

Exploring paperless working: A step towards low carbon footprint

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ABSTRACT

Mass production of paper is one of the significant factors that are contributing to increase in carbon outtrush in the global ecological system. The paper trade releases large volumes of air, water, and soil pollutants, which pony up to green house gasses. The rotted paper releases methane gas, which is many times more hazardous than carbon dioxide. Paperless business is a vital environmental business practice that is better for the upliftment of the current degrading environment. Global corporations are promoting paperless workplaces to move a step forward towards a sustainable ecological system and achieve the sustainable development goals of the United Nations. The research study after observation opined that although various challenges are being portrayed by employing digitalization of workplaces still working paperless is quite fruitful for the global ecological system. The digital innovations are the only alternatives available in the current times for the paper based job places. In this research study fairly was also studied the critical aspect of paperless workplace. On analyzing the dark data of the global corporeal world it was depicted that digitalization is also enhancing the carbon footprint. It is thus concluded in this research study that sensible and secure use of digital technology could only make paperless working successful.

Keywords: paperless, workplace, carbon footprint, environment, sustainability, sustainable development goals

INTRODUCTION

The paper utilization is extravagant in the global arena. Exponential abuse of paper is promoting unsustainability in the global environmental. The rapid advancement has raised the requisite of paper in the workplaces worldwide. The rise in paper demand has increased its manufacturing volumes at the global scale. But paper production is associated with several ecological disturbances, due to release of hazardous toxins. The global workplaces consume a large volume of paper annually for maintaining their daily working archives.

A paperless job place is also alluded to as a paper-free workroom. Paperless job place provides for minimum usage of tangible paper and alternatively utilizes digitalized documents. The employees who are involved in a paperless workplace largely discourage the use of paper in his/her office work and he/she is known to as a paperless employee. For an efficient paperless job place, alteration of paper file or archive files into digital files is a requirement and the mechanism of recasting such files is known as digitization (UNESCO, 2021).

The concept of a paperless job place is not new (Pennix & Penn, 2017). It came into existence after the involvement of computers in the workplaces. Although most of the modern workplaces are fully capable of working paperless, still several of the workplaces are relying on the papers for their document

maintenance. The paperless job place promotes safeguarding of biological reserves like saving trees. Paperless working place also helps in immunizing the digitalized document management (Remenyi, 2007). Although various benefits are being experienced by working paperless but still workplaces are regularly involved in papers like, online bills, receipts, employee payment receipts etc. The incline in paper consumption is being analyzed in the **Figure 1**.

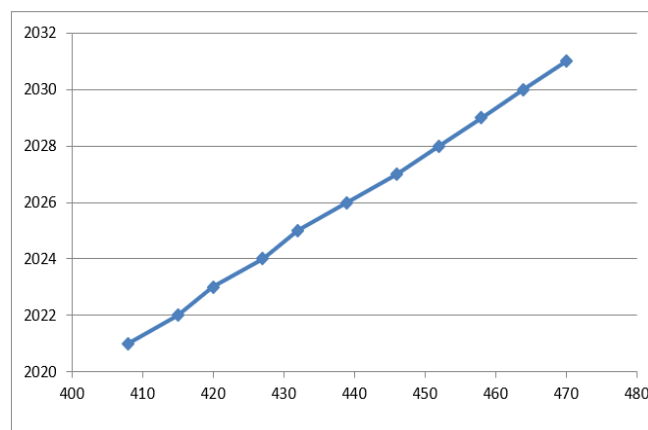


Figure 1. Estimated global paper consumption incline in million metric tons from year 2021 to 2032 (Source: <https://www.statista.com>)



