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A Review of Documentation: A Cross-Disciplinary Perspective

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Abstract: Documents are tools of communication which are changing rapidly in nature and quantity. Prompted by the COVID-19 pandemic, digital formats have become ubiquitous. However, documents and documentation have a long pre-digital history. In seeking to survey document types and features, two major online journal databases from the Web of Science database were analysed over a 30-year period to 2020. Documents were classified into types and the (arbitrary) features of format, dimension, production, administration and distribution. Such tabulation of journal documents has not been undertaken previously. As the sampled journals covered a range of fields, the types and features of documentation in selected specialised areas were included. Digitalisation of documentation, especially of rare documents, has accelerated in recent times, contributing to the retention of knowledge and its rapid dissemination, despite the accompanying disadvantages of the digital age, with its largely unregulated social media. Classifying and describing the diversity of existing documents is a major task and we have initiated this process by analysing two scientific databases.

Keywords: document; documentation; disciplines; classification



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1. Introduction

It was not until the recent COVID-19 pandemic lockdowns (2020 onwards) that, spontaneously and unpredictably, societies began relying on new digital technologies for tracing patients, communicating, reading the daily news, chatting via social media, shopping, teaching, and conferencing. This painful COVID-19 pandemic has taught many valuable lessons, among them the role of factual and rapid knowledge-sharing. Millions of informal and formal documents such as scientific and non-scientific articles, blogs, and commentaries have been generated, along with the dissemination of numerous myths, incorrect data, unverified or speculative information, and personal tweets [1].

As a preamble to the paper's central theme, these introductory remarks decode the "documentation" concept by introducing a few "documents" (articles, blogs, posts) and their distribution platforms (online platforms and social network tools). Additionally, indirectly noted is the importance of the speed and reliability of documents generated to address and adapt to a global challenge (the pandemic).

This scoping review paper is a timely response to the growing number of recent publications which scrutinize documents from numerous perspectives, disciplines and scales, both at the global level: for example, COVID-19 and its effects in cities [2] and nursing education across several countries [3], and at the national level: environmental policies in Poland [4] and emergency news on Weibo in China [5]. Such documents discuss the impacts of ad hoc or permanent decisions and responses made by national and global authorities on public health, wealth, financial well-being and living standards. The identification of definitions, classifications and typology of various documentation is therefore very relevant to present-day realities and concerns.

These aspects and others will be tracked by a description of the properties of documents. This paper reviews definitions of documents and presents a novel insight into

classifying them through a cross-disciplinary lens. The paper will make an inventory of existing documents, demonstrate the various types and significant features they display and consider analytical scenarios, benefits and criticisms attached to the ballooning digitalization movement. It will also briefly review the historical dimension of the evolution of documentation globally, with greater emphasis on scientific documents. Moreover, it will open a new avenue for further discussion under the heading of problematic documentation.

This paper aims to act as a cross-disciplinary reference for the analysis of documents across different specialised disciplines. Given the rising quality, quantity, accessibility, and shareability of documents, especially digital documents, an updated and comprehensive review paper seems timely. To the best of our knowledge, such a compilation of old and modern documents has not yet been published. Moreover, existing literature on documentation has been confined to particular specialisations (e.g., medical sciences) with their discipline-based terminology and have been analysed using different approaches (e.g., content analysis, web searching).

2. Basic Definitions

2.1. Documentation

During the 1920s, “documentation” was increasingly accepted as a general term to encompass bibliography, scholarly information services, records management, and archival work [6]. “Documentation helps the data to be more understandable and less ambiguous, as well as enabling easier data discovery” [7] (p. 409) and includes all types of documents. In another definition by Loosjes (cited by [6]): “the delegated task of creating access for scholars to the topical contents of documents, especially of parts within printed documents and without limitation to particular collections”, was documentation. Since 1950, terminology such as ‘information science’, ‘information storage and retrieval’ and ‘information management’, have replaced the word “documentation” [6].

At the project level, in addition to the physical structure and aspect of any developmental projects planned, implemented, and completed, the most important legacy that remains and can be retrieved would be the documentation associated with each component of the project’s progress. In addition to the technical and procurement aspects, project documentation (especially financial accounts and reports) can increase the accountability, transparency, and responsibility of project stakeholders. In contrast, poor documentation leads to either a paucity or an excess of information that hampers successful project implementation, causes documents to be lost during or after the life of the project, and diminishes the competitiveness of the project team to win a subsequent tender [8]. In health care systems, documentation is also critical in providing good care, supporting and structuring inter-professional and doctor-patient relations, and contributing to clinical efficiency [9].

One of the most comprehensive guidelines for documentation was published by the UN [10]. The guidelines delineated regulations for the control and limitation of documentation and defined the various types of documents to be distributed in the UN system, such as meeting records, publications, official records, conference room papers and working papers. Three types of distribution patterns were imposed: General, Limited, and Restricted. Although the UN is a large international organisation, requiring clearly defined documentation processes for successful operation, these guidelines can also be usefully applied to the management of smaller entities.

2.2. Document

The definition of “Document” is broad as it needs to be sufficiently comprehensive to cover existing (historic and current) and new documents. The word “document” is “derived from the Latin ‘*docere*’: to teach, and it means ‘instruction; a warning; a paper or other material thing affording information, proof or evidence of anything . . . ’” [11] (p. 109). The Merriam-Webster Online Dictionary [12] defines “document” as follows:

- “an original or official paper relied on as the basis, proof, or support of something (law)

- something (such as a photograph or a recording) that serves as evidence or proof (law)
- a writing conveying information
- a material substance (such as a coin or stone) having on it a representation of thoughts by means of some conventional mark or symbol
- a computer file containing information input by a computer user and usually created with an application (such as a spreadsheet or word processor) [to] create a new document."

In another definition, document could be "any source of information, in material form, capable of being used for reference or study or as an authority; e.g., manuscripts, printed matter, illustrations, diagrams, museum specimens, etc...." [6]. Knowledge is retained and shared through documents of various forms [13]. A document relates to a wide range of items, including "structured and unstructured data, raw data, meta data or compiled data, images, numerical data, spreadsheets, charts, infographics, questionnaires, forms, transcripts, brochures, reports, videos, audio files and presentation slides, among many others" [14] (p. 179).

