

The Business Case for Moving to **ELECTRONIC DOCUMENTATION**

By Lori Schroth and Brandon J. Hody

IMAGINE THIS SCENARIO: A young, enthusiastic man in a business suit greets you at the door on the first day of your new job as a safety manager. He provides you with a workplace orientation as he walks you toward the office area. As you approach the elevators, you observe a few haphazardly placed orange-and-white-striped cones on the floor and immediately recognize that you have walked into a barricaded area. You see a small, barely legible sign taped to one cone. You squint to make out the words: “Authorized Personnel Only, Elevator Out of Order.” A few contractors wearing bright orange safety vests and yellow hard hats stand around the open elevator shaft laughing and ignoring the open pit next to them. The contractors make eye contact with you, acknowledging your presence, but say nothing and continue to converse with each other. As you continue toward the office area, you inform the man escorting you of the unsafe practices and inquire about the company’s contractor induction process, and safety and health expectations. He says that he is not familiar with contractor processes and practices, but that you should be able to find related documentation in one of the boxes he left at your desk.

You begin digging through the boxes at your desk looking for the contractor’s authorization to work at your company. Hours pass as you continue to search for the documentation. Eventually you come across contractor work permits and other related documents. Upon review, you notice past due OSH training

records, partially complete work permits, and inconsistent information, dates and signatures. Some documents have torn edges and ripped corners, others have begun to yellow, and some have blurred ink and are unreadable. All the while, you still have not located the specific contractor authorization to work document. If an inspector were to arrive at your workplace today, you know you would not be able to provide documentation regarding the company’s contractor safety and health oversight and management process. Can you relate to this scenario?

A documentation management system (DMS) impacts the management and execution of OSH programs and processes (e.g., risk management, safety reporting, sustainability, compliance; Ma & Bolton, 2019), as well as the ability to retain, control, review and route OSH documentation (e.g., safety plans, OSH training records, work permits, lists of hazardous chemicals, audit reports, OSH evaluations). Consider the DMS as the hub to an OSH program, centralizing documents and data, enhancing control over processes, and facilitating access to information (Sussman, 2017; Ysaguirre, 2016). A DMS can be paper or electronically based, or a hybrid of the two. Today, countless companies use paper-based documentation systems simply because that is the way they kept documents historically. However, these systems have many disadvantages. After recognizing the disadvantages of a paper-based system and evaluating organizational documentation and recordkeeping needs for the OSH program, firms should consider migrating to an electronically based documentation system to improve the efficiency and effectiveness of OSH processes, comply with regulations and drive down financial costs.

Constraints of Paper-Based Documentation

Due to the shortcomings of paper recordkeeping, many organizations endlessly devote resources to archiving, maintaining and organizing documents manually (Schuman, 2017). Many paper systems lack the integrity to confirm the completeness, timeliness, and revision or updating of documents, especially at companies with a large OSH program or with dozens of contractors. The loss of a single OSH document can be detrimental to the bottom line, impacting project start times and burdening productivity. Paired with the surge of adopting electronic records (Lewellen, 2015), organizations must ask why they are still using paper systems.

KEY TAKEAWAYS

- The adoption and acceptance of electronic documentation in the workplace is on the rise, which may impact safety and health programs and processes.
- Research shows electronic documentation ensures better compliance with OSH standards and document retention requirements, and electronic documents provide organizations with options that paper documentation cannot.
- Understanding the benefits of electronic documentation, and the shortcomings and economic implications of paper-based documentation can help companies make informed decisions regarding OSH documentation management.
- This article outlines a 10-step approach to successfully transition from paper to electronic documentation. Organizations can follow the process to reduce obstacles to implementing an electronically based documentation system and drive culture change.

FIGURE 1
COSTS OF PAPER DOCUMENTATION

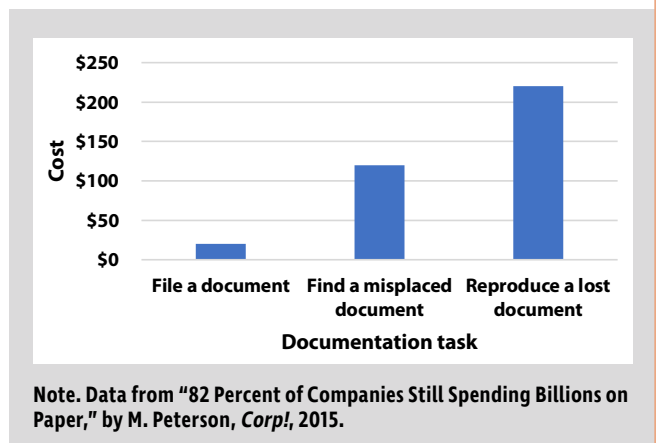
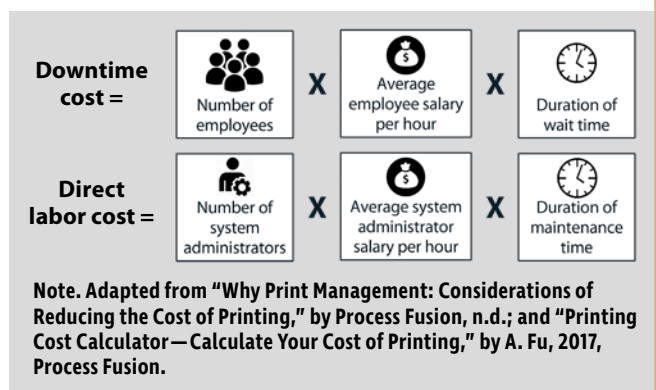


FIGURE 2
CALCULATING EQUIPMENT DOWNTIME & MAINTENANCE COSTS



Document Organization Obstacles

The stability of an organization's documentation is dependent on individual preferences, diligence, motivation and situation, among other influences. A responsible person must manage and maintain a paper documentation system to support the longevity of the system, manually filing documents and ensuring that they are organized and easily accessible (Sherman & Freeman, 2007). Even with dedicated personnel, employees may file OSH documents incorrectly and a paper system does not automatically index or back up these documents for easy retrieval. If paper documents must be reorganized, companies must devote resources to filter through them and choose which to keep, and trust that employees will follow the established archival construct.

