

# *The Role of Communication Technology Diffusion in Government Transformation: The Ottoman Empire Example (1823-1923)\**

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### ABSTRACT

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This study examines and evaluates the processes of communication technology transfer and adoption during the last century of the Ottoman Empire, 1823-1923. To this end, the adoption processes of four technologies, the postal system, telegraph, telephone, and the printing press, are examined in detail. The objective is to explain the underlying reasons for technology adoption by the government by using a historical perspective. In general, the study's primary purpose is to examine the effect of technology on administrative processes historically. The findings of the study show that these communication technologies were instrumental. First, they connected the Ottoman countryside to the Imperial Capital (Istanbul) for administrative and military purposes, making it easier for the central Ottoman Administration to control the Empire. Second, they were instrumental in integrating the Empire's economy into the global capitalist economy, and along the way, transforming the Ottomans into a de-facto semi-colony. The impact created by these technologies, which were used for administrative centralization provides important lessons for current technological transformation processes.

*Keywords:* Technology adoption, communication technologies, technology transfer, administrative history, public administration

### ÖZ

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Bu çalışma, Osmanlı İmparatorluğu'nun son yüzyılı olan 1823-1923'te iletişim teknolojilerinin transferi ve benimsenmesi süreçlerini incelemekte ve değerlendirmektedir. Bu amaçla posta sistemi, telgraf, telefon ve matbaa olmak üzere dört teknolojinin benimsenme süreçleri ayrıntılı olarak incelenmiştir. Amaç, devlet tarafından teknolojinin benimsenmesinin altında yatan nedenleri tarihsel bir perspektif kullanarak açıklamaktır. Genel olarak çalışmanın öncelikli amacı, teknolojinin idari süreçler üzerindeki etkisini tarihsel olarak incelemektir. Araştırmanın bulguları, bu iletişim teknolojilerinin etkili olduğunu göstermektedir. İlk olarak, idari ve askeri

amaçlarla Osmanlı taşrasını Başkent'e (İstanbul) bağlayarak merkezi Osmanlı İdaresi'nin İmparatorluğu kontrol etmesini kolaylaştırdılar. İkincisi, İmparatorluk ekonomisini küresel kapitalist ekonomiyle bütünleştirmede ve bu arada Osmanlıları fiilen bir yarı-sömürgeye dönüştürmede etkili oldular. Yönetimsel merkezileşme için kullanılan bu teknolojilerin yarattığı etki, mevcut teknolojik dönüşüm süreçleri için önemli dersler vermektedir.

*Anahtar Kelimeler:* Teknoloji uyarlama, iletişim teknolojileri, teknoloji transferi, idari tarih, kamu yönetimi

## Introduction

This study examines and explains the technology transfer and adoption processes during the last century of the Ottoman Empire (1823-1923) from an administrative history perspective. Historically, governments have always needed to adopt new technologies to reform their administrative systems and thus to keep up with the political, economic, and military developments in other countries of interest. The last century of the Ottoman Empire is no exception to this underlying necessity and the resulting technology transfer and adoption process.

The period (1823-1923) and the government (Ottoman Empire) in question are very significant for two reasons: First, examining the government adoption and use of the technological developments during the last century of the Ottoman Empire informs us about the adoption patterns of new technologies by a government that ruled a considerable part of the Balkans, the Middle East and North Africa in an environment of global imperialism and semi-colonization. This historical context places the dynamics of technology adoption by the government within a framework of North-South division, in which the North symbolizes the colonizers. In contrast, the South represents the countries under threat of being colonized. In this sense, technology use in government can be evaluated as an essential part of the Ottomans' efforts to keep their Empire under control and in one piece against the foreign forces that placed political, economic, and military pressures on the *Sublime Porte*.

Secondly, although it is not the objective of this study, the practices of the Ottoman Government in adopting new technologies may enable future researchers to compare the mechanisms of technology adoption by the government with those of today. Such practices in the Ottoman Empire can be comparatively analyzed with similar patterns experienced today in the former Ottoman territories in the Middle East and the Balkans, especially in the modern Republic of Türkiye. Although Türkiye is not the only descendant of the

Ottoman Empire, the political and administrative elites of the Ottoman Empire predominantly stayed within Türkiye's borders after the fall of the Empire. Therefore, Türkiye is the country most comparable with the Empire it was born of.

Within this framework, this article aims to examine and evaluate the adoption of four communication technologies by the government during the 19th and early 20th Centuries in the Ottoman Empire. The technologies in question are the postal system, telegraph, telephone, and printing press. Although the Ottomans adopted the printing press in the 18th Century, it is also included within this selection to understand better the technology adoption process by governments in this vital area of technological progress.

### **Literature Review**

Historical studies of information systems at organizational and national levels can bring depth and breadth to our understanding of technology as they can be powerful sources of knowledge and insight. Bannister<sup>1</sup> argues that historical accounts of technology in general, and information systems in particular, are largely overlooked, although there is much to learn from such studies. This article aims to contribute to the literature by providing a historical understanding of technology adoption in government by examining the late Ottoman Empire period case.

The topic of technology adoption and transfer has been an active field of scholarly research. For example, Diamond examined and explained why societies react to new technologies differently. More specifically, he wanted to understand whether there are continental differences in technology development.<sup>2</sup> While this question is fascinating, it is only indirectly related to the main topic of this article, which is the adoption processes of communication technologies in the last century of the Ottoman Empire.

Another attractive stream of research was conducted on the diffusion and communication of innovations.<sup>3</sup> Diffusion research is defined as the “*microanalysis*

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<sup>1</sup> Frank Bannister, “The Dimension of Time: Historiography in Information Systems Research”, *Electronic Journal of Business Research Methods*, Vol. 1, No. 1, Jan 2002, p. 1-10.

<sup>2</sup> Jared Diamond, *Guns, Germs and Steel – The Fates of Human Societies*, W. W. Norton & Company, New York, 1999, p. 251.

<sup>3</sup> M. Everett Rogers, *Diffusion of Innovations*, New York: The Free Press, Fourth Edition, 1995, p. 519; M. Everett Rogers and F. Floyd Shoemaker, *Communication of Innovations: a Cross-Cultural Approach*, The Free Press, New York, 1971, p. 476.

*of communication and change, and ... change agents whose purpose is to diffuse innovations*".<sup>4</sup> These studies, primarily conducted in developing countries, aimed to gain an understanding of technology diffusion in these societies to evaluate the impact of modern development programs in agriculture, family planning, public health, and nutrition.<sup>5</sup> This article differs from diffusion studies in that there is no objective to evaluate current social change in general and specific development programs in particular. Still, some concepts developed by diffusion research can be helpful in a study such as this one. For example, the concept of reinvention is defined as the "*process in which users of a technology or idea create new ways to use it beyond those initially accepted.*"<sup>6</sup>

Two areas of literature can be drawn upon to understand the adoption of communication technologies in the late Ottoman Empire. The first is the transfer and adoption of technologies in the colonies of the major European powers. Although the Ottoman Empire, in its core (Asia Minor), had never been a colony up until World War I, it can be accepted as a semi-colony<sup>7</sup>, similar to what Wallerstein called the semi-peripheral countries, which "*act as a peripheral zone for core countries and in part they act as a core country for some peripheral areas.*"<sup>8</sup> During the period under consideration, European merchants purchased and collected raw materials, and then sold consumer goods in the Ottoman market in an economically advantaged environment, thanks to uneven commercial agreements. The communications (e.g., telegraph) and transportation (e.g., trains) systems that enabled profitable European commercial presence in the Ottoman Empire were established, to a great extent, and after their establishment, run by, up to a certain point in time, European investor firms. The word "*semi-colony*" is deliberately used here because these favorable commercial conditions were not established and maintained by the direct presence of the invading European armies but by trade concessions given and commercial agreements signed and

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<sup>4</sup> Rogers - Shoemaker, *op.cit.*, p. xviii.

<sup>5</sup> Rogers, *op.cit.*, p. xvi.

<sup>6</sup> Joseph Straubhaar and Robert LaRose, *Communications Media in the Information Society*, CA: Wadsworth Publishing, Belmont, 1997, p. 41.

