Meyer, 1985: 7).

Abdülhamid's interest in clocks led him to receive special clocks as gifts from numerous European countries. The most well-known of these are the silver model of the Izmir Clock Tower, a gift from German Emperor Wilhelm II, the Gryphon table clock, a gift from the Russian Tsar, and sit-down table clocks. In addition, a pair of porcelain made by the Sultan in his name at the Yıldız Porcelain factory is among the essential clocks of the relevant period (Gedük, 2016: 799). In this respect, Sultan Abdülhamid contributed to 19th-century Ottoman clockmaking in a social sense and through his personal efforts.

6. CONCLUSION

This study has examined the historical development of mechanical clocks in the Ottoman Empire, paying particular attention to the changing sociocultural role of horology from the 15th through the 19th century. The findings reveal a multifaceted story of technological transmission, cultural adaptation, and, local innovation—one that challenges simplified narratives of technology moving passively from West to East. The Evidence suggests that, although mechanical clocks first entered the Empire as luxury goods and diplomatic gifts limited to the court, they gradually became integrated into wider Ottoman society through a process of selective acquisition and creative transformation.

A major conclusion of this research concerns the nature of technology transfer in the Ottoman Empire. The Empire appears to have followed a pattern of *selective technological adoption*—prioritizing the development of local expertise rather than relying entirely on foreign supply. This strategy unfolded in distinct phases throughout the four centuries examined. In the 15th and early 16th centuries, the imperial

court served as the main gateway for mechanical clock technology. European diplomatic offerings and the work of foreign craftsmen introduced these devices to the Ottoman elite. Yet, rather than remaining passive consumers, Ottoman scholars and artisans soon began to study, understand, and reproduce these mechanisms.

The contribution of Taqī al-Dīn al-Rāşid in the 16th century is emblematic of this active engagement. His 1556 treatise *al-Kawâqib al-durriyya fî vaz' i'l-benkâmât al-devriyya* was not merely a reworking of European material but an original synthesis, combining Islamic astronomical knowledge with European mechanical design. As the earliest known comprehensive work on mechanical clockmaking in the Islamic world, it demonstrates the Empire's capacity for technological creativity rather than mere imitation.

By the 17th century, the formation of the Ehl-i Hiref clockmaking unit signaled a decisive step toward institutionalizing this knowledge. The Ottomans ensured that skills acquired from foreign experts were systematically transferred to local artisans through formal training within the palace and structured guild organization. The official recognition of the Cemaat-i Saatçıyan in 1671 provided a framework for sustained domestic production.

Perhaps the most distinctive outcome of this study is the identification of the Mevlevi order's central role in 19th century Ottoman clockmaking—a rare blending of spiritual tradition with technological craftsmanship. Figures such as Ahmed Eflakî Dede, Hüseyin Hakî and Mehmed Şükrü exemplify how religious institutions could become hubs of innovation while preserving their spiritual ethos.

This involvement was fostered by multiple factors: the Mevlevi emphasis on artisanal skill, rooted in Mevlana's teaching on honest labor; the strategic location of the Galata Mevlevihane near both European clockmaking circles and Taqī al-Dīn's former observatory; and perhaps even symbolic parallels between the circular motion of clockworks and the ritual whirling of the dervishes. Such intersections of spiritual meaning and mechanical ingenuity produced some of the most refined and artistically distinctive timepieces in Ottoman history, notably skeleton clocks that revealed their workings in designs resonating with Mevlevi architectural motifs.

Ottoman clockmaking evolved through more than direct imitation of European prototypes. Local clockmakers developed technical and aesthetic features suited to Ottoman needs and sensibilities. Innovations included mechanisms displaying both Hijri and Rumi calendars, designs accommodating Islamic prayer schedules, and decorative elements drawn from Ottoman artistic traditions. The transition from import reliance to indigenous production required the growth of domestic supply networks, training systems, and quality standards. Centers such as Galata, palace workshops and regional hubs contributed to a sustainable and self-defined Ottoman clockmaking heritage.

The Ottoman case underscores that effective technology adoption requires more than the import of technical know-how; it depends on embedding that knowledge within local cultural and institutional structures. Religious communities, elite sponsorship, and skilled artisan groups all played vital roles in facilitating this process. Rather than following a simple diffusion model, the evidence points to an active cycle of selection, modification, and innovation—transforming foreign devices into products rooted in local identity. This framework may hold relevance for other historical cases and even modern debates about technological integration.

Ultimately, the Ottoman experience with mechanical clocks offers lessons on cultural resilience in the face of external innovation. The Mevlevi contribution, in particular, illustrates how spiritual traditions can enrich and be enriched by technological skill. The transformation of imported timepieces into distinctly Ottoman works was not simply a matter of mechanical mastery; it was a creative process that fused technology with culture, producing objects that carried both functional and symbolic value.