Poorly organized documentation increases the risk of document loss and misplacement (Jervis & Masoodian, 2014; Svenson, 2017). In some cases, firms may need to recreate the lost or misplaced OSH documentation. According to Peterson (2015), it costs about \$20 to file a document, \$120 to find a misplaced document and \$220 to reproduce a lost document (Figure 1). A disorganized system and missing documents may result in productivity losses due to time spent on new document creation; financial losses; and nonconformance with OSH regulations, when the company cannot readily provide the document for an inspector or employee.

Storage Space Limitations

The extent of paper documentation storage varies by organization. Some companies maintain all historical OSH documents, some duplicate documentation for archival purposes, and others only maintain a few files. Many organizations like to keep some OSH documentation in paper form to easily provide

to inspectors and employees. In any case, the need for extra storage space means an increase in overhead expenses.

Brick-and-mortar organizations are limited to the space within their walls. When a firm begins running out of space, one can anticipate the use of unused areas for document storage (e.g., aisles, egress routes, under stairways), posing risks to productivity and workplace safety. Storage areas may also become convoluted with irrelevant OSH documents, resulting in unnecessary storage expenses and loss of valuable on-site space where employees could perform business tasks that directly impact cash flow.

Vulnerability to Damage & Deterioration

Organizations must exercise caution when storing paper documents. High temperatures and low humidity can affect the preservation of paper documents. Exposure to high temperatures may result in the mold growth, discoloration and moisture loss, causing the paper to curl or become unreadable. Low humidity may cause static buildup causing documents to stick together, which can create difficulty finding documents, thereby increasing the financial loss (Peterson, 2015). Paper documents are also susceptible to damage from exposure to damp environments, water, fires and sunlight when placed in inadequate storage areas. A company will not be able to provide damaged or deteriorated documents to employees and inspectors, which means it may be noncompliant with OSH documentation expectations (no documentation to support OSH processes).

Security, Confidentiality & Privacy Concerns

Organizations may handle confidential information and must secure many OSH documents to protect the privacy of individuals (e.g., personal identifying information for employees, contracts, medical records, injury and illness forms). The U.S. Office for Civil Rights (OCR, n.d.) tracks protected health information data breaches (affecting 500 or more individuals). In 2018, 13.7% of reported cases involved paper documentation. On the other hand, Nitro (2015) found that "61% of data breaches within companies of less than 500 employees involve paper records." The data breaches indicate there are struggles to maintain secure, confidential and private documents with paper documentation.

Aside from data breaches, a paper-based system opens the possibility of tampering, theft, destruction and loss of documentation, as well as unauthorized access and disclosure (OCR, n.d.). Many organizations attribute data breaches to employees who do not realize the sensitivity of the documents and carelessly leave them unsecured in public places for others to view. While companies can resolve this concern with training and education, it leaves them open to noncompliance with OSH regulations, violation of the Health Insurance Portability and Accountability Act and organizational privacy concerns.

Limited Accessibility

A paper system may pose a barrier to providing employees timely access to OSH information, especially since many firms store documents behind locked doors or in locked file cabinets. Limited access to OSH documents may lead to employees working without the knowledge they need to perform assigned work safely. For example, organizations have a duty to provide affected employees and contractors with ready access to safety data sheets (SDS). Suppose a company's hazard communication program requires supervisors to maintain hard copy binders of SDS in their office for employee access. Some supervisors lock their office when they leave for the day, making SDS inaccessible

to employees working during the supervisor's absence. The practice violates the hazard communication regulation and affected personnel may begin work before they have the OSH information needed to protect themselves, increasing the possibility of injury or illness (incurring direct and indirect costs) and creating confusion if a chemical-related spill occurs requiring special cleanup.

Inefficient Document Development & Control Process

It is difficult to edit and revise documents and sustain version control in a paper system. Also, simultaneous editing and revisions are impossible with paper documents. To develop or modify a paper document without the use of technology, an organization may create multiple copies of a document so that several people can add notes and change the content. The approach means someone must review each set of notes and incorporate the changes into the central paper document. Updates may include deciphering strikethroughs and notes from others, transferring information between documents, solving mathematical equations by hand, and adding new graphics and tables to existing text. Manual updates increase the margin of human error and, at times, creates concern regarding the legibility, completeness and accuracy of the document, all complicating the version control process (Lucas et al., 2019; Pollack, 2017; Varela et al., 2019).

Environmental Consequences

The production of paper pollutes the environment, fills landfills and creates global health hazards (Burbello, 2012; Ysaguirre, 2016). The paper manufacturing industry is the third largest user of the world's limited fossil fuels and is among the world's leading generators of air and water pollutants, waste products and gases that contribute to climate change (Gupta, 2015; Shah et al., 2019).

Paper use directly supports the paper manufacturing industry, contributing to energy consumption and the Earth's carbon footprint (Gupta, 2015). Paper use also has an impact on human health, leading to occupational hazards (e.g., exposure to airborne contaminants from photocopying equipment, contact with toner or ink, manual material transportation) and air, soil and water contamination that affects the health of communities and organizations (Shah et al., 2019). The more paper a company uses, the more it contributes to the environmental consequences of paper usage.

Economic Implications

Studies show that companies spend up to 3% of their annual revenue on printing (Fu, 2017; Process Fusion, n.d.). In many cases, printing costs are an unmanaged expense due to the perception that paper and printing supplies are inherent to business operations. The mentality that a business does not need to track printing expenses leads to the underestimation of printing costs by up to 40%, implying that printing costs may be higher than studies estimate (Process Fusion, n.d.).

Paper & Printer Consumables

Paper and printer consumables (e.g., ink cartridges, toner, energy) are the largest expenses related to office and administration activities (Gupta, 2015). The average employee prints about 10,000 sheets of paper per year, with about 60% of printed papers being unnecessary to business operations (EPA, 2018; Restore Digital, n.d.).

Organizations spend an average of \$790 per employee each year for paper and toner, which means they also could save \$538

per employee by choosing a DMS other than a paper system, based on \$190 for the cost of one ream of multipurpose copy printer paper and \$150 for one high-capacity toner cartridge, 3,000-page yield. Extending this thought to where there is a significant contractor presence, printing costs may be greater per contractor due to contractor OSH documentation requirements.

