



2017第八届中国数据库技术大会

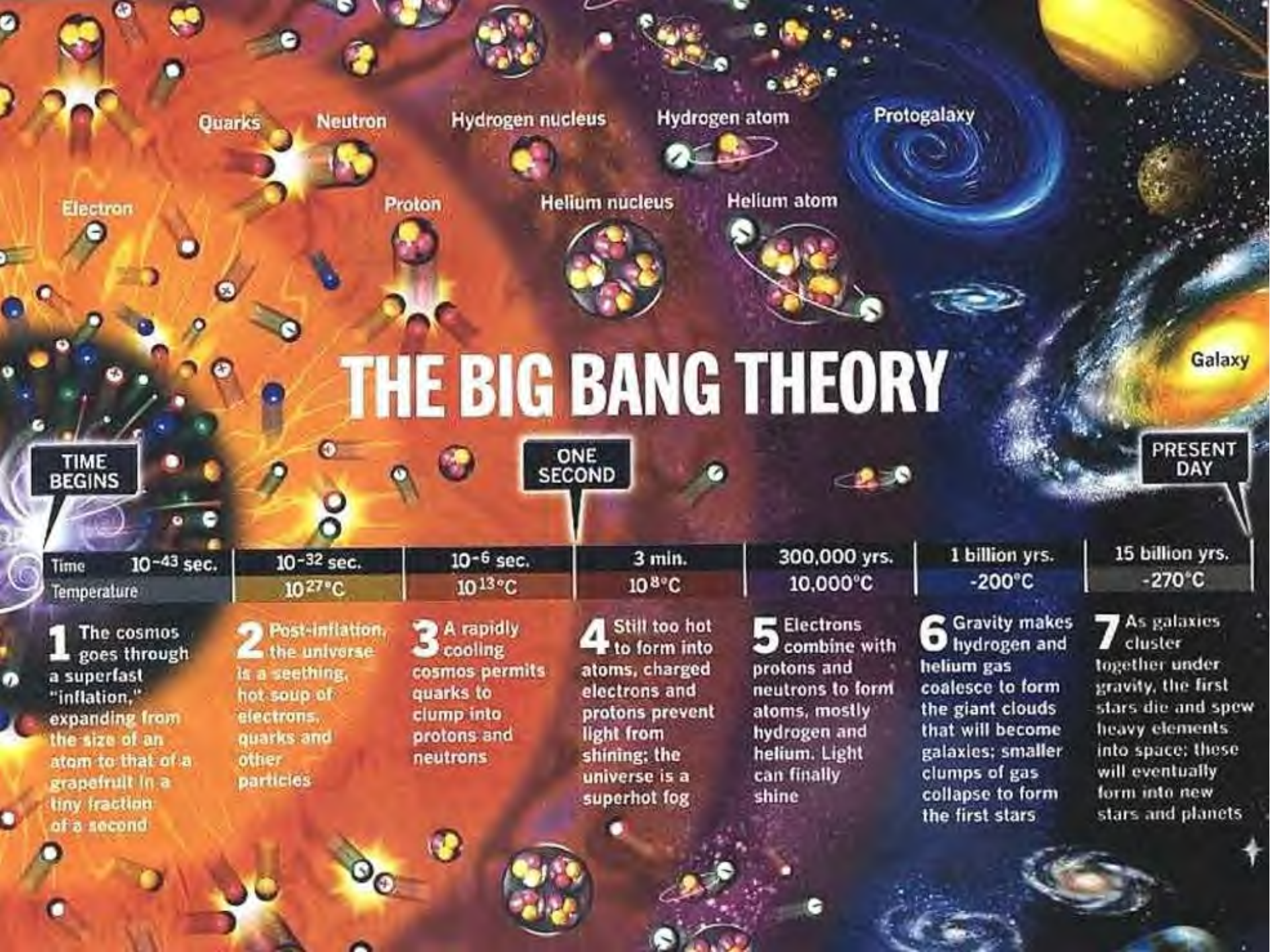
DATABASE TECHNOLOGY CONFERENCE CHINA 2017

数据可视化-无限可能的艺术

贺华 IBM资深软件技术顾问

内容提要

- **大数据时代面临的挑战**
- **IBM业务分析解决方案**
- **可视化案例分享**



Quarks

Neutron

Hydrogen nucleus

Hydrogen atom

Protogalaxy

Electron

Proton

Helium nucleus

Helium atom

Galaxy

THE BIG BANG THEORY

TIME BEGINS

ONE SECOND

PRESENT DAY

Time	10^{-43} sec.	10^{-32} sec.	10^{-6} sec.	3 min.	300,000 yrs.	1 billion yrs.	15 billion yrs.
Temperature		10^{27} °C	10^{13} °C	10^8 °C	$10,000$ °C	-200° C	-270° C

1 The cosmos goes through a superfast "inflation," expanding from the size of an atom to that of a grapefruit in a tiny fraction of a second

2 Post-inflation, the universe is a seething, hot soup of electrons, quarks and other particles

3 A rapidly cooling cosmos permits quarks to clump into protons and neutrons

4 Still too hot to form into atoms, charged electrons and protons prevent light from shining; the universe is a superhot fog

5 Electrons combine with protons and neutrons to form atoms, mostly hydrogen and helium. Light can finally shine

6 Gravity makes hydrogen and helium gas coalesce to form the giant clouds that will become galaxies; smaller clumps of gas collapse to form the first stars

7 As galaxies cluster together under gravity, the first stars die and spew heavy elements into space; these will eventually form into new stars and planets

大数据的特征 4个V



BIG DATA



VOLUME

DATA SIZE

量级

VELOCITY

SPEED OF CHANGE

时效

VARIETY

DIFFERENT FORMS
OF DATA SOURCES

复杂

VERACITY

UNCERTAINTY OF
DATA

精准

如何理解大数据？

- Big Data = 大数据 + 大数据的处理方案 (**存储+计算+展现**)
- “Big Data” 泛指数据集的大小超过了通常的数据库，数据管理软件所能获取，存储，管理和分析范围的结构化与非结构化数据
- “Big Data” 是一个相对的概念，不能从绝对意义上指明某一个数值来定义，而且这个相对的标准根据所处的行业和客户的不同千差万别。



Big Data 解决方案分层

应用--访问及展现

计算框架

数据存储

大数据和分析功能在企业的主要应用模式



可供采取行动的全方位客户洞察

如何才能最深入地了解客户和潜在客户，以期让每一次交互更有意义，从而把客户转化为终生的品牌拥趸？



商品优化

是否能够预测应该购入哪种商品以及如何在各个地点上架和定价，从而优化我的业务？能够在客户服务与利润最大化之间实现平衡吗？



数据和模式探索

怎样才能快速找到、可视化及理解所有数据，以改进决策和客户服务？



基于位置的服务

如何分析客户的购物模式，以提供有针对性的信息及更好的店内服务，并尽早预防欺诈？



数据仓库现代化

如何降低现有IT基础架构的成本，同时还要为各个部门提供更高程度的信息利用率？借助于Hadoop、分析工具以及分栏（columnar）引擎，是否能够找到更好的性价比选择？

