An Analysis of the Paperless Office: A Literature Review

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Introduction

It's no secret that the way people work is drastically changing. The World Economic Forum (2018) predicted that only half of today's current jobs through 2022 will stay the same (*The Future of Jobs Report 2018*, 2018). At that point, while jobs will have an overall net growth, their estimates suggest that 0.98 million jobs will wane while 1.74 million new jobs are created (*The Future of Jobs Report 2018*, 2018). Why *any* decline in jobs? They assert that by 2025 AI and automation will perform many of the jobs that 71% of humans are currently performing (*The Future of Jobs Report 2018*, 2018). These predictions - made before the COVID-19 pandemic - didn't account for the drastic shift in the way humans live and work that started in the United States in March of 2021. "COVID-19 brought massive disruption to the workforce, highlighting the importance of physical proximity in work and spurring changes in business models and consumer behavior, many of which are likely to endure" (Lund et al., 2021, vi). This includes shifts to remote and hybrid work, a drastic increase in e-commerce, disruptions in leisure, travel, and brick-and-mortar stores, and an increase in automation and AI in customer service and manufacturing (Lund et al., 2021, vi). From this information and our own experiences throughout the pandemic, we can conclude that jobs have already changed. The fear that humans will be replaced by technology is a reality. Continued fear is unnecessary, however, as new jobs creation will surpass the number of jobs that are lost due to automation and AI. These new jobs, however, will require different skill sets that must be accounted for creatively to ensure the preparedness of current and future workers among other workforce challenges.

The role of paper has also shifted dramatically since the onset of the pandemic. Verso Corp.'s Wisconsin Rapids Paper Mill is one of several paper plants shuttering their doors since March of 2020. According to the Washington Post, this Wisconsin mill, which made coated printing paper for glossy magazines, saw a steady decline in production before the near stop caused by the pandemic (Kendall, 2020). Since the beginning of 2021, Paper Money lists 41 closures and cutbacks globally throughout the year (*Closures and Cutbacks in 2021*, 2021). Magazine and print media consumption has been steadily decreasing since 2007, the same year Steve Jobs introduced the first iPhone (Watson, 2021). Process automation is also accountable for the decrease in paper use since the advent of the PDF. Within schools, operations management, staff management, and student services are three areas citing improved workflows. This includes processes such as onboarding new employees, printing student IDs, communicating and collecting

student fines, student registration for classes, vendor contracts, payroll, and much more (Linderman, 2020). The pandemic only worked to increase automation and AI due to lack of physical proximity and fear of contracting COVID by touching shared surfaces.

The advent of the truly paperless office is upon us. An analysis of the systematic implementation of a paperless office indicates that the benefits outweigh the costs. The paperless office saves money, time, and space through improved workflows and a decrease in paper storage. Proper implementation will effectively upskill and reskill current employees and prepare them for the future of jobs. Finally, it is an effective way to walk the talk regarding modeling blended learning for the district. This literature review covers a brief history of the paperless office, a review of the benefits and disadvantages of paperless practices, and the implications of working in a paperless office in the district as a whole.

Definitions of Paperless Office:

The literature provides several definitions for the term paperless office:

- "In a truly digital environment, every process in the office is paperless" ("Practicing CPA," 2003, p. 4).
- "A paperless office is a work environment in which the use of paper is eliminated or greatly reduced. Use of any number of mechanisms that convert traditional office paper processes into electronic processes" (Hastrup et al., 2014, p. 101).
- "The purpose of a paperless office is to use information technologies and communication to improve the quality and accessibility of services by reducing costs and protecting the environment. A paperless office means a work area where the use of paper has been omitted or considerably reduced." (Orantes-Jiménez et al., 2015, p. 55).
- "A paperless office is a work environment which uses minimal physical paper and instead uses primarily digital documents" (Agade et al., 2020, p. 260).
- Dematerialization is the "reduction of paper consumption and the consequences of the digitization of information and implementation of paperless policies in organizations and firms" (Oliveira et al., 2021, pp. 1-2).

In this review, I will use paperless to mean a work environment in which paper is eliminated and converted to electronic processes. I will use dematerialization to refer to the reduction in non-paper items in an office required because of paper, such as pens, pencils, filing cabinets, filing folders, and the like.

