Generating value from digital data streams

Gabriele Piccoli
Federico Pigni
Richard T. Watson
Do you know what data people have socialized around you and your product?

Do you have an inventory of the data streams in your ecosystem and those surrounding you?

Have you thought about the data streams you produce? Could they be valuable outside your organization?

How many of your organizational systems are (could easily be) architected to provide data in real-time?

Are you keeping an eye on the changing value of your digital assets?
A digital data stream (DDS)

```json
{
  "STATUS":"SUCCESS",
  "NUM_RECORDS":"117",
  "MESSAGE":"117 records found",
  "AVAILABILITY_UPDATED_TIMESTAMP":"2014-03-20T07:36:15.534-07:00",
  "AVAILABILITY_REQUEST_TIMESTAMP":"2014-03-20T07:36:15.411-07:00",
  "AVL":[
    {
      "TYPE":"OFF",
      "OSPID":"934",
      "NAME":"Golden Gateway Garage",
      "DESC":"250 Clay Street",
      "INTER":"Clay between Front & Davis",
      "TEL":"(415) 433-4722",
      "OPHRS":{
        "OPS":[
          {
            "FROM":"Monday",
            "TO":"Friday",
            "BEG":"4:00 AM",
            "END":"10:00 PM"
          },
          {
            "FROM":"Saturday",
            "BEG":"7:00 AM",
            "END":"10:00 PM"
          },
          {
            "FROM":"Sunday",
            "BEG":"9:00 AM",
            "END":"10:00 PM"
          }
        ]
      },
      "OCC":"557",
      "OPER":"1165",
      "PTS":"1",
      "LOC":"-122.3986032,37.79544154"
    }
  ]
}
```
A changing world

- The world creates a mass of **born** digital [di-ˈjə-təl] data
  - Mobile M2M traffic to increase 40-fold (2010-2015)
  - Ubiquitous (not simply mobile)
- Lowering of costs for creating, capturing, and managing digital data
- More and more real-time [rē(-ə)l ˈtīm] digital data
- Metadatum are growing faster than data
Data are increasingly “socialized”

My first advice is to look into the data that people socialize, the data that they willingly and knowingly share. Set up a world where people benefit from the data they socialize.

Andreas Weigend
Director Social Data Lab
Stanford
A Tweet is only 140 characters...

... or is it?!
Digital Data Genesis
Generating data in digital form
Digital data streams

While you can mine a mountain of data looking for gold, you can also channel a stream to leverage its flow to generate continuing value.
A digital data stream

Born digital data enter the data stream

Data are harvested to create value
Contextualizing

Birthing → Streaming → Harvesting → Sales → Contextualizing → Product catalog

Birthing → Streaming → Harvesting → Inventory → Contextualizing

Birthing → Streaming → Harvesting → Web views → Contextualizing → Extraction

Web views → Contextualizing

Inventory → Contextualizing
Contextualizing

Availability of seasonal item when viewed

Seasonal sales

Core sales

Product size

Availability

Sales
## Contextualizing

<table>
<thead>
<tr>
<th>Data stream DNA</th>
<th>When</th>
<th>Where</th>
<th>Who</th>
<th>What</th>
<th>How</th>
<th>Why</th>
<th>Outcome</th>
</tr>
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<tbody>
<tr>
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<td>2014-03-05</td>
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<td>6713458</td>
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<td>Example</td>
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<td></td>
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<td><strong>When</strong></td>
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<td>A timestamp with date, time, and time zone</td>
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<td><strong>Where</strong></td>
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<td><strong>Outcome</strong></td>
<td>The result of an action related to data segment creation</td>
<td>Revenue, cost, resources used, customer satisfaction</td>
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## Value archetypes

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<td>Generation</td>
<td>Creating a data stream, either deliberately or as a byproduct of other activities</td>
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<tr>
<td>Aggregation</td>
<td>Collecting, aggregating, and repurposing a digital data stream to provide data services</td>
</tr>
<tr>
<td>Service</td>
<td>Merge and manipulating streams to provide services or to improve existing services</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Using digital data streams to optimize internal operations or to track business performance</td>
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<tr>
<td>Analytics</td>
<td>Enhanced decision making by producing superior insight or knowledge</td>
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DDS Generators

TriplIt is a platform opportunity. If we are successful, we will be the “home base” for all of a consumer’s travel information.

