2015 Florida Transportation Data Symposium

Seeing the Clear Road Ahead with Big Data Analytics

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A Technology Revolution is Driving the Nexus & Digitalization Era

PC Era

The computer gets personal

Web Era

Engaged self-determination becomes practical

Digitalization

80s | 90s | 2000s

Client Server & GUIs

Access to data without programmers

Nexus Era

Combined forces transform life, work, and play

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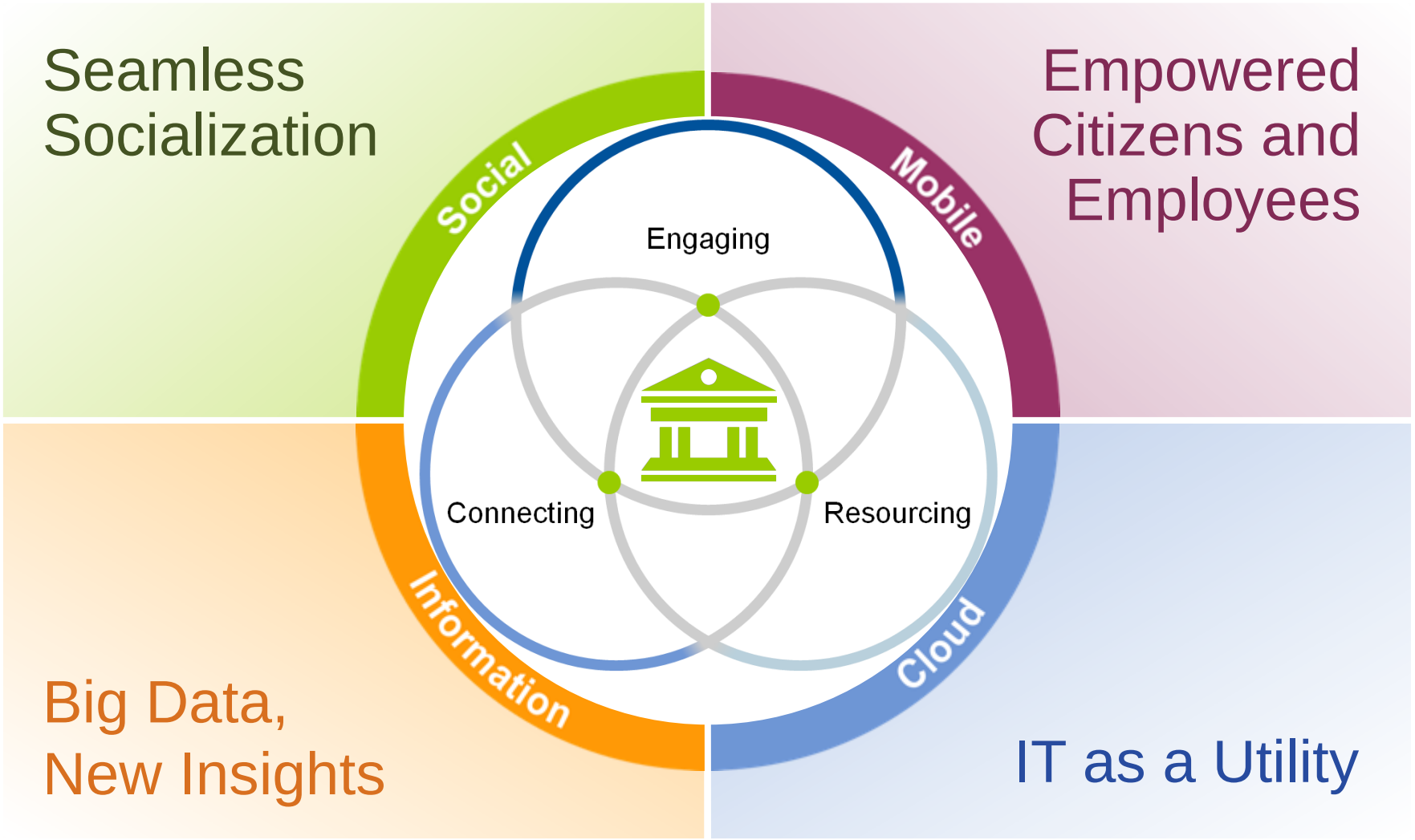
A Nexus of Forces Is Driving Innovation in Government