Figure 2. Research design for the current inquiry

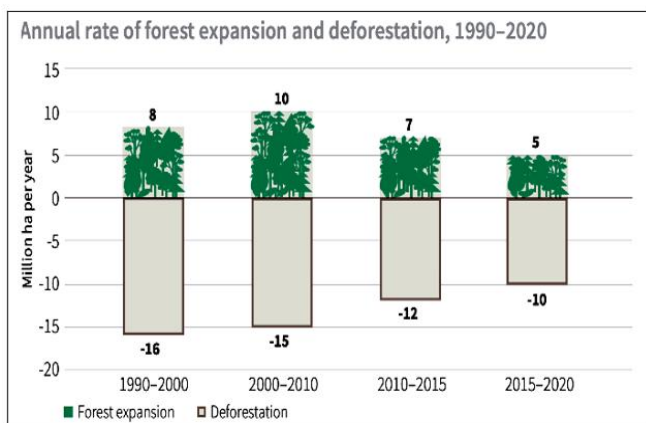


Figure 3. Forest expansion & deforestation during 1990-2020 (Source: <https://www.weforum.org>)

METHODOLOGY

The current research study is an exploratory qualitative research. The data utilized for this study was made available from secondary sources that included articles of journal, books, book chapters, websites, magazines, newspapers, reports, conference papers, organization documents and various internet sources. After the collection of the secondary data it was subjected to in-depth analysis and evaluation to obtain a conclusion. The research design adopted to the current study is being laid down in **Figure 2**.

RESULTS AND DISCUSSION

Environmental Threats of Using Paper in Workplaces

Loss to forests

In America almost 85% of the paper is being manufactured by isolating wood from the coniferous wood logging. Around 42% of the world's wood harvesting is being utilized in paper manufacturing (Suraj & Khan, 2015). The exponential rise in deforestation has caused a serious implication on the forest

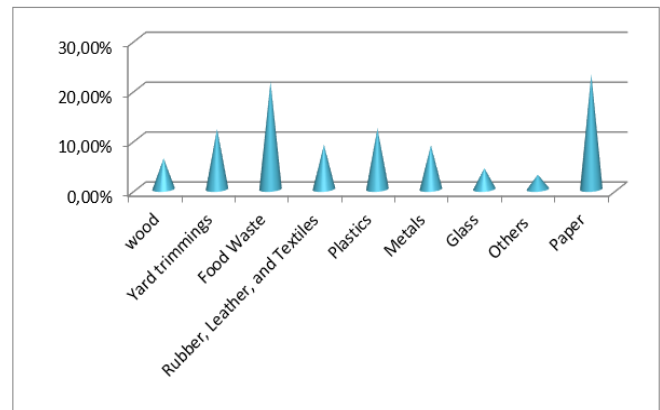


Figure 4. Municipal solid waste in the United States in 2018 (Source: <https://css.umich.edu>)

regions around the planet. It has further led to loss to wildlife species and also contributing to soil erosion. The loss of forest vegetation has exhibited a steep rise in the carbon footprints as the forest vegetation bears the properties to absorb carbon dioxide. In addition to this, loss to the forest regions is contributing to global climate change. The annual rate of forest expansion and deforestation evaluated by world economic forum for the duration 1990-2020 is being expressed in **Figure 3**.

Rise in pollution

Paper accounts for around 26% of total waste at landfills (WWF, 2022). From 2010 to 2060 world paper utilization is expected to double with similar paper waste statistics (Green Journal, 2021). The pulp and paper sector, which produces items like tissue, office and catalogue paper, glossy paper, and paper-based packaging, uses between 33% and 40% of all industrial wood traded globally and contributes for 13% to 15% of overall wood consumption (WWF, 2022). Paper production contributes to air pollution such as acid rain and greenhouse gasses by releasing nitrogen dioxide, sulphur dioxide, and carbon dioxide into the atmosphere (Jian et al., 2021). In fact paper industries are among the top industries emitting excessive greenhouse gasses in the ecosystem (Jian et al., 2021). During the process of paper manufacturing wood is converted into a pulp and through a series of chemical processes white paper is obtained (FAO, ITTO, & United Nations, 2020). The municipal solid waste stats in America, in 2018 are being exhibited in **Figure 4**.

Dumping threat to nature

The waste being generated during paper manufacturing poses a big dumping threat by the paper manufacturing industries (Haile et al., 2021). The paper industry waste includes both the solid and liquid waste (Haile et al., 2021). The wastes often are discharged by the paper industries without necessary treatment procedures in the water bodies and in the landfills (Cabrera, 2017). Studies reveal that the working population in their workplaces is employing paper documents in excess of the required estimate.

