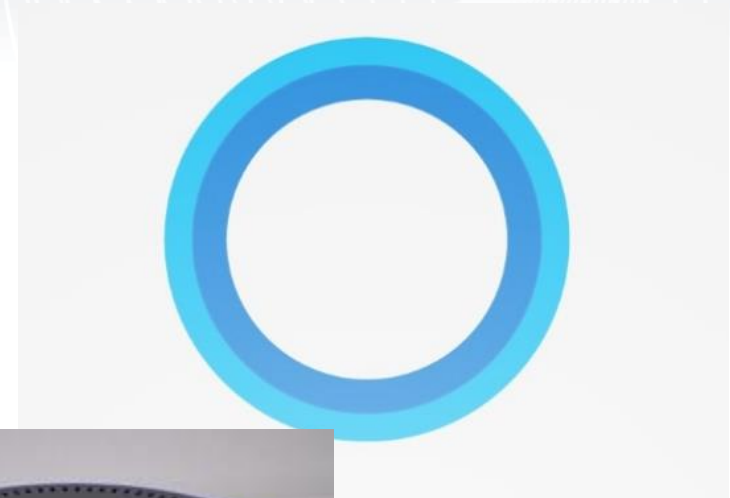


# Geotechnical Data Interchange and Risk Management?

Scott L. Deaton, Ph.D.  
Dataforensics

- Alexa
- Google Assistant
- Siri
- Cortana
- AI
- Big Data



Hi, how can I help?



# Geotechnical Data

If you can process it into one or more formats

**without re-inputting it**

**or**

**without using multiple cut and paste operations**

**You have data**



PDF borehole logs  
(Not Data)

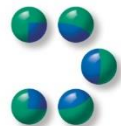
Keynetix Dataforensics		Borehole ID: BH-31																					
Client: A Client		Project Name: A Name																					
Project Number: 20150924		Project Location: A Loc																					
Date Started: Jun 04 2015	Completed: Jun 04 2015	Logged By:																					
Drilling Contractor: ABC Drilling	Latitude: 34.259924	Longitude: -83.936980	Elevation: 305.00																				
Drilling Method: 4-1/4" Hollow stem auger	Ground Water Levels																						
Equipment: CME 1100	At time of drilling	15.00 on Jun 04 2015																					
Hammer Type: Automatic hammer	After drilling	17.00 on Jun 04 2015																					
Notes: Notes go here	24 hours	19.00 on Jun 04 2015																					
Depth	Graphic	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts (N Value)	Pocket Pen. (tsf)	Dry Unit Wt. (pcf)	SPT N-Value														
									PL	MC	LL	Fines Content											
1		Asphalt																					
2		POORLY GRADED GRAVEL WITH SAND silty sand (SP), very loose, moist to wet, dark brownish black and light grayish brown, poorly graded, rounded, coarse grained, very hard, elongated, moist to wet, very loose, stratified, trace ferrous nodules, trace construction debris, trace manganese, no odor, moderate cementation, iron oxide staining, weak, Fill Something else goes here																					
3																							
4																							
5				AU-1																			
6																							
7		LEAN CLAY sandy lean clay (CL), medium stiff to stiff, moist, no dilatancy, medium plasticity, medium toughness, medium dry strength, dark brown, moist, medium stiff to stiff, varved, Fill																					
8			SPT-2	100		1-2-3	1.25																
9																							
10			SPT-3	93		2-4-6	2.25																
11		POORLY GRADED SAND sand (SP), loose to medium dense, moist, light brown, poorly graded, moist, loose to medium dense, trace silt, hydrocarbon odor, Alluvium																					
12			SPT-4	87		3-6-9	3.25																
13																							
14																							
15			SPT-5	67		5-10-15	4.25																
16																							
17																							
18		LEAN CLAY fat clay (CL), very stiff to very hard, moist to wet, dark brown, moist to wet, very stiff to very hard, iron oxide staining, Alluvium	SPT-6	60		6-12-18	3.50																
19																							
20																							
21																							
22																							
23			SH-7	100			2.50																
24																							
25			SPT-8	83		9-12-50/0.2	1.50																
26		POORLY GRADED GRAVEL sandy gravel (GP), very dense, dark red, poorly graded, well rounded, fine and coarse grained, very hard, elongated, very dense, Alluvium																					
27			SPT-9	71		15-50/0.2	4.50																
28			SPT-10	100		50/0.1	4.50																
29																							
30																							



