# International Postal Big Data: Discussion Forum Recap

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"Big data" — large datasets combined with powerful analytics — is a disruptive technology trend that has the potential to change how businesses drive innovation, efficiencies, and customer satisfaction.

On January 28, 2014, the U.S. Postal Service Office of Inspector General (OIG), in collaboration with the Universal Postal Union, hosted postal and big data experts to discuss how postal operators could benefit from big data and to learn from pilot experiments conducted in the postal sector. This Issue Brief recaps the forum discussion.

The declining cost of data collection, processing and storage, combined with the rapid accumulation of new data sources and analytics tools, allows postal operators to extract value from very large quantities of internal and external data in support of improved operational, business, and strategic decision-making.

> **Highlights**
>
> **Big data creates enormous opportunities for posts to become more agile and flexible, add value to postal operations and products, and improve interactions between posts and customers. It can also rejuvenate posts' "public service" missions.**
>
> **Successful big data strategies require not only the development of new capabilities, but also step-by-step implementation of major organizational and cultural changes.**
>
> **The first lessons from pilots conducted by postal operators confirm that big data is not "hype." Nevertheless, tomorrow's effective postal big data business model is still unfolding.**

Postal operators have already developed and are piloting innovative big data applications with the objective of streamlining processes, reducing costs, improving customer interaction, and creating new products and services.

The development of the *Internet of Things* — sensor technologies that enable physical objects to collect and communicate data via the Internet in real-time — can open up opportunities for posts that go far beyond current experimentation. For example, affixing sensors to postal trucks has often been mentioned as a way to help reduce fleet maintenance costs, optimize routes, report dead spots in mobile and wireless coverage, and detect harmful chemical agents. Data collected by such sensors would interest

more than just posts, and this information could become a basis for a new portfolio of postal services for government agencies and other public and private entities.

New big data analytics tools also give postal operators the opportunity to extract additional value from existing data. Some postal operators in Europe are opening large aggregated data sets, like national address databases or mail tracking data to innovators or city planners so they can develop new services and applications. International postal big data analytics can provide governments with valuable real-time snapshots of Gross Domestic Product (GDP) growth, global trade patterns, and demographic movements.

The success of these open data initiatives will depend on postal operators' ability to develop clear data transparency and privacy policies. In particular, posts will have to address critical questions such as who owns the data collected, whose permission is needed to collect it, and under what forms and conditions it will be disseminated.

As with all disruptive technologies, big data analytics should be deployed in incremental steps to maximize effectiveness and reduce implementation risks. Postal operators may start by collecting and analyzing data based on clear business objectives and by focusing on existing data before engaging in new big data plans. To succeed, they also need to start a multi-pronged transformation process. Engaging senior management, developing pilot tests, hiring multidisciplinary data experts, and partnering with other data providers will be key success factors. Over time, big data should be implemented across all business units and used as a key decision making tool at all levels. Nevertheless, managers should be aware of the risks of over relying on big data: analytics can help uncover correlations, but do not always provide clear-cut answers to business issues.

Despite the clear benefits and the enormous potential of big data analytics, the right business model for postal operators to fully harness its power is still unfolding.

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## Introduction

"Big data"— large sets of unstructured data that are managed and analyzed by increasingly powerful and sophisticated tools — is one of the latest in a series of technology revolutions that are changing the nature of business. The relentless growth in data is fueled by the increasing volume of information captured by companies, the rise of social media, and the development of the Internet of Things. It has the potential to unlock enormous value to organizations that harness the power of big data as a decision-making tool.[1]

The process of how to become a data-driven organization and how postal operators specifically can use big data to drive innovation, efficiency, and customer satisfaction were the main topics discussed during an international online forum hosted on January 28, 2014 by the U.S. Postal Service Office of Inspector General (OIG). Attended by postal operators, data experts, and industry organizations, the event was organized in collaboration with the Universal Postal Union (UPU), the U.N. specialized agency for the postal sector.