Greg Brockway
Co-Founder TripIt

... and leverage the streaming of this traveler information.
### Build your itinerary

- **Auto**
  Make an Auto reservation without having to reenter your flight or travel details.

- **Foodibytes**
  Get personalized deals at restaurants in the cities you’re traveling to.

- **GO Airport Shuttle**
  Add your airport shuttle directly to TripIt.

- **Hotwire**
  Book travel on Hotwire and automatically add it to TripIt.

- **Hudson Group**
  Software for transportation companies with “Add to TripIt” support link.

- **TaxiMagic**
  Add taxis or limos booked with TaxiMagic to TripIt automatically.

- **TripTrace**
  Organize travel locations on a map and plan trips.

- **ParkSleepFly**
  Book pre-flight airport hotels and parking packages.

- **Unikin**
  Explore insider tips on destinations on your mobile.

- **FlexTrip**
  Broadcast your plans and receive offers for activities during your trip.

- **TVFoodMaps**
  Receive email alerts with restaurants that have been on TV near your upcoming trips and find famous places near your destinations.

### Stay organized

- **Calendar integration**
  Easily add your plans to your calendar using an iCal feed or iCS files.

- **Lotus Notes Sidebar Widget**
  View your TripIt itineraries in your Lotus Notes sidebar.

- **Mobile phone**
  See your plans on any mobile phone with a web browser.

### Share your plans

- **Activity feed**
  Get an RSS feed of activity in TripIt.

- **Add Connections**
  Connect and share your travel plans with the people that matter.

- **Blog badge**
  Add your upcoming trips to your blog.

- **Facebook**
  Automatically publish when you are planning, departing and returning from a trip.

- **TripIt for Google Apps**
  Helps any company streamline travel planning and improve employee collaboration.

- **Join a Group**
  See when and where people at your company are traveling.

- **Yammer**
  Automatically publish your travel plans to your Yammer network.

- **Salesforce Chatter**
  Automatically publish your travel plans to your Salesforce Chatter organization.

- **LinkedIn**
  Share your travel plans with your LinkedIn network using the MyTravel app.

### Applications provided by others

- **FlightCaster**
  Predict flight delays before the airlines, on BlackBerry or iPhone.

- **Flight Pro**
  Track your flights in TripIt and view worldwide airport maps.

- **FlightTrack Pro**
  Manage travel on your iPhone with this new mobile app.

- **Flight Update Pro**
  Plan, track and get up to the minute flight status for your flights.

- **GlobeJet**
  Organize your itinerary in style on the iPhone.

- **Hashwork**
  Hashwork tells your social network at work about your travel plans.

- **Plazo Pulse**
  Share your TripIt plans with your Plazo Pulse network.

- **Windows Live**
  Share your TripIt plans with your Windows Live network.
ExpenseWatch.com—Complete Control over All Company Spending

Automation
- Saves time and money

Visibility
- Understand spending

Control
- Enforce company policy

If you run a business you spend money. With ExpenseWatch.com you have the power to control it.
Trip to New York

Automatic Link between credit card and itinerary item

Expense Report Details

Drag and Drop Flexibility

Difference: USD347.82
I envision a day before too long when literally millions of datasets will be available practically in real-time as the data is produced and/or collected.
Aggregation
Aggregation

Basically, having built a generalized data-brokering backend to connect physical (and virtual) entities to the web, others can now start to build the applications that make the connections really useful.

Joseph Kelly
Co-founder and CEO, Infochimps
Aggregation
Service

The digital ordering system will change the taxi market fundamentally. By being creative and revolutionary, myTaxi can become the leader of this billion Euro market in Europe.

Lars Hinrichs
Founder of XING and Hackfwd
Service
TripIt drags traveling kicking and screaming into the 21st Century.

TripIt turns all your flight, hotel and rental car confirmation emails into simple, mobile travel itineraries just by hitting forward.
Service

Explore the urban landscape with an app as rich & vibrant as the city itself

What is MyCityWay?

MyCityWay is a real-time app designed to transform your smart mobile device into a multi-use tool for navigating the urban space. By combining urban reference apps and app platforms with vital urban information, MyCityWay helps you plan and explore the city's cities like never before. Use MyCityWay to: find a Chinese restaurant in your neighborhood, locate the nearest Chinese hotpot, or buy tickets for the next showing of a blockbuster movie. Connect with other users to find the perfect spot, keep tabs on apartments for rent, or check live traffic needs before leaving your home or office.