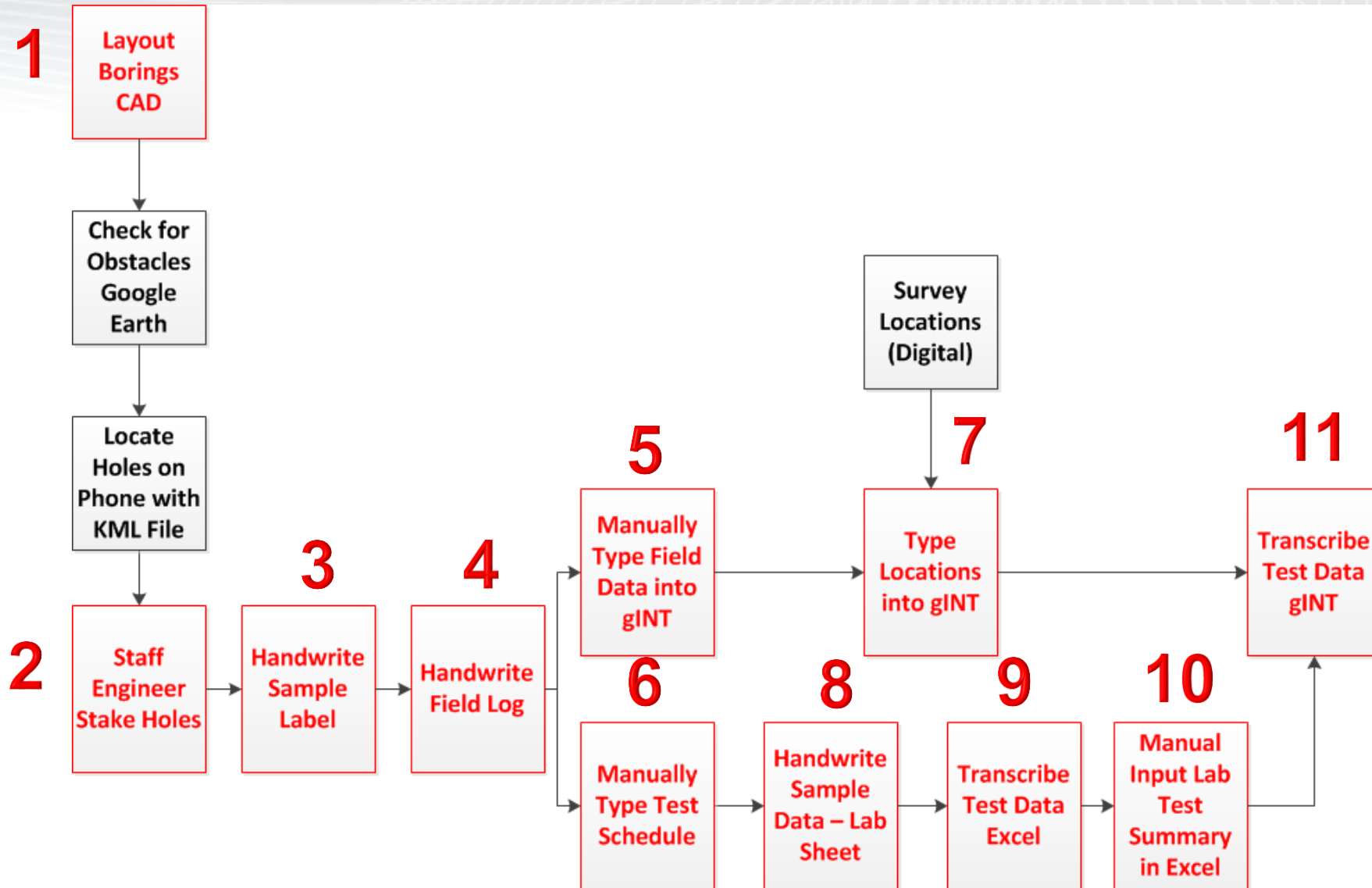


# Why do we care about data?

- How would you feel if you were told to re-type the N-Values for all of your boreholes on a project 10 times?
  - How reliable would that data be?
  - How many errors would there be?
- Panko and Shidler have found typically there is a 1% error rate for expert typists



