MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION

RESEARCH REPORT

STUDY OF IMPACTS OF TECHNOLOGY ON THE FUTURE WORKFORCE AT THE MDOT SHA

PRINCIPAL INVESTIGATORS:
CHAODONG HAN, PHD JAMES OTTO, PHD

TOWSON UNIVERSITY

FINAL REPORT

April 2023

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. MD-23-SHA/TU/3-01	2. Government Accession No.	3. Recipient's Catalog No.		
4. Title and Subtitle Study of Impacts of Technology on the Future Workforce at the MDOT SHA		**5. Report Date** April 2023		
		6. Performing Organization Code N/A		
7. Author(s) Chaodong Han, Ph.D. https://orcid.org/0000-0003-1618-0184; James Otto, Ph.D.		**8. Performing Organization Report No.** N/A		
9. Performing Organization Name and Address Towson University 8000 York Rd Towson, MD 21252		**10. Work Unit No.**		
		11. Contract or Grant No. SHA/TU/3-01 SPR22B43		
12. Sponsoring Agency Name and Address Maryland Department of Transportation (SPR) State Highway Administration, Office of Policy & Research 707 North Calvert Street Baltimore MD 21202		**13. Type of Report and Period Covered** Final Report (July 2022 – April 2023)		
		14. Sponsoring Agency Code (7120) STMD - MDOT/SHA		
15. Supplementary Notes				

16. Abstract

Artificial intelligence, robotic process automation, natural language processing and virtual collaboration technologies are transforming the landscape of the office and administrative workforce by automating non-value added, repetitive tasks and processes, as well as supporting remote and flexible work. The scope of this study is to provide recommendations on how administrative assistants (AA) and business analyst (BA) jobs may be redesigned to better meet MDOT SHA's needs in function areas where there is a strong need for AAs and BAs. The study reviews related literature and analyzes job data provided by MDOT SHA and information collected from focus group meetings and one-on-one interviews with MDOT SHA's AAs and their managers. The study conducts job analysis and identifies gaps after assessing MDOT SHA's existing capabilities in terms of office technology infrastructure, AA and BA workforces, and related processes against its mission and strategic plan. Based on the People, Process and Technology model, the study recommends that MDOT SHA consider a digital office of the future when managing its AA workforce and adopt a Center of Excellence model managing its BA workforce. Additionally, the research team recommends that the MDOT SHA carefully consider whether additional AA staff will be needed over the next few years when conducting its strategic workforce planning. Many administrative tasks will be at least partially, if not fully, automated over the next few years. Any hours or other resources saved by a reduced need for AA services could be reallocated toward other, more pressing personnel needs. The digital office of the future offers the opportunity for more flexible work schedules, allows for work from anywhere, supports a hybrid work environment, automates repetitive tasks, reduces menial activities for human workers, and provides more opportunities for higher-value tasks such as relationship management, customer engagement, team building, innovation, creative activities, and high-level data analysis. Anticipated results include a motivated AA workforce with high productivity, efficiency and retention rate and a capable BA workforce which integrates with the functional areas and offices and supports MDOT SHA's critical mission. Implementation of recommendations, including challenges and risks, is discussed.

| **17. Key Words**
Automation; Flexible Work Schedule; Center of Excellence Model; Strategic Workforce Planning; Job Analysis; Gap Analysis; Job Characteristic Model; People, Process and Technology Model | | **18. Distribution Statement**
This document is available from the Research Division upon request. | | |
| **19. Security Classif. (of this report)**
None | **20. Security Classif. (of this page)**
None | | **21. No. of Pages**
61 | **22. Price** |

Form DOT F 1700.7 (8-72)   Reproduction of completed page authorized

Table of Contents

List of Tables

List of Figures

Executive Summary

Artificial intelligence, robotic process automation, natural language processing and virtual collaboration technologies are transforming the landscape of the office and administrative workforce by automating non-value added, repetitive tasks and processes, as well as supporting remote and flexible work.

The scope of this study is to provide recommendations on how administrative assistants (AA) and business analyst (BA) jobs may be redesigned to better meet MDOT SHA's needs in function areas where there is a strong need for AAs and BAs.

The study reviews related literature and analyzes job data provided by MDOT SHA and information collected from focus group meetings and one-on-one interviews with MDOT SHA's AAs and their managers. The study conducts job analysis and identifies gaps after assessing MDOT SHA's existing capabilities in terms of office technology infrastructure, AA and BA workforces, and related processes against its mission and strategic plan. Based on the People, Process, and Technology model, the study recommends that MDOT SHA consider a digital office of the future when managing its AA workforce and adopt a Center of Excellence model managing its BA workforce. Additionally, the research team recommends that the MDOT SHA carefully consider whether additional AA staff will be needed over the next few years when conducting its strategic workforce planning. Many administrative tasks will be at least partially, if not fully, automated over the next few years. Any hours or other resources saved by a reduced need for AA services could be reallocated toward more pressing personnel needs.

The digital office of the future offers the opportunity for more flexible work schedules, allows for work from anywhere, supports a hybrid work environment, automates repetitive tasks, reduces menial activities for human workers, and provides more opportunities for higher-value tasks such as relationship management, customer engagement, team building, innovation, creative activities, and high-level data analysis.

Anticipated results include a motivated AA workforce with high productivity, efficiency and retention rate and a capable BA workforce which integrates with the functional areas and offices and supports MDOT SHA's critical mission. Implementation of recommendations, including challenges and risks, is discussed.

With the pandemic beginning to subside, many government agencies and companies are reassessing their remote work policies and practices. While some companies have chosen to reverse their remote work policies, citing concerns over collaboration and communication challenges, productivity declines, erosion of company culture, and challenges in employee training and development, others have decided to continue with remote work policies due to the benefits they offer, such as increased employee satisfaction, cost savings, environmental impact, access to talent, and improved business flexibility and continuity. While digital offices may be the future, it is important to note that remote work is not a one-size-fits-all solution at present. Organizations need to find a balance between the need for interactions in the workplace and the tech savviness of workers enabled by organizational technology capabilities.

1   INTRODUCTION

Enabled by emerging technologies in artificial intelligence (AI), communications, collaboration, and analytics, the U.S. has entered an era of the big-data economy, which has profound implications for the workforce and job designs. Technologies have made remote work a reality. More administrative tasks can be performed virtually from anywhere, using a variety of electronic systems. The potential for remote work has grown and the COVID-19 pandemic has accelerated this trend. A recent Gallup survey (2021) estimates that 60 million U.S. full-time jobs can be done remotely and predicts a 37% reduction of in-office days worked per week even when the pandemic wanes.

As an alternative solution to office shutdowns during the pandemic, remote work arrangements can present challenges to organizations whose mission is customer-driven and requires frequent face-to-face interactions and engagements. And job designs, work processes, organizational structures, policies, and institutional culture may not have been fully updated to accommodate, monitor, evaluate, and reward remote work. Facing choices about shifting back to normal and continuing remote work, organizations need to make long-term decisions about how to achieve an optimal remote work strategy in the aftermath of the COVID-19 pandemic. Harvard Business Review (2021) challenges organizations to leverage recent remote work experience to intentionally plan for a remote/hybrid workforce in the future, including updating company policies, determining the right mix of remote work, nurturing a new culture, redesigning job descriptions, and training.

The MDOT SHA's high level of customer dedication, combined with the general trend of remote work, has created both opportunities and challenges for the MDOT SHA. As part of its strategic workforce planning, MDOT SHA should evaluate workforce supply and demand, identify skill gaps, assess its organizational structure, and determine what talent management initiatives are required to drive organizational efficiency and effectiveness into the future.

The primary focus of this study is to research, analyze, and provide recommendations regarding MDOT SHA's needs for office administration requirements, how administrative assistants and business analysts fit into those needs, and how job redesigns might increase efficiency and effectiveness. Additionally, this study examines how business analysts support office administration and how they are organized to provide that support.

This report is organized as follows. In Section 2 of this document, the research team provides a comprehensive review of the literature. Section 3 describes our methodology including data collection. The research team presents gap and risk analyses along with the results in Section 4. Finally, the last section offers our recommendations.

2   LITERATURE REVIEW

Based on the scope of the research project, we present a comprehensive review of five research streams: (1) office administration technology trends; (2) administrative assistant (AA) and business analyst (BA) job descriptions; (3) workplace transformations; (4) theoretical frameworks on Strategic Workforce Planning and Job Performance; and (5) state of the practice.

The goals are to identify the underlying driving forces of work, worker, and workforce transformations, define the best practices for work redesigns, and build a solid theoretical foundation to ground our analysis and recommendations.

2.1   Office Administration Technology Trends

This section reviews the literature on current and trending technologies that impact office administration functions and operations. Table 1 lists these office administration technologies under one of four categories. Additional details on the more salient technologies are discussed in the paragraphs following the table.

Table 1: Office Administration Technologies

Artificial Intelligence (AI)	Cloud Computing and Online Services
- Natural Language Processing (NLP) - Speech-to-Text - Text-to-Speech - Text to Image - Speaker Recognition - Automatic Meeting Transcription - Text Summarization - Chatbots - Voice Assistants - Interactive Voice Response (IVR) - Automatic Text Completion - Language Translation - Facial Recognition - Fingerprint Identification - Handwriting Recognition Systems - Optical Character Recognition (OCR) - Grammar, Spelling, and Format Checking - Virtual Reality (VR) and Metaverse - Augmented Reality (AR) - Robotic Process Automation (RPA)	- Travel Administration - Online Calendars - Automated Meeting Scheduling - Quick Response (QR) Codes - E-Commerce Applications - Digital File Sharing - Online Event Management and Registration - Online Banking Services - File Sharing Servers - Software as a Service (SaaS) - Online Training - Online Videos

Collaboration and Communication	Smart Workplace Devices
- Video Conferencing and Online Collaboration Platforms - Text Messaging - Email and Email Management Systems - Digital Signatures - Smart Contracts - Surveys - Facsimile Service - Virtual Private Networks	- Hot Desks - Smart Lockers - Hybrid Meeting Space - Automatic Visitor Login Systems - Smart Whiteboards - Digital Scanners - Voice over Internet Protocol (VoIP) Devices - Virtual Reality (VR) Headsets - Augmented Reality (AR) Devices - Security Keys

For the most part, the more impactful technologies are related to AI. Especially natural language processing (NLP), a subfield of AI, which provides us with speech-to-text and text-to-speech capabilities. These abilities allow us to verbally interact with our computers instead of typing our inputs and reading the output. NLP technologies are specifically impactful because much of administrative work involves communicating both verbally and via text, as well as converting between those two forms of communication. In this section, we discuss these, and other technologies, which are organized under four general technology areas: AI and NLP; communication and collaboration; cloud computing and online services; and smart workplace devices.

AI is fundamental to many of the newest, and most compelling office administration capabilities. AI refers to computing systems that mimic human intelligence to perform tasks. AI systems can change their behavior and improve their performance based on the information they collect (Oracle, 2020). According to Andrew Ng, an AI pioneer and expert from Google, Baidu, and Stanford (Jewell, 2019):

> ***AI is the new electricity. It will transform every industry and create huge economic value***. *Technology like supervised learning is automation on steroids. It is very good at automating tasks and will have an impact on every sector – from healthcare to manufacturing, logistics, and retail.*

And office administration is no exception. AI is having significant impacts on administrative functions. Many different AI technologies build on one another. For example, AI is fundamental to NLP, which is fundamental to speech-to-text systems, which in turn provides the ability of Microsoft Word dictation to type text based on your voice inputs.

NLP is a field within AI that works to understand human language as it is spoken and written (Hirschberg & Manning, 2015). Huge strides have been made in NLP performance and capabilities. NLP examples include automatically reading customer reviews and summarizing the sentiment inherent in those reviews. Another is translating between languages. Specific administrative applications of NLP that we discuss in this section include automatic meeting

transcription and summarization systems; language translation; speech-to-text; text-to-speech; text-to-image (such as DALL-E); text-to-video; speaker recognition; chatbots; and voice assistants.

Automatic Meeting Transcription and Summarization (Song et al., 2021) transcribes verbal discussions into text. Transcripts can then be automatically summarized by the system. This reduces the labor required for a human to take meeting notes. However, note that in some circumstances, human notetaking may be preferred. This is because human notetakers are currently better at considering discussion context and organizational sensitivities as they decide what to enter into (or withhold from) the minutes.

Speech-to-text converts human speech into text. As one can imagine, this technology has wide applications, from voice dictation in Microsoft Word to searching for internet information verbally. Text-to-speech is the reverse process. It reads text and converts it to human speech. Such technology is especially useful for hands-free and mobile operations. For example, giving and receiving verbal navigation directions from a Global Positioning System (GPS) map application. Another example is the YouTube tool that automatically creates video transcripts.

Speaker recognition systems identify the person speaking. This is useful for applications such as automatic transcription systems that list the speaker alongside the transcribed text and meeting systems that focus video attention on and identify the person speaking.

Chatbots are AI technologies that can chat with humans either by voice or by text in a human-like way. Chatbots can provide customer support by simulating a person-to-person conversation. Chat GPT is a powerful example of this technology (OpenAI, 2023). Other systems that leverage AI technologies include document grammar, spelling, and format-checking systems (Dale, 2016; Willis et al., 2020), such as Grammarly and ProWritingAid. Handwriting recognition systems scan human handwriting and convert it to computer-readable text. A related technology is optical character recognition (OCR), which extracts text from scanned hardcopy documents.

Online applications for communicating, collaborating, and sharing information can make online and remote interactions more efficient. Key systems include video conferencing and online collaboration platforms, which grew their user base immensely during the pandemic because people could not physically meet due to health restrictions. Examples include Microsoft Teams, Webex, Slack, and Zoom. These systems typically provide the following functionalities: video conferencing; individual and group chat; discussion forums; screen sharing; file sharing; video recording; text transcripts and summaries; breakout rooms; background screens; audio and video testing and muting; and participant identification.

Other potentially labor-saving communication and collaboration applications include text messaging, email and email management systems, digital signatures, smart contracts; surveys; digital facsimile (fax) service; and Virtual Private Networks. These technologies are discussed in the following paragraphs.

Extending the capabilities of the standard e-mail communication system, email management applications (Patel, 2017) can automate aspects of email usage. These systems can sort and

prioritize emails based on user specifications. They can reply to emails with pre-written responses. And they can generate and send personalized mass emails via email marketing campaign software like MailChimp and ActiveCampaign.

Digital signatures enhance the ability to implement organizational processes fully online because they replace pen and ink signatures. Thus, digital signatures avoid the need to print out a hard copy for a wet signature and more conveniently implement remote document signing. An example of software providing digital signatures is DocuSign.

