

## A Study on History of Paper and possible Paper Free World

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### ABSTRACT

The World wakes up with the newspaper every day!! Everyone needs paper to write, to note and several other purposes. Can we imagine a World without Paper?? Is it possible?? Yes, why not!! In this paper, we discussed the world before paper, present world with paper and our ideas of the future world where paper is replaced with modern technology. But, we need to make a paper free world to save environment and to maintain ecological balance. In this paper we have analysed the advantages, benefits, constraints and disadvantages of 'paper free world' the most anticipate breakthrough solution to environmental degradation by means of human beings.

**Keywords:** History of paper invention, production of paper, paper used in today's world, paper recycling, technologies replacing paper.

### I. Introduction

Paper is such a versatile material that, we hardly notice when we use it for several purposes like writing, printing, packaging, cleaning, communication etc. Although we frequently take it for granted, it's hard to imagine what our lives might be like without it hence we need to be aware when utilizing paper because there are so many resources used in making it. Do you know how many trees are required to produce paper? It's hard to believe, but twelve trees, 540,000 liters of water, on average, many necessary chemicals are all needed to produce one ton of paper. There is also the fuel consumption in transporting the trees and paper. Additionally, only 37 percent of the paper produced is recycled [1].

We view things happening on earth & around it through papers in the form of newspapers, articles, magazines etc. Once upon a time we communicated to people distantly via mails & letters. But with time, advancement has changed the way we live. Today we need not wait

until morning to get our newspapers, large percentage of population use Internet to get all the news happening live. E-mails, social networking sites & video calling facilities have made it easy to communicate within minutes to any part of the world. Modern technologies have advanced in such a way that many universities in several countries are teaching through online programs. Applications to colleges, government sites are online. Hence in many ways paper is replaced by these technologies.

To preserve our ecological balance, we have to plant more & more trees, save our forest, minimize the use of paper that are produced using these trees & recycle paper as much possible. In this paper we have discussed the history of invention and usage of paper, its demerits and the innovative proposal of paper free world. We have also analyzed the advantages, benefits, constraints and disadvantages of 'paper free world' the most anticipate breakthrough solution to environmental degradation by means of human beings.

## II. History of Invention of paper

Way before invention of paper, writing was first developed in the River plains of Mesopotamia from 3100 BC. Clay was easily found in this area & used as writing material of the temple scribes. Characters were formed from the wedge-shaped marks formed by a reed's corner when pressed on damp clay. This style of writing was known as Cuneiform. These clay tablets were then dried hard in sun. But were very inconvenient for sending messages[2]. Around 3000 BC the discovery of an easily portable writing substance began in Egypt. People began making a flexible smooth surface from an aquatic plant while grew near river Nile called Cyperus papyrus that accepted & retained ink without blurring or smudging. Thus the word "Paper" was derived from the Latin word "Papyrus" [3-4]. It was used in ancient Egypt and other Mediterranean cultures for writing, spanning a period of more than 3500 years before the introduction of paper into the Middle East and Europe [5]. Bamboo books in China from 1500BC were as convenient to write as Papyrus in Egypt. Chinese used thin strips of bamboo to write in a single column or two lines of threads were linked to each bamboo strips for longer documents. These were used in the "Shang Dynasty" for almost 1000 years [6].

In 5<sup>th</sup> Century BC: Many civilizations used locally available materials for Scribes. Palm Leaves were used in many parts of India& Indonesia. Earliest Buddhist texts are on strips of birch bark. Pergamum, parchment & Vellum in 2<sup>nd</sup> Century BC: People in Mediterranean began using more expensive alternatives for papyrus, the animal skin or animal membranes. The word parchment evolved (via the Latin pergamenum and the French parchemin) from the

name of the city of Pergamon, which was a thriving center of parchment production during the Hellenistic period [7]. Leather was occasionally used for writing since about 2500 BC, but only one side could be written on. But a parchment was smoothed & could be used to write on both the sides [8]. In Europe, it was the material used in all famous illuminated manuscripts produced in the monasteries. For more expensive books, a softer finer version is often used known as Vellum, made from hides of young or sometimes still born or unborn calves, sheep & goat [9-10]. French sources, closer to the original etymology, tend to define velin as from calf only, while the British Standards Institution defines parchment as made from the split skin of several species, and vellum from the unsplit skin [11]. In the usage of modern practitioners of the artistic crafts of writing, illuminating, lettering, and bookbinding, "vellum" is normally reserved for calfskin, while any other skin is called "parchment" [12].