Documents increase our understanding by describing events and environments, as well as providing instructions and guidelines for the present and future and are effective for sharing data and information among large groups. Even unsolicited advertising material, sales letters, fund-raising brochures and bank statements could be categorised as documents, as they are sharing information. Companies and goods producers use illustrative documents and guides as supportive learning tools to present the use of their products and enhance communication with customers to expand their enterprises [15]. According to Briet's definition [6]: "A document is any physical or symbolic sign, preserved or recorded, intended to represent, to reconstruct, or to demonstrate a physical or conceptual phenomenon". Briet believed that "a star in a sky is not a document while a photo of star is" [6].

Documents can become valuable objects in the marketplace. Aside from exceptional items which are sold for millions of dollars, such as the bag of moon dust sold by Sotheby's for USD 1.8 million in 2017 [16], documents signed by celebrities and well-known figures are also often sold for large sums in auctions. Trivial items such as a family photo, cigarette pack, or a letter signed by a celebrity, singer, researcher or politician may be sold at a high price decades later. For example, a so-called 'Disaster Girl' meme illustrating a five-year-old girl (now 21) standing in front of a burning building became popular on the internet and was sold for USD 473,000 [17].

Regular family letters may be converted into saleable documents decades later, especially if they accidentally become part of an historical event. An American first-class passenger on the Titanic could never have imagined that his heavily water-stained letter to his mother (dated 13 April 1912) would be sold for USD 153,000 at an auction in England in 2017 [18]. It is not just the quality of a document, or even its written content which is significant, rather its financial value is also related to its historical context and the identity of the contributor or author.

From a documentary perspective, tags could be regarded as documents: tags or labels on items such as glass bottlenecks or luxury liquid bottles, artworks, jewellery, artefacts, auctions, and address labels on suitcases all act as documentation. Any one of these apparently trivial items may be considered as a valuable, informative document during court hearings or trials, forensic examinations, police investigations, accident reconstructions, aircraft accidents, official claims, and missing postal items, among many others. For example, an unexpected finding in the UK unearthed 271 historical items, including Egyptian relics and medieval and Bronze Age pieces, inside a large, buried jug [19]; these items were stolen but were finally returned to the owner as some still had recent auction tickets [19].

We may conclude here that any piece of paper which is dated, templated, pictorial, signed, and marked with or without the name of manufacturer or producer could be interpreted as a document, as it has an "identity", is "replicable" and "shareable".

3. Materials and Methods

3.1. Database Searching

Journals have become increasingly more specialized, both in their language of publication and the knowledge field addressed, and the grey literature is expanding rapidly across all fields and languages. The Web of Science's sources are exclusively in English [20], but recent research indicated that articles in the field of computer sciences ($n > 500$) were published in nine languages [20]. Within the specific discipline area of "Library and Information Sciences", Scimago has listed 248 journal titles. In addition, there are substantial and complex differences among large bibliographic global data sources (e.g., [21]), making it challenging to select the best one(s). It is therefore beyond the capacity of a single review to comprehensively cover all subjects, articles, and journals.

Acknowledging such constraints, we conducted a qualitative survey by including two English-language online journal databases appearing in the Web of Science database, namely Taylor & Francis Online and SAGE Journals. The former is one of the Taylor & Francis Group's major content platforms. Its aim is "to facilitate discovery and allow our users to access relevant research and information quickly and easily, wherever they are", within 2700 journals in total [22]. The SAGE journals database incorporates 1000 scholarly and professional journal titles [23].

3.2. Setting Criteria

Major global search engines follow similar database rules for retrieving and displaying queries. A database query is made by a user by inputting a word in a designated location; then, the search engine seeks relevant web pages (here "journals") using their algorithms and presents the results to the user. We used both online databases (Taylor & Francis and SAGE) to extract the searching term "Document" using the following query:

[All: document]

This keyword (DOCUMENT) was applied in the search engines of the two databases. In our search, most articles contained both specialized and broad contents from the health and medical sciences, computer sciences, and artificial intelligence. Each of these scientific fields contained a range of technical words related specifically to their own field of study, but we considered only those terms deemed to be more applicable for general usage. For instance, the construction industry has a compendium of 44 unofficial documents [8], from which we extracted the few without discipline-specific terminology.

Based on database terminology, "AND" is regarded as an operator which displays a record when all the conditions separated by AND are "TRUE". In our study, it meant that "ALL" types of articles in the two publishers' databases having words such as "Documentary, Documentation, Documenting" were listed, regardless of the discipline. All fields of study having DOCUMENT in their wording structure for a specified 30-year timeframe were considered:

[All: document] AND [Publication Date: (1 January 1990 TO 31 December 2021)]

As our study did not involve quantitative and statistical analysis and had no humanistic health impact or sensitivity, the chosen methodology was not biased toward any specific findings.

3.3. Cross-Referencing

Using two searching filters (date of publication, subject), we then screened our articles and obtained a total of 107, mainly from the fields of library, information science, business, management, and administration. Many of the screened main articles, supplementary articles, reports and websites (the latter unlisted in our screening phases) were utilized to support the technical evidence of definitions, concepts, and discussions cited as examples in this paper (Table 1). We used all these types of documents, except academic conference proceedings.

Table 1. Documents used in this review paper.

Documents	No.	% of Total	Abridged Topical Examples
Articles (main)	107	74%	Linking construction documents to design objects [8]
Articles (supplementary)	8	6%	American–Norwegian discovery and exploration of the North Pole [24]
Reports and book chapters	5	3%	Digital communications during the UNCCD Conference [25]
Websites	25	17%	UNESCO website (Local Knowledge, Global Goals) [26]
Total	145	100	

3.4. Dataset Collection

A dataset was formed after the completion of two phases of coding and tagging. In the coding phase, an article with high relevance to our documentation research was individually assessed. If it were deemed pertinent to our research, it was coded as D1 to D_n and stored in a separate folder. In the tagging phase, each of these articles was read and the words relating to our research were tagged as “essential” to form our table entries (Table 2).

Table 2. Classification of documents and associated features.