<sup>7</sup> Funda Başaran, *İletişim ve Emperyalizm: Türkiye'de Telekomünikasyonun Ekonomi-Politigi*, Ütopya Yayınevi, Ankara, 2000, p. 97; İlber Ortaylı, *Türkiye Teşkilat ve İdare Tarihi*, Cedit Neşriyat, Ankara, 2007, p. 349.

<sup>8</sup> Immanuel Wallerstein, Semi-peripheral Countries and the Contemporary World Crisis, *Theory and Society*, Vol. 3, 1976, p. 463.

renewed by the promise of political and military aid or threat of political and military intervention.<sup>9</sup>

The Ottoman Empire's geographical location between Europe and the Far East is essential. Diamond<sup>10</sup> argues that societies' geographical location is critical in shaping how they receive technology by diffusion from other cultures. He gives the example of the Medieval Islamic Civilization, which was conveniently and centrally located in Eurasia, an advantage that enabled the Islamic countries to benefit from the inventions of Indians and Chinese and those of the ancient Greeks. This "*proximity argument*" helps examine and understand the nature of technology adoption in the Ottoman Empire.

Although there are differences between the circumstances of semi-colonized countries such as the Ottoman Empire and the colonies of the European powers, it is still possible to better understand technology adoption in colonies. The Europeans' use of various technologies, such as steamships, railways, and telegraph systems, by acquiring and controlling colonies is an exciting area of research.<sup>11</sup> These studies provide valuable categories for the research question presented below.

Headrick<sup>12</sup> argues that the geographical and cultural diffusion of innovation and its adoption in new environments include two processes: The first is the relocation of equipment and methods, together with the technical personnel necessary to run and maintain the technology in question. The second process is the diffusion of knowledge, skills, and technology-related attitudes from one society to another. He also emphasizes the importance of the technology transfer agents, such as exporters (e.g., salespeople, foreign aid officials, engineers) and importers (e.g., students, purchasing agents, spies) of technology, and migrants, who can be both importers and exporters of technology.<sup>13</sup> Similarly, Diamond

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<sup>9</sup> Ortaylı, *op.cit.*, p. 338-339.

<sup>10</sup> Diamond, *op.cit.*, p. 256-257.

<sup>11</sup> Howard Bailes, "Technology and Imperialism: A Case Study of the Victorian Army in Africa", *Victorian Studies*, Vol. 24, No. 1, 1980, p. 83-104; Diamond *op.cit.*, p. 241; Daniel R. Headrick, *The Tools of Empire: Technology and European Imperialism in the Nineteenth Century*, Oxford University Press, New York, 1981, p. 3-12; Daniel R. Headrick, *Power Over Peoples: Technology, Environments and Western Imperialism 1400 to the Present*, New Jersey: Princeton University Press, Princeton, 2010, p. 381.

<sup>12</sup> Daniel R. Headrick, *The Tentacles of Progress: Technological Transfer in the Age of Imperialism, 1850-1940*, New York: Oxford University Press, Oxford, 1988, p. 9.

<sup>13</sup> Headrick, *op.cit.*, p. 10; See also Daniel R. Headrick, *The Invisible Weapon: Telecommunications and International Politics, 1851-1945*. Oxford University Press, Oxford, 1991, p. 184.

argues that peaceful trade, espionage, emigration, and war are primary tools of innovation diffusion.<sup>14</sup>

Another category that needs to be considered in understanding technology adoption is the individuals and groups that support or resist technology transfer and adoption. Headrick rightfully argues that industrial societies preferred not to suppress technology transfer once they realized that such suppression would not be possible and feasible in the long run. Instead, they encouraged the export of technologies on their terms, with appropriate precautions.<sup>15</sup> These terms were brought to life through subsidies, special taxes or tariffs, and police and military protection.<sup>16</sup>

These reassurances and subsidies are also interesting because they violated the free-market idea prescribed by the European powers of the time. Headrick<sup>17</sup> aptly argues that this point shows that these technology transfers were essentially political.

As the second piece of literature to draw upon, the institutional theory of organizations, especially the concept of isomorphism, may provide valuable concepts for analyzing technology transfer and adoption by the Ottoman Empire.<sup>18</sup> For example, Di Maggio and Powell<sup>19</sup> asserted that institutional theory helps explain why organizations are so similar. The similarity of technology adoption processes can also be analyzed at the governmental level. Again, Scott<sup>20</sup> argued that organizational structure is an adaptive vehicle, and institutionalization refers to evolutionary adaptive processes. This argument can be extended to governmental structures adapting to complex political, economic, and administrative conditions by adopting new technologies.

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<sup>14</sup> Diamond, *op.cit.*, p. 256.

<sup>15</sup> Headrick, *op.cit.*, p. 11.

<sup>16</sup> *ibid.*, p. 12, p. 378.

<sup>17</sup> *ibid.*, p. 380.

<sup>18</sup> Mete Yıldız, *E-Government Policy Processes from a Grounded Theory Perspective: The Case of Türkiye*, Saarbrücken: Lambert Academic Publishing, 2009, p. 31-36.

<sup>19</sup> Paul J. Di Maggio and Walter Powell, "The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields" *American Sociological Review* Vol. 48, No. 2, 1983, p. 147-60.

<sup>20</sup> W. Richard Scott, "The Adolescence of Institutional Theory", *Administrative Science Quarterly* Vol. 32, No.4, 1987, p. 493-511.

From an institutional theory perspective, governments can adopt new technologies because of isomorphic pressures. Three main types of isomorphic processes are stated in the literature: coercive, mimetic, and normative<sup>21</sup>: Coercive isomorphism suggests that governments adopt new technologies either because of binding government decisions (such as trade agreements) or by the informal pressures of other governments and private companies that use these technologies successfully. Mimetic isomorphism suggests that governments model themselves after other governments, which they perceive to be better organized and more successful. Normative isomorphism suggests that governments adopt new technologies because of the newly emerging administrative or economic norms of doing business (and statecraft).

### **Method**

The information about the transfer and adoption processes of selected communication technologies by the Ottoman government is scattered in bits and pieces through the works of many Turkish and non-Turkish scholars in diverse areas of expertise, such as the history of science and technology, administrative history, political science, and public administration. This study pulls these bits and pieces together, organizes them to understand the technology adoption process by the government, and systematically presents these findings. To this end, several research questions are posed to classify the information in numerous texts into coherent analyses. These research questions are: When and how did the Ottomans adopt these technologies? Which groups, institutions, and countries were instrumental in the transfer process? Which groups, institutions, and countries supported or opposed the adoption of these technologies? How did the Ottoman Government use these technologies for administrative and other reasons? What were the overall administrative, economic, political, and social impacts of adopting and using these technologies?

By answering these questions, the study aims to analyze and present the dynamics of government technology adoption and use during the last century of the Ottoman Empire.

### **Context: Technology adoption in the Ottoman Empire before the 19th Century**

This section provides the context in which the Ottoman Empire perceived the need to adapt to the technological progress of the West before the transfer and adoption of communication technologies in the 19<sup>th</sup> Century.<sup>22</sup> Ottomans'

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<sup>21</sup> Di Maggio-Powell, *op.cit.*, p. 147-160.

<sup>22</sup> Yıldız, *op.cit.*, p. 43-45.



early interest in technology was almost exclusively determined by the Empire's relationship with her European neighbors since the scientific and technological skills of the European countries began to surpass those of the Ottomans starting in the 15<sup>th</sup> Century. İhsanoğlu<sup>23</sup> argues that the Ottoman Empire's historical connections with and geographical proximity to the European countries created the first non-western setting in which European science and technology were applied.

The first wave of technological transfer occurred during the 15<sup>th</sup> Century in warfare technologies such as firearms and mining. The escape of a sizeable Jewish population from religious persecution in Europe, especially from Spain to the Ottoman territories, provided the Empire with numerous skilled artisans and scientists. This influx of intellectual capital increased Ottoman access to the advances of the Renaissance, especially in medical technology and astronomy. The Christian inhabitants of the conquered Eastern European countries, such as Serbia and Bosnia, contributed to scientific knowledge and technology transfer.<sup>24</sup> In addition to the contribution of non-Muslim subjects of the Ottoman Empire, beginning from the 15<sup>th</sup> and 16<sup>th</sup> Centuries, a top-quality group of scientists and explorers called "*Taife'î Efrençiyân*" (Efrençi Technicians) were given the duty of continuously following up the developments in the European countries. These people were responsible for applying the most recent European scientific achievements to the Ottoman military and non-military projects. *Taife'î Efrençiyân* were not servants of the Sultan but contracted scientists for limited periods.<sup>25</sup> Therefore, these were the first contracting-out practices in technology-related issues in the Ottoman Empire.

