Advanced BI: Self-Service, Real-Time and Collaborative BI

New trends in BI

New trends in BI

- Self Service Business Analytics (today)
- Real Time Analytics (today)
- Collaborative Business Analytics (today)
- Internet of Things
- Big Data

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SSBI: the problem

- The BI tools that were popular half a decade or more ago required specialists not just to use but also to interpret the resulting data and conclusions.

- That led to an often inconvenient and fallible filter between the people who really **needed** to get and understand the business—the company decision makers—and those who were gathering, processing, and interpreting that data—usually data analysts and database administrators.

- Because being a data specialist is a demanding job, many of these folks were less well-versed **in the actual workings of the business** whose data they were analyzing.

- That led to a focus on data the company didn't need, a misinterpretation of results, and often a series of "standard" reporting that analysts would run on a scheduled basis instead of more "ad hoc" intelligence gathering and interpretation, which can be highly valuable in fast-moving situations.

SSBI: definition

- "Self-service business intelligence is defined as **end users designing and deploying their own reports** and analyses within an approved and supported architecture and tools portfolio." (Gartner)

- The goal of self-service BI is to make business users become self-reliant and **less dependent on their IT organization** or BI team to utilize data and information to answer business questions as they arise.

- More recently, state of the art BI tools provide these tools and applications to the business, such that at the time business users need that data and information, <u>they can get it themselves</u>.
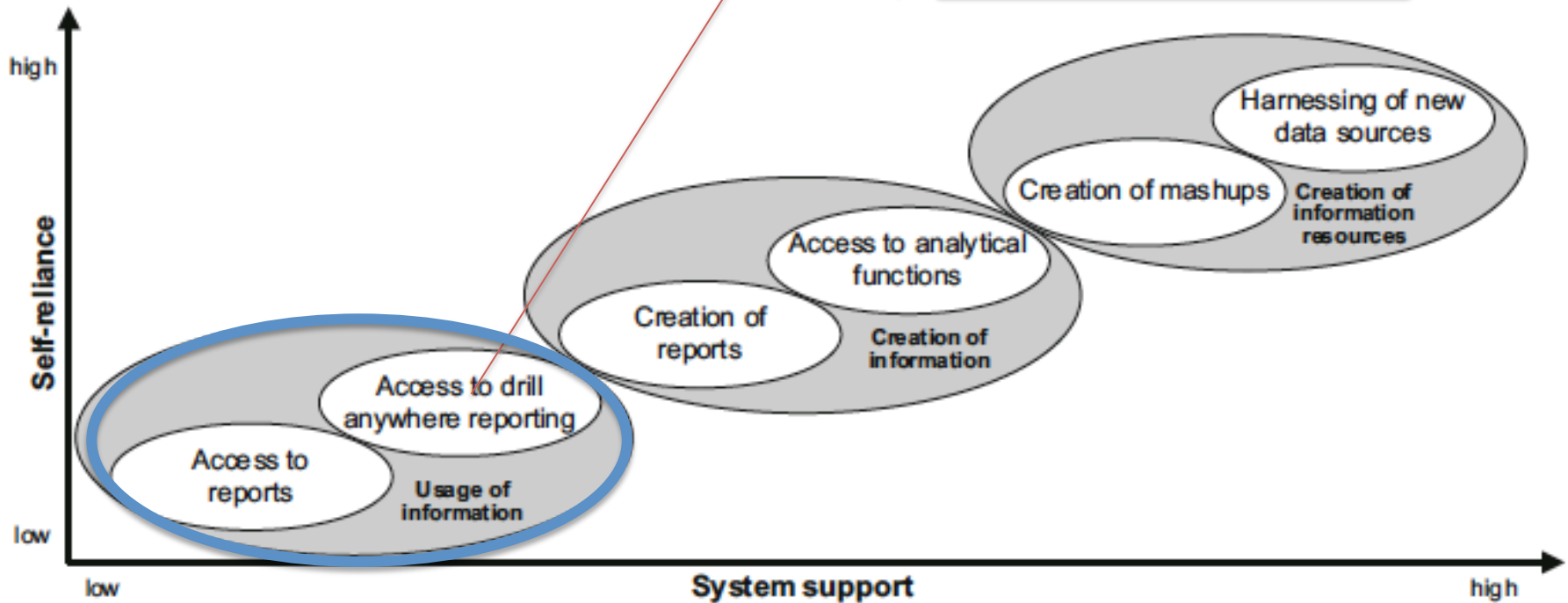
The need for SSBI: more demand

- More data: NEW, ABUNDAND TYPES OF DATA ARE AVAILABLE FOR BUSINESS USERS: social media systems, machine sensors, devices like smart phones, and other sources generate new data which often differ from traditional operational data regarding their structure, rate of growth, and **volume**

- More users: NOT ONLY MANAGERS ARE IN NEED OF DECISION SUPPORT: The scope of BI has been extended from strategic questions to operational tasks so that more employees have a need to apply BI

What Users Want to Do

Access

Clean

Share

Mash-up

Visualize

Explore

Mash-up = integrate diverse data sources
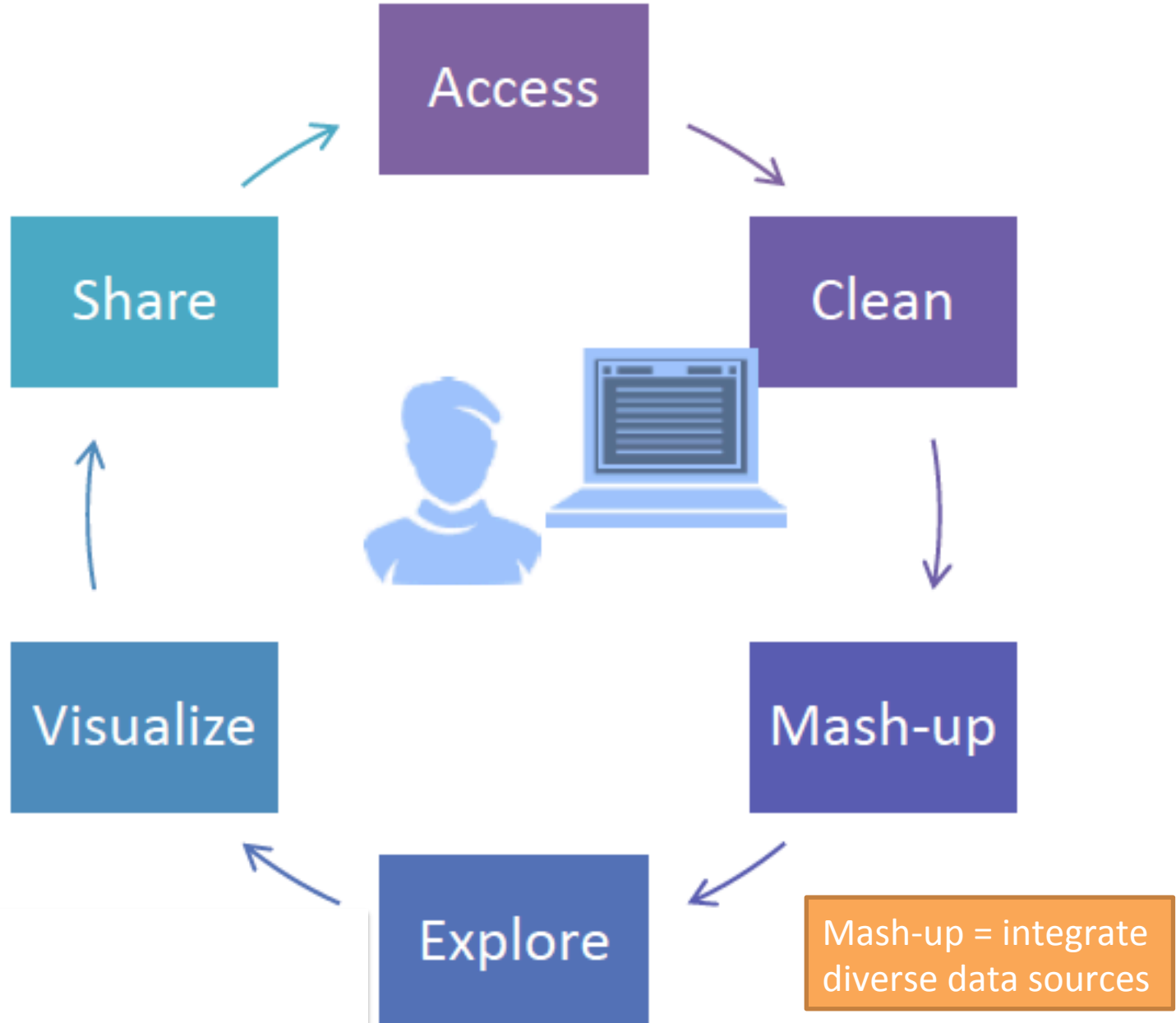
Levels of self service

