

Automated Predictive Analytics

For maintenance and quality:

Let the data speak for itself!



**WARWICK
ANALYTICS**

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Visit us: Hall 19, Stand A53,(A53/7)

24 – 28 April 2017 • Hannover • Germany



Dan Somers
28 April 2017

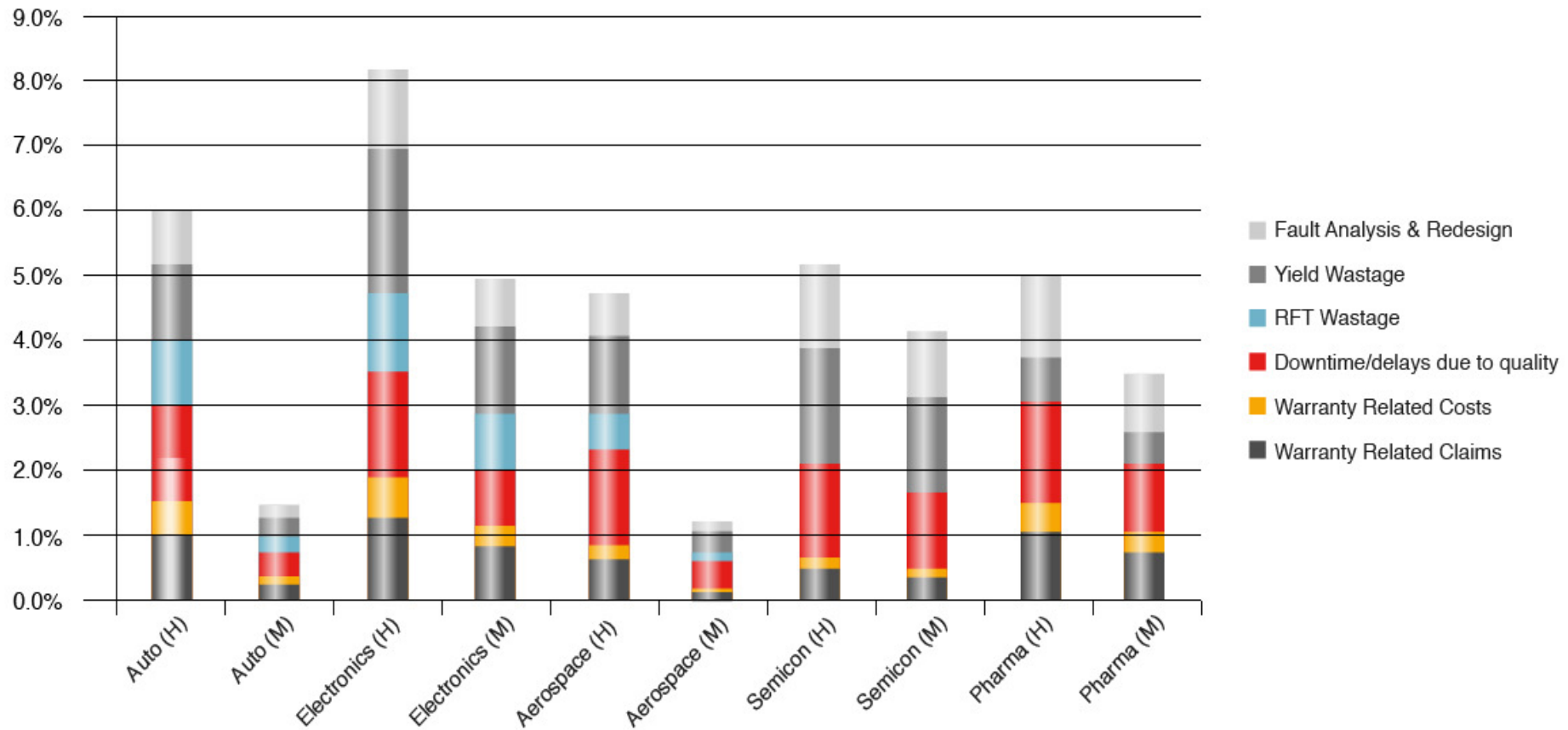


Question:

Why are we still talking
about Predictive Analytics?

