The British Museum

Data-driven museums

Alice Daish
Data Scientist
@alice_data

12th International Digital Curation Conference
February 2017

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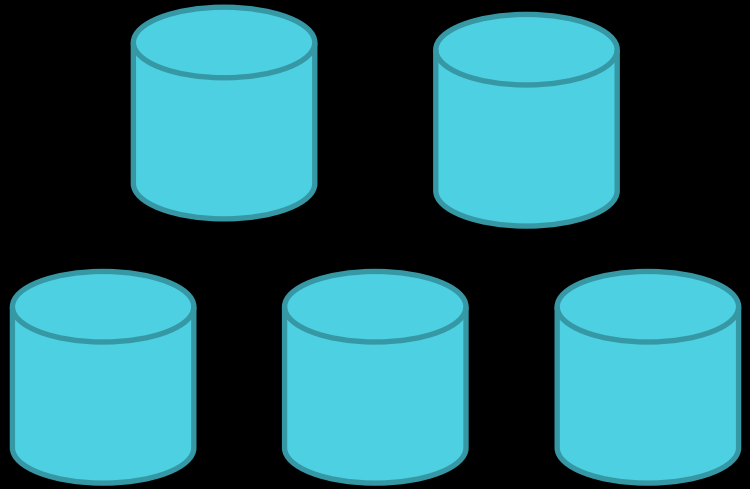
Data Silos



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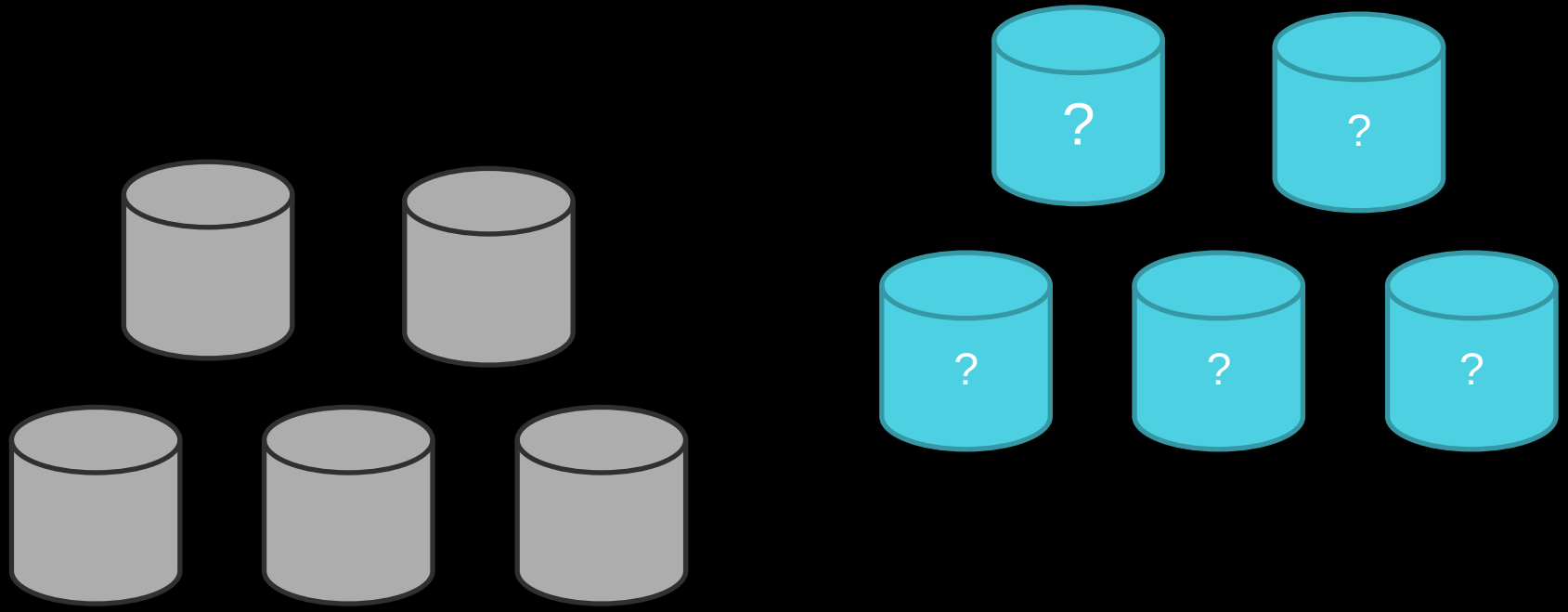
Unmanaged data



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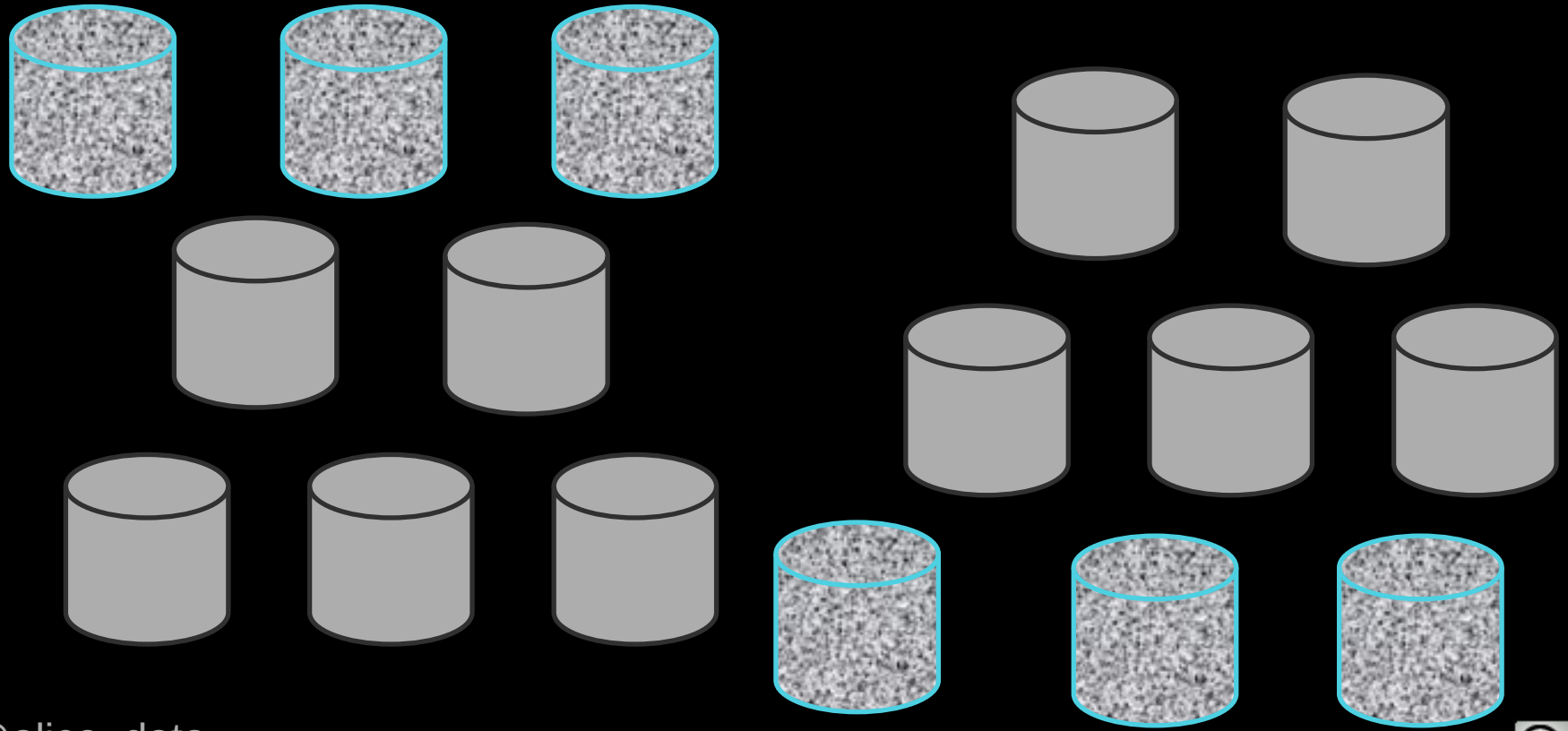
Undervalued data



