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RISC Report

Step into Tomorrow: The U.S. Postal Service and Emerging Technology

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Executive Summary

Over the past decade, technological innovation has advanced at an increasingly fast pace, creating both opportunities and disruptions in virtually every industry. The postal industry is no exception.

Since 2011, the U.S. Postal Service Office of Inspector General (OIG) has produced over 30 white papers on emerging technologies to analyze their potential impact on and application for the Postal Service. Our research focused on four technology categories: mail innovations, data analytics, autonomous technologies, and intelligent infrastructure.

In this paper, we revisit some of the technological developments discussed in our previous work to assess which remain relevant today, where the Postal Service has implemented or piloted new technology, and which are important for the Postal Service to consider for implementation in the future.

We found that, over the past decade, the Postal Service has focused its technology development efforts on two areas: mail innovations and data analytics. Postal experts agreed that advancements in these areas will continue to lead transformation in the postal industry going forward.

The Postal Service's recently released "Delivering for America: Our Vision and Ten-Year Plan to Achieve Financial Sustainability and Service Excellence" indicates that these technologies are and will continue to be a priority going into the future.

Other emerging technologies that have not yet had a major impact on the Postal Service, either in terms of revenue or cost efficiencies, are blockchain, Internet of Things, and autonomous vehicles. The Postal Service's engagement with these technologies has been limited to research and testing so far. Experts, however, believe these innovations will become increasingly impactful in the coming years.

Despite facing constraints that other competitors in the postal marketplace do not, the Postal Service has managed to integrate many of the latest technological innovations into its business practices to improve the efficiency and quality of the service it provides to its customers. Its size prevents it from being as nimble as smaller players in the postal industry. In addition, the Postal Service faces legal, technical, financial, and regulatory hurdles. However, these challenges can be mitigated within the boundaries of the Postal Service's current regulatory, operational, and financial framework.

Making effective use of new and emerging technologies, as well as successfully addressing the challenges to innovation will enable the Postal Service to become a more efficient organization that exceeds its customers' expectations.

Observations

Introduction

Over the last decade, the postal marketplace has seen growth in many new technologies that have helped enhance the value of mail and packages for senders and recipients. The rapid rate of technological innovation holds potential opportunities – such as increasing customer value, creating cost efficiencies, and generating new revenue – for nearly all aspects of the Postal Service’s operations. At the same time, however, innovation can create challenges of its own. Technology can lower barriers to entry, making it easier for new competitors to enter the delivery marketplace. Smaller and more nimble players may have an advantage in that they are better able to rapidly develop and implement new innovations.

Over the past 10 years, the U.S. Postal Service’s Office of Inspector General (OIG) has produced more than 30 white papers on technology-related topics. We grouped these papers into four categories: mail innovations, data analytics, autonomous technologies, and intelligent infrastructure (Figure 1). In this body of work, we sought to identify ways new technologies could increase efficiency in postal operations, provide a better customer experience, generate new revenue, or keep the Postal Service relevant in the digital age.

The objective of this paper is to revisit some of the technological developments discussed in OIG white papers over the past decade. We assess which remain relevant today, where the Postal Service has implemented or piloted new technology, and which are important for the Postal Service to consider for implementation in the future.

As part of our analysis of the current and future relevance of the technologies we interviewed industry experts and Postal Service management.¹ On March 23, 2021, we hosted an event, “Step into Tomorrow: The U.S. Postal Service and Digital Technologies,” with panelists representing the Postal Service and IBM. The purpose of the event was to discuss the future of technological innovation in the postal industry.

¹ For more information on the methodology, please see [Appendix A](#).

FIGURE 1: THE OIG’S PAST PAPERS FOCUSED ON FOUR MAJOR TECHNOLOGY AREAS



Source: OIG analysis.

Additionally, we wanted to gain insights into the Postal Service’s planned implementation and use of digital technologies in the decade ahead. We reviewed the Postal Service’s recently released “Delivering for America: Our Vision and Ten-Year Plan to Achieve Financial Sustainability and Service Excellence” (hereinafter “10-year plan”).² Finally, we asked industry experts to identify technologies they see as having substantial promise in the near future.

The Adoption of Key Emerging Technologies by the Postal Service

We reviewed past OIG research on emerging technologies to identify which ones have been embraced by the Postal Service. The Postal Service has focused its implementation efforts on two technology categories: mail innovations and data analytics tools. For each category, we provide a brief overview of the technologies, past OIG research, the Postal Service’s adoption of the technologies, and experts’ views on its importance.

“The Postal Service has focused its implementation efforts on two technology categories: mail innovations and data analytics tools.”

Mail Innovations

In past white papers, we discussed opportunities to increase the value of mail by bringing it into the digital age. Mail innovation is not a single technology, but rather the combination of tools that improve the value of mail to recipients and enhance the overall quality and effectiveness of mail sent by postal customers. OIG white papers highlighted innovations that illustrated how technologies support the integration of digital and physical advertising and

improve customer interface with the Postal Service. The postal representatives interviewed by the OIG for this paper referenced Informed Delivery (ID) and Quick Response (QR) codes as two innovations that help facilitate the integration of direct mail with digital channels.

Informed Delivery (ID)

In 2017, the U.S. Postal Service introduced ID, a free feature which allows customers to digitally preview their letter mail and package delivery via email notification – the “Daily Digest” – or through an online dashboard or mobile application. In prior research, the OIG identified ID as an important feature of the Postal Service’s mobile app.³ The OIG also assessed ID interactive campaigns. ID interactive campaigns offer mailers additional functionality, such as enhancing mailpiece images and allowing mail recipients to act on a mailpiece immediately by clicking on a related link.⁴ The OIG identified opportunities for the Postal Service to further enhance ID by adding features allowing better integration of ID with digital advertising channels.⁵

ID currently has more than 39 million subscribers, and USPS continues to promote its use. For example, USPS offers an “Informed Delivery Promotion,” a seasonal, two percent discount on postage for business mailers who launch an ID interactive campaign.⁶ The Postal Service actively works with mailers to identify new features that can improve its use as a marketing tool.

QR Codes

A QR Code is a black-and-white image that users can scan using the camera on their smartphone or tablet to automatically open a specific website, as shown in [Figure 2](#). When used in marketing, it is a simple and effective way to bring customers to a seller’s website and provide them in-depth information about available products and services.

2 U.S. Postal Service, *Delivering for America: Our Vision and Ten-Year Plan to Achieve Financial Sustainability and Service Excellence*, March 2021, https://about.usps.com/what/strategic-plans/delivering-for-america/assets/USPS_Delivering-For-America.pdf.