## The Round Table

The round table was divided into two sessions. The first session covered the definition of big data and possible implementation strategies. The second session focused on how posts are using big data and on opportunities to expand its use in the future. Specific examples of how postal stakeholders can directly benefit from postal big data were also provided.

### Big Data Defined

The discussion revealed that there is no single, unified definition of big data. However, in comparison to traditional data, three criteria, or "3V's," seem to characterize big data: its volume, which makes it difficult to store and process, the velocity at which it is produced, and the variety of data sources, both structured and unstructured, ranging from databases to tweets.

> "Big data is about adopting new technologies that enable the storage, processing, and analysis of data that was previously ignored."
> – Adam Houck, IBM

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[1] "The Internet of Things" refers to the ever-growing network of physical objects with embedded sensor technologies. This enables the objects to collect and communicate data over the Internet between one another and to other Internet-enabled devices and systems.

According to discussants, the "3Vs" do not fully capture the essence of big data. Two additional and perhaps more important attributes should be considered: value, the applicability and usefulness of these new data sets to the business, and veracity, the quality, reliability, and accuracy of the data.

Participants also discussed the following two points:

▪ Big data is generally data "that was previously ignored," meaning it was either collected but not analyzed or not collected at all until organizations recognized its business value; and

▪ New technologies are necessary to collect, extract, clean, tag, and analyze this data effectively.

## Implementation Considerations

In terms of big data implementation strategies, the first three speakers provided their perspectives on possible approaches:

▪ Anne Washington, Assistant Professor at the George Mason University (GMU) School of Public Policy, discussed the opportunity to create synergies between government and private sector data. Government is a major, authoritative source of data that is produced and maintained over time. These large public datasets represent reliable information infrastructures that the private sector could leverage to develop big data projects. Nevertheless, to fully harness the power of public sector data, governments will have to balance demands for data quality, transparency, and privacy. This will require governments to collaborate with scientists, data archivists, lawyers, and policy experts.

> **"Information established for internal government programs, especially metadata like ZIP codes, legitimize private sector big data projects."**
> **– Anne Washington, GMU**

▪ Adam Houck, Managing Consultant, Advanced Analytics with IBM Business Consulting Services, discussed a road map to big data implementation. The first step is to leverage existing data before undertaking additional big data plans, and then build analytics capabilities based on clear business objectives. In addition, big data plans should be developed from the start with customers' needs in mind to ensure a customer-centric approach to data. Implementation also requires organizational changes to ensure the integration of analytics across business units, as well as effective change-management processes. Finally, Houck warned the audience on the risks of over relying on data analytics. Big data does not always provide clear-cut answers to business issues, and senior management needs to develop new skills to interpret and act upon data.

- Michael Nelson, Principal Technology Policy Strategist at Microsoft, offered his own definition of big data and presented his views on how postal operators can leverage it.[2] The first challenge for posts is to understand the broad spectrum of uses for the data — for instance, monitoring customer sentiment, improving their brand and image, and designing new products and services.

> "Make part of your data available in open formats to the community. … Find out how that can lead to new applications in big data."
> – Michael Nelson, Microsoft

In addition, postal operators should exploit their unique competitive advantages: an infrastructure that covers the whole country, the ownership of critical data sets such as national address databases, and their universal reputation as a trusted "steward of information." Posts could leverage their role as a trusted third party and participate in the "open data" revolution by making postal data publicly available for innovators to develop new services and applications. To succeed, however, they will need to design transparent data policies, hire best-of-class data experts, and combine the new digital data-oriented culture with their traditional, operations-driven approach.

## Opportunities for Posts

Opportunities clearly abound for posts when it comes to big data. Posts and other industry players have already experienced some successful use cases:

- Mohammad Adra, Assistant Inspector General for the Risk Analysis Research Center at the OIG, discussed how the dramatic decline in the cost of sensors, connectivity, data processing, and mass storage has fostered the emergence of the Internet of Things. The postal sector is already an extremely data-rich environment. In the future, the possibility of equipping the postal network (vehicles, mailboxes, mail pieces and parcels, sorting centers, etc.) with low-cost sensors will exponentially expand the capability of postal operators to collect valuable data. However, postal operators will not be able to benefit fully from the amount of postal data available until they have put in place tools and strategies to analyze it effectively and efficiently.