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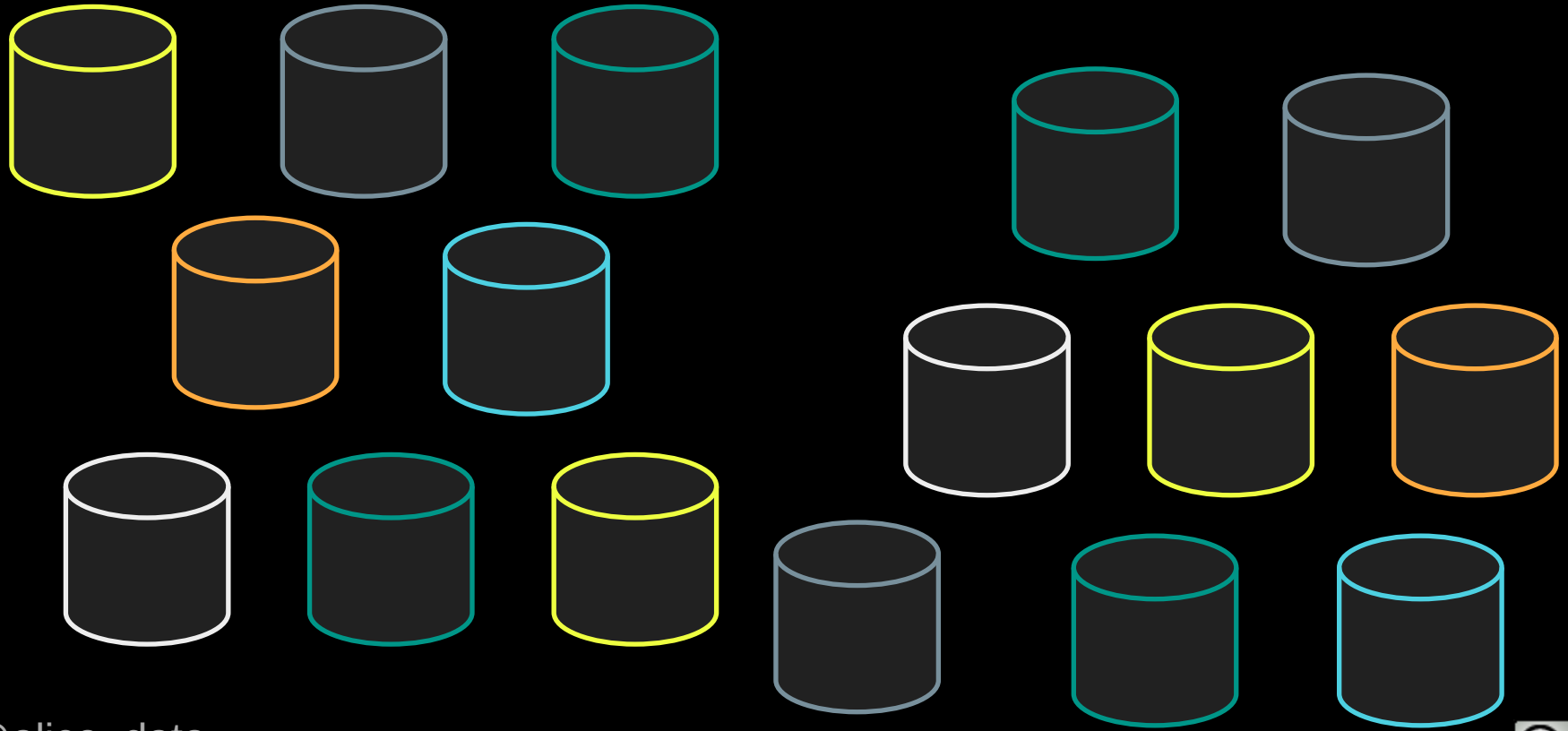
Data opportunity



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Questions

Problems

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Here to help us …

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The British Museum …to the rescue

Questions

Problems

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Questions

Problems

Answers

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Questions

Problems

Answers

Decision

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Questions

Problems

Answers

Decision

Actions

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Questions

Problems

Answers

Decision

Actions

More Q's

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However…

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Questions

Problems

Answers

Decision

Actions

More Q's

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Questions	Data	Answers
		Decision
Problems		Actions
		More Q's

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Data-driven

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Data-Driven

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Data-Driven

Data in the
hands of
decision makers

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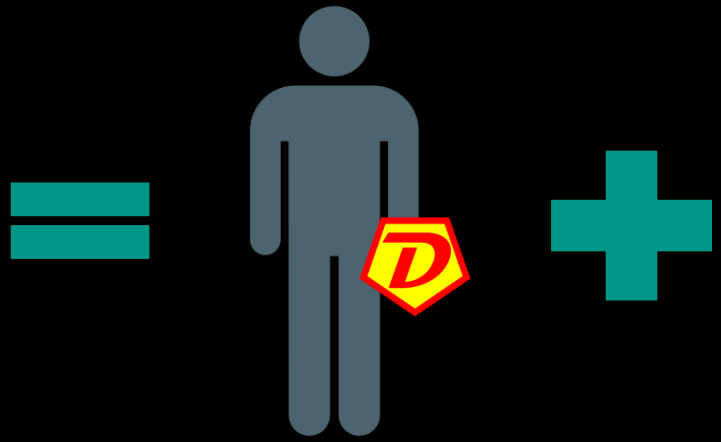
Data-Driven



Data in the
hands of
decision makers

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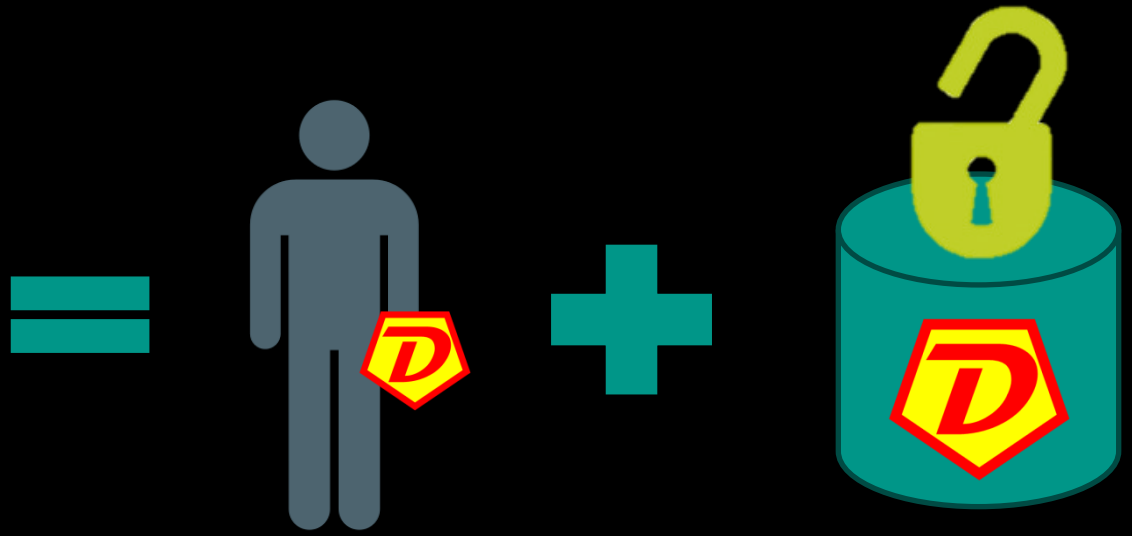
Data-Driven



Data in the hands of decision makers

De-siloed, accessible, centralised data

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Data Science at The British Museum

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Set up

Opened 1759 to all 'studious and curious persons'
1st National Public Museum in the World

Today
One of the most visited museum in the world
8 million objects
2 million years of human history

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Starting point

Didn't have …

- No list of data sources
- No data access
- No databases
- No data warehouse

Did have…

- R
- Data Scientist
- Big Data: Senior Product Manager
- What does "big data" mean to the museum?