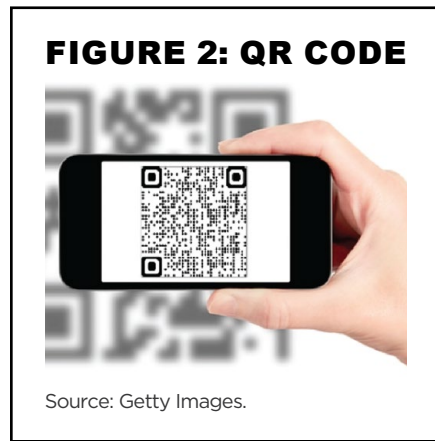
3 U.S. Postal Service Office of Inspector General, *Marketers’ Perceptions of Informed Delivery and Informed Visibility*, RISC-WP-21-005, June 9, 2021, <https://www.uspsig.gov/sites/default/files/document-library-files/2021/RISC-WP-21-005.pdf>.

4 U.S. Postal Service, *Informed Delivery Interactive Campaign Guide*, 2021, <https://www.usps.com/business/pdf/informed-delivery-interactive-campaign-guide.pdf>.

5 U.S. Postal Service Office of Inspector General, *Marketers’ Perceptions of Informed Delivery and Informed Visibility*, RISC-WP-21-005, June 9, 2021, <https://www.uspsig.gov/sites/default/files/document-library-files/2021/RISC-WP-21-005.pdf>.

6 U.S. Postal Service, “Promotions & Incentives,” *USPS.com*, <https://www.usps.com/business/promotions-incentives.htm>.

The OIG studied marketing mailpieces containing QR codes to understand how they might enhance the mail's value to the sender.⁷ The OIG examined the use of QR codes as part of a money order app that would make the process of



purchasing a foreign or domestic money order both faster and more accurate.⁸ In addition, the OIG noted that the use of QR codes was particularly attractive to so-called “digital natives”, i.e., those born after 1980.⁹

The COVID-19 pandemic changed customers' interaction with and perception of QR codes. At the OIG's event, Postal Service management mentioned the increased use of QR codes during the pandemic, noting that QR codes are an easy and quick way to access digital content (for

example, restaurant menus). The surge in the number of digital online sessions prompted by QR codes – which grew from 2.5 billion in 2019 to 3.7 billion in 2020 – illustrates the acceleration of this trend.¹⁰ “[QR codes] matter because they are the bridge between the physical and digital world,” said Gary Reblin, Vice President of Innovative Business Technologies. “Now, when anybody receives a mailpiece with a QR code they know how it works. It is the norm, and it is a huge benefit for the Postal Service.” At OIG's technology event, Chris Karpenko, Director of Brand Marketing, said “The next level of QR codes may involve smart devices with image recognition that pick up on things embedded in an image,

rather than a black-and-white code, to deliver a customized experience.” He called these “QR plus”.

“Changing customer expectations and increased competition for last-mile delivery have resulted in a demand for innovative solutions.”

Data Analytics

In past research, the OIG reviewed the possible applications of different kinds of postal data and noted that more accurate tracking information for mail could increase operational efficiencies, prevent service failures, optimize new costing methods, and better detect missing mail.¹¹ We also assessed postal applications of artificial intelligence (AI), especially as a tool to improve customer service.

Analytics to Support Visibility

The Postal Service collects massive quantities of data on an ongoing basis. A challenge is putting this data to its most valued use to improve the customer experience (for example, Informed Visibility (IV), and package tracking, among others). Changing customer expectations and increased competition for last-mile delivery have resulted in a demand for innovative solutions. Data-driven advanced algorithms and analytics can play a critical role in the design of these new, last-mile solutions. Postal infrastructure is – and will continue to be – supported and enhanced by the use of big data across the supply chain.

7 Advertising Mail Innovations, RARC-WP-16-016, September 6, 2016, <https://www.uspsoid.gov/sites/default/files/document-library-files/2016/RARC-WP-16-016.pdf>.

8 U.S. Postal Service Office of Inspector General, *Mobile Opportunities: Smart Services for Connected Customers*, RARC-WP-15-015, August 31, 2015, https://www.uspsoid.gov/sites/default/files/document-library-files/2015/rarc-wp-15-015_0.pdf.

9 U.S. Postal Service Office of Inspector General, *Enhancing Mail for Digital Natives*, RARC-WP-14-001, November 18, 2013, https://www.uspsoid.gov/sites/default/files/document-library-files/2015/rarc-wp-14-001_enhancing_mail_for_digital_natives_0.pdf.

10 A “digital online session” refers to a single user visit to a website, regardless of the number of individual activities or transactions taking place during that visit. Emily Von Sydow, “What is a Session? A Look at the Google Analytics Change,” *Digital 2 Business*, May 3, 2014, <https://www.business2community.com/seo/session-look-google-analytics-change-0863538#:~:text=A%20session%20is%20defined%20as,time%20frame%20on%20your%20website.&text=Meaning%20whatever%20a%20user%20does,they%20leave%20equals%20one%20session>.

11 U.S. Postal Service Office of Inspector General, *Enriching Postal Information: Applications for Tomorrow's Technologies*, RARC-WP-14-006, May 23, 2014, https://www.uspsoid.gov/sites/default/files/document-library-files/2015/rarc-wp-14-006_0.pdf.

The Postal Service transports millions of mailpieces and packages through its network every day. To track where the mail is, how quickly it is travelling to its delivery destination, and identify any problems in the network, the Postal Service scans mailpieces at several points along its route. The network is vast, so the collection and utilization of this information is best harnessed through data analytics. In 2006, the Postal Service launched the Intelligent Mail barcode (IMb), which allowed the tracking of a single, barcoded piece of letter mail for the first time.

In 2018, the Postal Service launched the IV – Mail Tracking & Reporting (IV-MTR) platform, which builds on the IMb. IV-MTR is a mail tracking component and analytics tool the Postal Service currently provides for its commercial customers through an online app.¹² Offered as a free service for customers, IV-MTR harnesses scan data to provide marketing mailers and intermediaries with near real-time data on the location of their mail in the processing and delivery network and its expected delivery date.¹³ IV-MTR provides detailed insight into the mailstream by combining actual scans with assumed and logical handling events for letters and flats, as well as handling units and containers.¹⁴

In interviews, representatives of a U.S. shipper and a shipping platform both prioritized the need to improve the visibility into processing and delivery issues and therefore saw enhanced tracking as an extremely powerful technology. One large shipper welcomed the Postal Service's use of GPS-based solutions for the tracking of trucks and containers. In his opinion, the long-term future of package tracking could even reside in smart packages tracked through their radio frequency identification (RFID) labels, alleviating the need for scans.

International experts, who discussed future trends in the global postal industry, highlighted other aspects of big data. One expert focused on delivery route optimization, which he called a “work in progress”. He mentioned dynamic routing — the application of real-time analytics — as the next frontier. In the future, real-time optimization may enable a better allocation of delivery resources (vehicles, drivers) and optimal vehicle loading. Other experts mentioned predictive analytics and its increased use for operations and workforce planning. Collected data can be used to more efficiently allocate both human and capital resources.

Most experts interviewed reiterated the growing importance of data analytics in the past few years and in the near-term future. Continued development and implementation of tools reliant on analytics could make the Postal Service more competitive and improve the quality of the products offered to their customers.