Paperless Workplace Promotes Sustainability

The employees in the global arena are demanding corporations to be more sustainable. During the recent

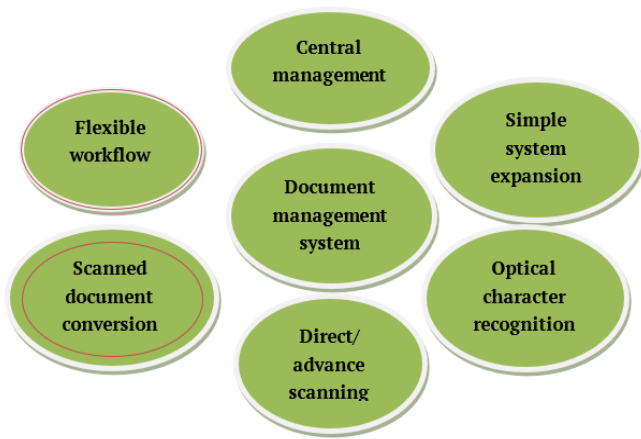


Figure 5. Document management system benefits of paperless workplaces (Source: Author's own elaboration)

COVID-19 pandemic the reliance of the corporations on the digital tools increased exponentially (De' et al., 2020). In fact the majority of the work was paperless on the digital platform. The paperless workplace of any corporation depicts its sustainability approach towards the planet. Corporations are keen to reduce carbon footprint from their businesses and also from the global environment.

Paperless Document Management System

It was way back when corporations truly relied on the paper based workplace to manage their document and control their standard operating procedures or SOPs. As the business of the corporations expanded, the reliance on modern computer tools in office works also increased the consumption of paper (Shah et al., 2019). Many corporations due to high reliability on the paperwork often faced huge financial losses and steep decline in their reputation. In order to overcome the financial loss being incurred due to dependence on paper workplaces, the corporations are now engaging paperless document management policies, which seek into the alternative method of paperwork. Paperless document management systems are being widely explored to overcome the use of paper in workplaces (Ugale et al., 2017). A paperless document management system helps in properly managing the office documents with ease. The benefits of document management system are being exhibited in **Figure 5**.

Benefits of Paperless Workplace

Numerous gains can be availed by a paperless job place. Few are discussed, as follows.

Saves space

Workplaces around the globe that are totally based on paper documentation often face challenges of retention of paper records. The yearly workload in job places is rising day by day and archives related to different works are also rising. The never ending storage requirement for the paper document is showcasing a problem globally. The problem is common both for the government firms and also for the private corporations. However, digitizing the paper documents has proved to be quite a useful tool for the employers around the globe. The paperless archives require less space for storage in comparison to the paper documents.

Whether secured archive in cabinets, boxes, on shelves, in an accordion folder, or stored in another manner, it takes up a lot of area. The volume of space that has to be relinquished for the storage of physical copies is never-ending, and paper often piles up quicker than it can be stored in an organized fashion. This is especially true for governments considering all the permits, licenses, forms, and other important documents they handle. The digitized files can be stored on a server that can be accessed from any place worldwide without the paper document requirements. The paperless workplace requires less space for archives of the physical records.

Saves time

One of the disadvantages of a job place using papers is that it requisite a large time period for paper documentation filing, sorting and inquiring during daily working procedures. The time that is being wasted in such documentation and searches can be utilized for more fertile burden. In a paperless job all the documents are secured in the centralized digital archived repository. The digital document management system is a powerful tool that can identify a required paper document with no waste of time. The time of the employees is saved by using such management systems that can be utilized for generating extra revenue through other projects.

Saves money

Traditional workplaces required extra efficiency while working with paper archives. It sometimes becomes hectic for both the employers and workers. The paperless workplace not only promotes efficiency but also saves capital. A workplace working on paper archives requires extra capital for maintaining paper stocks, printers, ink, postage, and storage spaces. On the contrary, the paperless job place does not require such a requirement. The monetary savings through a paperless job place can be applied for other development of the workplace, employee or the corporation.

