Big Data & AI for Industry 4.0 – Feedback and Lesson Learned

COGNITUS
The builder of next generation experts

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The Journey Today

Cognitus – In a Nutshell

COGNITUS
The builder of next generation experts

Cognitus is a research-driven innovative solution and service provider headquartered in Paris.

It was founded by a group of computer scientists and industry experts.

Cognitus has a vibrant development team of experienced and young data scientists, Big Data architect, solution architect, developers etc..

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Cognitus is a Young Innovative Enterprises affiliated by the ministry of research and innovation in France.

The core activities of Cognitus include research, solution development, training and consulting.

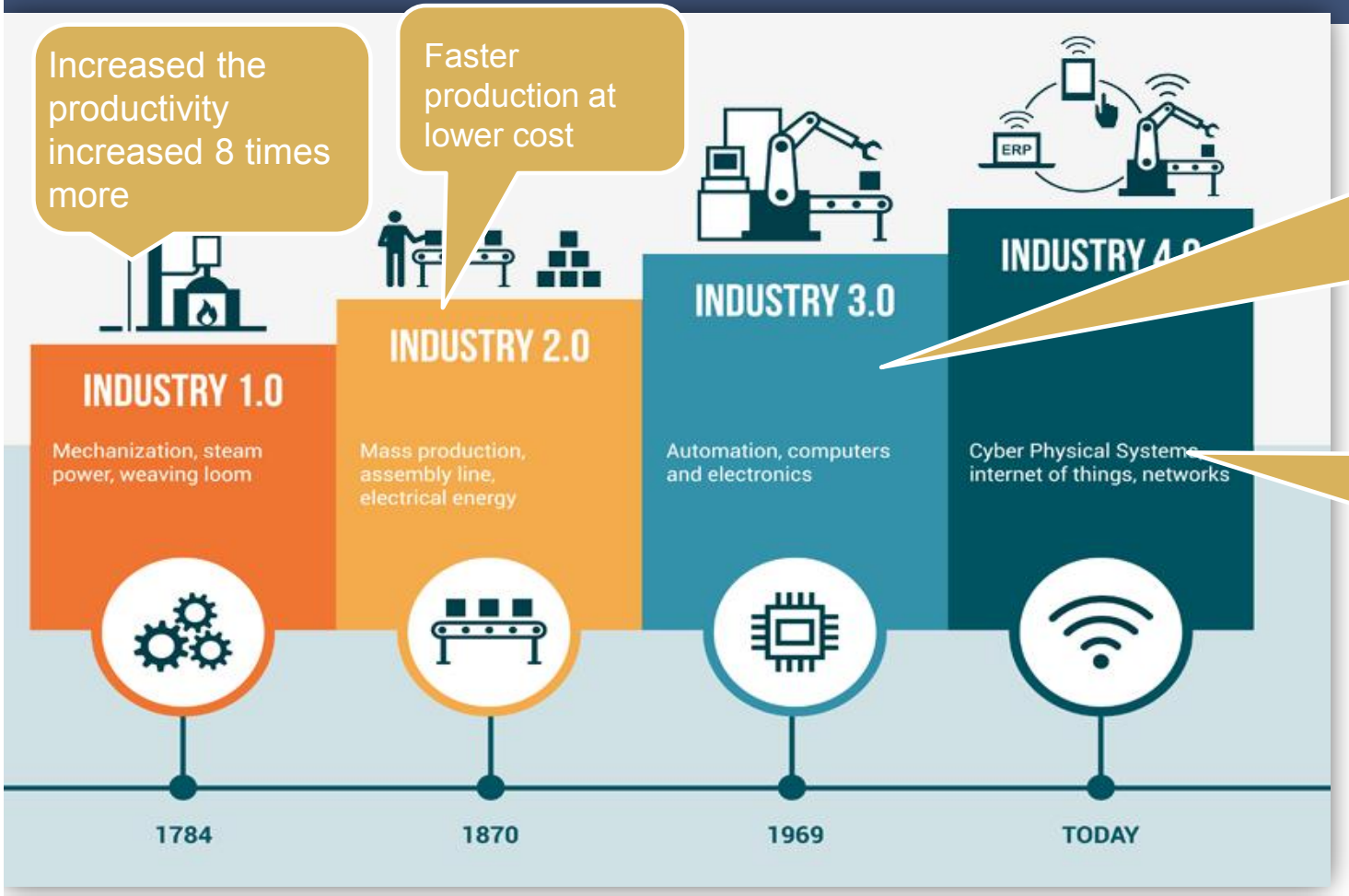
Cognitus has a specialist data science problem solving team consisting of scientists from top quality universities within Europe and North America.

1

Outlook of Industry 4.0

How Industry 4.0 Looks Like Today?