In India, the available writing materials were generally of two types: hard and soft. Stone, metal, shells and earthenware were the examples of hard material. Engraving, embossing, painting and scratching were used for writing. Soft materials were wooden board (pati), dust (dhuli), birch-bark (bhurja-patra), palm-leaves (tada-patra), leather (ajina), cotton cloths (karpasika pata) and paper [13].

- Stone : - Stone engravings were made on caves, smoothed or rough pillars, slabs, lids of vases, caskets, etc. These dealt with official and private records, royal proclamations, land grants, eulogies and memorials [13].
- Metal : - Commonly gold, silver, brass, bronze, iron and tin, copper were used as writing materials.
- Shell : - Specimens of some inscribed conch-shells have been discovered from the ruins of a Buddhist establishment at Salihundam in Srikakulam district of Andhra Pradesh.
- Bricks, earthenware, terracotta : - In ancient times bricks, earthenware and terracotta were also used as writing material. Bricks and earthenware were generally scratched before being dried or baked.
- Wooden board : - About 5th century BC the wooden board was used for writing purposes. Writing on it could be done with a piece of chalk (pandu-lekha). This method was used for teaching. Al-Biruni, the great Arabian medieval scholar, also writes, "The (the Hindus) use black tablets for the children in the school and write upon them along the long side, not the broad side, writing with a white material from the left to the right" [13-14].

- Birch-bark : - The inner bark of bhurja (*Betula* spp.) tree was the most popular material for writing manuscripts, especially in northern-western India. Al-Biruni informs, "In central and northern India, people use the bark of the tuz tree, one kind of which is used as a cover for bows. It is called bhurja. They take a piece, one yard long, and as broad as the outstretched fingers of the hand, or somewhat less, and prepare it in various ways. They oil and polish it, so as to make it hard and smooth and they write on it [14].
- Palm-leaves (tada-patra) : - In southern India, palm-leaves tada or tala or tati were widely used for writing manuscripts. Al-Biruni has observed, "The Hindus have, in the south of their country, a slender tree like the date and coconut palms, bearing edible fruits and leaves of the length of one yard and as broad as three fingers, one put beside the other. They call these leaves tati and write on them... They bind a book of these leaves together by a cord on which they are arranged, the cord going through all the leaves by a hole in the middle of each... They write the title of a book at the end of it, not at the beginning" [13-14].
- Leather : - Leather was rarely used, as writing material in India, but in early and medieval times it was predominant in western Asia and Europe. Al-Biruni also notes, "The Hindus are not in the habit of writing on hides, like the Greeks in ancient times" [14].
- Cloth : - Smooth and non-porous cotton cloth was also used as writing material in ancient India. Nearchos (4th century BC), an admiral of Alexander's fleet, was the first to mention that the Indians used to write letters on well-beaten cotton cloth.
- Paper : - Paper, as a writing material, was hardly known in India before the 11th century AD.

### **Discovery of Paper:**

Papermaking has traditionally been traced to China when Cai Lun, an official attached to the Imperial court during the Han Dynasty (202 BC-AD 220), created a sheet of paper using mulberry and other bast fibers along with fishnets, old rags, and hemp waste, [15] though the earliest piece of paper found, at Fangmatan in Gansu province inscribed with a map, dates from 179-41 BC [16].

After the defeat of the Chinese in the Battle of Talas in 751 (present day Kyrgyzstan), the invention spread to the Middle East. Many Chinese materials were not available to Middle Eastern papermakers, who instead used flax and other substitute fibers, as well as a human-

powered trip hammer to prepare the pulp [17]. The legend goes, [18] the secret of papermaking was obtained from two Chinese prisoners from the Battle of Talas, which led to the first paper mill in the Islamic world being founded in Samarkand. There are records of paper being made at Gilgit in Pakistan by the sixth century, in Samarkand in modern day Uzbekistan by 751, in Baghdad by 793, in Egypt by 900, and in Fes, Morocco around 1100 [19]. Since the First Crusade in 1096, paper manufacturing in Damascus had been interrupted by wars, but its production continued in two other centers. Egypt continued with the thicker paper, while Iran became the center of the thinner papers. Papermaking was diffused across the Islamic world, from where it was diffused further west into Europe [20].