The economical benefits are huge

Percentage of Total Turnover Which Could be Saved by Predictive Analytics

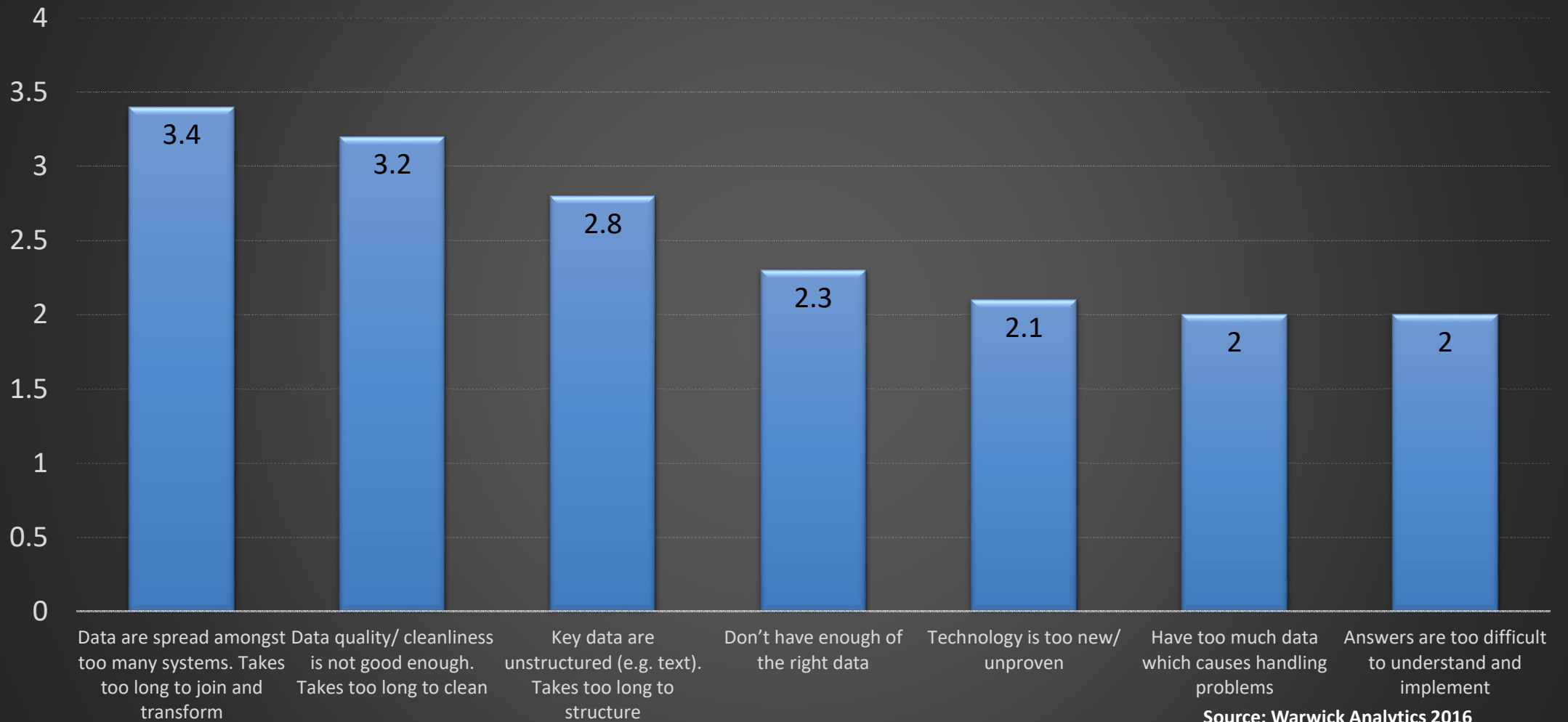


Source: Financial Accounts, WA

Why has it not achieved
more to date?

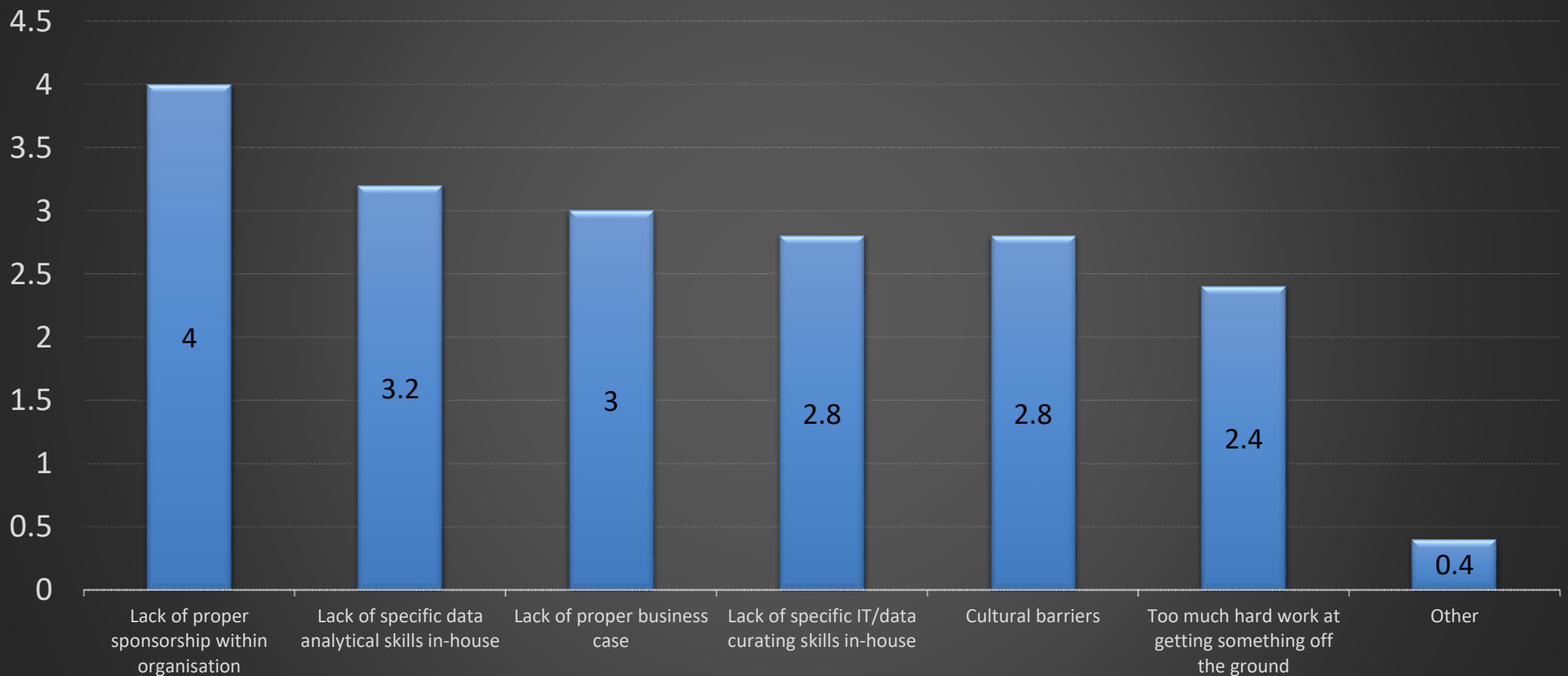
Data issues are the main technical challenges