Equipment Purchases

The purchase and maintenance of photocopying and printing equipment have associated costs. The capital cost and useful life of a multifunctioning industrial printer varies depending on brand, model and conditions of use. A standard midrange laser printer (i.e., HP LaserJet Enterprise MFP) costs about \$1,800, with an average replacement every 5 years for ultimate functionality (HP, 2019a). When not purchasing the equipment outright, organizations must allocate funds toward leasing the printer, maintenance fees and total copy charges.

Energy Use

Printers and photocopiers need energy to operate. In a typical office, office equipment can account for about 15% to 30% of total electricity consumption, with each additional printer and photocopier increasing energy consumption, thereby overhead costs (Government of South Australia, n.d.). According to Energy Information Administration (n.d.), the average price of electricity for commercial facilities is 11 cents per kWh. The energy consumption of a standard midrange HP laser printer is 629 W during operation, 28.8 W in standby mode and 0.06 W for printers in the off position (based on the specs for the HP LaserJet Enterprise MFP M528DM that is designed for office productivity; HP, n.d.a;b). For the operation of a single printer 8 hours a day for an entire year, the printer consumes 1,836 kW of energy and accrues \$202 of electricity, contributing to overhead expenses.

Equipment Downtime & Maintenance

Printing and photocopying equipment have associated downtime and maintenance costs. Employees cannot print or copy paper documents when equipment is in need of repair or undergoing maintenance, contributing to possible profitability and productivity losses (Fu, 2017; Process Fusion, n.d.). For example, if an organization utilizes a paper documentation system and has to issue a physical hot work permit to an employee or contractor, the printer downtime impacts the start time of the hot work and the employee or contractor may experience pressure to start the work without a permit, creating an unsafe work environment. Equipment outages affect each company differently, but there is a monetary cost for downtime and direct labor costs, affecting the bottom line (Figure 2).

System Maintenance & Productivity

Beyond paper and toner expenses, a firm can spend upwards of \$8,000 a year to maintain paper documentation (Harrison, 2018), devoting time and money to document filing, retrieval and the reorganization of files.

It takes an employee about 18 minutes to locate a paper document, and sometimes longer when encountering obstacles (e.g., loss or misplacement; M-Files, 2019; Mikado, 2015). Consider periodic 18-minute delays at an organization. If a contractor has to wait 18 minutes for someone to locate and produce an OSH document, costs are incurred for the contractor's wait time and delays to the contract work performed, affecting the bottom line. These 18 minutes could be put to better use performing more important business-related tasks.

Document Storage

Paper-based documentation has up-front and recurring storage costs. Organizations need a physical location to store paper documents (e.g., file cabinet, storage room, off-site storage unit), leading to a cost per square foot to file paper documents; the cost varies by company. Using on-site space for document storage also limits the ability to expand business operations and positive cash flow.

Some organizations pay for off-site storage space to retain documentation. The average cost of a 10-ft x 20-ft storage unit in the U.S. is \$180 per month or \$222 per month for a climate-controlled environment (Spear, 2018). A single storage unit is a recurring expense that adds up to more than \$2,100 annually (Figure 3); this expense does not account for transportation time or associated fuel costs to travel to the storage space.

Recycling & Disposal

Recycling and disposing of paper documents incurs expenses as well. According to Michael Shapiro (as cited by Ramberg et al., n.d.), former EPA director, “A well-run curbside recycling program can cost anywhere from \$50 to more than \$150 per ton.” One ton of paper is approximately 200,000 sheets of printer paper. Considering the average employee produces about 6,800 sheets of unintended paper waste each year (EPA, 2018; Restore Digital, n.d.), estimated recycling and disposal costs equate to \$1.70 to \$5.10 per employee each year.

Using paper documentation to support OSH programs has many disadvantages. Organizations may not realize the full impact of using paper documents because of the indirect costs heavily associated with this type of DMS. So, how can electronic documents benefit a company’s bottom line and support OSH programs?

Benefits of Moving to Electronic Documentation

Organizations can overcome the limitations of paper recordkeeping by transitioning to an electronically based documentation system. While these systems are not without disadvantages, such as economic implications and environmental consequences, understanding the anticipated benefits and outcomes of an electronic system and a comprehensive strategic plan helps ensure a successful transition. Organizations can reduce costs, make OSH programs and document retrieval more efficient, and drive document accessibility, communica-

tions, and completion for on-site and off-site employees and contractors. Consider the OSH documentation requirements for contractors within a paper system when performing on-site work. Contractors must submit documentation to the company periodically for review or approval to meet contractual obligations (e.g., work permits, OSH inspection and audit reports, incident investigations, updated training records). Think about the time, money, personnel and paper that a firm must devote to toward this process. It would be simpler, quicker and more efficient with an electronic system.

Productivity Enhancements

Organizations can experience many productivity enhancements with the migration to an electronic recordkeeping system for OSH. Companies save time by directly routing documents to appropriate personnel with the click of a button, allowing for quick review of information. End users also save time with the use of metadata (e.g., keywords, dates, file names) to instantly cross-reference documents, reducing the amount of time needed to retrieve a document. For example, if an inspector were to request a confined space entry permit for a specific process, the end user can simply use the process name, permit name or type, or date ranges to quickly locate and produce the permit.

Electronic systems also support remote approval processes for OSH documents. In standards interpretations, OSHA has permitted the use of electronic signatures for documentation such as safety training and Form 300A (Fairfax, 2000a; b; Goddard, 2009). Most OSH documentation can be electronically signed, unless specifically required by standard, speeding up the approval process by removing the need to seek handwritten signatures. An electronic system allows OSH documents to be sent to appropriate personnel directly for approvals and signatures, regardless of location, reducing the time dedicated to tracking people down and waiting for approvals. These systems also allow end users to track changes in real time, sometimes simultaneously with others, driving efficiency with completing documents. The time saved with productivity enhancements gives employees, contractors and appropriate personnel additional time to complete more work, increasing billable hours and the completion of higher priority business tasks (Dykman & Davis, 2012).

