Cultural Heritage of Montilla

The printing press was key for the dissemination of culture and knowledge in the Modern Age. It was used to produce books, documents, and etchings, which are key elements for the dissemination of knowledge and the preservation of human heritage.

1. Introduction

The ancient printing heritage, marked by the invention of technologies such as the Gutenberg press, contributes to sustainable development goals by exemplifying the power of knowledge dissemination, fostering education, and promoting cultural exchange, thus laying the foundation for inclusive and equitable societies. Indeed, in the framework of the 2030 agenda for sustainable development, it is target 4 of SDG 11, "Sustainable Cities and Communities", which is based on improving efforts to protect and save cultural and natural heritage.

According to physician D. Francisco Antonio Tenllado and Mangas, founder of the Tenllado Printing Press, in Lucena (Córdoba) in 1860, "The printing press avoids all the inconveniencies of the communication means known to humans. It is not ambiguous or as perishable as signs; it preserves events for history, which cannot be achieved by language; it is understandable even for the inept reader; in prints, it is all about knowing how to read old letters; ink is a varnish that time does not erase, and the directors, typesetters and correctors are trained people who check and revise the editions many times before publishing them. The printing press is the best means to communicate ideas to others due to its promptness, low cost and instantaneous reproduction of copies" [1].

2. Cultural Heritage of Montilla

2.1. Precursors and History of the Printing Press

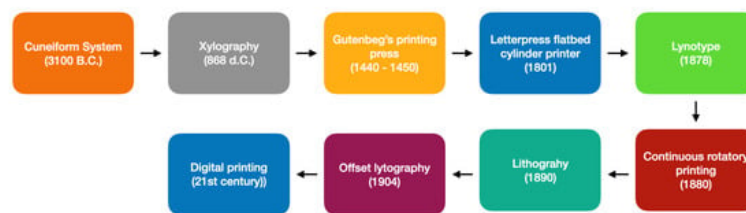**Figure 1** shows some relevant facts regarding the precursors and precedents of the printing press.

Figure 1. Evolution of printing systems.

In Sumer (present-day Iraq) in the year 3100 B.C., the cuneiform writing system emerged [2][3]. The precursor of the modern press was xylography, which was discovered in China in the year 868 A.D. [4].

In the Middle Ages, knowledge was transmitted through handwritten copies manufactured in monasteries. The birth of universities and the social change in the Modern Age entailed a demand for identically reproduced texts [5]. In the first half of the 15th century, different attempts were made to satisfy this demand. In this context, Gutenberg developed the printing press of moveable types. It was a wooden press, whose machinery was similar to that of wine presses, in which typographic letters made of cast metal soaked in fat were pressed [6]. Gutenberg's Latin Bible marked a turning point. It was the first book printed in Europe using a printing press with metal moveable types. It is estimated that 180 and 45 copies were manufactured in paper and vellum, respectively [7]. The *art of printing* was born, which is mentioned by Cervantes in his famous book *Don Quixote de la Mancha* [8], achieving a greater dissemination of culture through written texts, thereby increasing the production of documents and expanding the reading public [9][10].

2.2. The Printing Press in Spain and Its Expansion throughout the New World

Gutenberg's invention spread quickly throughout Europe despite the Islamic opposition that weakened its progress as well as innovation in this way of communicating. Consensus has not been reached to date on where the first printing press

was installed in Spain. Some authors date it to 1472 [11][12], whereas others date it to 1473 [6]. Studies assert that the first printing presses appeared in Barcelona, and then others appeared in Madrid, subsequently spreading throughout the Iberian Peninsula [6][11][12]. According to the literature, the first printed work in Spain was *El Sinodal de Aguilafuente*, printed in 1472 [13], although several authors, such as Viñes, Serra, and Clair, disagree with this statement. The arrival of German printers in the last decade of the 16th century constituted an inflection point for the spread of the printing press in Spain. In its inception, this art was transmitted verbally, and different treatises have been published in this respect [14][15]. The first of these documents is a complete manual of the printing press, made by renowned printer Joaquín Ibarra, regent of the Kingdom's Company of Printers and Booksellers. The second document is a very specific and simple treatise for typesetters. Both documents were classic works for Spanish printers of the 19th and 20th century.

The evolution of the printing press in Spain cannot be understood without the protection of the Spanish Crown at different moments of history. The first law in this regard was enacted by the Catholic Kings on 8 July 1502: the *Procedures that must precede the printing and sale of books of the kingdom, and for the course of* [16]. Carlos III, the "Father of Letters and protector of the arts", granted important privileges to printers [3], facilitating a reemergence of typography. During the reign of Carlos IV, the development of the periodic press via the printing press was favored [3][14][15][16][17][18]. With the discovery of America, the printing press was introduced to the New World [11]. In fact, in the City of Mexico alone, Morán Reyes located over thirty printers in the 17th century [19]. This rapid expansion led to the development of legislation for the regulation of this art.