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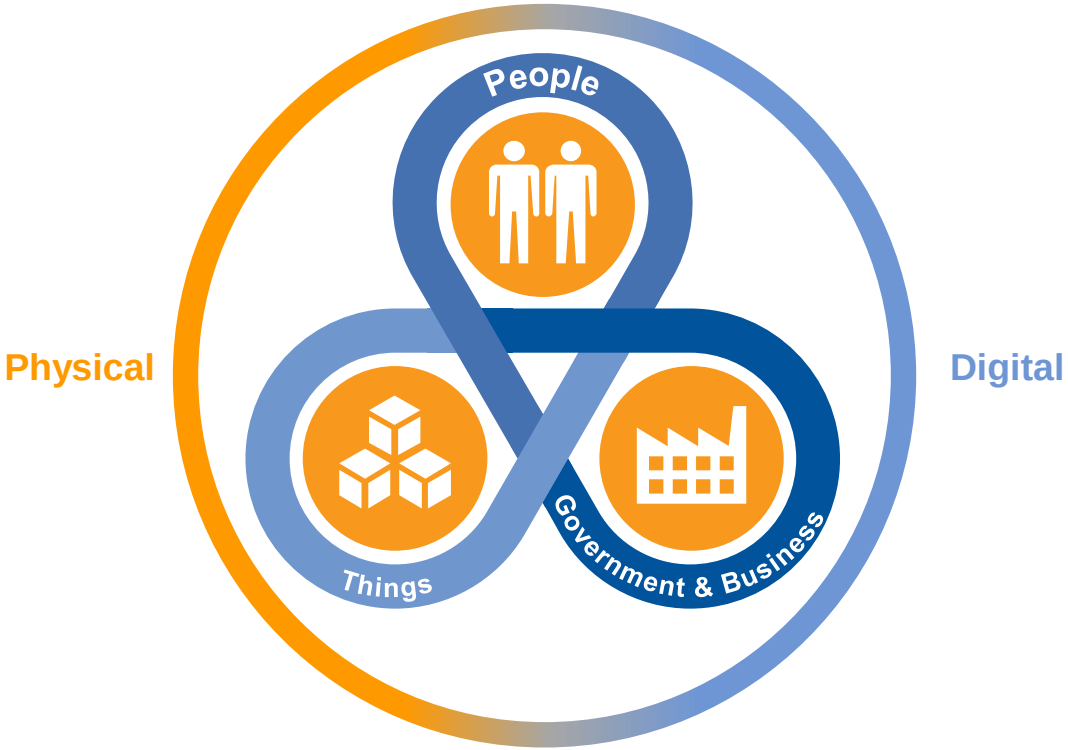
Digitalization is the creation of new business designs by blurring digital and physical worlds

A new and disruptive world of people, business, and things.

Gartner forecasts that personal devices will reach 7.3 billion by 2020 and some 30 billion connected things.

…also, Internet-connected things (e.g., sensors, cameras, meters, signal devices) will outnumber humans by a ratio of 4-to-1.



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And the connected car is becoming a major dimension in the Internet of Things (IoT)

Gartner forecasts that by 2020….

the number of connected passenger vehicles on the road (worldwide) will be about 250 million – approx. 1 in 5.

70% to 80% of all new vehicle models being sold in mature automotive markets will offer standard or optional Internet.

By 2030, autonomous-driving-capable vehicles will represent approximately 25% of the passenger vehicle population in use in mature markets.

Data exchanged with vehicles – and between vehicles and roadway infrastructure in this Internet of Cars – will help transportation agencies improve highway planning, safety, operations and construction.