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Araştırma Makalesi / Research Article

Mechanical Clocks in the Ottoman Empire: Technological Adoption and Cultural Transformation (16th–19th Centuries)

Osmanlı İmparatorluğu'nda Mekanik Saatler: Teknolojik Benimseme ve Kültürel Dönüşüm (16. ve 19. Yüzyıllar)

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DOI : [10.63556/ankad.v10i1.358](https://doi.org/10.63556/ankad.v10i1.358)

Geliş/Received: 21/10/2025

Kabul/Accepted: 21/01/2026

Geniş Özet

Zamanı doğa olaylarının dışında mekanik araçlarla ölçmeye başlamak insanlık tarihi açısından farklı bir anlama sahiptir. Bu anlam insanoğlunun zamanı algılamasından, zamana verdiği anlamdan öte içerisinde farklı bileşenler barındırmaktadır. Tarih sahnesinde çok uzun bir süre varlık gösteren Osmanlı açısından ise mekanik saatlerin tanınması, kullanılmaya başlanması ve toplum tarafından kabul edilmiş süreçleri devletin zaman içerisinde yaşadığı kültürel dönüşümle yakından ilgilidir. Mekanik saatlerin tarihinin Osmanlı İmparatorluğu içerisinde taşıdığı bu imgesel ve büyük anlam onu pek çok önemli araştırmanın konusu yapmıştır. Bu çalışma sözü edilen araştırmaları ve onların kaynaklarını dikkatli şekilde yeniden incelemiş ve Osmanlı mekanik saat tarihini yeni bir anlayışla sunmayı hedeflemiştir.

Makalenin temel amacı, Osmanlı İmparatorluğu'nda mekanik saatlerin yaygınlaşmasını, saraydan topluma uzanan geniş bir perspektifle ele alarak, bu sürecin sosyo-kültürel ve kurumsal boyutlarını ortaya koymaktır. Araştırma, nitel araştırma yöntemlerinden tarihsel araştırma yöntemini benimsemiş olup, ilgili literatürün sistematik bir şekilde taranmasının yanı sıra, arşiv belgeleri, mahkeme kayıtları ve *Evlîyâ Çelebi Seyahatnâmesi* gibi döneme ait birincil kaynakların titizlikle incelenmesiyle zenginleştirilmiştir. Bu metodolojik yaklaşım, mekanik saatlerin Osmanlı toplumuna nasıl entegre olduğunu, sembolik ve işlevsel rollerini, saray ve şehir yaşamındaki yerini çok boyutlu bir şekilde analiz etme olanağı sağlamıştır.

Çalışmanın elde ettiği sonuçlar, mekanik saatlerin Osmanlı toplumunda yaygınlaşma sürecinin 16. yüzyıl gibi erken bir tarihte başladığını ve 17. yüzyılda günlük yaşamın bilinen nesnelere haline geldiğini göstermektedir. İlk mekanik saatlerin Osmanlı sarayına diplomatik armağanlar aracılığıyla girdiği ve zamanla hem sarayda hem de daha geniş toplum kesimlerinde bir prestij sembolü haline geldiği çalışma ile görülmüştür. Özellikle 18. yüzyıldan itibaren kendi saatlerini üreten Osmanlı saatçileri arasında, Mevlevî saat ustalarının en değerli örnekleri ortaya koyduğu gözlenmektedir. Bu gözlemden yola çıkarak, makale Mevlevîlik ile saatçilik arasındaki ilişkiyi sistematik bir şekilde tartışmaya açmıştır. Bu bağlam, çalışmanın özgün ve dikkat çekici yönlerinden birini oluşturmaktadır.

Makale beş ana bölüm ve bir sonuç bölümünden oluşmaktadır. Giriş ve yöntem bölümlerini müteakip, üçüncü bölüm, mekanik saatlerin Osmanlı İmparatorluğu'na girişi ve 16. yüzyıldaki gelişmeleri, Takıyüddin'in mekanik saatlerine ayrılmış özel bir alt bölümle birlikte incelemektedir. Dördüncü bölüm, 17. ve 18. yüzyıllardaki saatçilik faaliyetlerine odaklanırken, beşinci bölüm ise 19. yüzyılı ve Mevlevîliğin bu dönemdeki etkisini detaylı bir şekilde ele almaktadır. Bu yapı, Osmanlı'da mekanik saatlerin tarihini kronolojik bir akışla ve dönemsel özellikleriyle birlikte sunarak, okuyucuya bütüncül bir bakış açısı kazandırmaktadır.

Çalışmada, Osmanlı'ya mekanik saatlerin on beşinci yüzyılın sonu itibari ile Yabancı unsurlar vasıtası ile girdiği ve bu nedenle Frengî saat olarak nitelendirildiği belirtilmiştir. Arşiv belgelerinde mekanik saatlere ilişkin ilk bilgiler Frengî saat olarak geçerken, saat ustalarına ilişkin ilk isimler de yine yabancı kökenli kişilere ilişkindir. Osmanlı'ya giren ilk saatler, Yabancılar tarafından Osmanlı sarayına hediye olarak gönderilmiştir. İlk mekanik saatçilerimizin ise bu hediyeler ile gelen Yabancı saat ustaları olduğu düşünülmektedir.