### **In India:**

After the paper technology reached the Arabs, the Arabians improved the technique and supplemented linen with flax and other vegetable fibres. With the conquest of Sind by the Arabs, Khurasani paper was first introduced in India early in the eighth century AD. Muslim merchants introduced paper manufacture to India in the 13th century, where it almost wholly replaced traditional writing materials [21]. The reference to Indian paper suggests that the papermaking industry, however limited, had already been established in India, most probably in Delhi and Lahore, the two chief political and cultural seats of the Sultanate period. The first paper industry was developed in Kashmir, established by Sultan Zainul Abedin (Shahi Khan) of Kashmir in 1417-67 AD. The author of Tarikh-i-Kashmir stated the following about Shahi Khan, "During his stay at Samarkand he acquired knowledge. When he returned to Kashmir he brought with him a number of artisans skilled in different trades such as paper-makers, book-binders, carpet-makers, harness-makers and well trained midwives." Soon, because of its quality, the Kashmiri paper was much in demand in the world and the rest of the country for writing manuscripts. With the rapid demand of writing materials the paper making centers were established in different parts of the country like in Sialkot (Punjab); Zafarabad in district Jaunpur (Oudh); Bihar Sharif in district Azimabad (Patna) and Arwal in district Gaya (Bihar); Murshidabad and Hooghly (Bengal); Ahmedabad, Khambat and Patan (Gujarat); and Aurangabad and Mysore in the south. Generally Indian papermaking centers produced glazed paper. Rahman has categorized ancient paper into seven categories: Kashmiri, Ahmedabadi, Hyderabad, Faizabadi, Khasah-i-Jahangiri, Kanpuri and Aurangabadi [22].

- Ahmedabadi paper was a little thick and was of two qualities: fine and superfine. The paper had extra whiteness and glossiness.

- Kashmiri paper was stout and glazed. Some Kashmiri centers produced superfine paper called silken paper.
- Khasah-i-Jahangiri paper was made at Sialkot. The paper was glossy, thin, polished and bluish white.
- Hyderabad paper was well glazed; some was polished and of brown color with very fine shades.
- Faizabadi paper had three varieties: i) unpolished paper (medium quality); ii) pale yellow; and iii) polished dark yellow.
- Kanpuri paper was prepared from bamboo and was greyish in color.
- Aurangabadi paper was glossy and stout, had a few varieties like, Bahadur Khani (medium quality paper, thick, stout and durable), Sahib Khani paper (medium quality, thick), Murad Shahi paper (fine quality), Sharbati paper thick and fine), Qasim Begi paper (thick), Ruba-Kari paper (This variety was made in four or five different grades) and Balapuri paper (four or five varieties of different colors).

In 1925, Bamboo Paper Industry (Protection) Act and in 1931, Indian Finance (Supplementary and Extending) Act came into existence which provided the protection, and some more mills appeared on the scene. Rohtas Industries Ltd., Dalmianagar; Orient Paper Mills, Brajraj Nagar; Mysore Paper Mills Ltd., Bhadravati; Star Paper Mills Ltd., Saharanpur; and Sirpur Paper Mills, Kagajnar, Sirpur; were set up just before the outbreak of the Second World War. Indian paper Industry made remarkable progress during the war period [23]. In 1925, Punjab Paper Mills was started with an annual capacity of 6000 tons. By 1930-1931, the total capacity of paper production in India was increased to 45,600 tons as against 33,000 tons in 1925. The share of indigenous production in national consumption was now 71 % as against 54% in 1925 [23].

#### **In America :**

William Rittenhouse near Germantown, Pennsylvania established the first paper mill in America in 1690. In 1688, Rittenhouse left Holland, where he had been an apprentice papermaker, and settled in Philadelphia, near the print shop of William Bradford [24].

Table 1: The net production of paper in India during the 1911-1950:

Year	Production (thousand tons)
1911	27.2
1921	24.7
1931	40.0

1941	95.0
1942	92.5
1943	102.6
1945	110.1
1946	105.1
1948	92.8
1949	106.1
1950	109.3

Table 2: Production of individual paper Mills in 1947:

