DATA REVOLUTION:
How changes in data collection and analysis are changing the world around us

José María Álvarez-Pallete
Cambridge, MA, April, 14th 2016
The biggest technology revolution period in human history

- **1300**: WATT's Steam Machine
- **1700**: Steam Locomotive
- **1800**: Telegraph
- **1900**: Electric Generator
- **2010**: Mobile Data
- **2020**: Web

Source: Gordon 2012 & GE 2012
Drastic adoption cycles reduction

**Diffusion Rate:**
Years to reach 50 million

<table>
<thead>
<tr>
<th>Technology</th>
<th>Years to 50 million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telephone</td>
<td>75 years</td>
</tr>
<tr>
<td>Radio</td>
<td>38 years</td>
</tr>
<tr>
<td>TV</td>
<td>17 years</td>
</tr>
<tr>
<td>Internet</td>
<td>4 years</td>
</tr>
<tr>
<td>Facebook</td>
<td>3.5 years</td>
</tr>
<tr>
<td>Angry Birds</td>
<td>35 days !!!</td>
</tr>
</tbody>
</table>

**Number of devices multiplies with each new technology**

- **1960**
  - MAINFRAME: + 1 M
  - MINI COMPUTER: + 10 M
  - PC: + 100 M
  - DESKTOP INTERNET: + 1 Bn
  - MOBILE INTERNET: + 5 Bn
  - INTERNET OF THINGS: + 20 Bn

The pace of technological disruption is faster than ever

Storage and computation costs

Price per Gigabyte

$569

$222

Price per 1 Mm transistors

Laptop battery cost
CAGR -15%

Capacity
10 TB

2005

2015

1979

2015

Source: Deloitte University Press
Exponential growth of data

Data/Month

Source: Alcatel Lucent
Digital disruption

**Hotel Industry**
- Estimated Value 2015: $25.5 Bn
- Market Cap 2015: $9.2 Bn

**Food Industry**
- Estimated Value 2015: $4.9 Bn
- Market Cap 2015: $0.9 Bn

**Transport Industry**
- Estimated Value 2015: $62.5 Bn
- Market Cap 2015: $3.6 + $6.3 Bn

**Telecom Industry**
- Acquisition Value (by Facebook 2014): $19 Bn
- Acquisition Value (by Telefónica 2010): $9.8 Bn

Note: Campofrio’s market Cap. as of 31 Dec 2014. The company was acquired by Alfa in June 2015. Source: Bloomberg, TWSJ & Company information
Increasing demand for sophisticated data analysis skills

**Cumulative Number of Data Scientists Over Time (Thousands)**

- **x2 over the last 4 years**

**Data Scientists Per Company. Top 25 | 2014**

- Microsoft
- Facebook
- IBM
- GlaxoSmithKline
- Booz Allen Hamilton
- Nielsen
- GE
- Apple
- LinkedIn
- Teradata
- HP
- Intel
- Twitter
- Capital One
- Google
- Accenture
- Oracle
- SAS
- AT&T
- Amazon
- Groupon
- King
- Allstate
- American Express
- Capgemini

65% of the students entering primary school today will end up working in new jobs that do not exist yet

Source: Forbes, WEF
Digital Globalization: The new era of global flows

Data flows are soaring

45x growth in data flows 2005 - 2014

Finance

Trade

1980 2014

Cross Border Data Flows | 2014

Global flows increase economic growth

10% increase in world GDP, worth ~7.8 Tn USD en 2014

2.8 Tn USD GDP increase from data flows, large impact than goods trade

~50% potential GDP boost for some countries by increasing participation in global flows

Bandwidth (Gbps)

- <50
- 50-100
- 100-500
- 500-1,000
- 1,000-5,000
- 5,000-20,000
- >20,000

100% = 211.3 Tbps (Terabits per second)

Source: McKinsey Global Institute
Evidence that digital and social networks are isomorphic

Social Network based on mobility

Network based on phone calls

Source: Coscia & Hausmann
Building geographical interaction graphs

Mobility graph
- 25 Bn records analyzed

Mobile-calls graph
- 1.9 Bn records analyzed

Fixed-calls graph
- 230 Mn records analyzed

Source: Internal Data
High correlation between mobility and mobile-calls networks

Source: Internal Data

Normalized Mutual Information 0.81
Community clusters built from mobility reflect real-life interaction

Source: Internal Data
Big data, an engine for economic forecast

Data

Time: 49 months

Universe

>1.4 million series; >67 million data, 2012-2015 period

Data Records: >13,000 millions

>70,000 Corporations and SMEs with international traffic

Data volume: 1.2 Terabytes

>21,000 export and import data records

Source: Internal data & DataComex
Similarities in the evolution of Telco and external trade data, suggest relations among series

Behavioral pattern of international mobile traffic*, imports and exports (2012-2015)

*Top 1000 by total volume of international traffic (02/2016).

Source: Based on Operator’s aggregated and anonymized data & DataComex (2016).
A cross-correlation analysis corroborates the strong relation between time series of import/export and traffic – lag 0 | 2012-2015

Strong Cross-correlations between time series of import/export and traffic – lag 0 | 2012-2015

- **Exports**: 91% IMT vs Exp
- **Imports**: 87% IMT vs Imp

Source: Based on Operator data & DataComex (2016).
International traffic pattern shows signs of sectorial economic activity

International mobile traffic breakdown by region | 2012-2015

<table>
<thead>
<tr>
<th>Region</th>
<th>Construction</th>
<th>Textile</th>
<th>Automotive</th>
<th>Turism</th>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>47%</td>
<td>74%</td>
<td>90%</td>
<td>76%</td>
<td>47%</td>
</tr>
<tr>
<td>Latin America &amp; the Caribbean</td>
<td>26%</td>
<td>7%</td>
<td>3%</td>
<td>11%</td>
<td>22%</td>
</tr>
<tr>
<td>North America</td>
<td>10%</td>
<td>5%</td>
<td>3%</td>
<td>8%</td>
<td>11%</td>
</tr>
<tr>
<td>Middle East</td>
<td>6%</td>
<td>1%</td>
<td>0.2%</td>
<td>1%</td>
<td>6%</td>
</tr>
<tr>
<td>Asia</td>
<td>2%</td>
<td>8%</td>
<td>3%</td>
<td>1%</td>
<td>4%</td>
</tr>
<tr>
<td>Africa</td>
<td>9%</td>
<td>4%</td>
<td>2%</td>
<td>3%</td>
<td>9%</td>
</tr>
<tr>
<td>Oceania</td>
<td>0.5%</td>
<td>0.2%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>1%</td>
</tr>
</tbody>
</table>

Source: Based on operator’s data in Spain.
Thank you