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Finding data

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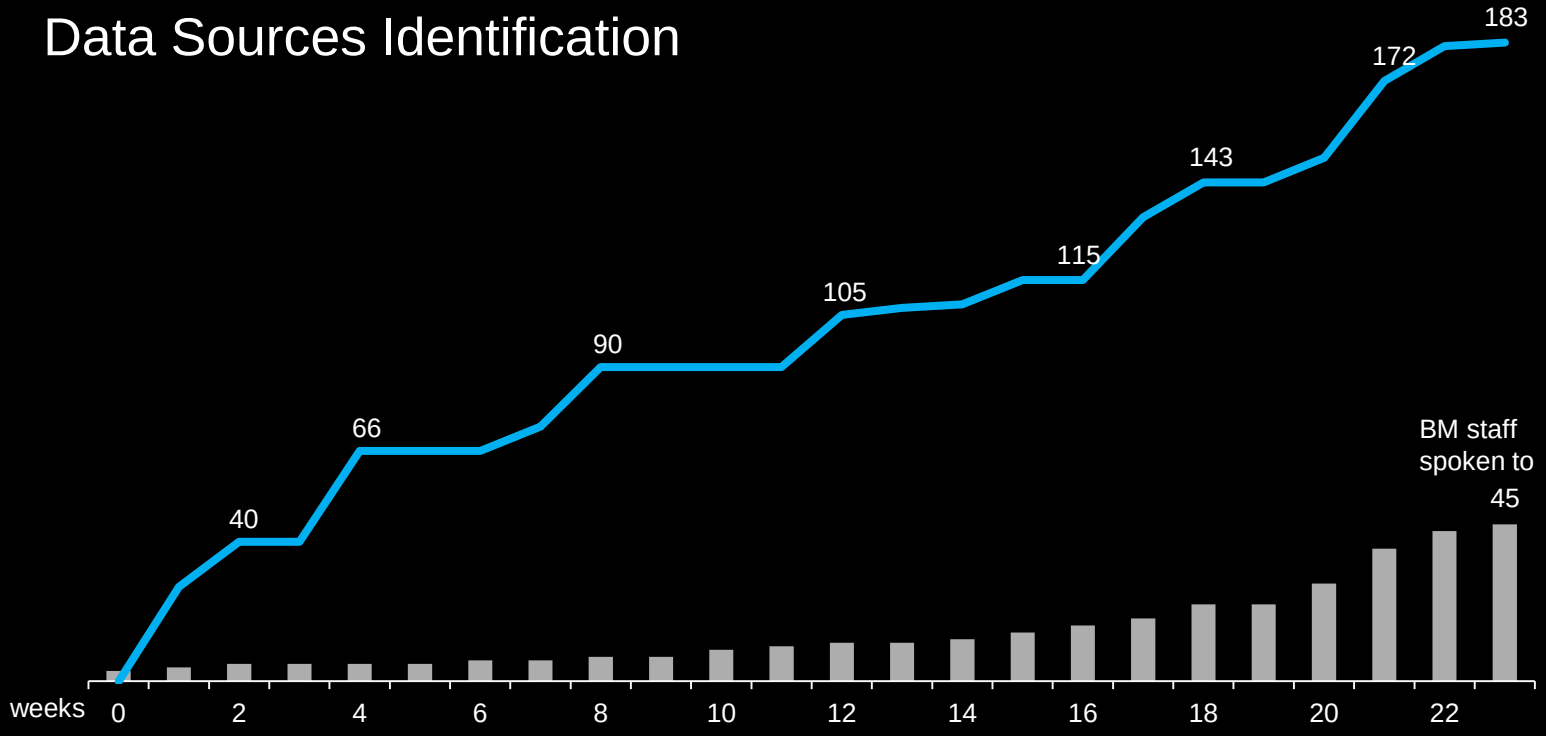
Data Sources Identification



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What is a data source? From a excel spreadsheet to large database e.g. ODIN

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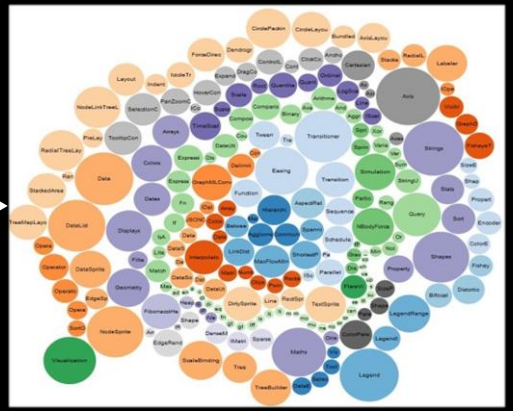
Bubble Envy



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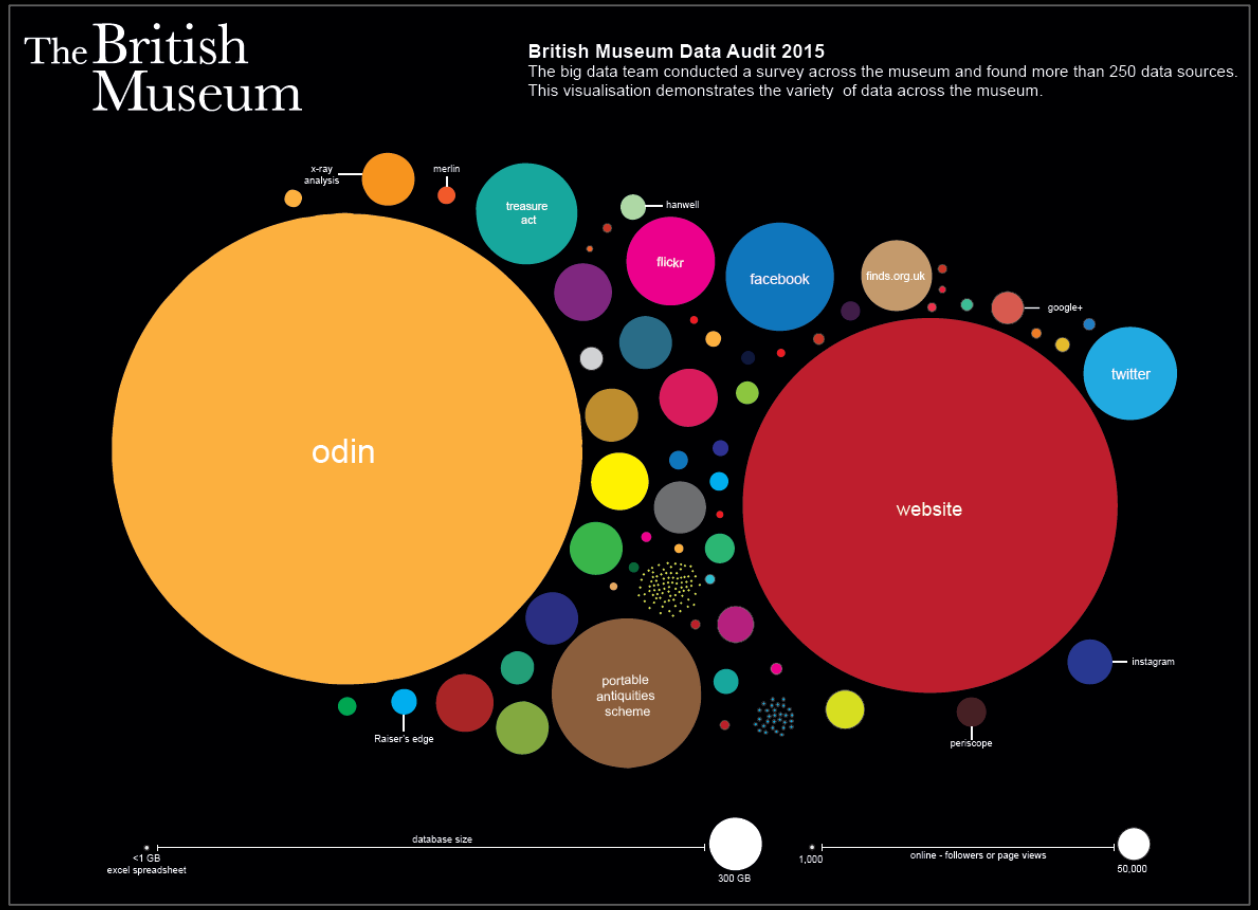
D3 Bubble Chart: https://bl.ocks.org/mbostock/4063269