Cloud computing and online services provide server-based information technology (IT) and software services. This allows previously client-based software to be centralized for consistent management and administration. Also, cloud computing services are more easily scalable to meet Fluctuations in user demand. In addition to server-based applications, cloud servers also can provide data storage and system backups. Examples of cloud computing software as a service (SaaS) include Microsoft 365 office applications and Google Docs software.

Digital online calendars can support automated meeting scheduling. This is where software views participant calendars and automatically determines meeting times that are available to all invitees (Purbo & Kurniawan, 2020). The scheduling assistant for Microsoft Outlook Calendar is an example. Related to this are online event management and registration applications, such as Eventbrite and EventCreate.

E-commerce applications can expedite the purchase of supplies and materials for the office as well as the coordination and purchase of organization travel. Amazon.com is an example of an e-commerce site that sells a wide variety of goods and services. Expedia.com is an example of an online travel booking and management site.

While files can be exchanged via e-mail, sometimes it is more convenient and efficient to use a file-sharing or file delivery server, where the recipient of a file gets an e-mail that directs them to a server to retrieve a file. This is especially useful for files that are too large or too sensitive to send via e-mail attachment. An example is Dropbox.com.

While not yet widely adopted, the metaverse, which is a VR platform that appears similar to a 3D computer game, may allow us to interact with each other using personal avatars. Operation in the metaverse typically, but not always, requires a virtual reality (VR) headset. Augmented reality (AR) is related to virtual reality, except that AR overlays digital information onto a view of the real physical world instead of operating in a fully simulated environment as with VR.

Large Language models are machine-learning neural networks with a huge number of parameters (hundreds of billions) that can be adjusted. These software applications can predict follow-on text based on some initial text input. This technology is relevant to systems like automatic sentence completion. Because the models possess an immense number of training parameters and because the systems are trained on enormous text libraries (hundreds of gigabytes), some unexpected and interesting behaviors emerge. For example, these systems (such as Chat GPT) have demonstrated the ability to write convincing essays, create charts and websites from text

descriptions, generate computer code with limited to no supervision, and translate between languages (Tamkin & Ganguli, 2021).

Robotic process automation (RPA) uses bots to automate repetitive tasks on computers. So, for example, if data needs to be repeatedly extracted from several websites, RPA can run scripts to accomplish this task with little, or no human intervention. This saves time and labor while also reducing human tedium by taking over dull and repetitive tasks.

Smart workplace devices include those technologies that streamline or automate the use and management of the office infrastructure. One such technology is hot desks. During the pandemic, fewer employees were coming into the office every day to their own dedicated desks. Since fewer employees were coming in, they might instead use available general-use shared desks for which they sign up for or use on a first-come basis. Google invented a technology that automatically adjusts a hot desk to the preferred height and tilt when an employee logs in (Hartmans, 2021). Additionally, smart lockers controlled by their badge or smartphone are available for employees to store their personal items.

VoIP provides phone service over the internet. A primary advantage of this technology is that it converts the analog phone system into a networked digital system that can then take advantage of software applications like automatic speech-to-text transcription and voicemail routing. The same conversion to digital can be made for facsimiles by replacing a traditional analog facsimile line with a cloud-based facsimile service.

2.2   Administrative Assistant and Business Analyst Positions

This section presents an overview of data sources for administrative assistant (AA) and business analyst (BA) job descriptions along with their knowledge, skills, and abilities (KSAs) and tasks. As remote work has increased, technology has moved many administrative activities into the digital and virtual realms, including meetings, file sharing and storage, and communication (e.g., chat features, emails, text messaging, etc.). Because these activities are in the digital domain, there are many opportunities to automate MDOT SHA AA and BA tasks in ways that better and more efficiently support MDOT SHA needs. While these labor-saving technologies can improve organizational efficiency, they do require training to manage and use them effectively.

An excellent source of data concerning AA and BA job requirements can be found in the O*NET Online database (O*NET, n.d.). This website provides prodigious amounts of information related to over 1000 occupations. Occupational data available at the site include the necessary KSAs, and tasks required by the occupations, along with many other metrics such as salary and employment outlook for these positions. This database is sponsored by the U.S. Department of Labor (DOL), Employment & Training Administration. The database is developed and maintained by the National Center for O*NET Development through a grant to the North Carolina Department of Commerce (National Center for O*NET Development, n.d.). Each position in the O*NET database is identified by a specific job title and job code. For the purpose of this study, the O*NET job title and code related to AAs are represented by:

- Secretaries and AAs, except legal, medical, and executive (job code 43- 6014)

Which has the following summary description in the O*NET database:

> *Perform routine administrative functions such as drafting correspondence, scheduling appointments, organizing and maintaining paper and electronic files, or providing information to callers.*

It is important to note that there are many different position titles that can refer to AAs and/or overlap with their duties. Possible alternate job titles to use when searching databases for AA job descriptions include those listed in Table 2.

Table 2: Possible Alternative Administrative Assistant Job Titles

• Administrative Aide • Administrative Associate • Administrative Clerk • Administrative Office Assistant • Administrative Secretary • Administrative Support Specialist	• Clerical Aide • Clerical Assistant • Executive Assistant • Management Assistant • Management Associate • Office Administrator • Office Aide • Office Assistant • Office Associate	• Office Clerk • Office Coordinator • Office Manager • Office Services Specialist • Office Support Assistant • Secretary • Staff Assistant

For BAs, we are specifically interested in the following O*NET job:

- Computer Systems Analysts (job code 15-1211)

Which presents the following summary description in the O*NET database:

> *Analyze science, engineering, business, and other data processing problems to develop and implement solutions to complex applications problems, system administration issues, or network concerns. Perform systems management and integration functions, improve existing computer systems, and review computer system capabilities, workflow, and schedule limitations. May analyze or recommend commercially available software.*

Like AAs, BAs also have alternative position titles that can be used when searching databases for BA position descriptions as listed in Table 3.

Table 3: Possible Alternative Business Analyst Job Titles

• Administrative Analyst	• Information Technology Analyst
• Applications Analyst	• Management Analyst
• Business Systems Analyst	• Management Consultant
• Computer Analyst	• Organizational Development Consultant
• Computer Systems Consultant	• Program Management Analyst
• Information Systems Analyst	• System Analyst

Table 4 provides a summary of the extent and type of information available in the O*NET database. Sample AA descriptors are provided for each of the items. The table also lists the number of total tasks along with how many of those tasks are sampled in the table. For example, Table 4 shows two samples out of the 32 total AA tasks listed in the O*NET database.

For the Tasks, Work Activities, Knowledge, Skills, Abilities, Work Values, and Work Styles items, O*NET provides the level of importance (out of 100) of those items to the job. For example, the first task (Answer telephones and give information to callers, …), has an importance level of 83 out of 100. The same type of information is also available in the O*NET database for BA positions (e.g., Computer Systems Analysts with job code 15-1211).

Table 4: Sample Data in the O*NET Database

Secretaries and Administrative Assistants, Except Legal, Medical, and Executive Job Code 43-6014		
Perform routine administrative functions such as drafting correspondence, scheduling appointments, organizing and maintaining paper and electronic files, or providing information to callers.		
2021 U.S. National Median Wages: $18.21 hourly; $37,880 annual		
Tasks (2 of 32 listed)	Answer telephones and give information to callers, take messages, or transfer calls to appropriate individuals. **(Importance = 83/100)**	
	Greet visitors or callers and handle their inquiries or direct them to the appropriate persons according to their needs. **(Importance = 83/100)**	
Technology Skills (2 of 48 listed)	Access software — Citrix cloud computing software	
	Accounting software — Fund accounting software; Intuit QuickBooks; Sage 50 Accounting; Tax Software	
Tools Used (14 of 14 listed)	Digital cameras; Laser fax machine; Mobile phones; Notebook computers; Pagers; Personal computers; Personal digital assistant PDAs or organizers — Personal digital assistants PDA; Photocopiers; Pocket calculator; Portable data input terminals; Scanners; Special purpose telephones	
	Working with Computers — Using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, or process information. **(Importance = 85/100)**	

Work Activities (2 of 41 listed)	Communicating with Supervisors, Peers, or Subordinates — Providing information to supervisors, co-workers, and subordinates by telephone, in written form, e-mail, or in person. **(Importance = 79/100)**
Detailed Work Activities (2 of 37 listed)	Answer telephones to direct calls or provide information.
	Discuss account status or activity with customers or patrons.
Work Context (2 of 57 listed)	Telephone — 93% responded "Every day."
	Contact With Others — 87% responded "Constant contact with others."
Skills (2 of 35 listed)	Active Listening — Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times. **(Importance = 75/100)**
	Speaking — Talking to others to convey information effectively. **(Importance = 75/100)**
Knowledge (2 of 33 listed)	Administrative — Knowledge of administrative and office procedures and systems such as word processing, managing files and records, stenography and transcription, designing forms, and workplace terminology. **(Importance = 88/100)**
	English Language — Knowledge of the structure and content of the English language including the meaning and spelling of words, rules of composition, and grammar. **(Importance = 82/100)**
Abilities (2 of 52 listed)	Oral Comprehension — The ability to listen to and understand information and ideas presented through spoken words and sentences. **(Importance = 75/100)**
	Oral Expression — The ability to communicate information and ideas in speaking so others will understand. **(Importance = 75/100)**
Work Values (2 of 6 listed)	Support — Occupations that satisfy this work value offer supportive management that stands behind employees. **(Importance = 67/100)**
	Relationships — Occupations that satisfy this work value allow employees to provide service to others and work with co-workers in a friendly non-competitive environment. **(Importance = 61/100)**
Work Styles (2 of 16 listed)	Attention to Detail — Job requires being careful about detail and thorough in completing work tasks. **(Importance = 90/100)**
	Integrity — Job requires being honest and ethical. **(Importance = 88/100)**

The same O*NET job codes and titles are also used for labor data available in another comprehensive source of workforce information, the U.S. Bureau of Labor Statistics (BLS). For example, the BLS forecasts a decline of 7.6% (from 2.05 million to 1.87 million jobs), in the number of AA positions (job code 43-6014) between 2020 and 2030 (U.S. Bureau of Labor Statistics, n.d.). For the same time period, the BLS forecasts a 7% employment increase for computer system analysts (job code 15-1211).

Another important source of AA and BA job descriptions created by the Maryland Department of Budget and Management is the Job Class Specifications (MJCS) database (MDBM, 2022). This

database contains over 3700 position descriptions that are searchable by occupation title or by a six-digit classification code. Specific detailed data regarding these Maryland job position descriptions include the information listed in Table 5.

Table 5: Maryland Job Class Specification Data

• Position title and six-digit code	• Minimum Qualifications
• Salary	• Licenses, Registrations, and Certifications
• Grade	• Special Requirements
• Nature of the Work	• Acknowledgments
• Examples of Work	• Revision Date
• Knowledge, Skills, and Abilities	

Administrative assistant position descriptions in this database appear under the titles of 'Office Secretary I/II/III', 'Administrative Aide', or 'Management Associate'. These different occupations define a standardized, formal AA career path. Table 6 lists the relevant position titles and job

Table 6: Maryland Job Class Specification for Office Secretaries

Job Title	Job Codes
Office Secretary I	001318, 006128, 007705
Office Secretary II	001328, 006030, 007704
Office Secretary III	001362, 006150
Administrative Aide	002572, 006182, 007695
Administrative Aide II	007697
Management Associate	002650, 006413

The BA position (as we define it in this study) appears in the MJCS database as an 'IT Functional Analyst'. As shown in Table 7, this career path has multiple levels from trainee to supervisor.

Table 7: Maryland Job Class Specification for Business Analysts

Job Title	Job Codes
IT Functional Analyst Trainee	004497
IT Functional Analyst I	000498, 006043, 001642
IT Functional Analyst II	004499, 006048, 001643
IT Functional Analyst Lead	004500, 006080, 001644
IT Functional Analyst Supervisor	004501, 006040, 001645

In addition to general job descriptions available in the O*NET and MJCS databases, other sources of current job description data are the job search websites that are sponsored by commercial firms (e.g., CareerBuilder.com, Indeed.com, Monster.com, ZipRecruiter.com), the United States government (e.g., USAJobs.com), or the state governments (e.g., Maryland State Online Employment Center).

2.3 Workforce Transformation

This section reviews the literature on Government workforce transformation. The World Economic Forum (2016) projects that 65 percent of students attending elementary schools today will ultimately end up working in completely new job types that don't exist today. As an example, the US Geological Survey (USGS) transitioned from paper to digital map production in the 1980s. This transformation significantly improved production efficiency and completely changed the nature of cartographers' jobs (Eggers & Viechnicki, 2017).

Eggers & Viechnicki (2017) estimated that AI, depending on the level of AI investment, could save government workers from 96.7 million to 1.2 billion working hours each year. This is out of approximately 4.3 billion worked total. According to Ebbers & Viechnicki (2017), most existing quantitative models that predict which jobs will be replaced by technology use occupation as the unit of analysis. Instead, the analysis should use tasks since technology does not initially replace jobs, but rather tasks. Similarly, according to Bessen (2020) "...tasks are automated, not jobs." Acemoglu and Autor (2011) proposed a framework where tasks are defined as units of work that produce output, and skills refer to the ability to perform tasks.

The social distancing and operating restrictions imposed by the COVID-19 pandemic along with the march of technology is still having significant and long-lasting effects on how organizations operate, the technologies they use, and how AAs and BAs perform their jobs (Yang et al., 2022).

A survey of executives (McKinsey Global Institute, 2021) found that globally, on average, companies accelerated the digitization of their interactions with customers, supply chains, and internal operations by three years and sped up the incorporation of digitally enabled products by seven years.

Three areas with lasting changes to work and the workplace include the shift to remote work and virtual interactions, the increased use of e-commerce and other online transaction platforms, and the increased deployment of automation (Lund et al., 2021). Remote work and virtual interactions have increased due to the available communication, collaboration, and information-sharing technologies accelerated by the pandemic (Lund et al., 2021). All these changes have significant impacts on AA and BA jobs and tasks. A 2021 McKinsey survey found an increase in the desire for a hybrid work environment (Feijao et al., 2021) increased from 30% pre-COVID to 52% post-COVID (see Table 8).

Table 8: Employee Preferred Work Modes (Source: Feijao et.al, 2021)

	Fully Onsite	**Hybrid**	**Fully Remote**
Pre-COVID-19	62%	30%	8%
Post-COVID-19	37%	52%	11%

According to Feijao et al., a hybrid model, which is a combination of remote and in-office work, "can help organizations make the most of talent wherever it resides, lower costs, and strengthen organizational performance".