A Brief History of the Paperless Office

Paper use during the industrial age required pens, brushes, and ink. Penmanship was important and considered to be a criterion of literacy. The introduction of the typewriter by Remington Arms Company in 1874 changed the way that paper was used. Because of the typewriter, document creation was much faster and easier to read, and office clerical work availability increased (*The Industrial Age: 1650 AD to 1900 AD*, 2010). With the typewriter came the advent of the keyboard, later used in other information processing systems like the word processor, computer, laptop, and even on tablets and smartphones (*The Industrial Age: 1650 AD to 1900 AD*, 2010). Throughout the industrial age, paper use increased as an office staple. Discussions around paper pains in the workplace soon followed. An early article titled Checkless Society (1968) attributes many bank office pains to the use of paper checks, including human error, bank fraud, and the backlog of paperwork. Despite these early pain points, the authors couldn't grasp a vision for the future. "The world of the computer where every man simply can not be his own programmer. Cost, technology, and complexity unite to insist that as never before bank-depositor agreements must be contracts of adhesion which means they must be written, or at least overwritten by public authority" (Dunne, 1968, p. 132). They went on to say that "computerized data processing, inside or outside a payments mechanism, should not be a substitute for decision-making. Rather it should be but a prelude to it in an environment where the issues are known, the guesswork eliminated, and the resulting range of choice all the freer because of those developments" (Dunne, 1968, p. 132). In a heavily referenced article from 1975, The Office of the Future, the authors were ready to move into a paperless environment. Creating a more efficient office would require a change in traditional structures, including how secretaries were distributed and how paper is used (Hastrup et al., 2014). They recognized the pervasiveness of industrial age structures, stating that moving to the office of the future "cannot be a social revolution, it has to be an evolution," and that office technology's ease of use, training requirements, and adaptability will be taken into account when planning for the office of the future (Hastrup et al., 2014).

With such early discussions on paper pains, why aren't offices completely paperless in 2021? Paper use is higher than ever and on the rise. As shown in figure one, Global paper use hovered around 180 million metric tons of paper globally from 2010-2018 (Tiseo, 2021).

Figure 1.

Consumption of pulp worldwide from 2010 to 2018 (in 1,000 metric tons)

Consumption of pulp worldwide from 2010 to 2018 (in 1,000 metric tons)*
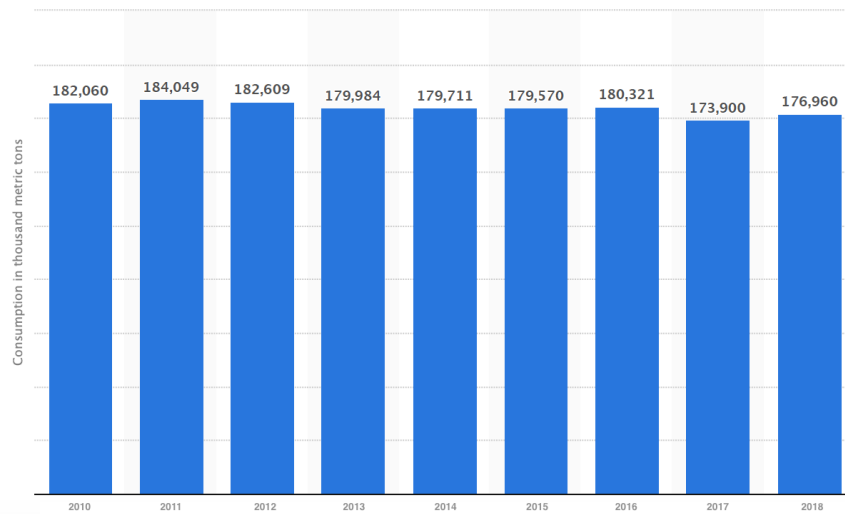
Note. This figure demonstrates the change in paper consumption over time in 1,000 metric tons between the years 2010 and 2018. Paper use remained relatively constant during that time despite increased technology capability and access (Tiseo, 2021).

Figure two demonstrates how paper use spiked to 399 million metric tons of paper globally in 2020, though the largest increase can be attributed to containerboard, likely due to the rise in e-commerce caused by the pandemic (Tiseo, 2021).

Figure 2.