Yabancı seyyahların iddialarının aksine Osmanlı tarihine ilişkin birincil kaynaklar 16. yüzyıldan itibaren mekanik saatlerin Osmanlı toplumunda kullanılmaya başlandığını göstermektedir. İlgili tarihe ilişkin İstanbul Kadı sicillerinde geçen saatler, başka kıymetli mallar ile birlikte bir miras unsuru olarak yer almaktadır. 16. yüzyılda Osmanlı sarayında bulunan saatlerin ise hem sayı hem de nitelik olarak oldukça gelişmiş olduğu arşiv kayıtlarından anlaşılmaktadır. Aynı döneme ait arşiv kayıtlarında artık Müslüman saat ustalarının da adı geçmeye başlamıştır. Bu isimlerden Saatçi Hasan, bir Saray mensubu olup Sultan III. Murad'ın en yakınlarından biridir. 16. yüzyılda, Osmanlı'nın en büyük Matematikçilerinden Takıyüddin bin Râsîd'in saatler üzerine yazdığı eser yalnızca İslam Dünyasında değil o tarihte Avrupa'da da mekanik saatler üzerine yazılmış ilk eserdir. Takıyüddin'in bu önemli eseri saat tarihi açısından ayrıcalıklı bir yere sahiptir.

Çalışmada Osmanlı Sultanlarının saatlere olan düşkünlüğüne özellikle dikkat çekilmiş ve Sarayın Osmanlı'da teknolojik değişimlerin kabulündeki yeri vurgulanmıştır. Ayrıca yine Osmanlı saatçilerini yetiştiren asıl unsurun Saray olduğu vurgusu yapılmıştır. Bununla birlikte 16. yüzyılda oluşmaya başlayan Galata Saatçi esnafı üzerinde de durulmuş bu anlamda Osmanlı tarihinde Galata Semtinin ve bu semte yerleşen Yabancı unsurların oynadığı rol ifade edilmeye çalışılmıştır.

Öncelikle Galata Mevlevihanesi olmak üzere, Mevlevilik ile saat yapıcılığı arasındaki bağ, bu çalışmanın vurguladığı bir başka unsurdur. Makalede, Mevleviliğin el sanatları ile uğraşmayı ve kendi kazancını kendi temin edebilmenin önemini vurgulayan öğretisinin saat yapıcılığı üzerindeki etkisi sorgulanmış ve daha önce başka kıymetli araştırmacıların da dikkat çektiği üzere saatin dönen kolları ile Mevlevilik tarikatının semâ ritüeli arasında olası bir bağ yeniden dile getirilmiştir.

Makalenin ulaştığı sonuçlardan bir başkası ise Osmanlı son dönemi sultanlarından II. Abdülhamid'in saatlere duyduğu merakın Osmanlı saatçiliğinin gelişiminde etkili olmuş olmasıdır. Dönemde, Mevlevi saat ustaları en güzel saat örneklerini vermiştir. Bununla birlikte Sultan tarafından ilgi ve destek gören isimlerden Almanya'dan gelen Meyer Ailesinin Cumhuriyet Döneminde de saatçilik mesleğini icra ettiği makalede belirtilmiştir.

Sonuç olarak, Osmanlı mekanik saat tarihini, dönemsel bağlamda okuyucusuna aktarmaya çalışan bu araştırmada, diplomatik bir hediye ve prestij kaynağı olarak Osmanlı'ya giren mekanik saatlerin zaman içerisinde Galata esnafı tarafından ticarileştirmesi ve nihayetinde Mevlevi Tekkelerinde bir sanat ve tefekkür aracına dönüşümü anlatılmıştır. Araştırmada, Osmanlı'nın Batı teknolojisine kayıtsız kaldığı yönündeki iddiaların tümü ile gerçeği göstermediği ortaya konmuştur. Araştırma ile teknolojinin nasıl benimsendiği yerelleştirildiği ve özgün bir kimlikle yeniden üretildiği somut örneklerle ortaya konmuştur. Araştırmanın gelecekte yapılacak çalışmalar için, Osmanlı saat ustalarının kullandığı malzeme ve tekniklerin metalurji ve malzeme bilimi açısından incelenmesi veya farklı şehirlerdeki (örneğin Selanik, İzmir, Şam) saatçilik faaliyetlerinin karşılaştırmalı olarak ele alınması gibi yeni ufuklar açması beklenmektedir. Makalenin zamanın ve onu ölçen aletlerin, bir medeniyetin kendi kimliğini ve dünyayla olan ilişkisini nasıl şekillendirdiğini anlamak isteyen okuyucu için bir kaynak olması ümit edilmektedir.