Outlook of Industry 4.0



Automate an entire **production process** - without human assistance. E.g., **robots** that perform programmed sequences without human intervention

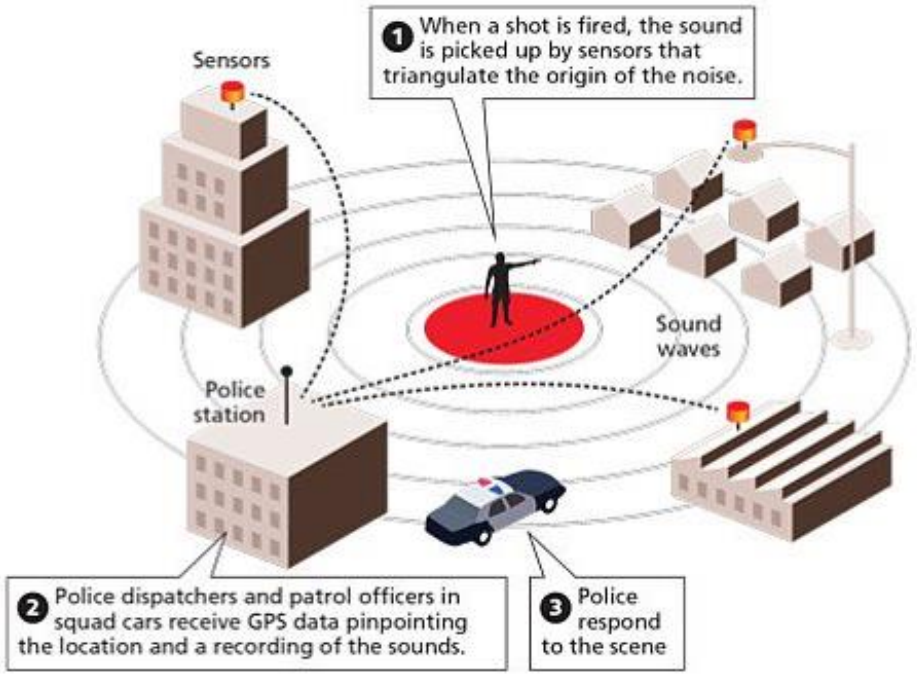
Production systems, **components** and **people** communicate via a **network** and **production is nearly autonomous**

Outlook of Industry 4.0

Marty, as it's called, is a tall robotic assistant that will be introduced to Giant Food Stores, a supermarket chain which operates in Pennsylvania, Maryland, Virginia and West Virginia.

Retail 4.0 will change the shopping experience entirely. T System is pioneering smart ecosystem for retail sector.

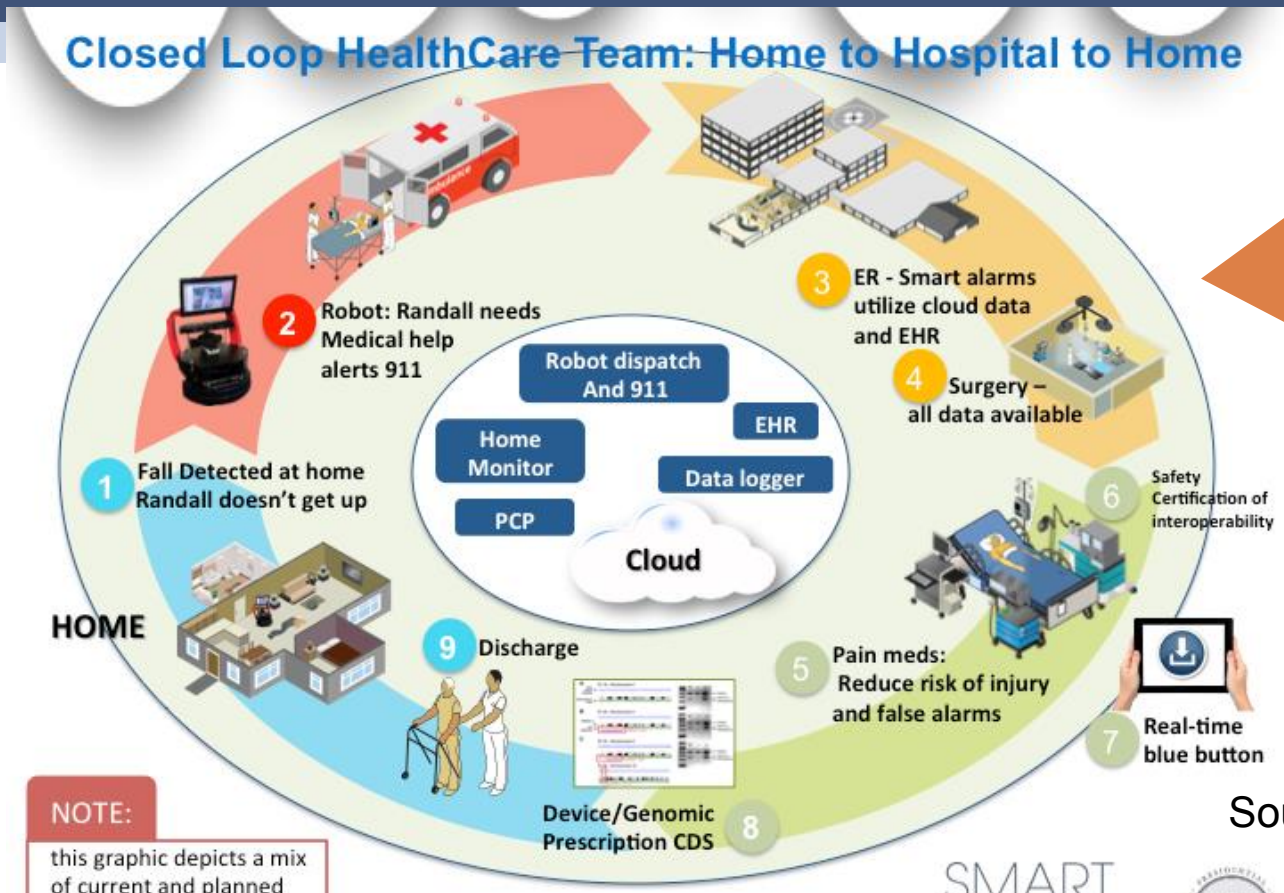
Outlook of Industry 4.0



Police 4.0: Smart technologies are changing investigation landscape.