> "There is no lack of postal data — it is already big. Let's start to address the imbalance between the plethora of data and the paucity of analysis, and extract value out of it."
> – Mohammad Adra, USPS OIG

- Katrin Zeiler, Project Manager, Customers Solutions and Innovations at Deutsche Post DHL; Delphine Desgurse, Director of Digital Strategy at La Poste; and Ulisse Del Gallo, Manager ICT Business Development at Poste Italiane, presented their companies' big data use cases. These operators are currently using big data to achieve the following objectives: create new products and

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[2]  Michael Nelson coined the acronym "BFMUDD" to describe the main features of big data: Big, Fast, Messy, Unstructured, Distributed Data.

services, add value to existing ones, support sales, cut costs, and streamline processes. The speakers also provided concrete examples of the big data-based solutions that they have launched or are planning to launch in the future.

- Jody Berenblatt, Advisor at GrayHair Software, called on the U.S. Postal Service to make its data more useful to customers. One way would be to make change-of-address information available faster and more frequently to mailers. Mailers would also benefit from getting more data on delivery dates. For cross-border mail, posts could simplify access to data generated along the supply chain, such as customs data. More importantly, big data analytics could help enhance the return on investment on mail, particularly direct mail.

- Jose Anson, Economist at the UPU, presented the first results of his new research on the predictive power of international postal data as a real-time indicator for trade flows, GDP fluctuations, and other socio-economic trends. If postal operators would share additional international postal big data with the UPU, it could become a "trusted big data repository," able to help both the global postal community and governments better define policies and serve citizens.

## Key Themes

The forum covered a wide variety of topics, recommendations, and best practices. The OIG took away the following key themes:

- **Imagining the Internet of Postal Things** – The integration of information technologies and new sensor-based operational technologies can bring dramatic improvements to postal operators in terms of new product offerings, better operational diagnostics, and insights into consumer behavior for a better customer experience and increased satisfaction. In addition, the Internet of Postal Things could have a positive spillover effect on other adjacent non-postal sectors, as the information collected *by* and *for* the Postal Service could be useful to others.

- **Becoming data-driven organizations** – It is important for postal operators to take the strategic steps necessary to enable a timely and cost-effective implementation of big data plans from collection, to analytics, to successful usage.

- **Leveraging postal operators' best practices** – Posts should capitalize on the best practices of other postal operators to develop, test, and launch innovative big data solutions that reduce costs, generate revenue, or provide economic and social good.

### Imagining the Internet of Postal Things

Postal operators already collect a plethora of information from their rich physical networks. The Postal Service, for example, scans mail pieces and parcels up to 11

times, which represents a potential of *1.7 trillion* scans a year. Its big data supercomputer center is one of the most powerful in the United States.

Postal operators generate an increasing amount of data from customers, workers, processes, and equipment. In theory, each component of the physical infrastructure — whether a mailbox, a vehicle, a machine, or a letter carrier equipped with a sensor — could become a source of new data. The deployment of new software applications (operational technologies) could help posts monitor and control these assets and processes and effectively analyze and structure the data collected.

The convergence between the increasing amount of actionable data, the ubiquity of network connectivity to integrate and share this data, and the rapid development of analytics may open up a new world of opportunities for postal operators — the "Internet of Postal Things."