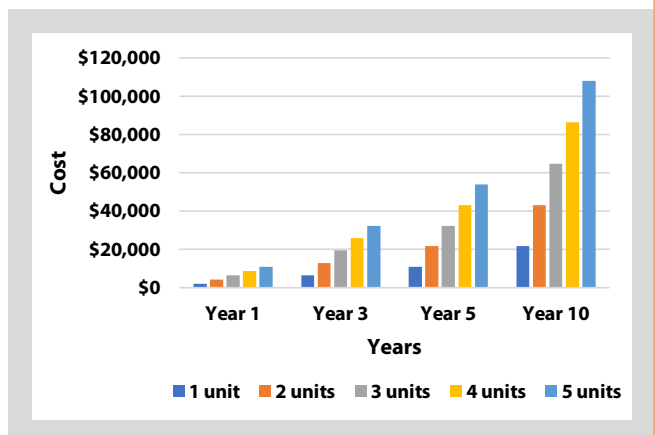
Storage & Backup Improvements

An electronic system allows organizations to maintain documentation in a centralized location on devices as simple and compact as a thumb drive. The storage improvements help reduce or eliminate paper documents and reclaim file cabinets, storage rooms and other areas throughout a facility. Companies can utilize cloud storage to give end users an unlimited quantity of virtual document storage, which is beneficial for OSH professionals as some regulations require historical access and maintenance of certain records. In addition, backup options are available to protect electronic documents against loss and deterioration and increase the likelihood for recovering lost documents (Pollack, 2017). Such systems also drive accessibility to OSH data since the organization can easily file the documents in many locations electronically.

Document Organization Possibilities

With electronic documentation, companies can easily create an archival system, duplicate documents, transfer information from one document to another, and organize the documents in several ways for the end user (Pollack, 2017; Sussman, 2017; Varela et al., 2019; Ysaguirre, 2016). Using an electronic system

FIGURE 3
STORAGE UNIT COSTS OVER TIME



can vastly improve the consolidation of OSH documents, document retrieval and process workflows (e.g., reporting hazards, completing OSH inspection reports, filling out work permits; Deloitte, 2012; Gupta, 2015; Svenson, 2017; Ysaguirre, 2016).

Consistency in the Standardization & Completion of Documentation

An electronically based system promotes consistency in documentation (Pollack, 2017). Firms can set up templates, create standard formats and provide electronically fillable forms to make documents easy to complete. Such systems also allow end users to enter information into predefined sections, some of which may be pre-filled, reducing the time needed to fill in information from one form to another (Pollack, 2017; Sussman, 2017).

For example, consider a company that has six separate facilities, each with its own confined space entry form with a different layout; employees, contractors, OSH professionals and inspectors may find the different formats unclear as they move between facilities. An electronic system provides an opportunity to establish consistency within the processes and standardize documentation between facilities. These efforts may lead to benefits such as streamlining the workflow process and approval procedures, making the process more understandable for employees and contractors, making auditing easier, and helping to ensure compliance with documentation requirements.

Accessibility & Retrieval Ease

Electronic systems enable organizations to grant end users instant access to documents (Pollack, 2017), and permit users to retrieve and access documents remotely (Friedberg et al., 2014; Lucas et al., 2019; Pollack, 2017; Ysaguirre, 2016). Easy access allows documents to be quickly shared via social media, email, throughout the organization or publicly (Gupta, 2015; Ysaguirre, 2016). The accessibility helps provide employees and contractors with timely access to OSH information, drives communications and reduces the labor costs associated with manual document retrieval.

Compatibility With Mobile Devices

Electronic documentation systems are commonly compatible with mobile devices and office computers, promoting flexibility and ease of remote access. In the U.S., 75% of adults own desktop or laptop computers, 50% own tablet computers, 50% have e-readers, 96% own a cell phone (Pew Research Center, 2019), and ownership of mobile devices continues to increase.

Embracing digital life is evident among not only the younger workforce, but older generations as well, with a significant growth in adopting new technology since 2012 (Singer & Alexander, 2017; Vogels, 2019). The use of multiple devices to access electronic documents allows employees and contractors to review OSH documents without requiring an on-site computer or laptop, driving safety communications and data sharing wherever the company performs work.

Functionality & Capability Improvements

Electronic systems provide capabilities beyond those of paper documents. Many such systems have built-in verification and functionality capabilities, such as the automatic calculation of mathematical equations based on user input, prefilling information based on the data entered in a different field, and suggesting common inputs based on input history. Such systems may also analyze data entered into the system, helping organizations generate trend reports, make informed business

decisions and identify continuous improvement opportunities within the OSH program.

Multiple Layers of Security

Electronically based systems promote the privacy and security of documents through multiple layers of encryption, passwords and other security measures to protect against cyber threats and data breaches (Shenoy & Aithal, 2016). Many systems allow firms to set up permissions to grant authorized users with access to sensitive information. Encryption and password protection help protect sensitive data against unauthorized changes as well. Some systems also monitor data breaches and notify the organization when a data breach occurs, giving advance notice to address the situation and secure private OSH information as needed.

Automated Reporting

Automated reporting is a common feature of electronic systems. Organizations can set up workflows to automatically deliver certain OSH documents (e.g., training reports, inspection findings, permit approvals) to specific personnel, eliminating the need for personnel to search for the information. Automated reporting needs vary by company, but it streamlines processes and shares data more efficiently. Automated reporting also eliminates the need to manually generate reports, reducing the possibility of errors and freeing up time to analyze data and perform other business tasks.

Collaborative Feedback

An electronically based system enables an organization to provide feedback, post comments and allow for open discussions among end users. For example, if an employee or contractor submits a hazard report, the company can provide feedback to the submitter regarding the status of action taken. The submitter can review the documented hazard report at any time to understand the progress made and submit questions electronically. A feedback system helps the organization drive performance and motivates employees and contractors to become more involved in OSH and utilize the system for continuous improvement purposes.

Communication Improvements

Organizations can set up a system to notify employees or contractors to take action on an open item. For example, it can automatically notify a contractor when an outstanding document must be uploaded. Notifications are also useful for reminding employees and contractors of OSH training requirements due in the future. The communication improvements relay reminders and notifications quickly, remove the need for manual monitoring and allow the company to deliver a substantial amount of communications to employees and contractors.

Auditable Trails

An electronic system gives organizations an auditable trail to follow the periodic reviews and updates to documentation. It allows them to straightforwardly track required retention times for certain documents to comply with OSH regulations and gather documentation quickly during OSH audits and inspections (Pollack, 2017). Such a system not only eases the burden of ensuring that documents are up to date, it also provides quicker, easier access to those records for the auditors or inspectors.