Lund et al. (2021) see long-term changes in labor demand, occupational mix, and required workforce skills. Between 2018 and 2030, they forecast that 45.3 million U.S. workers will be displaced by automation in the post-COVID-19 scenario, which is 8.4 million more than in the pre-COVID-19 scenario. Of special interest is their forecast that U.S. occupations related to office support drop by 17% between 2018 and 2030 and that 5.7 million office support workers will need to find new work outside the office support occupational category. Meanwhile, demand for BAs or equivalent positions is on the rise. The BLS forecasts a 7 percent growth for BAs (computer systems analysts).

AI and RPA are transforming the landscape of the office and administrative workforce by automating many low-value-added, repetitive processes and functions. Mesquita et al. (2019) assert that the AA position will be significantly impacted in the next years by automation. They concluded that most tasks performed by AAs can be automated by technology. And tasks that cannot be automated will be absorbed by other job positions, such as middle managers. This will lead to a reduced need for AA positions and the tasks they currently perform.

Mesquita et al. (2019) map AA tasks against technologies that could, at least in part, automate those functions. For example, for the secretarial task of "Maintaining scheduling and event calendars", they forecast that these office administration tasks will be automated and managed by AI digital assistants such as Siri (Apple), Alexa (Amazon), and Google Assistant.

2.4 Theoretical Frameworks on Strategic Workforce Planning and Job Performance

In this section, the research team reviews the literature related to theoretical frameworks concerning strategic workforce planning, job characteristics model, remote work arrangement, and the matrix management structure.

2.4.1 Strategic workforce planning (SWP)

According to the Society of Human Resources Management (SHRM, 2022), strategic workforce planning is the process an organization uses to analyze its workforce and determine the steps needed to prepare for future workforce needs. In strategic workforce planning, an organization conducts a systematic assessment of workforce characteristics and composition issues and determines what actions must be taken to address future needs. The actions to be taken may be determined by internal factors, such as job needs, worker capabilities, age of the workforce, and external factors, such as technological changes, the demand and supply dynamics of skills, and competition. Together, these factors may determine whether future skill needs will be met by recruiting, training, or outsourcing work.

SWP involves four components:
- The workforce characteristics that will be required to strategically position the organization in the competitive marketplace.
- The gaps that exist between the current state of the workforce and the future needs, including any special skill sets and capabilities required to stay competitive.
- The recruiting and training plans for long-term and short-term workforces that must be put in place to bridge those gaps.

- Outsourcing may be needed to deal with a shortage of skills.

According to SHRM, strategic workforce planning typically involves four steps (Figure 1):
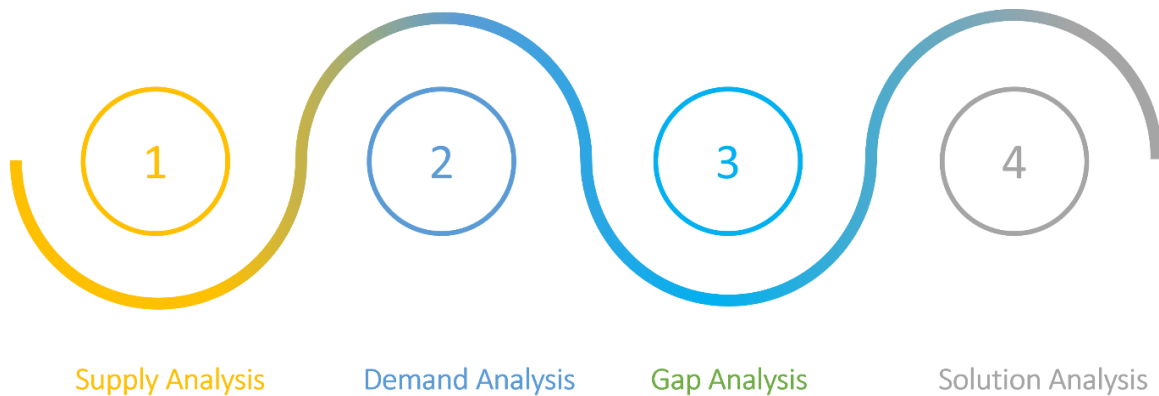

Figure 1: SHRM's Four Steps for Strategic Workforce Planning

- **Step 1 -** Supply Analysis, also called the "supply model" or "staffing assessment," which involves an analysis of an organization's current workforce supply. This analysis should include not only the size of the workforce and their skill sets, but also factors such as workforce demographics. Demographics is important and relevant in workforce planning when large numbers of workers are nearing retirement age, or if an organization has large numbers of young workers who may have higher turnover rates.

- **Step 2** - Demand Analysis, also called the "demand model," refers to a review of future business needs, organizational objectives, and business plans. A great variety of issues need to be taken into consideration: projected workforce availability within a particular geographic area and for specific types of positions, the competitiveness of compensations, attractiveness of the work environment and the organizational culture, employee turnovers, the needed mix of skills and capabilities, and the composition and demographics of the future workforces.

- **Step 3** - Gap Analysis, which identifies skill surpluses and deficiencies through a comparative analysis of the differences in the supply and demand models. The planning may need to analyze various future scenarios and identify the number of new employees to be acquired, the additional employees needed, and the employees who may be no longer needed due to outdated skill sets and lack of readiness for technological change.

- **Step 4** - Solution Analysis, which focuses on how to address gaps in the current state of the workforce and future staffing needs through recruiting, training and development, contingent staffing, outsourcing, and restructuring. Recruiting helps bring in new skills but has long-term consequences, such as costs and risks. Training and development work best for high-value positions. With the fast pace of emerging technologies, employee skill sets tend to become obsolete and **hence the organization** needs to focus on updating skills and capabilities through a variety of training and development activities. These include in-house workshops, on-the-job training, continuing education, e-learning, and webinars. Contingent

staffing may be considered when the demand for future skills is highly uncertain, including temporary workers, part-time employees, contract workers, and consultants. Outsourcing may be considered when non-core business functions may be performed more efficiently by outside partners so that the organization can focus on what it does best.

The U.S. Office of Personnel Management (OPM, 2005) defines SWP as the systematic process for identifying and **resolving the gaps** between current workforce capabilities and those needed for the future**. The OPM SWP model** aligns workforce requirements with an organization's strategies and business plans, uncovers and reduces workforce competency gaps, identifies and overcomes barriers to workforce changes, and implements optimum workforce structures. The OPM SWP model involves five steps that are interconnected (Figure 2).

Figure 2: OPM's Five Steps for Strategic Workforce Planning Model
Adapted from U.S. Office of Personnel Management (2005)

- **Step 1 -** Set Strategic Direction, which aligns the SWP process with the agency's strategic plan, annual performance/business plan, and work activities required to carry out the goals and objectives of the long-term strategic plan and short-term performance plan.

- **Step 2 -** Analyze Workforce, Identify Skill Gaps, and Conduct Workforce Analysis sets out to determine what the current workforce capabilities are and project how they may evolve in the future. It also develops specifications for the kinds, size, and locations of employees needed to achieve the organization's strategic requirements. At this stage, the organization also identifies the gap existing between the current capabilities and projected workforce needs.

- **Step 3 -** Develop Action Plan deals with the identification of strategies to bridge gaps, plans to implement the strategies, and measures for assessing progress and success. Acting strategies include recruiting, training, upskilling, restructuring, contracting, succession planning, and technological enhancements.

- **Step 4 -** Implement Action Plan involves the organization ensuring that human and financial resources are in place, roles are understood, and the necessary communication, marketing, and coordination are ready for executing the plan and achieving the strategic objectives.

- **Step 5 -** Monitor, Evaluate, and Revise involves performance evaluation and progress monitoring against milestones, assessment for continuous improvement, and potential corrections needed to address new issues.

2.4.2   Job characteristics model and its implications on job designs

Initially developed by Richard Hackman and Greg Oldham (1974), the Job Characteristics Model (JCM) deals with employee morale, motivation, and productivity and provides recommendations on how to best enrich jobs in organizations and how to best design work to achieve high performance based on five core job characteristics: skill variety, task identity, task significance, autonomy, and feedback (Figure 3).

Figure 3: Job Characteristics Model

- **Skill Variety** - Jobs can become more interesting and fulfilling when employees have the opportunity to develop a wide range of skills and talents to solve problems and perform job functions. In contrast, jobs without skill variety would ask employees to repeat the same set of skills over and over again, creating a boring and unfulfilling environment. Automation technologies may be able to take over such repetitive job functions.

- **Task Identity** - Task identity measures the extent to which an employee owns the completion of the tasks. Task identity occurs when an employee is enabled to complete the

entire task from start to finish, instead of working on a small portion. Task identity also motivates full responsibility among employees when they can identify themselves with tasks.

- **Task Significance** - Task significance refers to the sense of meaning and achievements associated with completing tasks. Employees are more motivated to perform if they believe they are doing something with significant positive impacts on the well-being of others, the mission of their organization, and the good of the broader society.

- **Autonomy** - Autonomy means that employees have freedom in decision-making, independence in the work process, and authority over their work. Autonomy provides a high level of motivation and a strong sense of personal meaning, resulting in more productive work with high quality.

- **Feedback** - It is important for employees to receive timely and constructive feedback on their performances. Positive feedback can help employees build their confidence and hence enable them to become more motivated to continue high performances. Constructive feedback can even help employees correct mistakes and improve job skills. In contrast, a lack of feedback would demonstrate a lack of care for employees. Even worse, constant critical feedback would significantly decrease employee morale, eventually leading to high turnovers.

The implications of JCM for job designs are listed in the following five areas.

1. Vary a job's tasks and rotate employees for various jobs. Unlike machines, humans become bored and less motivated when performing monotonous and repetitive tasks. Instead, technology-enabled automation should take care of repetitive tasks.

2. Assign teamwork to complex tasks. Teamwork encourages interactions among employees and allows teams to complete tasks from start to finish, creating a sense of achievement and task identity.

3. Carefully develop a work breakdown structure (WBS) and delegate tasks to the lowest level so that an employee can take full responsibility. Employees are more motivated when they feel a strong sense of autonomy and personal responsibility.

4. Rotate jobs if a job does not involve skill variety, then rotate jobs so that employees are challenged and motivated

5. Conduct timely and constructive performance evaluations. Reward employees with outstanding performances based on an objective and fair evaluation system. Employees with unsatisfactory performances may be re-trained.

2.4.3 The matrix organization

A matrix organization is a management structure where there are two chains of command, one along functional lines and the other along project, product, or client lines. For large organizations, chains of command along with geographic location may also be adopted. As an innovation, the matrix structure has been widely used in project management for the past decades (Figure 4). Instead of delegating segments of a project to different units or creating autonomous project teams, project participants assume dual managerial accountability and responsibility and report simultaneously to both functional and project managers.

Matrix structure may be temporarily used or stay as a permanent management structure. Depending on the relative authority of the project manager and functional managers, there are three variations of matrix structures: weak matrix, balanced matrix, and strong matrix. Figure 4 shows a typical example of a matrix structure. As shown, the company manages three projects concurrently. Each project has a dedicated project manager supported by a full-time or part-time administrative. All three project managers report to the corporate Director of Projects. However, note that other participants with functional expertise participate in a project in a way that participants report to both the project manager and their functional manager in their home department.

	CEO			
Finance			**HR**	

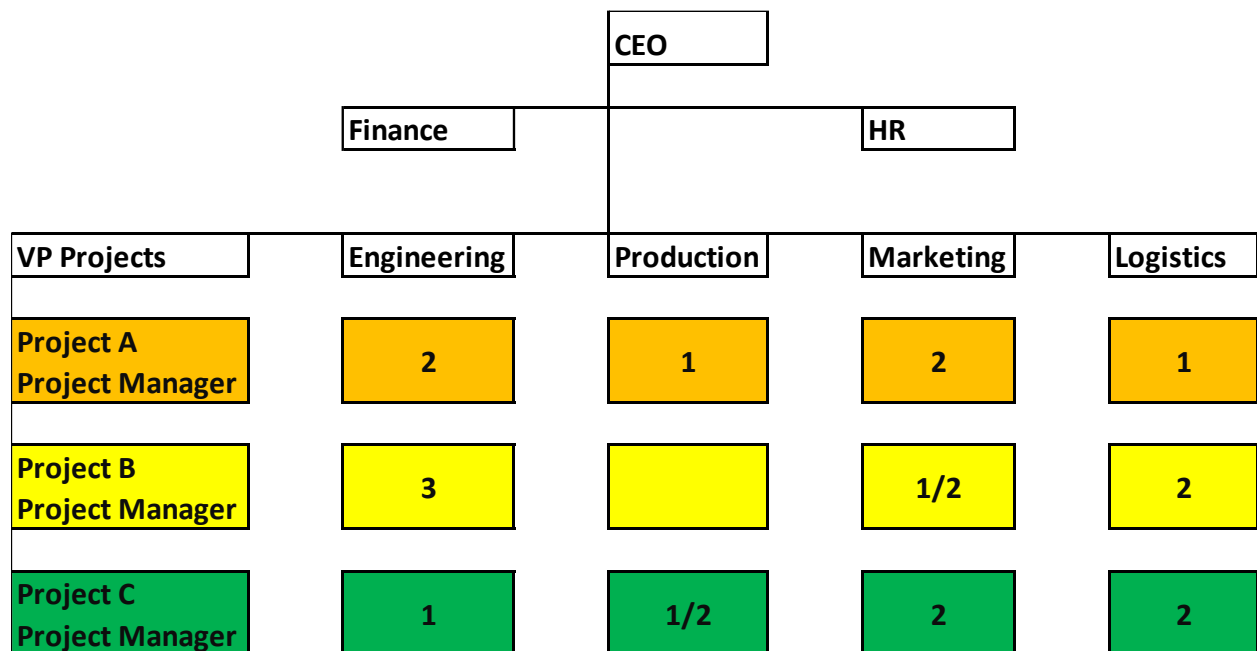| VP Projects	Engineering	Production	Marketing	Logistics
Project A **Project Manager**	2	1	2	1
Project B **Project Manager**	3		1/2	2
Project C **Project Manager**	1	1/2	2	2

Figure 4: Matrix Structure of Project Management
Adapted from Gray & Larson (2021)

In a weak matrix structure, the project manager acts as a project coordinator who draws the schedules, updates the work status, and coordinates collaboration among all functional personnel. Meanwhile, functional managers have full responsibility for managing their portions of the project.

In a strong matrix structure, the project manager controls most aspects of the project, including budget, schedule, scope trade-offs, and assignment of functional personnel. The project manager has the final authority on major project decisions and functional managers may act like subcontractors.

In a balanced matrix structure, authority is shared, and responsibilities are split between the project manager and functional managers. Typically, the project manager establishes the overall plan for the project, including scope, schedule, and cost while functional managers are responsible for assigning personnel and executing their segment of the project.