Remember: drill up/ down is when you aggregate (drill up) or specialize (drill down) the data through queries

Self-reliance (high / low)

System support (low / high)

Access to reports

Access to drill anywhere reporting

Usage of information

Creation of reports

Access to analytical functions

Creation of information

Creation of mashups

Harnessing of new data sources

Creation of information resources

Level 1: Access to reports

- At the lowest level, the users receive access to information that has already been created (existing reports), or where they only need to **set parameters** (e.g. the temporal interval) before processing them.

- This differs from traditional reporting systems by the fact that not only a few standard reports are provided. The user obtains access **to all reports** that are potentially relevant to her.

- The advantage of this approach is that it is well suited for **casual users** without special analytical or tool skills.

Level 2: Creation of Information

- Users can be granted access to data at the lowest disaggregated level available in the system to create new information from it (e.g. the datawarehouse).
- The rationale is that others cannot foresee all the needs that users may have and prepare appropriate views for them.
- In principle, with SQL, a non-procedural too complex for the majority of business users.
- The new tools create virtual views almost on the fly, even from big data files if necessary.
- E.g. like when on Watson Explorer you click on facets and generate a query (you can see the SQL query but you actually generate it without knowing SQL, in few clicks)

Level 3: Creation of Information Resources

- In traditional BI systems, the data from different sources are combined and offered to the user as a unified source (ETL).

- Due to the emerging variety of data sources and user requirements, this **data preparation** is becoming increasingly challenging, as we have seen (e.g., texts) .

- Business users can be given the opportunity to autonomously harness new data sources for analysis that are not preprocessed by IT.

- A simple implementation can give business users the opportunity to load data into a personal workspace (e.g. Watson Explorer allow users to upload datasets, however, they cannot combine different data sources in an easy way: this still needs ICT specialists)

User-adapted SSBI

- Division of user types into casual and power users can be made, based on the level of their analytic and tool skills.

- Casual users consume information most of the time while **power users also produce information, either for themselves or for others (e.g. when applying predictive/prescriptive analytics)**

- A tailored approach that matches the needs of the individual BI users to the optimal analytic experience and desirable set of capabilities is the best approach.

CONSUMERS

Defined Experience

Consume | Interact | Personalize

Information Consumers want a defined experience where they can consume, interact, and personalize dashboards and reports that have been configured for them.

CREATORS

Managed Experience

Query | Author | Share

Content Creators prefer a managed experience so they can query data sources, author dashboards and reports, and share what they've created with others.

ANALYSTS

Self-Directed Experience

Connect | Discover | Collaborate

Data Analysts need a self-directed experience to bring their own data, discover new insights, and collaborate to find the best new metrics driving the business.

Organizational Issues in SSBI

- The idea of SSBI is not yet widespread within companies.

- There are also reports of failed deployments.

- One way to support diffusion of BI use in companies is to assist users in helping each other (user collaboration).

- See later (collaborative BI)

TOP INSIGHTS

91% of the Business and IT agree that it is important for business users to access data and information without the help of IT.

The biggest driver for self-service BI among business users is the flexibility to get things done on their own time. The top outcome is increasing operational efficiency.

On average, self-service BI reduces IT requests by 47%, up from 37% last year.

37%   47%
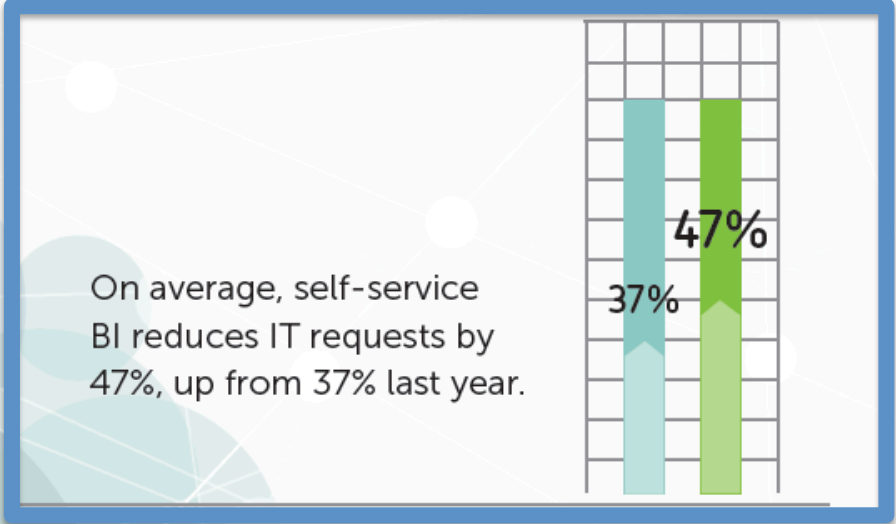
Only 22% of business users have access to and use self-service BI tools when needed.

22%
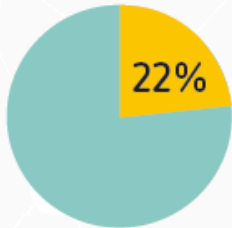
Business users are more reliant on IT compared to last year.

The most underserved department is marketing.