Cost Savings & Avoidance

Deloitte (2012) says an electronically based documentation system is less than one-fifth the cost of a paper system, even

when backed up for recovery purposes. Migration to an electronic system allows for reducing the volume of paper documents and makes available on-site square footage previously allocated to document storage. Eliminating document storage space increases the opportunity to expand revenue-related operations. The transition also reduces overhead expenses for paper, printer, printer consumables and recycling, which may result in a significant savings against the bottom line.

Electronic documentation offers several advantages over paper documentation. Depending on organizational needs, some companies switch fully to an electronic system, while others only partially transition.

How to Transition to an Electronically Based Documentation System

The migration from paper to electronic documentation may seem intimidating and challenging, but the key to a successful transition is thorough planning paired with a business case to support the change. So, how does an organization transition from a paper system to an electronic one? Several studies identified critical steps to successfully transition a DMS (Alshibly et al., 2016; Johnston & Bowen, 2005; Karlos & Nengomasha, 2018). The authors reviewed and consolidated these steps to provide a 10-step process for making the transition (Figure 4).

Step 1: Consider Organizational Needs & Expectations

Each electronic documentation system offers different capabilities and components, and organizations must evaluate its needs and wants for a system by answering the ultimate question: Why transition to electronic documentation? Answering the “why” helps determine the overall goal of the transition. Consider the future direction of the OSH program, business-related goals, end user feedback, capabilities needed, available resources and performance needs for the system, helping to make an informed decision on which one to use. When contemplating these needs, ask:

- What functions or features do we need from the system?
- Should we migrate all paper documents to the system, or just specific documents?
- How will we phase out old, paper documentation during the transition?
- Who do we anticipate our end users to be (e.g., employees, vendors, contractors)?
- What is the definitive goal for the transition?

Step 2: Contemplate Factors Affecting Implementation of Electronic Systems

Karlos & Nengomasha (2018) found the main factors affecting implementation of electronic documentation systems are management support, resource commitment, strategies to convert paper records to an electronic format, safety and security concerns, system maintenance and end user buy-in. Prepare for obstacles relating to these factors by discussing what issues may arise before, during and after system implementation. Possible questions to answer include:

- How will our document management process change?
- How will electronic documents affect our workflow?
- Do we need the system to work with other processes, workflows or electronic documentation systems we have?
- Do we have security, confidentiality or privacy concerns related to specific documentation and can the selected system maintain that security?

- Do we have any limitations that impact employee accessibility (e.g., employees without access to computers or mobile devices, firewalls on computers or mobile devices, internet capabilities during off-site work)?

- How can we gain support from employees for use of an electronic documentation system in place of paper?

- What is our plan to back up electronic documentation?

Answering these questions helps define what the system must do in terms of supporting the OSH program and DMS, as well as define organizational goals. Not all systems are the same and identifying this information narrows down the choices.

Step 3: Solicit Input & Feedback From Possible End Users

Ask for end user (e.g., employees, process owners, supervisors, contractors, vendors, customers) feedback to further identify the organization’s needs and wants for the system. For example, a training manager overseeing the completion of safety training for employees and contractors may need the system to notify personnel of scheduled or past due training, store historical training records, include searchable fields to sort and locate training records, and allow trainers and contractors to upload attendance rosters and the completion of training. The feedback helps ensure that the system supports the documentation needs of the OSH programs and allows others to participate in the decision-making process, driving cultural buy-in from end users who may be hesitant to use an electronically based documentation system.

Step 4: Assess Resource Availability & Technological Readiness

Think about dedicated resources and infrastructure needed for the successful implementation of an electronic documentation system.

Financial Resources

Cost is a critical factor when choosing a system, especially if it has significant up-front or licensing expenses. Identify a price point to spend on the system annually. Investigate data storage options and associated costs as well, evaluating hard space availability, available bandwidth from the service provider and the costs of needed backup systems. While costs associated with electronic systems may appear to be a burden, understand that substantial expenses are associated with a paper-based system; the indirect savings may not always be evident. Update OSH budgets to reflect these anticipated costs.

Technical Resources

Evaluate existing information technology (IT) infrastructure and determine whether it supports the migration to an electronic documentation system. Companies may need to upgrade technical capabilities and compatibility, update hardware and software (e.g., computers and their current capabilities, operating systems, printing and photocopying equipment), or devote monetary resources to help other organizational systems communicate with the system (Alshibly et al., 2016; Schuman, 2017; Svenson, 2017). A firm may incur additional costs to accommodate needed upgrades and purchases.

Human Resources

Evaluate the time and effort required to sustain and operate the documentation system on a full-time basis. Check with the developer or supplier as to whether administration and support are provided services, incur additional costs or are the

organization's responsibility. Determine whether additional IT staffing is necessary to administer the system and whether additional personnel are necessary to digitize historical documentation (e.g., scanning and uploading old documents, recreating electronic documents; Keneley et al., 2016; Varela et al., 2019). A company may also benefit from hiring a technology consultant to assist with the document migration (Svenson, 2017).

Step 5: Choose an Electronic System That Fits the Organization

Narrow down options and ask suppliers for trial periods or live demonstrations. Involve potential end users in demonstrations and trial periods to gain additional input on the needs and functionality of the system. Use this opportunity to verify compatibility with other electronic systems used at the organization. Determine how well the system supports the company's needs and expectations, considering system functionality, effectiveness, efficiency, user friendliness, usability and integration of systems and technology before making the final decision on a documentation system (Alshibly et al., 2016).

Step 6: Employ a Change Management Strategy

Changing the DMS is a significant, major organizational change that affects OSH (Bhandola, 2015; Karlos & Nengomasha, 2018). Develop a change management strategy to prepare for disruptions and changes, providing a greater sense of assurance and acceptance of change to end users (Karlos & Nengomasha, 2018). Bhandola (2015) describes the steps to develop and employ a change management strategy when introducing an electronic documentation system, helping promote user buy-in and plan for obstacles:

1. Propose the change. Lay out the steps needed for the DMS transition and state the reasons for implementing an electronic documentation system. Utilize cross-functional teams to provide input on business impacts and implementation factors.

2. Ask top organizational leaders to review and approve the proposal.

3. Develop an action plan to identify the actions necessary for implementing the system. Assess the risk for each action and prioritize the actions based on the risk.