TYPOLOGY		
Official (N = 86)	Textual (N = 75)	<u>Scientific</u> : architectural plans, articles (papers), atlases, dictionaries, dissertations, impact documents, interviews, journals, module outline, monographs, proceedings, prospectus, protocols, questionnaires, records (e.g., medical), reports, theses
		<u>Artistic</u> : billboards, bulletins, brochures, catalogues, lyrics, movie transcripts, paintings, posters, stamps, scenarios
		<u>General</u> : booklets, books, chronicles, contracts, forms, logbooks, magazines, manuals, memo, newspapers, periodicals, transcripts, travelogues, tweets
		<u>Public</u> : acts, agreements, audit reports, census reports, certificates, decrees, estimation papers, financial statements, guidelines, implementation plans, instructions, insurance policies, inventory list, laws, meeting agenda, mission statements, patent documents, policy briefs, project documents, registration forms, regulations, speeches, standards, strategy documents
Unofficial (N = 26)	Audial or visual (N = 11)	<u>Personal</u> : bank checks, bank statements, birth certificates, death certificates, deeds, diplomas, income statements, marriage certificates, passports, property deeds, promissory notes, statements of equity, tax statements, driving licences
		aerial photographs, audio files, hymnals, images, infographics, movie transcripts, maps (2D, 3D), motion pictures, photographs, pictograms, soundtracks, websites
	Textual (N = 20)	bills, business cards, blogs, change notices, chats, CVs, diaries, emails, greeting cards, invoice letterheads, labels, letters, meeting minutes, memes, posts (tweets, Facebook, Instagram), resumes, scheduling papers, SMS, submissions, tickets
Rare (N = 8)	Audial or visual (N = 6)	drawings, graffiti, NFT, personal voices, podcasts, post cards
	Textual, audial or visual (N = 8)	ancient manuscripts/tablets, digital heritage, endangered languages, folklore, indigenous photos, oral testimony, rituals, tribal memories

Table 2. Cont.

FEATURES		
Division: Format		
Class	Terms	
Form	content, discipline, objective, purpose, title	
Layout	background, font, graphic, illustration, navigation feature, table, text	
Mission	academic, business, creative, general, informative, intuitive, judgment, know-how, knowledge, methodological, perspective	
Division: Dimension		
Class	Terms	
Scale	city, global, institution, local, national, provincial, project, regional	
Scope	alarming, documentary, educating, fact-finding, public awareness	
Status	MoU, private, public (government)	
Profile	commercial, directive, fact, guideline, memory, news, policy, research, teaching	
Discipline	anthropology, architecture, art, culture, engineering, humanities, legal, medical, natural science	
Division: Production		
Class	Terms	
Contributor	administrator, author, authority, blogger, columnist, content manager, journalist, historian, manager, officer, practitioner, researcher, technician	
Approach	analysing, interviewing, observing, recording, surveying, translation, verbal, writing	
Productivity	competitiveness, peer-reviewing, profitability, risk, scheduling	
Digitisation	digital record, dataset, digital file, digital publishing, digital record, digitized materials, metadata	
Division: Administration		
Class	Sub-class	Terms
Platform	Analog	archive, arts centre, conference, exhibition, gallery, library, meeting, museum, photo album, workshop
	Digital	API, cloud, dashboard, database, portal, social network, virtual space, website, webinar
Tool	Analog	cameras, Dictaphones, microfilms, microphones, phonograph records, photocopying machines, recorders, smart phones, typewriters, video-players
	Digital	Apps, CDs, computers, DVDs, floppy disks, hard drives, kindles, laptops, printers, scanners, software, tablets, USB flashes, video projectors, web search engines
Archive	digital format, digital libraries, digital preservation, digital repositories, image repositories, library loans, preservation	
Division: Distribution		
Class	Terms	
Copyright	acquisition, authorization, authorship, confidentiality, duplication, exploitation, intellectual property, licensing, open access, overlapping, plagiarism, provenance, subscription, transfer	
	Creative Commons license [27]: CC BY; CC BY-SA; CC BY-ND; CC BY-NC; CC BY-NC-SA; CC BY-NC-ND	
Delivery	offline (paper), online (electronic), post-print, preprint	
Visibility	accessibility, circulation, disclosure, dissemination, retrieval, security, usability	
Impact	accountability, engagement, quality, reliability, searchability, transparency	
Release	occasional, one-off, permanent, transitory	

Abbreviations: **API**: Application Programming Interface; **APP**: Mobile application; **Blog**: weblog; **CC BY**: Attribution; **CC BY-SA**: Attribution-ShareAlike; **CC BY-ND**: Attribution-NoDerivs; **CC BY-NC**: Attribution-NonCommercial; **CC BY-NC-SA**: Attribution-NonCommercial-ShareAlike; **CC BY-NC-ND**: Attribution-NonCommercial-No Derivs; **MoU**: Memorandum of Understanding; **NFT**: Non-Fungible Token; **SMS**: Short Message Service. **Notes**: (1) a few documents have been categorised as both formal and informal (e.g., tweets); (2) many of the audio-visual tools are outdated. **Sources**: author, based on the literature review.

3.5. Classification of Terms

A table was created and the tagged words or terms (associated with “Documentation” topic) were grouped (Table 2). Two main headings were considered: “Typology” and “Features”. Typology lists various types of documents. The “Features” heading used here was further sub-divided arbitrarily into Divisions, Classes and Sub-classes (in one case).

4. Results

Upon completion of the abovementioned screening processes, a final table was compiled by categorising document types under the five arbitrary Divisions of Format, Dimension, Production, Administration, and Distribution (Table 2). As the classification has been created for this paper, two points must be clarified here. First, these selected words under the ‘Typology’ Section (‘tagged words’ as described earlier) were extracted from a diverse range of references, so it was not possible to provide the exact reference for each of them individually in the Table (except for one instance). Second, the “Features” mentioned in the Table are also arbitrary and based on our interpretation, as no existing classification was found. Here, we will outline the five Divisions within “Features”, elaborating on only a few selected terms which may be more critical or ambiguous to readers.