95% of IT organizations plan to invest in self-service BI in the next two years, up from 84% last year.
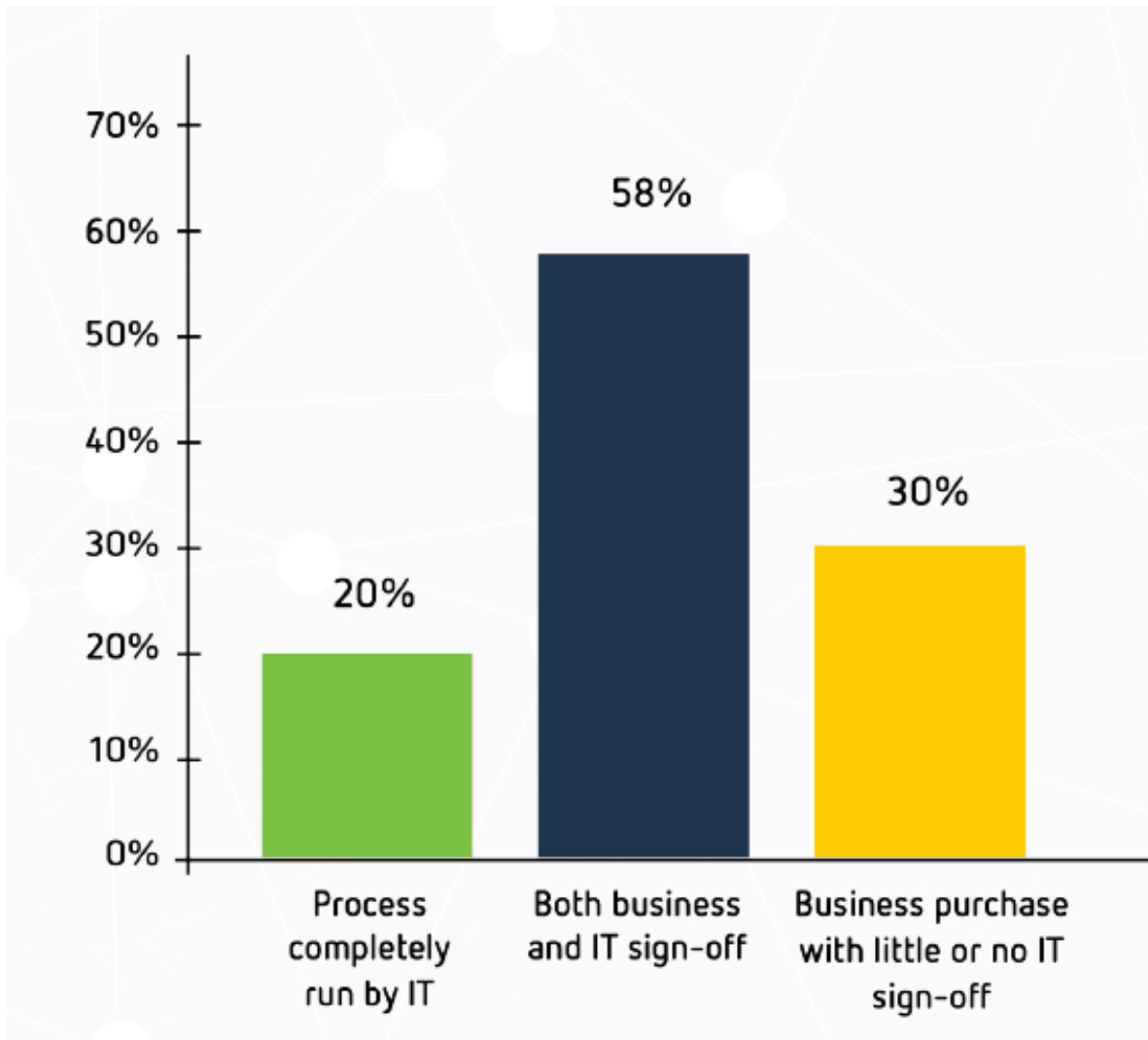
The top area for investment is end-user training.

25% of businesses have already purchased self-service BI tools without IT sign-off, and this trend is growing.

36%
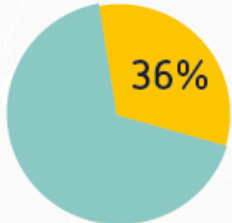
Only 36% of business users say they can promote a new insight they've discovered to a standard report delivered by IT.

Self-service means self-purchase

2015 State of Self-Service BI Report

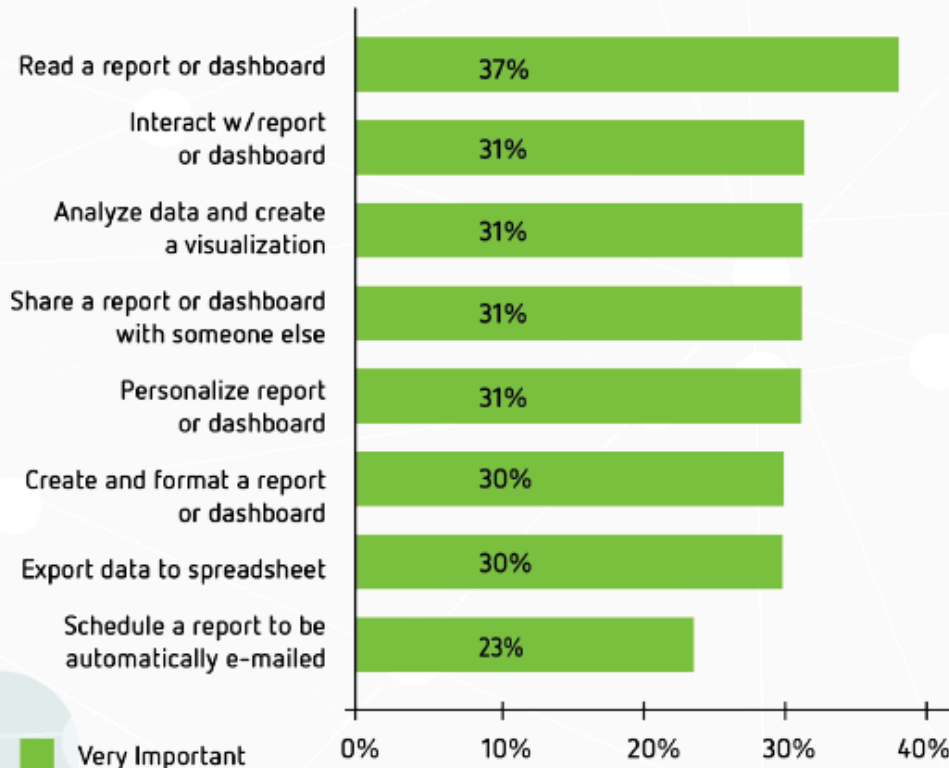# Summary of Main features of SSBI and their relative importance

- Read a report or dashboard
- Interact with report or dashboard
- Analyze data and create a visualization
- Share a report or dashboard with someone else
- Personalize report or dashboard
- Export data
- Schedule report to be automatically e-mailed