The matrix structure has many advantages, including more efficient use of organizational resources without having to set up expensive dedicated project teams, strong project focus with a dedicated project manager and a project administrator, an easier post-project transition of functional personnel, and great flexibility. However, there are also many disadvantages associated with a matrix structure. In practice, the dual chains of command could cause stress to employees who must report to both bosses. Authority and responsibilities are not always shared smoothly between the project manager and the functional managers, potentially resulting in dysfunctional conflict and infighting.

Whether a matrix structure or what form of the matrix structure should be used depends on two sets of factors: (1) organizational factors, including the experience of the organization in managing projects, the percentage of core work involving project management, and the level of resources available; and (2) project factors, including the size of the project, the significance of the project, need for integration, budget and time constraints, etc. The rule of thumb is that more authority shall be delegated to the project manager if the project is critical to the organization's mission and subjected to stringent budget and time constraints.

2.5   State of the Practice

2.5.1   Using emerging technologies to reduce administrative workload and improve efficiency

RPA is recognized as a powerful automated processing tool, which emulates human actions and significantly reduces a federal agency's low-value added workload, allowing government employees to focus on high-value work. The Federal RPA Community of Practice (2021) estimates that in FY21 the U.S. federal government was able to reduce over 1.4 million hours of low-value work due to the use of RPA.

Since 2018, the U.S. General Services Agency (GSA) has pioneered the introduction of RPA into government work. In FY20, GSA officially launched its first enterprise-wide automation, named Truman, to allow its acquisition workforce to focus on negotiations, market research, and customer engagement by pre-populating internal pre-negotiation and price-negotiation memos with information from vendor packages and conducting compliance checks with external databases. In FY21, GSA created the Federal Acquisition Service (FAS) Process Automation Center, which automates contractor assessments and reviews of vendor-supplied GSA Advantage files.

The U.S. Social Security Agency (SSA) administers retirement and disability benefits and its over 60,000 employees need to manually adjust and update a beneficiary's social security record. However, record updates may fail for various reasons and failures require human intervention and corrections. The SSA started to use automation in the eight processing centers residing in the Office of Systems that support all the business activity across the agency. The end user base for automation grew from 300 to 3,000 in FY21 and automation saved over 70,000 work hours.

The U.S. Department of Defense's Defense Advanced Research Projects Agency (DARPA) collects and processes large-scale data from a wide range of sources to create and assess its plans and execute critical missions. However, the challenge has been that much of the information is implicitly rather than explicitly expressed. Automated, deep NLP technology may be utilized to efficiently process text information and enable understanding connections in text that might not be readily recognizable to human intelligence. DARPA created the Deep Exploration and Filtering of Text (DEFT) program, which uses NLP to automatically extract relevant information and help analysts derive actionable insights from it (DARPA, 2022).

The U.S. Food and Drug Administration (FDA) receives nearly a million accident safety reports annually, 10 percent of which are submitted on paper. Paper submissions were digitalized manually by data entry staff, creating massive backlogs and potential human errors. In 2013, FDA decided to partner with Captricity, which demonstrated a capability of processing paper submissions 50 times faster at a fraction of the cost with the same accuracy as the FDA's own data entry staff (Fast Company, 2013).

The FDA's Center for Drug Evaluation and Research (CDER) regulates over-the-counter and prescription drugs and hires nearly 1,300 employees in review teams to assess and approve new drugs. The challenge has been that many of its employees with pharmaceutical science or medical degrees have to spend valuable time on non-productive manual administrative tasks. Using RPA, CDER can ensure that applications are complete before transcribing information from PDFs to CDER's system, determine where to route new drugs, investigation, and master file submission among hundreds of workflows so that they are assigned to reviewers and project managers appropriately, and in a timely manner. As a result, CDER is able to save 24,000 work hours annually (Analytics Insight, 2019).

The National Science Foundation (NSF) processes thousands of grants for colleges, universities, and school systems. Processing payments for grant recipients involves numerous applications and is very time-consuming. The challenges facing NSF have been limited resources resulting from decreased contract support, reduced federal hiring, and increased regulatory requirements. Based on the first proofs-of-concept in 2017, NSF determined that RPA could help with its resource issues and identified several repetitive, time-intensive, and error-prone processes for automation. NSF identified two processes to automate through a pilot project using RPA: 1) automate an alerting system that NSF uses from Treasury called the Invoice Processing Platform, and 2) process joint grants or intra-agency purchases through the Intra-Government Payment and Collection system. These two automation efforts combined reduced over 600 staff hours annually, cut transaction processing time by 90%, and increased employee morale by allowing them more time to perform analytical work (ACT-IAC, 2021).

The Georgia Government Transparency and Campaign Commission processes approximately 4,000 pages of campaign finance disclosures and campaign contribution forms monthly. In 2013, the Georgia legislature mandated that all disclosure and campaign contribution forms had to be transmitted to the commission from county offices through e-filing or faxing by year-end, and the commission needed to make campaign financial disclosure and campaign contribution forms available online. However, the challenge was that data transmitted in faxed forms, some of which containing handwriting in crayon, needed to be converted to structured output and integrated with the existing online filing system.

Faced with a tight deadline and constrained budget, the commission decided to use handwriting recognition software with crowd-based human review, serviced by Captricity, so that a large volume of documents was processed timely and with quality. Captricity's cloud-based system integrates Optical Character Recognition (OCR) scanning technology and manual data-entry workers from Amazon Mechanical Turk (AMT), a crowdsourcing Internet marketplace that allows Captricity to coordinate the use of human intelligence to perform tasks that computers are not capable of doing. As a result, the structured data returned by Captricity was 99% accurate, even for handwritten forms (Walker, 2014).

San Diego County's Health and Human Services Agency offers a wide range of health and social programs, including food stamps, technology assistance for Needy Families, and Medical, to low-income applicants. The challenge has been to verify the supporting documents used to qualify every applicant. Using RPA, the agency can check the open forms of various computer configurations on a caseworker's screen, navigate the verification field, retrieve relevant supporting documents, and automate once-manual tasks. As a result, the county was able to reduce approval time from 60 days to less than one week and improve productivity by 30% (Automation Anywhere, 2022).

2.5.2   Redesigning government work around emerging technologies

According to a Deloitte survey (2018), 61 percent of the 11,000 business leaders surveyed reported that they were actively redesigning jobs around AI, RPA, and new business models. Government work needs to be kept pace with new technological advancements and opportunities. Deloitte presents a three-stage model for government job redesign.

Stage one is to think long-term. Government agencies should analyze the disruptions of external factors including technological advancements, automation, changing customer demands and behaviors, and the new generations of talents, and determine how those disruptions would impact the agency in the future.
Stage two is to deconstruct (then reconstruct) work. The Deloitte Center for Government Insights proposes an S2C2 framework for work redesign (Deloitte, 2019): Start – Stop – Change – Continue.

Work, which can drive desired outcomes, may have to be performed by technologies and start new: including new technologies, new processes, and new talents. Work that is no longer critical to the mission may be stopped completely. Some work may need to be changed by the application of new technologies. And some work may continue without significant changes.

Stage three is to consider different talent options – crowd workers, gig workers, or digital labor (i.e., AI). New training and hiring requirements may be required if permanent employees are desired.

2.5.3 Where do business analysts fit in an organization?

Deloitte (2014) studied five models which can be used to place BAs in an organizational structure: the centralized model, the consulting model, the center of excellence (CoE) model, the functional model, and the dispersed model (Table 9).

Table 9: Structure Model for Managing Business Analysts

Model	Description	Advantages	Disadvantages
The Centralized Model	Business analysts (BAs) act as an independent unit and serve the entire organization	Ability to work on cross-functional projects, share ideas easily, and assign BAs to problems and projects efficiently Long-term stability of the BAs talents and expertise	Risk of being unresponsive to the needs of the business due to workload and time constraints BAs are seen as outsiders by the business teams and find it hard to influence change
The Consulting Model	BAs are centralized but assigned to projects throughout the organization and expected to recover costs by charging for their time	The value of BAs can be tracked and reported on the project level	Less funded business functions may not get the attention of BAs. Some critical problems may be overlooked simply due to budget constraints
The Center of Excellence Model	BAs are based primarily in business functions, but their activities are coordinated by a centralized group (CoE), which	Appropriate for large organizations with a variety of analytical needs.	CoE may not have enough control over BAs and ensure their effectiveness

	provides training and innovative tools to BAs	BAs are in direct contact with business units and supported by a central group	
The Functional Model	BAs are placed primarily within some dominant functions	BAs are concentrated where they are most needed and add the most value to the organization. Analytical value can be directly monitored and traced	Functions without dominant status in the organization may find it difficult to get support from BAs
The Dispersed Model	BAs are spread throughout the entire organization without any coordination mechanism	Business functions can hire and retain their own BAs	Lack of centralized coordination leads to overlapping and underutilization of expertise

Considerations for a particular structure model may include the size of the organization, the importance and severity of the issues to be solved, budget and time constraints, organizational culture, and organizational strategic priorities. Organizations may stay with a specific model but need to reassess the effectiveness of the model and may evolve into a different model.

While a small number of analytics organizations may create a Chief Analytics Officer to provide leadership for BAs and analytical capabilities, BAs in most organizations may report to IT, corporate strategy, shared services, finance, or marketing. Commonly, many organizations build analytical capabilities within the IT department because analytics is heavily reliant upon both data and software. However, the IT function tends to be slow in delivering analytical capabilities. Sometimes the IT function may over-emphasize a particular technical solution without appropriate consideration of business functions.

Reporting to corporate strategy, BAs can align themselves with the key strategic initiatives and strategic goals of the organization. BAs tend to get along well with the strategy group which understands and appreciates analytical work. The potential downside is that the strategy group is often small and may lack the expertise to fully understand the technical and data resources needed to make analytical projects successful.

BAs may belong to shared administrative services which allow BAs to serve the entire organization. The drawback is that analytics may be considered a low-value, non-strategic resource. With many CFOs taking an analytics leadership role, the finance department of many organizations may house BAs because analytics is used to improve efficiency and drive business performance.

3 METHODOLOGY

The guiding principle for the study is to provide best practice-based, theoretically grounded actionable recommendations to SHA. The research team conducts a literature review, performs job analysis, conducts gap analysis, benefits and costs analysis, and provides recommendations based on the People, Process, and Technology framework.

3.1 Literature Review

The research team reviews three streams of literature: (1) the current state of the practice in the private sector and government with respect to remote work arrangements and outcomes, (2) research on automation and its impacts on the future workforce, including job trends and redesigns, and (3) Job Characteristics Model and other theoretical frameworks on job designs and remote work arrangements. The goal is to identify the underlying driving forces of job and workforce transformations, the best practices for administrative and analytics work redesigns and remote work arrangements, and build a solid theoretical foundation to ground our analysis and recommendations.

3.2 Data Collection

3.2.1 General job data

The research team collected administrative assistant and analytical job functions and requirements provided by the U.S. Bureau of Labor Statistics and other career service websites, including O*Net Online, usajobs.gov, governmentjobs.com, and indeed.com. The objective is to identify trends of changes to job functions and requirements as well as best practices in managing and transforming the administrative workforce and business analytics jobs.

3.2.2 MDOT SHA-specific data

The research team also collected samples of job descriptions of AAs and BAs currently employed with DOT SHA and organizational charts of the overall MDOT SHA as well as OIT under MDOT SHA. The research team collected reports published by MDOT SHA, including its strategic plan. The research team collected job classification data from the MJCS database managed by the Maryland Department of Budget and Management.

3.2.3 Focus groups and interviews

The research team held separate focus group meetings with AAs and managers. The research team also conducted one-one-one interviews with managers.

The focus groups and interviews were conducted virtually and took approximately one hour each to complete. Participation was completely voluntary, and participants signed a consent form approved by the Towson University Institutional Review Board (IRB).

To encourage involvement and to maintain participant privacy, neither audio nor video of the meetings was recorded. The research team did take written notes during the meetings, however. The research team notes will not be shared with outside organizations. Finally, results are aggregated so that responses cannot be traced to specific individuals. Because the research team collected data via focus groups and interviews, instead of through a comprehensive survey, it is important to understand that our results are primarily based on the personal experiences of the interviewees and their anecdotal evidence.

The primary objective of the focus group meetings and interviews was to help develop an understanding of the current practices, processes, and issues given the limited availability of documentation and data points.

3.3   Data Analysis

The research team conducts the following analysis: (1) a job analysis based on sample of job descriptions provided by MDOT SHA; (2) a gap analysis when assessing MDOT SHA's current capabilities of AA and BA workforces, office technology infrastructure and related processes against MDOT SHA's mission and strategic plan; (3) benefits and costs analysis associated recommendations; (4) risk analysis associated with implementation of recommendations, including challenges, barriers and mitigation plans.

3.3.1   Job analysis

Job analysis refers to the process of analyzing jobs and determining work activities and responsibilities, qualifications of workers and the conditions under which the work is performed. The research team analyzes the sample job descriptions of MDOT SHA's AA and BA positions and reviews the organizational chart related to management of AAs and BAs within MDOT SHA.

3.3.2   Gap analysis

A gap analysis is a process in which an organization compares its current performance to its expected performance (Leonard & Bottorff, 2022), or a method of assessing the differences between existing capabilities and the desired performance outcomes (McKinsey, 2015). An effective gap analysis starts with a thorough review of documentation of organizational practices, policies, and procedures and is complemented by in-person, facilitated focus groups with key stakeholders (AHRQ, 2022). The purpose of gap analysis is to identify deficiencies in terms of capabilities, processes, and performances and develop a plan of action to close the gaps.

In this study, the research team started with the MDOT SHA's strategic plan and goals and assessed its existing capabilities in terms of IT infrastructure, workforce, and related processes.

3.3.3   Benefits and costs analysis / risk analysis

The research team conducts benefits and costs analysis for each recommendation provided regarding both AA and BA workforces. Benefits and costs analysis is the process of comparing anticipated outcomes and opportunities against projected or estimated costs associated with a

project decision. Risk analysis concerning the implementation of recommendations is performed as well. Risk analysis identifies the hurdles and challenges and provides mitigation plans.

4   RESEARCH FINDINGS AND DISCUSSIONS

In this study, we start with the MDOT SHA's strategic plan and goals and assess its existing capabilities in terms of IT infrastructure and workforce, and related processes. A gap analysis can help the MDOT SHA examine where it is and where it wants to be to meet organizational goals. The ultimate objective of this gap analysis is to help the MDOT SHA create a plan of action to move the organization forward and fill the gaps. This is especially important given anticipated funding and workload increases where the MDOT SHA must compete for talent and operate with new technologies for increased efficiency and effectiveness.

In its 2020-2025 Northbound Strategic Plan, the MDOT SHA strives to provide innovative and affordable transportation by employing the newest technology, business practices, and public-private partnerships. With 2,960 employees spreading across the headquarters, Hanover Complex, and seven District Offices, the MDOT SHA owns and maintains the Interstate, U.S. and Maryland numbered, non-toll routes in 23 counties, accounting for approximately 16% of roadways and 65% of state traffic.