AI to Improve Customer Interface

AI is the development of computer systems that can perform tasks that normally require human intelligence. Examples of tasks that computers can be “taught” to perform are visual perception, speech recognition, decision-making, and foreign language translation. AI was touched upon in our prior research as a promising area of opportunity. We noted that an AI chatbot could assist customers with setting the day and time of their deliveries.¹⁵

“Most experts interviewed reiterated the growing importance of data analytics in the past few years and in the near-term future.”

¹² U.S. Postal Service, “Informed Visibility Mail Tracking and Reporting,” <https://iv.usps.com/#/landing>.

¹³ The platform provides “predicted,” “expected,” and “anticipated” delivery date estimates. For definitions, see U.S. Postal Service, “Informed Visibility Orientation,” (presentation, June 2020), https://postalpro.usps.com/mnt/glusterfs/2020-06/IV-MTR%20Orientation_v1.1%20June2020.pdf, p.53, and Angelo Anagnostopoulos, “Informed Visibility: What It Is, What It Provides, and Why You Should Use It,” *Mailing Systems Technology*, August 12, 2019, <https://mailingsystemstechnology.com/article-4534-Informed-Visibility-What-It-Is-What-It-Provides-and-Why-You-Should-Use-It.html>.

¹⁴ An assumed event is based on the assumption that when, for example, a container is scanned, the mailpieces nested in it are all there. IV-MTR creates a logical delivery event after the final scan of a mailpiece has been recorded and data from the letter carrier's GPS device show the carrier has crossed into a ZIP+4 geo-fence near the delivery address. While there is not an actual delivery scan, IV-MTR shows the mailpiece as “expected to have been delivered.” U.S. Postal Service, “Informed Visibility Orientation,” (presentation, May 2021), https://postalpro.usps.com/mnt/glusterfs/2021-05/IV-MTR%20Orientation_v1.2%20May2021.pdf.

¹⁵ U.S. Postal Service Office of Inspector General, *Coordination and Optimization Technologies and Postal Applications*, RARC-WP-18-014, September 6, 2018, <https://www.uspsaig.gov/sites/default/files/document-library-files/2018/RARC-WP-18-014.pdf>, p.14.

In another paper, we highlighted the key role that AI may play in ensuring that autonomous delivery vehicles properly handle unusual or dangerous situations.¹⁶

The Postal Service already uses AI in different ways. In the retail space, the Postal Service’s Artificial Intelligence Virtual Agent (AIVA) – a chatbot – is being used in call centers to assist customers. In addition to AIVA, the Postal Service has a pilot with a state Department of Motor Vehicles involving transactions with intelligent self-service kiosks in post offices. AI and machine learning have current applications in postal operations, as well. USPS is experimenting with AI edge servers located at its processing facilities. Combined with optical character recognition, these systems analyze the billions of images each facility generates to provide insights that can, for example, identify missing packages much faster.¹⁷ One U.S. shipper interviewed mentioned this pilot and commended the Postal Service for its efforts in this area.

The Postal Service’s Future Technology Priorities

The Postal Service’s 10-year plan highlights the technologies it intends to leverage in the coming years.¹⁸ We reviewed the plan to understand the Postal Service’s future technology priorities and how they compare with the top technologies that our experts identified.

Technology Initiatives are a Crucial Component of the 10-Year Plan

The stated goal of the 10-year plan is to establish clear strategies to quickly achieve financial sustainability and service excellence at the Postal Service. Technologies are a critical component of six of the plan’s 11 key strategies and related sub-strategies. The planned investment in technology over the next 10 years represents about \$2.4 billion, or 6 percent, of the total critical strategic investment outlined in the plan.¹⁹ Table 1 summarizes the technology initiatives listed in the plan and the strategies they support.

Table 1: The 10-year Plan’s Main Technology Initiatives

Key Strategy	Sub-Strategy	Supporting Technology Initiatives
A bold approach to growth, innovation, and continued relevance	Launch new parcel products (USPS Connect) and e-commerce solutions	As part of the USPS E-commerce Marketplace initiative, create branded online storefronts for local retail businesses on the usps.com website.
	Strengthen the value of mail	Develop new tools that leverage mail data and enable better integration with digital media channels. Improve the Informed Delivery and Informed Visibility platforms.
Best-in-class mail and package processing	Expand and align facility footprint and size to market demand	Produce effective analytic tools and dashboards to inform the optimal configuration of sorting equipment, facility consolidation, and processing operations.
	Leverage emerging technologies to drive predictable, precise performance	Provide employees and managers with new and emerging technology to help improve daily and long-term decision-making operational performance, including intelligent workload planning, real-time management visibility, sensor technology, and predictive modeling.
	Implement enhanced product tracking	Leverage technology to track mail and packages in near-real time. Provide business senders with improved insights into their mail.
Fully optimized surface and air transportation	Deploy state-of-the-art logistics platform	In particular, integrate supplier and carrier collaboration tools, and implement near real-time visibility for third-party carriers.

¹⁶ U.S. Postal Service Office of Inspector General, *Autonomous Vehicles for the Postal Service*, RARC-WP-001, October 2, 2017, <https://www.uspsoidg.gov/sites/default/files/document-library-files/2017/RARC-WP-18-001.pdf>, p.5.

¹⁷ Chuong Nguyen, “How the USPS uses Nvidia GPUs and A.I. to track missing mail,” Digital Trends, May 6, 2021, <https://www.digitaltrends.com/computing/usps-ai-at-the-edge-gpu-computing/>.

¹⁸ The 10-year plan also provides for accelerated investments in technologies not covered in our paper, such as package sorting equipment.

¹⁹ The 10-year plan references future investment in autonomous material handling technologies, advanced transportation management systems, carrier delivery scanners, route optimization software, expanded government and digital services, contactless and locker technologies, the Informed Delivery platform, and enhanced cyber security.

Key Strategy	Sub-Strategy	Supporting Technology Initiatives
Best-in-class delivery operations	Invest to best equip carriers	Modernize delivery platforms to better use data to drive precision in delivery operations. Equip carriers with state-of-the-art mobile devices to improve operations and provide enhanced digital services to customers.
New delivery vehicles	Next Generation Delivery Vehicles	Equip new vehicles with telematics data for predictive maintenance and operational benefits. ²⁰
A modernized post office network	Transform retail locations	Expand self-service and digital options.
	Expand public trust services	Partner with all levels of government to become the storefront for government services and generate new revenue.
	Retail hubs for local business growth	Improve parcel locker services to meet increased ecommerce customer needs.

Source: OIG Analysis of the Postal Service's 10-year plan.

The Plan Prioritizes Some Technologies over Others

The 10-year plan identifies certain technologies as higher priority than others. For example, mail and parcel innovations, as well as data analytics tools are among the main pillars of the plan. They support several of its key strategies, such as:

- **Digital platforms enhancing the value of mail and parcel products:** Examples include the ID platform and the creation of online storefronts for local retailers on usps.com, which could make it easier for merchants to sell to local customers.