4.1. Types of Documents

We have arbitrarily grouped documents into the types of official, unofficial, and rare. This paper categorized 120 types of textual and audio-visualized documents. Of course, many of these documents can be categorized further into sub-classes; for example, books encompass a diverse range of genres (e.g., fiction, non-fiction), shapes, sizes, and formats (e.g., e-books, audiobooks). We have intentionally used the suffix “s” (plurality) to address this typology concern (e.g., books can include various genres: fiction book, scientific book, etc.). There are also a few documents (Table 2) which may be regarded as advertising items (e.g., posters, billboards) but the premise to include them is that some convey messages, photos, contact details, etc. (bearing “identity” as discussed earlier) and can be labelled as documents. We must also remember that different scientific disciplines may have other document categories and abbreviations suited for their research. For example, health sciences recognize certain documents as grey literature (the absence of peer review), such as clinical trial registrations, unpublished practice guidelines, review protocols, and documents from device manufacturers [28]. Therefore, such specialized discipline-related documents have not been listed in Table 2. Informal documents are also becoming more numerous with the growth in social media, which many people access daily to comment, create and post texts, images, photos, and videos. In addition, social media is increasingly being employed as a scientific dissemination tool for information or scholarly communication, and as altmetric data sources for scientific publications [29].

4.2. Document Features

4.2.1. Format

The format is “the shape, size, and general makeup (as of something printed)” [30]. In this category, documents are seen in three groups: Form, Layout and Mission (Table 2). Document titles have been considered as part of the Mission. Authors with a background in one particular discipline (for example, psychology, psychiatry or sociology) may give their published works titles that name their discipline, even though the content of the works might just as easily justify the mention of another field [31] (p. 173).

4.2.2. Dimension

Dimension is “the range over which or the degree to which something extends” [32]. We have categorised it further into the five sub-classes of Scale, Scope, Status, Profile, and Discipline (Table 2).

4.2.3. Production

Production is “the act or process of producing” [33], and here, we have categorised it into the four sub-classes of Contributor, Approach, Productivity and Digitisation (Table 2). Contributors have significant impacts on the way that messages are conveyed in a document. As contributors to newspapers, researchers are invited to write scientific reports on various topics. However, compared to other groups, they may have less inclination to be involved in this medium. Analysis of Iranian newspapers, for example, showed that researchers had the lowest share in writing on topics related to general environmental issues (10%) and water (9%) [34,35]. This low participation of researchers is more or less the same elsewhere in the world.

4.2.4. Administration

Administration is “the act or process of administering something” [36] and is further divided in this Section into Platform, Tool, and Archive (Table 2). As one of the sub-classes of Administration, portals are considered as single-point-access software systems and an indispensable platform which provides easy and timely access to information and supports communities of users who share common goals in a modern-day organization [37]. Archives are powerful agents in storing, preserving and recovering memories and as a means of interpreting the past [38]. Many are now being re-formed from the physical (non-digital) to digital formats.

4.2.5. Distribution

Distribution includes Copyright, Delivery, Visibility, Impact, and Release (Table 2). Each of these categories covers a broad area. Among them, however, copyright is probably the most challenging given the growing number of unauthenticated online documents and unauthorized use of excerpts from other publications. To tackle these important challenges, numerous strategies have been put in place, such as the Creative Commons license [27] or the commercial program Turnitin for checking the authenticity and cross-referencing of scientific works. Turnitin uses three axes for scientific works: upholding academic integrity, powering assessment, and fostering original thinking [39].

5. Discussion

5.1. Documents in and of the Past: Paving the Way for the Future

Historically, many of the monuments, buildings, roads, bridges and other physical structures built in the past have been demolished and lost. The only memories remaining are those found in the documents left behind among these ruins or burnings, or in interpretations of archaeological remains. Numerous examples exist of the role of documents in the temporal linkage and transfer of knowledge and information, and some instances from different disciplines will be outlined here.

Knowledge has been gradually documented throughout history and has formed the basis for new technologies, scientific achievements, and explorations. Long before the invention of modern DNA and isotope analysis, the illustrative paintings found in caves—some of the first documents—revealed the process of hunting [11], lifestyle, and eating habits of past societies. In modern times, personal paintings and drawings have also documented the history of nature conservation. Although it was too late to conserve the Persian tiger last seen in the 1950s in Iran’s Caspian forests, the historical documents verify the animal’s presence in Iran (the then Persia) during the Sassanian Empire in the mid-7th century AD [40]. In Australia, Governor Hunter’s sketchbook (circa 1790) depicted a now extinct bird which was then present on Lord Howe Island [41].

Paper-based documents have a long history. In ancient Rome, the *Acta Diurna* or Daily Events, was printed on papyrus and distributed at various locations throughout the city. Its motto was “Publicize Additionally, Propagate” [42]. In Europe during the Renaissance, and with the rise of the printing industry, new editions of ancient texts began being printed and circulated [43]. The contemporary signs of progress in medical sciences are indebted to

earlier documented attempts, with the oldest known surgical text dating back to 1600 BC. This is the Edwin Smith Papyrus from Egypt, which describes many surgical applications and treatments [44].

Technical advances in the past have assisted documentation and information transfer over subsequent centuries. The Chinese inventor Bi Sheng (AD 990–1051) made movable type [45]. Around 1450, Johannes Gutenberg introduced the metal movable-type printing press in Europe, along with innovations in casting the type based on a matrix and hand mould [45]. Contemporary scholarly literature and research on mythology have been based on documentation produced by earlier well-known poets. For example, “The Sha’hnameh (the Book of the King), written by the Persian poet Ferdowsi in about A.D. 1000, gives an account of Persian mystic stories of ancient times” [44] (p. 2003). Changes in language usage over time have been documented in dictionaries, which have been part of British life since at least 1604, when Robert Cawdrey’s *A Table Alphabeticall*, containing around 3000 words and definitions, was published [46].

Because of the existence of old recipe- and cook-books, and personal diaries and notes on cuisines and dietary materials, we have learned much about past traditional, nutritional, medicinal, and cultural aspects of foods worldwide (e.g., [47]). “One of the earliest statements on nutrition is Hippocrates’ oft-quoted ‘let food be thy medicine, and thy medicine food’” [48] (p. 109). In the 19th century, food wrappers and the exchange of cards provided further understanding of people’s social relationships [49].