第5个V: Value 价值



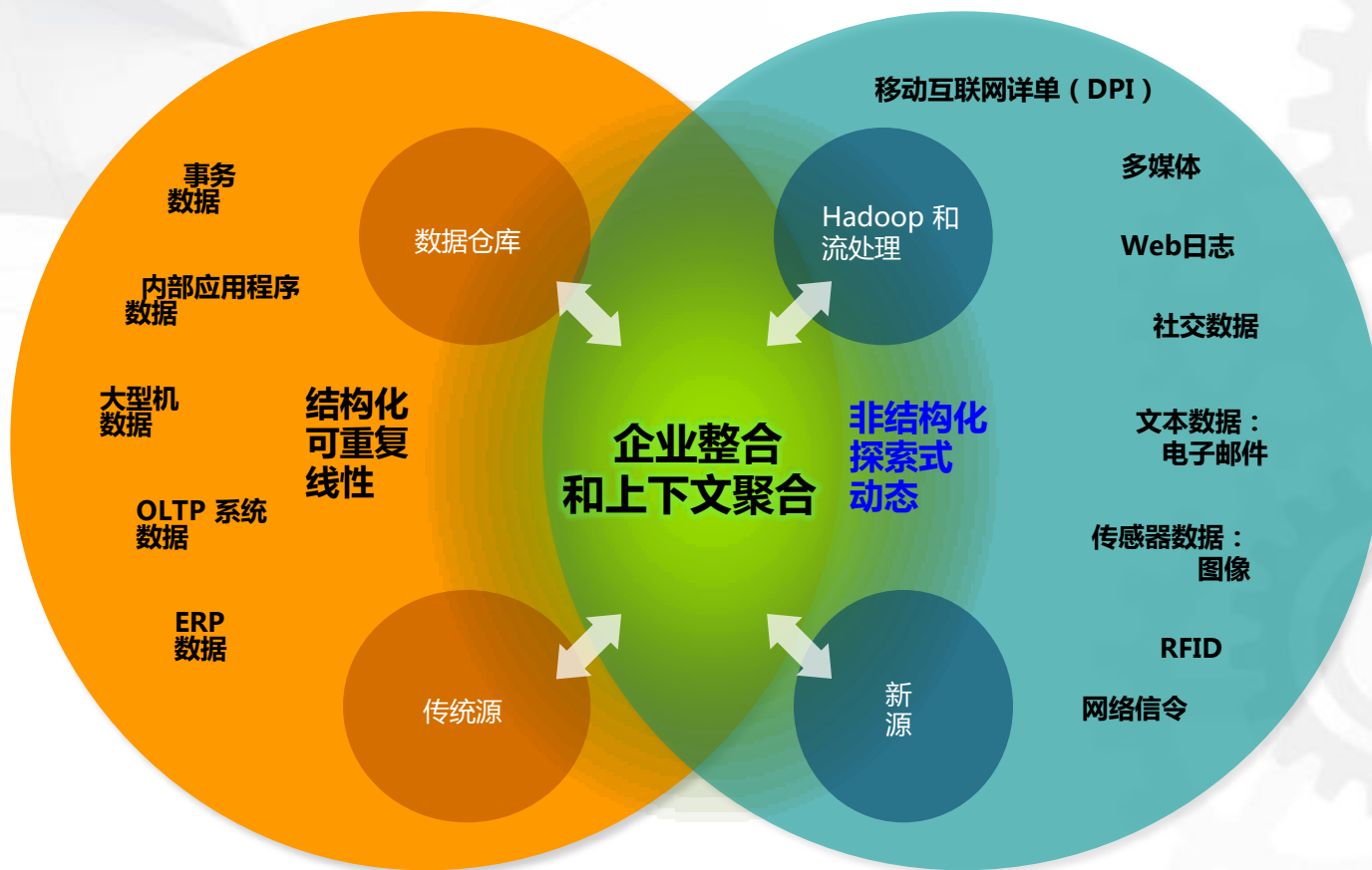
大数据如何释放新洞察、如何创建新机遇？

传统方法

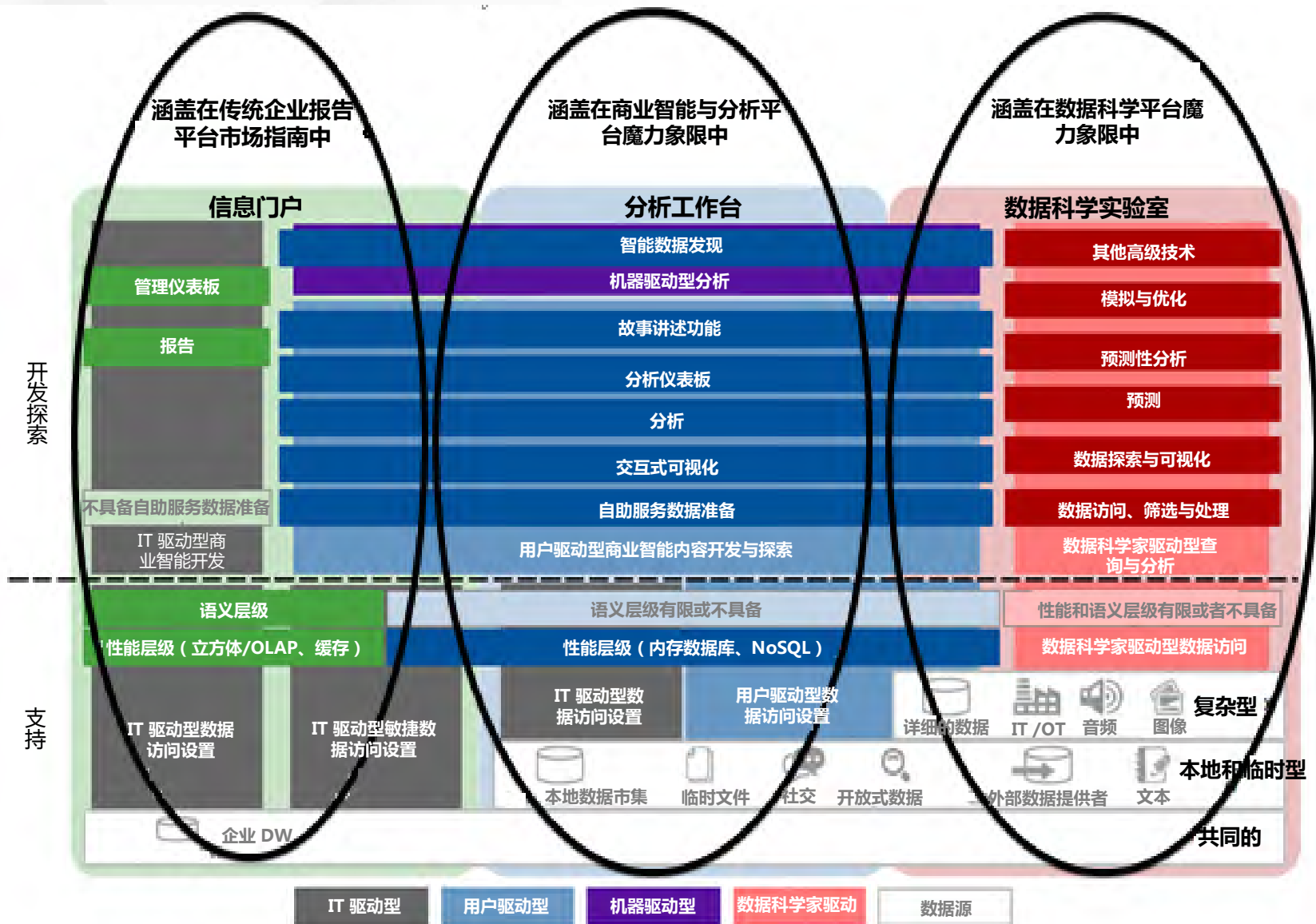
结构化、分析、逻辑

新方法

创新、全面考虑、直观



Gartner 现代商业智能和分析参考体系结构



来源：Gartner “如何实施现代商业智能和分析平台” - <https://www.gartner.com/technology/media-products/newsletters/ibm-cognos/1-3K3NKKK/index.html>

Welcome to the Cognitive Era. A new era in technology, a new era in business.

IBM 分析软件帮助客户回答那些最难回答的问题，通过数据分析驱动可执行的业务洞察。

Descriptive
discover, report, analyze

Predictive
predict, decide, act

Cognitive
understand, reason, learn

越来越多的软件公司会把分析能力嵌入到他们的业务应用程序之中。然而讽刺的是，很多客户仍然没有意识到这样做带来的影响和附加的业务价值。

Source: Hurwitz & Associates, Predicting 2016 What's Old is New Again

企业级分析如何满足业务用户需求

业务专家

定制分析内容，创建仪表盘、即席查询报表、数据模块



Enterprise BI Platform
Cognos Analytics
(managed)

Amplified business value

业务人员，业务分析师
创建与分享报表及仪表盘



业务领导

查看静态及交互式报表，向其它下属提问



智能数据探索拓展对企业数据的理解

业务专家

通过自然语言探索数据，发现预测性因素，并通过仪表盘和图表可视化探索



相关见解返回到企业分析平台

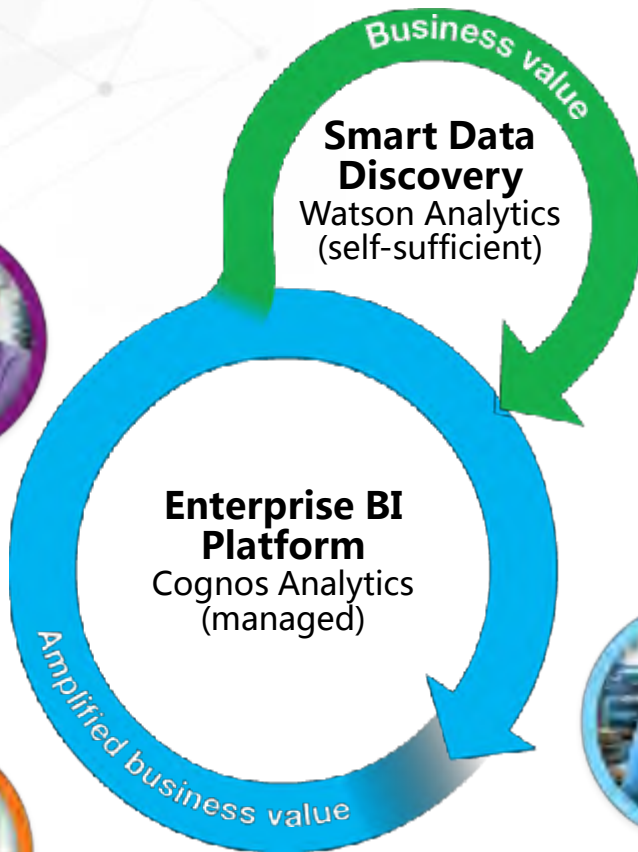
Smart Data Discovery
Watson Analytics
(self-sufficient)

业务人员，业务分析师

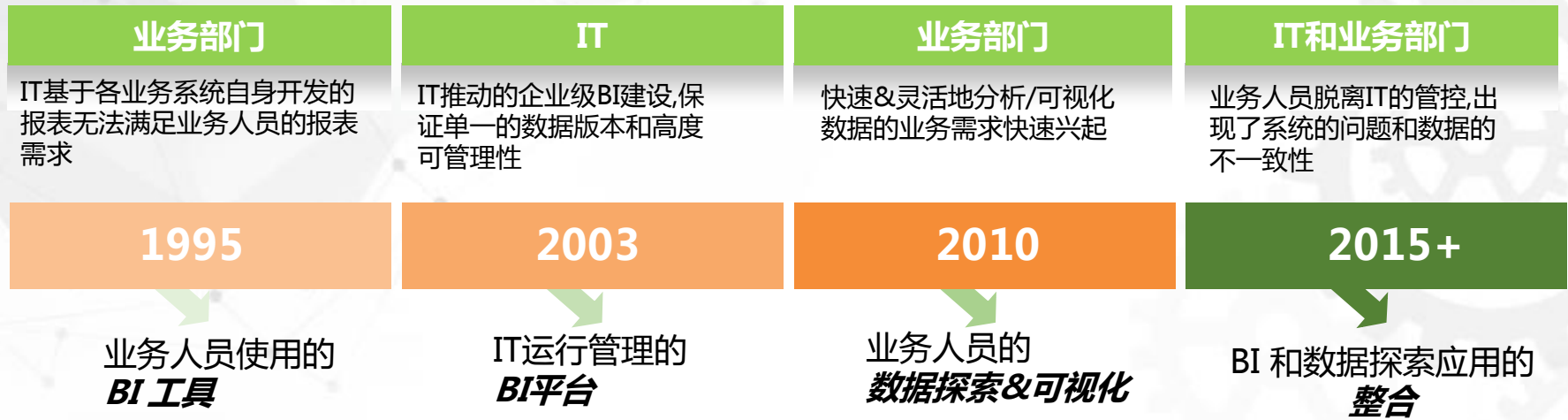
Enterprise BI Platform
Cognos Analytics
(managed)



业务领导



商业智能被业务部门和IT交替推动着向前发展



Gartner prediction: Through 2016, less than of self-service business intelligence initiatives will be governed sufficiently to prevent inconsistencies that adversely affect the business.

10%

Source: Gartner "Predicts 2015: Power Shift in Business Intelligence and Analytics Will Fuel Disruption", Josh Parenteau, Neil Chandler, Rita L. Sallam, Douglas Laney, Alan D. Duncan, 21 November 2014

Cognos Analytics将敏捷BI融合到企业BI中,使业务用户自主分析和企业IT管控间保持平衡

寻求完美平衡

在业务部门级的自由分析和在企业级的安全、管控和监督的需求之间



自助服务分析是一个系列



业务用户

90% 普通用户
(高管、经理、一线工作人员)

10% Power 用户
负责分析数据



60%
数据消费者



30%
数据开发者



8%
数据分析师



2%
数据科学家

“自助服务分析的弊端，就是它需要实现标准化。”

“许多已经部署自助服务分析的公司已经被海啸般大量的矛盾冲突报告、报表集市 (spreadmart)、脱节的报告系统以及其他数据孤岛所淹没。”

Source: Chart data and quotes from “Eckerson Group: A Reference Architecture for Self-Service Analytics”, Wayne Eckerson, Barry Devlin, September 2016

Cognos Analytics 支持一系列自助服务功能



业务用户

90% 普通用户
(高管、经理、一线工作人员)

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负责分析数据



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2%
数据科学家

静态
报告

互动式
报告

个性化
报告

仪表板和
案例

数据模块和临时
报告

数据模式和专业报告

- 业务用户从单纯使用数据发展至扩展和创造数据 (成为数据开发者)

Source: Chart data from "Eckerson Group: A Reference Architecture for Self-Service Analytics", Wayne Eckerson, Barry Devlin, September 2016

Cognos Analytics – 针对统一环境的框架

自助服务 (仪表盘, 案例)

- 数据开发 (临时)
- 主要用例
 - 回答问题
 - 头脑风暴/构想与概念的社会化
 - 构建原型



业务线用户

管理报告

- 数据呈现
- 通过管理下列内容实现增值：
- 安全和治理
 - 输出完整性
 - 输出的有效分配



熟练的用户 (Power/IT)