Main Technical Inhibitors to being better at Big Data Analytics



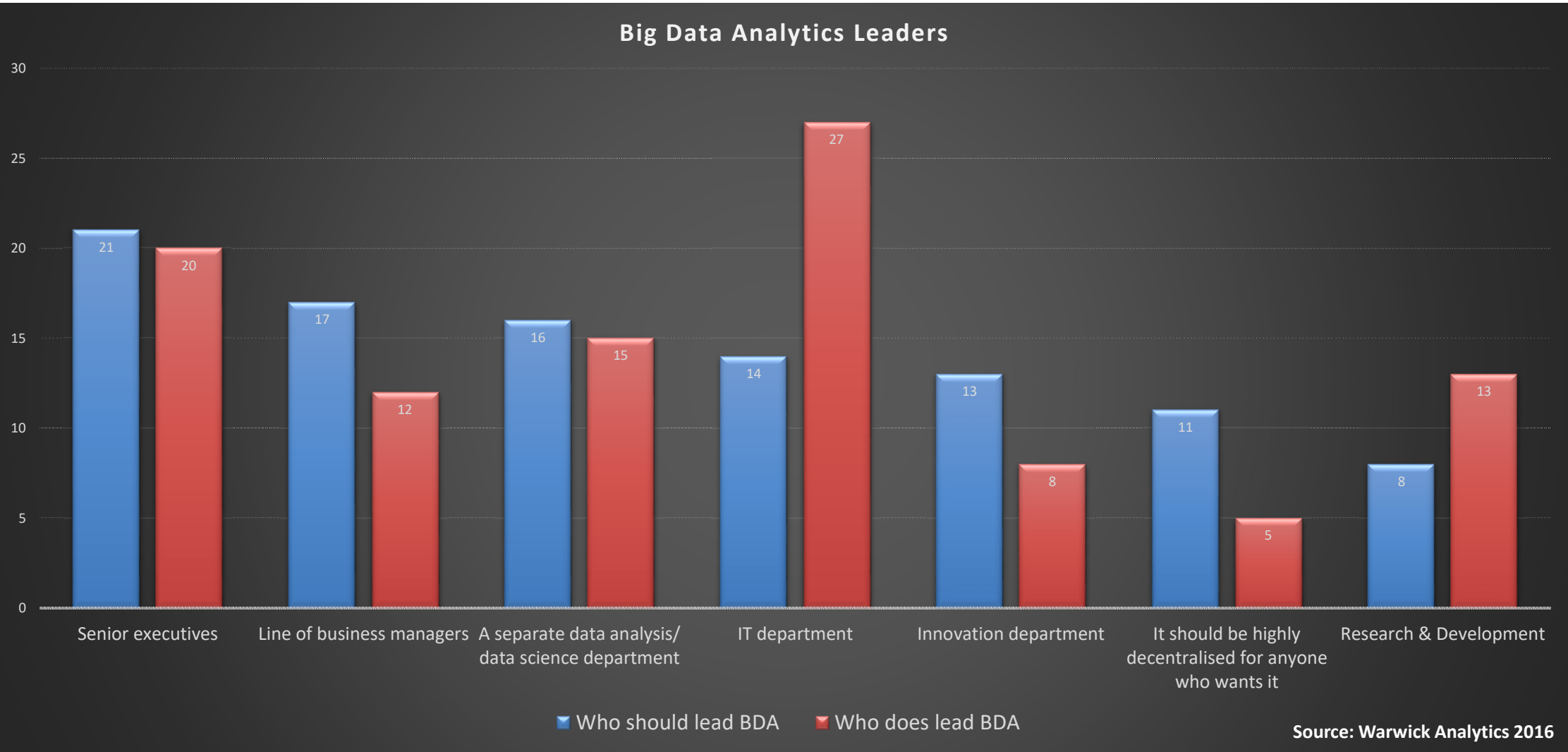
Lack of sponsorship was the main business challenge