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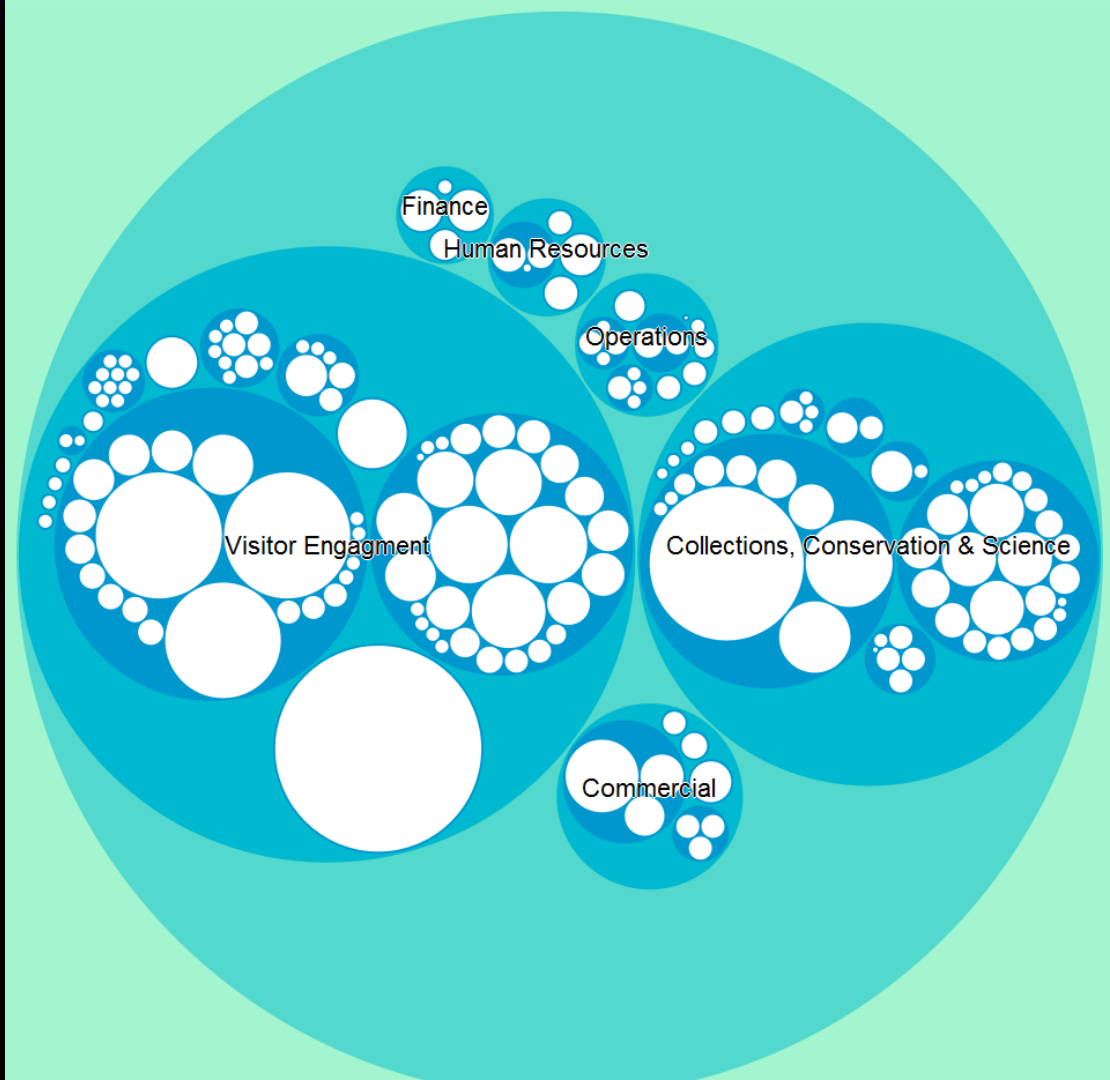
D3

(Data-Driven Documents)



2017 update
In Development

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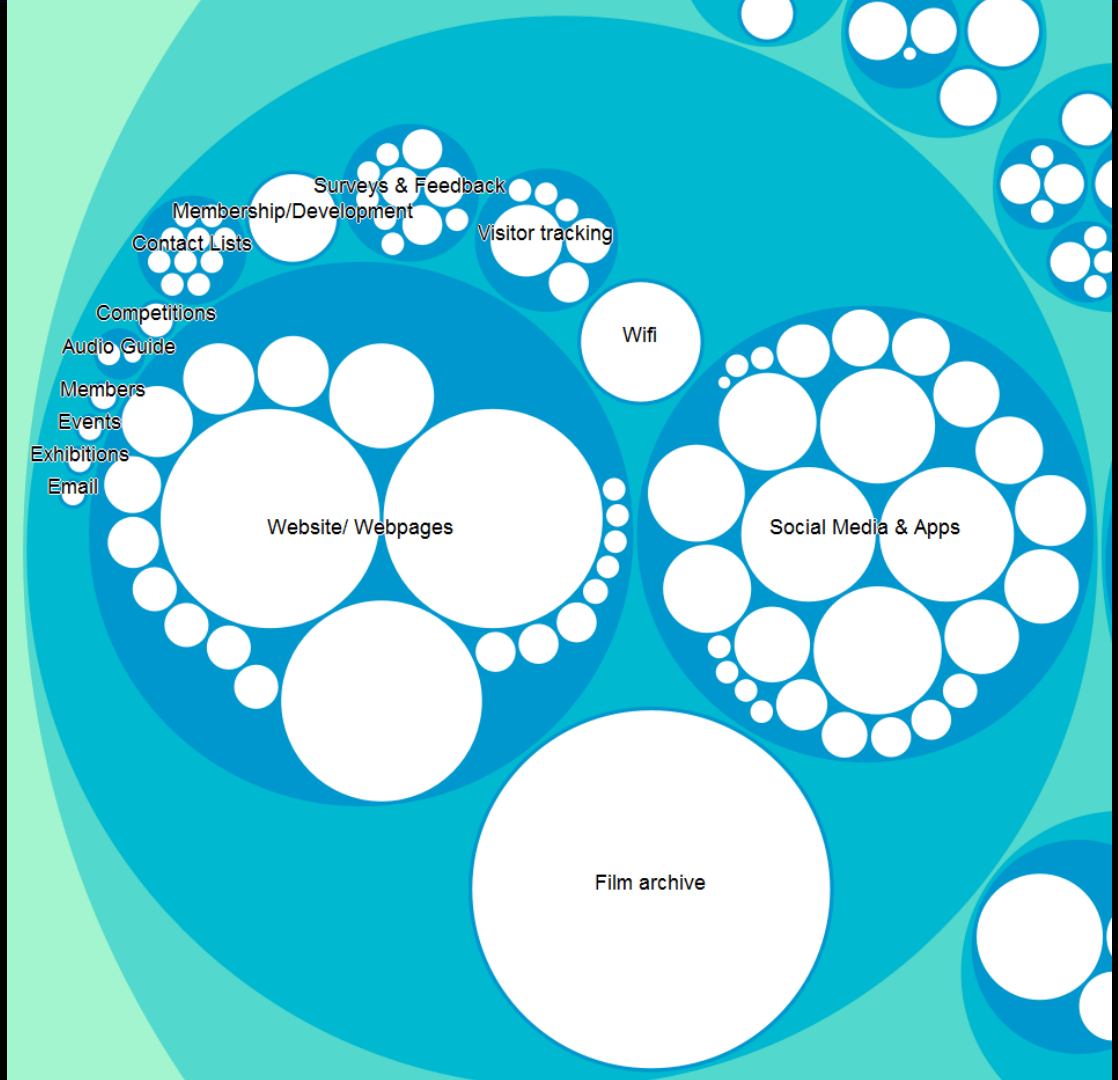
D3

(Data-Driven Documents)



2017 update
In Development

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Valuing data

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Symbol - Noun Project: Dara Ullrich, DE

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Business Problems = Data Opportunities

We don’t know who our visitors are?
Online = > 9 million
Offline = 6.8 million

We don’t know what they do in the museum?