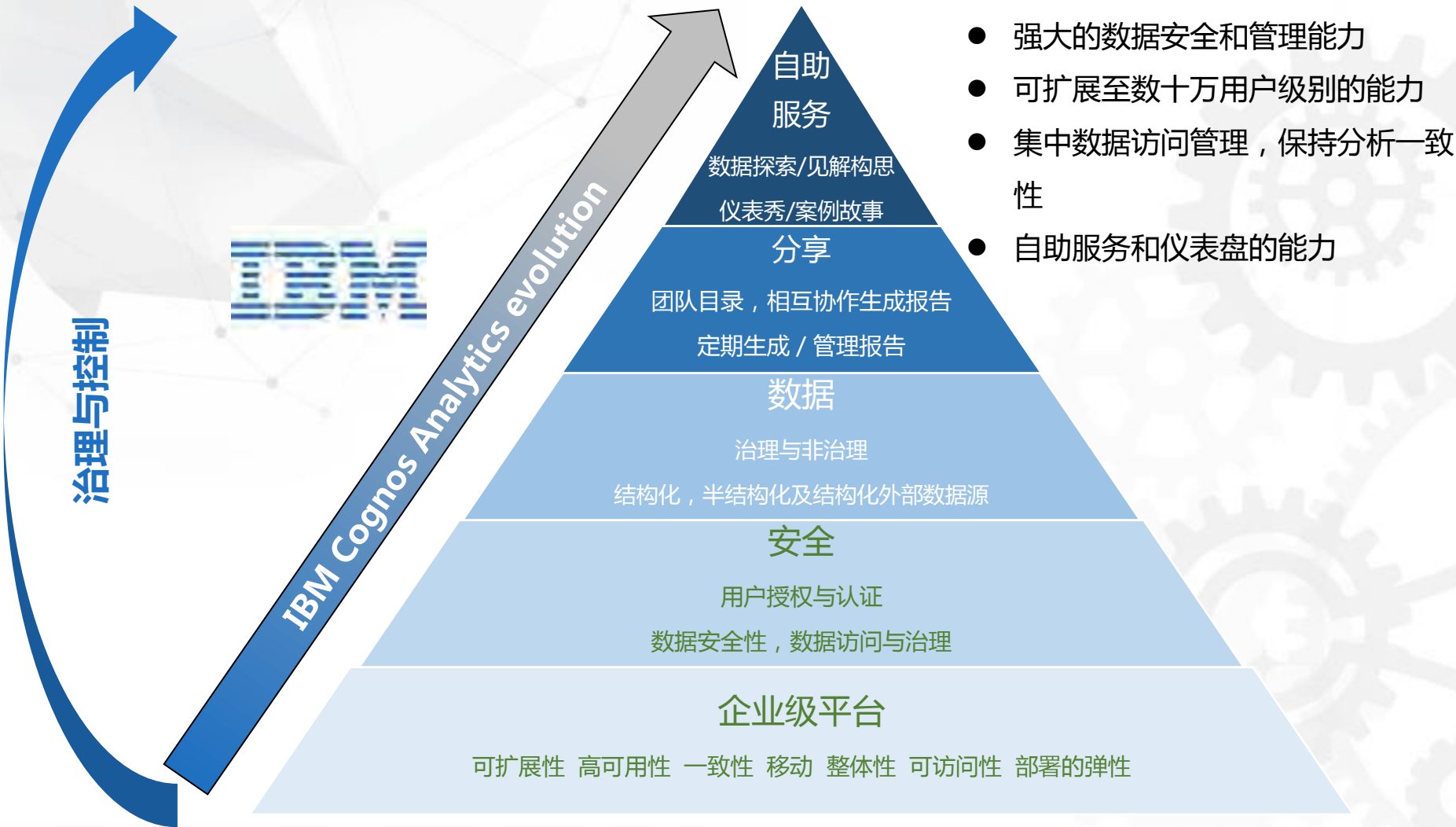
平台

- 支持安全性、可扩展性和完整性的企业级架构
- 为自助服务和管理报告接口提供一致性

Cognos Analytics – 针对统一环境的框架



Cognos Analytics提供企业级BI与分析能力



为了更好的在自助分析和IT管控之间获得平衡， IBM对商业智能做了重新定义

Cognos Analytics完全重新定义的BI用户体验

Dramatically increase productivity for departmental and enterprise reporting

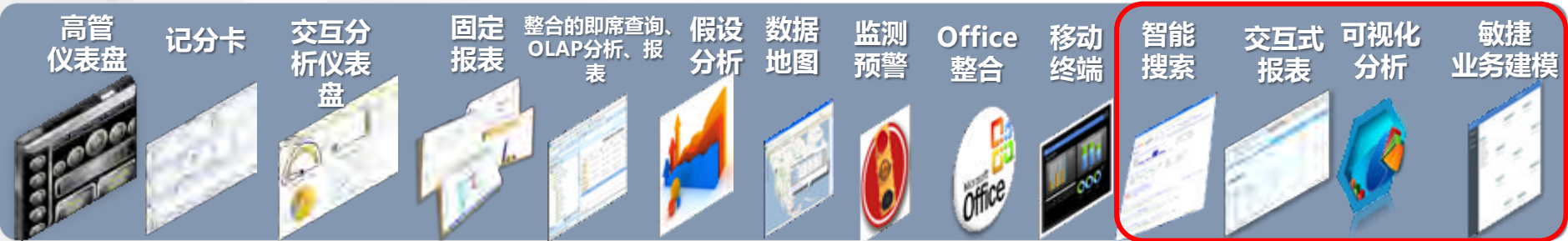
加速
业务建模
及性能

重新定义
制作报表
和分析

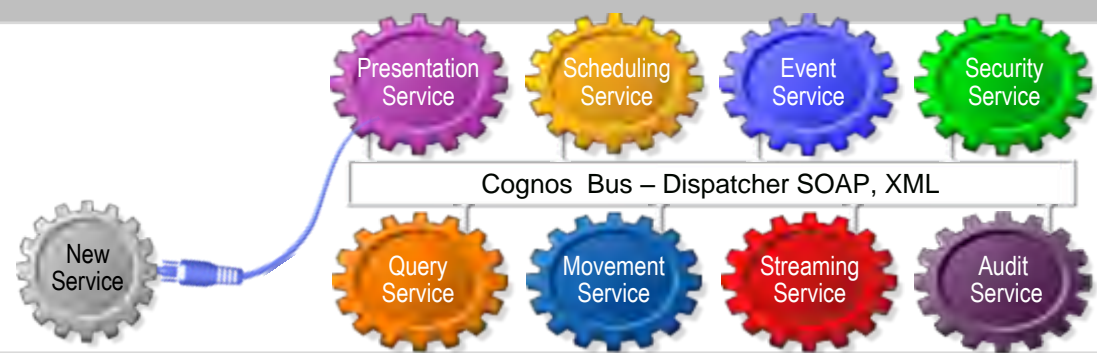
重新定义
BI应用
在各种设备上的体验

+ **IBM Watson Analytics** 智能数据探索

Cognos Analytics同时提供企业级BI+敏捷BI能力



- 统一的元数据
- 统一的安全性
- 统一优化的查询服务
- 单一的系统管理
- 负载容错
- 开放的API(数据和管理)



公共的企业BI模型



IBM可视化分析引擎RAVE

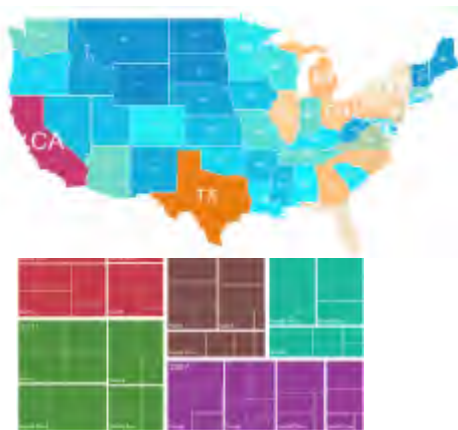
A paradigm shift for delivering value to users

挑战:

- 新的可视化需求随着大数据的出现在不断增加
- 每个需求都是特别的,难以直接满足

解决方案:


- 提供大量的可视化种类,也就是意味着可以方便地定制。



IBM RAVE图形引擎提供了大量的可视化示例



Get Rave Now

Home **Visualizations** Media Downloads Blog Apps Learn Workbench 

Visualizations

Using RAVE 1.8.0.10 (Schema 7.2)

Search Visualizations

Filters

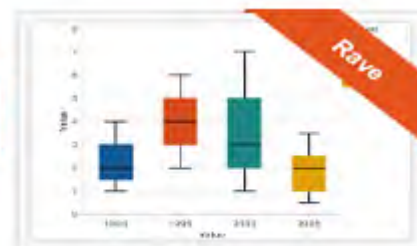
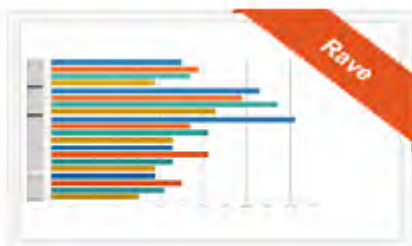
Clear All

Provider

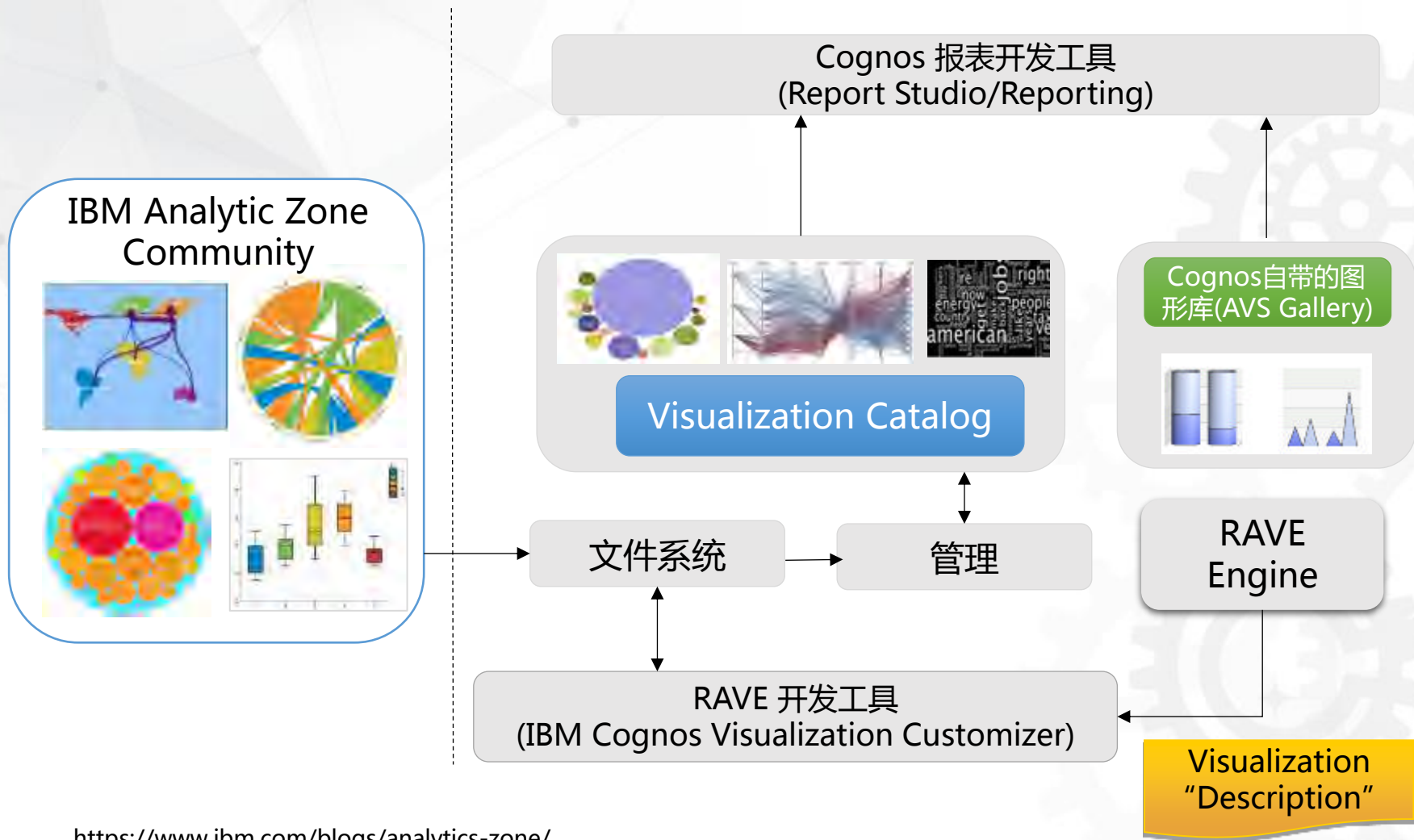
- Rave (58)
- Research (9)
- PureScale (3)
- BI (18)
- FPM (2)
- Hackday (9)
- Experimental (1077)
- Rave Development (29)

Chart Type

- area (63)
- edge (151)
- interval (550)
- line (141)
- path (9)
- point (521)
- polygon (29)
- schema (4)
- schema:boxplot (20)
- text (36)



RAVE图形引擎与Cognos Analytics



<https://www.ibm.com/blogs/analytics-zone/>

RAVE 开发工具

- IBM Cognos Visualization Customizer

The screenshot displays the IBM Cognos Visualization Customizer interface. On the left, a code editor shows JSON configuration for a chart. The configuration includes a title style with a blue fill and Arial Unicode font, and a legend entry style with zero padding and a swatch method. The right pane shows the 'RAVE' tab with 'Chart Type Definition' selected. The 'Draw Chart' section is active, showing settings for 'Validate' (checked), 'Animation' (None), and 'Background' (White). The 'HOVER' section is set to 'Type: element' and 'SubType: (all)'. The main visualization area shows a world map with three pie charts overlaid on North America, Europe, and Asia.

```
428     "family":"'Arial Unicode
429     "size":"'10pt"
430   }
431 },
432 "titleStyle":
433 {
434   "fill": "#808080",
435   "align": "middle",
436   "font":
437   {
438     "family": "'Arial Unicode
439     "size": "'10pt"
440   },
441   "padding":
442   {
443     "bottom": 5
444   }
445 },
446 "legendEntryStyle":
447 {
448   "padding": 0
449 },
450 "method": "swatch"
451 }
452 ],
453 "resource":
454 [
455   {
456     "id": "id1",
457     "type": "geo/json/text",
458     "URIs":
459     [
460       "embedded:///resource/*[\\"id
461     ],
462     "embeddedData": "{\\"type\\":\\"Fea
463
```

RAVE 开发工具

- IBM Cognos Visualization Customizer

The screenshot displays the IBM Cognos Visualization Customizer interface. On the left, a code editor shows JSON configuration for a chart. The right side features a control panel with tabs for 'RAVE', 'Chart Type Definition', and 'Thumbnails'. Below the tabs are settings for 'Draw Chart', 'Validate', 'Animation', 'Background', and 'HOVER' type. The main area shows a world map with three pie charts overlaid on different regions.