MDOT SHA's mission is to be a leader that delivers safe, sustainable, intelligent, and exceptional transportation solutions to connect its customers to life opportunities. MDOT SHA embraces the following principles: innovation, modernization, transparent communication, and positive customer experience. The ten strategic goals are as follows:

1. Create a culture of inclusiveness
2. Implement a dynamic human resources process
3. Formalize operational infrastructure asset management
4. Advance highway maintenance
5. Develop plan for optimizing funding stability and flexibility
6. Fill capital shelf with system packages
7. Deliver I-495 & I-270 P3 Program
8. Establish Office of Alternative Project Delivery
9. Implement vision zero plan
10. Enhance internal and external communications

The scope of this study is focused on MDOT SHA's AAs and BAs who are government employees. The research team does not include commercial contract personnel in our analysis. Following typical gap analysis steps, the research team started by reviewing job descriptions for AAs and BAs. Our analyses are based on the DTS-3 job description forms that the research team received from MDOT SHA, along with job descriptions available in the MJCS database. The DTS-3 forms have been appropriately redacted to protect employee privacy.

Given MDOT SHA's strategic plan and our understanding developed through focus group meetings and reviewing some documents, we have identified five gaps as follows:

- Recruiting and retention gap
- Current AA job description gap
- Future administrative assistant job description gap
- Vision implementation gap
- Capability gap

4.1   Recruiting and Retention Gap

The FY2023-FY2028 budget is the largest ever capital program budget for Maryland transportation. This represents an increase of approximately $2.2 Billion (from $17.7 Billion to $19.9 Billion) over the previous five-year budget (MDOT, 2022). This is an increase of 12.4% from the FY2022-2027 budget and an increase of 31% over the FY2021-FY2026 budget. And the FY2023-FY2028 budget forecast may not include all the additional funds from the Federal Infrastructure Investment and Jobs Act (IIJA) that may also be coming. MDOT SHA's share of those 5-year funds is on the order of $7.8 Billion (or 39%).

Given these budget increases, it is reasonable to assume that additional MDOT SHA personnel, and/or supporting technologies will be required to help manage and implement the additional workloads from the increased capital programs.

Unfortunately, hiring additional employees, and even retaining existing employees, may be challenging in highly competitive and tight labor markets. This is especially true for very skilled technical talent. And there are potential process-related recruiting and hiring barriers for technical staff. For example, there are limited descriptions of highly technical positions in the MJCS database. And technical staff can only grow their salary so far before they must move into management to further increase their pay.

4.2   Current AA Job Description Gap

To assess current AA job description gaps, the research team 1) compared MDOT SHA and MJCS job descriptions against the O*NET database of job descriptions, 2) aligned AA tasks with technologies that support them, and 3) assessed the MDOT SHA job descriptions against the transition to post-Covid remote and hybrid working environments.

Our research, focus groups, and interviews helped us understand the job duties that are appropriate to AA job descriptions. The research team compared job descriptions for each of these items against the well-respected and authoritative federal occupational data source (O*NET, n.d.) to assess how they compare to current benchmark standards for job tasks, activities, and detailed activities.

For our AA analysis, the research team used the O*NET data for Occupational Code 43-6014.00 (Secretaries and Administrative Assistants, Except Legal, Medical, and Executive).

To help determine possible current AA job duty gaps, the research team was provided five AA DTS-3 job description forms (all redacted of personal information) by MDOT SHA human resources. The research team compared these MDOT SHA DTS-3 forms and the MJCS Secretary II description against their respective O*NET job duties to discern whether or not the O*NET job duties are also included in the DTS-3 job descriptions.

Table 11 (in Appendix A) provides our comparisons between the O*NET job duties and the MDOT SHA DTS-3 job descriptions, as well as the MJCS job description for the Secretary II position. This information is provided in the rightmost column of the table. This column shows the number of O*NET job descriptions that were also listed in the MDOT SHA DTS-3 job descriptions and/or MJCS descriptions. Since there were five DTS-3 job descriptions and one MJCS job description for a total of six job descriptions that were compared to the O*NET job descriptions. For example, in the second row of Table 10, one can see that the O*NET work activity (or its close equivalent) described as "Observing, receiving, and otherwise obtaining information from all relevant sources," is contained in all the six MDOT SHA job descriptions. Similarly, the fifth row of the table shows that "Developing specific goals and plans to prioritize, organize, and accomplish your work" does not explicitly appear in any of the MDOT SHA job descriptions.

If a job duty appears on the O*NET list, but not on the DTS-3 forms, that does not automatically mean that it represents a current gap. It only represents a current gap if a job duty is both missing from the DTS-3 forms and is also important to the current mission and goals of the organization. Thus, a supervisor or hiring manager can use this table as a comprehensive checklist to select job duties to develop or assess AA descriptions.

The research team compiled a comprehensive list of AA tasks and supporting technologies that can be seen in Table 10. There are many technologies that support the implementation and automation of AA tasks. With these supporting technologies, the performance of these tasks has, and will, become more efficient. And this will only increase as these technologies become more commonplace in the office administration infrastructure. These technology-generated efficiencies will free up AA labor resources that can be applied to higher-value, mission-focused activities.

On the flip side, as these technologies become more commonplace, the management, maintenance, support, and training related to these new technologies will likely increase and require more attention from technical staff.

Table 10: Task Supporting Technologies

Task	Supporting Technology	Example Systems
Answer telephones and give information to callers, take messages, or transfer calls to appropriate individuals.	Chatbots; IVR; Automated Customer Voice Authentication	Chat GPT; Vonage IVR;
Greet visitors or callers and handle their inquiries or direct them to the appropriate persons according to their needs.	Chatbots; IVR; Automated Customer Voice Authentication; QR Codes	Chat GPT; TalkDesk.com; QRfy.com
Create, maintain, and enter information into databases.	RPA	Microsoft Power Automate

Use computers for various applications, such as database management or word processing.	Speech-to-Text	Microsoft Office Dictation
Operate office equipment, such as fax machines, copiers, or phone systems, and arrange for repairs when equipment malfunctions.	Facsimile Service; VoIP	Efax.com; RingCentral.com
Set up and manage paper or electronic filing systems, record information, update paperwork, or maintain documents, such as attendance records, correspondence, or other material.	RPA, Text Summarization	UiPath RPA; QuillBot Text Summarizer
Operate electronic mail systems and coordinate the flow of information, internally or with other organizations.	Email Management System	MailChimp
Schedule and confirm appointments for clients, customers, or supervisors.	Online Calendars; Automated Meeting Scheduling; Video Conferencing	MS Outlook; Scheduler for 365; Zoom
Maintain scheduling and event calendars.	Online Calendars; online event management and registration	Google Calendar; Eventbrite
Compose, type, and distribute meeting notes, routine correspondence, or reports, such as presentations or expense, statistical, or monthly reports.	Speech-to-Text; Automatic Meeting Transcription; Language Translation	Google Speech-to-Text; Zoom Transcription; Google Translate
Complete forms in accordance with company procedures.	RPA	IBM RPA
Locate and attach appropriate files to incoming correspondence requiring replies.	RPA; Email Management	UiPath; ConstantContact.com
Conduct searches to find needed information, using such sources as the Internet.	Internet search engines	Google.com
Open, read, route, and distribute incoming mail or other materials and answer routine letters.	RPA; Text-to-Speech; OCR; Handwriting Recognition;	UiPath RPA; Adobe Acrobat OCR; Amazon Textract Handwriting Recognition
Review work done by others to check for correct spelling and grammar, ensure that company format policies are followed, and recommend revisions.	Grammar, Spelling, and Format Checking	Grammarly
Make copies of correspondence or other printed material.	Digital Scanners	

Learn to operate new office technologies as they are developed and implemented.	Smart Desks; Smart Lockers; Smart Whiteboards; Digital Scanners; Webcams; VR Headsets; AR Devices	
Train and assist staff with computer usage.	Online Training; Training Videos	Linkedin.com; SkillShare.com
Order and dispense supplies.	E-commerce	Amazon.com
Prepare conference or event materials, such as flyers or invitations.	Online Printing Services	Vistaprint.com
Perform payroll functions, such as maintaining timekeeping information and processing and submitting payroll.	RPA; Online Banking Services	MBT.com
Collect and deposit money into accounts, disburse funds from cash accounts to pay bills or invoices, keep records of collections and disbursements, and ensure accounts are balanced.	RPA; Online Banking Services	WellsFargo.com
Establish work procedures or schedules and keep track of the daily work of clerical staff.	Online Collaboration Systems	Zoom; Microsoft Teams
Provide services to customers, such as order placement or account information.	QR Codes	QRfy.com
Prepare and mail checks.	RPA; Online Banking Services	SAP RPA; Citibank.com
Arrange conference, meeting, or travel reservations for office personnel.	Online Travel Sites	Travelocity.com
Supervise other clerical staff and provide training and orientation to new staff.	Online Training; Training Videos	Youtube.com; w3schools.com
Manage projects or contribute to committees or teamwork.	Online Collaboration Systems	Zoom; Microsoft Teams
Coordinate conferences, meetings, or special events, such as luncheons or graduation ceremonies.	Online Event Management	Eventbrite

Two important technologies supporting AA tasks are Robotic process automation (RPA) software and AI. Some examples of how Table 10 can be used to construct scenarios using the technologies to support AA tasks are discussed below.

RPA software can potentially automate select AA tasks. Some sample RPA application scenarios for AA tasks include:

- **Create, maintain, and enter information into databases**. RPA is tailor-made for extracting information from one format, converting it to another format, and then transferring that data somewhere else. A good example is an RPA bot that extracts invoice data from many PDF

files and then opens a database and types the data into a database form or emails the data to another department.

- **Complete forms in accordance with company procedures**. Many handwritten forms from customers need to be retyped into web forms. An AA scans the forms into image files. An RPA bot opens OCR software that converts the image files into text files. At a pre-scheduled time in the evening, an RPA bot reads these text files, opens the web form, and enters the data into the form. After entering all the data, the bot closes the web form and sends an email informing the AA that it has completed its assigned task.

- **Locate and attach appropriate files to incoming correspondence requiring replies**. An RPA bot reads incoming emails that are addressed to a specific e-mail address created for customers requesting files. Based on the text in the e-mail, the bot attaches the requested file to an e-mail reply and sends it to the customer.

NLP applications can also help automate select AA tasks. Some sample NLP application scenarios for AA tasks include:

- **Use computers for various applications, such as database management or word processing**. An AA is tasked to type a long weekly report. The AA is tired and suffering from carpal tunnel syndrome. Instead of typing the document on the keyboard, the AA instead uses Microsoft Word dictation and completes the task quicker and with less physical strain.

- **Open, read, route, and distribute incoming mail or other materials and answer routine letters.** An AA is driving from their headquarters building to their field office. While the AA is driving, the Microsoft Outlook email text-to-speech capability 'Read Aloud' is employed, and the emails are read aloud to the AA. The AA increases the speed of the reading to raise the efficiency of the process.

- **Open, read, route, and distribute incoming mail or other materials and answer routine letters.** The AA is responsible for reading incoming mail and routing it to the appropriate department. A customer sends a letter written in German. The AA does not understand the German language, so the AA submits the text to an online translator that returns English text. The AA subsequently understands the letter and routes it to the appropriate department.

- **Arrange conference, meeting, or travel reservations for office personnel.** Because the collaboration software is simple to use, a manager sets up an online meeting using the Microsoft Teams platform. The manager would like a full transcript of what was said in the meeting and by whom. For these more complex requirements, the manager asks the AA to help. The AA enables the Microsoft Teams Transcription which records the audio along with identifying the speaker and converts it to text. After the meeting, the AA provides the text transcript to the manager.

The research team analyzed current AA job duty gaps from a hybrid workplace perspective. The results of our analysis are shown in Table 11 in Appendix A. The research team has edited current O*NET job descriptions (in underlined text) to better suit the hybrid office. The research

team also suggested additional duties towards the end of the table (also in underlined text). Thus, for example in row six of Table 11, the research team has added the highlighted text to address a gap related to the new hybrid working environment. Additionally, at the end of the table, the research team added a future job duty, "Use speech-to-text applications to create administrative reports and enter data into database systems".

4.3   Future AA Job Description Gap

The digital office of the future also represents a fundamental shift in the way work gets done. A digital office is a working environment in which information is stored and organized electronically and is easily retrievable from anywhere. Document imaging allows users to view electronic documents instead of paper documents. And work processes are all digital instead of paper-based. This provides an infrastructure that allows employees to interact from anywhere since files and documents are digital and can be easily and nearly instantaneously shared.

The digital office of the future offers the opportunity for more flexible work schedules, allows for work from anywhere, supports a hybrid work environment, automates repetitive tasks, reduces menial activities for human workers, and provides more opportunities for higher-value tasks such as relationship management, customer engagement, team building, innovation, creative activities, and high-level data analysis.

Competition for employees will become more important as the budgets and workloads of the MDOT SHA increase over the next five years. More employees will be needed to manage contracts and projects. In such an environment, the government must be able to acquire and retain critical and highly skilled personnel. A more flexible, innovative, and creative work environment helps attract and keep the type of employees desired by organizations.

Additionally, the digital office of the future can improve the efficiency and effectiveness of MDOT SHA administration because all-digital processes do not require the movement of paper through the system. Also, process automation can be more easily implemented in all-digital realms.

As a first step, the research team reviewed the job duties related to the AA occupation as listed in Table 10. Then the research team provided our estimates about whether the importance of specific job duties will increase (↑), decrease (↓), or is unknown (○) over the next five years. These estimates are based on our expertise in the field and our understanding of where technology is going (see Table 1 in Section 2.1). The fundamental rubric that the research team applied to assess the change in importance for each of these items is listed below.

- The importance of the AA job duty *decreases* if it:
  - can be at least partially replaced with existing or emerging technologies
  - involves a repetitive and/or relatively simple task
  - can become a self-service activity for AA clients

- The importance of the AA job duty *increases* if it:
  - cannot be easily automated

- involves leveraging technology to improve administration efficiency or effectiveness
- involves higher value tasks that provide more opportunities for higher-value tasks such as relationship management, customer engagement, team building, human ingenuity, innovation, creativity, or high-level data analysis

Similar to the way that the research team analyzed the hybrid working environment, the research team also analyzed, edited, and added to the O*NET job duties to better align them with the needs of a digital office of the future needs. Edited O*NET job descriptions are shown in **bold text.** Additional duties related to the digital office of the future are also depicted in **bold text** at the end of the table.

4.4   Vision Realization Gap

Among the ten initiatives listed in the 2020-2025 Northbound Strategic Plan, MDOT SHA has also laid out a goal of enhancing internal and external communications through exploring emerging technologies to find open and proactive ways to better deliver MDOT SHA's messages to its broad audience.