# How important are these features to BI (and IT) users?

BUSINESS

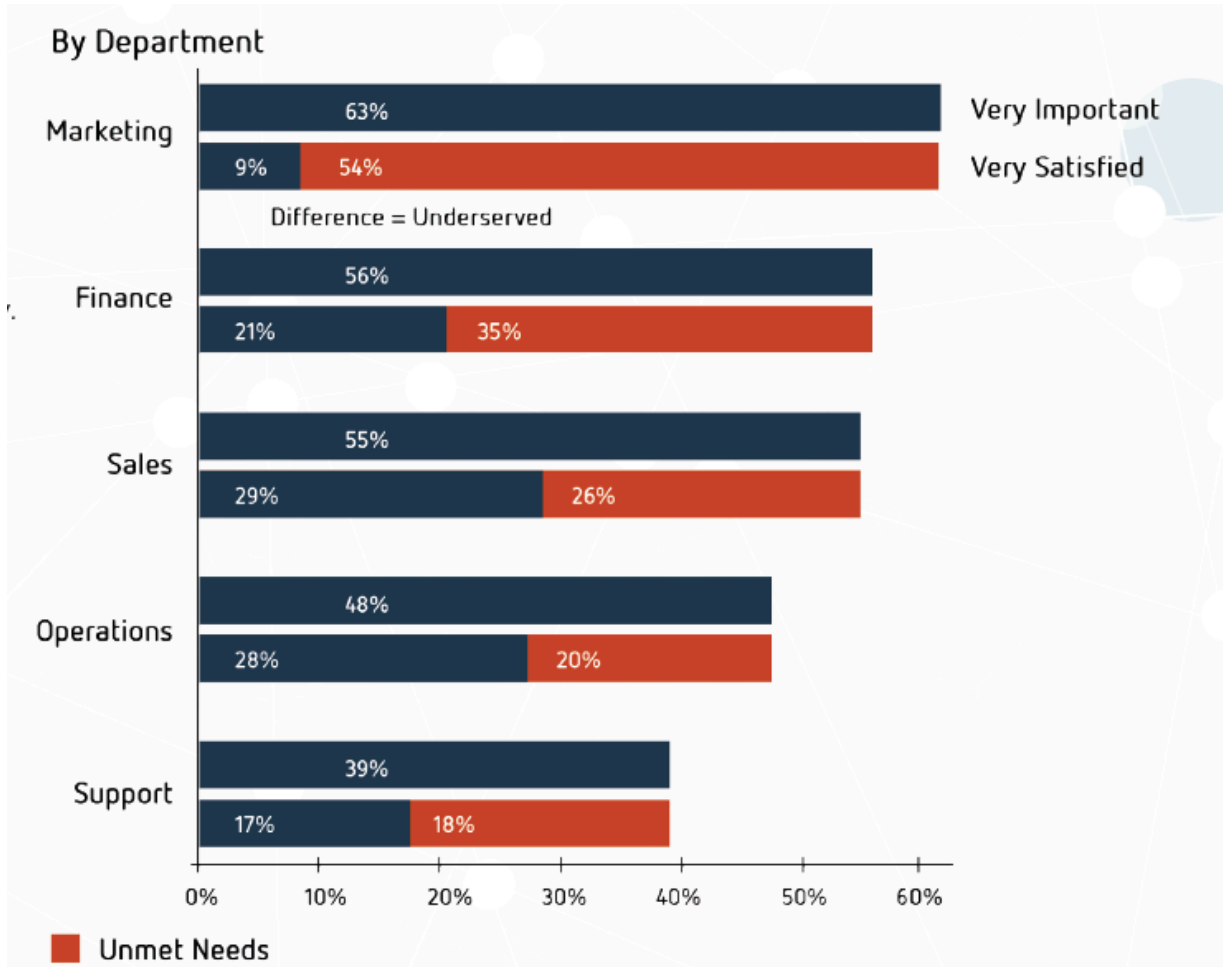How important are the following self-service BI capabilities?

Feature	Very Important
Read a report or dashboard	37%
Interact w/report or dashboard	31%
Analyze data and create a visualization	31%
Share a report or dashboard with someone else	31%
Personalize report or dashboard	31%
Create and format a report or dashboard	30%
Export data to spreadsheet	30%
Schedule a report to be automatically e-mailed	23%

IT

How important are the following self-service BI capabilities to business users?

| Feature	Very Important
Read a report or dashboard	49%
Interact w/report or dashboard	45%
Analyze data and create a visualization	44%
Share a report or dashboard with someone else	44%
Personalize report or dashboard	39%
Create and format a report or dashboard	38%
Export data to spreadsheet	40%
Schedule a report to be automatically e-mailed	38%
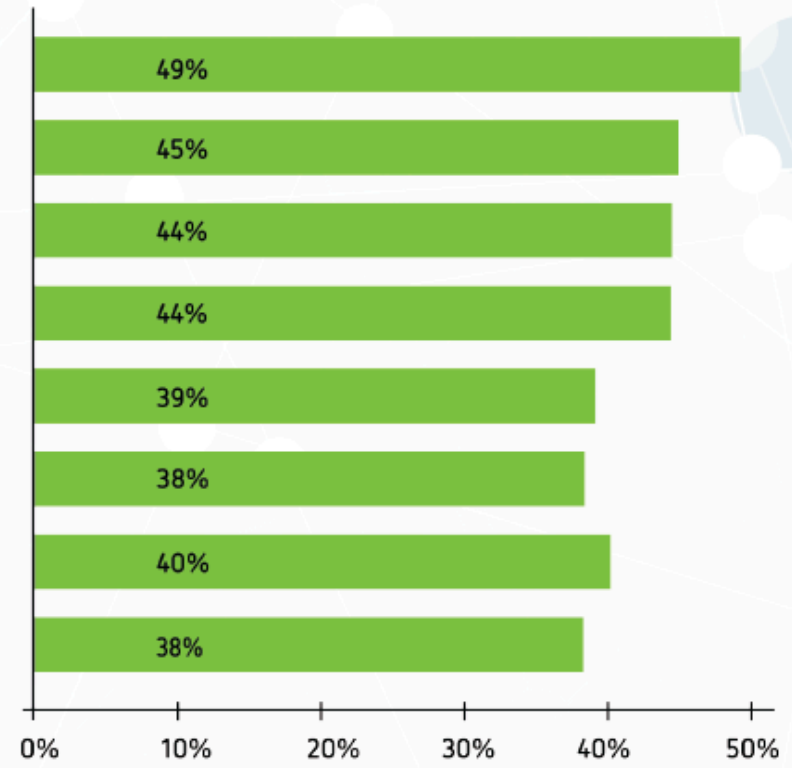
Unmet needs by department