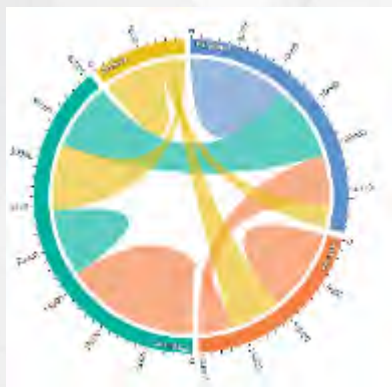
```
428     "family":"'Arial Unicode
429     "size":"'10pt"
430   }
431 },
432 "titleStyle":
433 {
434   "fill": "#808080",
435   "align": "middle",
436   "font":
437   {
438     "family": "'Arial Unicode
439     "size": "'10pt"
440   },
441   "padding":
442   {
443     "bottom": 5
444   }
445 },
446 "legendEntryStyle":
447 {
448   "padding": 0
449 },
450 "method": "swatch"
451 }
452 ],
453 "resource":
454 [
455   {
456     "id": "id1",
457     "type": "geo/json/text",
458     "URIs":
459     [
460       "embedded:///resource/*[\\"id
461     ],
462     "embeddedData": "{\\"type\\":\\"Fea
463
```


RAVE | Chart Type Definition | Thumbnails

Draw Chart | Validate, Animation: None | Background: White

HOVER Type: element | SubType: (all) | Info: | DataSet:

RAVE 2更加值得期待...



 Data-Driven Documents



用户交互界面 (UI)