Digital security

It is often assumed that a workplace based on paper documents is more secure than a paperless job place. However this is a myth, as a paperless job place has a more secure digital documents monitoring mode. These systems have built in special security systems that can be useful upon cyber-attack challenges. Moreover, administrators administer specific rights to notified persons for handling workplace documents so that the digital documentation is accessed by the right authorized person. In addition to this digital paper archives are automatically safeguarded from environmental factors like fire, water and natural mishaps.

Easier data transfer

In a paperless workplace, employees do not need to wait long for finding a document, copying it and then transferring it through post or a personal transport courier. In a paperless workplace the transfer of data is very easily and efficiently done by simply searching a file with required data on the computer and further converting it into a pdf and sharing it through a registered mail with a single click (Murthy, 2013). Electronic data can be managed in the workplaces on softwares like Microsoft office or Adobe Acrobat for easy accessibility. Moreover the data files can also be transformed into different

types like .docx, .pdf, .jpg, and many more, which can easily be used on the different digital tools like android mobiles and scanners.

Paperless Workplaces Are Environmentally Friendly

A paperless workplace has an immense impact on the ecological system (Kim et al., 2021). The process of paper manufacturing involves deforestation, climate change, which leads to increase in greenhouse gases in the surroundings (Jian et al., 2021). The deforestation not only causes loss of trees but also the wildlife habitat (Luiz, 2017). Thus deforestation also is encouraging endangerment and extinction of wildlife species. A large volume of water is being utilized in paper manufacturing (Bharagava, 2019). Studies reveal that a single sheet of paper manufacturing requires 47 gallons of water per ream of paper (Illinois Library, 2022). From cradle to consumer, the carbon footprint of office paper is 4.64, 4.74, and 4.29 g CO₂eq per A4 sheet (Dias & Arroja, 2012). Transportation is now the second largest contributor of greenhouse gasses (Albuquerque et al., 2020). Since paper manufacturing requires transportation therefore it also contributes to greenhouse gasses.

The used paper in the workplaces is also posing a big problem in terms of waste pollution. On the contrary, a paperless workplace acts environmentally friendly. This waste documentation are often shredded and discarded in a dustbin, which is dumped in the environment and left for decomposing in the environment. The chemicals present in paper are being released in the soil, which further joins the soil and water natural cycle mechanism. Thus, paper manufacturing pollutes air, water and soil along with loss to the natural habitat of the natural wild living beings.

The usage of paper involves land filling waste, ink or toner that is being manufactured from nonrenewable resources causing major damages to the environment (Parthasarathy, 2021). Although recycling of paper is being proposed to reduce harmful impacts of paper manufacturing. Switching the workplace to paperless is more sustainable to the global environment.

Facts About Paper and Paper Pulp Industry

Nearly 400 million tons of paper is being manufactured by paper and pulp industries that are expected to rise to 900 million tons by 2050 with its largest sharing part going to Asian regions (Rio et al., 2022). Further around 400 million tons of wasted paper is being disposed every year, out of which half is that of municipal waste (Rio et al., 2022). The paper and pulp industry releases about 1.3% green house gases (Rio et al., 2022).

Global market evaluation on paper and paperboard

The paper and pulp manufacturing units plays a notable role in world financial growth. Around 400 million tons of paper and paperboards are generated worldwide (Bajpai, 2015). The consumption of paper and paper board is highly in demand is Asia especially in China. Simultaneously in Northern United States there is a steep decline in paper manufacturing. In the last years China is the nation that has been spotted as the top producer and consumer of the gross paper and paper board followed by the United States. China acquired 25% of the

global demand of paper and 26% for global paper production (Bajpai, 2015). Various analytical trends suggest that paper consumption till 2025 shall rise to 500 million tons with a growth rate of 1.6% per annum (Bajpai, 2015). Asia has already shared 44% of the world consumption (Bajpai, 2015). Northern United States and America holds the third share consumers of paper (Bajpai, 2015). During the period of 1991-2011 pulp manufacturing in Europe rose while during the same tenure, the manufacturing of paper and paperboard in European nations raised to 50% (Bajpai, 2015).

Environmental effects of paper waste

The main result of our careless use of paper is deforestation. In safeguarding ecologically significant forests and restricting commercial access, conservation organizations have made laudable progress. For humanity, this is a huge step forward! Just consider how much time it will take a tree to reach its maximum size. We are only now becoming aware of the unnecessary exploitation of our trees, which emit oxygen and shield the world from further global warming. Another result of paper waste is paper pollution, which is a major issue. By 2020, paper mills are predicted to produce 500,000,000 tons of paper and paperboard annually (Mace, 2015).