# Typical Consultant Workflow



# Three Golden Rules for Data Entry

1  
Only do it once

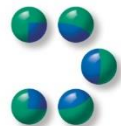
# Three Golden Rules for Data Entry

2  
Get someone else  
to do it



# Three Golden Rules for Data Entry

Do NOT put multiple  
pieces of DATA in the  
same field

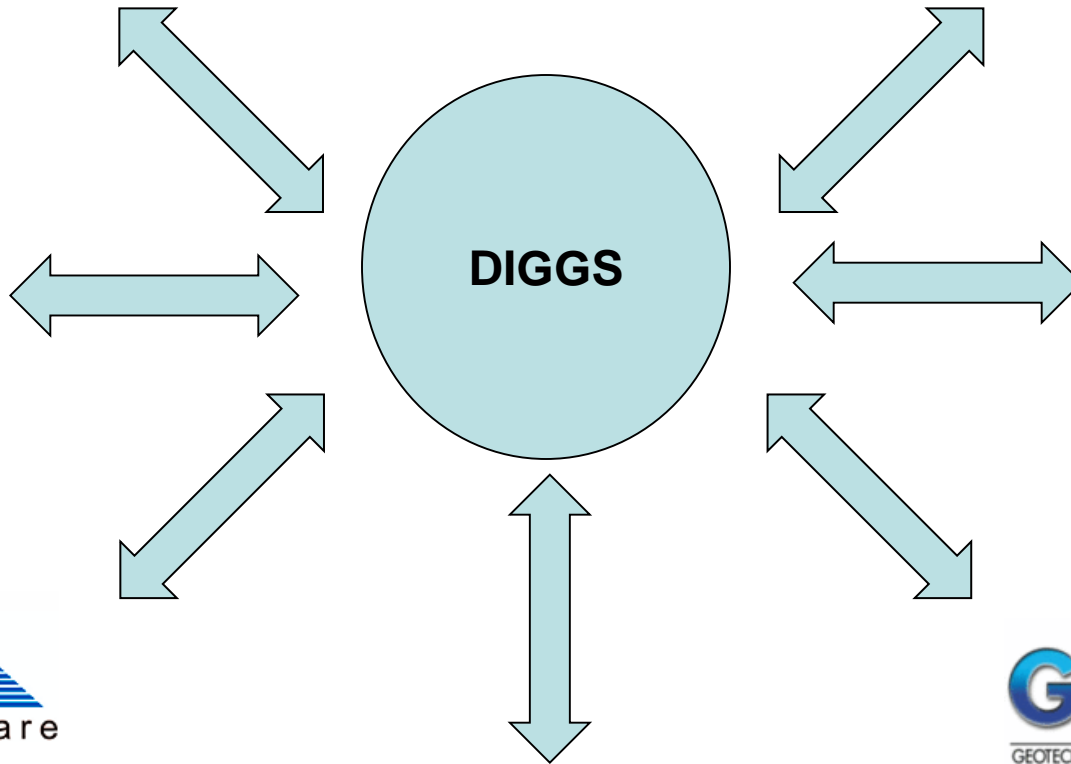


# Data Interchange Standards

- Allows Data Producers to optimize their processes
  - Use software/platforms that best fits their needs
- Allows Data Consumers to utilize data
  - Use software that best fits their needs