简洁的用户界面
能够满足用户各
种分析需求：

数据上传

智能数据探索

仪表盘

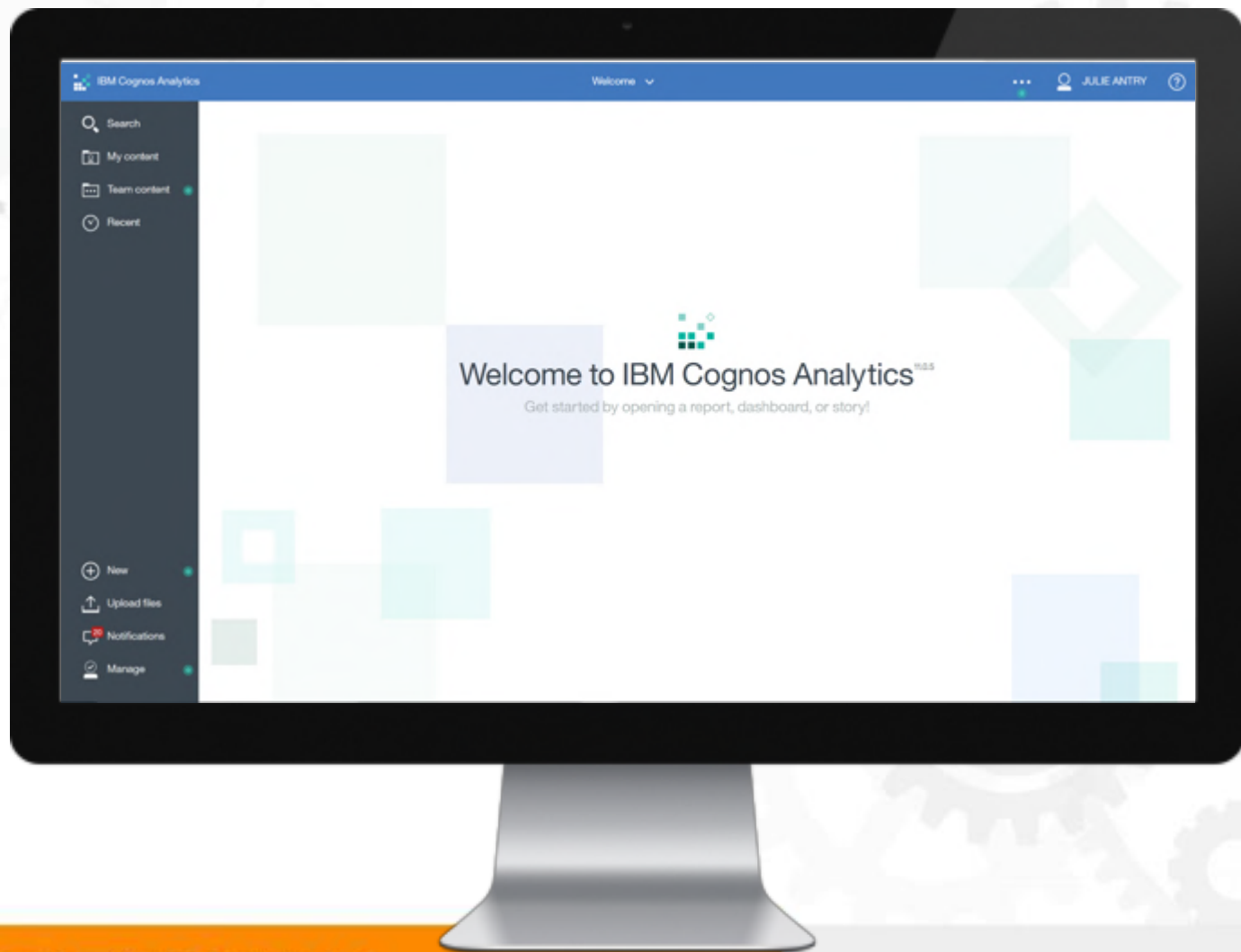
图表

创建故事

即席查询分析

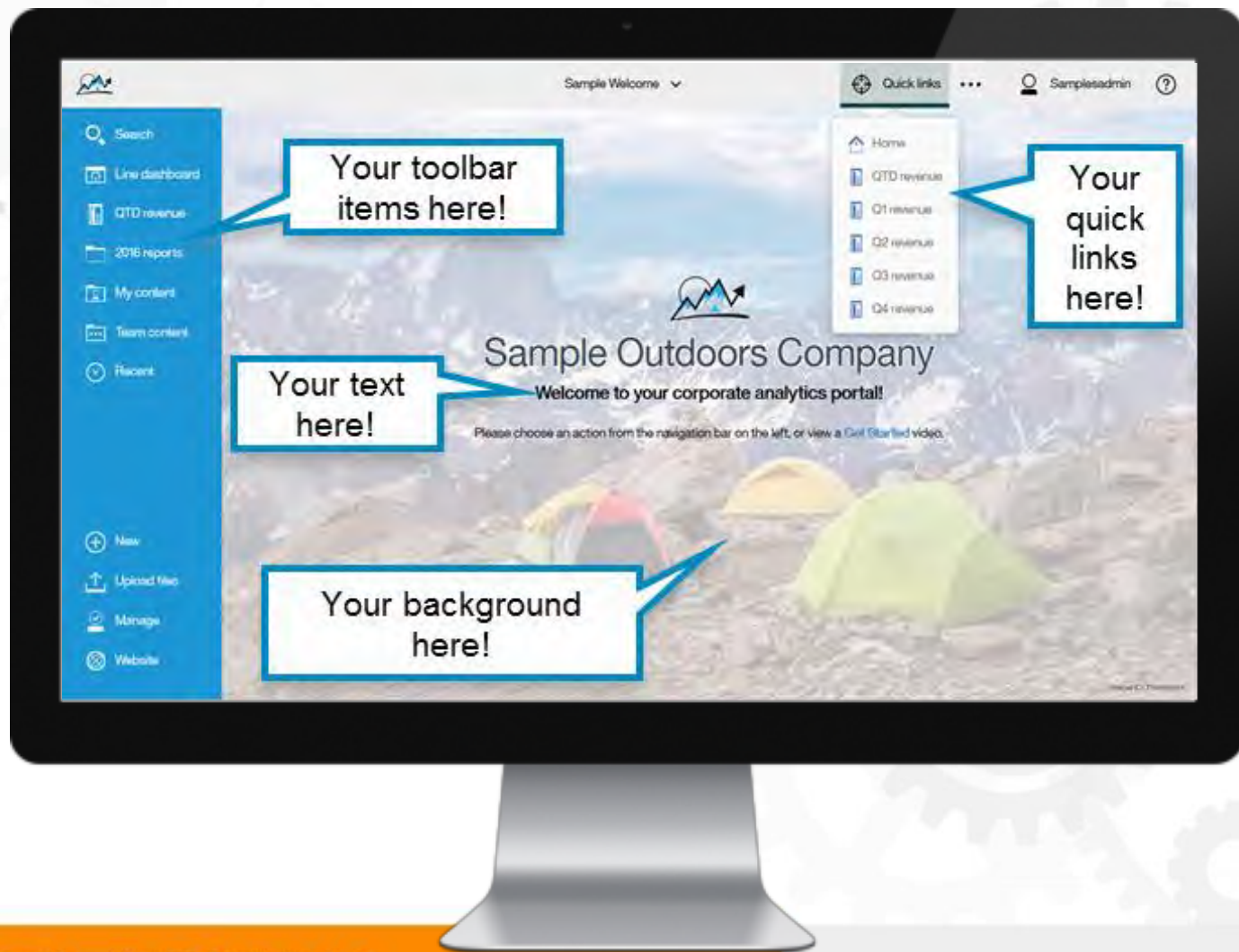
报表制作

数据建模



皮肤主题与界面定制化

主题允许自定义：
登录页面
欢迎页面
背景
导航列表项
快捷菜单
可以应用到用户组
级别



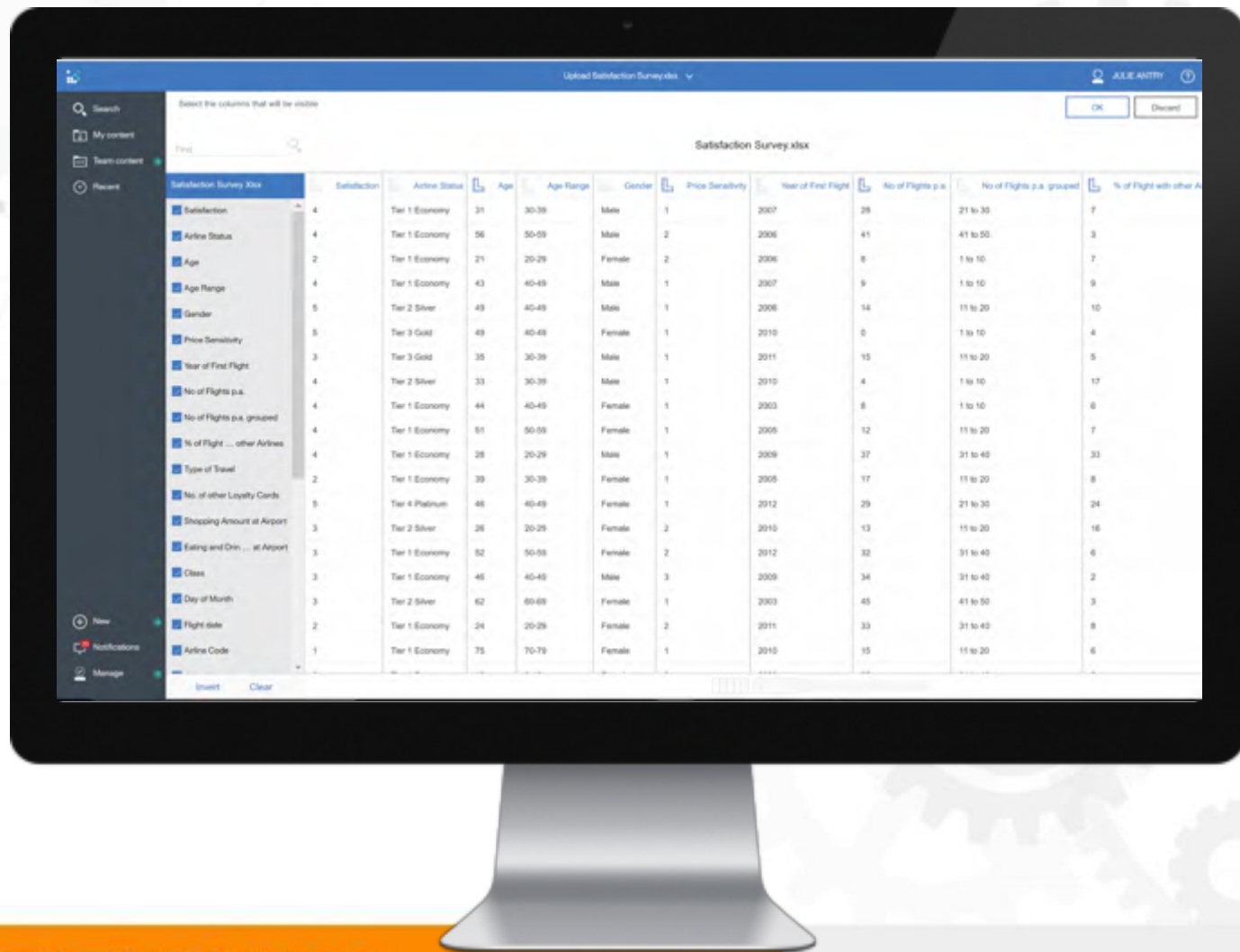
一流的管理报表

可交互式、
完美像素、
按需运行的报表，
或者后台批量生成
在线或者离线报表，
并且不限制使用用
户数。



数据上传

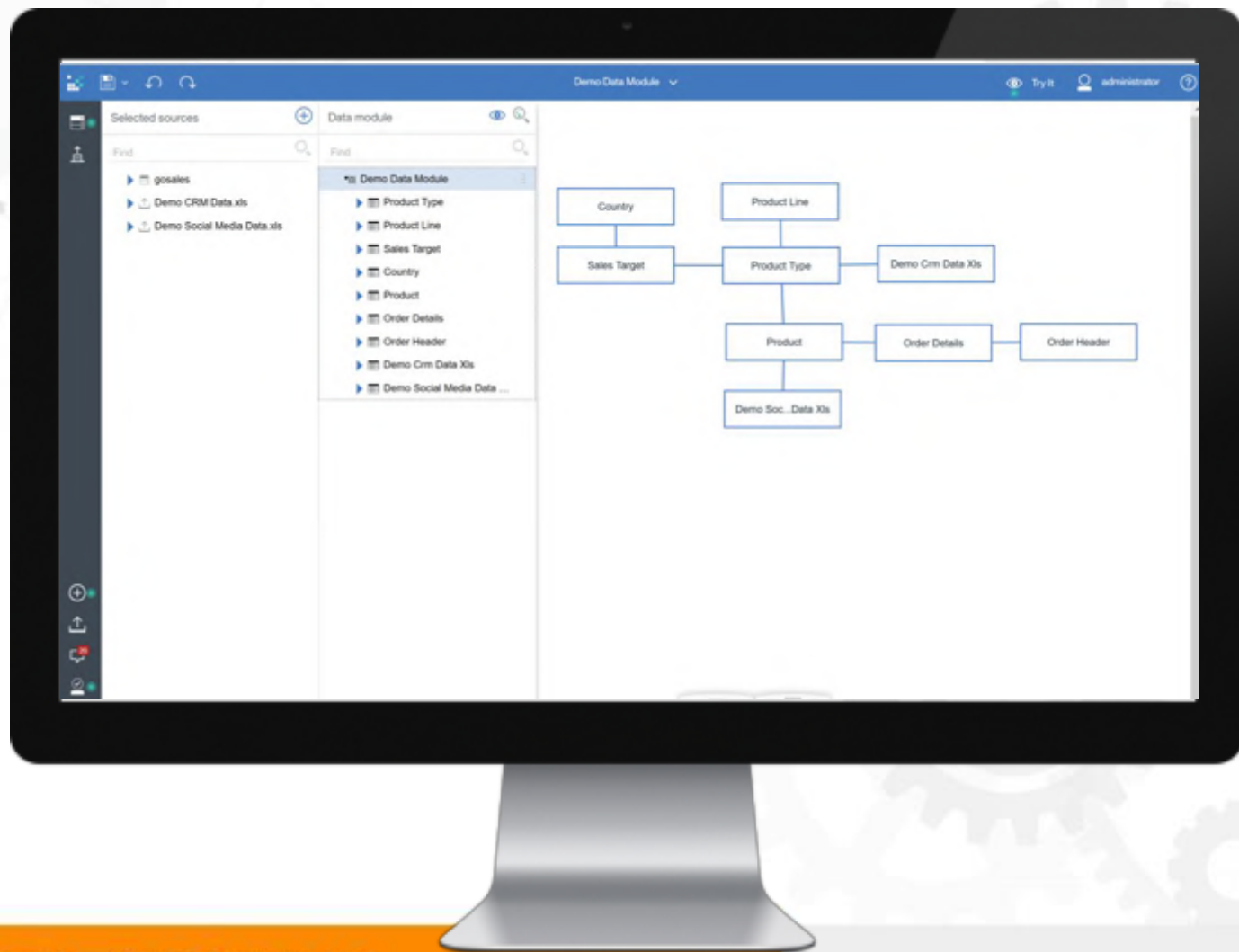
用户可以上传外部数据源，并且通过交互式操作立即对数据进行加工，并为即席查询、仪表盘提供数据，从而快速获得洞察。



数据建模

数据模块功能可以为用户按需进行数据混合操作。

用户可以将企业管控的数据与外部数据进行拼接。



高度可视化交互式仪表盘

Cognos Analytics 的仪表盘是高度可视化，并且完全可交互的。

智能搜索与自然语言提供快速产生业务价值的智能数据探索。



可视化图形

示例包括：

数据演示器（时间滑动器）

地理空间地图

信息图表

世界地图

热图

树图

网络图

散点图

箱图

龙卷风图

气泡图

雷达图

弦图

甘特图

面积图

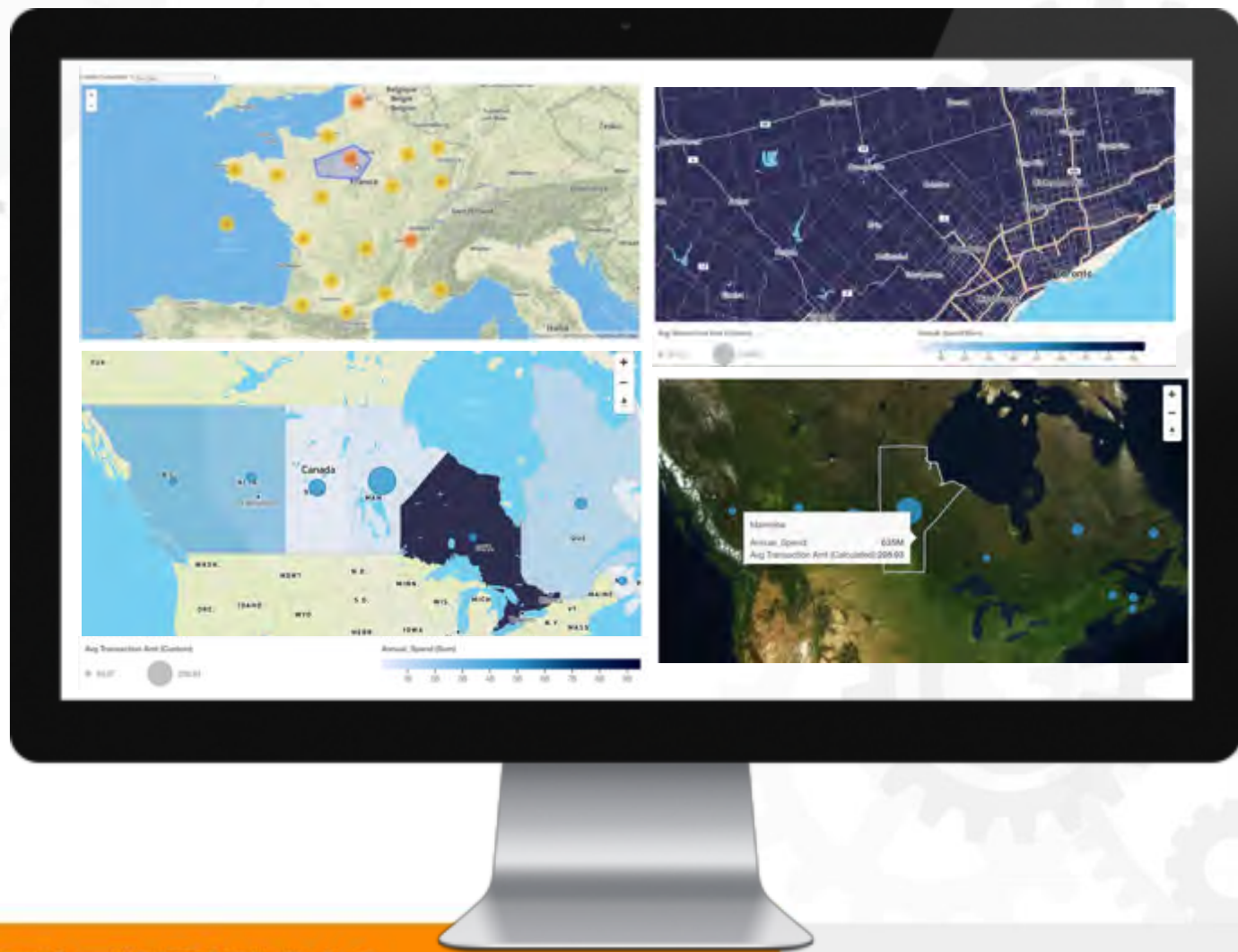
仪表图



Cognos Analytics还可以提供更多的可视化图表，甚至合适图片、视频、网页链接等。

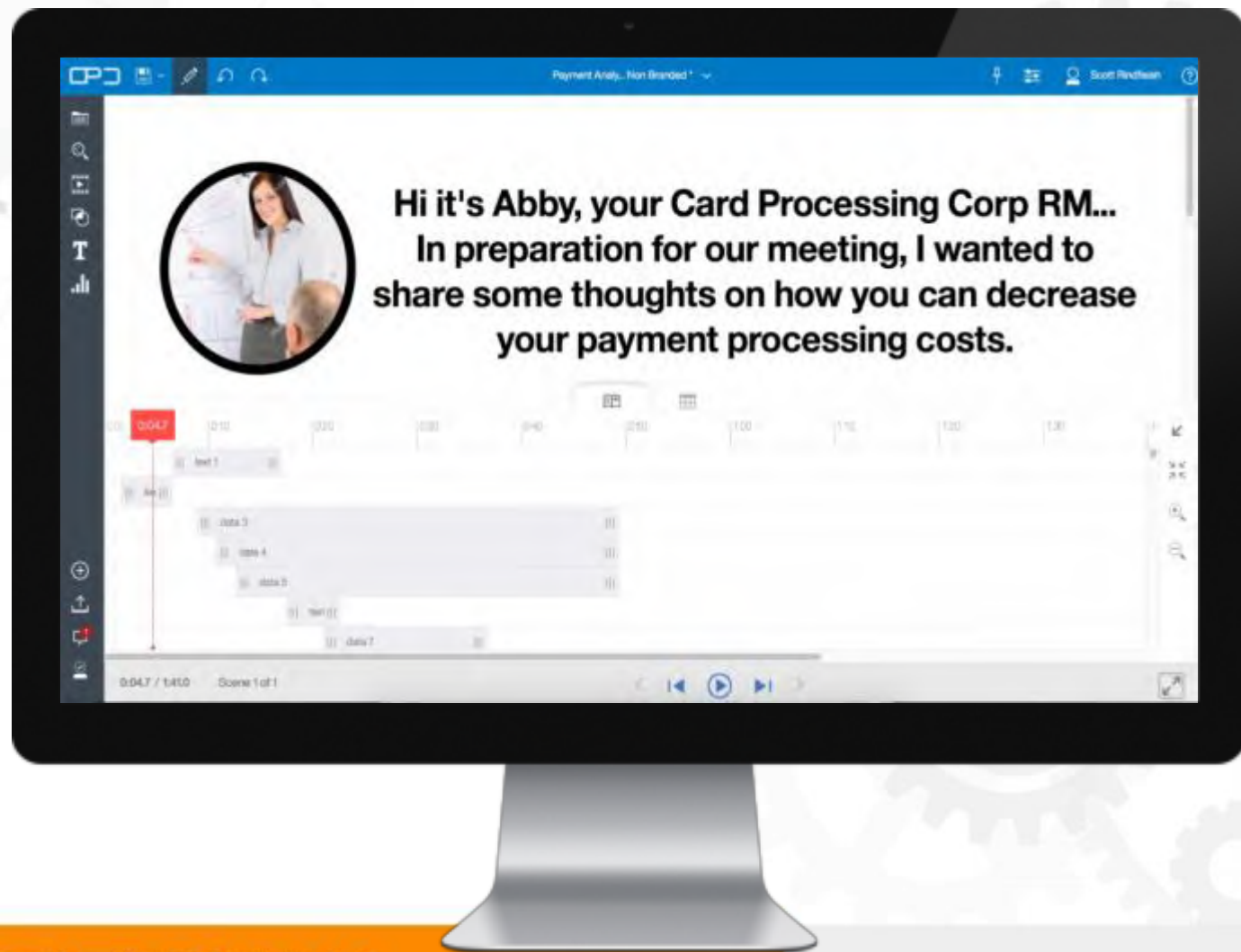
世界级的地理空间地图

Cognos Analytics
与 MapBox合作，
可以提供世界级的
地理空间地图，包
括街景视图与卫星
照片视图。



自动演示分析

Cognos Analytics的故事与向导式的录制功能可以利用仪表盘的内容，增加动画、图片、文字等信息来完成最终的演示故事。



客户对IBM Cognos Analytics的反馈



IBM Cognos Analytics combines self-service and managed data analytics capabilities to support new features, including intent-driven modeling, smarter search that works in-context and a single environment for all types of business reporting.

Charles King,
Industry analyst



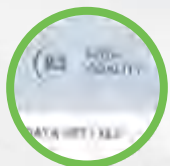
One of the most impressive features is the improvement and prominence of the search functionality and its harmonization with what has been described as the “intent-driven” experience of authoring and modeling.