**Figure 1: The Internet of Postal Things**
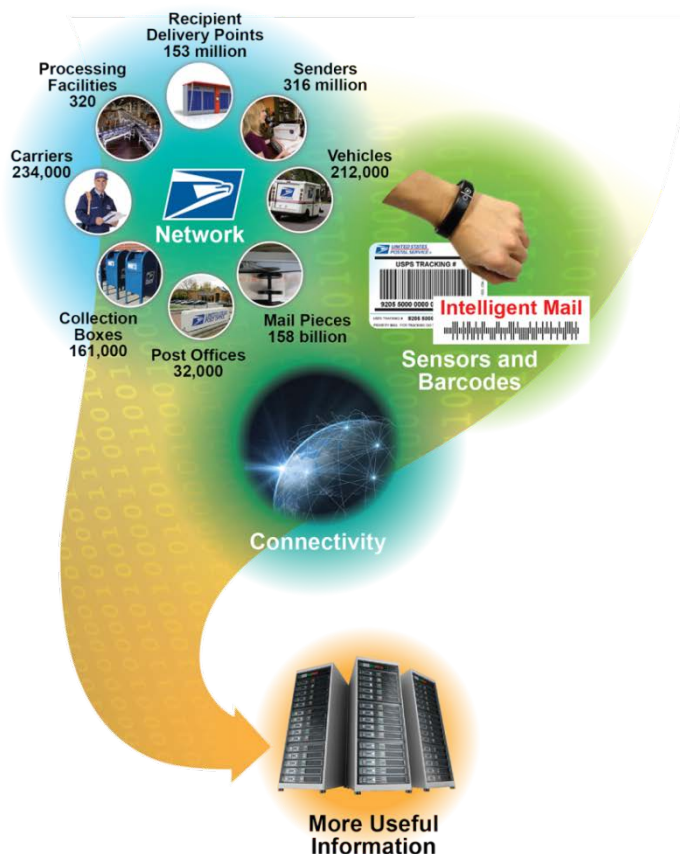


Source: OIG Graphic.

To avoid getting lost in this growing universe of data, postal operators will have to refine their ability to identify opportunities that can offer the most competitive advantage or return on investment, as well as develop an integrated approach to data. Participants indicated the following actions as the key steps for posts to benefit fully from the Internet of Postal Things:

- Select and analyze data based on clear business objectives, such as creating efficiencies, increasing revenue, or improving the customer experience,

- Focus on existing data first — what Gartner calls the "dark data," which is information that is either already collected but not yet analyzed, or data, that if further analyzed with more powerful analytics tools, could reveal new valuable insights,

- Ensure the convergence between operational technologies (OT) and information technologies (IT). For instance, sensor data from vehicles could be combined with data from existing Enterprise Resource Planning (ERP) systems for vehicle fleets to be better managed,

- Expand the value of the big data collected through the postal infrastructure by integrating it into the broader "Cloud of Things" with data and sensors run by other stakeholders, such as private companies.[3]

By integrating operational and information technologies across company processes, posts can improve their performance, reduce their costs, and optimize postal processes. For example, they could move toward real-time optimization of their sorting, transportation, and delivery processes. Finally, integrating IT and OT can help provide more effective and comprehensive dashboards for managers to make faster and more informed decisions.

## Becoming a Data-Driven Postal Organization

Participants indicated that turning postal operators into data-driven organizations is a continuous process that includes the following key steps:

- **Taking into account customers' needs from the outset** – Postal operators' big data strategies should go beyond increasing operational efficiency and look into ways to collect and generate data able to drive customer satisfaction and loyalty. For example, some posts have started working more closely with their business

> **"Look at the data you currently have and enrich it to make it more valuable and more useful to customers. If you were mailing a payment to a bank, wouldn't you like to see the path of that mail piece?"**
> **– Jody Berenblatt, Grayhair Software**

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[3] Michael Nelson contacted the OIG after the Forum regarding the term "Internet of Postal Things". In his opinion, what matters is not the "Things" but the data they generate and the way they are stored and analyzed.

customers to understand what categories of big data they should share or collect to help customers improve their performance and bottom line.

- **Raising awareness about big data** – DHL and La Poste recommended that posts start their big data journey by making senior management and shareholders aware of big data opportunities and challenges. The development of strong business cases is essential for CEOs to recognize the business value of big data and to initiate a big data strategy.