- **Big data analytics, AI, and machine learning:** Throughout the plan, the Postal Service calls for the increased use of more sophisticated data analytics that improve processes by enabling “predictable, precise performance”. Examples include:
 - Helping management optimize processing and delivery operations and making short-term and long-term decisions on workload planning and transportation management; and
 - Providing near-real-time visibility and tracking of mail and packages. The plan mentions internal benefits – such as visibility data to monitor third-party carriers – and benefits to senders – such as providing them with improved insights into their mail.

The experts we interviewed agreed with the importance of the priorities identified in the Postal Service’s plan. In particular, experts identified data analytics tools as the most impactful technologies for postal operators in the future (see [Appendix B](#) for more information).²¹

Other important technologies that had a more limited role in the 10-year plan were:

- **Secure digital technologies to support government services:** The Postal Service plans on partnering with all levels of government to expand identity services, including passport processing, fingerprint capture, biometric data capture, and in-person proofing. The plan does not reference blockchain explicitly, but this is often one of the underlying technologies enabling secure identity management; and
- **IoT:** IoT was minimally mentioned in the 10-year plan, which simply stated that next-generation delivery vehicles would include telematics – an application of IoT – for “predictive maintenance and operational benefits”.²² Although not specifically mentioned in the plan, the Postal Service is currently conducting pilots using data sensors in vehicles to measure broadband coverage.

²⁰ Telematics is the combined use of sensors, mobile communications, and navigation and IT systems for application in road vehicles.

²¹ We did not define “impact” and let them provide a qualitative assessment based on their knowledge and perception.

²² USPS 10-year plan, p. 32.

Experts indicated that additional technologies, not highlighted in the 10-year plan, are likely to grow in relevance for postal operators in the near future. These technologies are discussed in the next section.

Emerging Technologies with Future Potential

Several emerging technologies analyzed in past OIG reports have not yet had a major impact on the Postal Service, either in terms of revenue or cost efficiencies. Below, we discuss three that experts believe will become increasingly impactful in the coming years: blockchain, IoT, and autonomous vehicles.

Secure Solutions: Blockchain

As a relatively new innovation, blockchain technology holds the potential to disrupt services that traditionally have required intermediaries. Blockchain is generally viewed as an effective and secure means of transferring any type of information.

Blockchain technology originally evolved as a means of allowing peers to exchange money directly without the need for a traditional financial intermediary, lowering the cost and increasing the speed of transactions. Recently, blockchain has proven to be much more than a way to transfer funds. At its core, blockchain technology is a way to record and transfer any kind of information and transaction in a fast, tracked, and secure way. As such, its applications include identity authentication, property transfers, the execution of contracts, network and device management, and records management.

A 2016 OIG report discussed the potential postal applications of blockchain in financial transactions, supply chains (including across international borders), and identity verification.²³ The report highlighted how blockchain technologies could potentially increase customer value and enhance cost efficiencies.

23 U.S. Postal Service Office of Inspector General, *Blockchain Technology: Possibilities for the U.S. Postal Service*, RARC-WP-16-011, May 23, 2016, <https://www.uspsoig.gov/sites/default/files/document-library-files/2016/RARC-WP-16-001.pdf>.

24 According to the patent application, a registered voter would receive a QR code by mail. When casting their ballot, the voter's identifying information is separated from their vote, ensuring anonymity. Votes are stored on a blockchain, which is certified by election officials. The patent was filed too late to be used in the 2020 election. "US Postal Service Files Patent for Combined Mail and Blockchain Voting System," *PostalTimes*, September 21, 2020, <https://www.postaltimes.com/postalnews/u-s-postal-service-files-patent-for-combined-mail-and-blockchain-voting-system/>.

25 Vertrius, "USPS Certifies CaseMail as First Blockchain Generated ePostage." *PRNewswire*, April 13, 2021, <https://www.prnewswire.com/news-releases/usps-certifies-casemail-as-first-blockchain-generated-epostage-301267842.html>.

26 Ahmed Mahboob Musabih, "Dubai Customs introduces blockchain-based platform to facilitate cross-border e-commerce," *World Customs Organization News*, February 2020, <https://mag.wcoomd.org/magazine/wco-news-91-february-2020/dubai-customs-introduces-blockchain-based-platform-to-facilitate-cross-border-e-commerce/>.

In 2020, the Postal Service filed for a patent to develop blockchain technology in election voting systems.²⁴ In 2021, it certified CaseMail, an ePostage provider that stores data about the shipment and mailing history on the blockchain, thus creating a verifiable chain of custody for digital and physical assets.²⁵ While the 10-year plan does not explicitly mention blockchain, the Postal Service is considering potential applications of blockchain for the [REDACTED]

[REDACTED] – and vote by mail.

According to four of the five international experts we spoke with, blockchain has significant potential and could be a game changer in the postal market. The international experts said the complexity of the technology, regulatory

hurdles, and the absence of convincing business cases are among the reasons for its slow implementation. The experts highlighted emerging applications, such as the collaboration between a post and domestic third-party delivery partners to assign parcel deliveries in the most efficient way. Representatives of international posts also

mentioned collaboration within

international supply chains. For example, Deutsche Post DHL has piloted blockchain-based transactions with a national customs agency.²⁶ The idea was to allow each of the entities involved in a transaction – the shipper, the transporter, and government authorities – to access the same data related to an ecommerce

“Experts indicated that additional technologies, not highlighted in the 10-year plan, are likely to grow in relevance for postal operators in the near future.”

transaction and expedite goods' movements. The US experts interviewed seemed less enthusiastic about international shipping applications. While agreeing on the need for smooth international supply chains, they said this could be achieved through traditional technologies.

Another emerging application of blockchain is in the creation of crypto stamps. Two countries (Austria and Croatia) and one territory (Gibraltar) have already issued such stamps. A crypto stamp looks like a regular stamp and can be used for postage purposes, but it simultaneously exists digitally within the blockchain.²⁷ They may be used for postage but can also be retained as a digital collectible. In other words, the blockchain-based digital image of the stamp would have value as a unique item in its own right. For some experts, the business value of crypto stamps remains uncertain, but the Universal Postal Union believes that they could help revitalize philately in a digital world.

The Internet of Postal Things

With its massive infrastructure of facilities, vehicles, and workers located in nearly every community across the nation, the U.S. Postal Service stands uniquely positioned to collect and disseminate data of vital importance to a wide variety of interested parties. The term Internet of Postal Things (IoPT) refers to the placement of sensors on USPS facilities, vehicles, machines, and other infrastructure components in order to collect data that can be shared with interested parties, such as local governments.

Potential benefits to be gained include generating new revenue and contributing to the Postal Service's mission of binding the nation together. IoPT enables the Postal Service to develop a new range of data collection services for private and public entities by leveraging sensors placed on postal assets, achieves operational efficiencies by allowing greater control over postal infrastructure, and facilitates better data-based decision making.