S.No.	Year	Name and location	Production (Tons)
1	1881	Upper India Cooper Paper Mills, Lucknow	2,0302
2	1882	Titagarh Paper Mills Titagarh and Kankinara	38,550
3	1887	Bengal Paper Mills, Raniganj	11,760
4	1887	Deccan Paper Mills, Hadaspur	3,090
5	1918	India Paper Pulp, Naihati	6,040
6	1925	Andhra Paper Mills; Rajahmundry	1,630
7	1925	Shree Gopal Paper Mills, Yamunanagar	10,360
8	1931	Punalur Paper Mills, Punalur	4,120
9	1933	Gujarat Paper Mills, Barejadi	1,500
10	1935	F. Pudumjee, Bombay	1,120
11	1936	Star Paper Mills, Saharanpur	4,250
12	1936	Orient Paper Mills, Brajrajnagar	27,310
13	1937	Mysore Paper Mills, Bhadravati	3,990
14	1938	Sirpur Paper Mills, Sirpur-Kaghaznagar	5,480
15	1939	Rohtas Industries, Dalmianagar	12,860

Many colonial paper mills, such as the Rittenhouse mill, were also located near print shops. Even before they had a reliable supply of paper, however, the colonies had begun to publish newspapers. The first newspaper in the colonies was the Boston News Letter, which appeared in 1705; the second was the Boston Gazette, first published in 1719. The third, also dating from 1719, was Bradford's Mercury, which was published by Andrew Bradford, the son of printer William Bradford. To supply paper for the New York Gazette, William Bradford started a paper mill in New Jersey around 1726. In 1798, the Frenchman Nicholas-Louis Robert (1761-1828) invented a prototype of a machine on which paper was formed on a continuous sheet of wire cloth. The invention was patented on January 18, 1799. The first fourdrinier machines (by Henry and Sealy Fourdrinier) in the US was imported from England and erected in Saugerties, New York, in 1827. Mechanic George Stafford built the second in Connecticut. He and his partner, James Phelps, completed the first American-built fourdrinier in May 1829 and sold it to Amos Hubbard at a cost of \$2,426. In 1809, John

Dickinson of Hertfordshire, England, introduced a cylinder-type paper machine. Amid great secrecy, Thomas Gilpin built the first cylinder machine in America at Brandywine Creek, Pennsylvania. It produced a sheet 30 feet wide at a rate of 60 feet per minute [24].

The first use of paper has been excavated in China dating to the reign of Emperor Wu of Han from the 2nd century BC, used for purposes of wrapping or padding protection for delicate bronze mirrors [25]. It was also used for safety, such as the padding of poisonous 'medicine' as mentioned in the official history of the period [25]. Although paper used for writing became widespread by the 3rd century AD, [25] paper continued to be used for wrapping (and other) purposes. Toilet paper was used in China from around 875 AD [26]. During the Tang dynasty (618–907) paper was folded and sewn into square bags to preserve the flavor of tea [25]. During the same period, it was written that tea was served from baskets with multi-colored paper cups and paper napkins of different size and shape [25]. During the Chinese Song dynasty (960–1279) not only did the government produce the world's first known paper-printed money, or banknote (see Jiaozi and Huizi), but paper money bestowed as gifts to deserving government officials were wrapped in special paper envelopes [26].

By the 9th century, Muslims were using paper regularly, although for important works like copies of the revered Qur'an, vellum was still preferred [21]. By the 12th century in Marrakech in Morocco a street was named "Kutubiyyin" or booksellers, which contained more than 100 bookshops. The earliest recorded use of paper for packaging dates back to 1035, when a Persian traveler visiting markets in Cairo noted that vegetables, spices and hardware were wrapped in paper for the customers after they were sold [27].

### III. Paper Usage – Today's World

Paper may be impregnated, enameled, metalized, made to look like parchment, creped, water-proofed, waxed, glazed, sensitized, bent, turned, folded, twisted, crumpled, cut, torn, dissolved, macerated, molded, and embossed. It is naturally combustible, or can be made fire-retardant. It may be a carrier or a barrier or a filter. It may be made tough enough to withstand acid, or soft enough for a baby's skin. The range of possible uses of paper seems almost limitless. Evolution of using paper will continue because paper is an expression of everyday living.

During recent years, a country's per capita consumption of paper has come to be regarded as an indicator of that country's standard of living - the phrase "paper consumption represents a cultural standard" has emerged from this. In the modern era, countries with high cultural



levels also increase their paper production. Paper manufacturing is also listed as one of a country's most important industries [28].