- **Putting innovation at the forefront** – DHL's big data strategy is the brainchild of the Customer Solutions and Innovations division. They identified big data on their "logistics trends radar" a couple of years ago and are now conducting pilots that cover a wide range of applications. This division brings together futurists, engineers, and marketers to work jointly on new business solutions. They manage the entire product development process — from early trends analysis to use cases, pilot tests, and the launch of products.

- **Bringing in new skills** – La Poste is training its marketing experts, who are learning to pull the datasets they need from the company's large data warehouses (DataNova project). Posts also need to hire multi-disciplinary experts bridging different fields — not just experts in data management. This could include data scientists who have a background in operations or marketing. There is also a growing need for lawyers specialized in data privacy and transparency to help posts develop new policies. Finally, organizational changes will be required to break down organizational silos between IT and other teams and to ensure the integration of analytics across business functions.

- **Partnering on data and new services** – Speakers stressed the importance of partnerships. DHL builds big data projects around multiple partnerships with research institutes and customers, who actively participate in the research and prototyping work. They also partner with other providers of big data, such as telecom operators, to support DHL's predictive analytics.

## Leveraging Postal Operators' Best Practices

The representatives from the three postal operators reported that they were starting to explore new opportunities offered by big data. Although priorities varied, these postal operators were focused on two main goals. On one hand, they use big data to strengthen the core through cost reductions, efficiencies, product innovation, and customer interaction. On the other, big data also allows postal operators to better fulfill broader public service missions, such as supporting economic growth and government services.

**Figure 2: Examples of Business Objectives Supported by Postal Big Data**
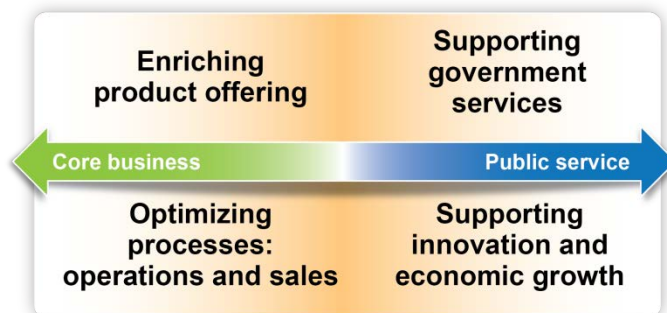


Source: OIG Graphic.

- **Optimizing processes: operations and sales** – Big data helps postal operators streamline operational processes, such as mail and parcel processing and delivery, and reduce fixed costs (e.g. transportation costs can be reduced through dynamic routing). DHL, for example, developed a tool to analyze correlations between external factors such as weather, flu epidemics, Google trends, and shipment data. The result was a model that allows them to predict parcel volumes and better determine delivery staff and vehicle requirements. Predictive maintenance applications are also on the rise. La Poste has equipped new electric vehicles with sensors that track vehicles' vital statistics.

  In the postal sector, as in other industries, analytics now drive customer life-cycle management. Australia Post is using predictive analytics to develop daily customer sales forecasts and to predict the profitability of products. Gaining better insight into customer interactions with the post also contributes to increased customer satisfaction. Poste Italiane's newly deployed big data architecture supports financial services sales in two main ways: credit risk assessment and the real-time generation of tailor-made offerings and discounts for mobile banking customers.

- **Enriching product offerings** – Speakers presented various examples of disruptive big data-based product innovations. DHL MyWays is a crowd logistics platform, a "crowdshipping" service, connecting individual parcel shippers with occasional parcel deliverers (such as commuters).[4] Potential deliverers can "reserve" and pick up parcels, which they deliver to the recipient. Using an ad hoc mobile app, the service connects individuals who ask for flexible deliveries

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[4] To learn more about DHL's use of big data in logistics see: "Big Data in Logistics - A DHL perspective on how to move beyond the hype," December 2013, http://www.dhl.com/content/dam/downloads/g0/about_us/innovation/CSI_Studie_BIG_DATA.pdf.

with those offering to transport parcels along their daily routes. DHL conducted a pilot test in Sweden in the second half of 2013.[5]

Posts could also leverage big data to help with the development of new customer-centric delivery services — competitors already do. One presenter referred to the SoPost platform, which, in the UK, lets people use Facebook and Twitter accounts as their postal address for the delivery of gifts or product samples, without actual delivery details being shared.