Experience MyCityWay on your iPhone, iPad, Android and Blackberry

MCW for YOU & ME
Are you a longtime resident? A survey

MCW for BRANDS
Real-time GPS technology

MCW for BUSINESSES
Connect with potential customers through...
Service

Based on more than 100 feeds
Efficiency in traffic control

We are now aware that the police have used traffic information that you have helped to create to place speed cameras at dangerous locations where the average speed is higher than the legally allowed speed limit.

TomTom to Bar Police Data Use

Navteq Device Maker Vows to Prevent Use of Information to Set Speed Traps

AMSTERDAM—The use by police of navigation equipment maker TomTom NV’s data to position speed cameras looks to have been limited to the Netherlands, but the company still has to lay out more clearly how it protects the privacy of its customers, Chief Executive Harold Godshalk said.
What's its number?
Where's my bus?
What vehicle?
Efficiency
Efficiency
Analytics

The best free way to manage your money.

Mint brings all your financial accounts together online or on your mobile device, automatically categorizes your transactions, lets you set budgets and helps you achieve your savings goals.

Watch the video | Learn more

Free! Get started here
Analytics
Save energy with your friends.
See how your energy use stacks up against friends and homes across the US. Join groups and discover how you can save even more.

See how your home stacks up!
Try the home comparison without connecting to Facebook.

- See how your energy use stacks up against similar homes. Try it!
- Check how your energy use ranks against your friends' each month.
- Share and explore great energy saving tips and advice.
- Work with your friends to compete and hit savings goals.
Profiting from DDSs

Data stream depth

- low
- high

Number of streams
- single
- multiple

Generation
- TripIt
- myTaxi

Service
- DDS aggregators
- Socrata
- pachube

Analytics
- mint.com
- FlightCaster
Value driver

The unique quality of an activity that causes the change in its value contribution
## Value drivers

<table>
<thead>
<tr>
<th>Value Driver</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensing</td>
<td>Detecting the current state of a given entity</td>
<td>The location of a plane, the speed of a car, or the mood of an individual</td>
</tr>
<tr>
<td>Mass visibility</td>
<td>The identification of the state of multiple entities in real-time, contextualized by their relationships</td>
<td>Visibility of all shoppers and employees in a store for a real-time image of traffic flow and resources</td>
</tr>
<tr>
<td>Experimentation</td>
<td>Real-time data gathering and analysis to test interventions and derive immediately measurable results</td>
<td>Changing the content of a customer’s landing page</td>
</tr>
<tr>
<td>Coordination</td>
<td>Adjusting behavior based on fast-cycle feedback regarding the current state of other entities</td>
<td>Charging thousands of plugged-in electric cars when there is excess renewable energy</td>
</tr>
</tbody>
</table>
Real-time sensing

- The possibility to detect the current state of a given entity
  - Location of a plane
  - Speed of a car
  - Mood of an individual
- It is a first-order value driver, a prerequisite for all other value drivers
Real-time sensing

Flight Details

Flight No.
TRAVEL AIRWAYS 88
Route
JFK TO MIA
Scheduled 9:30am - 11:30am

Predicted Arrival Status:

- Probably Delayed: 3%
- Less than 60m late: 14%
- More than 60m late: 83%

Official Airline Reported Status

Estimated Departure: 9:30am
Estimated Arrival: 11:30am

Delay Factors:

- Inbound Aircraft: T4.49hr is 72 min. delayed
- Departure Airport Status: No FAA alerts
- Arrival Airport Status: The FAA has a 45 ground delay program in effect
- Official Airline Status: On-time
- Departure Weather: Cloudy; Visibility 10nm, Wind 30kt
- Arrival Weather: Sunny; Visibility 5nm, Wind 20kt
Real-time mass visibility

- The possibility to identify the state of multiple entities contextualized by their relationships
  - Traffic route congestion
  - Mood of the nation
- It is a second-order value driver, requiring real-time sensing
  - Requires the ability to contextualize
Real-time mass visibility
Real-time experimentation

- The possibility for fast cycle, reliable data generation and gathering
- It is a second-order value driver, requiring real-time sensing
- Requires an ability to impact the data stream
Real-time experimentation

Google Website Optimizer

Experiments  My Account

Website Optimizer - New experiment

What type of experiment would you like to create?