Scott Misage,
Engagement Manager



Watson Analytics: 智能数据探索

Watson Analytics在业务用户的易用性和强大的功能之间需求平衡



智能元数据能够自动整理数据源中的数据以更好的用于分析



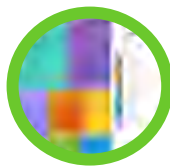
认知指引在分析的开始给予分析建议，并提供自然语言对话方式进行分析



高级分析不需要专业知识就可以发现数据模式和内在关系



访问**社交媒体**数据，并对其进行分析,从而获取外部客户的观点和态度

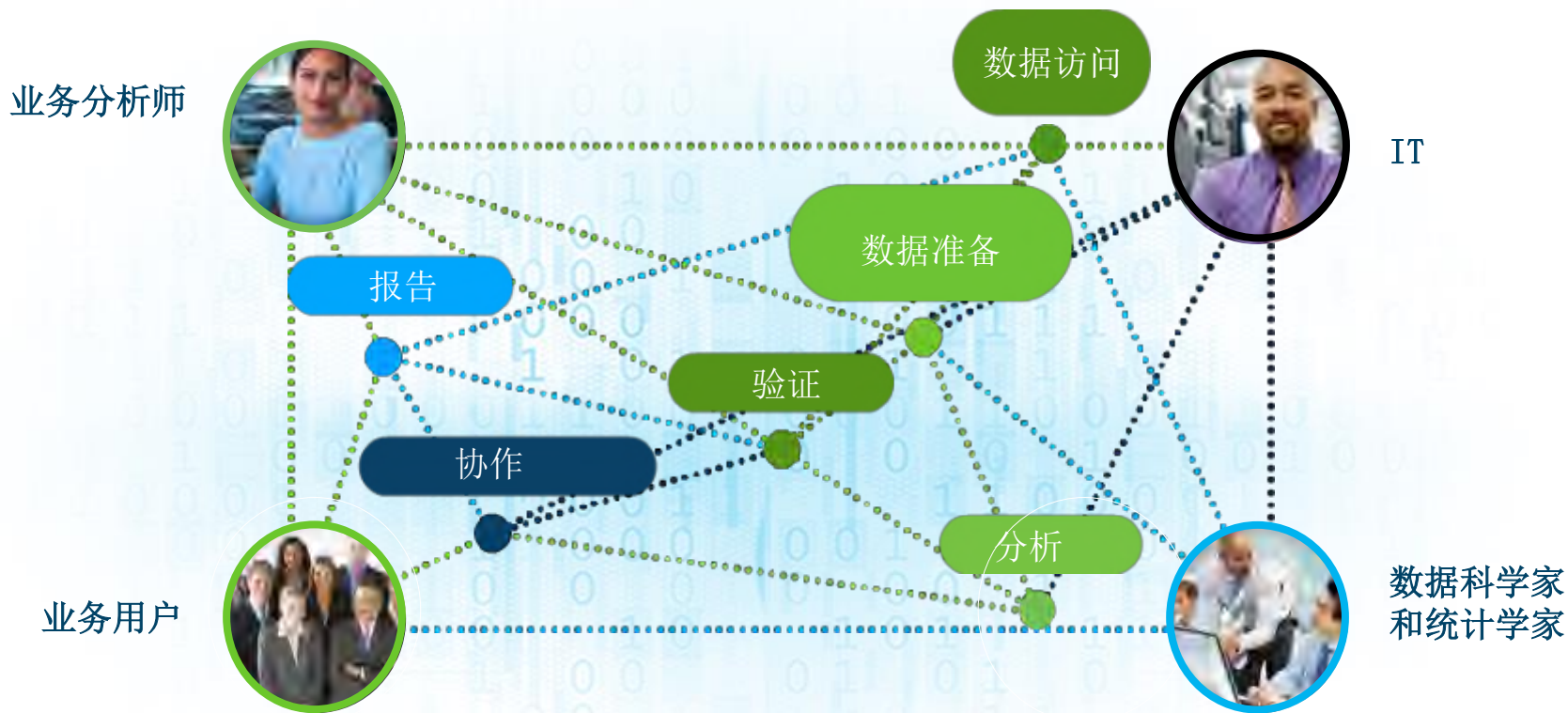


以**仪表板**的形式可视化支持您的决策，传达决策结果

即使是简单的分析项目，也需要繁杂的步骤和大量的人员



过程往往错综复杂

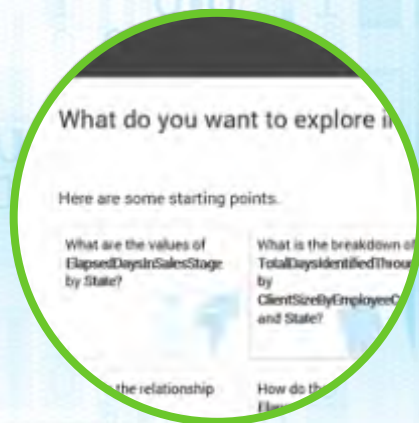


IBM Watson Analytics

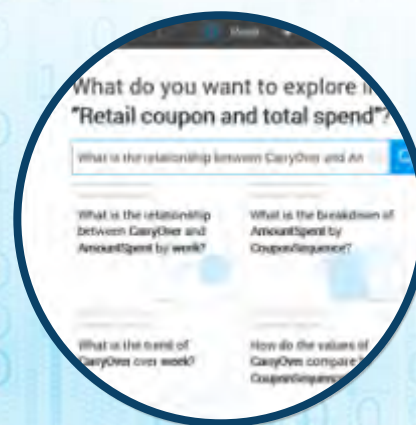
云端自助式分析功能



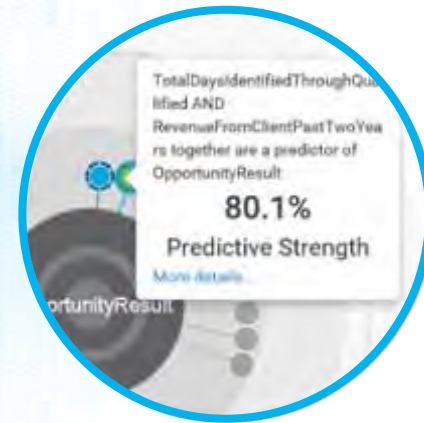
单一分析
体验



完全自动化
智能



自然语言
对话



引导式分析
发现

Watson Analytics 客户成功案例

Honest Café – Brewing up the Perfect Business Model Based on Customer Insight

The Transformation

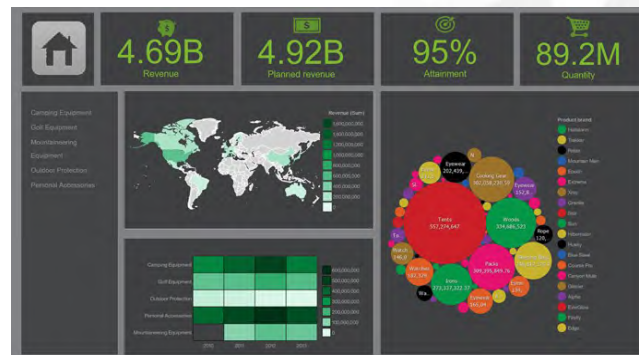
Vending specialist Honest Café offers premium-quality coffee and snacks without the staffing costs of a traditional café. Cognitive analytics revealed that customers see a visit to Honest Café as a social experience – leading the company to redesign its retail spaces, adding seating areas to encourage longer visits and upsell.

“Cognitive analytics has transformed our understanding of customer behaviour – and our retail strategy.”

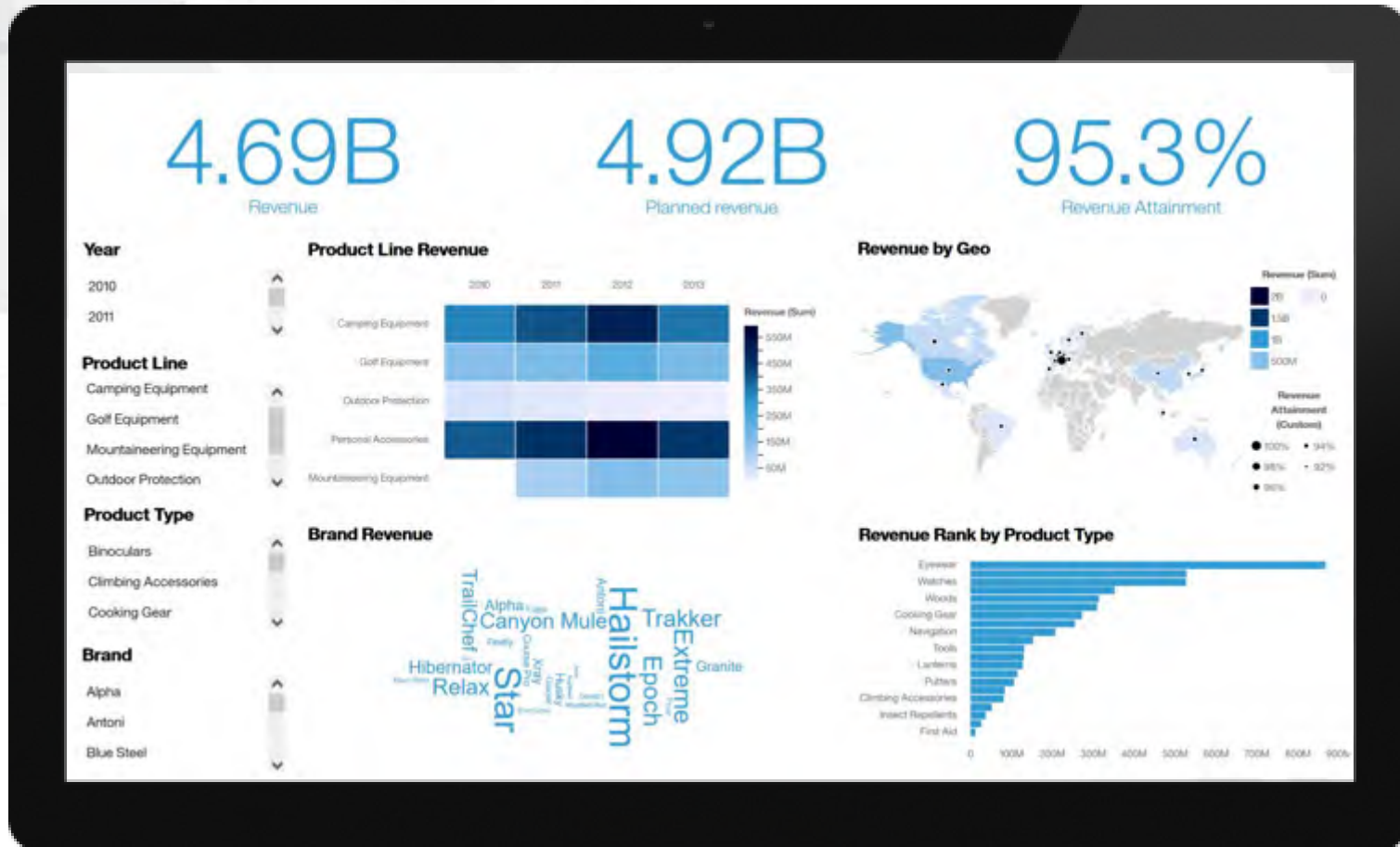
- Mark Summerill, Head of Product Development, Honest Café