Several postal operators already use big data to help direct mailers better target their mail campaigns. As indicated by Jody Berenblatt, mailers would benefit from big data — it could assist in analyzing direct mail pieces' delivery dates in conjunction with information on the date the consumer responded to that piece, and on the channel used (mail, Internet, in-store, etc.).

▪ **Supporting economic growth** – One participant called on posts "to imagine a world where postal operators would provide insights useful to new businesses." For instance, postal big data could help retailers select new retail sites. DHL presented a solution they already offer to businesses: GeoVista. This online geomarketing tool allows German businesses to analyze location and product potential. Detailed geodata from Deutsche Post Direct has been combined with external socio-demographic and housing data, as well as statistics on consumption patterns. This tool helps users prepare realistic sales forecasts based on a scientific model or select new retail locations and is provided for a fee.

One participant shared his vision of a postal big data platform, which would be a repository for postal and non-postal big data. Entrepreneurs and government agencies would freely access it and team up with the post and other participants to think through new services based on the data. Based on the same premise, La Poste's Dataposte program promotes experimentation and discovery. Working with innovative software companies, La Poste aims at co-creating new services that leverage its databases, such as postcodes, post office locations, or change of address files.

▪ **Supporting government services and policies** – Several participants referred to a 2010 paper by Michael Ravnitzky of the Postal Regulatory Commission, which suggested the application of sensors on all postal vehicles and envisioned a number of potential uses for the data collected. For example, sensors could detect chemical or biological agents or radiological materials. Accelerometer sensors could evaluate road conditions and detect potholes to help municipalities

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[5] On crowdshipping, solutions, see also U.S. Postal Service Office of Inspector General, *Using the 'Crowd' to Deliver Packages*, February 12, 2014, http://www.uspsoig.gov/sites/default/files/document-library-files/2014/using_the_crowd_to_deliver_packages.pdf.

prioritize repairs. Government departments and agencies at all levels could use this data to set policies and plan actions to address potential issues.[6]

The value of international postal big data was also emphasized. The UPU records 100 billion data points every year — mainly tracking data related to international letters, packages, express items, and payments.

> **"…Can you imagine a world where postal services would provide heat maps showing population movements after disasters, where people are in economic stress, and how well policies are working on the ground?"**
> **– Robert Kirkpatrick, U.N. Global Pulse**

International postal data could provide operational insights to help build a more resilient international postal network. This data could also be used as an effective real-time proxy for trade flows and GDP trends.[7]

Robert Kirkpatrick, Director of the UN Global Pulse, echoed these views. Even in countries where mobile-phone ownership and Internet penetration rates are low, people send and receive mail, packages, or remittances and visit local post offices. In other words, they are still creating "digital footprints" — online data trails — through interactions with the postal system. Working with the UPU and other international agencies, the UN is spearheading research to develop big data-based solutions which provide real-time insights to inform policymakers on topics such as public health, food security, migration, economic activity and disaster relief.

# Conclusion

Beyond the current hype, postal big data is an emerging reality. Several postal operators have already used it to develop or enhance products, services, and applications. Big data analytics can support any line of business — mail, parcels, logistics, retail, or financial services. It can support a variety of business goals, from process optimization and cost reduction to customer interaction or revenue generation. Open data strategies can also help postal operators rethink and innovate their "public service" mission in support of government services and economic growth.

Advances in data collection and analytics will allow posts to derive more value from their existing data, collect and analyze new information in real-time, and combine it with a limitless supply of external structured and unstructured data. Managing this new plethora of data effectively is a major challenge that requires a new mindset.