We can see few major uses of paper in our surrounding in the following areas

- Agriculture: Paper sacks, seed packets, animal bedding etc.
- Building: Wallpaper, damp-proof courses, roofing, flooring, flame resistant papers, plasterboard and decorative laminates for furniture.
- Business: Receipts, circulars, catalogues, filing systems, sales and service manuals, brochures, letter heading, notes, posters, advertisements etc.
- Cars: Fascia boards, door and roof liners, filters, the Highway Code, driving licenses.
- Communications: Writing pads, envelopes, newspapers, magazines, greeting cards, calendars, diaries, telephone directories, labels, visiting cards and passports.
- Domestic Products: Tissues, paper plates and cups, toilet paper, kitchen towels, table napkins, wallpaper and lampshades.
- Education: Books, exercise books, maps, wall charts, flip charts and report cards.
- Electrical: Special insulating boards, electrolytic condenser paper, wrapping and identification for electrical cables, printed circuits and battery separators.
- Entertainment: Menu cards, paper hats, crackers, fireworks, wrapping paper, programs, playing cards, board games, kites, model aircraft, and race cards.
- Filtration: Filters for water, air, coffee, tea bags, medicine, beer, oil, and mechanical uses.
- Impregnated Papers: Polishing, waxing, and cleaning.
- Industry: Protection for manufactured goods, Packaging, in transport, transfer sheets for decorating chinaware, display boards, point of sale materials and in storage.
- Medical: Wrapping to keep instruments and equipment sterile, bandages, first aid bands, clothing for nurses, face masks, surgeon's caps, disposable bedpans, sheets and pillowcases, medicine packaging, prescriptions, medical history.
- Money; Finance; Security: Bank notes, insurance forms, cheque books, ledgers, stamps, cash bags and security papers that contain special markings which are only visible when subjected to ultra-violet light etc.

As we can see, paper has evolved over the years from just a writing surface to a material that touches nearly every aspect of our lives. We read millions of magazines, billions of books and newspapers a year - all printed on paper. Our children play with paper dolls, paper masks, paper board games, and paper kites. Tickets to movies, shows, parking etc are made

out of paper, and so are the containers and carryout trays for our popcorn and drinks. Even the batteries in TV remote control contain paper, and so does the television itself. Most of us expect to find paper in schools and businesses; our desks are usually covered with it. Thanks to computers, which were once expected to make ours a paperless society, we now generate even more paper than ever before. Our money, checks, stock certificates, deeds of ownership, birth certificates and marriage licenses, all the documents which govern our lives are made out of paper [28].

How would you ship light bulbs, water glasses, or your new microwave oven without the corrugated containers that protect them? The largest category of paper products today is the one we take most for granted - paperboard. Corrugated board is used to ship 95% of all manufactured goods (even paper itself!) and is much lighter and more recyclable than the wooden crates of yesteryear [29]. Frozen juices would be less convenient without the composite foil-lined can made of paper. And where would breakfast be without cereal boxes, coffee filters, or egg and milk cartons? [29] We use paper bags for delivery of food items, Pizza boxes, daily morning many people have a cup of tea reading newspapers.

From ancient times to the modern era, packaging has been closely related to human life, and is in fact the crystallization of human intelligence. With the appearance of each new product comes the emergence of each new form of packaging. That is to say, with the incessant development and creation of new products in the present day, we have entered an era in which new forms of packaging are constantly being designed. In fact, without a special or unique form, it is not possible for a new product to be sold to huge numbers of customers in a completely bare and unadorned fashion. Therefore, in the process from the production of a product to its use by consumers, packaging is an absolute necessity, regardless of how it is processed, to reduce damage and disposal of products. In summary, packaging has already become a ubiquitous part of our daily lives, and an indispensable product. Because natural resources are finite, during recent years, environmental awareness has increased within the general public, a mentality epitomized by the slogan "it is better to elate the next generation a clean environment, rather than monetary wealth." For this reason, saving energy and preserving the environment have become not only an economic issue, but also a legal and moral issue as well. For this reason it has been necessary to consider the use of recyclable materials for packaging, in order to conform to the trends of the era [29].

### **Recycling of paper**

Have you ever wondered what happens to a piece of paper when you recycle it? The paper

industry is responsible for most of the recycling now taking place in the United States. And 1993 was the first year in history in which more paper was recycled than was buried in landfills. But recycling is not as simple as it may seem. Paper can be recycled only 5 to 8 times before the fibers in the paper become too short and weak to be reused. Old newspapers are commonly used to make tissue and cardboard, while magazines are often recycled into newsprint. Interestingly, the clay originally added to the paper to make it glossy will help to separate the ink from the paper during recycling.