Not sure which type of experiment is right for you? Learn more about Website Optimizer experiments

A/B Experiment - The simplest way to start testing fast

This method compares the performance of entirely different versions of a page. Use it if the points below describe your desired experiment.

- You are able to publish a new page to test against an existing page
- You want to test a new layout or overall look of a page

Multivariate Experiment - The most robust way to test lots of ideas

This method compares the performance of content variations in multiple locations on a page. Use it if the points below describe your desired experiment:

- Your page receives more than ~1,000 views a week
- You want to try multiple content changes in different parts of the page simultaneously
Real-time coordination

- The possibility to adjust behavior based on fast cycle feedback on the current state of other entities
- It is a second-order value driver, requiring real-time sensing
- It requires contextualization of entities but not mass visibility
Real-time coordination
Real-time coordination
Value Archetypes

Value Drivers

- Real-time Sensing
- Real-time Mass Visibility
- Real-time Experimentation
- Real-time Coordination
Contextualization in action

THE KLOUT SCORE
MEASURING INFLUENCE SINCE 2008

The Klout Score measures influence based on your ability to drive action. Every time you create content or engage you influence others. The Klout Score uses data from social networks in order to measure:

**True Reach**: How many people you influence

**Amplification**: How much you influence them

**Network Impact**: The influence of your network

TRUE REACH

Your True Reach is the number of people you influence. We filter out spam and bots and focus on the people who are acting on your content. When you post a message, these people tend to respond or share it.
Contextualization in action

One Awesome Customer Experience: How JetBlue’s Twitter Saved the Day

Like one of tens of thousands of people traveling this past holiday season, I had booked a JetBlue flight for the day after Christmas to spend quality time with friends and loved ones. However, Mother Nature had other plans. A storm that quickly produced between 12 and 32 inches of snow fell on many areas of the North East that eventually caused the cancellation of some 10,000 flights. It certainly earned its titles as the “Snowpocalypse,” or “Snowmaggedon” of 2010. This was the view out my window:

The morning of my flight, an automated text message told me my flight was, expectedly, canceled. So, like most people, I turned to Twitter for answers and possible alternatives. I immediately searched for JetBlue using Twitter Search. I quickly located the official JetBlue Twitter account and quickly learned that there was a mix-up with their internal systems:

Top Influencers & Advocates Mentioning @jetblue

- American Express: 94, 365,097, 200, 89, 100,000
- @blackblue: 81, 100,140, 51, 57, 170,000
- @FareCompare: 81, 1247,396, 59, 416,000
- @filiegirl: 79, 71,301, 62, 81, 20,700

The Red Sox & @JetBlue entered their official online store. For those wondering, JetBlue actually flew the team to games.
Key lessons...

- Real-time digital data streams are a new breed of data assets for value creation
- Opportunities exist to leverage existing DDSs
- If the opportunity is large enough you may create a DDS
  - But this requires re-architecting systems
- Be alert to the DDSs you already have
  - They could enable platform plays
Recognizing opportunities

Zubin Dowlaty
Head of Innovation and Development
Mu-Sigma

If there is any business reason for you to move the decision point towards where the event occurred, then there is a good use case for real-time analytics.
Survey – key lessons

❖ Decision makers still think that real-time DDSs hold a large and un-tapped potential
❖ Customer service is where real-time data are needed the most
❖ Data streams are mainly used to monitor the business
❖ The main exploitation of real-time DDSs is leveraging efficiency and analytics value archetypes
❖ Mass visibility is the main value driver behind current real-time initiatives
DDSs and big data

Public and proprietary data streams

Stream

Data repository (big data)

Security and authorization mechanism

API
API
API

Real-time data analysis

Historical data analysis
Resources and skills

How ready is your organization to leverage DDSs?
DDS Readiness

- **Mindset**: The willingness of senior executives to pursue DSS initiatives
- **Skillset**: The ability to deliver resources necessary to deliver value from DSSs
- **Dataset**: The ability to identify DDSs that can generate value
- **Toolset**: The capacity to use appropriate technology to harvest DDSs
# Readiness for DDS

<table>
<thead>
<tr>
<th>Mindset</th>
<th>Is senior management ready to champion DDS value generation?</th>
</tr>
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<tbody>
<tr>
<td>Skillset</td>
<td>Do you have skills to generate, stream, and harvest digital data streams?</td>
</tr>
<tr>
<td>Dataset</td>
<td>Have you identified potential public, private, and partner DDSs?</td>
</tr>
<tr>
<td>Toolset</td>
<td>Have you the tools for real-time data stream analysis and reaction?</td>
</tr>
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</table>
Action

- Check your readiness
- What should you stream?
- What streams should you harvest?
- What value can you create?
How do you decide?