The main characteristic of this first wave of technology transfer was the Ottomans' selectivity regarding which technology to transfer. An important reason for this selectivity was the Ottomans' perceived moral and cultural superiority over the Christian "*infidels*." Another reason was the relative self-sufficiency of the Ottoman economy and educational system. This selectivity and the false sense of superiority cost the Ottomans considerably. They could not

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<sup>23</sup> Ekmeleddin İhsanoğlu, "The Ottoman Science: The Last Episode in Islamic Scientific Tradition and the Beginning of the European Scientific Tradition" Ed. E. İhsanoğlu, A. Djebbar and F. Gunerğun *Science, Technology and Industry in the Ottoman World*, Turnhout: Brepols, 2000, p. 25.

<sup>24</sup> Ekmeleddin İhsanoğlu, *Osmanlıların Batı'da Gelişen Bazı Teknolojik Yeniliklerden Etkilenmeleri* Ed. E. İhsanoğlu, *Osmanlılar ve Batı Teknolojisi: Yeni Araştırmalar, Yeni Görüşler*, İstanbul Üniversitesi Edebiyat Fakültesi Yayınları, İstanbul, 1992, p. 125.

<sup>25</sup> Rhoads Murphy, "The Ottoman Attitude Towards the Adoption of Western Technology: The Role of Efrençi Technicians" Ed. E. İhsanoğlu, *Osmanlılar ve Batı Teknolojisi: Yeni Araştırmalar, Yeni Görüşler*, İstanbul Üniversitesi Edebiyat Fakültesi Yayınları, İstanbul, 1992, p. 8.

keep in touch with the scientific and intellectual developments in Europe that caused the Renaissance and triggered the Scientific Revolution.<sup>26</sup>

Despite all the channels of scientific knowledge transfer from the European countries to the Ottoman Empire, the flow of information increasingly slowed down beginning in the 17<sup>th</sup> Century. Murphey<sup>27</sup> explains this trend with two factors: First, while the Ottoman central administration was losing power to local power holders, a period of consolidation and centralization of political power occurred in many European countries. These newly formed central authorities in Europe restricted the flow of information from their countries to establish their authority further. Second, these newly consolidated countries began using mercantilist economic policies, limiting the Ottomans' ability to purchase raw materials from their European trading partners. The trade of raw materials slowed down and eventually came to a complete halt beginning in the 1680s. Murphey<sup>28</sup> concludes that economic rather than religious factors played an essential part in the technological decline of the Ottoman Empire. Inspired by Immanuel Wallerstein, Murphey<sup>29</sup> argues that such deliberate policies of the North Atlantic economies to exclude countries such as the Ottoman Empire from the global economic system represent the beginning of a process of increasing economic dependence and then later (re)integrating with the financial system at a disadvantaged position. İhsanođlu<sup>30</sup> further explains the process of Ottoman economic and scientific dependency by pointing out the inability of the Ottomans to produce new technology.

### **Findings: Technology adoption in the Ottoman Empire after the 19th century**

In this section, through a brief discussion of the history of technologies mentioned earlier, the reasons for and the processes of technology transfer and adoption in the Ottoman Empire are evaluated. To this end, internal and external factors shaping the transfer and adoption processes are explained. The explanations are presented in chronological order. After discussing each technology's transfer and adoption processes, the processes' similarities and differences are considered in a separate subsection.

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<sup>26</sup> İhsanođlu, *op.cit.*, p. 25.

<sup>27</sup> Murphey, *op.cit.*, p. 8-9.

<sup>28</sup> *ibid.*, p. 10-11.

<sup>29</sup> *ibid.*, p. 17.

<sup>30</sup> İhsanođlu, *op.cit.*, p. 128.

## The Printing Press

The printing press was invented in the Far East for the first time, but it was Gutenberg in 1440 who used the carved letters system to distribute and recombine these letters in an orderly manner. Thus, he was accepted as the founder of the modern printing press.<sup>31</sup> This technological innovation spread rapidly to many different countries, and it entered the Ottoman Empire's territory after nearly fifty years, thanks to the Jewish community. After this first attempt, other minority communities widely used the printing press, especially to print their religious books.<sup>32</sup> Because of the use of the printing press for publishing religious texts, which had been traditionally done by hand by numerous scribes, Turks' interest in the printing press generally remained low.<sup>33</sup>

The first Turkish printing house was founded in 1727 by İbrahim Müteferrika (an Ottoman bureaucrat), whose origin was Hungarian, and Sait Çelebi, who was the son of Katip Çelebi (The ambassador in Paris).<sup>34</sup> These people argued that more books could be printed faster and cheaper<sup>35</sup>, and the Sultan and elders of the palace also supported them.<sup>36</sup> The "Ulema," members of the religious establishment, had published a supportive religious declaration, a `fatwa,` for the printing press as long as religious texts were hand-written and the numerous scribes could be kept employed. This action clearly shows that there was no religious reaction toward this new technology.<sup>37</sup> Still, people who were making a living through writing and decorating books saw a threat to their professions in the long run.<sup>38</sup> As mentioned above, their suspicious and somewhat hostile

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<sup>31</sup> Hidayet Nuhoglu, *Osmanlı Matbaacılığı ve Türkler*, Ed. H. C. Güzel, K. Çiçek ve S. Koca *Türkler*, Yeni Türkiye, Ankara, 2002, p. 927.

<sup>32</sup> Niyazi Berkes, *Türkiye'de Çağdaşlaşma*, Yapı Kredi Kültür Sanat Yayıncılık, İstanbul, 2002, p. 58-61.

<sup>33</sup> Abdülkadir A. Adıvar, *Osmanlı Türklerinde İlim*, Remzi Kitabevi, İstanbul, 1970, p. 149; Mustafa Akbulut, *İbrahim Müteferrika ve İlk Türk Matbaası*, Ed. H. C. Güzel, K. Çiçek ve S. Koca, *Türkler*, Yeni Türkiye, Ankara, 2002, p. 920.

<sup>34</sup> Akbulut, *op. cit.*, p. 920-922; Franz Babinger, *Müteferrika ve Osmanlı Matbaası: 18. Yüzyılda Osmanlı'da Kitabiyat*, Çev. Nedret Kuran – Burçoğlu, Tarih Vakfı, İstanbul, 2004, p. 69.

<sup>35</sup> Adıvar, *op. cit.*; p. 150; Alpay Kabacalı, *Başlangıcından Günümüze Türkiye'de Matbaa, Basım ve Yayın*, Literatür Yayıncılık, İstanbul, 2000, p. 17; Hakan Yüksel, "Osmanlı İmparatorluğu'na Matbaanın Girişi ve Toplumsal Yanlılıkları", Master Thesis, Ankara University, 2007, p. 147, p. 173.

<sup>36</sup> Adıvar, *op.cit.*, p. 150; Akbulut, *op.cit.*, p. 71; Berkes, *op.cit.*, p. 54, p. 57; Yüksel, *op.cit.*, p. 147.

<sup>37</sup> Berkes, *op.cit.*, p. 57-58; Yüksel, *op.cit.*, p. 147, 173.