sensemetrics





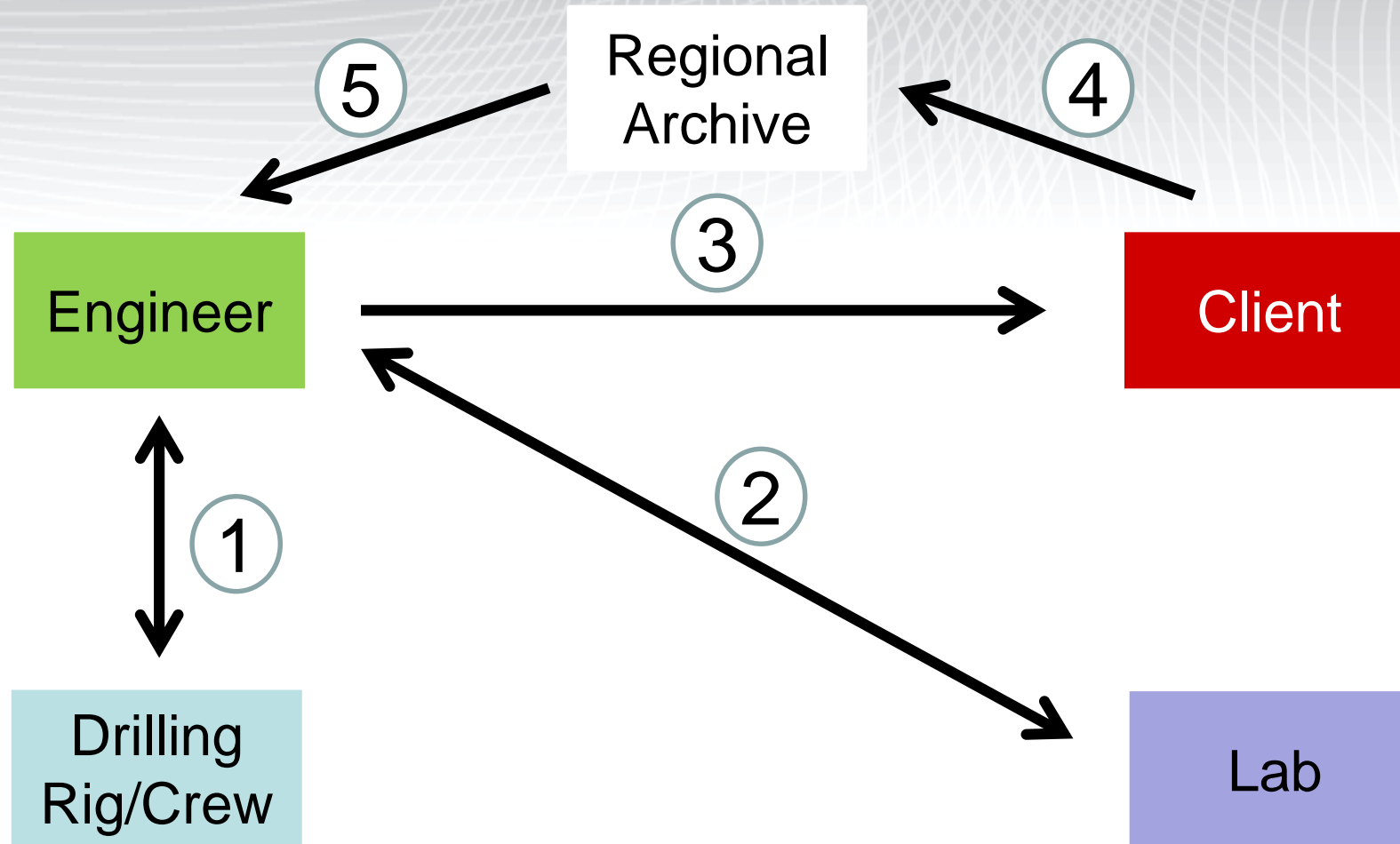
# Geotechnical Data Producers

- Field Personnel
- Lab Personnel
- Design Personnel
- Automated Instrumentation

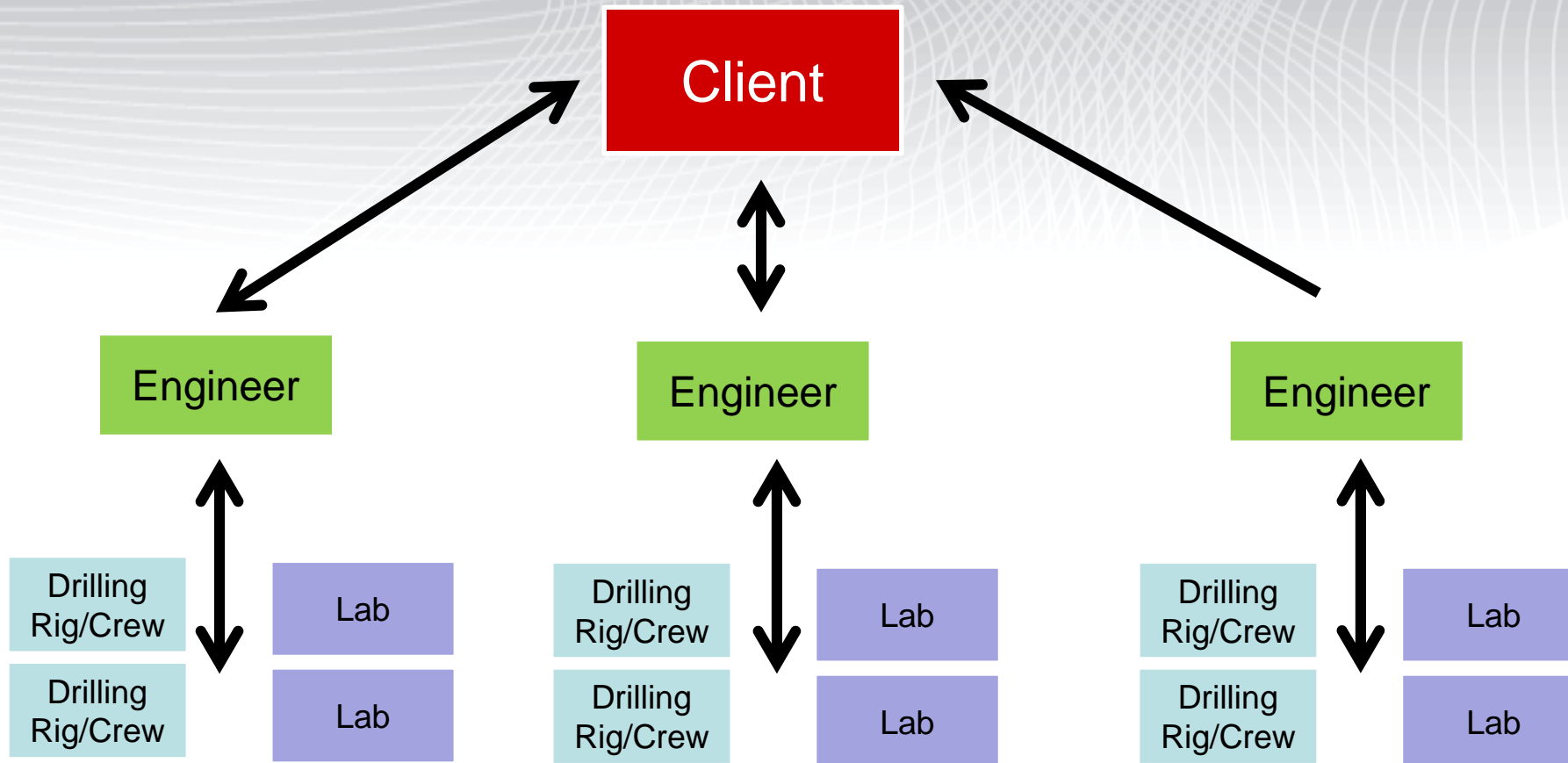
# Geotechnical Data Consumers

- Consultants (for historical projects or teaming projects)
- Clients (DOT's, USACE, large commercial/industrial clients)
- Contractors
- Different departments (e.g. within a DOT – pavement design, bridge design, culvert design, etc)
- Asset Managers