Paper demand worldwide in 2020, by type

Paper demand worldwide in 2020, by type*
(in million metric tons)
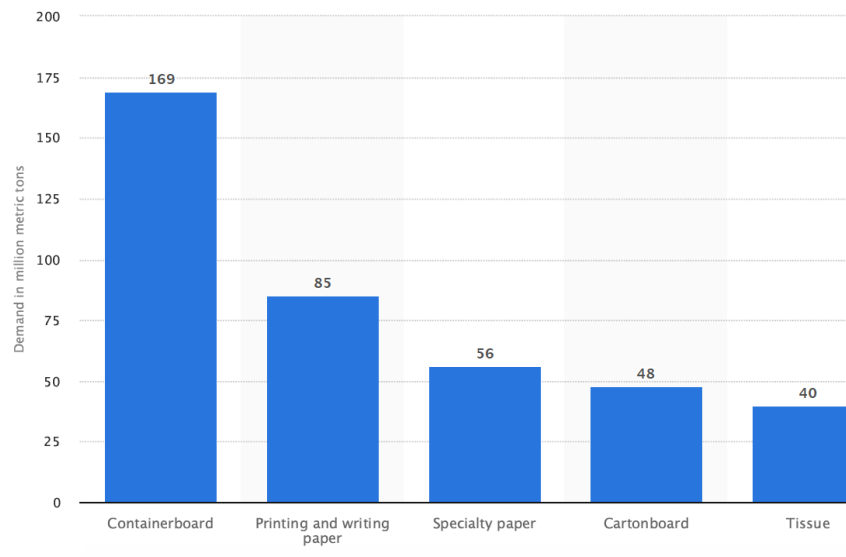
Note. This figure compares the consumption of paper products in 2020 by type. Notice that while the amount of paper increased from 180 million metric tons globally between 2018 and 2020, the largest increase is attributed to Containerboard (Tiseo, 2021).

In The Social Life of Paper (2002), the use and overuse of paper in offices is traced back to industrial-age thinking. "To cope with the complexity of the industrial economy, managers were instituting company-wide policies and demanding monthly, weekly, or even daily updates from their subordinates. Thus was born the monthly sales report, and the office manual, and the internal company newsletter" (Gladwell, 2002, p. 94). Malcolm Gladwell attributes this to the requirement of knowledge workers to use paper as a thinking tool. Paper is flexible and tailorable. Humans can, "annotate and scribble without altering original text. Because paper is a physical embodiment of information, actions performed in relation to paper are, to a large extent, made visible to one's colleagues" (Gladwell, 2002, p. 93). Other studies revealed that despite technology use, the use of paper has an important role in knowledge work (Oliveira et al., 2021). Brain science backs up the use of paper documents over digital documents. Paper uses a passive (reflective) light source. Paper is also is multisensory, requiring four of the five senses. The weight and texture of paper give a sense of the length and age of text, while smells and sounds provide even more information (Oliveira et al., 2021). Digital documents, however, use an active light source and the only sense accessed is the sense of sight (Oliveira et al., 2021).

On the other hand, not all paper use increased. Yale University from March to April 2020 was marked by a 90% decrease in paper purchasing and a 96% decrease in printing-related costs (*What COVID-19 Taught Us About Paper and Printing Sustainability*, 2020). This led to $82,000 saved in paper costs from February 2020 to April 2020. A comparison between April 2019 to April 2020 revealed, "$105,000 saved in paper costs and 97% fewer emissions from copy machines, printers, and paper purchased" (*What COVID-19 Taught Us About Paper and Printing Sustainability*, 2020, p. 1). While packaging attributes to the global paper increase from 2018 to 2020, other increases in paper consumption despite the introduction of paperless technology to the workplace can likely be attributed to the Jevons paradox. The Jevons paradox occurs when technology increases the efficiency with which humans can use a resource, thereby causing the increased consumption of that resource (Jevons, 1865). Even the perception of digital books and documents might shift as time passes and those who view e-books as "technology" age. In his book Grown Up Digital, Don Tapscott refers to technology as the air we breathe. (Tapscott, 2009) He quotes Alan Kay, who said that technology is only, "technology for people who are born before it was invented" (Tapscott, 2009, p. 19). The way that people view

and use technology will only continue to change as time progresses. The paperless office is no longer the office of the future - it is the reality of the present.

<div align="center">**Analysis of a Paperless Office: Benefits and Disadvantages**</div>

I) Benefits

Many of the benefits of a paperless office are better understood in the context of paper pains. Paper is only accessible in one location. It takes up a large amount of space, particularly via archives. Paper delivery is slow and tedious and requires a third party. Paper documents can only be used by one user at a time. Also, it is not easy to modify paper documents in an attempt to combine or change information. Making copies requires a copier or scanner. Finally, paper documents are more prone to destruction than digital documents, especially as technology improves (Oliveira et al., 2021). Eliminating paper use would quickly eliminate these pains and provide a cleaner office, streamlined workflows, reduced business risk, better customer relationships, and a positive environmental impact. Furthermore,

> "corporate electronic document management systems have several benefits: (a) customer service representatives have access to the information needed to provide complete service; (b) staff can access the information needed to perform their duties anywhere; (c) the creation of electronic documents means that paper originals can be destroyed, reducing filing space; (e) reduction in printing and printers due to electronic documents; (f) reduction in staff due to improved efficiency; (g) the provision of an audit trail of electronic information updates; and (h) the improvement of information management" (Oliveira et al., 2021, p. 5).