Main Business Inhibitors to being better at Big Data Analytics



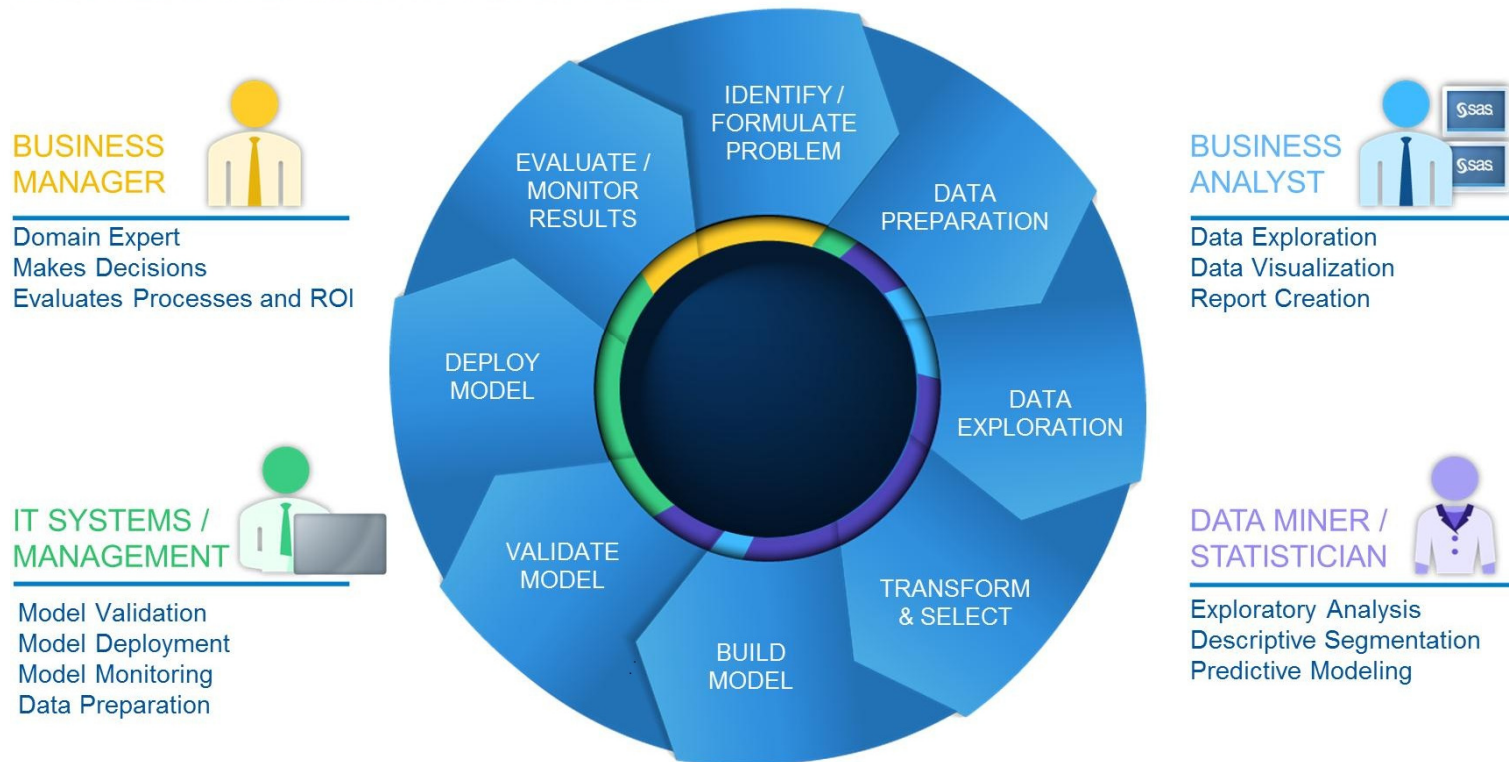
Source: Warwick Analytics 2016

Big Data Analytics was being mostly led by IT



Answer: Today Predictive Analytics is a project, not a product.

THE PREDICTIVE ANALYTICS LIFECYCLE



Source: SAS

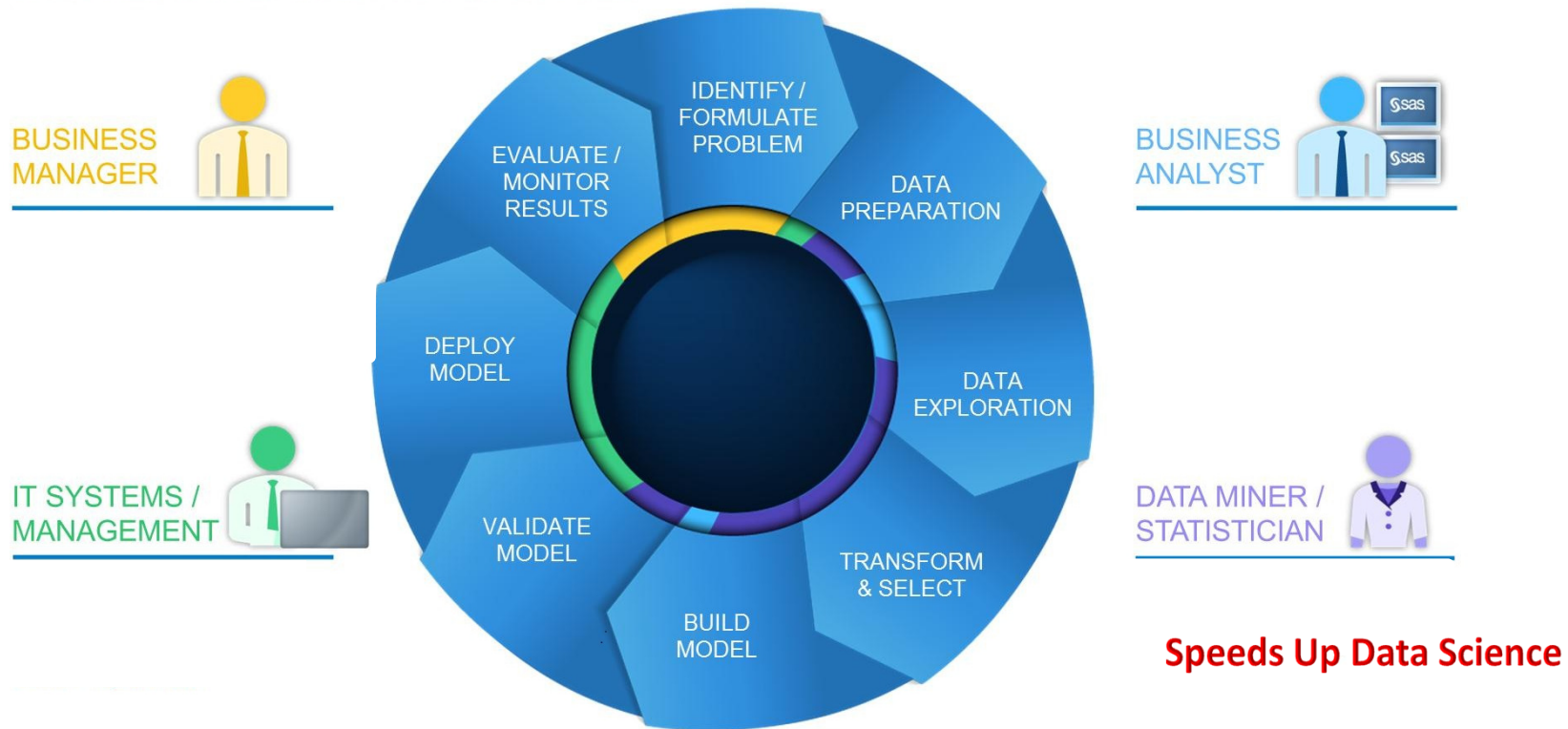
The Technology

About Warwick Analytics

- Founded 2011, after ten years of academic research at Warwick University
- Proprietary algorithms AIR and OL
- Prestigious international awards:
 - DEMO winner (Silicon Valley)
 - SAP's Global Award. most innovative partner
 - Frost & Sullivan's Global Manufacturing Software Award

Answer: Today Predictive Analytics is a project, not a product.