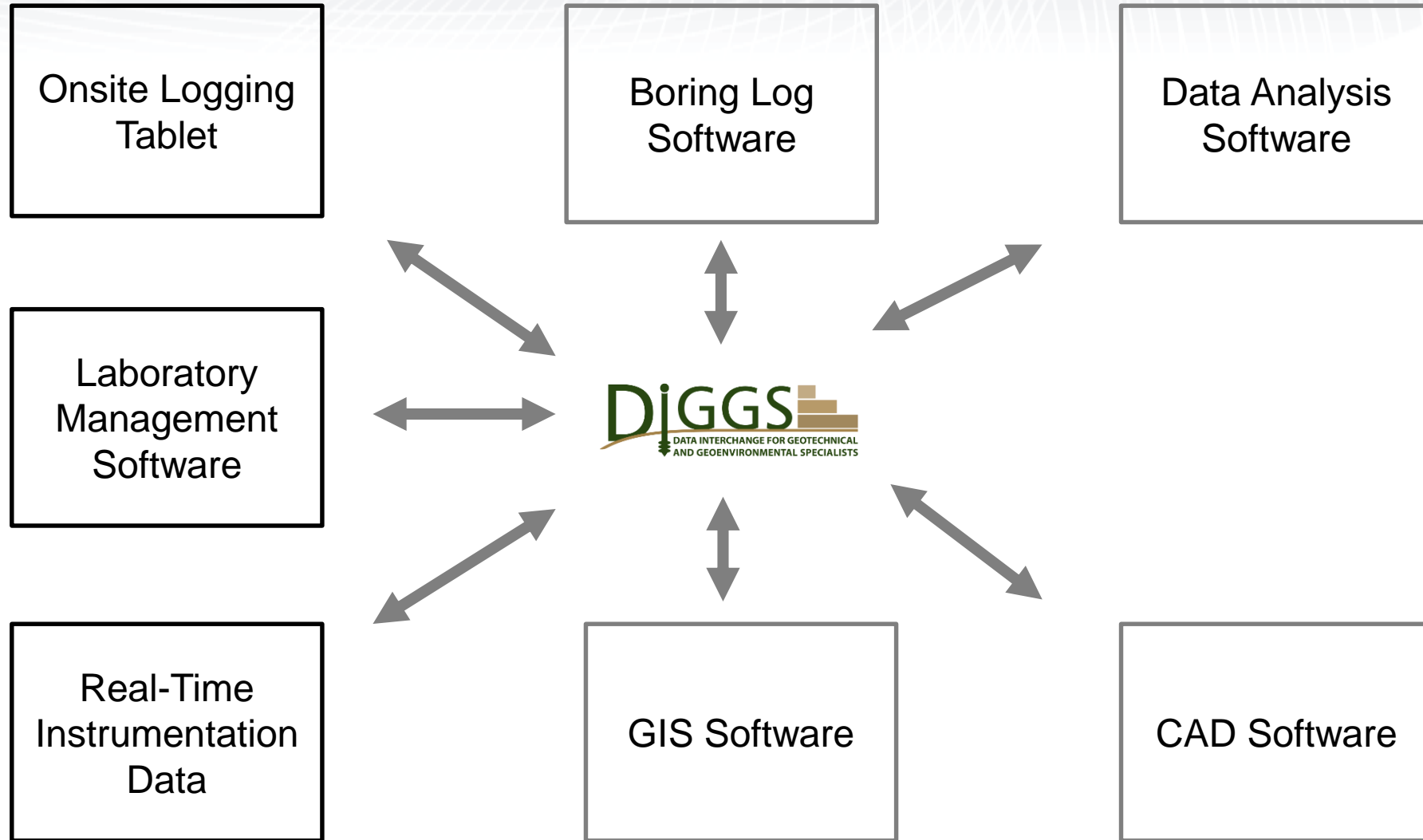


# 5 stages of data transfer



# 15 stages of data transfer

# Streamline Internal Processes



# Benefits for Consultants

- Enables consultants to get DATA from clients (DOT's, USACE, teaming partners)
  - Use data without re-inputting it **– reduce costs!**
- Eliminate redundant data entry internally
  - Fewer errors and reduces cost of internal processes **– reduce risk**

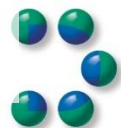
# Benefits for Consultants

- Optimize your internal process for producing data
  - Don't need to have a different process for each client/owner
  - More efficient, more reliable data, lower **risk**
- Do more analysis & design instead of data manipulation



# Benefits for Owners

- More reliable **DATA** provided to owners
- Enables contractors to use **DATA**
  - Optimize construction, reduce risk, safer/more reliable
- Eliminate redundant data entry internally
  - Fewer errors and reduces cost of internal processes
- Optimize your internal process for producing data and sharing data among data consumers
  - Reduce software integration costs



# Benefits to Owners

- Owners can manage risk better by using data
  - Data Mining/AI/Machine Learning
- Assess vulnerabilities
  - Potential slope failures associated with specific soil/rock properties – combine with slope geometry (digital data)
  - Potential vulnerabilities associated with earthquake related failures in seismic zones
  - Combine real-time instrumentation data with geologic data

# Benefits to Owners

- If you can't measure it, you can't improve it.
- Improving data allows you to better manage risk
  - Operational risk
  - Construction related risk

# Benefits to Owners

- The National Economic Development Office (NEDO) conducted a review of 5000 industrial buildings and found 50% overrun by at least a month [5] of which around 37% of the overruns in the projects were due to ground problems.