Historical documents have motivated modernisation movements in construction and architecture. The architectural characteristics and aesthetic ideal of the magnificent Sydney Opera House (Australia), designed by a Danish architect, were inspired by the Chinese Building Standards first published in 1103 AD [50]. A study has also revealed that during the Second World War, the old archives of army architectural plans in Japan, except for a few that included a record from 1873, were destroyed [51]. The surviving documents describe some structural problems, with the lessons learned having since been incorporated into the design of healthier and more functional facilities [51].

Earlier travelogues and travel diaries have documented cultural, social, political, and economic aspects of the past. For instance, the *Early voyages and travels to Russia and Persia*, published in 1886 [52], provides a fascinating and otherwise untold history of people in those times. As a mission impossible, the first ambitious explorers of the North Pole also provided their subsequent followers with detailed diaries about survival in the harsh environment and on achieving previously unfulfilled wishes (e.g., [24]).

The first global synthesis of recorded climatic data relates to 1567, when a systematic measuring campaign was begun across Europe [43]. This data collection was composed of a network of correspondents who performed local meteorological measurements using a standardized protocol for a central data repository, leading to a new language for describing meteorological phenomena [43]. A recently launched online weather database in the UK (TEMPSET) spans 661 years, with the majority of 18,000 entries relating to the period between 1700 and 2000 [53]. This database incorporates information on weather extremes and chronologies of past events extracted from written records [53].

Despite limited scope, methodology, tools and knowledge, the earliest academic journals have documented progress that forms the foundation of our modern sciences. The so-called Bamboo Annals, written on bamboo slips, became classical chronicles in China before the Chinese invention of paper [43]. *La Connaissance des temps* in France was created as probably the first annual scientific journal in 1678, dealing with astronomy, time scales, referential systems, and coordinate transformation [43]. In 1861, Springer founded *Forstliche Bliitter* (Forestry Papers), the first scientific periodical published in German [54]. The first issue of *Nature* was published on 4 November 1869 and its subsequent success is a result of the dedication and scientific visions of Alexander Macmillan, Norman Lockyer (the first editor), and Thomas Henry Huxley (biologist) [55]. Huxley wrote a news item in the first edition: “Nature: Aphorisms by Goethe”, on 4 November 1869 [55].

The appearance of scientific journals and specialized document knowledge outlets has also revolutionized the life of people. For instance, as there was no modern architectural education system by the early 20th century in Korea, the publications of academic associations formed one of the main channels of disseminating various modern information and western concepts on housing hygiene (ventilation, solar lighting, moisture prevention and cleanliness) [56].

For many people, some of their best memories are of their school years. Springer published the first schoolbook in 1847, which was written by Carl Franke, a teacher at the *Joachimsthalsche Gymnasium* (Classical Secondary School) [54]. Despite the low literacy rate of modern societies in the last century, newspapers were instrumental in giving a voice to earlier political upheavals which inspired democratic movements (e.g., such attempts during the early 20th century in Iran). Documents can also take the form of political threats and are thus vulnerable to destruction. During the Spanish Civil War (1936–1939) and the ensuing dictatorship (1939–1975) “in an attempt to [erase] memory, the regime purged its records, including police, judicial and military papers, in the 1960s and 1970s” [57] (p. 152).

5.2. Specialized Documents across Different Fields of Studies

Every field of study has its particular documentation to address the multiplicity of technical and non-technical audiences. An awareness of the extent of technical terminologies across various disciplines has led to a range of approaches to documentation. “A novice programmer with no history in a particular project may get some sense of the work completed from a report written by a software engineer on the project” [13] (p. 619), but such a report is not necessarily useful for a seasoned IT professional or another person working in another field. In addition to the differences in their documentation needs, scholars and experts across various fields of study have their abbreviations, which may be the same but have discipline-specific meanings for those in their group. For example, the abbreviation “SOC” may refer to Security Operations Centre (cyber security), Soil Organic Carbon (Agriculture), Standard of Care (Medical Science), Super Optimal Broth (Biological Science), Selection, Optimization, Compensation (Psychology), and many others.

“Information-seeking behaviour” is a social behaviour that defines how humans’ needs and uses of information are different and primarily focuses on how individuals’ needs to acquire contextual information and take action are resolved by a variety of strategies (e.g., undertaking subject-specific searches) [58]. In natural sciences, documentation requiring consideration includes field surveys, climatic data, laboratory analyses, and satellite imagery. In the Humanities, interviews and text analyses provide basic information, as do the clinical evaluation reports and laboratory records in the medical sciences. The construction industry includes numerous unstructured documents such as daily reports, specifications, material submissions, changing orders, requests for information, and field change notices [8]. For construction engineering, Cha and Lee [8] listed 44 unofficial documents under the seven categories of cost, schedule, design, quality, safety, environment, and technology. As part of aircraft safety operations and accident investigations, and depending on the nature of the accidents, hundreds of pertinent on-board and ground-based manuals, cabin documents, maintenance documents, and weather documents (e.g., flight data recorders, cockpit voice recorder(s), cockpit airborne image record, technical flight documents, photo/video record) must be examined and analysed [59]. We have summarized the features of some selected documents in Table 3.

Table 3. Features of documentation used in selected fields of study.

Field of Study	Sub-Field	Document Type *	Advantages	Considerations/Examples	Source
Medical sciences	Nursing	Observation charts (P, E)	Facilitates administrative processes, provides a formal legal document of nursing care provided, and creates a record of care	Data duplication, loss of integrity	[60]
Linguistics	Language documentation	-	Preserves linguistic diversity	Primary language data is stored in archives, in addition to publications in journals and books, formal grammars, and dictionaries	[61]
Mathematics	All	Specialized journals (P, E)	Scope, reputation, inclusion of Reviews, indexing capabilities, tracking of authors' names, and historical record	MathSciNet is widely used	[58]
Scientists/Engineers	-	Scientific journal articles, internal documents, books (E, P)	E: skim-reading, accessibility, convenience, ease of storage and transportation P: comfort (less tiring) and readability, being able to make notes	Accessibility and accuracy are predominant factors	[62]
Computer/Information science/mathematics/linguistics	Text mining	Digitized texts (E)	Analyses large text corpora efficiently in a transparent and reproducible manner	Online content (newspapers, social media, company press releases, user reviews, scientific articles and discourse)	[63]
Journalism	Digital journalism	Newspapers' websites, social media	-	News stories must generally satisfy one or more of the following requirements to be selected: exclusivity, bad news, conflict, surprise, audio-visuals, shareability, entertainment, drama, follow-up, the power elite	[64]

* E: Electronic; P: Paper-based.