<sup>38</sup> Kabacalı, *op.cit.*, p. 5-6.

attitude towards adopting the new technology was appeased by the guarantee of continuing the production of religious texts by hand.<sup>39</sup>

After this first phase of technology adoption and transfer, Ottoman students were sent to the Netherlands to master the use of the printing press.<sup>40</sup> At the same time, craftsmen from Poland<sup>41</sup> and apprentices from Austria were brought into the Empire. Most current printing equipment was imported from the Netherlands.<sup>42</sup> This expanded use of the printing press culminated in the printing of modern textbooks, especially in the military schools, that opened the doors of Western languages, pieces of literature, knowledge, and technology to the young Ottoman elite and the emergence of a vibrant press in the form of numerous newspapers and magazines.<sup>43</sup> Map 1 below shows the penetration dates and the territorial disparities within the Ottoman Empire during the accommodation of the printing press. (see Appendix – Map 1)

### **Postal Service**

Regular mail systems were used by the Greeks and Romans even in ancient times. The recreation of such a system was first observed in Europe, especially in Austria, Britain, and France, during the 17th century.<sup>44</sup> Modern postal systems were organized towards the end of the 18th century.<sup>45</sup>

During the same period, a horsemen-based system (*Ulak-Menzilhane-Tatar* system) was in use in the Ottoman Empire. The system depended on sending mail by horsemen (*Tatarlar*) to main post offices (*Menzilhane*) in central locations. Then these mails were transported to smaller towns and villages by the waiting messengers (*Ulaklar*).<sup>46</sup> However, this system was limited to government communication. A postal system in its modern sense, which includes public communication as well, was only established at the beginning of the 19th Century through the operations of foreign mail services (France in 1812, Austria in 1821,

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<sup>39</sup> Adıvar, *op.cit.*, p. 152-153; Berkes, *op.cit.*, p. 57-59; Nuhoglu, *op.cit.*, p. 930.

<sup>40</sup> Nuhoglu, *op.cit.*, p. 922.

<sup>41</sup> Berkes, *op.cit.*, p. 61-62.

<sup>42</sup> Nuhoglu, *op.cit.*, p. 922; Akbulut, *op.cit.*, p. 69.

<sup>43</sup> Nuhoglu, *op.cit.*, p. 928; Yüksel, *op.cit.*, p. 163-166.

<sup>44</sup> Headrick, *op.cit.*, p. 183-186.

<sup>45</sup> Headrick, *op.cit.*, p. 186; PTT, *Geçmişten Günümüze Posta*, PTT Genel Müdürlüğü, Ankara, 2007, p. 173.

<sup>46</sup> Ekmeleddin İhsanoğlu and Mustafa Kaçar, *Çağın Yakalayan Osmanlı Devleti'nde Modern Haberleşme ve Ulaştırma Teknikleri*, İslam, Tarih, Sanat ve Kültür Araştırma Merkezi, İstanbul, 1995, p. 7.

England in 1832, Greece in 1834).<sup>47</sup> Inspired by these services, Sultan Mahmud II ordered the establishment of a modern postal system in 1832.<sup>48</sup> The system took effect in 1834, and the first modern postal service was initiated near Istanbul. Due to insufficient tax resources, postal service was suspended in early 1840.<sup>49</sup> In the same year, it was restarted for the internal communication needs of government agencies.<sup>50</sup> After carefully reviewing several foreign postal systems, the French system was emulated.<sup>51</sup>

On the one hand, the administrators of the postal system were trying to build an organization and transportation system that covered the whole country's letter, document, cash, precious metal, and light goods flow. On the other hand, the Ottoman postal system tried to compete with the foreign postal service companies operating in Ottoman territories and waterways.<sup>52</sup> The Ottoman Postal Service Office tried to become a monopoly in the country, launched international services, and became a member of the World Postal Union. While it started maritime and air transport services together with land transport in its later years, it could not effectively compete with the activities of foreign postal service companies. Only during the First World War it became a monopoly. When the war had ended, all foreign postal service companies reopened their postal offices.<sup>53</sup>

The most important support for establishing a modern postal system came from the sultans and bureaucrats of the Empire.<sup>54</sup> Except for the horse-mounted postal messengers (*Tatars*), who feared losing their jobs due to the new system, there was no opposition to the modern postal service.<sup>55</sup>

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<sup>47</sup> *Geçmişten Günümüze Posta*, p. 166, p. 173-177.

<sup>48</sup> Nesimi Yazıcı, *Tanzimat Döneminde Haberleşme Kurumu* Ed. H. D. Yıldız 150. Yılında *Tanzimat*, Türk Tarih Kurumu Yayınları, Ankara, 1992, p. 173-201, p. 142; *Geçmişten Günümüze Posta*, p. 143.

<sup>49</sup> Muzaffer Ayten, *Haberleşmemiz: Enişte'ye Draboma*, M&M Yayıncılık, İstanbul, 1997, p. 19; *Geçmişten Günümüze Posta*, p. 158; Yazıcı, *op.cit.*, p. 176-177.

<sup>50</sup> *Geçmişten Günümüze Posta*, p. 147, pp.171; Yazıcı, *op.cit.*, p. 146-148.

<sup>51</sup> Yazıcı, *op.cit.*, p. 145.

<sup>52</sup> *ibid.*, p. 153-166.

<sup>53</sup> *Geçmişten Günümüze Posta*, p. 179.

<sup>54</sup> *ibid.*, p. 143-145; Yazıcı, *op.cit.*, p. 144.

<sup>55</sup> Yazıcı, *op.cit.*, p. 172.

## Telegraph

The first example of a practical telegraph, the optical telegraph, was discovered towards the end of the 18th century by explorers such as the Frenchman Chappe and British Murray.<sup>56</sup> But, Morse from the United States was the first person to develop the electrical telegraph and create a usable code.<sup>57</sup> In 1835, Morse managed to communicate with faraway lands via codes. From then on, he tried to present the outcome of his efforts to wider audiences. Mr. Chamberlain, an assistant of Morse, visited the Ottoman Sultan Abdulaziz as early as 1839 as one of these promotion efforts. The Ottomans had used optical telegraphs for almost nine years, beginning in 1830. During Chamberlain's visit in 1839, the new telegram was demonstrated at the Ottoman Court. The Sultan liked the invention<sup>58</sup> and ordered a gift to be given to its inventor as a token of his appreciation. On their way back, while Chamberlain and a few of his companions were traveling from The Ottoman Empire to Austria, their ship sank, and they drowned. This unfortunate incident and accompanying technical difficulties delayed the use of the electrical telegraph in the Ottoman Empire for a decade and a half. Only with the alliance of the Ottoman Army with those of the British and French in the Crimean War of 1855 were telegraph lines installed on Ottoman soil for the first time for military purposes by foreigners.<sup>59</sup> The ownership of these lines was transferred to the Ottomans after the war. Later, new lines were set up around Istanbul and Anatolia by using concession systems.<sup>60</sup> After a while, the Ottoman Government terminated these concessions, created a telegraph commission within the postal service organization, and started to install telegraph lines through its efforts.

British companies set up telegraph lines stretching to the Arabian Gulf and India. The construction of landlines on Ottoman territory served the purposes of the British to establish a direct and fast communications system with its colonies, especially with India.<sup>61</sup> In many parts of Anatolia and the Balkans, telegraph lines were built by the government and completed with the support of the local community and regional traders. The general public found the telegraph as a valuable tool for faster communication. Merchants saw its potential for the

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<sup>56</sup> Bahri Ata, "The Transfer of Telegraph Technology to the Ottoman Empire in the XIXth Century", Master Thesis, Boğaziçi University, 1997; *Headrick, op.cit.*, p. 193-203.

<sup>57</sup> Headrick, *op.cit.*, p. 204.

<sup>58</sup> Ata, *op.cit.*, p. 34-35; Başaran, *op.cit.*, p. 64; Yazıcı, *op.cit.*, p. 179.

<sup>59</sup> Ata, *op.cit.*, p. 8; Yazıcı, *op.cit.*, p. 180-181.

<sup>60</sup> Yazıcı, *op.cit.*, p. 183-184.