- [1] National Economic Development Office, Faster building for commerce, NEDO, London, 1988

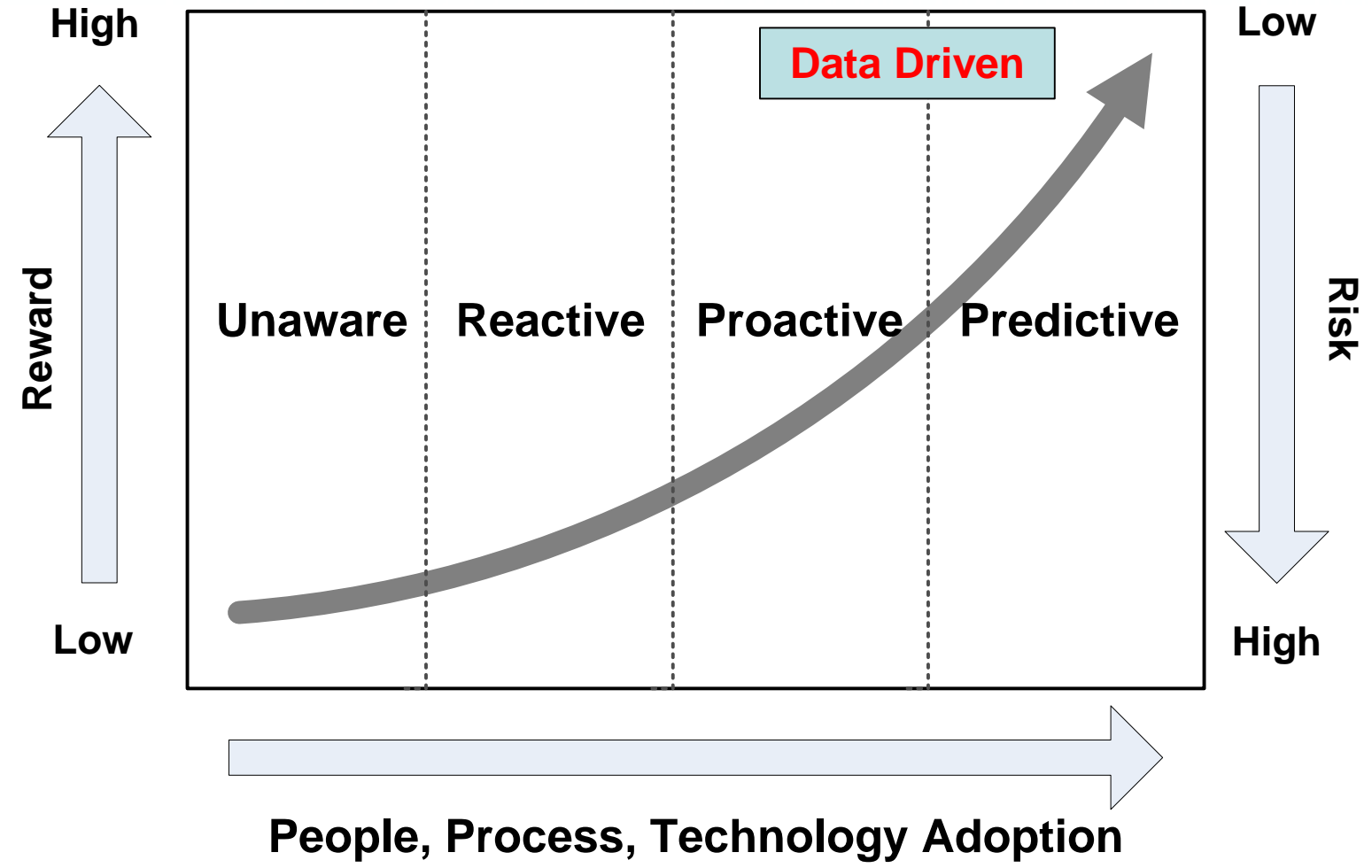
# Benefits to Owners

- In another report The National Audit Office [1] states an Office of Government Commerce study which found that 70% of a range of public projects were delivered late and 73% were over the tender price
  - [1] National Audit Office, Modernising construction, HC87, 11 January, The Stationery Office, 2001



# Data Management Maturity Model

Pareek, D. (2007) "Business Intelligence for Telecommunications"



# Closing Thoughts

- Do any of these benefits resonate with you?
- What is stopping you from using data interchange standards?