The OIG identified numerous IoPT applications in transportation and logistics, such as enabling monitoring the status and performance of vehicles.²⁸ The

OIG noted that the Postal Service could benefit from creating smart buildings – structures that integrate sensors to, for example, lock doors automatically or turn off lights when they do not detect movement for a certain amount of time. The OIG said that IoPT devices deployed on delivery vehicles could collect information as well.²⁹

“Potential benefits to be gained include generating new revenue and contributing to the Postal Service’s mission of binding the nation together.”

Experts said that most IoPT applications have started to gain traction in the past three or four years within the logistics industry, coinciding with an overall decline in the cost of sensors. As mentioned in the previous section, the 10-year plan references the Postal Service's growing interest in IoPT through its new delivery vehicles. According to Postal management, the vehicles could be retrofitted with the latest innovations in IoT sensors. Among the potential applications identified by postal management in subsequent interviews are imaging, climate sensing, monitoring road conditions, and measuring broadband signal strength. In its discussion with the OIG, Postal Service management said that the pilots were examples of how USPS is testing new models – new ways of doing business with partners while identifying potential sources of revenue. Postal management also noted that any data collected would need to satisfy a clearly identified postal need first; selling the data to others would be a secondary consideration.

Autonomous Technologies

Autonomous technologies include robots, drones and vehicles that have the ability to partially or fully operate without human involvement. These technologies have the potential to reduce labor costs, improve efficiency, and enable new delivery models.

²⁷ On the blockchain, stamps are represented as so-called irreplaceable or non-fungible token (NFT) which potentially have collectible value, just like classic stamps.

²⁸ U.S. Postal Service Office of Inspector General, *The Internet of Postal Things*, RARC-WP-15-013, August 3, 2015, https://www.uspsoidg.gov/sites/default/files/document-library-files/2015/rarc-wp-15-013_0.pdf.

²⁹ *Ibid.*

Autonomous Mobile Robots (AMRs)

Robots can operate independently (autonomous robots) or can work alongside a human (delivery robots). Use of robots can enhance labor cost efficiencies. The OIG's past work predicted that the new generation of smaller, nimbler AMRs automating the movement of mail in plants could help USPS save on work hours,

“The Postal Service tested self-driving technology in a Texas pilot program in 2019.”

speed up processing, and use space more efficiently.³⁰ The Postal Service is currently using Autonomous Guided Vehicles inside of 26 postal facilities. Autonomous Guided Vehicles are similar to AMRs but are primarily intended to transport cargo from one location to another, in this case within a sorting facility.

The use of AMRs in last mile delivery — working alongside a mail carrier helping to carry heavy items — is technologically and economically immature in the near term. While

the Postal Service is not utilizing AMRs for delivery, it may benefit from continuing to monitor the technology's technical, economic, and regulatory progress.

Drones

The USPS announced in a 2019 request for information that it would explore the use of Unmanned Aircraft Systems (drones) “for delivery of mail and to collect geodetic/spatial data to improve all autonomous vehicle performance.”³¹ In the request for information, USPS asked drone developers for insight into potential future drone service.

According to the Postal Service, “it [was] investigating the feasibility of using drones as an integrated part of its vehicle delivery fleet, as well as to provide image and other data collection services.”³² Postal management told the OIG that not much usable information resulted from the request for information. Serious issues — such as significant difficulties navigating drones in windy conditions — mean that their potential usage by the Postal Service in the near-term future is highly doubtful. Only one postal industry expert interviewed mentioned delivery drones, but they did not see them being deployed in the near future.

Autonomous Vehicles for Long-Haul Transport

Self-driving vehicles could potentially be more cost efficient and safer for long-haul mail transport than those operated by humans. Autonomous vehicles can enhance cost efficiencies, since the amount of time these trucks could spend on the road each day is greater than that for human drivers. In past work, the OIG noted that while there are barriers to adoption, USPS could test the technology, gradually automate vehicles where it makes sense, and refine its autonomous vehicle strategy as technology, regulation, and public perception evolves.³³

The Postal Service tested self-driving technology in a Texas pilot program in 2019. Using customized Peterbilt self-driving trucks, TuSimple conducted five round trips over two weeks to U.S. Postal Service distribution centers between Phoenix and Dallas, a distance of more than 1,000 miles. The trucks carried a safety engineer and a driver in order to monitor vehicle performance and ensure public safety.³⁴ All deliveries were made ahead of schedule, and there were no reported traffic incidents.³⁵

Viewpoints regarding the future of autonomous vehicles in the postal sector were cautiously optimistic. Although they hold significant potential for the

30 U.S. Postal Service Office of Inspector General, *Autonomous Mobile Robots and the Postal Service*, RARC-WP-18-006, April 9, 2018, <https://www.uspsoig.gov/sites/default/files/document-library-files/2019/RARC-WP-18-006.pdf>.

31 Fedbizopps, “USPS Unmanned Aircraft System (UAS) – USPS-RFI-UAS,” *FBO Daily*, September 25, 2019, https://www.postaltimes.com/wp-content/uploads/2019/09/USPS_UAS_RFI_Final.pdf.

32 *Ibid.*

33 U.S. Postal Service Office of Inspector General, *Autonomous Vehicles for the Postal Service*, RARC-WP-18-001, October 2, 2017, <https://www.uspsoig.gov/sites/default/files/document-library-files/2017/RARC-WP-18-001.pdf> and U.S. Postal Service Office of Inspector General, *Summary Report: Public Perception of Self-Driving Technology for Long-Haul Trucking and Last-Mile Delivery*, RARC-WP-17-011, September 5, 2017, <https://www.uspsoig.gov/sites/default/files/document-library-files/2017/RARC-WP-17-011.pdf>.

34 Neil Abt, “TuSimple Begins Self-Driving Pilot Program with Postal Service,” *FleetOwner*, May 22, 2019, <https://www.fleetowner.com/technology/autonomous-vehicles/article/21703847/tusimple-begins-selfdriving-pilot-program-with-postal-service>.

35 “Murray Slovick, “TuSimple Completes Self-Driving Truck Test for the USPS,” *ElectronicDesign*, June 24, 2019, <https://www.electronicdesign.com/markets/automotive/article/21808184/tusimple-completes-selfdriving-truck-test-for-the-usps>.

future, postal operators will need to overcome regulatory and technical barriers before autonomous trucks are ready for widespread implementation. Postal management told us that while the pilot program was successful, USPS won't adopt the technology until a human copilot in the truck can ride along blindfolded.

Implementing Innovation Has Its Challenges

Several challenges may affect the Postal Service's effort to test and deploy technological innovation. While some of them are common to other players in the postal industry, such as regulation and technology complexity, others, discussed below, are specific to the Postal Service.³⁶

Several Issues Can Potentially Hinder the Postal Service's Adoption of Technological Innovation

The OIG's past digital papers and our research have identified the following issues as limiting the ability of the Postal Service to implement emerging technologies.