<sup>61</sup> Başaran, *op.cit.*, p. 68-69; Yazıcı, *op.cit.*, p. 201.

development of trade. Their enthusiasm and support materialized in their contributions to establishing telegraph lines with financial backing or physical labor. Especially in the Balkans, non-Muslim traders quickly supported line completion by providing financial resources.<sup>62</sup> Herein, their need to speed up communication with European merchants and markets played an important role.<sup>63</sup>

Within this framework, the Ottomans adopted the electric telegraph. They set up their telegraph system in a considerable part of the country shortly after similar efforts of the major European powers. Some of the reasons behind this fast adoption process were the commercial, administrative, and military communication needs of the Empire. The communication needs of European powers with their colonies were also critical.<sup>64</sup> The system's operation has benefited from the experiences of French experts,<sup>65</sup> and the communications were conducted in the French language for a while. Eventually, Ottoman experts, who replaced the French, were educated, and a code in the Ottoman language was developed.<sup>65</sup>

As explained above, citizens and tradesmen supported establishing the Ottoman telegraph network. Ottoman Sultans, especially Sultan Abdülhamit II, supported and used the telegraph system effectively as a political and administrative control mechanism via an effective and widespread intelligence network.<sup>66</sup> Amasra, a small city in Anatolia, perhaps because of this intelligence network, showed opposition to the establishment of telegraph lines.<sup>67</sup> Except for that incident, no serious opposition against telegraph technology was witnessed in the Ottoman Empire. On the contrary, the Ottoman government regarded the establishment of telegraph lines useful to minimize the harmful effects of the biased news supplied by the foreign news agencies. To this end, the Ottoman Telegraph Agency (Agence Télégraphique Ottomane) was founded in 1909.<sup>68</sup> Map 2 below shows the penetration and the territorial distribution of telegraph lines within the Ottoman Empire in 1874. The full black dots in the map are

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<sup>62</sup> Başaran, *op.cit.*, p. 81.

<sup>63</sup> Başaran, *op.cit.*, p. 66; Yazıcı, *op.cit.*, p. 196-199.

<sup>64</sup> Başaran, *op.cit.*, p. 56-57; Yazıcı, *op.cit.*, p. 186-189.

<sup>65</sup> Ata, *op.cit.*, p. 123; Başaran, *op.cit.*, p. 92; Yazıcı, *op.cit.*, p. 193-197.

<sup>66</sup> Ata, *op.cit.*, p. 122; Başaran, *op.cit.*, p. 84-85; Yazıcı, *op.cit.*, p. 198.

<sup>67</sup> Başaran, *op.cit.*, p. 79-80.

<sup>68</sup> Ceren Uçan, "Endeavoring to Establish an Imperial News Agency: The Ottoman Telegraph Agency", *Turkish Studies*, Vol. 21, Issue 5, 2020, p. 762.

stations capable of international transmissions, the black and white dots are those only available for domestic use. Similarly, the thick black lines are international, the thin ones are domestic lines. (see Appendix – Map 2)

### Telephone

Long-distance transmission of sound was first realized in Germany in 1861. The transmission of the human voice was made possible for the first time by A. Graham Bell in 1876 in the United States of America.<sup>69</sup> Three years after Bell's successful test, the world's first telephone network was founded in Paris.<sup>70</sup>

Telephone technology was introduced in the Ottoman Empire shortly after its invention. In 1877, an Ottoman telegrapher, Emil Efendi, even produced a working telephone machine. However, the Ottoman Government refused his request to set up a telephone system. In 1879, a concession application made by a German named Otto Winkler was also rejected. Only two years later, in 1881, the first telephone line was established between the telegraph headquarters and the postal service administration for experimental purposes.<sup>71</sup>

Telephone technology did not draw significant attention in the Ottoman Empire like the telegraph. The expansion of the telephone system was prevented by Sultan Abdulhamid II, who thought that the telephone technology was dangerous since two people using the telephone could organize conspiracies against the Sultan and the government without being noticed. Although foreign countries such as; Russia, Britain, France, Italy, and Austria asked the Ottoman governments to establish a telephone system, only at the end of Sultan Abdulhamid II's reign and with the declaration of Constitutional Monarchy in 1908, the widespread use of the telephone technology was permitted.<sup>72</sup> After that, some short telephone lines were awarded by tender (*'iltizam'* system, in Ottoman). Specifically, the privilege and task of installing telephone lines were given to different firms: The tender for the telephone lines in Istanbul was awarded to a

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<sup>69</sup> Tanju Demir, *Türkiye'de Posta Telgraf ve Telefon Teşkilatının Tarihsel Gelişimi (1840 – 1920)*, Posta Telgraf Teşkilatı Yayını, Ankara, 2005, p. 154.

<sup>70</sup> Başaran, *op.cit.*, p. 62; *Türkiye'de Posta Telgraf ve Telefon*, p. 155; Aliye Önay, *Türkiye'de Telefon Teşkilatının Kuruluşu* in Ekmeleddin İhsanoğlu ve Mustafa Kaçar (ed.), *Çağın Yakalayan Osmanlı Devleti'nde Modern Haberleşme ve Ulaştırma Teknikleri*, İslam, Tarih, Sanat ve Kültür Araştırma Merkezi, İstanbul, 1995, p. 121-135, p. 121-122.

<sup>71</sup> Demir, *op.cit.*, p. 155.

<sup>72</sup> Önay, *op.cit.*, p. 123-126.



British supplier,<sup>73</sup> in Izmir to a Swedish company, Ericsson,<sup>74</sup> and in some other regions to a U.S. company.<sup>75</sup>

Expert technical personnel were also needed to build, run, and maintain these telephone lines. Therefore, the government invited foreign experts from Belgium.<sup>76</sup> Still, the diffusion of the telephone system throughout the Ottoman Empire was not as rapid as that of the telegraph.<sup>77</sup> The reasons for this delay were the general lack of demand and the preventive efforts of the government. Compared with other countries, the telephone system became operational in the Ottoman Empire roughly 30-40 years after its invention. The first long-distance network was founded 42 years after the Paris-Brussels line.<sup>78</sup> But it may be wrong to interpret that delay as an anti-technological attitude. The main reasons for this delay seem to be the widespread telegraph technology satisfying the same communication need in a similar period in the country and the suspicious attitude of the Sultan and his government.<sup>79</sup> Table 1 below summarizes the introduction processes, forms, and actors of these four technologies (printing press, postal service, telegraph, telephone) in the Ottoman Empire. The lag (in years) between the European appearance of the innovations, and their first Ottoman evidence and their general accommodation is added to the Table to test the general theory of accelerating the world in the Ottoman social-economic environment, drawing attention to the significance of local circumstances. (see Appendix – Table 1)

## **Discussion**

The Ottoman Empire first came to life on the Anatolian Peninsula, located between three continents (Asia, Europa, and Africa), an area that had been the center of great civilizations. Leaving a considerable administrative, economic, political, social, and cultural legacy, understanding the Ottoman Empire is essential for understanding the region it ruled over six centuries. This article examines the Ottoman Empire's technology transfer policy beginning when its most glorious period was ending, as its military, economic, and political systems were not functioning as well as they used to be. Under these circumstances, the

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<sup>73</sup> *ibid.*, p. 123.

<sup>74</sup> *ibid.*, p. 133.

<sup>75</sup> Başaran, *op.cit.*, p. 87

<sup>76</sup> Önay, *op.cit.*, p. 125.

<sup>77</sup> İsmail Hakkı Yücel, *Türkiye'de Bilim Teknoloji Politikaları ve İktisadi Gelişiminin Yönü*, Devlet Planlama Teşkilatı, Ankara, 2006, p. 16.

<sup>78</sup> Önay, *op.cit.*, p. 122.

<sup>79</sup> Başaran, *op.cit.*, p. 86-88; Önay, *op.cit.*, p. 123; Yücel, *op.cit.*, p. 17.

Ottomans tried to keep up with the Europeans and thus achieve political, economic, and administrative stability by following the technological developments in European countries and elsewhere. This section examines and evaluates more closely the reasons for and the process of technology transfer and adoption by the Ottomans in communication technologies such as the printing press, postal service, telegraph, and telephone.

The religious minorities in the Ottoman Empire quickly adopted the printing press. However, Muslims, in general, and Turks, in particular, adopted the technology much later. This time lag can be considered one of the breaking points of the scientific and technological development of the Ottoman Empire. However, later, the establishment of a Turkish printing press triggered a modernization movement, strengthened Ottomans' reputation in other Muslim countries,<sup>80</sup> and enabled developments in military matters and scientific-artistic knowledge, as the printing press was used for printing maps, which are used for military-administrative purposes, and textbooks for engineering and military schools.<sup>81</sup>

In contrast to the delay in adopting the printing press, the postal service, the telegraph, and telephone technologies were recognized fast and adopted (or planned to be adopted) shortly after their invention to be utilized in the Ottoman administrative system. On the one hand, the "foreign push" factor was influential in the adoption since the European and American governments, individuals, and firms introduced these technologies to the Ottoman Empire to create a market.