New York Police Department, China, and Dubai Police implemented Police 4.0 Ecosystem.

Outlook of Industry 4.0



Healthcare 4.0:

SMART America is a research project aimed at building a connected ecosystem for healthcare services. The project consortium included the big players including NIST, Intel, Harvard University etc.

Source: SMART America

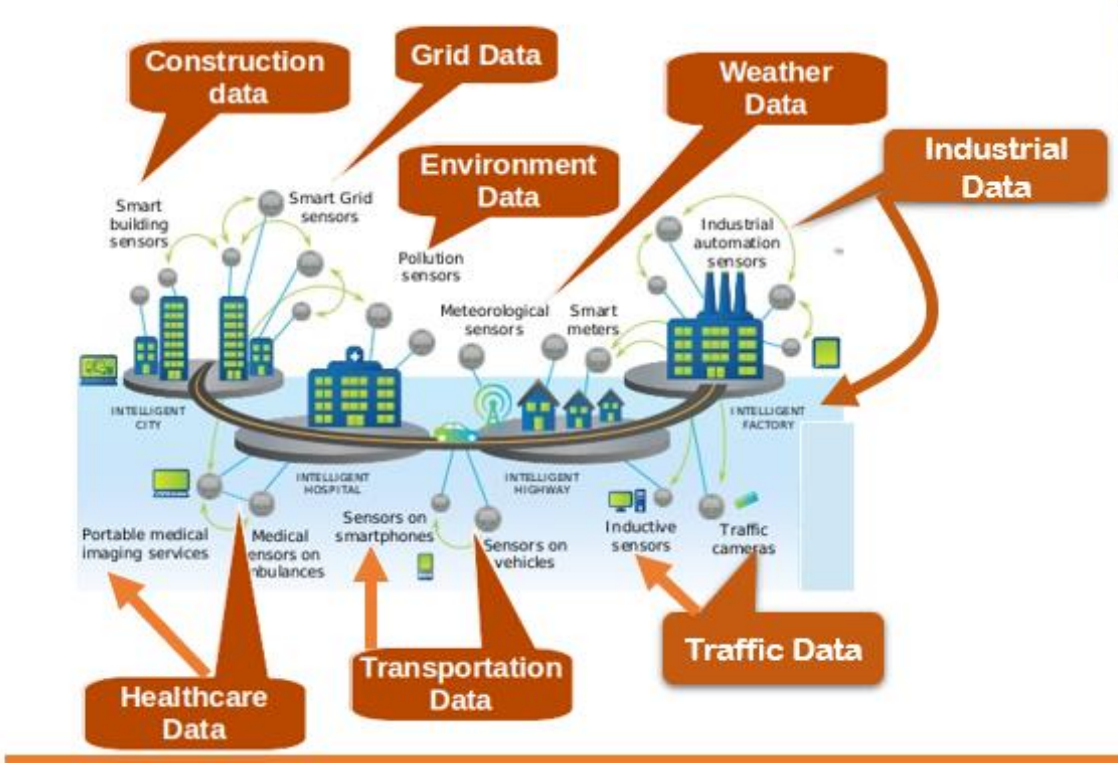
Outlook of Industry 4.0

Telecom 4.0:

Telecom industry has survived disruption including Industry 4.0 have pioneered many of the technologies and high connectivity (e.g., 5G), AI Chatbot) at its core, making innovation possible,

Outlook of Industry 4.0

- Internet of Things is leading to a massively connected smart urban life.



Outlook of Industry 4.0

Industry 4.0 is transforming the digital ecosystem of manufacturing industry which practically gave rise to the notion of Industry 4.0.

2

What is the Core of Industry 4.0

Foundation of Smart Ecosystem

The Core of Industry 4.0

This would include a wide range of physical devices include smart sensors, wearables, 3D printer, cloud-based infrastructure and storage services and many more

Virtual and Physical Devices

Cyber Physical System

Cyber-physical systems essentially enable the industries to make industrial systems capable to communicate and network them

Devices generate massive scale data which are analyzed to extract intelligence by using artificial intelligence techniques including the capability of AR and VR.

Big Data, Analytics, Artificial Intelligence

Interfaces and other software

Industry 4.0 ecosystem includes a wide variety of interfaces to facilitate interaction between human-machine, machine-to-machine; it also includes many other software

Autonomous

- Self-configuration
- Self-healing
- Self-awareness
- Self-optimization

The Core of Industry 4.0

Industry 4.0 framework and contributing digital technologies

Source: Industry 4.0: Building the digital enterprise, 2016 Global Industry 4.0 Survey, PwC, Engineering & Construction, 2016