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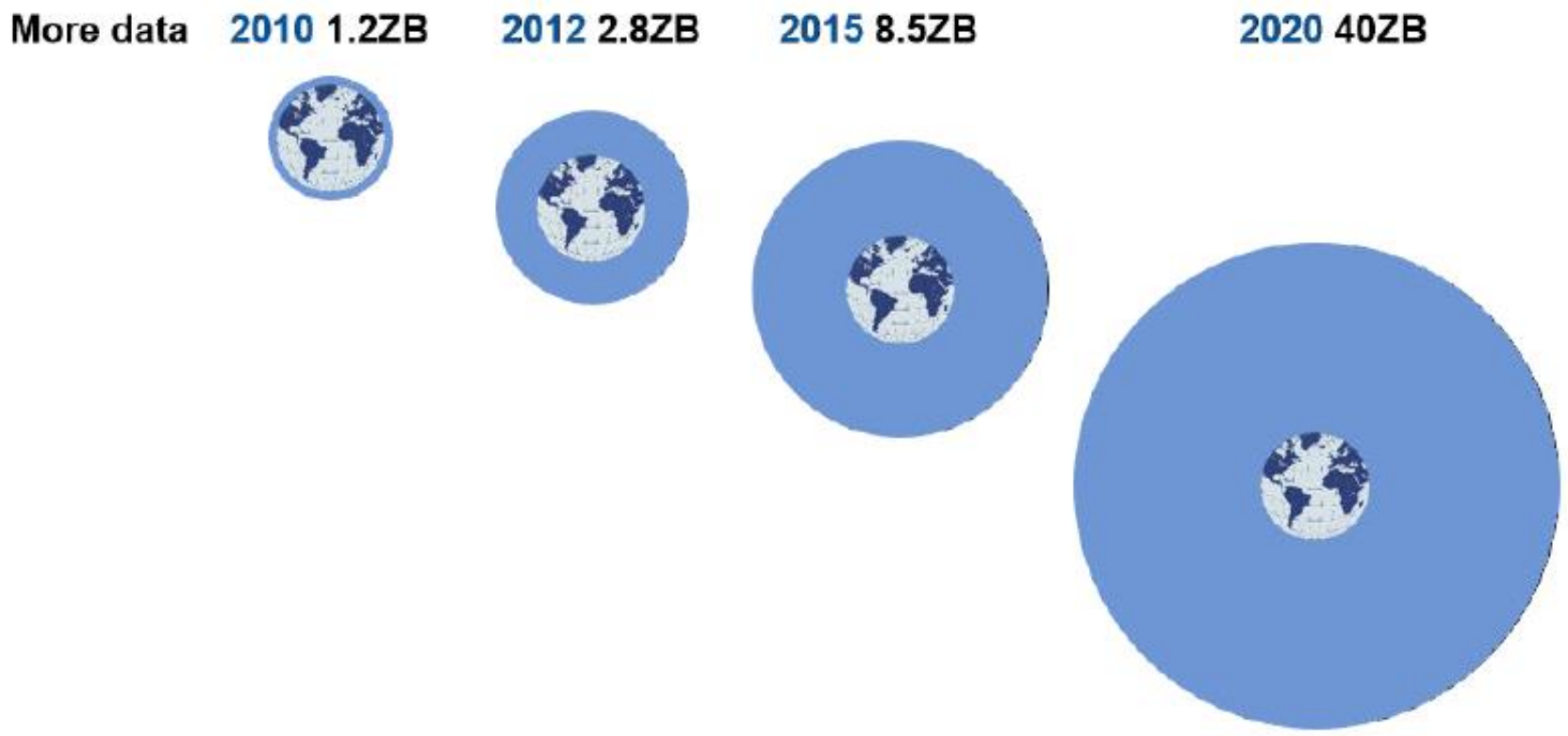
The anticipated growth in data over the next 5 years will be enormous

Streaming data from connected vehicles and autonomous objects or things is driving much of this growth



Source: HP Enterprise 20/20

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Highway users and their vehicles will provide greater volumes of more detail-rich data

	Traditional Government Data:	Data from People and Things:
Planning	• Accident records • Highway condition data • Road centerline and geometrics data	• Traffic counts (real time/ongoing) • Seasonal and event based congestion/bottleneck data • Public input (social media)
Operations	• Traffic flow/congestion • Lane/road closures • Equipment location (AVL) • Work order status	• Pothole locations • Structural system monitoring • DOT vehicle and driver data • Traffic flow (dynamic)
Construction	• Traffic changes/alerts • Construction schedules • Alternative routes (static)	• Public input (social media) • Alternative routing (dynamic)

Crowdsourced Traffic Management

Consumer Device to Government Infrastructure

Collaborative Transportation Planning

Big data can transform transportation agency decision making and information sharing

Big data is high-volume, high-velocity and high-variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making.

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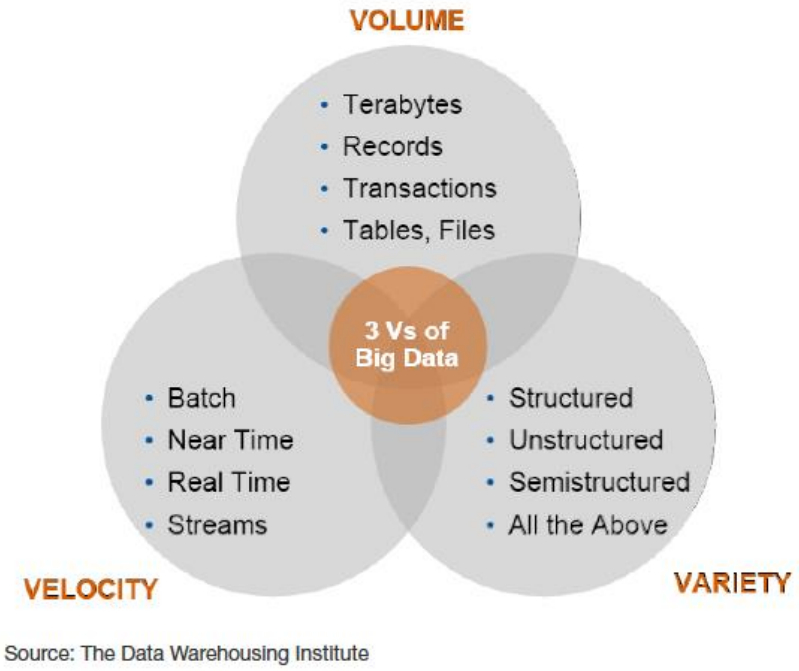
Big data vs. traditional analytics