The Ottoman Empire, on the other hand, adopted these technologies to achieve multiple objectives: Ottoman Sultans and bureaucrats aimed to maintain the societal order, provide more income to the treasury, strengthen the centralized character of the administrative system, and control the movement of all the letters, money news, and goods by setting up national postal service administration and telegraph lines.<sup>82</sup> Another objective was to ensure regular, reliable, and rapid communication both within the government agencies and among the people/regions of the Empire.<sup>83</sup>

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<sup>80</sup> Adıvar, *op.cit.*, p. 150-151.

<sup>81</sup> Nuhođlu, *op.cit.*, p. 919; Berkes, *op.cit.*, p. 54; Yüksel, *op.cit.*, p. 163.

<sup>82</sup> *Geçmişten Günümüze Posta*, p. 143, 161; Yazıcı, *op.cit.*, p. 143.

<sup>83</sup> *Geçmişten Günümüze Posta*, p. 146-147; Yazıcı, *op.cit.*, p. 146.

While the adoption of a modern postal system was internally generated and was required mainly by economic and administrative needs, the adoption of telegraph technology was asked by the powerful European states<sup>84</sup> to meet the need for military and diplomatic coordination during the Crimean War.<sup>85</sup> Later, the driving forces of its widespread use also included economic reasons, such as providing easier and more dependable access to colonized countries and open markets<sup>86</sup> and encouraging domestic and external trade,<sup>87</sup> as well as political (diplomatic communication) and administrative (administrative control tools) objectives.<sup>88</sup> These objectives also fit the Ottoman Empire's interests, so the telegraph technology adoption process was fast and easy. Under the rule of Sultan Abdulhamid II, telegraph technology enabled the establishment of a vast and powerful intelligence network to protect the country's order, keep society under control, and facilitate the flow of all kinds of relevant information.<sup>89</sup> Finally, communication between financial centers and merchants was provided by telegraph.<sup>90</sup>

As opposed to the relative ease by which the modern postal system and telegraph technology were adopted in the Ottoman Empire, telephone technology raised suspicions in the Sultan and the administrative elite.<sup>91</sup> Therefore its widespread adoption was delayed for four decades despite the pressures of foreign countries that emphasized the economic advantages of having a telephone system.<sup>92</sup> Once the restrictions on its adoption were lifted, the telephone system benefitted the Ottoman Administration considerably by providing official communications via the sharing of security information between the police and gendarmerie<sup>93</sup> and in responding to emergencies, such as its use by the firefighter departments.<sup>94</sup>

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<sup>84</sup> Ata, *op.cit.*, p. 8.

<sup>85</sup> Yazıcı, *op.cit.*, p. 180-183, p. 196.

<sup>86</sup> Başaran, *op.cit.*, p. 68-69.

<sup>87</sup> Başaran, *op.cit.*, p. 66; Yazıcı, *op.cit.*, p. 196-197.

<sup>88</sup> Başaran, *op.cit.*, p. 66-67.

<sup>89</sup> Başaran, *op.cit.*, p. 84-85.

<sup>90</sup> Yazıcı, *op.cit.*, p. 197.

<sup>91</sup> Başaran, *op.cit.*, p. 86-87; Demir, *op.cit.*, p. 156; Önay, *op.cit.*, p. 123-125; Yücel, *op. cit.*, p. 17.

<sup>92</sup> Başaran, *op.cit.*, p. 86; Önay, *op.cit.*, p. 124.

<sup>93</sup> Demir, *op.cit.*, p. 157.

<sup>94</sup> Başaran, *op.cit.*, p. 86.

This would be a good place to discuss the relationship between telegraph and telephone a bit, especially whether, when and how the telephone outcompeted telegraph in the Ottoman Empire, as it did in the West. However, this replacement process is outside the scope of this article, which covers the period that ended in 1923. Future researchers may examine this interesting phenomenon, which is worth discussion and comparison.

The overall impact of the adoption of communication technologies was multiple: The printing press, for example, was extremely useful for gathering military and technical information and using them in modern military training.<sup>95</sup> While the calligraphers, who were traditionally copying books by handwriting, seemed to be losing from the adoption of the printing press,<sup>96</sup> the total effect was positive, with the increasing number of books speeding up information circulation.<sup>97</sup>

Establishing a modern postal service also witnessed moderate opposition from the members of the traditional postal system's horse-mounted messengers. Still, the new system's advantages, such as the increase in the speed and security of postal deliveries, government revenues, and the number of employees, were strong enough to overcome the opposition.<sup>98</sup> The new postal system, which enabled the transportation of cargo loads and precious metals and established a small goods and money transfer system, made trade feasible in locations where it was formerly not.<sup>99</sup>

The Ottoman Government wanted to establish or strengthen its centralized administration by controlling and/or coordinating the functioning of communication technologies. In the case of the printing press, it controlled the number and type of books to be published, together with their prices. In establishing the postal system, an important objective was to weaken and then ban the activities of foreign postal service companies in the Empire. These "parallel systems" of foreign postal services provided printed materials that

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<sup>95</sup> Yüksel, *op.cit.*, p. 163.

<sup>96</sup> Berkes, *op.cit.*, p. 57-58.

<sup>97</sup> Adivar, *op. cit.*, p. 150; Yüksel, *op.cit.*, p. 137.

<sup>98</sup> *Geçmişten Günümüze Posta*, p. 150-153; Yazıcı, *op.cit.*, p. 142, p. 150-151.

<sup>99</sup> Yazıcı, *op.cit.*, p. 175.

spread politically “*dangerous ideas*.”<sup>100</sup> Likewise, the Russians used the telegraph system, especially for propaganda against the Ottoman Empire.<sup>101</sup>

As explained in detail below, the telegraph was used to organize and maintain a vast intelligence network for the government. This point is vital since telegraph technology was adopted when the Ottoman Empire’s traditional social and economic structure began disintegrating. There was maladministration in the military; state authority was weakened in the rural areas, and the government was wrestling with many financial problems. The telegraph enabled the central government to better control and coordinate the provinces in terms of military administrative control.<sup>102</sup>

While it served centralized control, telegraph technology also contributed to developing a new “*intergovernmental relations*” category in the Ottoman Empire. For the first time, the Sultan and high-level bureaucrats had the opportunity to eliminate intermediaries and establish direct communication with the public and civil servants to hear the complaints about the administrative system and to give direct orders to these bureaucrats to solve the problems.<sup>103</sup>

Adopting communication technologies also increased the government revenues of the Ottoman Empire.<sup>104</sup> For example, the postal service and the telegraph provided a new impetus to trade as they were used for communication between raw material suppliers and stock market dealers.<sup>105</sup>

Finally, the adoption and widespread use of communication technologies benefitted the civilian population of the Empire as well. People began to learn about the economic, political, and administrative developments in the Empire and the world faster and in greater detail.<sup>106</sup> Increased interaction with Europe has changed consumption patterns and has created a demand for new products. However, such a development increased the differences in lifestyles and consumption patterns between the Muslim and non-Muslim populations and created tensions in the social structure.<sup>107</sup>

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<sup>100</sup> Demir, *op.cit.*, p. 222-223.

<sup>101</sup> Başaran, *op.cit.*, p. 84.

<sup>102</sup> Yazıcı, *op.cit.*, p. 198.

<sup>103</sup> Başaran, *op.cit.*, p. 85.

<sup>104</sup> Başaran, *op.cit.*, p. 90; Yazıcı, *op.cit.*, p. 196-198.

<sup>105</sup> Başaran, *op.cit.*, p. 81.

<sup>106</sup> Yazıcı, *op.cit.*, p. 196.

<sup>107</sup> Ata, *op.cit.*, p. 25, p. 124-125.