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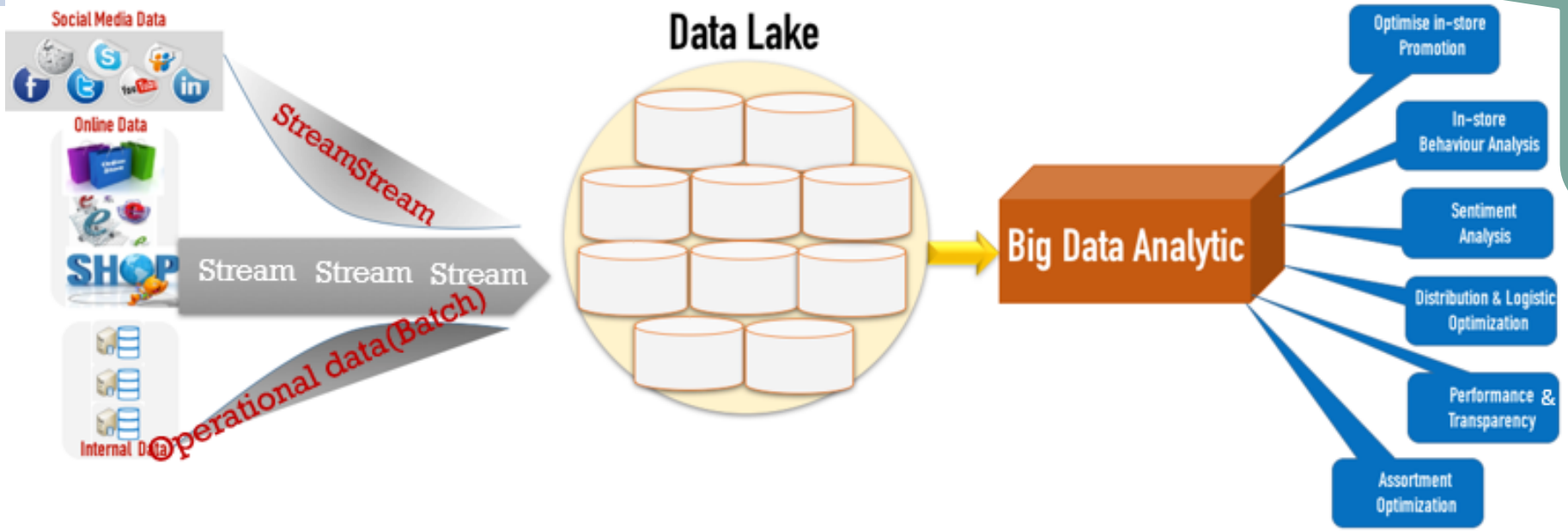
The Power of Data and Analytics for Industries