Office technologies, and communication technologies, in particular, have evolved rapidly. The COVID-19 pandemic has only accelerated the pace of technological innovations. Given MDOT SHA's mission and current technological capabilities, the research team has identified gaps both at the organizational and individual levels, with AAs and BAs in particular.

At the organizational level, there appears to be a gap between the vision of the digital office of the future and its implementation at a detailed level. A strategic plan for investment in emerging office and communication technologies, including hardware, software, training, and hiring is needed.

Various systems including legacy systems have been used across different district offices. Paperless operation is advocated in some district offices but not in others. Remote access to organizational resources can sometimes be challenging.

Our literature review shows that many government agencies, including federal, state, and local governments, have initiated a variety of projects based on emerging technologies, such as RPA, to reduce non-value-added repetitive tasks and allow employees to focus on relational and high-value tasks. With appropriate resources, MDOT SHA can make progress in this direction.

4.5   Capability Gap

At the individual levels, the research team has identified a capability gap with AAs. For AAs, retirements, and employee turnover can become a threat to the success of its human resources initiative. Based on focus group meetings and interviews, however, many AAs feel a need for training in new office technologies to handle daily tasks more efficiently. Given the increasing use of hybrid work modes, AAs are not always equipped with the right equipment and the updated skill sets to collaborate with colleagues who may be working from a variety of locations, including offices, homes, or anywhere in the world.

5   RECOMMENDATIONS FOR IMPLEMENTATION

The research team has completed the job analysis and identified five major gaps when evaluating MDOT SHA's mission and the capabilities of its current AA and BA workforces:

- Market gap
- Current administrative assistant job description gap
- Future administrative assistant job description gap
- Vision implementation gap
- Capability gap

For MDOT SHA to bridge the gaps, the research team provides specific recommendations for each workforce following the People, Process, and Technology (PPT) framework. Meanwhile, the costs and barriers to the implementation of each recommendation are discussed accordingly.

As shown in Figure 5, The PPT framework examines the interactions between three critical organizational pillars: people (who are doing the work), process (how people should be organized and the work should be done), and technology (to enable people and support processes) to help achieve an organization's mission with efficiency and effectiveness.
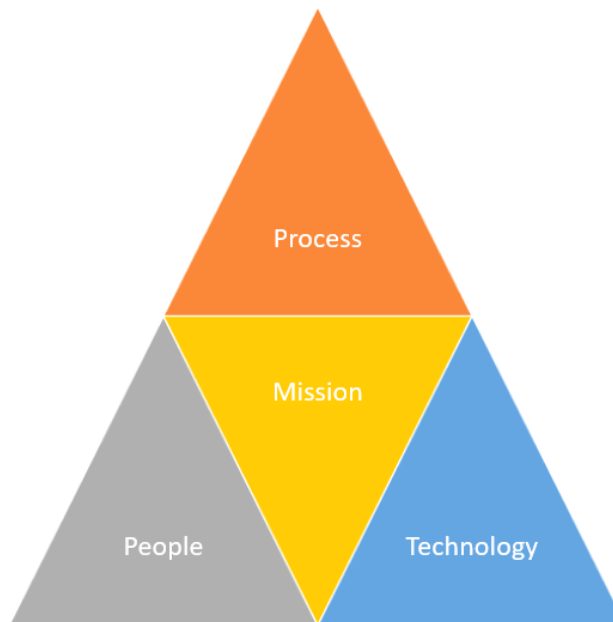
Figure 5: The People, Process and Technology Model
Adapted from source (Witt, 2023)

The PPT framework helps identify areas for improvement, assess the effectiveness of current systems, and develop strategies for improvement through implementing technology or process changes. It has been used by organizations to redesign their business models with the aim to build agile workforces that are able to adapt to and respond to the dynamics of internal and

external environments. The recommendations provided by the research team are organized according to this framework.

Based on our literature review, discussions, and focus group meetings with MDOT SHA managers and AAs, and our gap analysis, the research team recommends the following actions.

5.1 People

As the most valuable asset in any organization, people or employees are the most important pillar in the triangle. A successful organization has the right people with the right mindset and skillset. Our recommendations are focused on both AA and BA workforces.

5.1.1 The AA workforce

The research team recommends that the MDOT SHA carefully consider whether additional AA staff will be needed over the next few years when conducting its strategic workforce planning. Many administrative tasks will be at least partially if not fully, automated over the next few years. Any excess hours and other resources allotted towards AA services can be reallocated toward more pressing personnel needs. This suggestion becomes even more important as we witness the rapid advances in AI as exemplified by the Chat GPT (chatbot) and Dall E (text-to-image) innovations. We recommend that MDOT SHA update current AA job descriptions to reflect the skills and qualifications needed to adapt to the new environment and train existing administrative assistants to be tech-savvy or tech-ready.

AA Job Design

As technology evolves rapidly and automation of AA tasks increases, AA employees should have high technological understanding as part of AA job qualifications. The research team recommends that MDOT SHA update AA job descriptions to address those needs. In Table 10, the research team compiled and listed a large set of AA job duties and estimates whether the importance of these job duties will increase, decrease, or is unknown over the next five years. The research team also edited job descriptions and added new ones as shown in the bold text in the table. The research team recommends that MDOT SHA consider each of these duties individually to update the DTS-3 job description forms and the job descriptions in the MJCS database.

Implementation of the AA Job Design

Updating the AA job design will result in consistency of qualifications and responsibilities for AAs across the entire MDOT SHA and reflect the actual duties and responsibilities AAs are currently performing. More importantly, a job design update will ensure that MDOT SHA hires qualified AAs in the competitive job market to address future needs. With changes in office technologies and many administrative tasks being automated by RPA and enabled by AI, future AAs would have quite a different job profile. For example, here are some potential AA job tasks for the office of the future:

- Operate and monitor RPA scripts to execute administrative processes.

- Use speech-to-text applications to type administrative reports and enter data into database systems.
- Share large files with other individuals or organizations using online file-sharing servers.
- Leverage grammar, spelling, and format-checking software to review and correct documents.

The research understands that there are challenges facing AA job redesign. The Maryland Department of Budget and Management manages the Job Class Specifications. Any changes to DTS-3 forms may involve a collective bargaining process.

AA Training

As emerging technologies are more integrated into the MDOT SHA office infrastructure, AAs must be trained on how to use the new capabilities and become comfortable and proficient with emerging technologies. Thus, the training cadre should proactively ensure that the training available to the AAs (such as the MDOT SHA Cornerstone Online Learning platform) includes the necessary curricula to address the new capabilities. Additionally, AA employees may be able to take the lead and keep other MDOT SHA staff up to date on these newer office technologies. As AAs become less busy with routine and repetitive tasks as they are automated, AAs can focus on higher-value tasks such as passing on what they learned in training to their fellow staff members.

Implementation of AA Training

Supervisors of AAs may develop a training plan with individual AAs based on their changed responsibilities and demonstrated technological needs.

The MDOT SHA Cornerstone Online Learning platform may update its curricula to cover more emerging office technologies and their applications.

The main challenge concerning AA training would be how to balance the customized needs of individual departments and the resources available at OIT which provides training.

Another challenge would be how to motivate current AAs to participate in training and achieve desired outcomes. The research is aware that many AAs have been working for MDOT SHA over a long period of time and may lack technology understanding and desire to update their skill sets. Supervisors may include training in the performance evaluation process and career development plan of AAs.

For AA training to be meaningful and successful, the human resources department of MDOT SHA may need to set up basic expectations and provide needed incentives.

5.1.2   The BA workforce

BAs help guide business units in improving processes, products, services, and software through data analytics. These agile employees straddle the line between IT and business functions to help bridge the gap, determine requirements, deliver data-driven recommendations, and improve efficiency.

The research team recommends that MDOT SHA increase the budget for the function of BAs and expand the recruitment and training of BAs in MDOT SHA's SWP.

The research recommends that MDOT SHA define the competency profile of BAs in accordance with the business trends in general and the MDOT SHA's mission in particular. BAs must demonstrate the following characteristics:

- Excellent understanding of both business and technology within the project environment
- A leader, communicator, and collaborator
- Understanding of the skills associated with internal consulting techniques
- Proficiency in project management as well as a complete understanding of the internal process

Implementation for Expanding the BA Workforce

Enhancing the role of BAs will enable MDOT SHA to develop an agile workforce that can address the needs across various departments to achieve MDOT SHA's mission.

Elevating the strategic role of the BA function requires the buy-in and involvement of MDOT SHA's senior leadership. Expansion of the BA workforce and change in the reporting structure of the BA function may require some re-organization efforts within MDOT SHA and OIT.

There are challenges in implementing the BA initiative. It will be a huge challenge for MDOT SHA to hire and retain qualified BAs in a competitive job market. Without the commitment and support from MDOT SHA's senior leadership, the investment in the BA function may remain inadequate.

5.2   Process

A process is a sequence of activities and steps to be performed and a sequence of decisions to be made in order to achieve an organizational goal. Typically, business processes include management processes, operational processes, and support processes. Benefits of a successful process include consistency, stability, breakdowns of departmental barriers and functional silos, streamlined communication, strategic alignment, and efficiency.
A typical business process comprises some major characteristics:

- Interdependence of activities
- Expected time for each activity
- Variability of time for each activity
- Flows of activities

Processes can be classified into three categories: integration-centric processes, human-centric processes, and document-centric processes. Integration-centric processes depend on technologies that integrate data across systems such as human resource management, supplier management, or customer relationship management. Human-centric processes require approvals and center around human involvement. Document-centric processes center around a specific document such as a contract, which involves various forms and rounds of approvals.

5.2.1 The AA management process

The research team recommends a flexible work schedule with hybrid work modes depending on the interaction nature of the work to be performed and individual performance deemed by their supervisors. Rather than fully onsite or fully remote work, the research team recommends the current flexible hybrid policy for AAs in MDOT SHA. This recommendation aligns with the State of Maryland statement (MDOT, n.d.) that:

> *Overall, teleworking has many benefits. The State of Maryland recognizes these benefits and has streamlined the process for teleworkers and their supervisors in an effort to encourage more participation in the State's Telework Program.*

Since the pandemic, the MDOT SHA work environment has changed for many employees, from fully onsite to hybrid attendance (for example, 3 days onsite and 2 days remote). This policy of hybrid attendance at MDOT SHA suggests some potentially important goals for this new working environment, such as:

- All interactions between employees, whether virtual or physical, should be equally effective, important, and valuable. This implies that the necessary technology is available to provide quality communications and collaboration.
- The networking infrastructure, software applications, and information technology equipment provided to employees working remotely should provide an experience as productive as those working locally on the network in the office.

That said, the research team also recommends that supervisors carefully monitor AA performance and manage their working modes on individual basis. This is because the needs of each administrative office will differ and the suitability of individual AAs for remote work will also vary. Important understandings between employees working remotely and their supervisors include:

- How are employees evaluated and what are the organization's remote work policies?
- How will employee work be tracked and measured?
- What are the rules about the boundaries between work and personal time?
- How quickly are remote employees expected to respond to inquiries or telephone calls?

The benefits of the hybrid work mode include reduced employee commute time, lower office infrastructure and environmental costs, improved employee work-life balance, and wider MDOT SHA access to talent (MDOT, n.d.).

Challenges of the hybrid work mode include increased management complexity, more difficult technical support and security, and reduced ability to build and maintain relationships and organizational culture.

Process-Related Suggestions Collected from Focus Groups and Interviews

The following process-related suggestions were voiced during our interviews and focus group sessions with AAs and managers in MDOT SHA. The research team is conveying these suggestions for MDOT SHA's consideration.

- Speed up the process for hiring and reorganizations: It was suggested that the processes of re-organizing within MDOT SHA Divisions and hiring new staff take too long. Frequently, it can take around six months from an initial request to fill a PIN to the time an individual is selected and starts in that role. They would like to see more agile HR processes for hiring MDOT SHA staff and re-organizing.

- Formalize Shadow Software Development: Sometimes, power users will develop their own applications to meet their specific operating needs. While this can be a good thing, it can sometimes introduce problems because user-developed software might introduce security vulnerabilities or may not interact correctly with other software in the system. It was suggested that a guide should be developed for user-developed software and that this software should be included in the standard IT oversight and governance mechanisms.

- Instantiate Rapid Action Response: As critical business problems arise, there was a suggestion that MDOT SHA could respond to these critical needs with 'quick-hit' teams to address these important issues. This contrasts with the normal process of placing the requirements in the queue for development.

- Ensure Consistency and Compatibility: There was a desire that MDOT SHA standardize information and technology across the entire organization. This includes hardware, software, file and folder naming conventions, and folder organization. These types of standardization activities can be guided by a widely used and well-known framework such as the Capability Maturity Model (CMM).

5.2.2 The BA management process

Given the importance of the role of BAs in driving organizational success, the role of the BAs should be strategic at both the organizational level as well as at the project level. To facilitate this strategic role, the organizational structure must support the actions of strategic BA positions. The research team makes the following recommendations.

- Escalate the strategic role of BAs within MDOT SHA

To formalize the BA function, the researchers recommend that the BA function may report directly to MDOT SHA's high-level leadership.

- Establish a Center of Excellence (CoE) management structure at the organizational level

To balance the needs of business units and the need to provide training and coordination, the research team recommends the use of a matrix structure to manage BAs. According to our literature on best practices, a Center of Excellence Model is recommended.

In the matrix structure, BAs are assigned to business functions for projects as full-time employees but their activities are coordinated and supported by a centralized group under OIT, which provides leadership and resources including training and tools. A matrix structure is efficient in utilizing BA resources while BAs are accountable for their actions.

- Adopt a bottom-up approach for project initiation

Given the suggested matrix structure of managing BAs, the research team recommends that BAs initiate IT projects based on their thorough understanding of the business operations and close interactions with function managers. A bottom-up approach is recommended so that projects can take into account inputs from users and get early involvement from function managers and users. The challenge is that OIT has to manage a variety of bottom-up projects and balance the needs across different departments.

Overall, there is high uncertainty regarding the BA management process given that MDOT SHA's current full-time BA workforce is very small and a significant expansion is needed. There are only eight BAs based on the research team's understanding. Many consultants are hired to perform BA functions on a contractual basis.

The research team is also aware that BAs may not feel comfortable working in a matrix work environment. The common drawback associated with a typical matrix structure is that employees have to report to two bosses: the function manager who owns the project and the BA manager who coordinates and supports BAs. In the case of a Center of Excellence model, BAs report to both the manager of a centralized group residing in OIT and the manager of the individual office across MDOT SHA. Meanwhile, it is uncommon that matrix organization is subject to infighting when function managers and BA managers have competing priorities when managing BAs.