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[6] Postal Regulatory Commission, "Offering Sensor Network Services Using the Postal Delivery Vehicle Fleet," http://www.prc.gov/(S(je2vev45gxfhtai2g3npcczd))/prc-docs/newsroom/techpapers/MJR%20Postal%20Sensors%20Paper_1061.pdf.
[7] To learn more about the UPU's project to use big postal data analytics to monitor global trade and business cycles, see chapters 7 and 8 of the UPU's book "Development Strategies for the Postal Sector: An Economic Perspective" http://www.upu.int/uploads/tx_sbdownloader/publicationTrendsDevelopmentStrategiesForThePostalSectorEn.pdf.

In particular, building the right multidisciplinary capabilities, adapting organizational structures, and partnering with multiple providers and users of big data — whether mailers, recipients, businesses, or government — will be key factors for success. At the same time, postal operators will have to define clear data transparency and privacy policies to be able to benefit from data while preserving their role as a trusted steward of information.

In the end, all participants agreed that the potential of big data is enormous; nevertheless, the right business model for postal operators to fully harness the power of big data is still unfolding.

# Appendix    Speakers and Contributors



**Mohammad Adra**, U.S. Postal Service Office of Inspector General

madra@uspsoig.gov

Mohammad A. Adra is the Assistant Inspector General for the Risk Analysis Research Center (RARC) of the U.S. Postal Service Office of Inspector General (OIG). He has been with the OIG since 2002. Prior to his OIG tenure, he worked 5 years for the U.S. Postal Service in pricing and 5 years for the Energy Information Administration in mathematical modeling and energy demand forecasting. Mr. Adra received his master's in applied economics from John Hopkins University and an MBA from Humboldt State University. He also received his bachelor's degree in mathematics from the University of Colorado.



**Jose Anson**, Universal Postal Union

jose.anson@upu.int

Mr. Anson has been Data Scientist and Economist at the Universal Postal Union, the United Nations specialized agency for the postal sector, since 2005. His research areas include real-time data models, postal sector policies and strategies, postal reform in developing and emerging countries, inclusion policies, and development strategies. Mr. Anson holds a Ph.D. in Economics from HEC Lausanne business school (Switzerland).
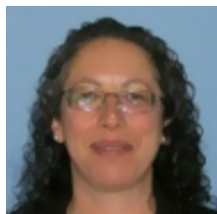


**Jody Berenblatt**, Grayhair Advisors

jody@grayhairadvisors.com

Ms. Berenblatt has been a Senior Advisor with GrayHair Advisors since 2012. GrayHair Advisors provides customized consulting services to address mail-related strategic

issues from planning through execution. She was previously a Senior Director, Postal Commerce, at Direct Brands, and a Senior Vice President, Postal Strategy, at Bank of America. Ms. Berenblatt has been actively engaged with various postal industry related committees and organizations for several decades, including 5 years as Vice-Chair and Chair of the Association for Postal Commerce. She holds a BA, Liberal Arts/Interdisciplinary from the New School University.



**Ulisse Del Gallo**, Poste Italiane

Mr. Del Gallo has been a Manager, ICT Business Development, Government and International Markets, at Poste Italiane since 2013. His role involves leveraging the IT capabilities required to support new businesses, such as payments solutions or government services. He was previously the CIO of Postel, the Italian post's document management subsidiary. Prior to that, he was for many years with Accenture, as a Project Manager assisting postal operators with the implementation of digital services projects. Mr. Del Gallo holds a degree in Economics from LUISS University (Rome).



**Delphine Desgurse**, Groupe La Poste
delphine.desgurse@laposte.fr

Ms. Desgurse has been Groupe La Poste's Head of Digital Strategy and Innovation since 2013. She was previously the head of market intelligence in the innovation department. Prior to working for the French postal operator, she was for many years a senior marketing and strategy consultant in the IT and telecom sectors, and a market research manager in the automotive sector. She holds a business degree from French business school ESSEC, and a Master of Sciences from the University of Sussex in the U.K.