Data keeps intelligence inside

The Power of Data and Analytics

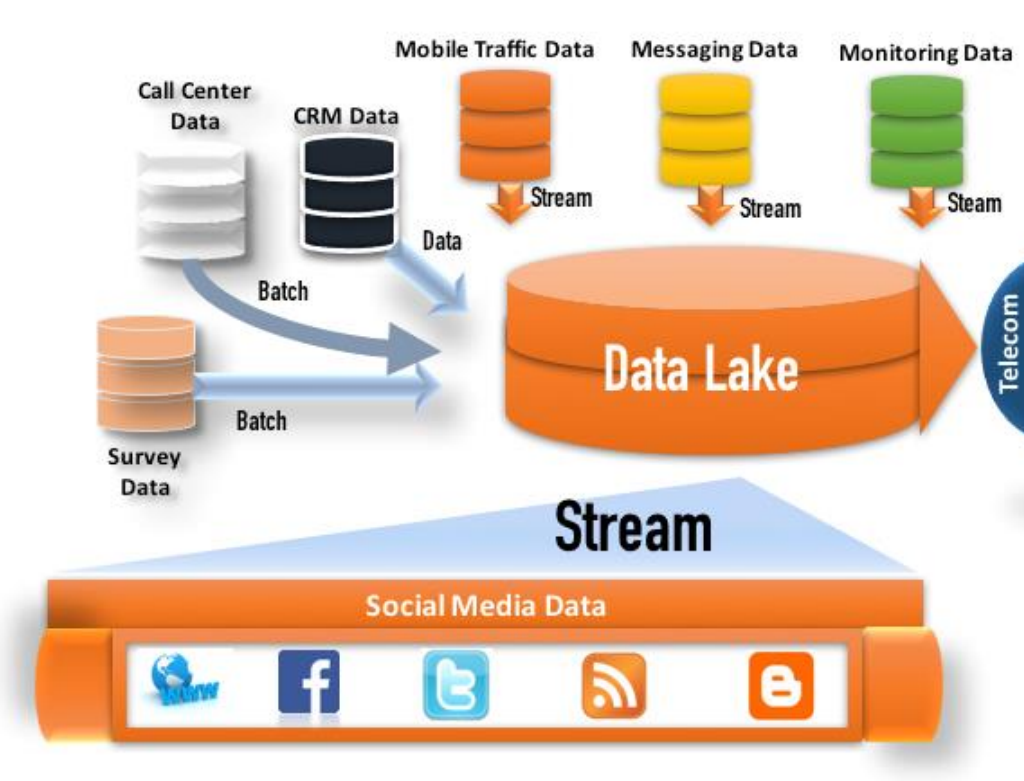


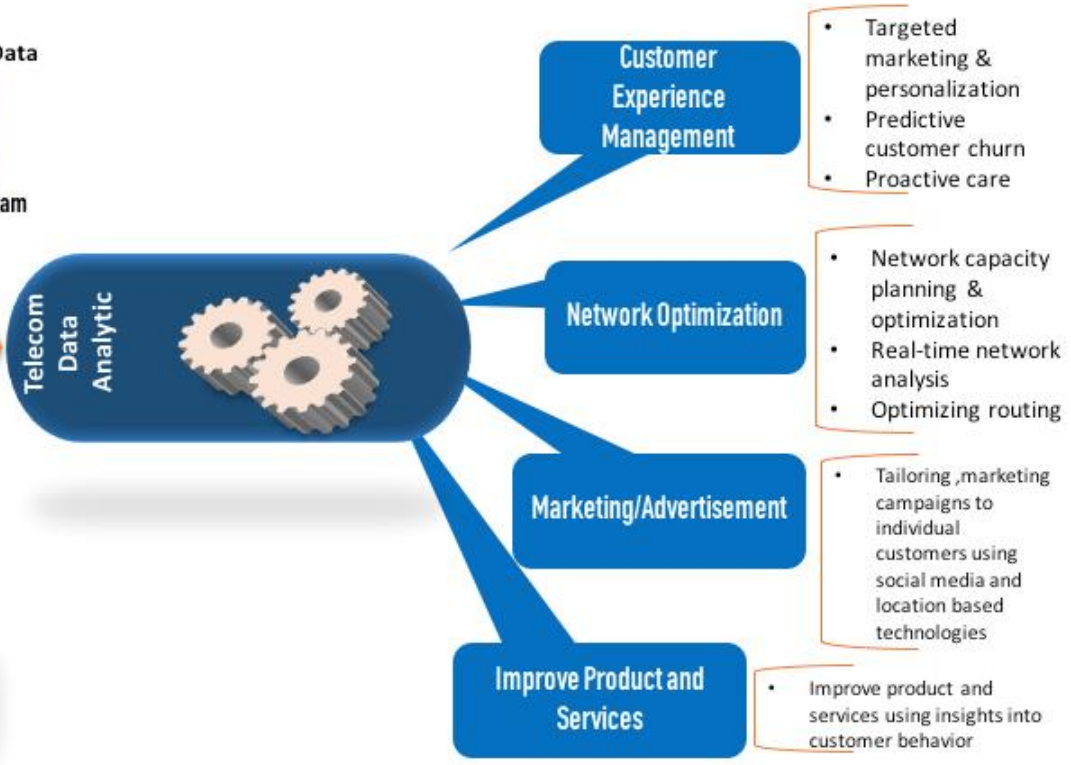
Analytics gives immense power to improve products, services, and insight of customers

The promotional offers can be optimized using Big Data Analytics.	Customer buying behavior in stores can be analyzed efficiently	Customer opinion are analyzed to extract their sentiments on products.	Distribution network could be optimized. Logistics route is optimized.	The overall performance of retail business is improved. Supply chain transparency can be managed better.	The strategies for packaging products to assort are optimized by analyzing demand

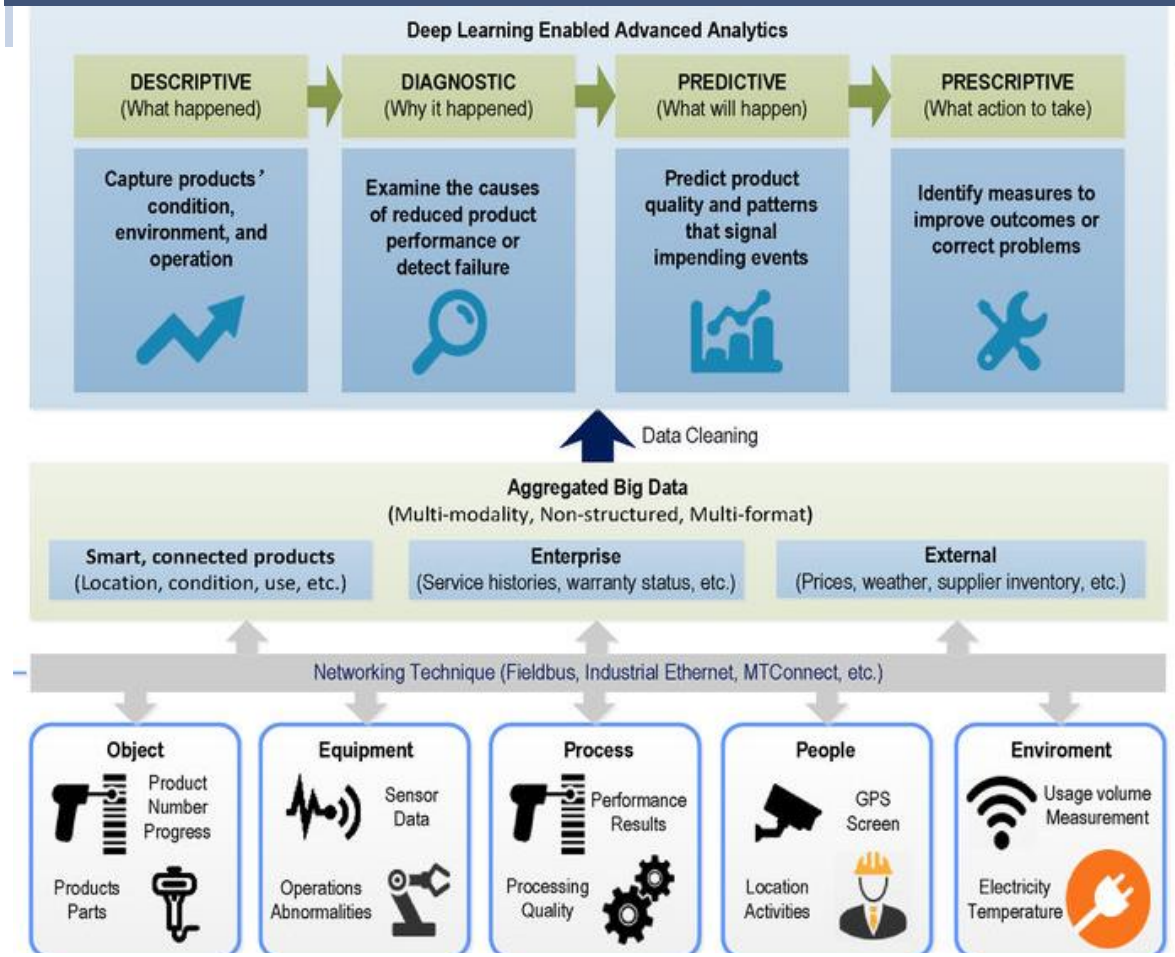
The Power of Data and Analytics

Data and analytics powered by AI is enabling telecom service providers to extracting critical knowledge