And we don’t know the opportunities to generate revenue?

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Business Problems = Data Opportunities

We don't know who our visitors are?
Online = > 9 million
Offline = 6.8 million

We don't know what they do in the museum?

And we don't know the opportunities to generate revenue?

"silos" and "wrangling"

data viz

visitor movement

predictive modelling

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“silos” and “wrangling”

Multiple visitor data platforms

CSV exports from external platforms

No SQL

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Packages: data.table, dplyr

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“silos” and “wrangling”

Multiple visitor data platforms

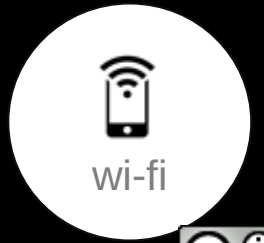
CSV exports from external platforms

No SQL

100’s of columns

print format exports nested by timeslots

Split first and second name



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Packages: data.table, dplyr

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No SQL = data.table

How many visitors are on multiple platforms?

Assess the visitor data siloing

Why?
To improve engagement and access of the museum we need to examine our visitor data.

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Packages: data.table, dplyr

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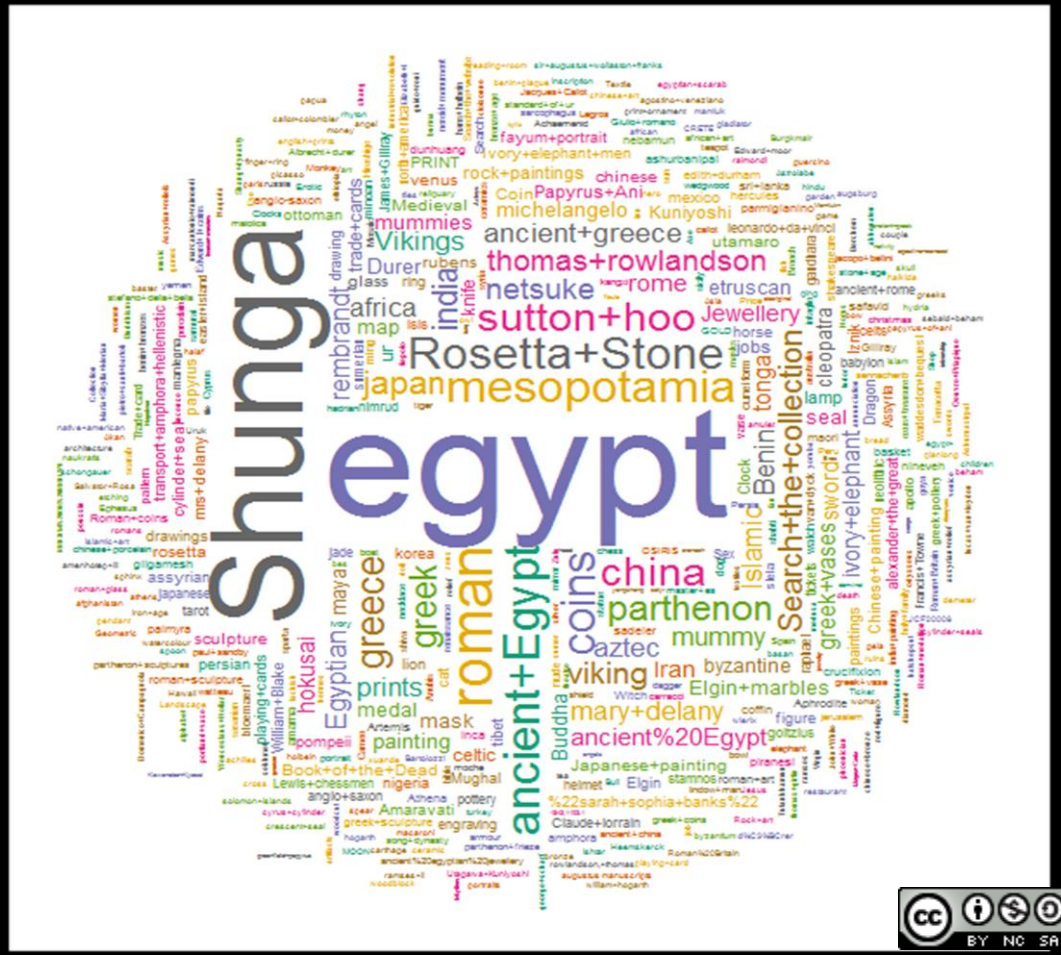
Top 500 website search

June 2015-16



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Packages : RSiteCatalyst (Adobe Analytics), WordCloud

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Alice Daish. (2016). R KeyWord Search WordCloud: First Release. Zenodo. 10.5281/zenodo.56283

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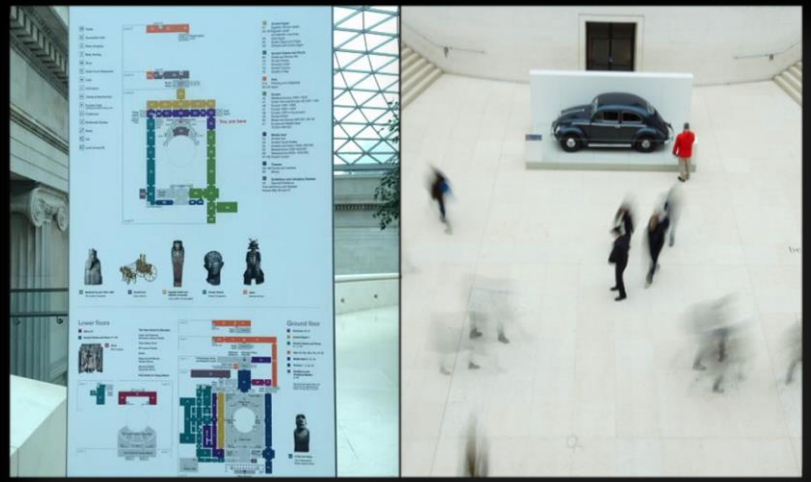
Visitor Movement

62 galleries, 3 floors, largest covered public square in Europe with 6.8 million visitors per year.



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Packages : httr, jsonlite

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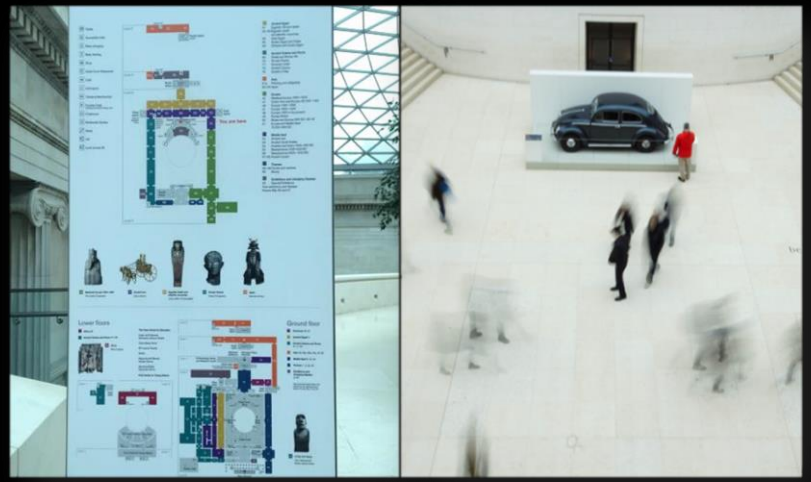
Visitor Movement

Wi-Fi presence used to sample visitor numbers



1st to use R to connect to CISCO Presence API

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Packages : httr, jsonlite

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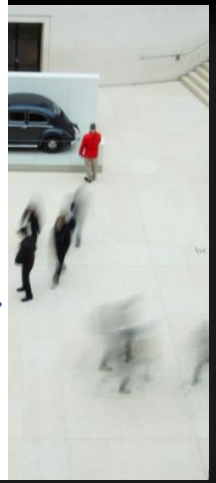
Visitor M