Comparing the importance versus the satisfaction of self-service BI by department gives us a clear view of those most in need (marketing).
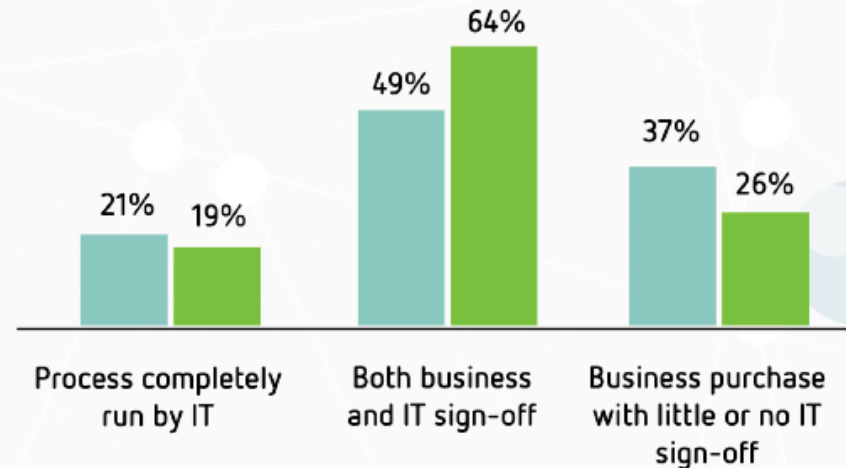
Role of data and BI (US vrs UK)
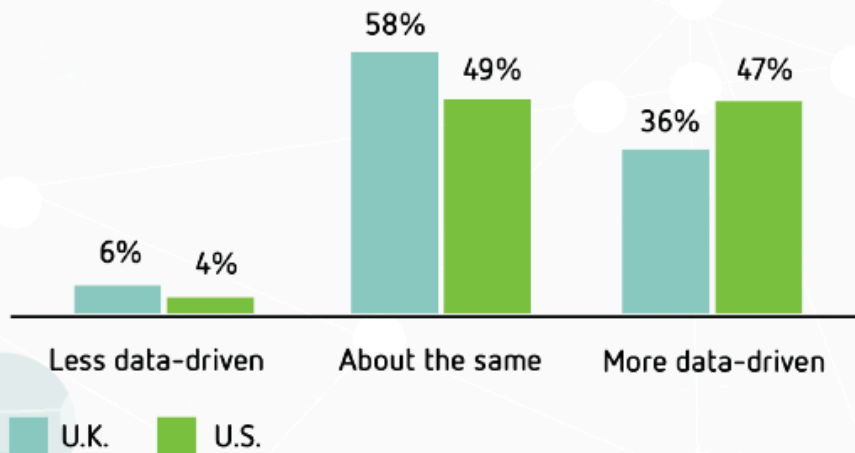
New trends in BI

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- **Real Time Analytics**
- Collaborative Business Analytics
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Additional features of SSBI: Real Time

- **Real**-**time business intelligence** (RTBI) is a concept describing the process of delivering **business intelligence** (BI) or information about **business** operations as they occur.
- **Real time** means near to zero latency and access to information whenever it is required (Wikidef).

Why is RT BI necessary?

- There are two main reasons that make real-time business intelligence a necessity (Azvine et al).:
  - Rapidly changing business environments:
    - Sales patterns change from place to place and from time to time.
    - Currency valuations shift and alter profit margins.
    - Suppliers change delivery schedules and their prices.
    - Customers become more educated and therefore more demanding.
  - Secondly, advances in technology, especially the Internet and modern ICT technologies, make real-time business intelligence seemingly achievable.

Where is real-time BI truly necessary?

- Real-time Analytics may be used with the following applications:
  - Algorithmic trading ,
  - **Fraud detection** ,
  - Systems monitoring ,
  - Application performance monitoring ,
  - Customer Relationship Management ,
  - Demand sensing ,
  - Dynamic pricing and yield management ,
  - Data validation ,
  - Operational intelligence and risk management ,
  - **Payments & cash monitoring** ,
  - Data security monitoring ,
  - Supply chain optimization ,
  - **RFID/sensor network data analysis** ,
  - Workstreaming ,
  - Call center optimization ,
  - Enterprise Mashups and Mashup Dashboards
  - **Transportation** industry.
- **Transportation industry** : leveraging real-time analytics for the railroad network management. Depending on the results provided by the real-time analytics, **dispatcher can make a decision on what kind of train he can dispatch on the track, depending on the train traffic and commodities shipped**.

What are the features of RTBI?

- **Event-based**:
  - RTBI may use Event Stream Processing to enable events to be analysed, without being first transformed and stored in a database.
  - For example, system can monitor sales (or product mentions on social, etc.) and trends, and detect bursty trends as they occur
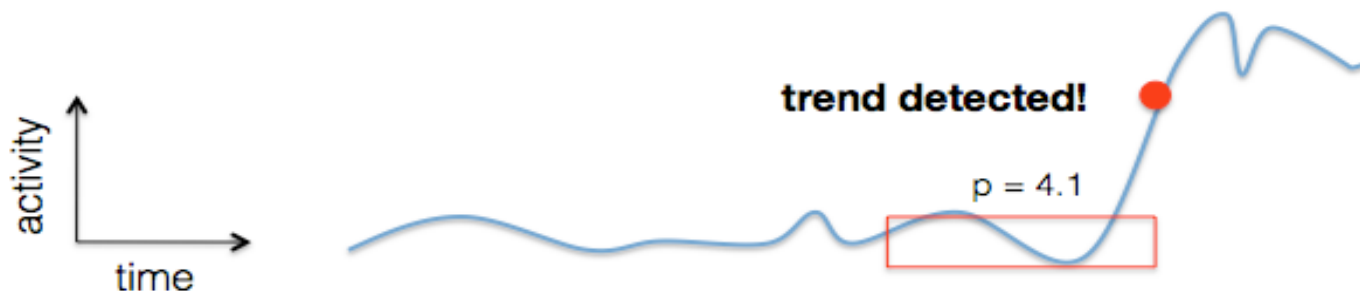
What are the features of RTBI?

- Data Warehouse:
  - An alternative approach to event driven architectures is to **increase the refresh cycle of an** existing data warehouse to update the data more frequently (in standard DW systems while operational data are in real time, DW is not).
  - These **real-time data warehouse** systems can achieve near real-time update of data, where the data latency typically is in the range from minutes to hours.

What are the features of RTBI?

- "Server-less" technology
  - [MSSO](#) Technology (Multiple Source Simple Output) removes the need for the data warehouse and intermediary servers altogether since it is **able to access live data directly from the source** (even from multiple, disparate sources).
  - Because live data is accessed directly by server-less means, it provides the potential for **zero-latency**, real-time data in the truest sense.

What are the features of RTBI?

- Business Activity Monitoring:
  - It allows entire processes (transactions, steps) to be monitored, metrics (latency, completion/failed ratios, etc.) to be viewed, compared with warehoused historic data, and trended in real-time.
  - **Advanced implementations allow** threshold detection, alerting and providing feedback to the process execution systems themselves, thereby 'closing the loop'.

New trends in BI

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Additional features of SSBI: Collaborative BI

- Collaborative BI (collaborative business intelligence) is the merging of business intelligence software with collaboration tools, including social and Web 2.0 technologies, to support improved data-driven decision making.

- Tools allow peers to analyze data and exchange information and ideas through Web 2.0 tools like blogs and wikis.

- Modern tools also support brainstorming through social networking-like features, which continue to gain popularity for both business and personal use.

A wiki (sometimes spelled "Wiki") is a server program that allows users to collaborate in forming the content of a Web site. The term comes from the word "wikiwiki," which means "fast" in the Hawaiian language.

Topic Tree

An example of wiki tool for project management

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What is collaboration?