This product is definitely necessary, and there are no plans to reduce our usage. The third-largest industrial polluter of air, water, and soil is the pulp and paper industry. As a result of the usage of chlorine-based bleaches during manufacture, hazardous substances are released into our water, air, and land. Methane gas, which is 25 times more harmful than CO₂, is released as paper rots.

Past Developments in Workplaces

Last 150 years of advancement in the field of technology has raised the quality of work in the modern workplaces. The digitization caused a breakthrough in the working of job places globally that also reduced the dependency of papers. Some of the significant developments that took place in the job places in the past are being summarized in **Table 1**.

Document Management Software Statistics for 2023 (Gilbert, 2023)

About 62% of IT workers estimate that trade wings are employing digitalized documents. Other wings being influenced are merchandising 57%, monetary 23%, and IT 41%. About 47% of IT specialists suggest that their establishments are using digitalized document operations. It is also reported that 72% of IT professionals depict that their establishment are using a merger of paper and digitalized archive proceeding. Moreover, 13% are using digital mechanism. About 61% of IT professionals suggest that they have started shifting to the cloud in their establishment. The studies reveal that about 36% of IT professionals are broadening to digital archives in the upcoming year. On the contrary about 35% IT professionals are upgrading to digital documentation technologies. In the year 2020, 50% of the paper imprints at houses was for the purpose of work, 18% was for schools or training intensions, whereas 32% was for individual cause. It is being referenced by genius that by the year 2025, the printing folio shall touch the 2.3 trillion folio mark. Although there is a decline in printing, still about 4.4

Table 1. Significant developments in the job places (Chopra & Gauri, 2015)

Year	Historical developments in the workplaces
1870	Introduction of commercial typewriter
1880	Innovation of telephone by Alexander Graham Bell
1920	Introduction of electronic typewriter
1930	Significant electronic machines like intercoms & dictaphones developed
1950	Development of computers, calculators, copying machines, tabulating, & accounting machines
1961	Launching of electronic typewriter with memory
1964	Introduction of word processing equipments
1970	Introduction of LAN or local area network
1980	Digitalization of tools like picture phones, telephone networks, etc.
1990	Cellular phones, the Internet systems, personal computers, micro processing tools, electronic mail, fax machines, pagers, modems, etc.
2000	Digitized offices, the Internet telephone, the Internet trading, BPO services, the Internet banking, etc.
2008	Broadband spectrum, LCD & plasma television, 3 D videoconferencing, speech & handwriting recognition software, voice mails, etc.
2012	3D printing, 1 TB hard disk, & face/voice/handwriting identification tools
2014	Wi-Fi, wireless printers, blue ray disc, voice navigation, cloud computing, website management, SaaS, the Internet of all things, etc.

million pages are imprinted globally per minute, which is equal to about 39 soccer grounds. The studies also reveal that about 23% of capital counsellors are outlaying through digital documents and e-signature.

Around 4.88 billion web enjoyers are surfing globally, has been estimated. In a report, in the year 2023 there would be 5.3 billion internet enjoyers on the planet. According to mordor intelligence, the world documenting managing means in the business sector will turn to around 11.47 billion US dollars by 2026. The cloud governance and safeguarding services are estimated to rise by 17.3% in the year 2022. It has also been reported that 35% of the chief information officers suggest cloud techniques as the top technical stake. Moreover, around 27% of the cyber shielding capitals of establishment are being allotted for cloud security. In the year 2020, 62% of the sales department employed digital documentation tools.

Most Popular Document Management Softwares

Some of the most common document management softwares globally recognized and are currently being used widely are described as under.