Wi-Fi presenc
used to sampl
visitor numbe

1st to use R to connect to CIS Presence API

```r
#-------------CISCO API Connection to collect CISCO data--------------
#DATE : 03/06/2016
#AUTHOR: Alice Daish adaish@britishmusuem.org

#-----Install and Load packages
library(httr)
library(jsonlite)

#Load password and username code file
source("logincisco.R")

#----FIND THE LIST OF SITES-------
sites<-GET("https://cmxcisco.com/api/config/v1/sites",authenticate(user, password))
# gets the URL api content including authroziation

#testing different export formats
str(content(sites)) #see content
sitelist<-content(sites, "text") #collects content as text string
sitelist<-fromJSON(sitelist) #convert to table format from string
head(sitelist) #see the top of the table

#List of site name and siteId
siteId<-cbind(sitelist$aesUidString,sitelist$name)

#EXAMPLE COLLECT HOURLY DATA OF ALL SITE FOR ONE DAY (14/05/2016)
hourdata<-matrix(NA,nrow = 97*1, ncol = 27) #blank matrix
colnames(hourdata)<-c("SiteID","SiteName","Date","0","1","2","3","4","5",
                      "6","7","8","9","10","11","12","13","14","15","16",
                      "17","18","19","20","21","22","23") #Label columns

  hourly<-GET(paste0("https://1nzgy2.cmxcisco.com/api/presence/v1/visitor/hourly?siteId=",
                     siteId[i,1],"&date=2016-05-14"),authenticate(user, password))

  hourdata[i,1]<-siteId[i,1] #ID
  hourdata[i,2]<-siteId[i,2] #Name of site
  hourdata[i,3]<-"2016-05-14"
  hourdata[i,4]<-content(hourly)$`0`
  hourdata[i,5]<-content(hourly)$`1`
  hourdata[i,6]<-content(hourly)$`2`
  hourdata[i,7]<-content(hourly)$`3`
```



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Packages : httr, jsonlite

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Visitor M

Wi-Fi presenc
used to sampl
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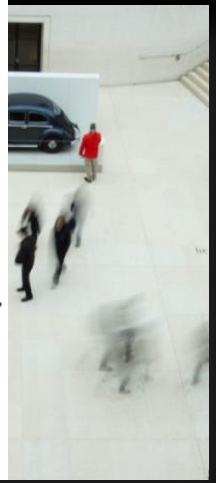
1st to use R to
connect to CIS
Presence API

```
#-------------CISCO API Connection to collect CISCO data--------------
#DATE : 03/06/2016
#AUTHOR: Alice Daish adaish@britishmusuem.org
```

9-10am	10-11am	11am-12p	12-13pm	13-14pm	14-15pm	15pm-16p	16-17pm	17-18pm	Total
23	155	212	254	174	165	155	141	120	1399
38	76	94	153	120	115	101	158	92	947
26	52	82	92	91	84	80	105	54	666
27	50	68	81	74	65	83	87	98	633
7	23	64	93	68	65	69	85	36	510
11	61	78	61	76	48	61	57	37	490
13	56	45	88	47	27	31	78	69	454
26	40	42	65	56	58	48	47	48	430
14	29	53	111	48	31	35	72	35	428
1	26	69	62	51	64	66	56	27	422
1	39	78	57	52	45	53	52	19	396
0	30	56	57	53	59	59	53	23	390
3	24	56	56	47	55	41	43	15	340
15	18	29	30	34	41	51	36	86	340
14	43	30	34	44	43	36	31	50	325
5	20	48	73	38	36	30	44	27	321
7	39	53	43	38	30	42	39	27	318
3	22	44	54	41	36	39	50	26	315
4	16	39	50	50	38	38	42	36	313
0	30	31	28	43	44	37	38	16	267
6	17	30	53	24	24	31	40	28	253
19	27	20	30	18	22	23	31	38	228
2	14	21	39	37	35	25	20	22	215
8	27	32	23	27	29	25	18	22	211
12	12	15	22	28	27	29	25	37	207
22	38	33	24	22	19	15	16	15	204
11	12	19	33	32	21	25	32	17	202
2	17	26	26	31	26	25	30	12	195
10	33	22	25	10	17	20	29	4	170
2	19	17	29	31	19	20	19	12	168
0	9	23	28	19	17	25	35	11	167
0	15	24	31	13	16	20	35	12	166
11	14	21	33	23	20	18	13	8	161
11	9	27	28	23	23	19	12	6	158
3	19	19	25	15	15	24	18	18	156

```
hourdata[i,7]<-content(hourly)$`3`
```



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Packages : httr, jsonlite

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Nothing is perfect

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Predictive modelling

Can we predict ticket sales for exhibitions?

mixed effect modelling

- data wrangling
- modelling
- prediction

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Packages : lme4, lubridate, dplyr, data.table, ggplot2, ggthemes

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Predictive modelling

First initial model created
Predicted first exhibition sales
Development continues …

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Packages : lme4, lubridate, dplyr, data.table, ggplot2, ggthemes

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Recommendations and Insights

Audio guide

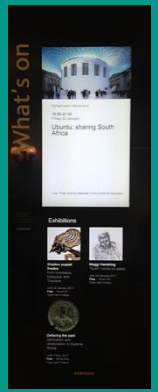
1 in 3 visits start at the Rosetta Stone

And 3 of the top visited stops are not on the “Top 10” tour

Digital Signage

Audio guide starting direction

Promoting exhibition tickets at quiet times



Ticketing Trends

Peak and Off-peak times across exhibitions looking at ticketing capacity

Recommendation for filling quiet timeslots and investigation into time dependent ticketing pricing

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De-siloed accessible data

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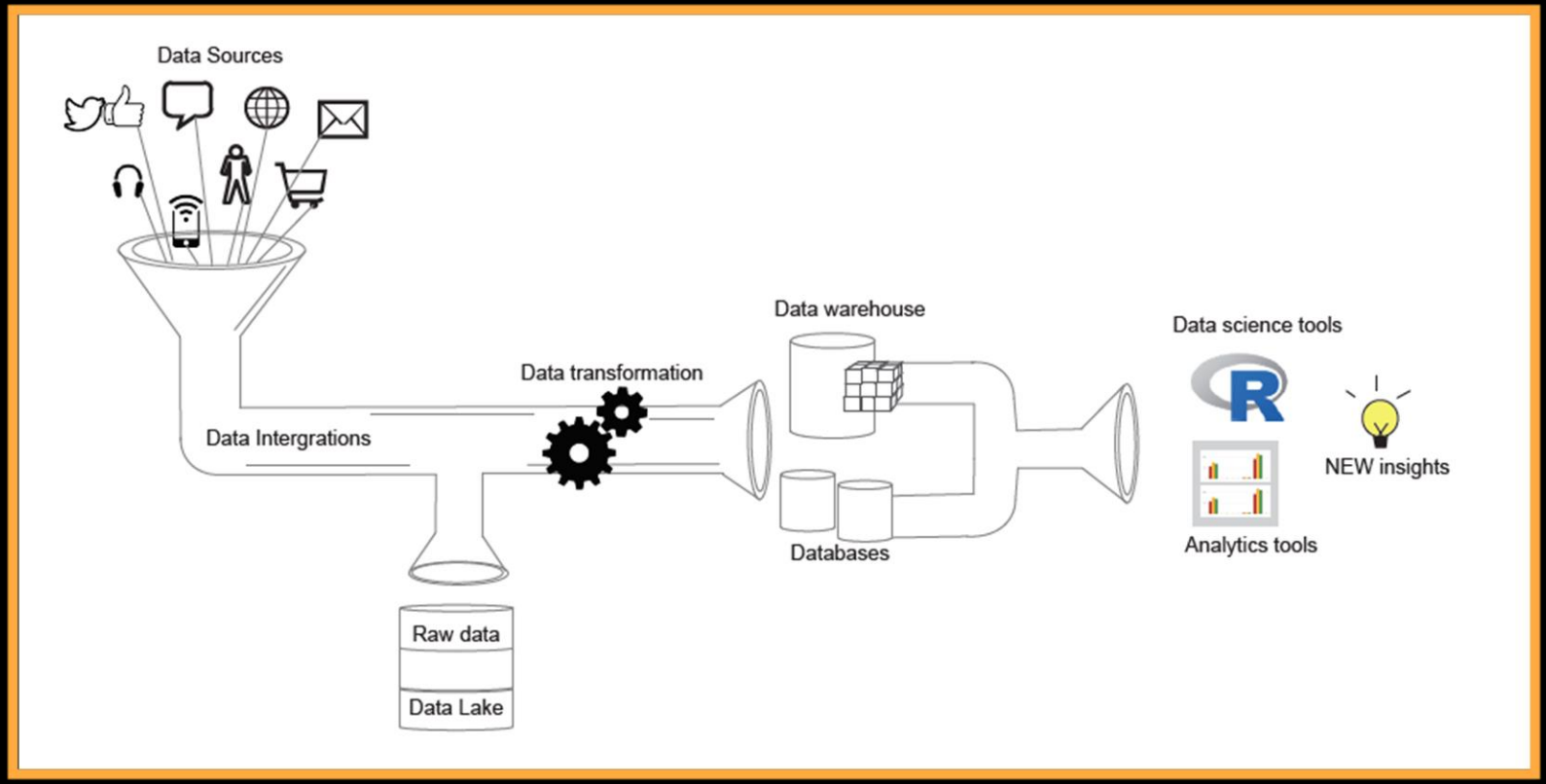
Data Pipeline