- Collaboration **is working together to achieve a goal**
- It is a recursive process where two or more people or organizations work together to realize shared goals — this is more than the intersection of common goals, but a deep, collective, determination to reach an identical objective— by sharing knowledge, learning and building consensus
- Most collaborations require *leadership.* Teams that work collaboratively can obtain greater resources, recognition and reward when facing competition for finite resources

Collaborative BI

- Collaboration is seen today by companies as one of the major means for increasing flexibility and innovating so as to survive in today uncertain and changing market
- Companies need strategic information about the outer world, for instance about trading partners and related business areas
- Users need to access information **anywhere** it can be found, by locating it through a semantic process and performing integration on the fly
- This is particularly relevant in **inter-business collaborative contexts where companies organize and coordinate themselves to share opportunities**, respecting their own autonomy and heterogeneity but pursuing a common goal

Collaborative BI: challenges

- In a distributed business scenario, where multiple partner companies/organizations cooperate towards a common goal, traditional BI systems are no longer sufficient to maximize the effectiveness of decision making processes. Two main requirements arise:
  - **Cross-organization monitoring and decision making**: Accessing local information is no more enough, users need to transparently and uniformly access information scattered across several heterogeneous BI platforms
  - **Pervasive and personalized access to information**: Users require that information can be easily and timely accessed through devices with different computation and visualization capabilities, and with sophisticated andcustomizable presentations

Problems with collaborative BI

- most information systems were devised for **individual companies** and for operating on internal information, and **they give limited support** to intercompany cooperation

- traditional BI applications are aimed at serving **individual companies**, and they cannot operate over networks of companies characterized by an *organizational, lexical, and semantic heterogeneity*

- Need for specific approaches to collaborative BI!
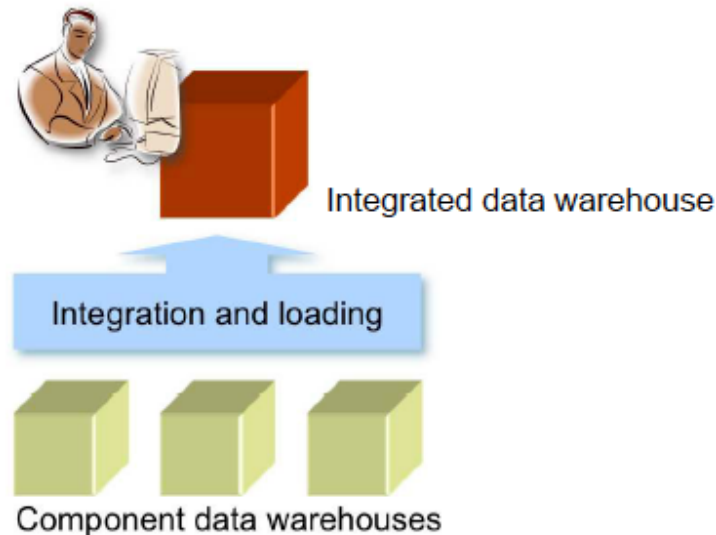
Approaches to Coll-BI (1)

Data warehouse integration is an enabling technique for collaborative BI; it provides a broader base for decision-support and knowledge discovery than each single data warehouse could offer

- Large corporations integrate their separately-developed departmental data warehouses
- Newly merged companies integrate their data warehouses into a **central** data warehouse
- Autonomous but related organizations join together their data warehouses to enforce the decision making process
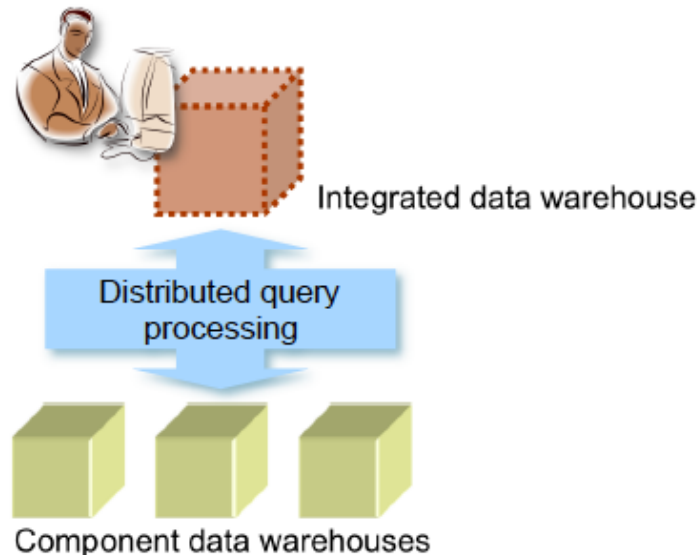
Approaches to Coll-BI (2)

Warehousing approaches:

- all components to be integrated share the same schema, or a global schema is given
- the integrated data are physically materialized

Integrated data warehouse

Integration and loading

Component data warehouses

Approaches to Coll-BI (3)

Federative approaches

- all components to be integrated share the same schema, or a global schema is given

- **integration is virtual (data are distributed)**

Integrated data warehouse

Distributed query processing

Component data warehouses

Approaches to Coll-BI (4)

P2P approaches

- they **do not rely on a global schema** to integrate the component data warehouses

- necessary in contexts where the different parties have a common interest in collaborating **while fully preserving their autonomy** and their view of business

- each peer can formulate queries also involving the other peers, typically based on a set of mappings that establish **semantic relationships between the peers' schemata**

Integrated data warehouse

Object fusion
Query reformulation

Component data warehouses
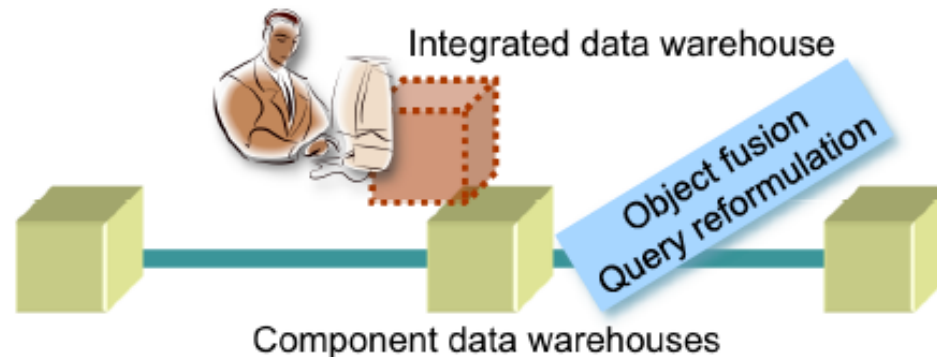
More recent solution: BI networks

Business Intelligence Network **(BIN):**

- an architecture for sharing BI functionalities across a dynamic and collaborative network of **heterogeneous and autonomous** peers

- Each peer is equipped with **an independent BI system**, that relies on a local multidimensional schema to represent the peer's view of the business and exposes **decision support functionalities** (basically, the FINDINGS of a BI engine) aimed at sharing business information

Gartner's Magic Quadrant for Business Intelligence and Analytics Platforms

Source: Gartner (February 2017)

Comparative Evaluation of best SSBI tools

- https://www.pcmag.com/article2/0,2817,2491954,00.asp
- https://www.softwareadvice.com/bi/self-service-tools-comparison/
- https://www.computerworlduk.com/galleries/applications/best-self-serve-analytics-software-for-enterprises-3635147/

Gartner predicts that by 2018, most business users and analysts in organizations will have access to self-service tools to prepare data for analysis: https://cdn2.hubspot.net/hubfs/2172371/Q1%202017%20Gartner.pdf?t=149626062

What's next?