❖ Which DDS to leverage?

❖ What value extraction tactics to use?
Process to actuate
Link & integrate to analyze
Birthing  Streaming  Harvesting

Process  Link & integrate  Actuate

Analyze

Contextualizing
Which DDS to leverage?

- Madden’s commentary
- Hindenburg’s disaster
- Captain James Cook’s logs
Streamability

- Streamability represents the degree of availability of events in real-time
  - Amenable to DDG
  - Amenable to Intercepting
SceneTap

Female, 23
Male, 26

Cans
Hot Spot
88% full
784.49 miles
43%
57%
M 27
P 26

Declans Irish Pub
Hot Spot
>90% full
785.63 miles
36%
64%
M 27
P 27

Duffy's Tavern
Hot Spot
>90% full
786.85 miles
34%
66%
M 27
P 27

Durkins
Hot Spot
>90% full
786.53 miles
39%
61%
M 27
• Amenable to DDG
• Detectability
  • Smart camera identifies a person’s face
• Measurability
  • Smart camera identifies person’s gender and age
❖ Amenable to Interception
❖ Volume
❖ Few event data and streamable
❖ Sensitivity
❖ Image is not retained
❖ No identifying information is released to the stream
❖ Latency
❖ A camera processes an image real-time
DDS Streamability

• Amenable to DDG
  • Detectability is the threshold necessary to sense the occurrence of an event
  • Measurability is the degree of difficulty in accurately establishing the magnitude of relevant attributes of an event
DDS Streamability

- Amenable to interception
  - *Volume* is the size of the minimum discrete event representation
  - *Sensitivity* is the degree of an event’s personal privacy invasion that prevents it from being streamed
  - *Latency* is the minimum delay in making the event data available
What are the data that you are most often asked for and you can’t deliver?

What makes it difficult to go from *wish* to *deliver*?
Information technology and streamability

- Representation
  - Information technology captures events occurring in the physical world, their properties, and characteristics
  - Enables detectability and measurability
- Reach
  - Information technology enables transmission of digital representations of events
  - Handles volume and latency
- Monitoring
  - Information technology can authenticate parties and the transaction track activity
  - Manages sensitivity by limiting access to the intended parties
Datastream

Event characteristics

Technological capabilities

Events
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## Collective completeness

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<tr>
<td><strong>Spliced episode</strong></td>
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What value extraction tactics to use?
Streamability \times \text{Completeness} = \text{Tactical Opportunities}
Value potential matrix

Completeness

Streamability
Puppy

- Be attentive, resist the hype
- Don't invest, yet
- Monitor IT evolution
- Be ready for future implementations
Sprinkler

- Process and Actuate; MyTaxi
  - Simple value extraction by leveraging timeliness
- Link and Analyze: Google traffic
  - Harvest and store
  - Consolidate with other data streams that enable analysis
• Process and Actuate
  • Generally infrequent
  • Hard to use in real time
  • Be aware of latency, volume, & sensitivity
  • Monitor IT progress and be ready
• Link and Analyze: consumer confidence index
  • Continuously harvest and accumulate
  • No need to consolidate
  • Analyze independently the deep content
Firehose

• Process and Actuate: SOCIAL bot
  • Enables complex real time action

• Link and Analyze: New Brand Analytics
  • Enables real time big data analysis
  • No need to store
  • May be hard to store given volume
Prioritization matrix

Streamability x completeness

Upside potential
Value extraction tactics

- Identify relevant events
  - Assess streamability
  - Assess completeness
  - Evaluate potential for collective completeness
- Conceptualize initiatives that leverage event data
- Prioritize among the selected initiatives

Your tactical options depend on your readiness
DDS tactics

• Understand streamability and completeness
• Evaluate the options you have
  • Value potential matrix
• Select opportunities based on ROI
  • Prioritization matrix
• Monitor (and foster) your DDS Readiness
• Become an artist; tools only go so far
The fog of business

- For centuries business has been conducted in a fog of uncertainty
  - Lack of data
  - Lack of timely data
  - Lack of processing capability
- Embrace digital data streaming to lift the fog enveloping your business