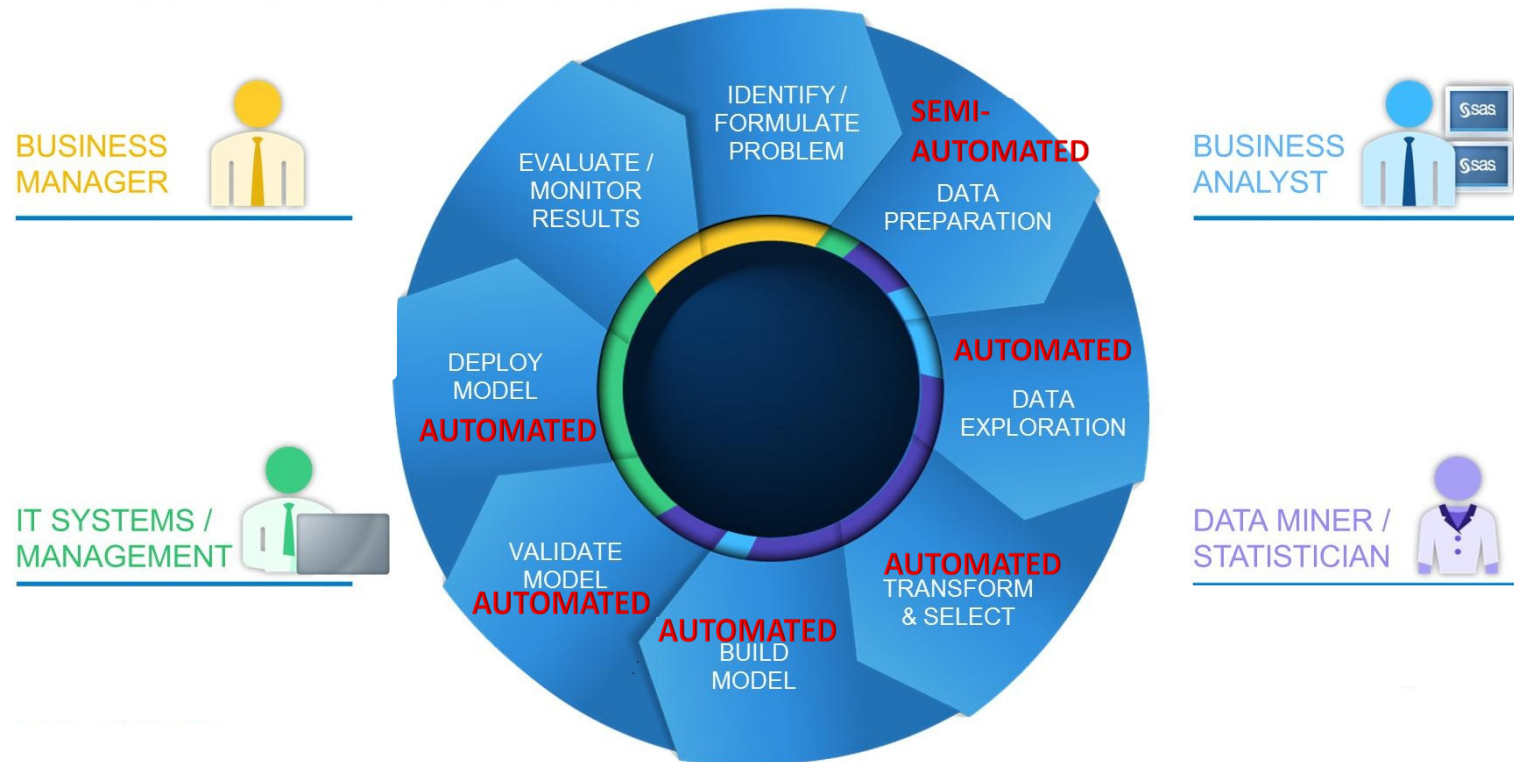
THE PREDICTIVE ANALYTICS LIFECYCLE



Source: SAS

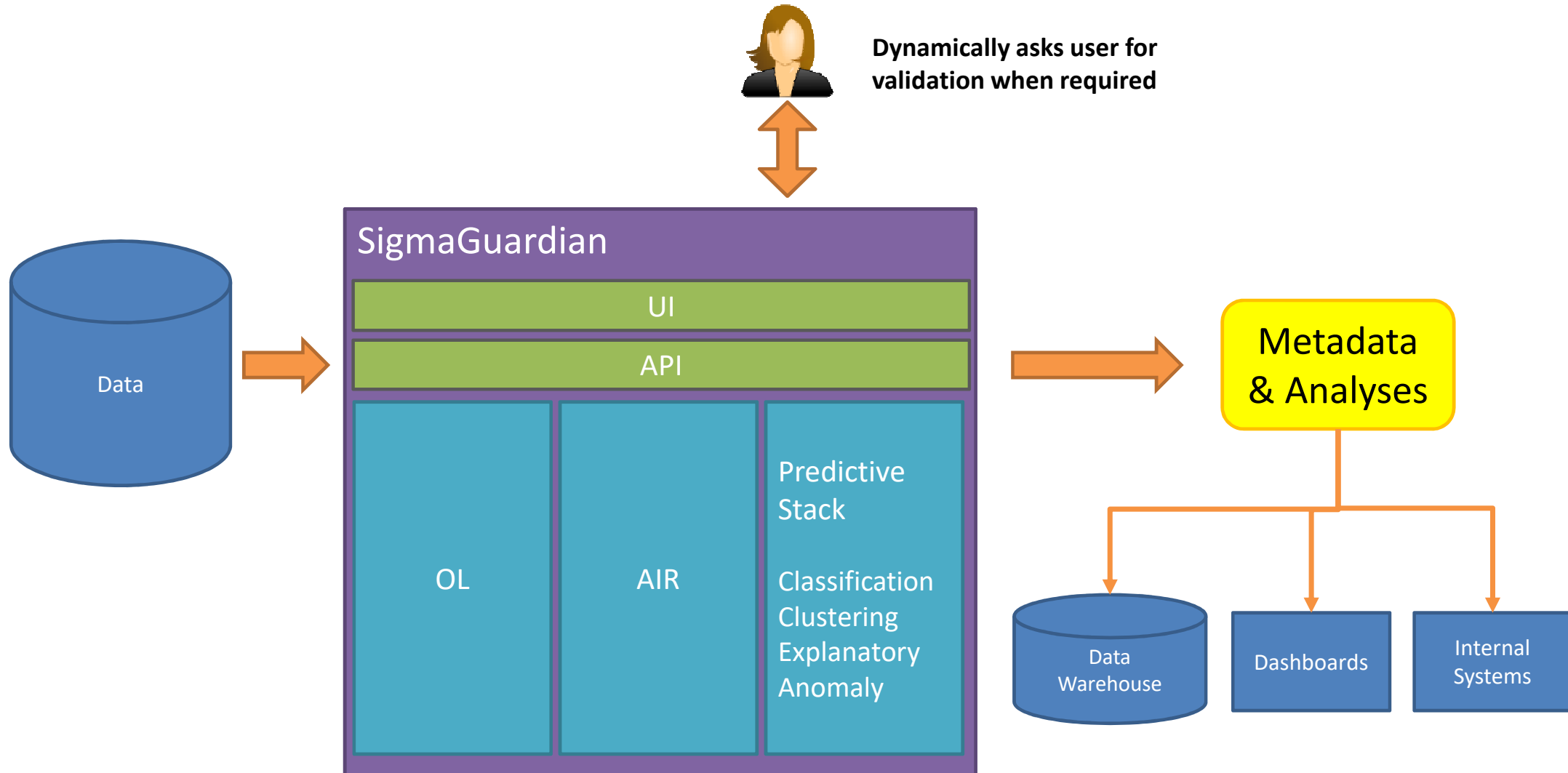
Thought: Imagine if there were an automated product...

THE PREDICTIVE ANALYTICS LIFECYCLE



Source: SAS, WA

Product is easy to deploy and use and interface to other systems



Case Studies

Case Studies:



Customer Experience

dyson

BRITISH AIRWAYS

Automatically analyse heterogeneous 'Voice of Customer' data to generate 'next best actions' to increase customer satisfaction and sales

Telefonica

BARCLAYS



Predictive Maintenance



Rolls-Royce



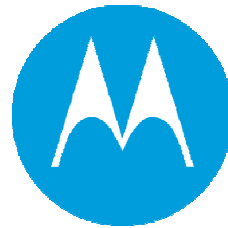
AIRBUS

Automated predictive maintenance from heterogeneous warranty and maintenance data to improve quality and reduce costs



e-on

Case Study 1:
Eliminating Warranty Problems
including No Fault Found
Mobile Phone Manufacturer