- Many features of SSBI are already in place in many systems

- But what's next?

- Gartner foresees a number of additional features

What's next? Data management

1. Metadata Management. Tools for enabling users to leverage a **common semantic model and metadata**.
   1. Robust and centralized way for administrators to search, capture, store, reuse and publish metadata objects such as dimensions, hierarchies, measures, performance metrics/key performance indicators (KPIs), and report layout objects, parameters and so on.
   2. Administrators should have the ability to promote a business-user defined data mashup (=integration).
2. Self-Contained Extraction, Transformation and Loading (ETL) and Data Storage. Platform capabilities for accessing, integrating, transforming and loading data into a self-contained engine, with the ability to index data and manage data loads and refresh scheduling.
3. Self-Service Data Preparation. "Drag and drop" user-driven data combination of different sources, and the creation of analytic models such as user-defined measures, sets, groups and hierarchies. Advanced capabilities include machine-learning-enabled semantic auto-discovery, intelligent joins, intelligent profiling, hierarchy generation, data analytics on varied data sources, including multi-structured data.

What's next? Analysis and Content Creation (1)

- **Embedded Advanced Analytics**. Enables business users to easily access advanced analytics capabilities that are self-contained within the platform itself or through the import and integration of externally developed models (e.g. embedded clustering capability with simple adaptation steps, etc.)

- **Analytic Dashboards**. The ability to create highly interactive dashboards and content with visual exploration and embedded advanced and geospatial analytics.

What's next? Analysis and Content Creation (2)

- **Interactive Visual Exploration**. Enables the exploration of data via an array of **visualization options** that go beyond those of basic pie, bar and line charts to include heat and tree maps, geographic maps, scatter plots and other special-purpose visuals.

- **Smart Data Discovery**: Automatically finds, visualizes and narrates important findings such as correlations, exceptions, clusters, links and predictions in data that are relevant to users without requiring them to build models or write algorithms. Users explore data via visualizations, natural-language-generated narration, search and NLQ(uery) technologies.

- **Mobile Exploration and Authoring**. Enables organizations to develop and **deliver content to mobile devices** in a publishing and/or interactive mode, and takes advantage of mobile devices' native capabilities, such as touchscreen, camera and location awareness.

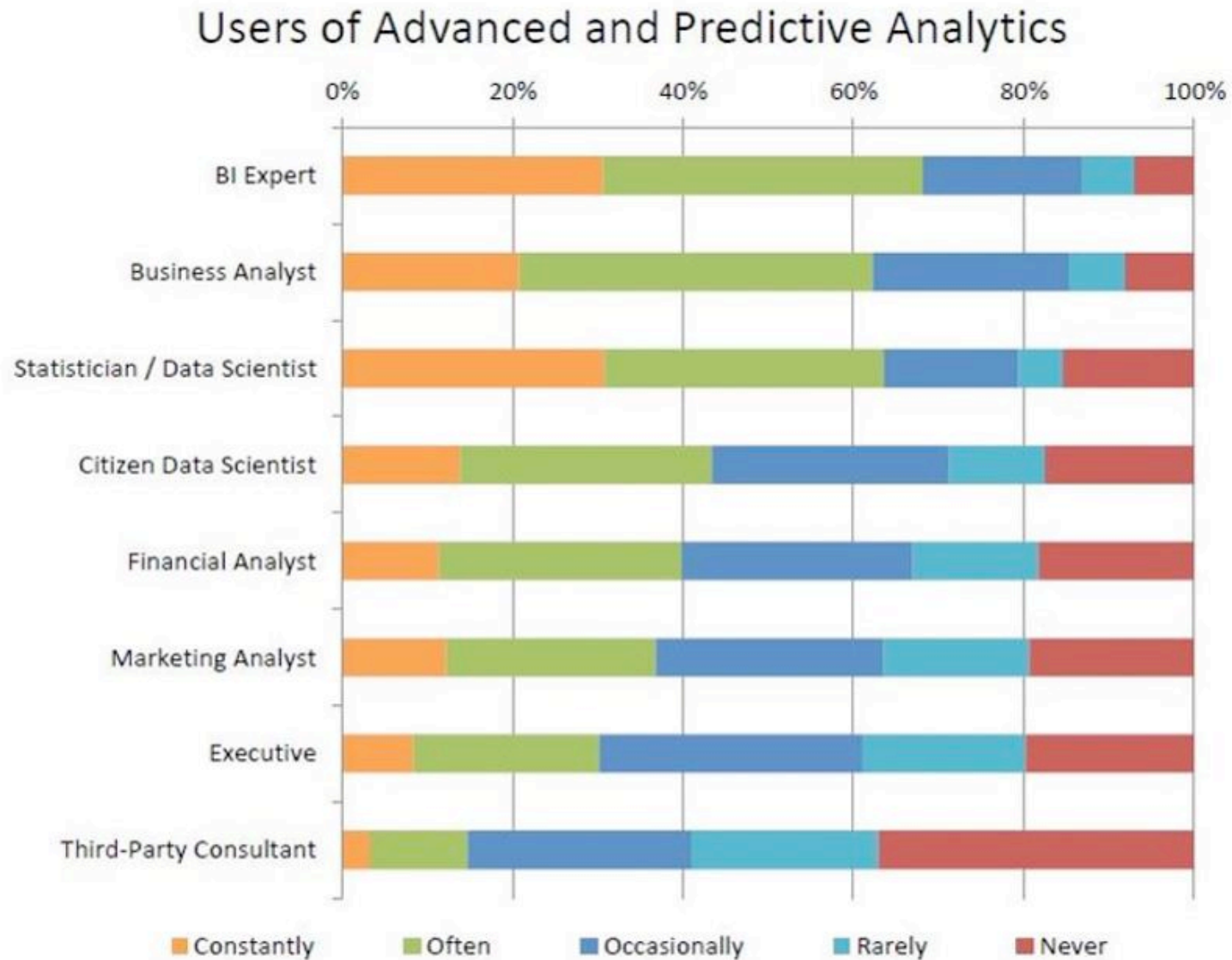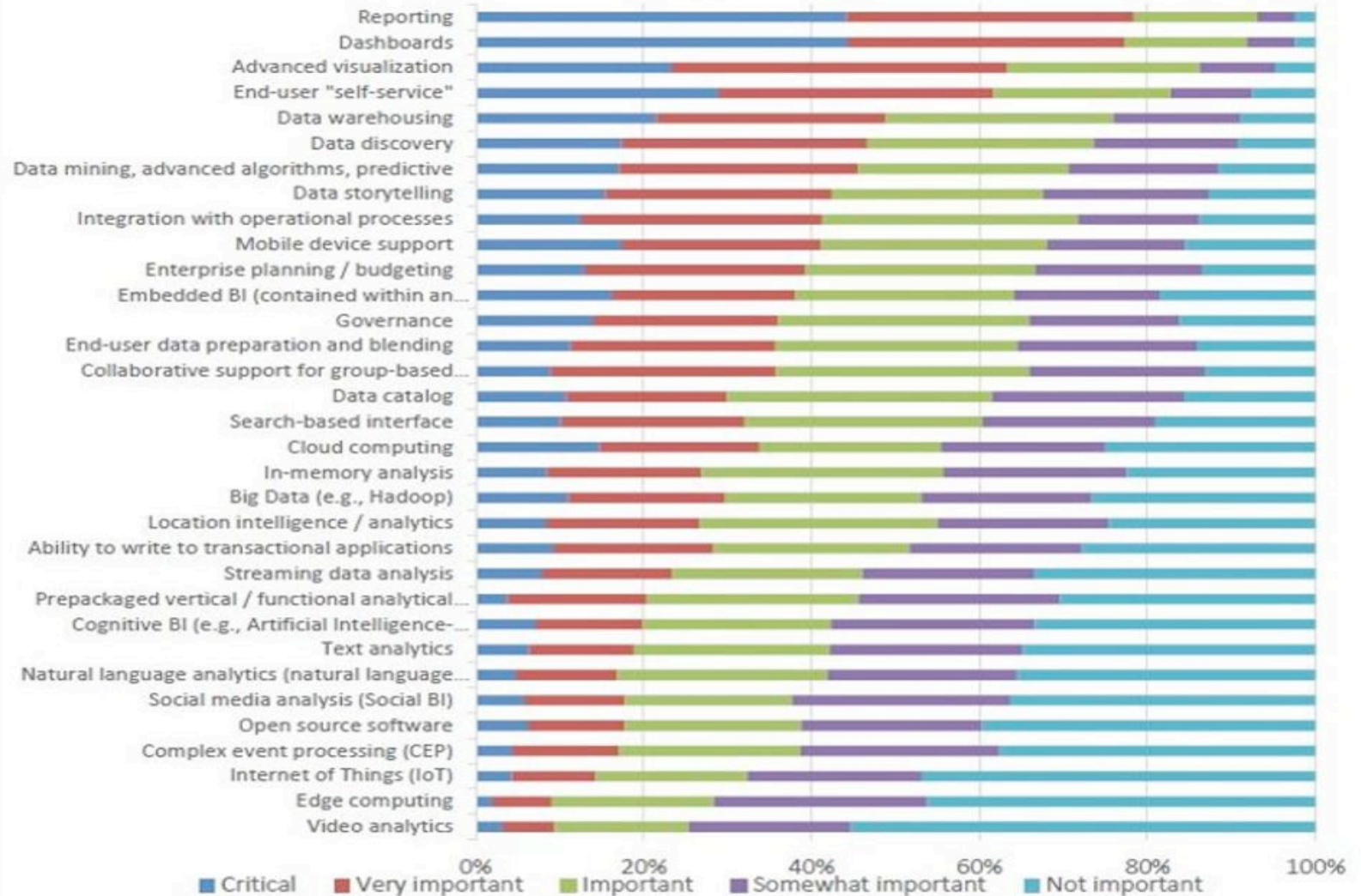# 2017 State Of Business Intelligence And Predictive Analytics