The research team recommends that in the early stage of the implementation, BAs directly report to the BA manager in OIT and indirectly report to the function manager as dotted line reporting. Admittedly, it will take time for a matrix structure to stabilize and show desired results.

5.3   Technology

Technology is an enabler for motivating people and smoothing organizational processes. Given the constant evolution of emerging technologies and their rapid applications in organizational processes, the research team recommends that MDOT SHA consider a digital office of the future in its long-term strategic plan. Based on benchmark research, the digital office of the future is characterized as follows:

- Digital infrastructure
- Paperless processes
- Automation and reduction of repetitive tasks
- Flexible work schedule including work from anywhere and at any time
- Distributed workforce and teams

Figure 6: Digital Office of the Future
(AI-generated image (Midjourney, 2023))

5.3.1 Benefits associated with the digital office of the future

First, the digital office of the future creates a work environment that is attractive to new generations of talents who prefer a flexible work schedule. MDOT SHA will be able to recruit and retain capable AAs and BAs in a competitive job market.

Second, the digital office of the future platform will result in a productive workforce and improve organizational efficiency for MDOT SHA. If AAs and BAs can work from anywhere and at any time, productivity will likely rise accordingly.

Third, when repetitive and low-value tasks are automated, human errors are avoided and productivity will increase. MDOT SHA will realize cost savings moving forward.

Fourth, with the automation of repetitive tasks, AAs and BAs can focus more on high-value tasks, such as customer engagement, data analytics, and team collaboration. With employees devoted to high-value tasks, the workforce will become more motivated in achieving MDOT SHA's mission.

While keeping transformation into the digital office of the future as a strategic goal, MDOS SHA may take small concrete steps in implementation. For example, MDOT SH may start with some simple RPA projects to digitize data collection, automate and streamline repetitive tasks, and implement paperless processes.

5.3.2 Challenges in implementing digital office of the future

The research team anticipates the following challenges in implementing the digital office of the future.

First, a cultural change is needed. From the frontline AAs to top leadership, people in the MDOT SHA must be convinced that the digital office is the future. The vision of the senior leadership is key.

Second, additional investment in office technologies and communications technology is needed to build the technology infrastructure. However, there are uncertainties associated with MDOT SHA's budget and priorities.
Third, data security and integration of different platforms can be a huge challenge.

Fourth, it may take time to train current AA workforces to be technology-savvy.

Fifth, management and operational processes need to be changed to support the digital office of the future.

Technology-Related Suggestions from Focus Groups and Interviews

The following technology-related suggestion was voiced during our interviews and focus group sessions with AAs and managers in MDOT SHA. The research team is conveying this suggestion for MDOT SHA consideration.

Similar Quality Meeting Audio for Remote and Onsite Personnel: A comment was made that not all the conference rooms were well-suited for mixed onsite and remote video conferences. In some cases, the remote attendees had a hard time clearly hearing the discussions among the onsite conference room attendees. They felt that it is important that remote attendees have meeting experiences that are of similar quality as the physical attendees.

6   RECENT DEVELOPMENTS ON REMOTE WORK POLICIES

With COVID-19 cases declining, the U.S. House on February 1, 2023 passed a Republican-led bill, titled "SHOW UP ACT," that would require federal executive agencies to terminate widespread teleworking policies implemented during the COVID-19 pandemic, ordering the entities to revert back to plans in place on December 31, 2019. Most democratic representatives spoke against the bill, arguing that "telework has strengthened private and public workplaces across the land, enhanced productivity, increased efficiency, improved the morale and satisfaction of the workforce, reduced traffic congestion and made positive environmental changes" (Schnell, 2023). The bill still needs to pass the Senate and be signed by President Biden before it becomes law. On April 10, President Biden signed H.J. Res. 7 into law which terminates the national emergency related to the COVID-19 pandemic.

Meanwhile, companies have been reassessing and rethinking their remote work policies based on the impacts of the remote work practice over the past few years.

Some well-known companies that have announced plans to bring employees back to the office include:

- Apple plans to bring employees back to the office three days a week starting in September 2021.
- Amazon plans to bring employees back to the office in a hybrid model that allows for both remote and in-person work.
- Goldman Sachs has been one of the most vocal proponents of bringing employees back to the office and has required all employees to return to the office by June 2021.
- Google plans to bring employees back to the office in a hybrid model starting in September 2021.
- JP Morgan plans to bring employees back to the office starting in July 2021.
- Microsoft plans to allow employees to work from home part-time, but also encourages employees to return to the office at least a few days a week
- Since his takeover of Twitter, Elon Musk has announced that working in the office is not optional.
- Tesla requires a minimum of forty hours in the office per week starting June 2022.

Companies have cited the following reasons for reversing their remote work policies:

- Collaboration and Communication: Companies may believe that it is easier for employees to collaborate and communicate effectively when they are working in the same physical location. In-person communication can facilitate the exchange of ideas and increase team cohesion.
- Productivity: Some companies may believe that employees are more productive when they are working in the office. They may believe that the office environment is more conducive to work and that employees are less distracted than they are when working from home.
- Company Culture: For some companies, being physically present in the office is an important part of their company culture. They may believe that employees who work remotely are less connected to the company and less likely to be invested in its success.
- Management: Some managers may prefer to manage their teams in person, rather than remotely. They may believe that they can better oversee their employees' work and provide more immediate feedback when they are in the same physical location.
- Employee Training and Development: Companies may believe that in-person training and development opportunities are more effective than remote options. They may also believe that employees are more likely to learn from each other when they are working in the same physical location.

However, many companies, including Square, Metaverse, Dropbox, Slack, Spotify and McKinsey, have decided to continue remote work policies, either partially or fully, due to the success of remote work observed during the pandemic. The benefits cited include:

- Employee Satisfaction: Remote work has been shown to increase employee satisfaction and work-life balance, which can lead to increased productivity and retention. Companies may continue to offer remote work as a perk to attract and retain top talent.

- Cost Savings: Remote work can save companies money on office space, utilities, and other overhead costs. By allowing employees to work from home, companies can reduce their real estate footprint and save money on office-related expenses.
- Environmental Impact: Remote work reduces commuting, which can help reduce greenhouse gas emissions and other pollutants that contribute to climate change. Companies may choose to continue remote work policies as part of their sustainability initiatives.
- Access to Talent: Remote work allows companies to access talent from anywhere in the world, not just from the local area. This can help companies hire the best people for the job, regardless of their location.
- Business Continuity: The COVID-19 pandemic highlighted the importance of having a flexible and adaptable workforce. By continuing to offer remote work options, companies can better prepare for future disruptions and maintain business continuity.

The research team acknowledges that while digital offices may be the future, remote work is not a one-size-fits-all solution at present. Organizations need to find a balance between the need for workplace interactions and the technical capabilities of their workers. To achieve this balance, the research team recommends implementing a flexible work policy. Based on the typological framework using work and worker requirements, the research team recommends that organizations may require employees to work in the office for work requiring employee interactions, particularly for workers with low levels of experience and limited technology skills. Meanwhile, experienced and tech-savvy workers responsible for work requiring less interaction and interdependence may be allowed to work remotely. Hybrid work modes, a mix of office and remote work, may be permitted to meet work requirements and accommodate motivated, productive, and experienced workers. Regarding hybrid work arrangements, each team leader should be empowered to determine, in consultation with team members, the number of days they need to come to the office.

REFERENCES

Acemoglu, D., & Autor, D. (2011). Skills, tasks and technologies: Implications for employment and earnings. *Handbook of Labor Economics*. 1043-171.

Agency for Healthcare Research and Quality (2022). Gap analysis facilitator's guide. https://www.ahrq.gov/patient-safety/settings/hospital/candor/modules/facguide3.html (Accessed November 16, 2022).

Alexander, A., De Smet, A., Langstaff, M., & Dan Ravid (2021). What employees are saying about the future of remote work. https://www.strumpfassociates.com/demo/wp-content/uploads/2021/05/What-employees-are-saying-about-the-future-of-remote-work-with-cover.pdf (Accessed October 2, 2022).

Analytics Insight. (2019). How the use of RPA helps the center for drug evaluation and research https://www.analyticsinsight.net/how-the-use-of-rpa-helps-the-center-for-drug-evaluation-and-research/ (Accessed August 24, 2022).

Automation Anywhere. (2022). San Diego County improves productivity by 30% with RPA. https://www.automationanywhere.com/resources/customer-stories/san-diego-county (Accessed August 25, 2022).

Bessen, J. (2020). Automation: A guide for policymakers. *Economic Studies at Brookings*. https://www.brookings.edu/wp-content/uploads/2020/01/Bessen-et-al_Full-report.pdf (Accessed June 22, 2022).

California Department of General Services (2022). Statewide Telework Policy. https://www.dgs.ca.gov/Resources/SAM/TOC/100/181 (Accessed August 29, 2022)

Conference Board (2020). Adapting to the reimagined workplace: Human capital responses to the COVID-19 pandemic. https://www.conference-board.org/topics/natural-disasters-pandemics/adapting-to-the-reimagined-workplace (Accessed June 19, 2022).

Defense Advanced Research Projects Agency. (2022). Deep exploration and filtering of text (DEFT). https://www.darpa.mil/program/deep-exploration-and-filtering-of-text (Accessed August 26, 2022)

Deloitte. (2014). Organizing analytics – from the inside out. https://www2.deloitte.com/content/dam/Deloitte/us/Documents/deloitte-analytics/us-da-organizing-analytics-inside-out.pdf (Accessed August 28, 2022).

Deloitte. (2018). The rise of the social enterprise: 2018 global human capital trends. https://www2.deloitte.com/content/dam/insights/us/articles/HCTrends2018/2018-HCtrends_Rise-of-the-social-enterprise.pdf (Accessed August 23, 2022).

Deloitte. (2019). How to redesign government work for the future. https://www2.deloitte.com/content/dam/Deloitte/ec/Documents/public-sector/DI_redesign-govt-work%20(2).pdf (Accessed August 2, 2022).

Eggers, W. & Viechnicki, P. (2017). How much time and money can AI save government? *Deloitte Insights*. https://www2.deloitte.com/us/en/insights/focus/cognitive-technologies/artificial-intelligence-government-analysis.html (Accessed July 3, 2022).

Fast Company. (2013). FDA adopts amazon mechanical turk for drug safety backlog. https://www.fastcompany.com/3021684/fda-adopts-amazon-mechanical-turk-for-drug-safety-backlog (Accessed August 21, 2022).

Federal RPA Community of Practice. (2021). The state of federal RPA – an update on the governmentwide impact, deployment, and best practices of RPA. https://digital.gov/pdf/state-of-federal-rpa-report-12-2021.pdf (Accessed August 27, 2022).

Feijao, C., Flanagan, I, Van Stolk, C. & Gunashekar, S. (2021). The global digital skills gap: Current trends and future directions. https://www.rand.org/pubs/research_reports/RRA1533-1.html (Accessed October 4, 2022).

Gallup (2021). Bet on it: 37% of desks will be empty. https://www.gallup.com/workplace/357779/bet-desks-empty.aspx (Accessed May 14, 2022).

Gray, Clifford F. & Larson, Erik W. (2021). *Project Management: The Managerial Process*, 8th edition, McGraw-Hill Education, New York.

Hackman, J. R. & Oldham, G. R. (1974). The job diagnostic survey: An instrument for the diagnosis of jobs and the evaluation of job redesign projects. Department of Administrative Sciences: Yale University.

Hartmans, A. (2021). Google invented a hot desk that remembers what you like. https://www.businessinsider.com/google-hot-desk-remembers-workers-preferences-2021-4 (Accessed August 8, 2022).

Harvard Business Review (2021). What is your organization's long-term remote work strategy? *Harvard Business Review*. https://hbr.org/2021/03/what-is-your-organizations-long-term-remote-work-strategy (Accessed May 9, 2022).

Hirschberg, J., & Manning, C. D. (2015). Advances in natural language processing. *Science*, *349*(6245), 261–266. https://doi.org/10.1126/science.aaa8685

Jewell, C. (2019). Artificial intelligence: the new electricity. *WIPO Magazine*. https://www.wipo.int/wipo_magazine/en/2019/03/article_0001.html (Accessed August 8, 2022).

Leonard, Kimberlee & Bottorff, Cassie (2022). Conducting a gap analysis: a four-step template. https://www.forbes.com/advisor/business/gap-analysis-template/ (Accessed November 15, 2022).

Lund, S. et al. (2021). The future of work after COVID-19. https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-after-covid-19 (Accessed July 6, 2022).

Maryland Department of Budget and Management (2022). Class specifications database. https://www.jobapscloud.com/MD/auditor/classspecs.asp (Accessed August 12, 2022).

Maryland Department of Budget and Management (2023). State of Maryland Telework Policy (Post-Pandemic) Telework Agreement. https://dbm.maryland.gov/employees/Documents/telework/Telework%20Agreement%20Rev%20June%202021.pdf (Accessed January 27, 2023).

Maryland Department of Transportation (MDOT). (2022). Draft 2023-2028 Maryland consolidated transportation program. https://www.ctp.maryland.gov (Accessed November 12, 2022).

Maryland Department of Transportation (MDOT). (2022). Teleworking Information Center. https://dbm.maryland.gov/employees/pages/telework/teleworkhome.aspx (Accessed January 12, 2023).

Maryland Department of Transportation-State Highway Administration (MDOT-SHA). (2022). *Northbound strategic plan 2020-2025*.

Massachusetts State Government Human Resource Division (2022). Telework best practice guide. https://www.mass.gov/guides/telework-best-practice-guide (Accessed August 29, 2022).

McKinsey & Co. (2015). Building capabilities for performance. https://www.mckinsey.com/capabilities/people-and-organizational-performance/our-insights/building-capabilities-for-performance (Accessed November 28, 2022).

McKinsey Global Institute (2021). The workforce of the future after COVID-19. https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/the-workforce-of-the-future (Accessed May 4, 2022).

Mesquita, A., Oliveira, L., & Sequeira, A. (2019). The future of the digital workforce: Current and future challenges for executive and administrative assistants. *New Knowledge in Information Systems and Technologies: Volume 1* (pp. 25-38).

Midjourney. (2023). *Midjourney* [Computer software]. https://midjourney.com.

National Association of State Technology Directors (2021). States technology directors say the pandemic has spurred enduring telework. https://statetechmagazine.com/article/

2021/05/state-technology-directors-say-pandemic-has-spurred-enduring-telework (Accessed August 29, 2022).

National Center for O*NET Development. (n.d.). O*NET Online https://www.onetonline.org (Accessed August 16, 2022).

O*NET. (n.d.). O*NET online. https://www.onetonline.org (Accessed August 15, 2022).

OpenAI. (2023). Example applications. https://beta.openai.com/examples (Accessed January 4, 2023).