The results of implementing a paperless environment include increased profitability, improved company image, and a reduction in running costs (Oliveira et al., 2021). Regarding environmental sustainability, "paper production, distribution, use, and disposal require a large amount of energy and raw materials. Streamlining systems through efficient tools like online platforms or apps minimizes unnecessary use and waste" (*Yale Sustainability*, n.d., p.1). Dematerialization would be another benefit, as the use of items required to use alongside paper - printers, paper clips, file folders, pencils, and pens - would be greatly reduced (*Yale Sustainability*, n.d.). Further benefits include reduced paper storage costs and reduced time and energy used handling paper documents (*Yale Sustainability*, n.d.).

II) Disadvantages

On the other hand, digital records are a well-known security risk. Digital records must be kept safe if they store personal or legal information (Oliveira et al., 2021). Security is a top complaint of digital management, especially in the education sector. Grapevine-Colleyville ISD suffers from an average of 24 attempted security attacks weekly with the goal of mining student information. Security measures continue to increase, but would-be hackers improve as well. Take passwords as an example. Data from Hive Systems (2021) shows that any password with fewer than six characters, regardless of complexity, is instantly breakable. Numerical passwords of up to ten characters are also instantly hackable.

Figure 3. Time it takes a hacker to brute force your password

Number of Characters	Numbers Only	Lowercase Letters	Upper and Lowercase Letters	Numbers, Upper and Lowercase Letters	Numbers, Upper and Lowercase Letters, Symbols
4	Instantly	Instantly	Instantly	Instantly	Instantly
5	Instantly	Instantly	Instantly	Instantly	Instantly
6	Instantly	Instantly	Instantly	1 sec	5 secs
7	Instantly	Instantly	25 secs	1 min	6 mins
8	Instantly	5 secs	22 mins	1 hour	8 hours
9	Instantly	2 mins	19 hours	3 days	3 weeks
10	Instantly	58 mins	1 month	7 months	5 years
11	2 secs	1 day	5 years	41 years	400 years
12	25 secs	3 weeks	300 years	2k years	34k years
13	4 mins	1 year	16k years	100k years	2m years
14	41 mins	51 years	800k years	9m years	200m years
15	6 hours	1k years	43m years	600m years	15 bn years
16	2 days	34k years	2bn years	37bn years	1tn years
17	4 weeks	800k years	100bn years	2tn years	93tn years
18	9 months	23m years	6tn years	100 tn years	7qd years

HIVE SYSTEMS -Data sourced from HowSecureismyPassword.net

Note. This table compares the number of characters in a password against the complexity of a password to the amount of time it takes a hacker to brute force a password. It is surprisingly easy to hack numerical passwords as well as passwords with fewer than eight characters (*Are Your Passwords in the Green*, 2021).

The environmental impact of outdated technology and data storage is also highly problematic and a growing contributor to climate change and global waste. "Everything with the word smart in front of it has a data center behind it" (Carroll, 2020). When "Despacito reached 5 billion streamed YouTube views in 2018, the energy consumption was equivalent to powering 40,000 US homes a year. It has now exceeded 6.5 billion views" (Carroll, 2020). Data centers around the world are responsible for using three percent of the global electricity supply. Greenhouse gas emissions are created by these large data storage warehouses compared to the same amount produced through global air travel (Alorse, 2019). The digital economy is accelerating faster than the actions being taken in the green economy movement to counter negative environmental impacts. To move forward, we must first start thinking differently (Alorse, 2019).

<center>**Implications of the Paperless Office**</center>

Upskilling employees

One of the most important and immediate effects of the paperless office is upskilling and reskilling employees. According to the World Economic Forum (2018) employers are ready to focus on reskilling and upskilling employees currently performing high-value roles strategically and that they intend to "target employees in key roles and in frontline roles which will be using relevant new technologies" (*The Future of Jobs Report 2018*, 2018, p. ix). Upskilling is defined as learning new competencies for the current role because of a change in skills required to do the job, while reskilling is learning new skills for a completely different role (*Towards a Reskilling Revolution Industry-Led Action for the Future of Work*, 2019). What skill foci are the most essential? Figure four provides an analysis of the increasing and decreasing skills required in job markets. As the twenty-first century progresses, higher-order thinking skills continue to grow in their importance over skills that can be replaced by AI or automation (*Towards a Reskilling Revolution Industry-Led Action for the Future of Work*, 2019).

Figure 4.