- *Prohibition on providing non-postal services.*³⁷ The prohibition limits the application of emerging technologies to areas such as operations or customer experience, excluding the possibility to use them to create new services and generate new revenues. An example is the Internet of Postal Things. While the Postal Service can collect data through the application of sensors on its vehicles, packaging this data as a product and selling it to the private sector for purposes not directly related to its core business would likely not be allowed under the current regulation.
- *Limited investment in information technology and research and development.* The Postal Service has stated that inadequate investment capacities in information technology (IT) infrastructure was one its main operational risks.³⁸

The Postal Service recently reduced its investment spending, which, it lamented, may have given an advantage to competitors "pursuing advanced, competing technologies and equipment".³⁹ The Postal Service only spent \$18 million in research and development in FY 2020 — or about 0.02 percent of its revenue versus 0.08 percent in FY 2018.⁴⁰

- *Restrictions to testing new concepts.* Market tests require an extensive notification and approval process with the Postal Regulatory Commission.⁴¹ The Postal Accountability and Enhancement Act sets conditions for the type of pilots that can be conducted as part of market tests. These conditions may limit the Postal Service's ability to effectively compete with unregulated private competitors or divert USPS experts' and management's time from strategy to regulatory compliance.
- *Limited ability to invest in technology companies.* Unlike private sector competitors and international posts, the Postal Service does not invest in startups. As a result, the Postal Service must spend more time in internal product development than it otherwise would, thus reducing its ability to quickly gain new technological expertise and attract new talent. Postal Service management told the OIG that managing acquired startups and integrating them into an existing business was not within their purview.

“The Postal Service has stated that inadequate investment capacities in information technology (IT) infrastructure was one its main operational risks.”

³⁶ Concord Law School, "Overcoming Drone Delivery Regulations in the Time of COVID-19," *Purdue University Global*, November 24, 2020, <https://www.concordlawschool.edu/blog/news/drone-delivery-regulations/>, and Master List of Drone Laws (Organized by State & Country), <https://uavcoach.com/drone-laws/>.

³⁷ The Postal Act defines a non-postal service as "any service that is not a postal service defined in 39 U.S.C. §102(5)." In turn, 39 U.S.C. §102(5) defines a postal service as "the delivery of letters, printed matter, or mailable packages, including acceptance, collection, sorting, transportation, or other function ancillary thereto." Under PAEA, the Postal Service can only provide the non-postal services it offered as of January 1, 2006.

³⁸ United States Postal Service, "2020 Report on Form 10-K — United States Postal Service," November 13, 2020, <https://about.usps.com/what/financials/10k-reports/fy2020.pdf>, p.15. The other categories of investments for which insufficient capital investment creates major risks are facilities, delivery vehicles, and mail processing equipment.

³⁹ *Ibid.*

⁴⁰ *Ibid.*

⁴¹ See 39 U.S. Code § 3641 - Market tests of experimental products and 39 CFR part 3035 – Rules for market tests of experimental products.

The Postal Service Has Taken Specific Steps to Foster Innovation

The Postal Service has taken steps to enhance its ability to innovate faster and more effectively more effectively, such as:

- *Establishing practices to identify and evaluate new technologies.* The Postal Service conducts studies to identify disruptive emerging technologies and evaluate their impact, threat, or business opportunity. It also assesses how it can take advantage of them to improve products.
- *Implementing market tests and operational tests.* While market tests are subject to an extensive approval process, Postal Service management told us they use another category of pilots with fewer requirements: operational tests. By utilizing operational tests, the Postal Service can more quickly determine whether to go ahead with a particular technological innovation.⁴²
- *Collaborating with startups.* Postal management told us that a very large organization, such as the Postal Service, cannot act with the agility of a startup. However, collaborating and interacting with startups, which are at the forefront of innovation, helps the Postal Service understand the future evolutions of new technologies and speed up adoption of innovations. Startups often come up with simple solutions to problems more effectively than large suppliers, because they are less risk averse and can “fail fast.” While it does not acquire startups, the Postal Service collaborates with them and seeks to identify early adopters of promising technologies. For example, it is involved with Plug and Play, a corporate innovation platform that connects startups to large companies. Postal management told the OIG that on the one hand, the Postal Service’s size and scope are among the challenges limiting its ability to deploy emerging technologies internally. On the other hand, its size and scope allow it to influence the direction of postal innovation externally. The work of postal partners, startups, and innovators is often driven

by the desire to develop new solutions that will be embraced by the Postal Service.

Other barriers to innovation stemming from legal restrictions can be and have been lowered through Congressional action. For example, pending legislation would allow USPS to partner with any state, local, or tribal government, as well as other federal agencies, to provide a wider range of non-commercial government services creating “enhanced value to the public.”⁴³

These factors have helped the Postal Service address the barriers noted previously. In addition, circumstances outside of the Postal Service’s control – most notably, the COVID-19 pandemic – have served to hasten the pace of innovation.

The Pandemic Has Contributed to Lowering Barriers to Innovation

The COVID-19 pandemic indirectly lowered barriers to innovation, thus speeding up the digitization of society.⁴⁴ New demand patterns and the operational and market disruptions caused by the pandemic forced the postal and logistics industries to launch new services and processes faster than they would have otherwise. In an emergency situation, posts managed to overcome organizational barriers impeding the adoption of innovation. According to the DHL Logistics Trends Radar report, the technologies that benefited the most from society’s increased digitization were

“New demand patterns and the operational and market disruptions caused by the pandemic forced the postal and logistics industries to launch new services and processes faster than they would have otherwise.”

42 According to the PRC, operational tests are designed to assess the Postal Service’s operational capabilities. They are more limited in duration and geographic scope than market tests and cannot generate any revenue. Market tests involve evaluating potential customer interest or marketing efforts.

43 U.S. Congress, House, *Postal Service Reform Act of 2021*, H.R. 3076, 117th Cong., 1st sess., introduced in House May 13, 2021, <https://www.congress.gov/bill/117th-congress/house-bill/3076/text?r=12&s=1#toc-H94B22855E0BC43E390C95A2EFF688444>. See §3703 (Postal Service program for state governments).

44 Michael R. Nelson, as quoted in “Experts Say the ‘New Normal’ in 2025 Will Be Far More Tech Driven, Presenting More Big Challenges,” *Pew Research Center*, February 18, 2021, <https://www.pewresearch.org/internet/2021/02/18/experts-say-the-new-normal-in-2025-will-be-far-more-tech-driven-presenting-more-big-challenges/#:~:text=Experts%20Say%20the%20%27New%20Normal,Big%20Challenges%20%7C%20Pew%20Research%20Center,p.45>.

wearable technology, warehouse robotics and automation, contactless delivery options such as parcel lockers, and in-app signature software.⁴⁵

At the OIG event, a Postal Service representative said that as a result of the pandemic, USPS adopted a new feature that recognizes the type of device an online customer is using (laptop vs. mobile, for example), and adapts to the experience of that device. As an expert told us, COVID-19 was a wakeup call – postal operators should take advantage of lessons learned to innovate in new business models. However, it is not yet clear whether good practices that posts may have adopted to speed up implementation of innovations will continue once the pandemic subsides.