There are three critical differences between traditional and big data analytics :

1. Big data analytics can handle variety, velocity and volume.
    - Variety means that data can come in various formats, ranging from sensor data to video images to unstructured text.
    - Big data analytics is also designed to handle massive volumes of data and the high speed in which the data is produced and changing.



Source: The Data Warehousing Institute

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Big data vs. traditional analytics

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1. Big data analytics can handle variety, velocity and volume.
2. Big data analytics can support a range of analytic capabilities:
    - Descriptive – using dashboards, historical reports, ad hoc queries to answer the question “what happened?”
    - Diagnostic – using root cause analysis, data visualization and clustering to determine why an event occurs
    - **Predictive – using causal forecasting, pattern-based and statistical analytics, and simulation to help understand likely future events.**
    - **Prescriptive – using optimization, heuristics, rule engines and artificial intelligence to help exploit or mitigate a future event**

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3. Many of the big data analytics techniques are revolutionary because they do not require the user to know what question to ask.
    - Rather, the analytics solution mines the data, finds patterns and uncovers relationships unknown to the user.

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Big Data
Use Cases

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Big Data Use Cases:
Monitoring Major Transportation Assets

Structural Health Monitoring System (SHMS) can continuously record data relevant to bridge/structural integrity, including temperature, strain and displacement measures.

Trend data can assess gradual changes due to environmental factors, changing loads, etc.

Prescriptive analytics can trigger alerts to be sent automatically to DOT staff and public safety officials when threshold values are met.

Objective: Enhance safety and mobility in and around the DOT's major transportation assets.

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Big Data Use Cases:
Monitoring Fleet Operations

Data can be generated through the monitoring of vehicle-specific data received via driver's mobile devices or other telematics devices.

Performance data can include idle time, rapid acceleration/deceleration, fuel usage, distance traveled and over-speed time. Data can also indicate instances of driver fatigue or aggressive driving.

Data can support analytics around mpg scores and rankings among the fleet, and can support corrective actions that include driver training and regular follow-ups.

Objective: Improve driver and vehicle safety in DOT fleet operations

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Big Data Use Cases:
Real-Time Routing and Rerouting

As incidents occurs on limited access highways, Crowdsource event data can be channeled real-time to other motorists via social media and traffic apps.

Connected vehicles can be advised to take specific alternate routes via on-board displays. Routes may be different based on driver destination and highway network load-balancing.

Integrated set of adaptive signal systems can detect changing traffic volumes real-time and adjust cycle times to enhance vehicular flow.

Objective: Improve overall traffic flow and reduce travel times following a major incident.

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Big Data Use Cases:
Highway Traffic Management

Hourly traffic counts can be collected continuously from connected vehicles, allowing planners and operational staff to understand time-of-day, seasonal and event-based travel trends.

Businesses and motorists access the same type of data to plan trips. And toll highway authorities can use data to set real-time congestion pricing.

Social media posts can be analyzed to help transportation agency staff make adjustments in construction and maintenance schedules and work zones.

Objective: Improve traffic flow and safety in maintenance and construction work zones.

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Recommendations for developing big data analytics capabilities in your organization

1. Know how to communicate the value and economics of big data projects
2. Understand the many business uses and sources of big data — especially those beyond internal data — that are used only for decision making
3. Reconsider information leadership, organization and skills by taking into account the different analytical skill sets that are required
4. Identify key success factors that will improve strategy, planning and governance of big data initiatives
5. Develop your big data solutions in the context of the Nexus of Forces initiatives in your organization — convergence of these technologies with big data will require rather difficult compromises

Source: Gartner Research Report G00263047 “Answering Big Data's 10 Biggest Vision and Strategy Questions” (August 2014)

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Questions?

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Contact

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