1. **Microsoft SharePoint:** A web based collaboration and document management system that enables organization to store, organization and share document (Khumalo & Mearns, 2019).
2. **Google Drive:** A cloud based storage solution that allows users to store and share documents, spreadsheets, and presentations (Prasertsith & Kanthawongs, 2016).
3. **Dropbox:** A cloud based file storage and sharing service that enables users to securely store and share files (Patil et al., 2020).
4. **Evernote:** A note taking app that allows users to take and store notes, documents and images (Crum, 2014).
5. **DocuSign:** A digital signature and document management platform that enables businesses to sign, send and manage documents electronically (Pino et al., 2021).
6. **Adobe Document Cloud:** A cloud based document management platform that allows users to create, edit, sign, and share PDFs (Fridsma & Gyncild, 2019).

7. **OneDrive:** A cloud based storage service that allows users to create and store document (Uden et al., 2014)
8. **Alfresco:** An open source document management system that enables organizations to manage and share digital content securely (Short, 2018).

Paperless Workplace Implications

The mindfulness directed by the public authority on paperless offices did not help a lot on the execution part. Accordingly, the public authority is prescribed to direct more mindfulness projects and studios on what and what not to carry out in that frame of mind of going paperless office. It is seen that the need for digitalized information and abilities in the working framework has impacted the reception of paperless offices. Thus, the government must direct proper digitalized preparation stages for workers to reinforce or foster their information and abilities for better execution of paperless offices. Administrative help is significant for effective execution of the paperless office. Thus, it would be great, on the off chance that the administration could coordinate the administration of individual service that they need to deliver any administrative help especially for the execution of a paperless office. Foundations like high velocity web networks, high capacity digitized tools, and different offices are additionally significant for the effective execution of paperless offices. The paperless documents can be implemented by using email, faxes, document management systems etc. You can make a significant difference on the environment, especially in terms of CO₂ emissions, by cutting back on your paper usage. In its 100 years of growth, a typical tree can only generate roughly 17 reams of paper (Harwood & Walker, 2015). About a low value of CO₂ to 573 kg to a high value of CO₂ to 923 is released into the atmosphere during the production of one ream of paper (Buell et al., 2019). The loss of a "carbon sink" represents the true cost, as the typical tree absorbs about 2,000 lbs of carbon dioxide over the course of its lifetime if left unattended (Fridell, 2009). Reducing paper use therefore directly affects the carbon footprint of an organization.

Converting papers to electronic files in job places is a good place to start. The demand for woodlands is expected to rise to 160 million m³ till 2030 of which majority shall be consumed by newspaper, printing and writing purposes (Rio et al., 2022). Despite growing interest in digitization, it's essential to double

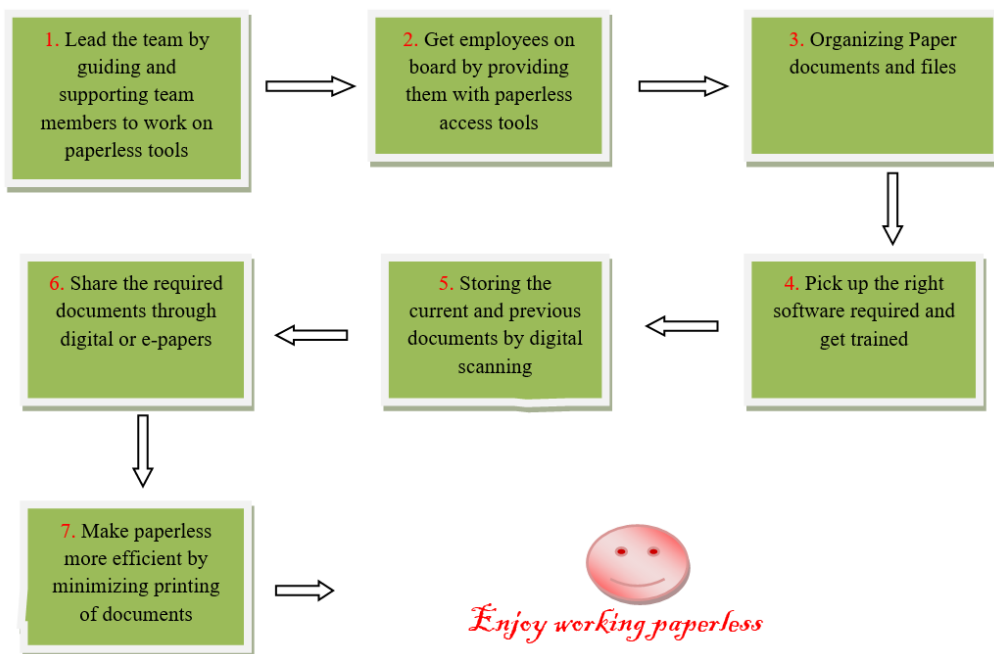


Figure 6. Seven steps towards efficient paperless workplace (Source: Author's own elaboration)

down and stop using paper altogether or to a minimum. The seven steps that have been evaluated to achieve paperless workplaces are depicted in **Figure 6**.