The Power of Data and Analytics



Predictive Maintenance

When operational data is analyzed with a pattern recognition method, upcoming failures and need for maintenance can be predicted well in advance.

Demand Forecasting

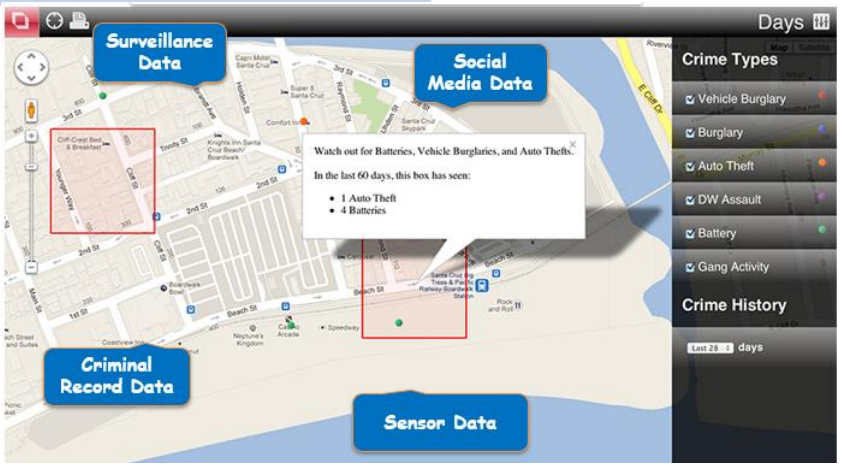
Advanced analytics can effectively identify recurring trends and anomalies in that data and align this with customer sentiment data to gain a clearer picture of future demand.

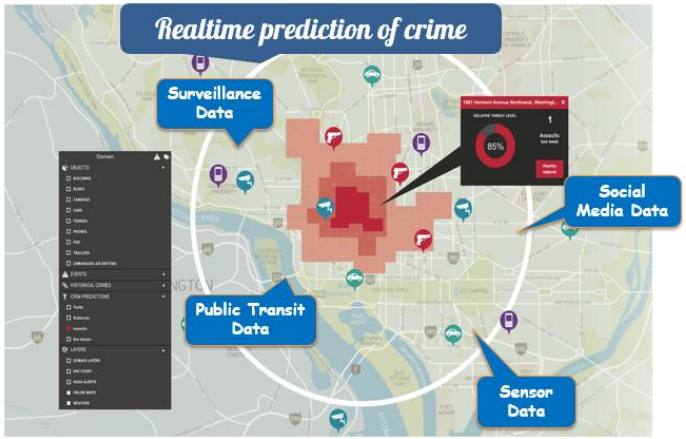
Asset Optimization

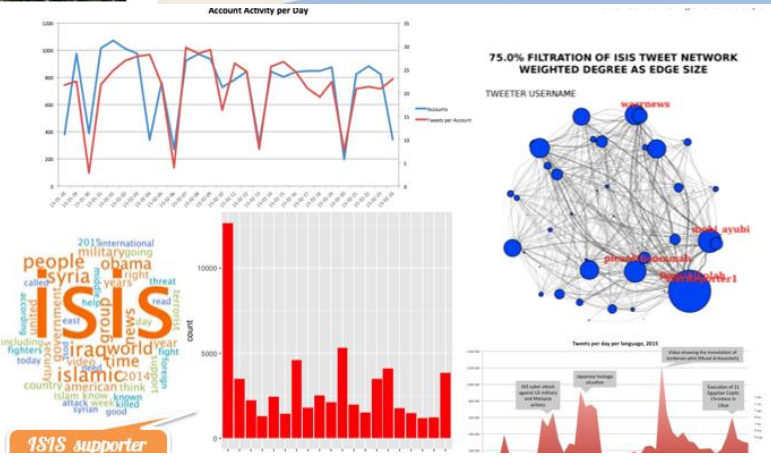
A big data analytics platform can minimize downtime by automating the data mining and data analysis from IoT sensors within the machine and can even automate its operations.

Source: Jinjiang Wang

The Power of Data and Analytics







Big data analytics powered by AI gives criminal investigators an ability to identify suspects, predict crime, realtime alert ..