Even within a broadly similar discipline such as healthcare systems, there are differences in practices and documentation across different states and jurisdictions within Federal systems such as Australia, Canada and the USA. In forensic science, inappropriate and fake documents are assessed by forensic laboratories for a variety of reasons: “to determine their authenticity, to identify the author of the writings, or to determine the printer/typewriter that produced the document” [65] (p. 1163). Many attributes of a paper document require attention from a forensic document examiner, including page replacement, the printing methods, consistency of the number of staple holes, indented writing, ink comparisons, fonts, consistency, or differences in paper brightness [66]. In this context, the document, rather than its contents, is examined—identifying fake (or false) information in the document is a separate process.

Østerlund and Crowston [13] outlined three approaches to asymmetric or symmetric knowledge between groups or individuals, namely genre theory, the work on boundary objects, and studies of provenance. Genre focuses on the common knowledge that people bring to document production and use (symmetric knowledge). Where knowledge is asymmetric and individuals have few shared points of reference, documents can act as a bridge between boundaries of different bodies of knowledge. Studies of provenance allow people to preserve the history of documents despite a lack of symmetric knowledge.

5.3. Rare Documents

Our document classification has considered critical documents referred to as “Rare” (Table 2). These include a wide range of documents from a unique original literary work to endangered languages, folklore, and indigenous photos. As a global milestone, the Rio Summit in 1992 (Agenda 21) recognised indigenous peoples' vital roles in environmental management and development [26]. Globally, indigenous peoples have diverse identi-

ties with distinct languages, cultures, and beliefs, among other features [26]. “Local and indigenous knowledge refers to the understandings, skills and philosophies developed by societies with long histories of interaction with their natural surroundings” [26] (p. 8). UNESCO launched the Local and Indigenous Knowledge Systems programme (LINKS) in 2002, which accentuates “revitalising knowledge across generations, safeguarding, complementary ways of knowing, and transdisciplinary understandings” [26].

An Indigenous Knowledge for Development Program was launched by the World Bank in 1998 to recognise local knowledge, which would then form part of Bank-supported programs [67]. In an international partnership with promoters, practitioners, and protagonists of indigenous knowledge, it released a report of 60 African case studies which documented indigenous knowledge to tackle challenges in various fields such as agriculture, environmental management, health, culture, and rural development [67]. As one of the possible techniques, the Material Transfer Agreement is an approach to protect indigenous knowledge by providing samples or information from local communities in exchange for monetary or non-monetary benefits [67].

5.4. Digitalisation Era

The current administrative styles of many organizations have changed dramatically in recent decades due to digitisation and, in the process, a new atmosphere for both growth and fears has been created. The internet has played a vital part in the movement to recover historical memory [57]. The new ways of internet-based communications and tools have expedited and modernized how documents are generated, authenticated, shared and analysed. Unfortunately, in another spectrum, the internet has facilitated and increased access to methods and ideas relating to forgery [68], crime, and terrorist acts.

The problematic storing of large boxes of documents in organisations has been primarily transferred to virtual spaces, having no physical boundaries and limitations. Large quantities of documents are scanned and stored in digital databases or pocket-size electronic devices (hard disks). Digitisation has reduced the costs accrued during the generation, production, reproduction, analysis, and distribution of documents, especially useful for those businesses and organisations with inadequate budgets, such as libraries, colleges, charities, and small businesses.

Digitisation could be a way to preserve documents, especially historical documents, from natural and human-made hazards, disasters, wars, conflicts, fires, and floods which may damage libraries and other storage facilities [69]. Physical repositories usually do not possess adequate measures for disaster prevention or environmental controls to avoid document losses [70]. “The term ‘collective amnesia’ refers to the vulnerability of documentary cultural heritage through losses caused by natural decay, damage through war, natural disasters, deliberate destruction and a host of other causes” [69] (p. 136). Digitisation could also be a safe and secure way to move documents and retain records, while making them accessible to a broader range of users who may be assigned permission to search remotely. Documents such as maps, guidelines, booklets, and survey reports have been digitized to offer details and guidelines to current and subsequent generations. The real-time nature of digital files and systems means that they can provide a snapshot and history of activity with minimal lag [71]. However, it is said that contemporary documents are essentially functional rather than illustrative or narrative [11].

In addition to increasing the searchability of documents, digitisation has also made available rare and otherwise unreachable research findings, inaccessible old paintings and historical maps, all of which can be accessed from any web-based endpoint across the world. For example, the New York Public Library has created a collection of more than 900,000 items, some of which date back centuries and which are accessible to all at no cost [72]. The considerable cost involved in such document availability here and elsewhere is that of the digitisation undertaken by providers.

A cost–benefit analysis of access to paperless documents through large web-based databases and digital platforms has encouraged universities and research centres to collate, scan, or generate further documents to be accessible throughout the world (Table 4). The associated subscription expenses are shared among the increasing number of beneficiaries (staff, academic members, researchers and students). The proposition of the open access option is increasingly noted and imposed by many countries (especially in the UK) to remove embargoes through funding mechanisms. For example, Sherpa Romeo [73] is a UK-based online website that aggregates and presents publisher and journal open access publishing policies from around the globe. A well-known article of Prof. Zadeh (University of California) on “Fuzzy sets” published in 1965, which has revolutionized the computer and other sciences, has become accessible to all scholars and has received the highest number of citations in this field in the world (20,069) [20]. The paper has been freely available online since 2004.