Conclusion

Technological innovation is ongoing and advancing at an increasingly faster rate. While some postal industry innovations may not currently have practical applications or may need time to mature, others hold tremendous potential to disrupt the status quo to the benefit of businesses and consumers alike, now or in the near-term future.

Despite facing constraints that other competitors in the postal marketplace do not, the Postal Service has managed to integrate many of the latest technological innovations into its business practices to improve the efficiency and quality of the service it provides its customers. Mail innovations and data analytics tools are successful examples. Continuing the effort to mitigate the challenges that still affect the Postal Service's ability to implement technologies will be key to the achievement of the innovation goals included in its 10-year plan.

Ongoing implementation of technological innovations will need to be a priority going into the future. Integrating technology into operations will require creativity and forward-looking vision, in addition to dedication and commitment. The potential benefits – for USPS and its customers – are substantial.

⁴⁵ DHL, *The Logistics Trends Radar*, 5th Edition, DHL Trends Research, 2021, <http://www.dhl.com/content/dam/dhl/global/core/documents/pdf/glo-core-logistics-trend-radar-5thedition.pdf> , pp.9 -10.

Appendices

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Appendix A: Additional Information

Objective, Scope and Methodology

The objective of this paper was to review technological developments discussed in OIG white papers over the past decade to answer the questions:

1. What digital technologies discussed in OIG white papers have had the greatest impact on the postal industry over the past ten years, and which has the Postal Service implemented? and
2. What digital technologies could be of particular importance for the Postal Service in the near future, and what are the potential benefits from and challenges to implementation and usage?

The scope of this project includes OIG white papers published from 2011 to 2020. The paper looks at the near-term future, which is defined as anything within ten years of 2021.

Our research methodology included the following:

- OIG event. The OIG hosted an event, “Step into Tomorrow: The U.S. Postal Service and Digital Technology” on March 23, 2021. In preparation for the event, we identified and reviewed all the white papers the OIG’s Research group had issued that dealt with digital technologies and classified them by theme. Speakers and panelists at the event were Adam Houck, IBM’s Global Postal Practice Leader, Gary Reblin, Vice President, Innovative Business Technologies, U.S. Postal Service and Christopher Karpenko, Director of Brand Marketing, U.S. Postal Service. The panel discussion focused on the future of technological innovation in the postal industry.

- Desk research and analysis of the 10-year plan. To answer the first research question, we conducted desk research to identify and understand the current status of the emerging technologies the Postal Service had tested or deployed in recent years. During our research fieldwork, the Postal Service issued its 10-year plan in March 2021. The analysis of the plan provided detailed insights on how USPS planned on leverage digital technologies in the coming years – our research question 2.
- Interviews with Postal Service management. We held interviews with Postal Service headquarters senior and executive management. Our objective was to update our information about their current use of emerging technologies and learn more about primary technology initiatives mentioned in the 10-year plan.
- Interviews with experts. We interviewed experts from ten postal and logistics industry organizations in order to gain insights into the past and future role of technological innovations in the postal and logistics industry — not the Postal Service specifically. We spoke with:
 - International stakeholders: Swiss Post, Deutsche Post DHL, Universal Postal Union, Postal Innovation Platform, UPIDO; and
 - U.S. stakeholders: [REDACTED]

We conducted work for this white paper in accordance with the Council of the Inspectors General on Integrity and Efficiency, Quality Standards for Inspection and Evaluation. We discussed our observations and conclusions with management on August 17, 2021 and included their comments where appropriate.

Prior Coverage

Report Title	Objective	Report Number	Final Report Date	Monetary Impact
<i>The Postal Service Role in the Digital Age Part 1: Facts and Trends</i>	To present research of the most prominent societal, behavioral, and technological tendencies affecting the postal ecosystem.	RARC-WP-11-002	February 24, 2011	None
<i>The Postal Service Role in the Digital Age Part 2: Expanding the Postal Platform</i>	To identify a set of applications the Postal Service should explore in its role to “bind the nation together.”	RARC-WP-11-003	April 19, 2011	None
<i>Digital Currency: Opportunities for the Postal Service</i>	To expand analysis of the electronic payment landscape by evaluating opportunities for the USPS to expand its money transfer services with prepaid cards.	RARC-WP-12-001	October 3, 2011	None
<i>eMailbox and eLockbox: Opportunities for the Postal Service</i>	To present a case for offering secure digital services: the “eMailbox” and the “eLockbox”.	RARC-WP-12-003	November 14, 2011	None
<i>Bridging the Digital Divide: Overcoming Regulatory and Organizational Challenges</i>	To examine current postal regulations alongside the organization of the Postal Service.	RARC-WP-12-004	November 22, 2011	None
<i>The USPS Global Card: A Conceptual Analysis of a Smart Card Platform</i>	To introduce the concept of a Postal Service-offered smart card called the “USPS Global Card.”	RARC-WP-12-006	February 13, 2012	None
<i>Meeting America’s Emerging Communications Needs</i>	To observe how new infrastructure and the Postal Service can meet America’s emerging communications needs in the Digital Age.	RARC-WP-12-009	April 27, 2012	None
<i>Digital Identity: Opportunities for the Postal Service</i>	To describe the challenges of the digital marketplace and the need for stronger identity authentication procedures.	RARC-WP-12-011	May 29, 2012	None
<i>e-Government and the Postal Service – A Conduit to Help Government Meet Citizens’ Needs</i>	To discuss the opportunity for the Postal Service to establish a multi-channel service platform that helps government agencies perform better.	RARC-WP-13-003	January 7, 2013	None
<i>Peer-to-Peer Commerce and the Role of the Postal Service</i>	To detect problems in the peer-to-peer market and discuss Postal Service solutions to these issues.	RARC-WP-13-005	January 14, 2013	None
<i>Enhancing Mail for Digital Natives</i>	To understand digital natives’ current uses and perceptions of physical mail.	RARC-WP-14-001	November 18, 2013	None