The Power of Data and Analytics

City Traffic analytics

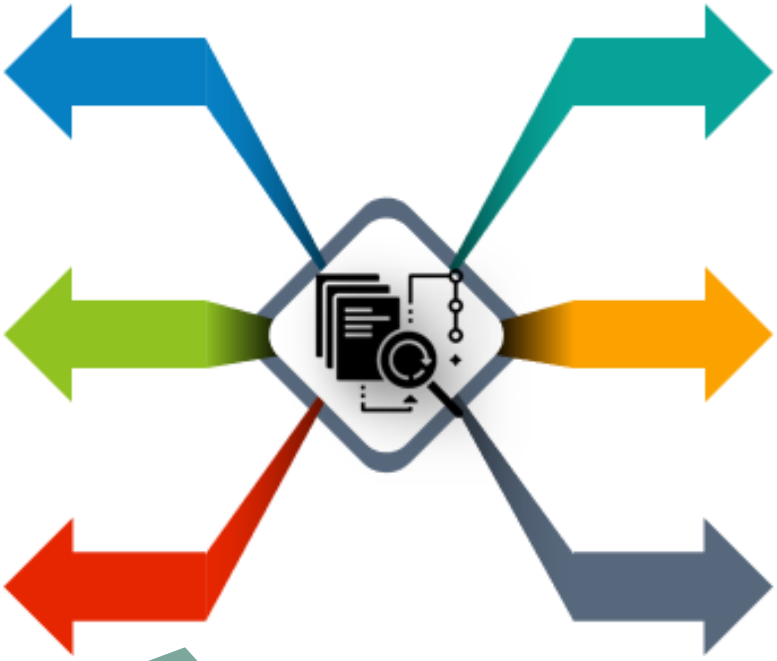
Through the analysis of data collected from transport authorities, you can study the patterns that will result in decreased traffic congestion and help transport authorities come up with intelligent ways to manage and monitor transport within the city.

Urban Planning

The effective use of data can help in identifying areas that need improvement and upgrading.

Budgeting and Spending

Using big data analytics, data collected in a smart city can suggest the majorly impacted areas and what type of upgrades are needed. Through proper analysis, investments can be made accordingly in the required fields.



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Future Proofing

- Data collected from various sources can be utilized to provide a sustainable environment with higher energy efficiency and less wastage of resources.
- Through predictive analysis, it's possible to analyze the growth of current infrastructure and plan for future needs of the city

Public Security

Predictive analysis can be of help to study historical and geographical data to recognize when and where crimes are likely to happen. A significant amount of improvement will be seen when the desired data turns a city into a much safer place.

Quality of Life

With better efficient work, services and living models, smart cities will have better Quality of life. The result of location and living/work spaces, more transportation for better and faster services and enough availability of information to make decision.

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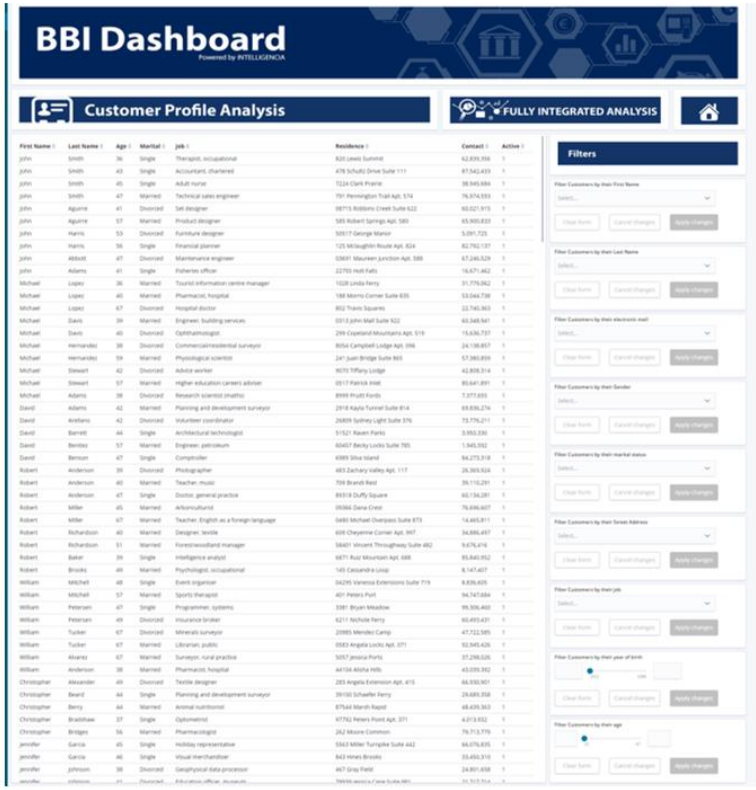
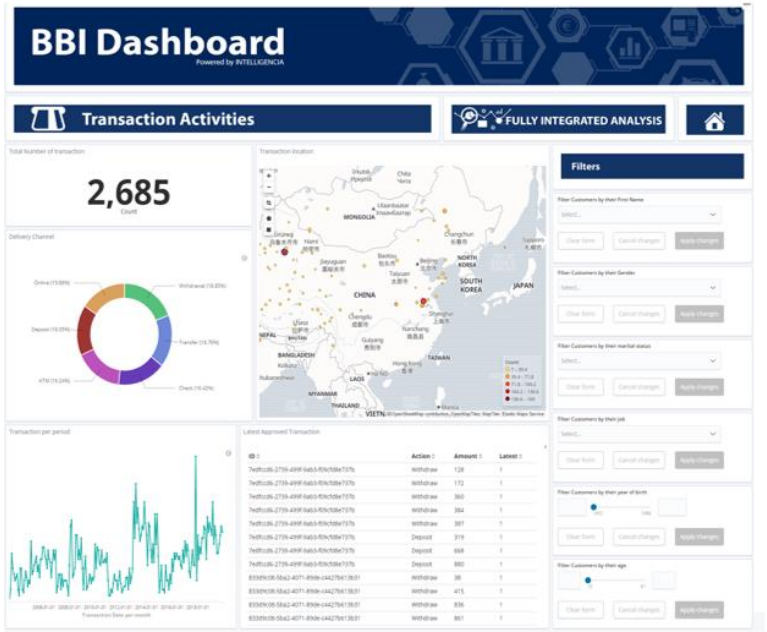
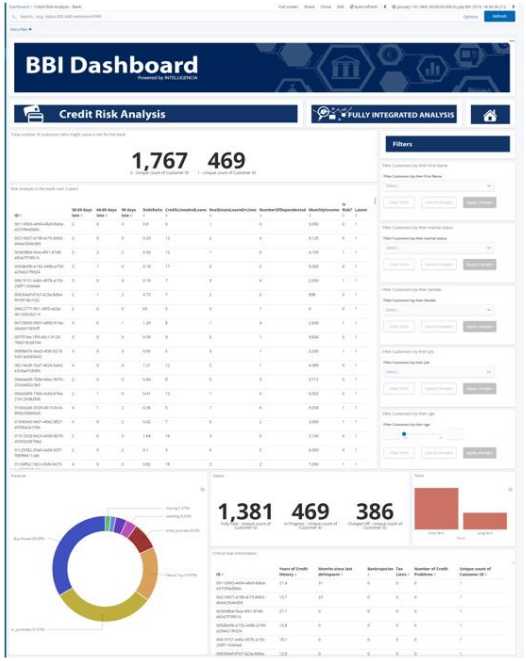
Some of our key projects