First, the waste paper must be collected. One of the most expensive parts of recycling is the collection, sorting, baling, and transportation of waste paper.[29] You can help by presorting your household waste, by separating newspapers, for example, from magazines. It is also important to keep the paper out of rain and sunlight, because exposure to the elements makes it harder to remove the ink from the paper.

The next step in the recycling process is re-pulping. The bales of sorted waste paper are soaked in large vats, where they disintegrate into fibers. Chemicals are added at this point so that, when ink particles start to separate from the paper, they can't reattach themselves to the pulp. To remove the ink, the pulp is fed into a deinking system. First, a series of increasingly fine screens remove extraneous material (known as "trash"), coatings and additives, and extremely small contaminants such as fillers and loose ink particles. The screened pulp is sent through several cleaning stages, where heat, chemicals, and mechanical action may be used to loosen ink particles. Finally, the pulp mixture enters a flotation device, where calcium soap and other chemicals are added. Air bubbles in the mixture float the remaining ink to the surface, where it is skimmed away.

The deinked pulp is now sent to the stock preparation area, where it is treated and loaded into the head box of a paper machine. From this point, the pulp is treated just the same as if it had been freshly made from wood chips rather than recycled. At the end of the recycling process, a new paper product has been produced from material that might otherwise have been dumped in a landfill. Recycling is an important way for consumers and papermakers to work together for a cleaner environment [29].

#### **IV. World without Paper**

Why do we need a world without paper? Firstly, to save our environment, i.e our trees, our forest, animals habitat. Secondly, to keep our society green & clean by preventing landfills with waste papers. When computers first entered our lives more than 20 years ago, the idea of having electronic communication was born. Soon the Internet and email brought electronic

communication into reality. [30a] The arguments for getting rid of paper are even stronger today than in the past. By eliminating paper in cabinets, a company can create more space and reduce storage costs outside the workplace. Through the exchange of electronic information with suppliers and customers, a business can make information quickly accessible anywhere, ensuring privacy and security with the use of encryption, passwords and other security measures. Because of fire, deterioration, water damage or loss, paper files also disappear, so paper documents are hardly one hundred percent safe either.

Our government agencies are at the forefront in the process of this revolution to move away from paper, as they are enormous consumers of paper and can also set standards for companies and consumers. The abandonment of the physical forms of Income Tax statements and returns; initiatives for electronic invoices; and digitizing legal proceedings in the new electronic environment are obvious examples of our government today moving away from paper.

To continue our efforts to use less paper, it is time for everyone — companies and individuals and the government — to invest in more computer equipment and software programs, employee training, and awareness campaigns. For example, you can start reducing the paper you use at home by asking your bank account manager to stop sending your account balance in hard copy every month to your home. Many banks already offer this solution, and instead you will receive a protected email with your current account statement or even your credit card invoice [30b]. Another step for individuals is to stop using an appointment book to schedule events. Instead, try using a calendar on your computer or mobile phone. Even simple cellphones (aka dumb cellphones) have this feature, and as a bonus you can set reminders for appointments with an alarm so you won't forget. With smartphones you can go even further: your personal appointment calendar can be synchronized with the Internet. Additionally, there are many applications available that can take a picture of a document and transform it into a scanned document and generate an image in pdf format ready to be sent by email, or to be stored on your computer or on the cloud, making it much easier to retrieve. [30c] As a last resort, if you really need to use paper, try to make notepads with scratch paper that can be reused. And when printing is absolutely necessary, use both sides of the sheet. There is no question that with a simple change of attitude and a few easy adjustments, many trees will be preserved [30c].

As we move further into the digital age, one would think our use of paper would continue to diminish. With many tree-free, eco-friendly alternatives available, here are some options

available to reduce our reliance on trees and hopefully reduce the 40 percent of paper products that make up landfills. Many of the alternative papers are not bleached at all or use sustainable oxygen-compounds for processing. For journals, notepads, postcards, stationery and gift cards, seemingly exotic and earthy options are plentiful and varied like hemp-based paper that is 100 percent wood free. Small businesses are starting to produce these items using natural materials and fibers from cotton, banana, tobacco, citrus, coffee bean, bamboo, bagasse, and recycled fabrics. Post-consumer waste, recycled toilet paper is readily available with increasing options made from bamboo and even sugar cane fibers. Choose tissue that is free of dyes, fragrances, or coloring. For bathroom tissue, check that is made from 100 percent-recycled content and at least 20 percent post-consumer waste [31]. For paper towels, it should also be 100 percent-recycled content with at least 40 percent post-consumer waste. Also pay attention to packaging, choosing a brand that uses recycled materials or material that can be recycled easily.