With over 100,000,000 gigabytes in size, the Google Search index contained trillions of web pages in 2021 [74], a dramatic increase from one trillion in 2008 [75]. Many other databases have been created and run to distribute documents accessible to all (Table 4).

Table 4. Selected large global databases recording digital documents.

ProQuest [76]	<ul style="list-style-type: none"> Digital pages: 6 billion e-books: 450,000 titles Authoritative sources: 90,000 (Timeline: Six centuries)	Springer [77]	<ul style="list-style-type: none"> Records: 14,121,791 Books: 120,000 titles Articles: 7,532,378 Chapters: 4,657,261 Conference Papers: 1,237,810 (Timeline: Since 1842)
British Library [78]	<ul style="list-style-type: none"> Theses: 160,000 Sound recordings: 95,000 Endangered Archive: 216,401 items (Timeline: Since 2000 CE)	Scopus [79]	<ul style="list-style-type: none"> Records: 75 million Books: 194,000 titles Peer-reviewed journals: 23,500 Conference papers: 9 million (Timeline: Since 1788)
Dimensions [80]	<ul style="list-style-type: none"> Publications: 117 million Datasets: 8 million Policy documents: 584,000 Clinical trials: 628,000 (Timeline: unknown)	IMDb [81]	<ul style="list-style-type: none"> Filmography: 142,530,261 Titles: 7,766,299 Images: 11,856,447 Videos: 471,449 (Timeline: unknown)
UNARMS [82]	<ul style="list-style-type: none"> Records: 248,723 (Text: 244,259; image, 4460) (Timeline: unknown)	Taylor & Francis Online [83]	<ul style="list-style-type: none"> Articles: 4,582,000

IMDb: Internet Movie Database; **UNARMS:** United Nations Archives and Records Management Section.

Digitalisation has brought the revolution of an “e-government” ethos across the globe on a larger and more intensive scale, where people obtain their administrative needs or access transparent and updated data through a dedicated online website or platform, providing a timely and efficient pathway for information and data collection. A growing number of international and governmental financial institutions invest in open data in developing countries to support their ongoing commitment to economic development [84].

Due to the unprecedented technological improvements in the current digitisation era, project documentation has found a new landscape for growing, recording, archiving, and illustrating (e.g., [63]). Many projects have allocated staff and departments dedicated to document, report and administer news, maps, technical reports, and bulletins. These documentation efforts have been distributed widely through websites and social networks.

Increasingly, large numbers of formal and informal documents are generated every day. People react to important national and international events through virtual platforms faster than ever before, and so various types of messages, comments, posts, and blogs are created. Global issues such as the COVID-19 pandemic, climate change, and land degradation have attracted attention worldwide (Table 5). During the COVID-19 pandemic,

46 of the 50 websites of the world's top universities contained dedicated coronavirus resource pages [1]. Issues are also being responded to at the national level. As one of the most critical global wetlands, the desiccation of the wetland Urumieh Lake in Iran has attracted attention, especially from inside the country. Googling the English version of the topic (15 August 2014, during a severe drought period), 10,000 links were found globally, whereas the Persian-language search yielded 628,000 links [34].

Table 5. Selected UN-based organizations and their website interactions.

Organization	Website Visits	Online Interactions
World Health Organization [85]	n/a	<ul style="list-style-type: none"> 250,000 volunteer editors edited more than 5200 coronavirus-related articles in 175 languages during the COVID-19 coverage
UNFCCC [86]	one million people every year	<ul style="list-style-type: none"> Twitter, Facebook, Instagram, and LinkedIn have a combined following of around 1.8 million people every year
UNCCD [25]	20,000 people in one month (April 2019)	<ul style="list-style-type: none"> 81,423 followers (April 2019) more than 100,000 social messages during the High-level Political Forum (2018) within a week

Digital texts (formal or informal) (Table 2), such as SMS, are increasingly used as conduits across governmental and banking systems and have become formal media tools for sending messages to the public. For example, the former Iranian president, Hassan Rouhani, sent nationwide annual greetings via SMS at the commencement of the Iranian New Year. In the Iran banking system, customers are charged annually on the summation of real-time transaction details already sent by SMS. Such texts have become formal documents for customers to claim their missing transactions. During the COVID-19 pandemic, the Iran Ministry of Health frequently sent messages to the public on various topics. Such messages can be regarded as formal medical records. In Australia, users of mobile devices are warned of bushfire or flood hazards within their region or of a positive COVID test via SMS. Tweets are also being extensively used by government authorities and Heads of State, though some have been problematic. A recent call in Australia has depicted such archival needs for Facebook posts or WhatsApp, noting: "The law governing which ministerial documents and communications are kept for posterity needs to be changed, the Head of the National Archives argues, saying the rise of Facebook and WhatsApp means potentially important discussions could be lost Mr Fricker said it was time for the Archives Act to be brought up to date and reflect changes in technology that have occurred over the past five decades" [87].

Despite social media being a major source of information, reflecting concerns and behaviours of today's populations, its very volume requires substantial computer capacity for meaningful analysis. Presumably, even more powerful analytical tools will be developed to filter the information overload and to ensure minimal unauthorised access to government and corporate websites.

Due to the opportunities that digitisation has provided, it has been a key player in the dominant contemporary issue of human rights and equality, as emphasised by Michelle Bachelet, UN High Commissioner for Human Rights: "Its value for human rights and development is enormous We can even use artificial intelligence to predict and head off human rights violations." [88].

5.5. Problematic Documentation

The production of diverse documents does not necessarily indicate their usefulness or effectiveness. Project documents such as reports, for example, do not always provide necessary data and trustworthy portrayals of the contractors' responsibilities, successes, or failures [89]. On the contrary, the excessive amount of project documentation may become a burden and source of confusion for project managers [90] or time-consuming for others. As a side effect of the growing types of documents, problematic criminal issues have risen. Falsified or counterfeit documents, threatening letters, and anonymous ransom notes exert enormous financial and logistical costs to societies and individuals.