Comparing skills demand, 2018 vs. 2022, top ten

Today, 2018	Increasing, 2022	Declining, 2022
Analytical thinking and innovation	Analytical thinking and innovation	Manual dexterity, endurance and precision
Complex problem-solving	Active learning and learning strategies	Memory, verbal, auditory and spatial abilities
Critical thinking and analysis	Creativity, originality and initiative	Management of financial, material resources
Active learning and learning strategies	Technology design and programming	Technology installation and maintenance
Creativity, originality and initiative	Critical thinking and analysis	Reading, writing, math and active listening
Attention to detail, trustworthiness	Complex problem-solving	Management of personnel
Emotional intelligence	Leadership and social influence	Quality control and safety awareness
Reasoning, problem-solving and ideation	Emotional intelligence	Coordination and time management
Leadership and social influence	Reasoning, problem-solving and ideation	Visual, auditory and speech abilities
Coordination and time management	Systems analysis and evaluation	Technology use, monitoring and control

Source: World Economic Forum, *Future of Jobs Report 2018*.

Note. Figure four shows the increasing and declining needs of particular career skills. Notice the increase in higher-order thinking skills over rote or managerial skills (*Towards a Reskilling Revolution Industry-Led Action for the Future of Work*, 2019).

How can we ensure best practices with upskilling and reskilling? "Three key workforce-related areas, in particular, emerged as critical to the continued success of an industry and its ecosystem: 1. Leverage strategic workforce planning, 2. Shape the future talent pipeline, 3. Optimize talent ecosystem conditions" (*Towards a Reskilling Revolution Industry-Led Action for the Future of Work*, 2019, p. 19). Figure five provides a comprehensive look at how to apply best practices in each of these categories.

Figure 5.

Overarching recommendations

Leverage strategic workforce planning
- Conduct **strategic workforce** planning
- Establish **strategic skills mapping** within jobs
- Close **management knowledge gap**

Shape the future talent pipeline
- Develop targeted **reskilling** programmes
- **Upskill** on a large scale
- Homogenize **skilling landscape**
- Align **educational curricula** with skills needs

Optimize talent ecosystem conditions
- Rethink **organizational structures**
- Transform **culture** to attract and retain next generation talent
- Develop a culture of **lifelong learning**
- Boost **diversity**

Sources: World Economic Forum and Boston Consulting Group.

Note. This figure details best practices in leveraging strategic workforce planning, shaping the future talent pipeline, and optimizing talent ecosystem conditions (*Towards a Reskilling Revolution Industry-Led Action for the Future of Work*, 2019).

Administrative Modeling

What implications could this have on the district as a whole? If the administration embraces the paperless office, this could truly impact blended learning across the district. "One of the keys is for leadership within a company to embrace paperless. Instead of telling staff to use less paper, company leadership should lead by example by being seen with their laptop or tablet instead of a stack of paper" (Orantes-Jiménez et al., 2015, p. 52). Administrators could model paperless environments and blended learning in training environments, meetings, events, and other communications:

- Meetings: Share materials in advance through e•mail or calendar links, hold meetings over Webex, and incorporate users' technology into the meeting for shared documents and note taking (*Yale Sustainability*, n.d.).

- Events: Use digital registration even if attendees register onsite, make agendas and communication digital, and use an app or site for communication before, during, or after the event is over (*Yale Sustainability*, n.d.).

- Newsletters and communications: E-newsletters like S'more have customizable templates and are easy to edit. They can also track valuable analytics (*Yale Sustainability*, n.d.).

Blended Learning

How does blended learning fit into this equation? Simply this: If we move away from industrial age thinking regarding paper; we can also move away from industrial age thinking regarding our students. Standardized, factory-model schools are not meeting our students' potential. For starters, students don't need teachers to stand at the front of the room and control the information in an age where content is accessible with a quick Google search. As early as 1916, John Dewey noted that student learning related to real-world, relevant problems produced better outcomes. Also, our students have different learning needs at different times and different paces of learning the same material (Horn & Staker, 2015). "Personalized and competency-based learning, implemented well and jointly, form the basis of a student-centered learning system" (Horn & Staker, 2015, p. 8). Online learning is here - let's create blended learning systems that support best practices around it. If administrators can implement paperless practices, with the right implementation engaging learning environments are sure to follow.

Conclusion

The paperless office can truly lead the way with the right planning through modeling digital document management, workflows, and reorganization of space upon dematerialization. While there are details to work out, the savings of money, time, and space through improved workflows and a decrease in paper storage are inarguable. Implications show that reskilling and upskilling current employees result in preparedness for the future of jobs. Finally, gains are made toward the evolution of a blended learning district by creating systems and modeling paperless expectations from administrators.

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