Physical books, cash, and plane tickets have already been replaced with e-readers, credit cards, and scannable QR codes. In schools, kids use laptops and tablets to take notes and complete assignments and tests. And certain cafés and shops email receipts to customers. We've already taken baby steps towards a paperless society, so what if paper was ultimately removed from our world? In the U.S. alone, 69 million tons of paper is used every year. Only 50% of this paper is recycled, and the rest ends up cluttering landfills [32]. Alternatives to paper are already part of our daily lives: e-books, digital advertisements, credit cards, e-tickets, etc. More recently, contactless credit cards, which do not need to be inserted into a reader to process a payment, are pushing things a step further and eliminate the need to withdraw cash when you have no coins. Water-shoots in toilets could eventually mean we won't need toilet paper or paper-based packaging anymore. Many airlines and train companies already allow travellers to register their boarding pass on their phone or on their loyalty card.

Paper is everywhere in your life: in your car, in your mailbox [33], in your bookshelves, and even stuck all over your monitor. You may not know it, but reducing your paper use by becoming more comfortable with current technology can lead to a more organized way of life. Wouldn't it be great to have everything you need electronically so it's easy to find? No more tearing the house apart or digging through the garbage to find a piece of paper that may or may not have been thrown out. Transitioning from regular paperback/hardcover books to electronic books may at first seem like the most expensive paper saving technique. However,

electronic books not only save paper, but they save you loads of space and the cost of purchasing bookcases, bookends, etc. That leaves you with less furniture to keep tidy and more living space in your home.

An e-Reader is a small handheld device that allows you to download and view millions of different books. The current average e-reader is about the size of a standard hard cover novel and holds up to 1,500 e-books or more. If you are used to owning and storing a huge collection of books, then being able to pack them all into one e-reader will save you a heck of a lot of space in your house. Let's say you go to a bookstore and the book you are looking for is out of stock. You've wasted your time and gas for nothing. What if you're sitting in an airport and your flight is delayed. [33] You just finished your book, and are left with nothing to read. In both situations all you would have to do is download the book onto your e-reader wherever you have a wireless connection. Google homepages, MSN.com, or your news website of choice is the go to resources for daily news. If you are paying for the internet, why would you need to pay for newspapers? Plus online news allows you to see real time headlines on the go. Organize your notes in folders on your computer's desktop. The top level should be for the semester, and then within that folder should be a folder for each course. Inside each folder should be a file for each day. Backup your files every night to be sure they are available in case of a problem. [33] There are free services that offer online backup of your files, which make everything easily accessible should your computer turn against you. Start paying any bills you can online. If there is the option to go paperless, do it. Most people elect not to do this, leaving them with a pile of unopened bills each month. Paying money to other via online banking is easier than sending checks. Getting comfortable with current technology is the key to reducing your paper use. Practice using one tip weekly to get accustomed to doing things differently and more efficiently.

Some manufacturers have started using a new, significantly more environmentally friendly alternative to expanded plastic packaging. Made out of paper, and known commercially as paper foam, the new packaging has very similar mechanical properties to some expanded plastic packaging, but is biodegradable and can also be recycled with ordinary paper [34].

With increasing environmental concerns about synthetic coatings (such as PFOA) and the higher prices of hydrocarbon-based petrochemicals, there is a focus on zein (corn protein) as a coating for paper in high grease applications such as popcorn bags [35]. Also, synthetics such as Tyvek and Teslin have been introduced as printing media as a more durable material than paper.