Oracle, Inc. (2020). What is AI? https://www.oracle.com/artificial-intelligence/what-is-ai (Accessed August 14, 2022).

Pacheco, G. (2022). 10 examples of smart contracts on blockchain. *TechTarget*. https://www.techtarget.com/searchcio/feature/Examples-of-smart-contracts-on-blockchain (Accessed January 5, 2023).

Patel, S. (2017). Six administrative tasks you can automate: Are you being productive or busy? https://www.inc.com/sujan-patel/6-administrative-tasks-you-can-automate.html (Accessed August 13, 2022).

Schnell, M. (2023). House passes bill to end coronavirus-era telework policies for executive agencies. https://thehill.com/homenews/house/3840064-house-passes-bill-to-end-coronavirus-era-telework-policies-for-executive-agencies/ (Accessed April 24, 2023).

SHRM (2022). Practicing the discipline of workforce planning. https://www.shrm.org/resourcesandtools/tools-and-samples/toolkits/pages/practicingworkforceplanning.aspx (Accessed August 4, 2022).

Song, Y., et al. (2021). SmartMeeting: Automatic meeting transcription and summarization for in-person conversations. *Proceedings of the 29th ACM International Conference on Multimedia*, 2777–2779. https://doi.org/10.1145/3474085.3478556 (Accessed August 11, 2022).

Tamkin, A. & Ganguli, D. (2021). How large language models will transform science, society, and AI. https://hai.stanford.edu/news/how-large-language-models-will-transform-science-society-and-ai (Accessed August 9, 2022).

U.S. Bureau of Labor Statistics. (2022). Occupational projections and worker characteristics. https://www.bls.gov/ooh/office-and-administrative-support/home.htm (Accessed May 6, 2022).

U.S. Bureau of Labor Statistics. (n.d.). Occupational Outlook Handbook. https://www.bls.gov/ooh/home.htm (Accessed August 4, 2022).

U.S. Department of Labor (2022). O*NET resource center. https://www.onetcenter.org/database.html#individual-files (Accessed May 6, 2022).

U.S. Department of State (2020). Five-year workforce plan – fiscal years 2019-2023. https://www.state.gov/wp-content/uploads/2020/02/Five-Year-Workforce-Plan-FY19FY23-Final.pdf (Accessed August 23, 2022).

U.S. Government Accountability Office (2003). Human capital – key principles for effective strategic workforce planning. www.gao.gov/cgi-bin/getrpt?GAO-04-39 (Accessed August 20, 2022).

U.S. Office of Personnel Management (2005). OPM's workforce planning model. https://www.opm.gov/policy-data-oversight/human-capital-framework/reference-materials/strategic-alignment/workforceplanning.pdf (Accessed August 6, 2022).

Van Zooned, W. et al. (2021). Factors influencing adjustment to remote work: employees' initial responses to the COVID-19 pandemic, *International Journal of Environmental Research and Public Health*, *18*(13).

Walker, Ricard W. (2014). Georgia solves campaign finance data challenge via OCR. https://www.informationweek.com/cloud-computing/georgia-solves-campaign-finance-data-challenge-via-ocr (Accessed August 21, 2022)

Wang, B., Liu, Y., Qian, J., and Parker, S. (2021). Achieving effective remote working during the COVID-19 pandemic: a work design perspective. *Applied Psychology*, *70*(1), 16-59.

Washington Post (2015). Hacks of OPM databases compromised 22.1 million people, federal authorities say. https://www.washingtonpost.com/news/federal-eye/wp/2015/07/09/hack-of-security-clearance-system-affected-21-5-million-people-federal-authorities-say/ (Accessed August 28, 2022).

Witt, B. (2022). Golden triangle. *The Foundation of Successful Workforce Management*. https://www.procore.com/jobsite/the-foundation-of-successful-wfm-people-process-technology (Accessed January 5, 2023)

World Economic Forum (2020). The future of jobs. https://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf (Accessed August 23, 2022).

Yang, L., et al. (2022). The effects of remote work on collaboration among information workers. *Nature - Human Behavior*. https://www.nature.com/articles/s41562-021-01196-4.pdf (Accessed May 8, 2022).

Appendix A – Job Task Descriptions

Table 11: Job Task Descriptions

O*NET Job Task Descriptions		
AA O*NET Work Activities	**Future Need**	**Job Desc (out of 6)**
Using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, **collaborate**, or process information.	↑	6
Observing, receiving, and otherwise obtaining information from all relevant sources.	↑	6
Providing information to supervisors, co-workers, and subordinates by telephone, in written form, e-mail, **web conferencing**, or in person.	↑	5
Performing day-to-day administrative tasks such as maintaining **digital** information files and **implementing digital work processes and** paperwork.	↓	6
Developing specific goals and plans to prioritize, organize, and accomplish your work.	↓	0
Developing constructive and cooperative working relationships with others, <u>including both in-office and remote personnel</u>, and maintaining them over time.	↑	0
Use speech-to-text technology for entering, transcribing, recording, storing, or maintaining information in written or electronic/magnetic form.	↓	5
Using relevant information, **AI tools,** and individual judgment to determine whether events or processes comply with laws, regulations, or standards.	↓	4
Communicating with people outside the organization, representing the organization to customers, the public, government, and other external sources. This information can be exchanged in person, in writing, or by phone or e-mail, **or by web conferencing**.	↑	6
Identifying information by categorizing, estimating, recognizing differences or similarities, and detecting changes in circumstances or events.	↓	0
Compiling, coding, categorizing, calculating, tabulating, auditing, or verifying information or data.	↓	0
Analyzing information and evaluating results to choose the best solution and solve problems.	↑	0
Monitoring and reviewing information from materials, events, or the environment, to detect or assess problems.	↓	0
Providing personal assistance, medical attention, emotional support, or other personal care to others such as coworkers, customers, or patients.	↓	0
Keeping up-to-date technically and applying new knowledge to your job.	↑	0

Scheduling events, programs, and activities, as well as the work of others **using manual methods and automated scheduling applications**.	↑	5
Developing, designing, or creating new applications, ideas, relationships, systems, or products, including artistic contributions.	↑	0
Handling complaints, settling disputes, and resolving grievances and conflicts, or otherwise negotiating with others.	⭕	0
Performing for people or dealing directly with the public. This includes serving customers in restaurants and stores, and receiving clients or guests.	⭕	0
Identifying the underlying principles, reasons, or facts of information by breaking down information or data into separate parts **and displaying it using data visualization software**.	↑	0
Translating or explaining what information means and how it can be used **and displaying it using data visualization software**.	↑	0
Assessing the value, importance, or quality of things or people.	↑	0
Getting members of a group to work together, **physically, virtually, or a combination of both** to accomplish tasks.	↑	1
Identifying the educational needs of others, developing formal educational or training programs or classes, and teaching or instructing others.	↑	0
Estimating sizes, distances, and quantities; or determining time, costs, resources, or materials needed to perform a work activity.	↓	0
Establishing long-range objectives and specifying the strategies and actions to achieve them.	↑	0
Encouraging and building mutual trust, respect, and cooperation among <u>remote and onsite</u> team members.	↑	0
Identifying the developmental needs of others and coaching, mentoring, or otherwise helping others to improve their knowledge or skills.	↑	0
Performing physical activities that require considerable use of your arms and legs and moving your whole body, such as climbing, lifting, balancing, walking, stooping, and handling materials.	↓	0
Providing guidance and expert advice to management or other groups on technical, systems, <u>collaboration tools</u>, or process-related topics.	↑	0
Monitoring and controlling resources and overseeing the spending of money.	↓	0
Using either control mechanisms or direct physical activity to operate machines or processes (not including computers or vehicles).	↓	0
Using hands and arms in handling, installing, positioning, and moving materials, and manipulating things.	↓	0
Inspecting equipment, structures, or materials to identify the cause of errors or other problems or defects.	↓	0
Recruiting, interviewing, selecting, hiring, and promoting employees in an organization.	↓	0
Providing guidance and direction to subordinates, including setting performance standards and monitoring performance.	⭕	1

Running, maneuvering, navigating, or driving vehicles or mechanized equipment, such as forklifts, passenger vehicles, aircraft, or watercraft.	⭕	0
Servicing, repairing, calibrating, regulating, fine-tuning, or testing machines, devices, and equipment that operate primarily on the basis of electrical or electronic (not mechanical) principles.	↓	0
Convincing others to buy merchandise/goods or to otherwise change their minds or actions.	⭕	0
Providing **digital** documentation, detailed instructions, drawings, or specifications to tell others about how devices, parts, equipment, or structures are to be fabricated, constructed, assembled, modified, maintained, or used.	⭕	0
Servicing, repairing, adjusting, and testing machines, devices, moving parts, and equipment that operate primarily on the basis of mechanical (not electronic) principles.	⭕	0

AA O*NET Detailed Work Activities	Future Need	Job Desc (out of 6)
Answer telephones, **emails, text messages, chat, or collaboration software** to direct calls or provide information.	↓	5
Discuss account status or activity with customers or patrons.	↓	1
Greet customers, patrons, or visitors.	↓	3
Refer customers to appropriate personnel.	↓	3
Execute sales or other financial transactions.	⭕	0
Enter information into databases or software programs **via keyboard or voice**.	↑	5
Operate computers or computerized equipment.	↑	5
Collect deposits, payments or fees.	⭕	0
Operate office equipment to support both remote and in-office personnel.	↓	4
Report maintenance or equipment problems to appropriate personnel.	↓	4
Record personnel information **in digital files**.	↓	3
Select resources needed to accomplish tasks.	↑	2
Operate communications equipment or systems for both remote and onsite personnel.	↑	5
Schedule appointments **both manually and using automated scheduling software**.	↓	4
Distribute materials to employees or customers.	↓	5
Issue documentation or identification to customers or employees.	⭕	0
Record information from meetings or other formal proceedings **using manual or software tools**.	↓	2
Prepare documentation for contracts, transactions, or regulatory compliance.	↓	1
Order materials, supplies, or equipment for both remote and onsite employees.	↓	5
Develop organizational policies or programs.	↑	0

Task		
Prepare employee work schedules **both manually and using automated scheduling software**.	↓	0
Send information, materials or documentation **via mail, e-mail, or other electronic means**	↓	5
Compile data or documentation.	↑	5
Make travel, accommodations, or entertainment arrangements for others.	↓	3
Schedule operational activities **both manually and using automated scheduling software**.	↓	4
Distribute incoming mail.	↓	3
Proofread documents, records, or other files to ensure accuracy **and correct spelling and grammar via grammatical software**.	↓	4
Route mail, **e-mail, and digital files** to correct destinations.	↓	4
Search files, databases or reference materials **using advanced digital search tools** to obtain needed information.	↑	5
Supervise clerical or administrative personnel.	○	1
Manage clerical or administrative activities.	○	1
Coordinate operational activities **using project management software applications**.	○	2
Maintain current knowledge related to work activities.	↑	5
Train personnel.	↑	0
Transcribe spoken or written information **using speech-to-text and text-to-speech software applications**.	↓	3
Prepare informational or reference materials.	↓	2
Develop computer or online applications.	↑	0
O*NET Tasks		
Answer telephones **or other digital communication mediums** and give information to callers, take messages, or transfer calls to appropriate individuals.	↓	6
Greet visitors or callers and handle their inquiries or direct them to the appropriate persons according to their needs.	↓	4
Create, maintain, and enter information into databases.	↑	6
Use computers for various applications, such as database management or word processing, **or other digital processes**.	↑	6
Perform payroll functions, such as maintaining timekeeping information and processing and submitting payroll.	↓	0
Collect and deposit money into accounts, disburse funds from cash accounts to pay bills or invoices, keep records of collections and disbursements, and ensure accounts are balanced.	↓	0

Task		
Operate office equipment **both onsite and at remote sites**, such as **digital cameras and lighting, microphones, computer projection systems,** fax machines, copiers, or analog **and voice-over-IP** phone systems and arrange for repairs when equipment malfunctions.	↓	6
Set up and manage paper or electronic filing systems, recording information, updating paperwork, or maintaining documents, such as attendance records, correspondence, or other material.	↑	6
Operate electronic mail systems and coordinate the flow of information, internally or with other organizations.	↓	0
Schedule and confirm appointments for clients, customers, or supervisors **both manually and using automated scheduling software**.	↑	5
Maintain scheduling and event calendars **both manually and using automated scheduling software**.	↓	5
Compose, type, and distribute meeting notes, routine correspondence, or reports, such as presentations or expense, statistical, or monthly reports **both manually and using speech-to-text and text-to-speech software**.	↓	4
Complete forms in accordance with company procedures.	↓	5
Establish work procedures or schedules and keep track of the daily work of clerical staff.	↓	3
Provide services to customers, such as order placement or account information.	↓	6
Locate and attach appropriate files to incoming correspondence requiring replies.	↓	6
Prepare and mail checks **or transfer funds electronically**.	↓	1
Arrange conference, meeting, or travel reservations for office personnel **both manually and using automated scheduling software**.	↓	3
Conduct searches to find needed information, using such sources as the Internet **and network drives**.	↑	6
Open, read, route, and distribute incoming mail or other **paper or digital** materials and answer routine letters **or other inquiries**.	↓	4
Review work done by others to check for correct spelling and grammar **using spelling and grammar checking software**, ensure that company format policies are followed, and recommend revisions.	↓	5
Make **digital scans and** copies of correspondence or other printed material.	↓	4
Supervise other clerical staff and provide training and orientation to new staff.	↑	1
Manage projects or contribute to committee or teamwork **using project management and team collaboration software**.	↑	1
Coordinate conferences, meetings, or special events, such as luncheons or graduation ceremonies **both manually and using automated scheduling software**.	↓	4
Learn to operate new office technologies as they are developed and implemented.	↑	0
Mail, **e-mail, and post to the internet,** newsletters, promotional material, or other information.	↓	1
Train and assist staff with computer usage.	↑	0
Order and dispense supplies.	↓	4

Take dictation in shorthand **or by machine speech-to-text software** and transcribe information.	↓	1
Prepare conference or event **paper and digital** materials, such as flyers or invitations.	↓	0
Develop or maintain internal or external company Web sites.	↓	0
Future AA Gaps		
Monitor worker compliance with remote work policy guidance.	↑	0
Scan hardcopy documents and convert them to digital documents.	↑	0
Operate and monitor RPA scripts to execute administrative processes.	↑	0
Use speech-to-text applications to create administrative reports and enter data into database systems.	↑	0
Share large files with other individuals or organizations using online file-sharing servers.	↑	0
Leverage grammar, spelling, and format-checking software to review and correct documents.	↑	0
Forward incoming phone calls to other onsite and remote worker telephones.	↑	0
Manage and host web meetings with both onsite and remote attendees.	↑	0