4. Communicate responsibilities and expectations in executing the actions.

5. Track the action plan. Provide supporting documentation and evidence to show the progress made.

6. Evaluate the system once it is fully implemented to ensure that it is operating as intended and planned.

Step 7: Demonstrate Top Management Support

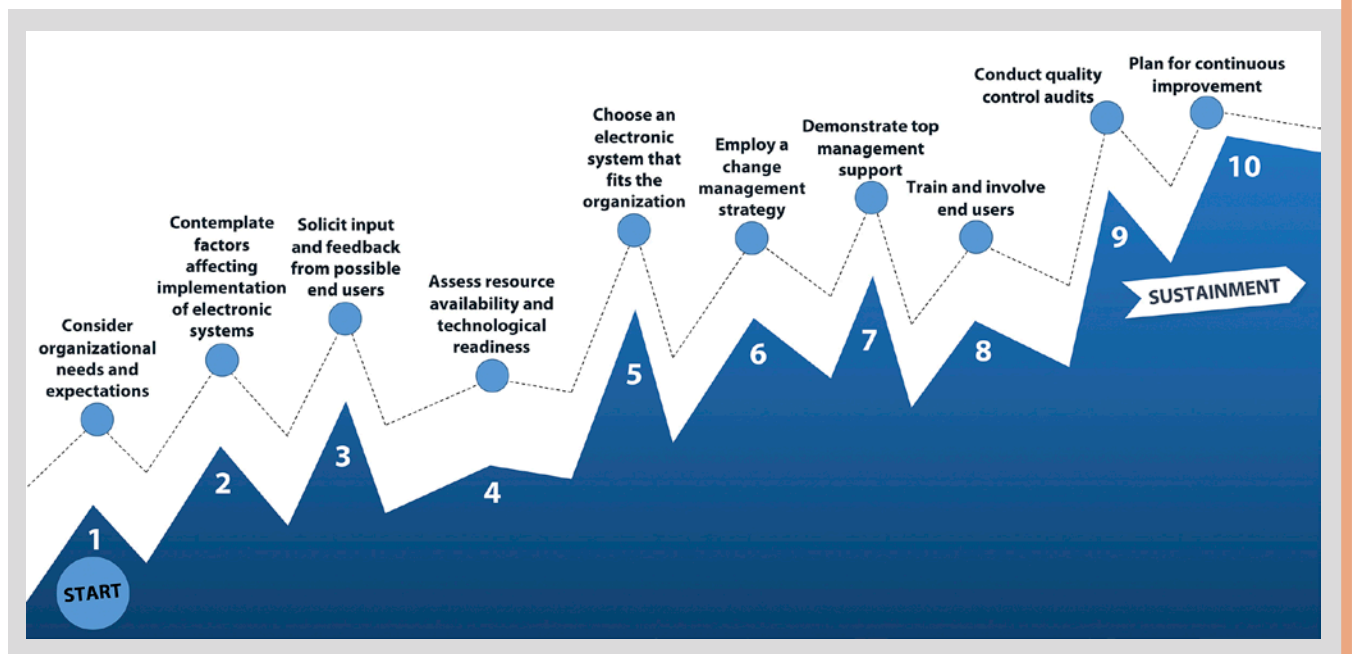
Alshibly et al. (2016) found that top leadership support (e.g., demonstrating encouragement, showing commitment, participating in implementation and use) is a leading factor in the successful implementation of an electronically based documentation system. When top leaders do not show support or interest in the system, these actions carry over to employees and contractors, leading to resistance to the new DMS (Alshibly et al., 2016). Help organizational leaders understand the value of the system and how it relates to the company and the OSH program to gain their support.

Step 8: Train & Involve End Users

Offer individualized training specific to the roles and responsibilities of different end users using the system (Alshibly et al., 2016; Bhandola, 2015; Friedberg et al., 2014; Lucas et al., 2019; Ysaguirre, 2016). For example, train end users how to input data, use functions, and document hazards and concerns within the DMS; train contractors to upload OSH documentation and complete work permits and other forms; and train top leaders and supervisors on the use of monitoring and measurement tools for tracking OSH trends or assigning corrective actions.

Avoid providing the same training to all end users because it can lead to a misunderstanding of specific roles within the sys-

FIGURE 4 STEPS TO TRANSITION FROM PAPER TO ELECTRONIC DOCUMENTATION



tem (Leikums, 2012). Consider the computer skills of potential end users and determine whether basic computer skills training is necessary (Ysaguirre, 2016). Remember, a system cannot reach its full potential unless end users know how to properly use it (Alshibly et al., 2016).

Step 9: Conduct Quality Control Audits

The keys to good documentation are accuracy, consistency and thoroughness (McCoy, 2017). The quality of the information put into the system is what to expect in return. Assign responsibility for someone (e.g., quality control personnel, project manager) to oversee the quality of documentation within the system and ensure its accuracy through periodic quality checks and audits (McCoy, 2017; Varela et al., 2019). Periodic audits help identify ongoing user errors and challenges, which can help organizations learn how to better educate employees on the use of the system. Draft formal procedures with steps or examples to complete a specific electronic document, helping avoid user error.

Step 10: Plan for Continuous Improvement

Be mindful of needed improvements to continually support the ongoing success, use and sustainment of the electronic documentation system. Many such systems have multiple capabilities and companies may not realize the full potential of the system they use. A firm may also choose to gradually transition to electronic documentation, rather than all at once. Use quality control audit findings to identify opportunities for improvement and develop action plans. Make sure the system continually supports organizational needs and answer any questions end users have regarding its use.

Conclusion

DMS can pose challenges to the management and oversight of OSH documentation, especially when using a paper-based documentation system. Research shows that use of paper systems has disadvantages. They have direct and indirect expenditures that can affect an organization's bottom line and these expenditures grow with the size of the workforce and use of contractors. Aside from the financial burdens a paper-based system presents, companies frequently encounter issues with poor organization, limited storage and accessibility, continued preservation of documents, lack of document control and data breaches, which are all preventable issues.