## V. ABCD framework of Paper Free Word

The advantages, benefits, constraints and disadvantages of 'paper free world' are listed below :

### (a) Advantages of Paper free World :

- Consumers and businesses will be able to greatly reduce the amount of storage space they reserve for books since they'll be able to store hundreds of books on a device the size of a paperback novel. [38]
- People around the world will no longer have to weigh themselves down with books or documents while traveling.
- Electronic Books (e-books) will offer people with disabilities the same access to books as the rest of the population. For example, people who are blind will be able to download any book and play software that reads the books aloud. Moreover, people with visual impairments won't be limited to the few books currently available in large print. "It means that every book is available in large print sizes automatically because it just comes with the system. It also provides sample & overview of the books, its print quality & features before any customer goes ahead with the purchase. Also there are columns that provide review from people who already purchased the books. [38-39].
- e-Books and e-documents will reduce the world's consumption of paper which helps the people to become environment friendly & live greener. A greener mother earth will emerge and global warming will be eliminated due to more trees growing.
- Less clutter, easier access to documents and a lot more organized files [39].
- On-line payment is more convenient; bills are ready to view or pay anytime. No more buying stamps and running to the post office to mail in the payment thus reducing junk papers.
- Citizens have easier access to apply for a place for their child at school, book a doctor's appointment, claim benefits, get a new passport, pay council tax or register a car from their computer at home [38].
- Document security can be maintained in areas like Commerce (e.g. Electronic Data Interchange (EDI)), Personal services (e.g. online banking), Government (passport services, tax filings, vehicle registration services) [38].
- In a paperless healthcare system, a patient's medical records would be uploaded to a central health care information server. This helps accessing the records via Internet from anywhere & sharing information easily.

**(2) Benefits of Paper free World :**

- The price of books will become cheaper because the labor & infrastructure required to produce them electronically will be far less intensive. Labor cost to grow trees, cut them down, transport them, pulp them, print on them, store that print, transport the printed material and send the unsold books back to the pulp plant to get pulped again and turned into other books will be reduced [38].
- e-Books and e - documents offer portability and convenience. You can bring the entire library or the entire contents of your filling cabinet without the bulk and weight of traditional books and documents.
- Circulation of newspaper has been falling in America, Europe, Australia, and New Zealand etc for decades. In the past few years the Web has hastened the decline. In fact, in a globalized & interconnected world, we will seek news more than ever before. The most featured & best selling item today is the Kindle digital reader & iPad has been topping news related to publishing technology all around the world. [39].

- Save cost & space for using & maintaining

**(3) Constraints of Paper free World :**

- Advancing software programs and hardware technology can be difficult to keep up.
- Sometimes it is more productive to take a pen and notepad to an outside meeting than it is to take a laptop.
- Mobility.
- Page orientation (i.e. to read at an angle, or any other preferred position).
- The ability to annotate a document (e.g. to scribble notes at side of page).
- Multiple display surfaces (i.e. the ability to flip between pages of paper).
- Sometimes System may crash leading to loss of data if it is not backed up [38].

**(4) Disadvantages of Paper free World :**

- Reading comfort.
- Not great to capture ideas because you need to find a computer/laptop to write down the idea. Unlike for papers, you can write it down easily in a small piece of any kind of paper.
- Paper documents can only be used by one person at a time. They cannot be remotely accessed, nor can they be revised, rearranged or edited easily. Without a photocopier, a paper document cannot be replicated easily and it can only hold fixed text (e.g. no moving images or multimedia).



- Legal documents that have been notarized, deeds and receipts that come in the mail with packages are all examples of paper that continues to plague the paperless office [38].
- Higher costs for software products, computer upgrades, document management and even costs to protect the documents that you are paying to manage virtually.
- Majority of vital documents is saved in the computer and can be hacked.

Although numerous efforts are made to achieve paperless life, it still seems to be a distant reality.

## VI. Conclusion

Worldwide consumption of paper has risen by 400% in the past 40 years leading to increase in deforestation, with 35% of harvested trees being used for paper manufacture. Most paper companies also plant trees to help re-grow forests. Logging of old growth forests accounts for less than 10% of wood pulp [36]. More than one in five (21%) organizations are still increasing their paper consumption. 10 liters of water are needed to make one piece of A4 paper. Recycling one ton of paper saves around 682.5 gallons of oil, 26,500 liters of water and 17 trees. 50% of businesses waste is composed of paper. To print a Sunday edition of the New York Times requires 75,000 trees. Every tree produces enough oxygen for three people to breathe [37]. By investing some time & money to find tree-free options, not only do you reduce the endless waste that ends up in landfills, but also you protect generations of forests that will supply clean air for years to come. Making seemingly small adjustments play a major part in turning the tide of unnecessary waste and create a renewed culture of resourcefulness. In this paper, we have analyzed the advantages, benefits, constraints and disadvantages of 'paper free world' the most anticipate breakthrough solution to environmental degradation by means of human beings.

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