这是在IBM Cognos Analytics里的数据



Cognos Analytics: Art of the Possible



Cognos Analytics: Art of the Possible



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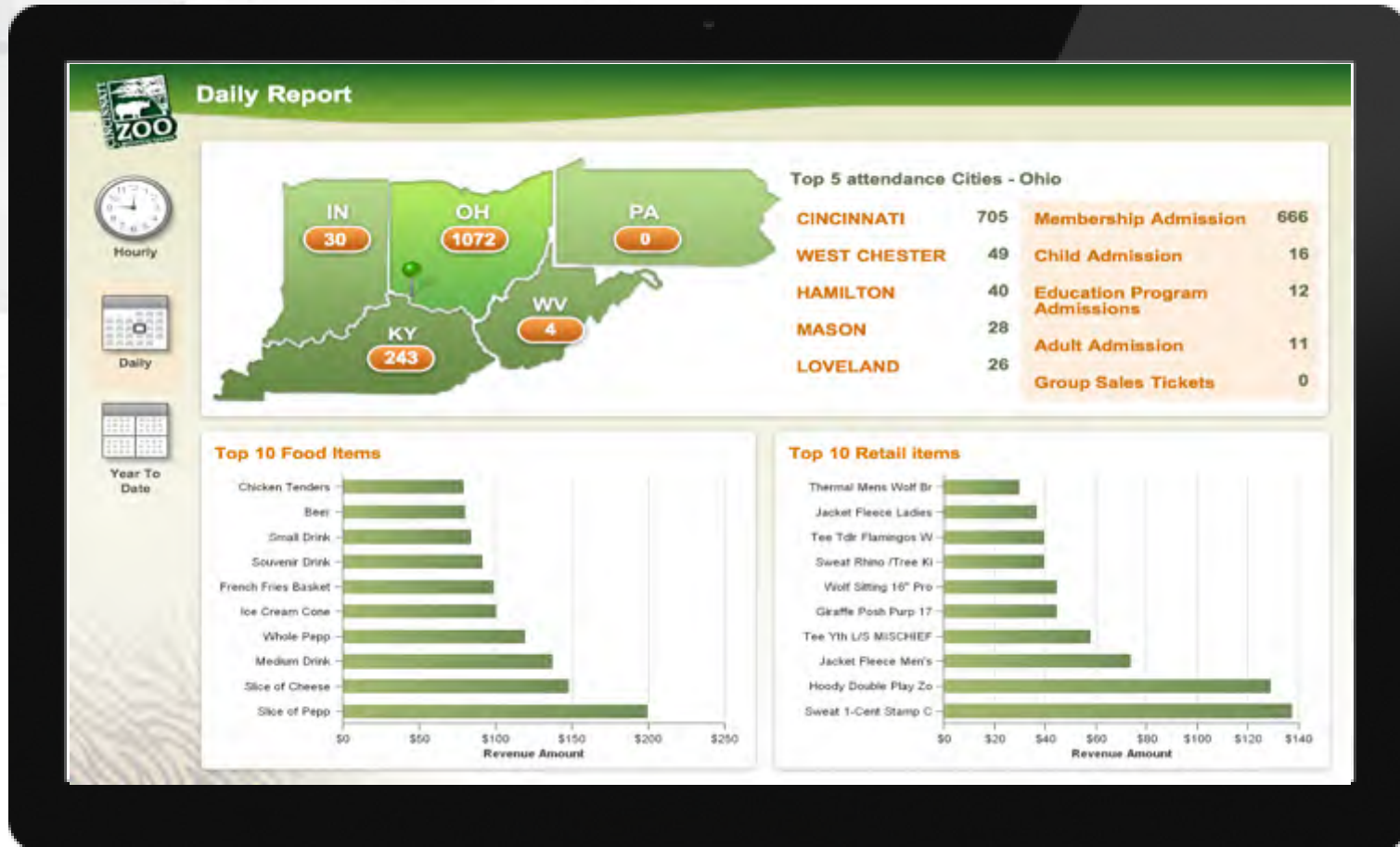
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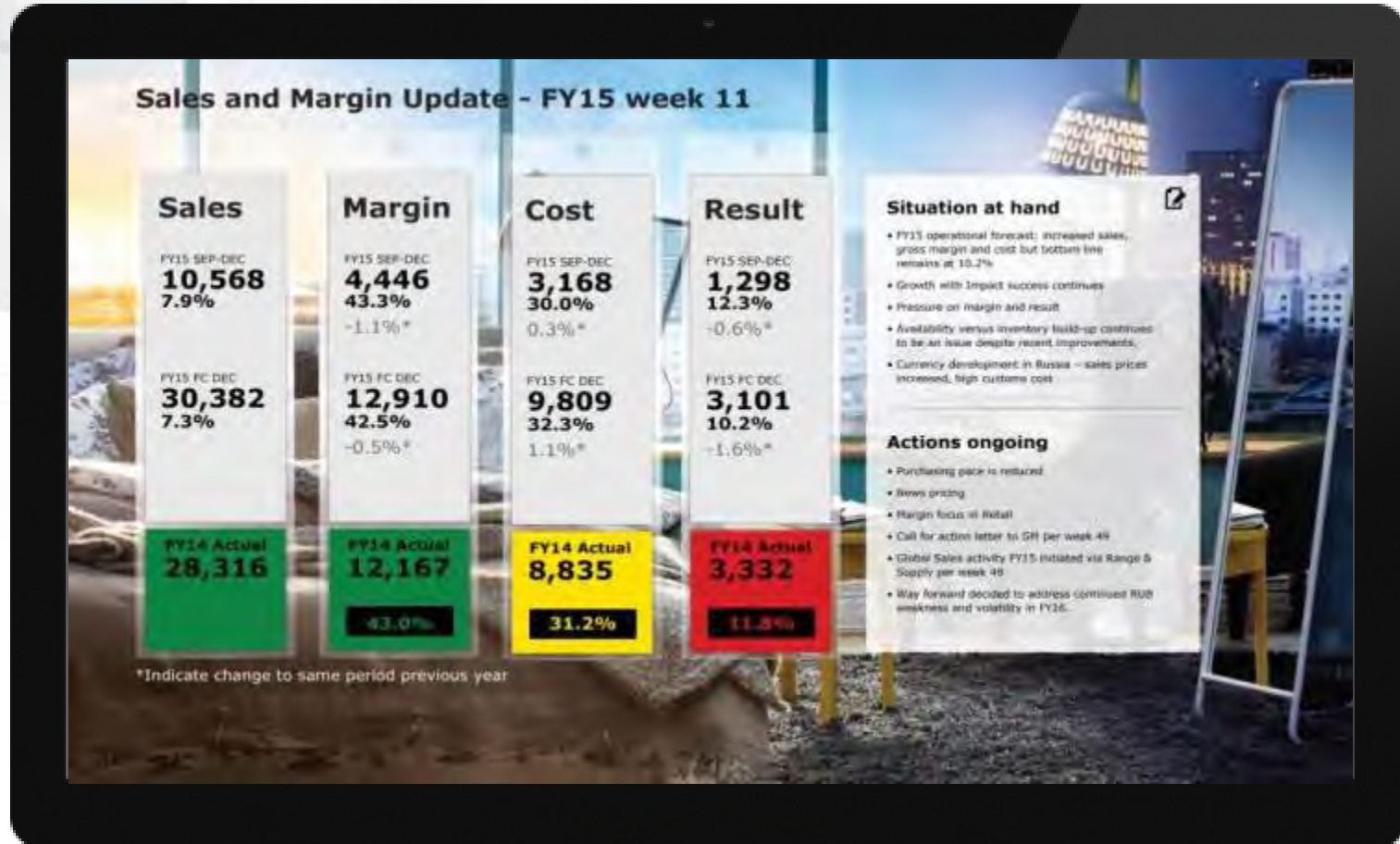
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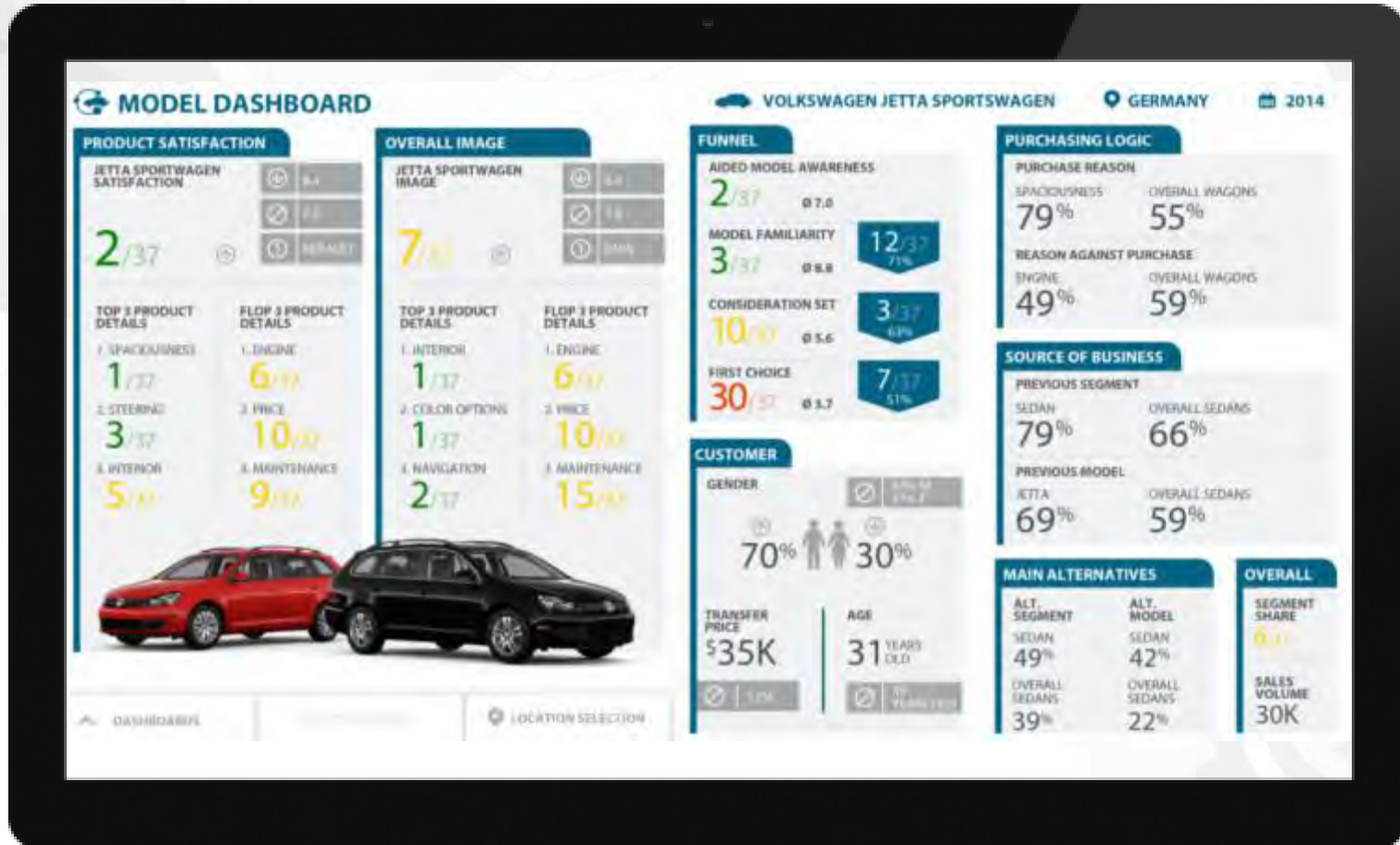
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Analytics—
Designed for me,
built for us

Empowering business
by infusing intelligence
across the enterprise

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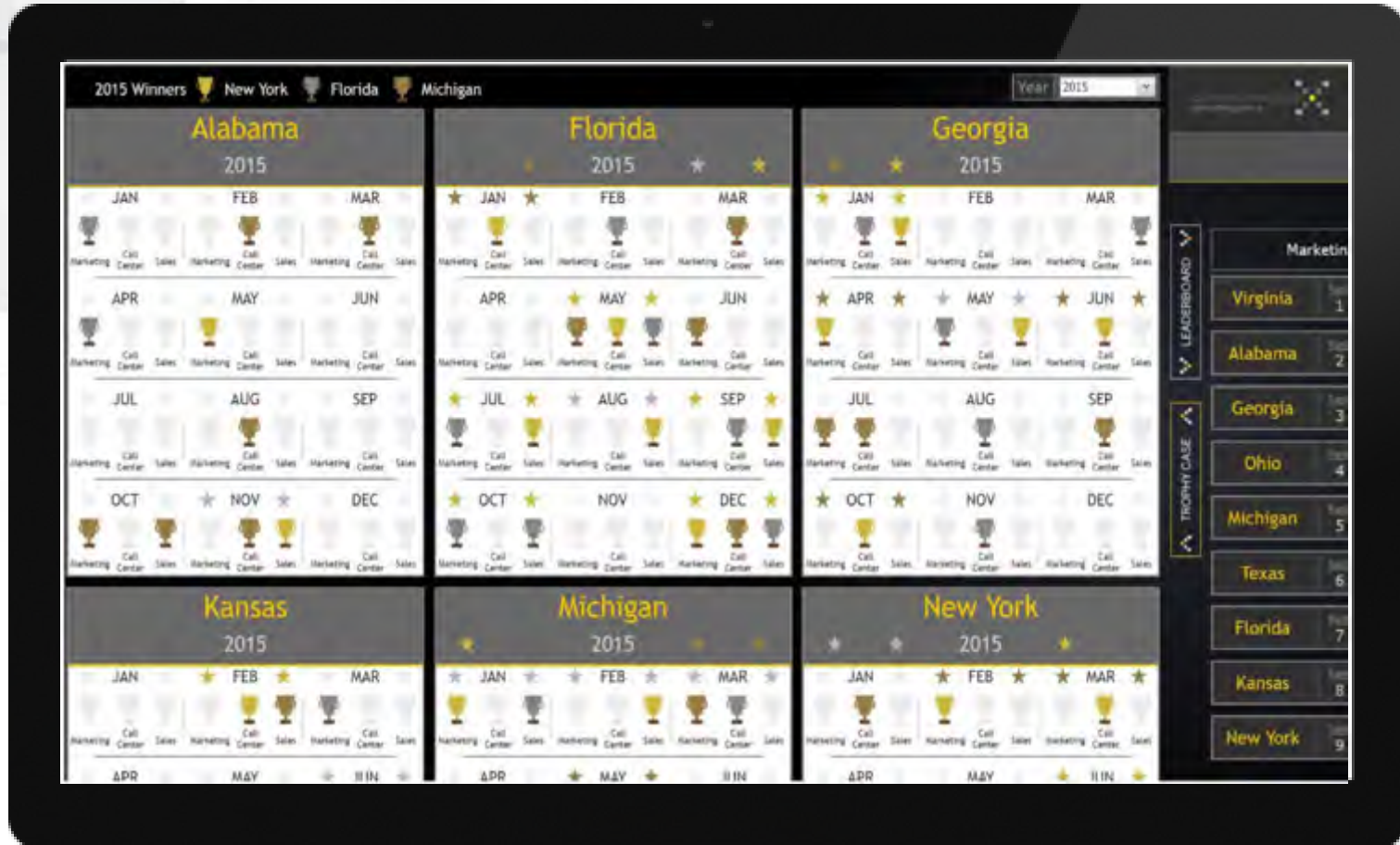
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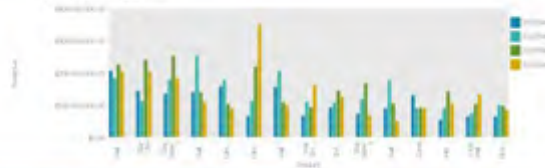
How Verizon Built a Centralized, Secure and Trusted Analytics Environment