The recommended solution to overcome these issues and concerns is to migrate the paper documentation system to an electronic one. OSH regulations call for robust documentation to support OSH processes and procedures. The transition to electronic documentation allows a firm to ensure compliance with these regulations by making document retrieval, completion and access more timely. OSH processes are enhanced through remote access to data and off-site approvals (e.g., contractors submitting OSH plans or risk assessments before the start of work), driving productivity, profitability and communications. Electronic systems provide options that paper systems cannot, such as compatibility with mobile devices, electronic keyword searches across multiple documents, remote access to OSH information, flexible functionality and capability options, automated reports to drive informed business decisions, and auditable trails to assist with document control. While the advantages of an electronic system are plentiful, Deloitte (2012) also says that an electronic documentation system is less than one-fifth the cost of a paper one once the system is fully implemented, a substantial benefit.

The successful transition to an electronic system requires a thorough plan, assessing organizational needs and expectations, determining the needs of such a system, identifying resource needs, and narrowing down options that support organizational goals. Companies should devise a comprehensive strategic plan to implement the system, gaining support and commitment for the system from both top management and end users, training end users on its use and capabilities, and conducting periodic quality control audits for its use. While implementing an electronic documentation system has challenges, having a plan helps to overcome anticipated challenges and promote use of the system. Organizations must continually evaluate use and improvements related to the system to ensure that their OSH programs and processes are continually supported by the system.

While studies identify many benefits to migrating to an electronic documentation system, additional research should be conducted on the benefits experienced across various organizations. Additional research substantiating the benefits and steps forward with specifically transitioning OSH programs and contractor oversight will help other companies make the decision to move forward with the transition to an electronic documentation system to improve OSH program performance. **PSJ**

References

- Alshibly, H., Chiong, R. & Bao, Y. (2016). Investigating the critical success factors for implementing electronic document management systems in governments: Evidence from Jordan. *Information Systems Management*, 33(4), 287-301. <https://doi.org/10.1080/10580530.2016.1220213>
- Bhandola, P. (2015). Leveraging change for continuous process improvement. *Pharmaceutical Technology*, 38(10), 62-68. www.pharmtech.com/leveraging-change-continuous-process-improvement
- Burbello, A. (2012, Aug. 21). Life without paper. *Curitiba World—Technology*. <https://curitibaworld.blogspot.com/2012/08>
- Deloitte. (2012). Is it time to go paperless? Records management: The cost of warehousing bad habits. www2.deloitte.com/content/dam/Deloitte/za/Documents/financial-services/ZA_ItsTimeToGoPaperless_24042014.pdf
- Dykman, C.A. & Davis, C.K. (2012). Addressing resistance to workflow automation. *Journal of Leadership, Accountability and Ethics*, 9(3), 115-123. www.na-businesspress.com/JLAE/DykmanCA_Web9_3_3.pdf
- Energy Information Administration (EIA). (n.d.). Electric power monthly: Table 5.6.A, Average price of electricity to ultimate customers by end-use sector, by state, August 2019 and 2018 (cents per kilowatthour). www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_6_a
- EPA. (2018). Paper and paperboard: Material-specific data. www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/paper-and-paperboard-material-specific-data
- Fairfax, R.E. (2000a, May 4). Standard interpretations: Trainee signatures are not required to verify training; U.S. Postal Service is covered by the OSH Act. www.osha.gov/laws-regs/standardinterpretations/2000-05-04-0
- Fairfax, R.E. (2000b, Apr. 10). Standard interpretations: Use of electronic signature pad to record signatures for training certification. www.osha.gov/laws-regs/standardinterpretations/2000-04-10
- Friedberg, M.W., Chen, P.G., Van Busum, K.R., Aunon, F., Pham, C., Caloyeras, J., Mattke, S., Pitchforth, E., Quigley, D.D., Brook, R.H., Crosson, F.J. & Tutty, M. (2014). Factors affecting physician professional satisfaction and their implications for patient care, health systems, and health policy. *Rand Health Quarterly*, 3(4), 1. www.ncbi.nlm.nih.gov/pmc/articles/PMC5051918
- Fu, A. (2017, April 12). Printing cost calculator—Calculate your cost of printing. Process Fusion. www.uniprint.net/en/printing-cost-calculator-calculate-cost
- Goddard, K. (2009, Jan. 29). Standard interpretations: Permissibility of using electronic signature to satisfy the annual summary certification

for OSHA Form 300-A. www.osha.gov/laws-regs/standardinterpretations/2009-01-29

Government of South Australia. (n.d.). Office equipment. www.tafesa.edu.au/docs/greening-tafesa/building_office_equipment.pdf

Gupta, S. (2015). Paperless society: From vision to fulfillment. *Global Journal of Enterprise Information System*, 7(1), 45-53. <https://doi.org/10.18311/gjeis/2015/3034>

Harrison, K. (2018, Aug. 27). Can't go paperless? Try this "paper-light" approach and save a fortune. *Forbes*. www.forbes.com/sites/kateharrison/2018/08/27/cant-go-paperless-try-this-paper-light-approach-and-save-a-fortune

HP. (n.d.a). HP LaserJet Enterprise MFP. <https://store.hp.com/us/en/mdp/printers/laserjet-enterprise-multi-function>

HP. (n.d.b). HP LaserJet Enterprise MFP M528dn. https://store.hp.com/us/en/mdp/printers/laserjet-enterprise-multi-function?jumpid=in_r11400_us/en/ipg/laser_printers/laserjet-enterprise-mfp/learn#1&tab=vao

Jervis, M. & Masoodian, M. (2014). How do people attempt to integrate the management of their paper and electronic documents? *Aslib Journal of Information Management*, 66(2), 134-155. <https://doi.org/10.1108/AJIM-01-2013-0007>

Johnston, G.P. & Bowen, D.V. (2005). The benefits of electronic records management systems: A general review of published and some unpublished cases. *Records Management Journal*, 15(3), 131-140. <https://doi.org/10.1108/09565690510632319>

Karlos, A.N. & Nengomasha, C.T. (2018). Change management: A critical factor for successful implementation of an electronic document and records management system (EDRMS): A Namibian case study. *Journal for Studies in Humanities and Social Sciences*, 7(2), 85-105. <http://journals.unam.edu.na/index.php/JSHSS/article/view/1092>

Keneley, M., Potter, B., West, B., Cobbin, P. & Chang, S. (2016). Digitizing archival records: Benefits and challenges for a large professional accounting association. *Archivaria*, 81(Spring), 75-100. <https://archivaria.ca/index.php/archivaria/article/view/13559>

Leikums, T. (2012). Managing human factors in implementing electronic document system in the public sector. *Romanian Review of Social Sciences*, 2, 21-30.