Report Title	Objective	Report Number	Final Report Date	Monetary Impact
<i>Enriching Postal Information: Applications for Tomorrow's Technologies</i>	To highlight the most relevant information-gathering technologies in the postal industry.	RARC-WP-14-006	January 13, 2014	None
<i>International Postal Big Data: Discussion Forum Recap</i>	To recap a forum hosted by the USPS OIG that discussed how postal operators could benefit from big data.	RARC-IB-14-002	May 12, 2014	None
<i>If It Prints, It Ships: 3D Printing and the Postal Service</i>	To explore the growth of the 3D printing industry and opportunities for the Postal Service.	RARC-WP-14-011	July 7, 2014	None
<i>The Internet of Postal Things</i>	To investigate how the Internet of Things could be applied to the Postal Service.	RARC-WP-15-013	August 3, 2015	None
<i>Mobile Opportunities: Smart Services for Connected Consumers</i>	To examine and suggest relevant features for the USPS Mobile app.	RARC-WP-15-015	August 31, 2015	None
<i>An Update on 3D Printing and the Postal Service</i>	To follow-up on developments in 3D printing and to examine what these changes could mean for the Postal Service.	RARC-WP-16-001	October 7, 2015	None
<i>Blockchain Technology: Possibilities for the U.S. Postal Service</i>	To better understand blockchain and identify potential areas of interest for the Postal Service.	RARC-WP-16-011	May 23, 2016	None
<i>Technological Disruption and Innovation in Last Mile Delivery</i>	To study the state of technological disruption and innovation in the last mile delivery over the next five to seven years.	RARC-WP-16-012	June 6, 2016	None
<i>Riding the Waves of Postal Digital Innovation</i>	To compare the Postal Service to major global posts in how they have navigated the waves of digital innovation.	RARC-WP-16-014	July 20, 2016	None
<i>Advertising Mail Innovations</i>	To identify opportunities in the digital integration of mail and small business solutions that the Postal Service can adopt.	RARC-WP-16-016	September 6, 2016	None
<i>The Postal Service and Cities: A "Smart" Partnership</i>	To discuss the development of smart city projects in the United States, describe the opportunities for Postal Service involvement, consider possible business models, and address implementation issues.	RARC-WP-16-017	September 26, 2016	None
<i>Public Perception of Drone Delivery in the United States</i>	To report the results of a USPS OIG nationally administered survey on public perception of drone technology.	RARC-WP-17-001	October 11, 2016	None

Report Title	Objective	Report Number	Final Report Date	Monetary Impact
<i>Summary Report: Public Perception of Self-Driving Technology for Long-Haul Trucking and Last-Mile Delivery</i>	To describe the results of a USPS OIG online survey on the public perception of self-driving vehicles.	RARC-WP-17-011	September 5, 2017	None
<i>Autonomous Vehicles for the Postal Service</i>	To identify ways the Postal Service could use autonomous vehicles in last-mile delivery and trucking.	RARC-WP-18-001	October 2, 2017	None
<i>Autonomous Mobile Robots and the Postal Service</i>	To recognize the development and potential use cases of autonomous mobile robots for the Postal Service.	RARC-WP-18-006	April 9, 2018	None
<i>Summary Report: Public Perception of Delivery Robots in the United States</i>	To share the results of a USPS OIG online survey on the public perception of delivery robot technology for independent and following self-guided robots.	RARC-WP-18-005	April 9, 2018	None
<i>Coordination and Optimization Technologies and Postal Applications</i>	To identify applications that illustrate how Coordination and Optimization Technologies could further help USPS's position for the future.	RARC-WP-18-014	September 6, 2018	None
<i>Same-Day Delivery: Implications for the U.S. Postal Service</i>	To thoroughly assess current customer interest in same-day delivery products.	RISC-WP-20-002	January 8, 2020	None
<i>Next Generation Connectivity: Postal Service Roles in 5G and Broadband Deployment</i>	To determine whether there are roles the Postal Service can play to support 5G and broadband deployment, particularly to unserved and underserved areas.	RISC-WP-20-007	September 14, 2020	None
<i>Implementing Advance Electronic Data: Challenges and Opportunities</i>	To examine the Synthetics Trafficking and Overdose Prevention (STOP) Act of 2018 and its challenges for the Postal Service.	RISC-WP-20-010	September 30, 2020	None
<i>Marketers' Perceptions of Informed Delivery and Informed Visibility</i>	To understand mailers' and intermediaries' perceptions of ID and IV and solicit their suggestions to improve these platforms.	RISC-WP-21-005	June 8, 2021	None

Appendix B: Experts' Perceptions of the Most Influential Emerging Technologies

Table 2 summarizes experts' views regarding the most influential emerging technologies. We asked two open-ended questions:

- What have been the most influential emerging technologies for the postal and logistics industry in the past years?
- What will be the most influential emerging technologies in the coming years?

Table 2: Experts' Views on the Most Impactful Postal Technologies (Past and Future)

	International Post 1	International Post 2	International Expert 1	International Expert 2	International Expert 3	U.S. Shipper	U.S. Shipping Platform	U.S. Consulting Firm
Big Data/ Artificial Intelligence/ Machine Learning	Artificial intelligence	Analytics, started with data lakes, moving to AI and ML	Crowdsourced delivery platforms	Big data, in particular predictive analytics, AI and ML	AI, ML focus on predictive analytics and dynamic routing. Evolution towards real-time optimization	Package visibility, tracking, scanning. Evolution towards enhanced, real-time visibility		Data analytics
Cloud Technologies		Cloud enabled anytime, anywhere connectivity	Cloud made adoption of innovation faster and more affordable					
Internet of Things	In particular, temperature-controlled applications	Only in the past 3-4 years	IoT for the processing of letters and parcels					
Autonomous Vehicles		Self-driving vehicles in warehouses			Drones	Drones, more advanced delivery vehicles		

	International Post 1	International Post 2	International Expert 1	International Expert 2	International Expert 3	U.S. Shipper	U.S. Shipping Platform	U.S. Consulting Firm
Blockchain		Applications in cross-border supply chains	Applications in cross-border supply chains and philately (crypto-stamps)	Applications in the last mile	Applications in the supply chain			
Mail Innovations	Direct mail platforms						Informed delivery	QR codes
Support to eCommerce			Postal eCommerce marketplaces					
Augmented Reality/Virtual Reality					Training and maintenance applications			
Other Comments	Technologies that will improve customer experience	Technologies that will improve customer experience			Innovations that support a sustainable last mile and new urban logistics models (eg. electric vehicles)		Existing technologies that bring benefits to largest shippers and improve service performance	

Legend: Impactful in the past Impactful in the future Impactful in the past and the future Respondent did not mention this technology

Source: OIG analysis.

Appendix C: Management's Comments



August 18, 2021

JENNIFER MYKIJEWYCZ
DIRECTOR, OPERATIONS CENTRAL
RESEARCH AND INSIGHTS SOLUTION CENTER

SUBJECT: Step into Tomorrow: The U.S. Postal Service and Emerging Technology
– Final Review Draft (Project Number 2021RISC007)

The Postal Service has reviewed the OIG draft report on Step into Tomorrow: The U.S. Postal Service and Emerging Technology and generally agrees with the overall findings.

A handwritten signature in black ink, appearing to read "Gary Reblin", written over a horizontal line.

Gary Reblin
Vice President, Innovative Business Technology

cc: *Manager, Corporate Audit Response Management*



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We conducted work for this white paper in accordance with the Council of the Inspectors General on Integrity and Efficiency's Quality Standards for Inspection and Evaluation (January 2012).