Salt Lake City Sporting Goods - Revenue
(Fake Client Example)

Customers by Revenue YTD - April



Products Revenue MoM



Customer Name	Revenue
Customer One	\$1,234,567
Customer Two	\$987,654
Customer Three	\$543,210
Customer Four	\$321,098
Customer Five	\$210,987
Customer Six	\$109,876
Customer Seven	\$98,765
Customer Eight	\$87,654
Customer Nine	\$76,543
Customer Ten	\$65,432
Customer Eleven	\$54,321
Customer Twelve	\$43,210
Customer Thirteen	\$32,109
Customer Fourteen	\$21,098
Customer Fifteen	\$10,987



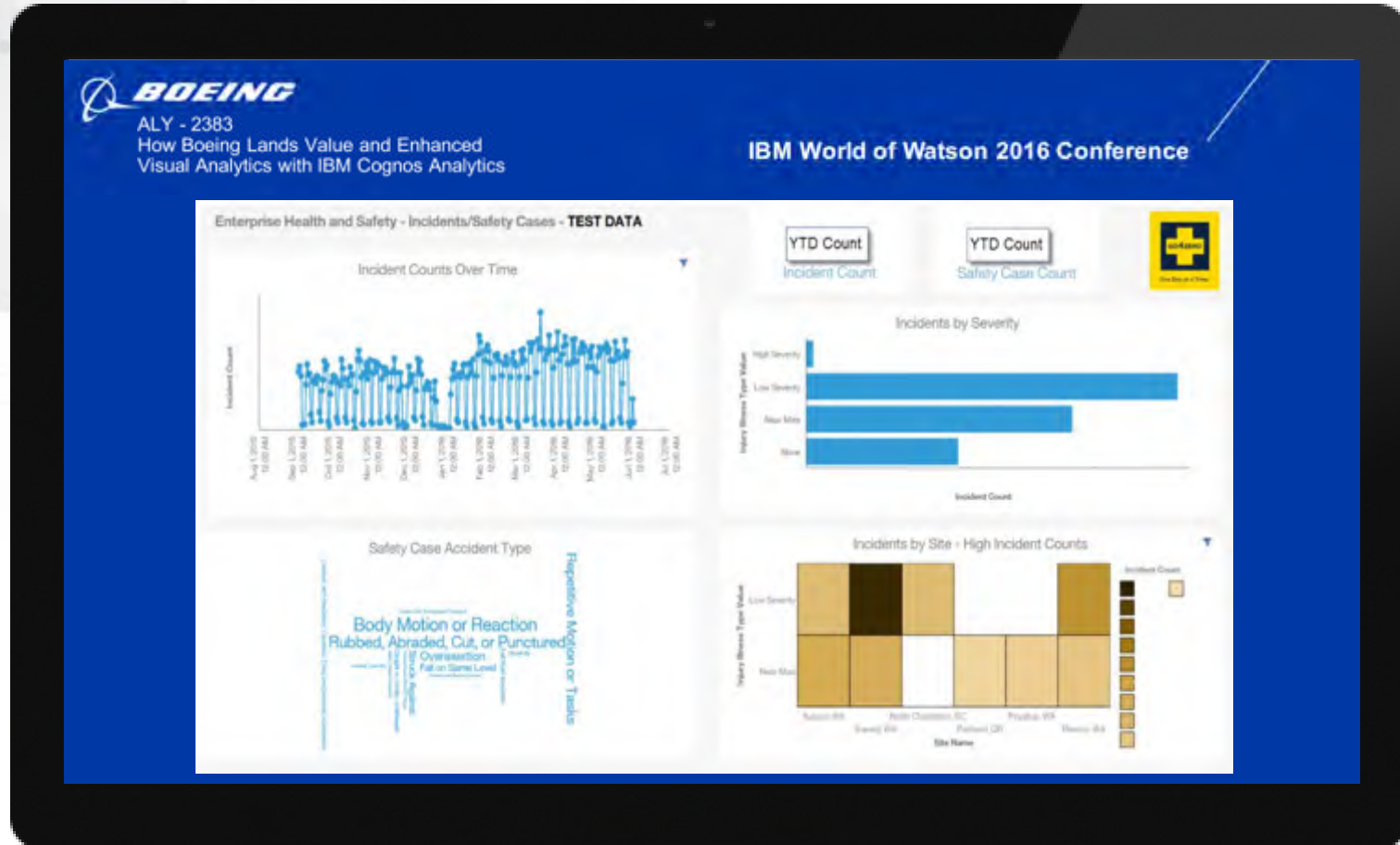
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Drawing lines between data is nothing new; and reading between those lines only gets you so far.

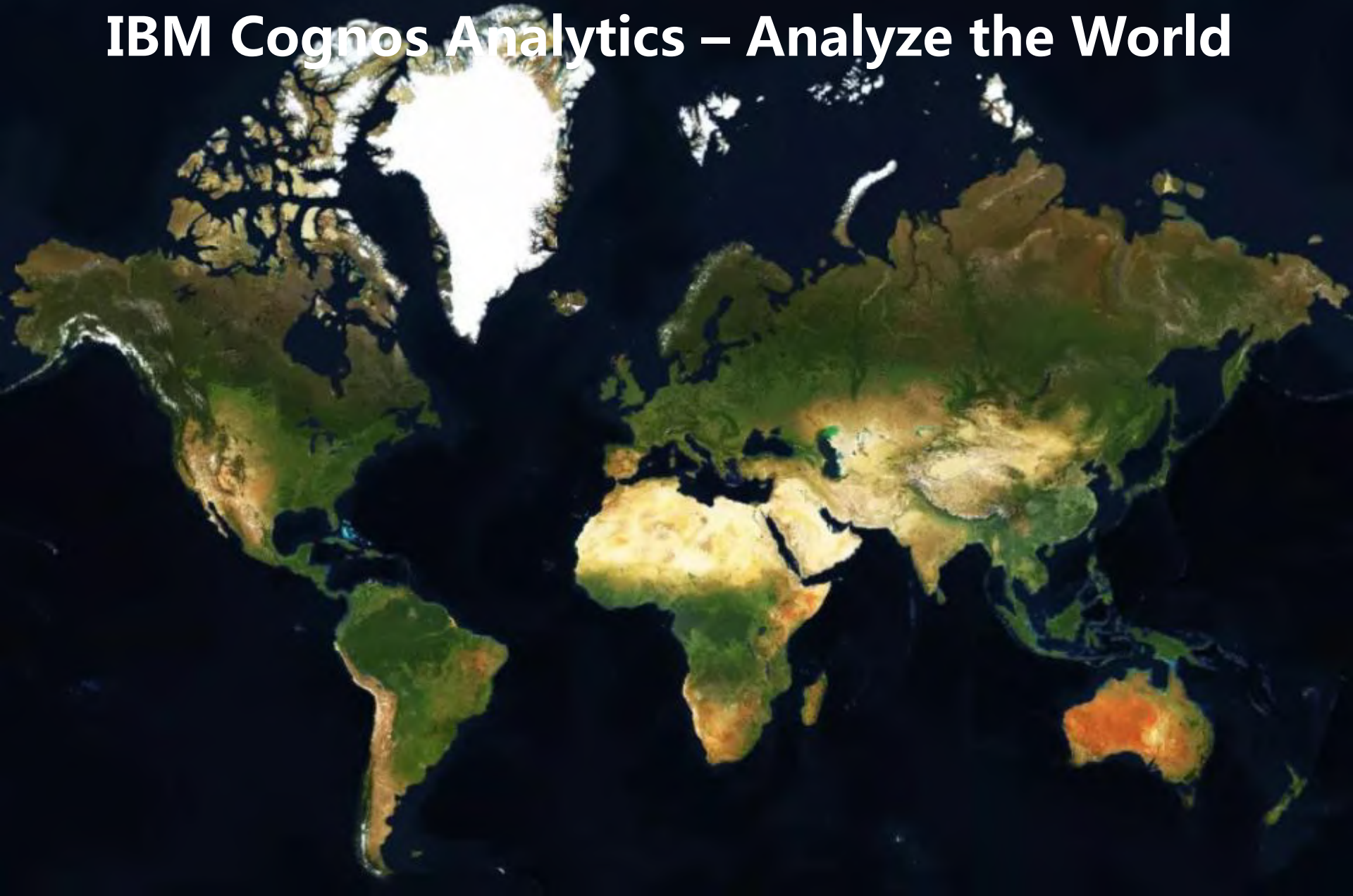
Building something WITH those lines – using the foundation of solid, transparent analytics – is our ultimate goal.



Cognos Analytics: Art of the Possible



IBM Cognos Analytics – Analyze the World



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2017年第八届中国数据库技术大会
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DB2 11 and Cognos Analytics 11 - Fast on Fast

数据仓库类分析：
用途最广、扩展最强的内存计算数据
仓库平台

大规模扩展数据仓库，内存计算的性能



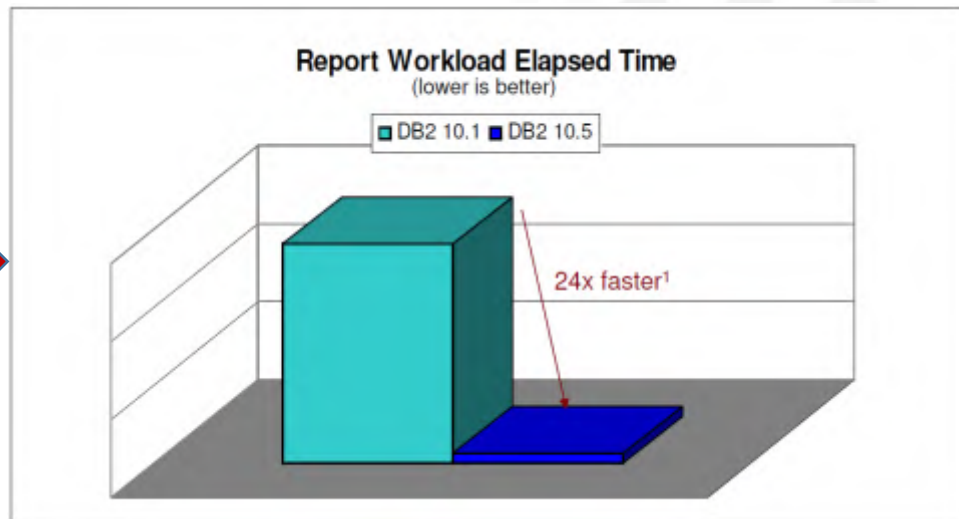
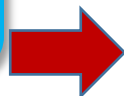
MPP BLU 扩展能力

- PB 级内存计算数据仓库

下一代内存计算性能, 功能和负载



- 更快的ELT/ETL 性能
- 优化了更多的查询负载
- 支持了更多的功能
 - 派生列
 - RCAC
 - OLAP + BLU性能



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