Lewellen, M.J. (2015). The impact of the perceived value of records on the use of electronic recordkeeping systems. Victoria University of Wellington. <http://hdl.handle.net/10063/4144>

Lucas, B., Schladitz, P., Schirrmeyer, W., Pliske, G., Walcher, F., Kulla, M. & Brammen, D. (2019). The way from pen and paper to electronic documentation in a German emergency department. *BMC Health Services Research*, 19, Article 558. <https://doi.org/10.1186/s12913-019-4400-y>

M-Files. (n.d.). The business case for information management: A collection of information management and enterprise content management (ECM) research data. www.m-files.com/Content/documents/en/res/ECM_Stats_White_Paper.pdf

Ma, Y. & Bolton, S. (2019, Mar. 26). Green quadrant EHS software 2019. Verdantix. <https://research.verdantix.com/report/green-quadrant-ehs-software-2019>

McCoy, S. (2017). Steps to accurate and consistent documentation. *Food Manufacturing*, 30(3), 14.

Mikado, M. (2015, Dec. 7). 7 stats that will make you rethink your document management strategy. Business.com. www.business.com/articles/7-statistics-that-will-make-you-rethink-your-document-management-strategy

Nitro. (2015). Why paper documents are a security risk in the workplace. <https://blog.gonitro.com/2015/09/why-paper-documents-are-a-security-risk-in-the-workplace>

Office for Civil Rights (OCR). (n.d.). Breach portal: Cases currently under investigation. U.S. Department of Health and Human Services. https://ocrportal.hhs.gov/ocr/breach/breach_report.jsf

Peterson, M. (2015, Nov. 5). 82 percent of companies still spending billions on paper. *Corp!* www.corpmagazine.com/industry/technology/82-percent-companies-still-spending-billions-paper

Pew Research Center. (2019, June 12). Mobile fact sheet. www.pewresearch.org/internet/fact-sheet/mobile

Pollack, D. (2017). Legal benefits of mobile digital documentation for human services agencies. *Policy & Practice*, 75(5), 30, 34.

Process Fusion. (n.d.). Why print management: Considerations of reducing the cost of printing [White paper]. www.uniprint.net/en/reducing-cost-white-paper

Ramberg, E., Casey, J. & Molinaro, M. (n.d.). Economical impact. Paper recycling. <https://sites.google.com/site/buildingspacetrees/economics>

Restore Digital. (n.d.). Paperless office? Paper waste statistics for the average U.K. office. www.restore.co.uk/Digital/Insights/Blogs/paperless-office-paper-waste-statistics-for-the-average-uk-office

Schuman, A.J. (2017). Pediatric office paper chase: Revisited! *Contemporary Pediatrics*, 34(7), 40. www.contemporarypediatrics.com/modern-medicine-feature-articles/pediatric-office-paper-chase-revisited

Shah, I.A., Amjed, S. & Alkathiri, N.A. (2019). The economics of paper consumption in offices. *Journal of Business Economics and Management*, 20(1), 43-62. <https://doi.org/10.3846/jbem.2019.6809>

Shenoy, P. & Aithal, P. (2016). A study on history of paper and possible paper free world. *International Journal of Management, IT and Engineering*, 6(1), 337-355. <https://doi.org/10.5281/zenodo.161141>

Sherman, B.J. & Freeman, E. (2007). *Paperless policy: Digital filing system benefits to DoD contracting organizations* [Master's thesis, Naval Postgraduate School]. Defense Technical Information Center. <https://apps.dtic.mil/dtic/tr/fulltext/u2/a475950.pdf>

Singer, L.M. & Alexander, P.A. (2017). Reading across mediums: Effects of reading digital and print texts on comprehension and calibration. *Journal of Experimental Education*, 85(1), 155-172. <https://doi.org/10.1080/00220973.2016.1143794>

Spear, M. (2018, Feb. 21). How much does a storage unit cost in 2018? www.lifestorage.com/blog/storage/storage-unit-costs

Sussman, A. (2017, Jan. 3). 3 benefits of centralizing your operation with a document control system. *Quality*, 53(1), 44. www.qualitymag.com/articles/93752-benefits-of-centralizing-your-operations-with-a-document-control-system

Svenson, E. (2017). Paper puncher: Establishing a paperless law practice may be right for you. *ABA Journal*, 103(4). www.abajournal.com/magazine/article/paperless_law_practice

Varela, L.O., Wiebe, N., Niven, D.J., Ronksley, P.E., Iragorri, N., Robertson, H.L. & Quan, H. (2019). Evaluation of interventions to improve electronic health record documentation within the inpatient setting: A protocol for a systematic review. *Systematic Reviews*, 8, Article 54. <https://doi.org/10.1186/s13643-019-0971-2>

Vogels, E.A. (2019, Sept. 9). Millennials stand out for their technology use, but older generations also embrace digital life. Pew Research Center. www.pewresearch.org/fact-tank/2019/09/09/us-generations-technology-use

Ysaguirre, E. (2016, Apr. 1). 7 ways technology can streamline your document control process. *Quality*, 55(4). www.qualitymag.com/articles/93194-ways-technology-can-streamline-your-document-control-process

Lori Schroth, D.B.A., CSP, CIT, CHSP, CSSM, is a safety and environmental professional at Concurrent Technologies Corp. in Johnstown, PA. She holds a Doctor of Business Administration and an M.S. in Occupational Safety, Health and Environmental Management from Columbia Southern University, and a B.S. in Safety Sciences and a B.S. in Natural Sciences from Indiana University of Pennsylvania. Schroth is a professional member of ASSP's Central Pennsylvania Chapter and a member of the Public Sector, and Training and Communications practice specialties, both of which she also serves as Nominations and Elections Chair.

Brandon J. Hody, M.S., CSP, CHSP, is a safety and occupational health professional at Concurrent Technologies Corp. in Johnstown, PA. He holds both an M.S. and a B.S. in Safety Sciences from Indiana University of Pennsylvania. Hody is a professional member of ASSP's Western Pennsylvania Chapter and a member of the Society's Emerging Professionals in OSH Common Interest Group and the Consultants, Public Sector, and Training and Communications practice specialties. Hody also serves as Administrator of the Public Sector Practice Specialty and Technical Question Coordinator for the Training and Communications Practice Specialty.