MOTOROLA

The background was high NFF warranty failures

PROCESS

Mobile phone assembly process



DATA

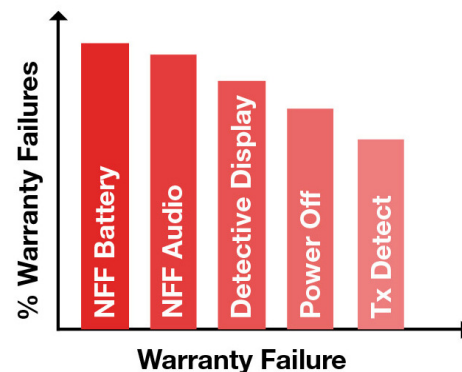
(i) Manufacturing Data

(ii) **Service Data**

Year	Age	Sex	FRS	FSR	FSR ₂	FRS ₂	FRS ₃	FRS ₃	FRS ₄	FRS ₄	FRS ₅	FRS ₅	FRS ₆	FRS ₆	FRS ₇	FRS ₇	FRS ₈	FRS ₈	FRS ₉	FRS ₉	FRS ₁₀	FRS ₁₀	FRS ₁₁	FRS ₁₁	FRS ₁₂	FRS ₁₂	FRS ₁₃	FRS ₁₃	FRS ₁₄	FRS ₁₄	FRS ₁₅	FRS ₁₅	FRS ₁₆	FRS ₁₆	FRS ₁₇	FRS ₁₇	FRS ₁₈	FRS ₁₈	FRS ₁₉	FRS ₁₉	FRS ₂₀	FRS ₂₀	FRS ₂₁	FRS ₂₁	FRS ₂₂	FRS ₂₂	FRS ₂₃	FRS ₂₃	FRS ₂₄	FRS ₂₄	FRS ₂₅	FRS ₂₅	FRS ₂₆	FRS ₂₆	FRS ₂₇	FRS ₂₇	FRS ₂₈	FRS ₂₈	FRS ₂₉	FRS ₂₉	FRS ₃₀	FRS ₃₀	FRS ₃₁	FRS ₃₁	FRS ₃₂	FRS ₃₂	FRS ₃₃	FRS ₃₃	FRS ₃₄	FRS ₃₄	FRS ₃₅	FRS ₃₅	FRS ₃₆	FRS ₃₆	FRS ₃₇	FRS ₃₇	FRS ₃₈	FRS ₃₈	FRS ₃₉	FRS ₃₉	FRS ₄₀	FRS ₄₀	FRS ₄₁	FRS ₄₁	FRS ₄₂	FRS ₄₂	FRS ₄₃	FRS ₄₃	FRS ₄₄	FRS ₄₄	FRS ₄₅	FRS ₄₅	FRS ₄₆	FRS ₄₆	FRS ₄₇	FRS ₄₇	FRS ₄₈	FRS ₄₈	FRS ₄₉	FRS ₄₉	FRS ₅₀	FRS ₅₀	FRS ₅₁	FRS ₅₁	FRS ₅₂	FRS ₅₂	FRS ₅₃	FRS ₅₃	FRS ₅₄	FRS ₅₄	FRS ₅₅	FRS ₅₅	FRS ₅₆	FRS ₅₆	FRS ₅₇	FRS ₅₇	FRS ₅₈	FRS ₅₈	FRS ₅₉	FRS ₅₉	FRS ₆₀	FRS ₆₀	FRS ₆₁	FRS ₆₁	FRS ₆₂	FRS ₆₂	FRS ₆₃	FRS ₆₃	FRS ₆₄	FRS ₆₄	FRS ₆₅	FRS ₆₅	FRS ₆₆	FRS ₆₆	FRS ₆₇	FRS ₆₇	FRS ₆₈	FRS ₆₈	FRS ₆₉	FRS ₆₉	FRS ₇₀	FRS ₇₀	FRS ₇₁	FRS ₇₁	FRS ₇₂	FRS ₇₂	FRS ₇₃	FRS ₇₃	FRS ₇₄	FRS ₇₄	FRS ₇₅	FRS ₇₅	FRS ₇₆	FRS ₇₆	FRS ₇₇	FRS ₇₇	FRS ₇₈	FRS ₇₈	FRS ₇₉	FRS ₇₉	FRS ₈₀	FRS ₈₀	FRS ₈₁	FRS ₈₁	FRS ₈₂	FRS ₈₂	FRS ₈₃	FRS ₈₃	FRS ₈₄	FRS ₈₄	FRS ₈₅	FRS ₈₅	FRS ₈₆	FRS ₈₆	FRS ₈₇	FRS ₈₇	FRS ₈₈	FRS ₈₈	FRS ₈₉	FRS ₈₉	FRS ₉₀	FRS ₉₀	FRS ₉₁	FRS ₉₁	FRS ₉₂	FRS ₉₂	FRS ₉₃	FRS ₉₃	FRS ₉₄	FRS ₉₄	FRS ₉₅	FRS ₉₅	FRS ₉₆	FRS ₉₆	FRS ₉₇	FRS ₉₇	FRS ₉₈	FRS ₉₈	FRS ₉₉	FRS ₉₉	FRS ₁₀₀	FRS ₁₀₀	FRS ₁₀₁	FRS ₁₀₁	FRS ₁₀₂	FRS ₁₀₂	FRS ₁₀₃	FRS ₁₀₃	FRS ₁₀₄	FRS ₁₀₄	FRS ₁₀₅	FRS ₁₀₅	FRS ₁₀₆	FRS ₁₀₆	FRS ₁₀₇	FRS ₁₀₇	FRS ₁₀₈	FRS ₁₀₈	FRS ₁₀₉	FRS ₁₀₉	FRS ₁₁₀	FRS ₁₁₀	FRS ₁₁₁	FRS ₁₁₁	FRS ₁₁₂	FRS ₁₁₂	FRS ₁₁₃	FRS ₁₁₃	FRS ₁₁₄	FRS ₁₁₄	FRS ₁₁₅	FRS ₁₁₅	FRS ₁₁₆	FRS ₁₁₆	FRS ₁₁₇	FRS ₁₁₇	FRS ₁₁₈	FRS ₁₁₈	FRS ₁₁₉	FRS ₁₁₉	FRS ₁₂₀	FRS ₁₂₀	FRS ₁₂₁	FRS ₁₂₁	FRS ₁₂₂	FRS ₁₂₂	FRS ₁₂₃	FRS ₁₂₃	FRS ₁₂₄	FRS ₁₂₄	FRS ₁₂₅	FRS ₁₂₅	FRS ₁₂₆	FRS ₁₂₆	FRS ₁₂₇	FRS ₁₂₇	FRS ₁₂₈	FRS ₁₂₈	FRS ₁₂₉	FRS ₁₂₉	FRS ₁₃₀	FRS ₁₃₀	FRS ₁₃₁	FRS ₁₃₁	FRS ₁₃₂	FRS ₁₃₂	FRS ₁₃₃	FRS ₁₃₃	FRS ₁₃₄	FRS ₁₃₄	FRS ₁₃₅	FRS ₁₃₅	FRS ₁₃₆	FRS ₁₃₆	FRS ₁₃₇	FRS ₁₃₇	FRS ₁₃₈	FRS ₁₃₈	FRS ₁₃₉	FRS ₁₃₉	FRS ₁₄₀	FRS ₁₄₀	FRS ₁₄₁	FRS ₁₄₁	FRS ₁₄₂	FRS ₁₄₂	FRS ₁₄₃	FRS ₁₄₃	FRS
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PARETO ANALYSIS

Illustration of Top-5 Warranty failures out of 23 reported failures



Variables measured

FREQ_OFFSET_FX

FREQ_OFFSET_FY

WARP_RESOLUTION

AVG_PWR_NL_F5

RXBER 111 F1 0 0K

AUTOWRSP_F1

AGC_TR_TUNING

170 parameters

The solution was very quick and eliminated problem

Data associated with
NFF-battery failure

A	B	A	B	A	B	A	B	A
B								
A		x		x		x		
B								
A			x					x
B								
A			x					x
B								
A		x						
B			x		x		x	
A								x
B								
A				x				x
B								
A								
B		x						
A			x					
B								
A								x
B				x				
A							x	
B					x			x
A								
B			x					