The reasons for adopting and using communication technologies in the Ottoman Empire can be summarized in Figures 1 through 3 below. (see Appendix – Figure 1, 2 and 3)

### **Conclusion**

Technology adoption is a complex process of motives and means, push and pull factors. During the 19th and early 20th Centuries, communication technologies in the Ottoman Empire were acting as tools for multiple processes<sup>108</sup>: First, they were instrumental in integrating the Empire's economy into the global capitalist economy and, along the way, transforming the Ottomans into a de-facto semi-colony. An excellent example of this process is the connection of the Ottoman trade centers and the ports to the European markets. Second, the telegraph connected the Ottoman countryside to the Imperial Capital (Istanbul) for administrative and military purposes. Technology made it easier for the central Ottoman Administration to control the Empire by providing constant information about the actions and intentions of the local political power holders.<sup>109</sup> The railways were especially extremely useful for transporting agricultural products, immigrants, and troops.<sup>110</sup>

Isomorphic pressures dominated a considerable part of the adoption process. There was constant pressure on the Ottoman political and administrative elites to learn and adopt Western technological advances to modernize the army and the administrative structure. Failing to do so or being late in technology adoption meant experiencing severe military or political repercussions in the form of losing wars and territory or being unable to respond successfully to the political developments in distant Ottoman provinces. Powerful European nations of the time also often asked the Ottoman Government to adopt and/or spread technology for military or economic purposes, as happened during the Crimean War. In such situations, coercive and mimetic isomorphism became one of the most influential factors in the Ottomans' adoption of new technologies.

Within this framework, transportation technologies, such as railways, connected Ottoman merchants, raw materials, and consumers to the European financial centers, factories, and markets. Even in the relative absence of the wars of conquest, *the imperialism of free trade*<sup>111</sup> was at work in the Ottoman Empire example. As Headrick suggested, technology transfer to the Ottoman Empire

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<sup>108</sup> Yıldız, *op.cit.*, p. 46-47.

<sup>109</sup> Bařaran, *op.cit.*, p. 55-85.

<sup>110</sup> Ortaylı, *op.cit.*, p. 512.

<sup>111</sup> Headrick, *op.cit.*, p. 6.

happened in European terms. An excellent example of this phenomenon is the 'mileage guarantees' given to European entrepreneurs while building railway lines. This technology export and adoption process also gradually removed the barriers to European trade and investment by providing a suitable technical and economic infrastructure.<sup>112</sup>

As for technology transfer agents, the Ottoman Government was already in the habit of employing foreign technical experts, especially in the military area, for a long time, before the 19<sup>th</sup> Century.<sup>113</sup> In addition, migrants, in the form of military and technical experts, sometimes after converting to Islam and joining the ranks of the Ottoman army or bureaucracy, played essential roles in the technology adoption process. In the Ottoman Empire example, in addition to Headrick's<sup>114</sup> categories of technology transfer agents (*exporters*: salesmen, foreign aid officials, engineers; *importers*: students, purchasing agents, spies, and finally migrants, as both importers and exporters), Ottoman Sultans and high-level bureaucrats can be added to the list of technology importers.

Due to increasing trade volumes, formerly small Ottoman towns with harbors close to the European markets became active centers of commerce and grew into big cities.<sup>115</sup> The accumulation of commercial wealth and the growing infrastructural needs of the merchants created a considerable demand for certain services, such as street lighting, paved roads, and gas and electricity systems in these cities. They thus prompted the establishment of European-style municipalities in the Ottoman Empire.<sup>116</sup>

Major European powers also had an instrumental interest in the technology adoption of Ottomans. The British government, for example, saw the telegraph lines built in the Ottoman Empire as an opportunity to connect its imperial center of the British Islands to her Indian colonies, first as part of the main line and then as a backup system.<sup>117</sup>

However, one argument for technology transfer and adoption, made within the context of colonialism, does not fit well into the example of the Ottomans.

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<sup>112</sup> *ibid.*, p. 379.

<sup>113</sup> İhsanoğlu, *op.cit.*, p. 52.

<sup>114</sup> Headrick, *op.cit.*, p. 10.

<sup>115</sup> Headrick, *op.cit.*, p. 379; Ortaylı, *op.cit.*, p. 322.

<sup>116</sup> Ortaylı, *op.cit.*, p. 291.

<sup>117</sup> Headrick, *op.cit.*, p. 100-101, p. 105

Headrick<sup>118</sup> summarizes this argument as “*the urge to proselytize their (European) techno mania among the ‘backward races’*”. Such proselytization cannot be observed through technology adoption in the late Ottoman Empire.

Finally, some researchers of technology transfer in colonies conclude that colonies experienced economic growth but little economic development since investments went into physical, not human, capital, and technology transfer was more geographical than cultural.<sup>119</sup> This argument is partially valid for the Ottoman Empire example. Although economic development was indeed limited in the Ottoman case, human capital in terms of native experts was quickly educated. Some of these technologies became culturally diffused in terms of hands-on learning, creating social mobility,<sup>120</sup> and even reinvention.

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<sup>118</sup> Headrick, *op.cit.*, p. 380.

<sup>119</sup> Headrick, *op.cit.*, p. 384.

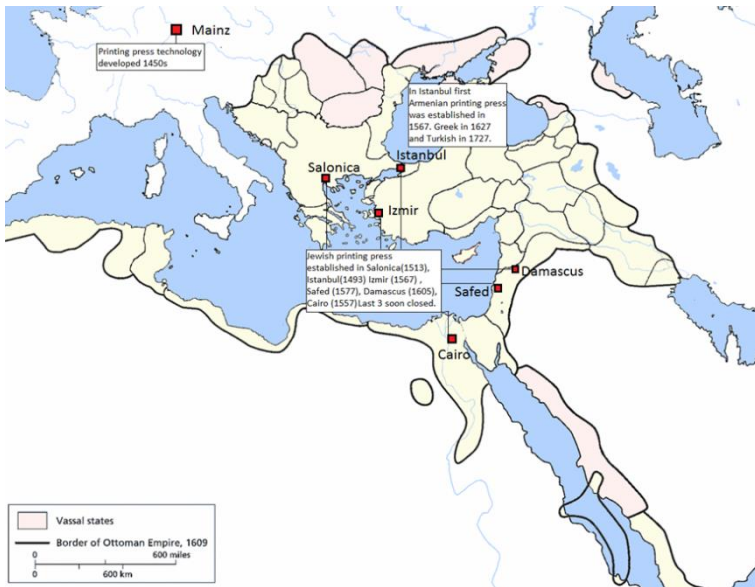
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## Appendices



**Map 1** - Penetration of the Printing Press in the Ottoman Empire

<https://www.reddit.com/media?url=https%3A%2F%2Fi.redd.it%2Foqttoo-gmm0j01.png>, Accessed on February 1, 2024.



**Map 2** - The Ottoman Telegraph Network in 1874

Atatürk Kitaplığı, DSCN5503, DSCN5504.

Technologies and Time Gap (From Discovery to Adoption)	Period	Forms of Introduction	Supporters and Opponents	Objectives
<b>Printing Press</b>	The first usage was in Europe in the 1450s, the first non-Muslim usage in Ottoman was in 1495, and the first Turkish printing press was built in 1727 (Gap: About 277 years).	A Bureaucracy-based civil initiative attempted to introduce the technology, but before them, it was introduced by minorities. Got inspiration from Europe. Although it was a private enterprise, the state had exclusive control, i.e., on book prices.	The Sultan and the bureaucracy supported it. The religious establishment ( <i>Ulema</i> ) was in favor of the Printing Press. Calligraphers opposed.	Increasing the number of books and ensuring valuable knowledge transfer, primarily via textbooks.
<b>Postal Service</b>	Modern postal service started in Europe around 1800. The first regular modern service in the Ottoman Empire began in 1832 (Gap: About 32 years).	Modern postal service was provided at the request and order of the Sultan. First, the awarding of tenders to private parties was tried. Proved unsuccessful, the government became the sole provider.	The Sultan was the most prominent supporter. The public and the merchants as active users were also supporters. The horse-mounted messengers of the traditional	Setting up a new, effective communication and transportation system and increasing government income.