Critical Analysis of Digitalization

Despite the benefits of paperless workplaces, there are also several challenges associated with this transition. One of the primary challenges is the need for robust digital infrastructure. This includes the need for reliable and secure digital storage systems, as well as the need for robust backup disasters recovery systems. Global corporations are working hard to decarbonize the working of their organizations (Jackson & Hodgkinson, 2022). It is a critical trait of the corporations to fulfill their sustainability strategy. It should also be taken into consideration that global states authorities and their policies do not address the carbon footprint concerning digitalization (Jackson & Hodgkinson, 2022). The dark data of organizations available decodes that the business organization worldwide are working to keep their digital carbon footprint in control (Jackson & Hodgkinson, 2022). The studies exhibit that exclusion of repetition of data reuse and information storage can deliberately reduce digital carbon footprints (Jackson & Hodgkinson, 2022). The drawbacks of digitalization in working places are being highlighted as under:

1. **Dependency on technology:** One of the major drawbacks of digitalization in workplaces is the increased dependency on technology. In case of technical failure, employees may not be able to perform their tasks, leading to reduced productivity and delays.
2. **Security risks:** Digitalization has also led to an increase in security risks. As organizations store sensitive data digitally, they are more vulnerable to cyber attacks and data breaches.
3. **Reduced personal interaction:** Digitalization has also resulted in reduced personal interaction among

employees. This can have a negative impact on workplace culture and employee morale.

4. **Skill gaps:** Digitalization has created skill gaps among employees, as many employees may not have the necessary skills to use digital tools and technologies effectively.

The digital impact on ecological system is yet in an infancy state and is to be studied deeply.

CONCLUSIONS

Going paperless significantly increases business performance, customer service, and efficiency while also saving money and protecting the environment. Apart from irrational fear or resistance to change, there are not many, if any, "actual" obstacles standing in the way of its widespread adoption. It is obvious that those who switch to a paperless system will thrive, while those who do not will either convert when doing so is more expensive and difficult or they will not. Scanners, cloud storage, PDF software, note-taking apps, and company chat services are some of the important technologies of the paperless office that are used often in working communities. An organization can become more productive and ecologically friendly by turning paperless. By effectively managing electronic documents and creating processes based on their use, paperless document handling seeks to promote more productive working conditions. To accomplish this, all staff members must collaborate to establish document management policies that are consistent throughout the organization. Additionally, specific policies must be established, such as different management procedures for internal and customer documents or dates for when files are to be deleted. The action of paperless office was established with the anticipation to yield significant reduction in paper use in all government services.

Thus, through an empirical approach, this study tried to determine whether paperless action is apprehensive among working places or not. It also aims to determine its positive impacts and challenges. The findings of the study revealed that going paperless has reduced costs, time and also bettered work effectiveness, productivity, work terrain, and security in the offices. Still, it's birtled that going paperless could not reduce waste generation as intended. The main reasons why going paperless could not be suitable to reduce waste generation is because of challenges. Also, other reasons could be workers' disinclination to shift towards a new system and there are systems in place similar as auditing, which still requires workers to maintain hardcopy. From the findings, it can be concluded that going paperless is grueling, because of poor internet connectivity, lack of computer chops, lack of IT professionals; security trouble and lack of directorial support. The reasons for lower relinquishment of paperless could be these mentioned challenges. In the current scenario digital innovations tools are the only alternative that are available for job places dependent on paper documents. It is advised through this research study that paperless working can only be successful until digital technology is being utilized more sensibly and securely.

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Data sharing statement: Data supporting the findings and conclusions are available upon request from the author.

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