Figure 8 – Users of advanced and predictive analytics

2017 State Of Business Intelligence And Predictive Analytics

Technologies and Initiatives Strategic to Business Intelligence

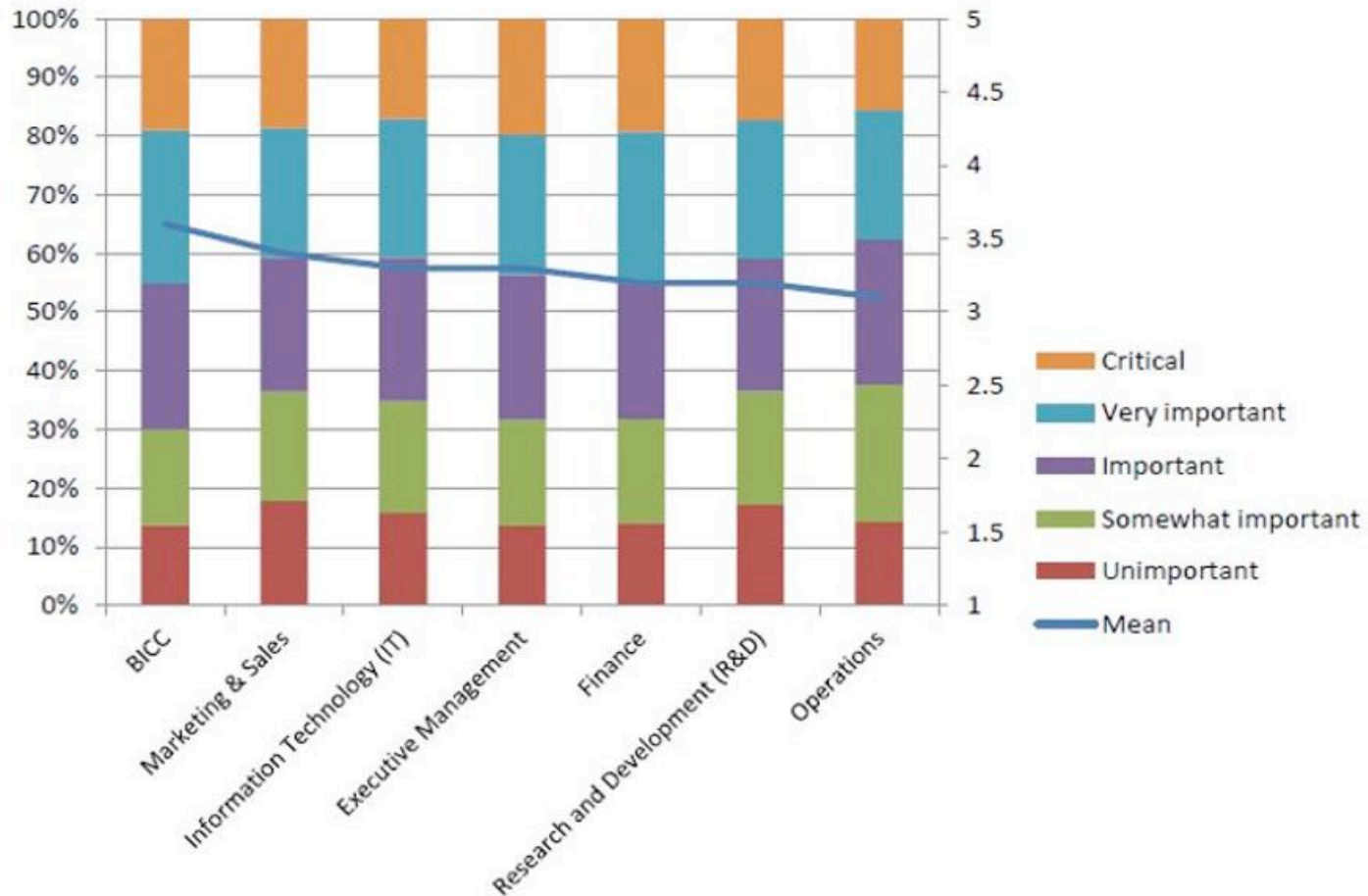# 2017 State Of Business Intelligence And Predictive Analytics

Figure 19 – Importance of advanced and predictive analytics by function

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