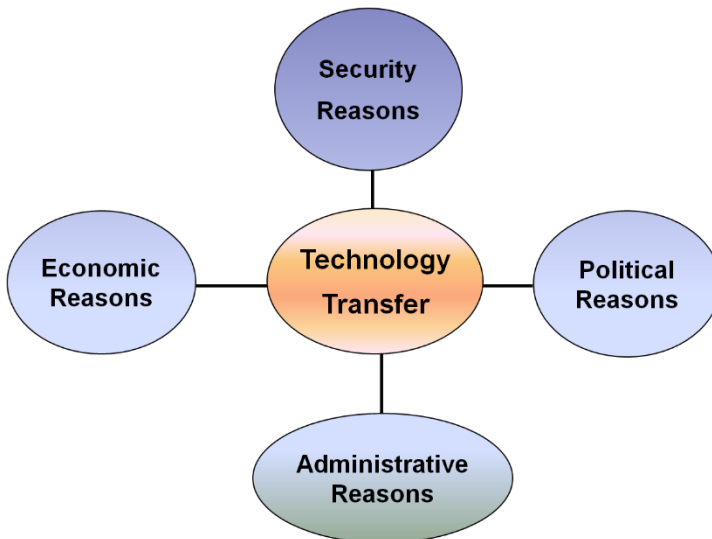
			postal system opposed.	
<b>Telegraph</b>	The initial invention was much improved by Morse in 1835. The first adoption effort in 1839 was unsuccessful. The Crimean War necessitated it in 1855 (Gap: 20 years).	During the 1855 Crimean War, telegraph lines were established with the strong request of the Allied forces. Following increased domestic and external demand, the system expanded after the War.	European countries supported the system to gain concessions and increase imports. The Ottoman public, merchants, and the military used and supported it.	At first, the telegraph was adapted for military purposes, but its use became widespread due to its benefits for trade and a centralized administration.
<b>Telephone</b>	Graham Bell invented the telephone in 1876. The first Ottoman phone was produced in 1877. The first limited telephone line was established in 1881 (Gap: 5 years).	A telephone line was built for the Postal Service Administration, but the suspicions of the Sultan delayed widespread adoption for four decades.	Requests for domestic and foreign privileges were not allowed. The Sultan completely stood against the telephone for four decades.	Speeding up communication. It was mainly used for military and domestic security purposes.
<b>Similarities and Differences</b>	Except for the printing press, Western technological innovations	At times, the initial demand came from the private sector (printing) and the other states	Sultans and bureaucrats were open to innovations. Society had no	Military and administrative purposes were paramount. Fast and reliable communication

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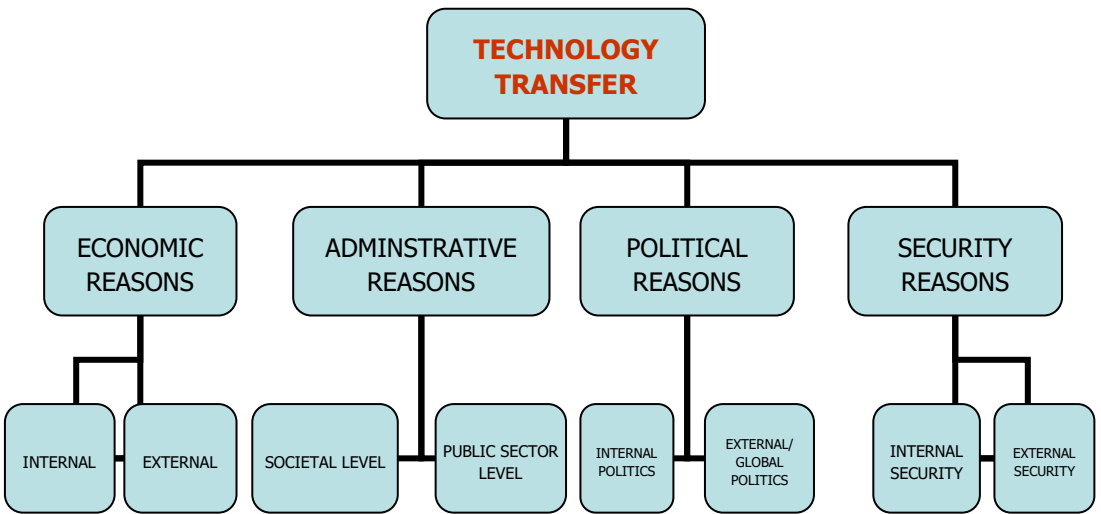
were followed closely without too broad a time lag in adoption after invention.	(telegraph), and the Ottoman Government oversaw adoption.	considerable opposition since people generally benefited from technological change. Groups whose interests were endangered were opposed.	was the key to a more effective centralized administration.
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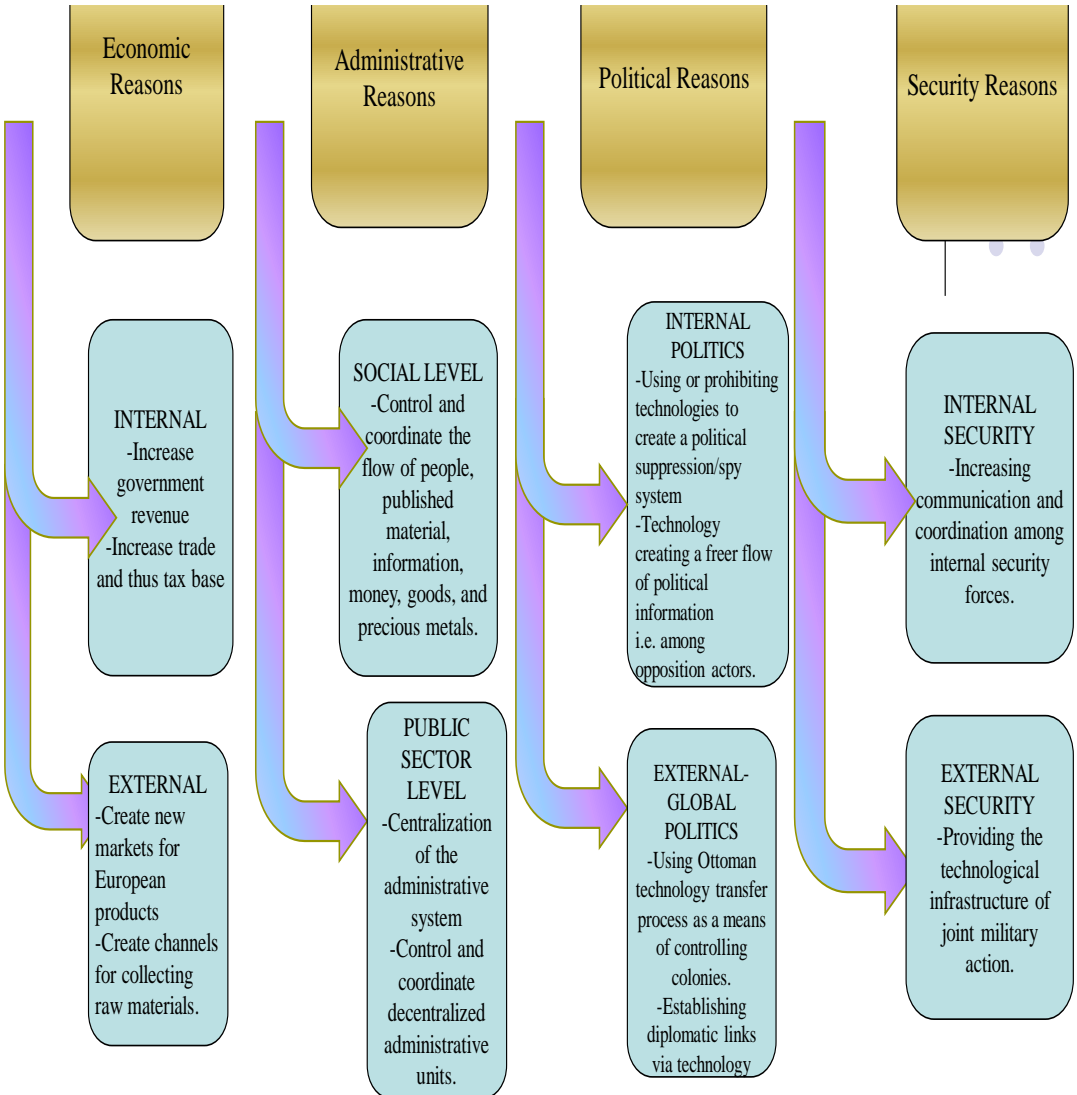
**Table 1** - Adoption of selected communication technologies in the Ottoman Empire



**Figure 1** - Reasons for technology adoption in the Ottoman Empire



**Figure 2 - Detailed reasons for technology adoption in the Ottoman Empire**



**Figure 3-** More detailed reasons for technology adoption in the Ottoman Empire