In health care systems, "shadow client files" have emerged, consisting of "entries that are not included in the official chart of the facility and are maintained by the health care professional for some time for private use" [9]. Such private documentation presents a risk to practise (e.g., patient's privacy) and jeopardises client care [9]. The problematic sides of digitalisation have already emerged. "In the past, trust in archival records was said to be reinforced by trust in archivists and in the institutions where archives were kept" [91] (p. 217). Such a notion may no longer be relevant as there are thousands of online archives which provide unauthorised access to documents. In fact, as the mildest side effect, "online users cannot interact with archivists or sense the physical institution in the way that traditional users could" [91] (p. 218). This "distancing" effect is exacerbated by the presence of the dark web and the anonymity available to users (and abusers) of social media.

Fake documents, altered documents, and unauthorised documents have clouded online "clouds". Legislation about use, transmission and control over what appears on the internet lags behind technological innovations, which may have ethical implications [11] (p. 110). Moreover, despite the fact that decisions at all levels have become more data-driven, not all stakeholders have equal access to data, especially to open data, due to costs and literacy [84].

With the increasing usage of social media, official and unofficial texts, photos, and videos have increased dramatically. Although most of these digital documents do not pose any direct harm or damage to others, some can influence the decision-making and opinions of digital consumers. As an example, we consider the precarious boundary between official and unofficial tweets (Figure 1). While a tweet from a regular person may not trigger any change in the stock market, exactly the same text from an influencer, celebrity or politician may unsettle the market significantly, even if its impact may be temporary.

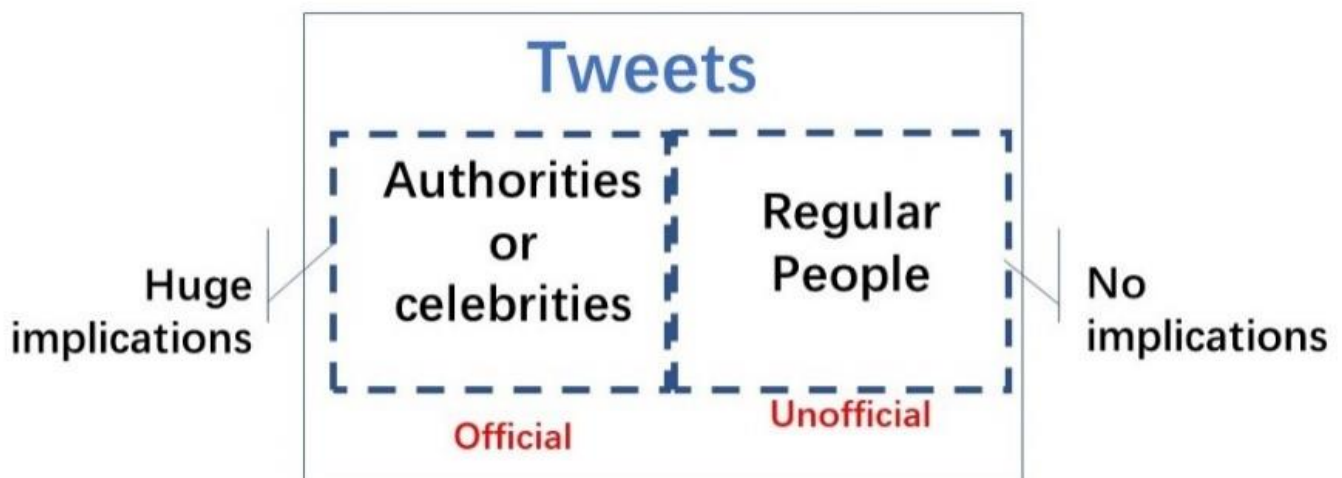


Figure 1. A virtual boundary in the virtual world.

Graffiti, originating from the Greek verb meaning “to write”, is universally seen in both ancient and contemporary inscriptions on walls, rocks, and other natural environments [92], and its positioning within public spaces is intended to draw attention. Apart from the commissioned decoration of public spaces in modern times, usually in the form of spray-painted images, most graffiti is illegal. It is an expression of personal or political views and its images may be transitory in situations where local authorities actively discourage such unauthorised activity. In these cases, graffiti (‘documentation’) may be a financial cost to society, while in other situations the engraving/scratching or painting of surfaces may cause environmental or cultural damage (e.g., defacement of ancient rock engravings). Any such conflict between past and present forms and perceptions needs to be examined and considered within the context of the past, present and future.

5.6. Documentation and Societal Impacts

Documents and documentation assist users to improve the usability, problem-solving, quality control, and future planning of products. In computer science, code documentation ensures software quality, program comprehension, bug detection, etc. [93]. In medical sciences, clinical documentation can improve reimbursement procedures, quality metrics and the accuracy of data records [94]. For large-scale businesses, appropriate documentation minimises risks while supporting the development and management of decisions [95]. In religious and cultural studies and projects, documentation can assist researchers in identifying or classifying cultural assets, preventive conservation, monitoring operations, or heritage enhancement [96].

Whether in historical or contemporary societies, documents and documentation have transmitted valuable knowledge that otherwise would have been lost. Ancient rock carvings and paintings, or earlier communication symbols, remind contemporary societies of past disasters, events or ceremonies. The introduction of new generations of communicative digital tools and applications has provided a secure pathway for transferring those earlier historical signs, while prompting innovative ideas to assist societies in adapting to future waves of unpredictable challenges.

6. Conclusions

Documentation has historically been based on materials such as rock (engraved or painted), clay tablets and plant products (papyrus, paper). Traditional paper-based documentation is increasingly being archived by digital means. Unprecedented events, such as the COVID-19 pandemic, have accelerated the revolution to digital media in documentation within government, workplaces, cultural institutions and in many aspects of private lives.

This paper sought to reveal the typology, multiplicity, and importance of documents. It provided new insight into classifying the diversity of existing documents and their attributes. Documents were categorised according to Typology and Features, the latter including five arbitrary Divisions. Every systematic review strives to be as wide-ranging as possible [28]. We acknowledge that the limitation of our methodology in choosing two databases could be to the exclusion of other possible articles published in alternative large databases. However, we strived to tackle this constraint by including a limited number of the most relevant articles retrieved from other databases.

This paper does not claim to cover all documents and associated technical considerations, but it provides a basis for further investigation and updating [28], especially in this digital age when processes of documentation and distribution are changing rapidly.

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