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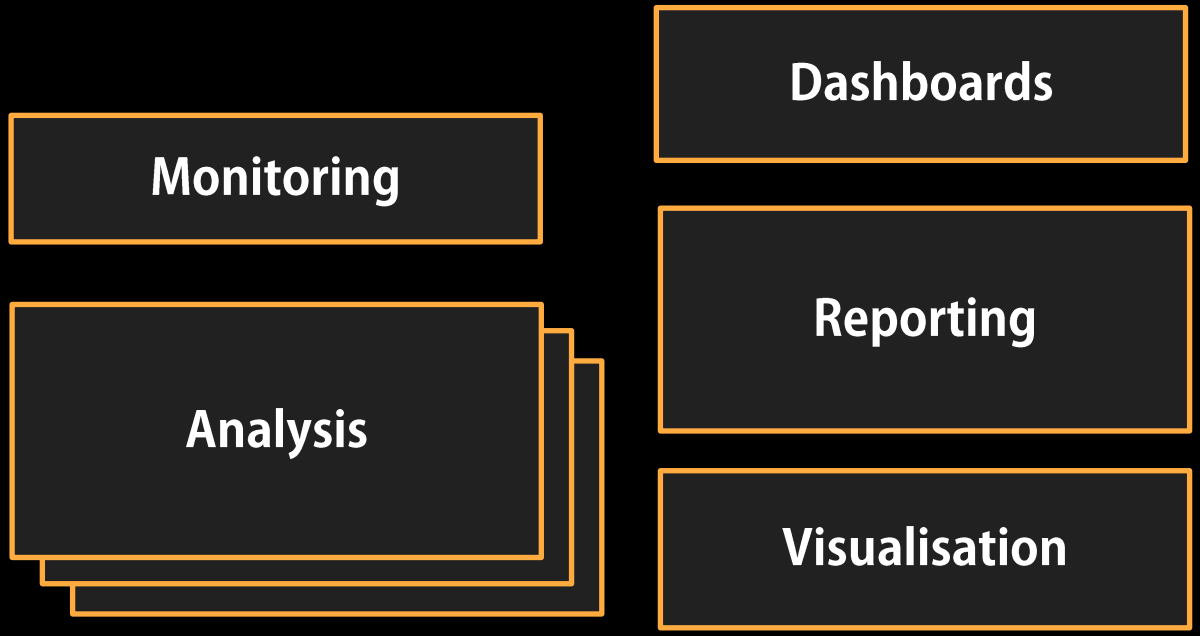

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What next…

Support staff empowerment
- Data in the hands of decision makers
- De-siloed accessible centralised data

Data-driven decision making primarily for product and content development and optimization

Scoping opportunities for revenue generation

BUT Who knows?
Internet of things
e.g. Toilet door locks, Boilers, Visitor Flow Signs

Machine Learning
e.g. Predicting Visitor Numbers, Optimization, New Collection Discoveries

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Transformation advice

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Problems to becoming data-driven

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Siloed and inaccessible data

=

Problems to becoming data-driven

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Siloed and inaccessible data

Problems to becoming data-driven

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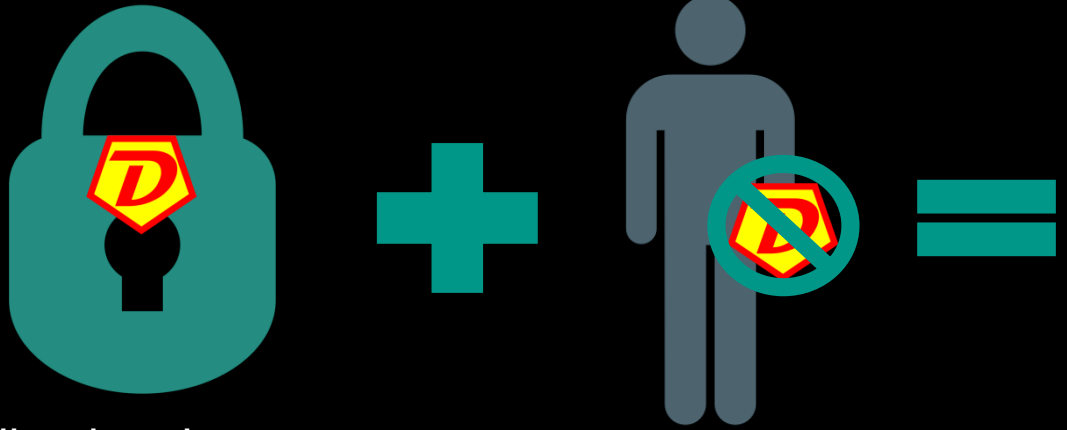

Siloed and inaccessible data

Data not in the hands of decision makers

Problems to becoming data-driven

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DATA CULTURE

Transforming any organisation to be data-driven is about changing behaviours and habits.

DATA ADVOCACY

Data value needs to be discovered and shared. By giving voices to data champions and advocates.

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support

High level support

Quick Wins

Find early adopters

Build trust

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Technical Evangelist

Technology orientated and use data frequently within their roles.

Supports data roles and adoption across the business

Data Ambassador

Data is highly important to their role but not necessarily their main responsibility.

Adopting data techniques and sharing the value and insight data can provide.

Business Data Advocates

Supports data application across business

Champion the use of data in high-level meetings and discussions

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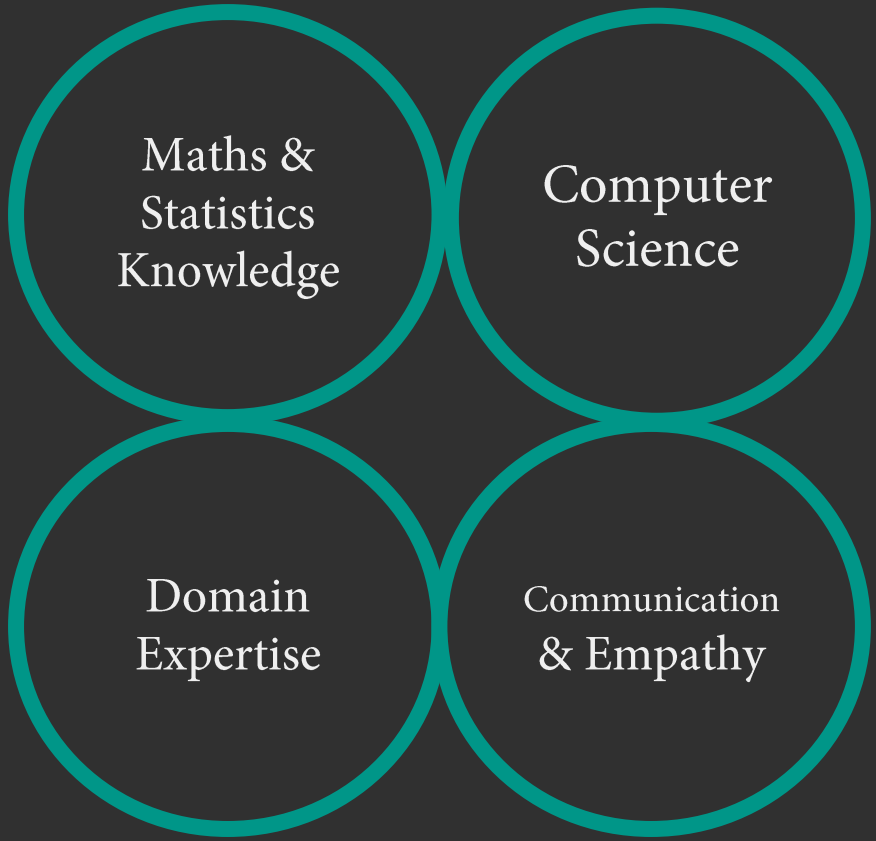
team skills