Identification



Critical parameter
identification

FREQ_OFFSET_FX
FREQ_OFFSET_FY
WARP_RESOLUTION
AVG_PWR_NL_F5
RXBER_111_F1_0_0K
-
-
-
AUTOWRSP_F1
AGC_TR_TUNING

Reporting

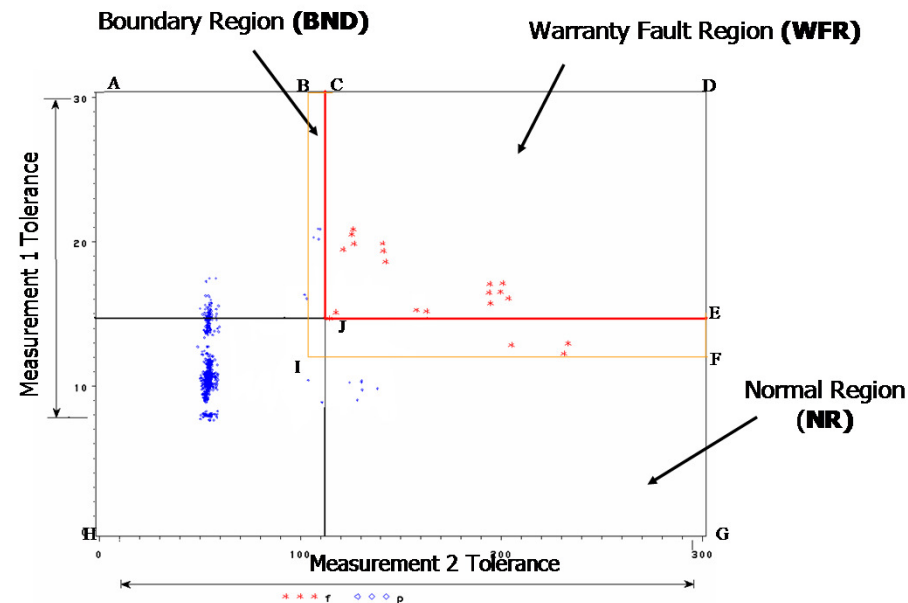


Out of **170** parameters,
2 parameters which explains the
NFF-battery problem are identified



Identified Parameter

Fault Region



Case Study 2:
Predictive Maintenance
Utilities Plant



The background was to lower maintenance costs & downtime

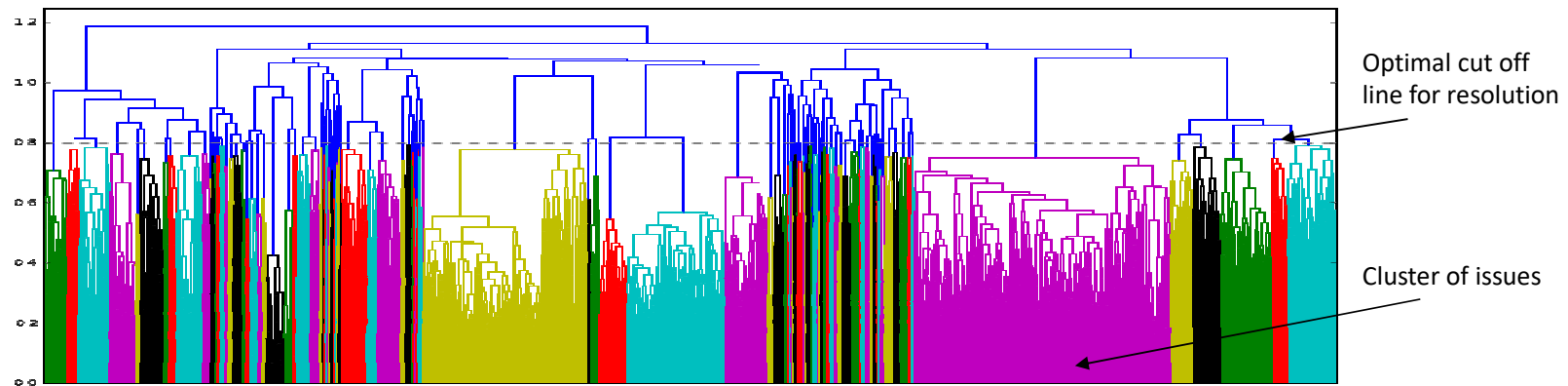
- Energy company with disparate data systems
 - Data: SAP, Asset Maintenance, Historians



- The condition-monitoring team was very experienced and strong
 - First step was to classify all the maintenance events into similar categories

The solution was two-step: first classification, then predicting

- Step 1: AIR and OL used to classify the free text into meaningful categories



- Step 2: RCASE machine learning algorithm generates 'predictors' of maintenance events from historian data and features

Case Study 3:
Increasing yield
Pharmaceutical company



Background was variable yield

- Looking to improve consistency and yields for a haemorrhoid drug

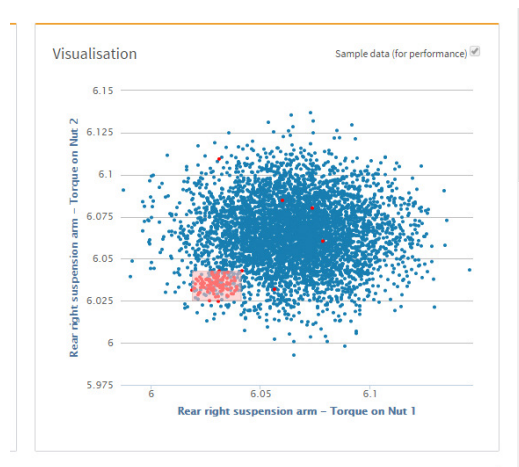


- *“The product is formed from a complex series of reactions from intermediate chemicals. It is very sensitive to many factors and has been a challenge to control the impurities for a long time. Clearly it is imperative to better understand the factors which drive impurity formation so that we can maximise the quality and avoid rejections”*

Site Operational Excellence Lead

Solution found causal factors and defined optimum controls

- SigmaGuardian found the ‘regions’ which best defined the root causes



- *“We are very pleased with the analysis that SigmaGuardian provided. We did not expect the results to be as good as they were, particularly with limited data we provided. Also the speed of calculation and the ease of interpreting the results was impressive too.”*

Site Operational Excellence Lead

DEMO



- **DANKESCHÖN / THANK YOU**

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