2.3. The Arrival of the Printing Press in Andalusia

The first evidence of the printing press in Seville dates to 1470–1480, relating to Jacobo Cromberger, trader and precursor of one of the most important family lines of printers of the 16th century [20][21]. It rapidly spread throughout Andalusia, mainly in Granada and Córdoba [11]. Valdenebro studied the evolution of the printing press in Córdoba [22], highlighting the workshops of Juan Bautista Escudero (1556–1577), Simón Carpintero (1561), Gabriel Ramos Bejarano (1585–1609), Diego Galván (1588–1595), and Francisco de Cea Tesa (1588–1620).

Ramírez de Arellano exchanged some letters with important people in Córdoba about local printing presses between 1888 and 1889. They were published in "Diario de Córdoba" and in "Gacetilla del Comercio de Córdoba" and were gathered in a volume held in the Old Repository of the University of Seville [23]. Some of these letters were exchanged with Montillian citizen Dámaso Delgado, who made use of documents from his private library and texts of Morte Molina. The study of Valdenebro is the most complete work published to date about the beginning of the use of the printing press in Córdoba. A recent study proposed a reinterpretation in this respect, refuting the relationship between the establishment of the printing press in Córdoba and the influence of the Fellowship of Jesus and relating it to the sponsorship of Juan de Córdoba, abbot of Rute, along with editor Alejo Cardeña (the bishopric) and the incumbents of the church [24].

2.4. From the Industrial Revolution to the Present Time: Technical Improvements of the Printing Press

With the arrival of the Industrial Revolution, the manual printing press was replaced by the mechanical printing press. Lithography appeared, ushering in the reproduction of colored illustrations, stamps, posters, etc. In 1886, linotype allowed for the composition of text from a keyboard and the automatic fusion of a block line. The works of Gillot led to the appearance of new photomechanical techniques. Along with his son Charles, he made photography printing possible [25]. In 1800, Lord Stanhope created a cast-iron press that was named after him. It was a revolutionary invention, and it spread throughout Europe and America [3][26][27]. This promoted literary production, reducing the price of books and increasing their accessibility.

In 1875, Englishman Robert Barclay developed a device made of tin for printing on paper; it was later improved by Ira Washington Rubel circa 1903. Thus, offset printing emerged, which is considered the second revolution of the printing press. It is a form of indirect printing, wherein the printing is not carried out directly on the paper but through rubber rollers. This substantially improved printing quality [28][29].

After the Second World War, the printing press underwent a new evolution. A great demand for printed material emerged, and the existing techniques were insufficient. The invention of the computer gave rise to the phototypesetter in the 1950s, which sparked a revolution regarding the production rate of texts. It was widely used in the 1970s and 1980s. With the generalization of the use of personal computers and inkjet printers, a new revolution began [30].

In 1982, Lamport developed the LaTeX v1.0 software product, which is widely used nowadays, especially for the production of scientific and technical documents, due to its high printing quality [31][32]. In the last decade of the 20th century, two relevant events occurred. The first of these events was the invention of the digital printer, known as *indigo*, which allowed the general public to obtain quality prints in a short time. The second event was the creation of the XML and LaTeX languages, which, along with digital printing, allowed intermediate users to produce their own electronic books in ePub format [33][34][35].

Nowadays, 3D printing is widely used. In fact, recent studies report its application in educational centers [36][37][38][39][40][41] and in the preservation of cultural heritage using photogrammetric techniques and laser scanning, among other methods. The use of augmented reality is a good way of creating and integrating information from a purely analogue medium, enriching the context and providing the user with a unique experience that facilitates the teaching–learning process [42].

The printing press undoubtedly facilitated access to information for all citizens. The printing and dissemination of copies spread knowledge to practically all parts of the world. This meant the creation of libraries, constituting safeguards and the future of information storage and access. There has been a change in this system, which is currently tending more and more toward digitization.

All this evolution in the art of printing, along with the globalization process that has transpired in the last few decades, has sparked a revolution in the editorial industry. Thus, despite the increase in the number of publications, the number of printed copies [43][44][45], as well as sales, has decreased considerably in favor of digital publishing, as is the case for the written press. For example, in Spain, Magadán [43][44] observed a 25% decrease in the editorial market in the last few years. Hulten [45] analyzed the reconversion of traditional printing to digital printing through the study of five printing companies in Sweden, concluding that an important investment in machinery is necessary, which has a shorter useful life compared to old printing presses. If the printers of the 21st century are to prevail over time, their offer of products must be modified, combining the traditional business model with the new digital model. This is where a new concept emerges: nanography. It consists in the application of nanotechnology to digital printing to modify the characteristics of pigments. The results improve exponentially, allowing the user to print in any material and favoring the care for the environment [46].

Following Anderson's long tail theory, the digitization of the market reduces the physical printing of copies, also reducing transportation or storage costs. On the contrary, this digitization means that printed resources reach more users and that they can access the information practically at any time and in any place.

In addition, projects involving the digitization of old works in archives and libraries make it easier for researchers from anywhere in the world to access copies without having to travel. This technique also plays a fundamental role in the conservation of these works, circumventing their deterioration [47].

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