Data Science



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team skills

Strategic Project Management

- Stakeholder Manage-ment
- Project Manage-ment
- Communication & Empathy
- Business Strategy

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upskilling

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Data Science Upskilling

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Data Science Upskilling

Excel main tool

- Filter
- Basic calculations

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Data Science Upskilling

Beginner	Intermediate	Advanced

Excel main tool
- Filter
- Basic calculations

Excel and BI tool
- Pivots
- Advanced Calculation
- Visualisation
- Data Analysis Reporting

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Data Science Upskilling

Beginner	Intermediate	Advanced

Excel main tool
- Filter
- Basic calculations

Excel and BI tool
- Pivots
- Advanced Calculation
- Visualisation
- Data Analysis Reporting

Tools including Programming
- Data Wrangling/Munging
- Visualisation
- Data Analysis
- Modelling/Machine Learning

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Data Science Upskilling

Beginner	Intermediate	Advanced
Excel main tool • Filter • Basic calculations	Excel and BI tool • Pivots • Advanced Calculation • Visualisation • Data Analysis Reporting	Tools including Programming • Data Wrangling/Munging • Visualisation • Data Analysis • Modelling/Machine Learning

Excel

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Data Science Upskilling

Beginner	Intermediate	Advanced
Excel main tool • Filter • Basic calculations	Excel and BI tool • Pivots • Advanced Calculation • Visualisation • Data Analysis Reporting	Tools including Programming • Data Wrangling/Munging • Visualisation • Data Analysis • Modelling/Machine Learning

Excel

BI tools/dashboard

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Data Science Upskilling

Beginner	Intermediate	Advanced

Excel main tool
- Filter
- Basic calculations

Excel and BI tool
- Pivots
- Advanced Calculation
- Visualisation
- Data Analysis Reporting

Tools including Programming
- Data Wrangling/Munging
- Visualisation
- Data Analysis
- Modelling/Machine Learning

Excel

BI tools/dashboard

Programming : R/Python

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listen & empathy

Listen to your stakeholders

Help them formulate

De-complicate keep it simple

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communicate

Comms series “Did you know”

Outreach

Encourage data ambassador

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process

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The British Museum — Big Data Team : 12 step Analytical Process

1		Identify a problem or question
2		Agree the business questions and/or hypothesis with stakeholders
3		Identify the data available
4		Decide how best to capture the data
5		Decide how to clean, transform and deal with gaps
6		Decide on how the data will be managed, stored, accessed, manipulated and scheduled
7		Analyze
8		Create report or visualization
9		Provide insights & storytelling back
10		Discuss how to embed these results into the business and/or future decision-making processes
11		Discuss how to better capture data in the future (new data or improve existng methods)
12		Can we close the project, or is there a new question?

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Vision for the future

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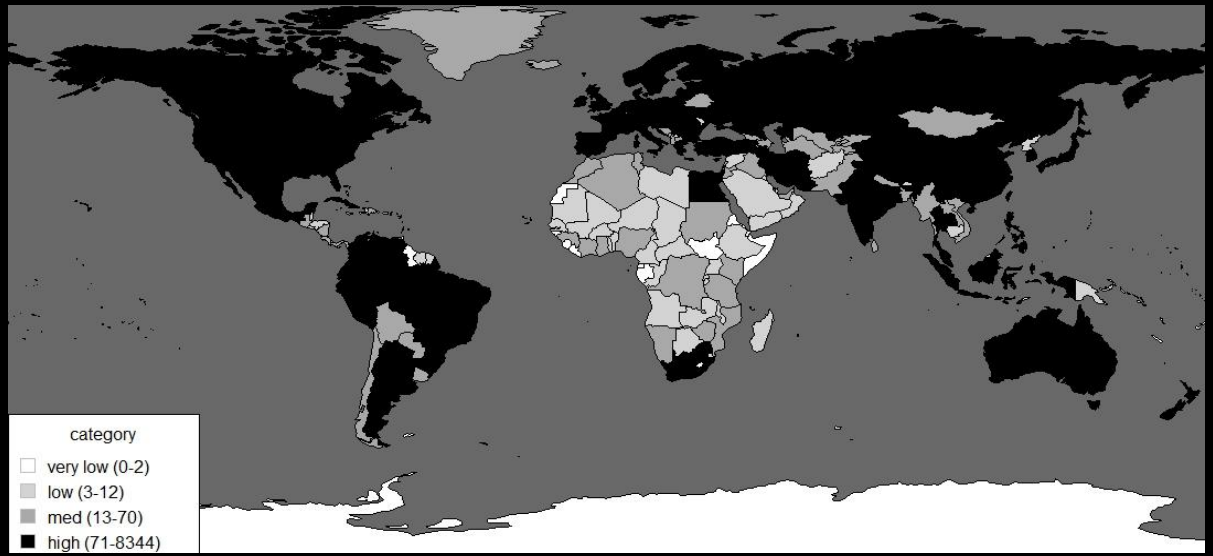
museums potential

55,000 museums 180 countries



Alice Daish (2016). RGlobalMuseumMap: First Release.. Zenodo. 10.5281/zenodo.56366

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Original Data Source: Museums of the World (2015) Berlin, Boston: De Gruyter Saur. Retrieved 5, Jun 2016, from http://ww.degruyter.com/view/product/448539

The British Museum

Business Problems

=

Data opportunity

Visitor Engagement

Objects

Operations

Buildings

Retail & ecommerce

Exhibitions

HR

Finance

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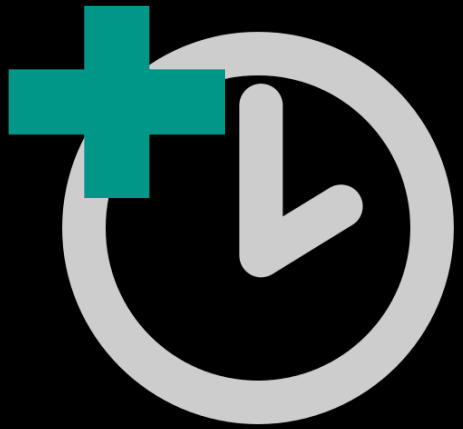

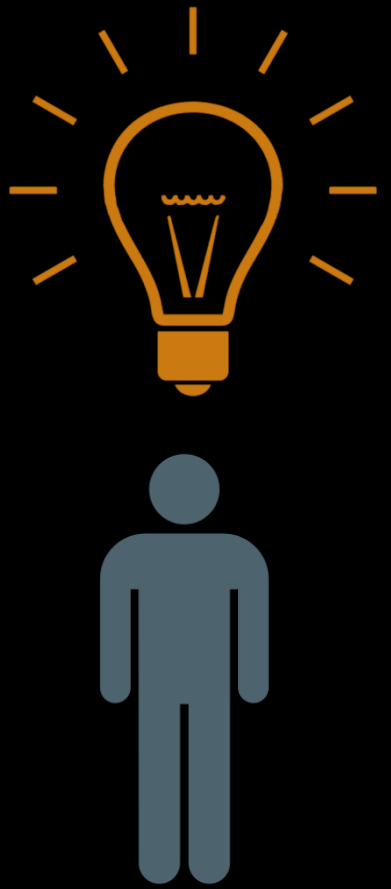

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Thank you & Questions

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Symbol - Noun Project: Dara Ullrich, DE