**Wendy Eitan**, Universal Postal Union

wendy.eitan@upu.int

Wendy Eitan is the Product Strategy, Integration and Economics Coordinator for the Universal Postal Union. In this role, she is responsible for the development of UPU basic services (Letter post, small packets and Parcel post) in accordance with the UPU Congress Strategy. In addition, Wendy supervises advanced postal economic studies covering topics of interest to the members of the UPU and the postal sector. Wendy began working for the UPU in December 2012. Prior to taking up this function, she worked as Director of International Relations in the Operations department of Israel Post.  Within this role, Wendy was involved with the development and operations of all international mail products.



**Adam Houck**, IBM

ahouck@us.ibm.com

Mr. Houck has been a Senior Managing Consultant in the Advanced Analytics practice with IBM since 2003, concentrating on the postal sector. His research areas include emerging and alternative business models for posts, utilizing new data sources and techniques to drive postal innovation, and the impact of postal operations on the environment. He has recently worked with the OIG to research tracking technologies and their relevance to the postal industry. Mr. Houck holds a Master's Degree in Economics from North Carolina State University.



**Robert Kirkpatrick**, United Nations

kirkpatrick@unglobalpulse.org

Mr. Kirkpatrick is Director, Global Pulse, in the Executive Office of the Secretary-General of the United Nations. Global Pulse is an innovation initiative of the UN Secretary-General exploring how new, digital data sources and real-time analytics technologies can help policymakers gain a better understanding of changes in human well-being and emerging vulnerabilities. Mr. Kirkpatrick has spent more than 15 years developing technology solutions for public and private sector organizations, and was the founding CTO of the Silicon Valley global health and disaster technology NGO InSTEDD, and the co-founder of Microsoft Humanitarian Systems. Mr. Kirkpatrick holds a BA in Greek and Latin from the University of North Carolina and took courses at Harvard University as part of its Special Students Programs.



**Michael Nelson**, Microsoft and Georgetown University

mrn24@georgetown.edu

As a Principal Technology Policy Strategist with Microsoft, Mr. Nelson is working to help define Microsoft's vision of the connected future, and to promote emerging technologies with governments around the world. Since January 2009, he has also been teaching courses and doing research at Georgetown University on the future of the Internet, cyber-policy, technology policy, innovation policy, and e-government. Mr. Nelson previously held senior positions with IBM and the FCC. He was Special Assistant for Information Technology at the White House Office of Science and Technology Policy during the Clinton administration. Mr. Nelson holds a Ph.D. in geophysics from MIT.



**Michael Ravnitzky**, U.S. Postal Regulatory Commission

michael.ravnitzky@prc.gov

Michael Ravnitzky serves as Chief Counsel to the Chairman of the Postal Regulatory Commission.  He has worked at the Commission since 2005.  He received a law degree from William Mitchell College of Law and a Bachelor's Degree in Physics from Cornell University.

**Anne L. Washington**, George Mason University

awashi14@gmu.edu

Anne L. Washington is an Assistant Professor in the Organization Development and Knowledge Management Program in the George Mason University School of Public Policy. Her current research areas include open government data and "political informatics," which brings big data principles to the study of government and politics. Ms. Washington holds a PhD in Information Systems from George Washington University, School of Business. Before completing her PhD, she had extensive work experience in the financial services and technology industries. She also was with the Congressional Research Service at the Library of Congress specializing in legislative systems for 9 years.



**Katrin Zeiler**, Deutsche Post DHL

Katrin.Zeiler@dhl.com

Ms. Zeiler has been a Project Manager with DHL Customers Solutions and Innovations since 2011, where she analyzes long-term trends that affect the global logistics business. She holds a Bachelor of Business Administration (BBA) from Hotelschool The Hague in the Netherlands.

U.S. Postal Service Office of Inspector General
1735 N. Lynn Street
Arlington, VA  22209

Telephone:  703-248-2100
www.uspsoig.gov

For media inquiries, contact Agapi Doulaveris
Telephone:  703-248-2286
adoulaveris@uspsoig.gov