Extract value from your data

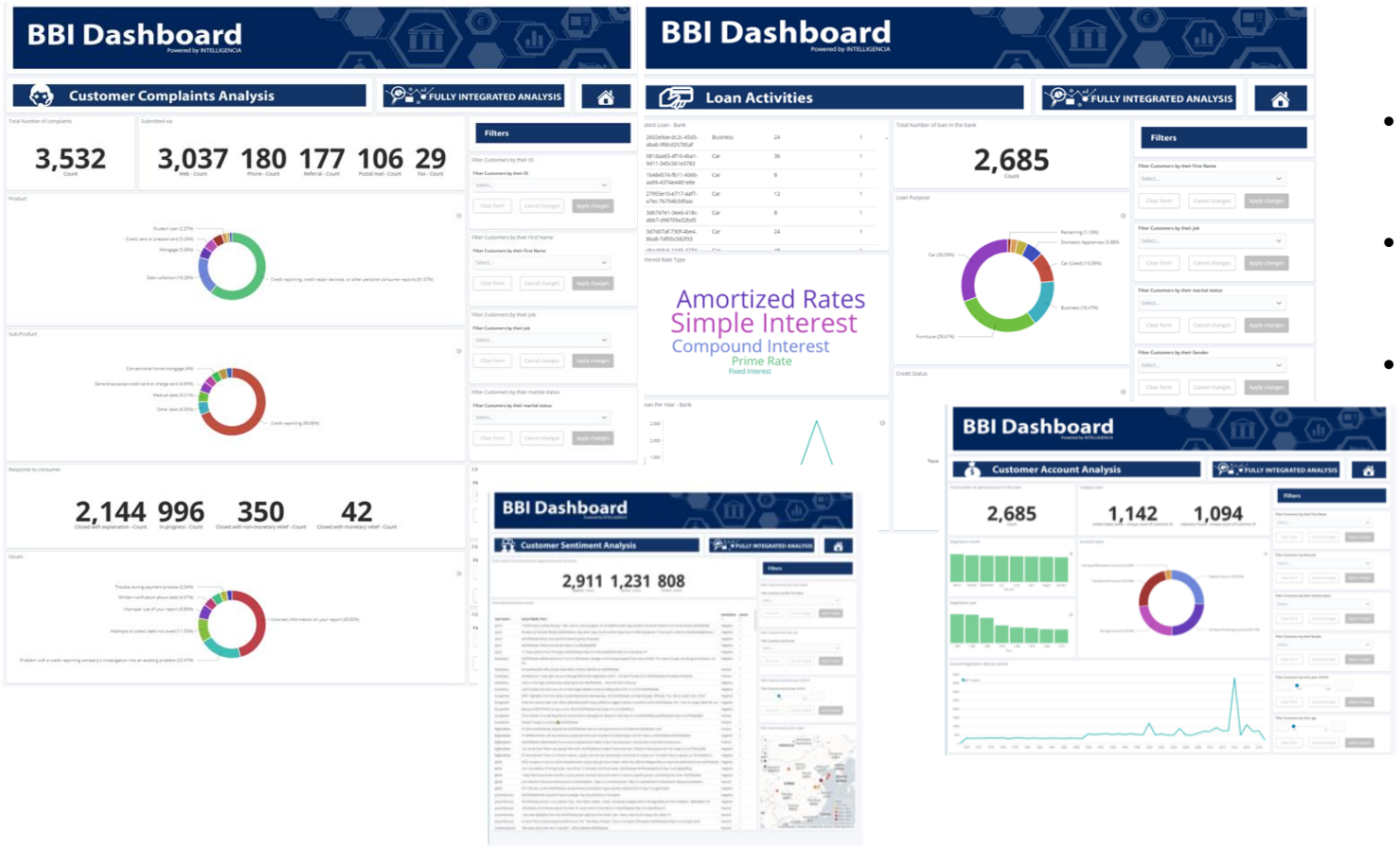
Customer 360 Analytics





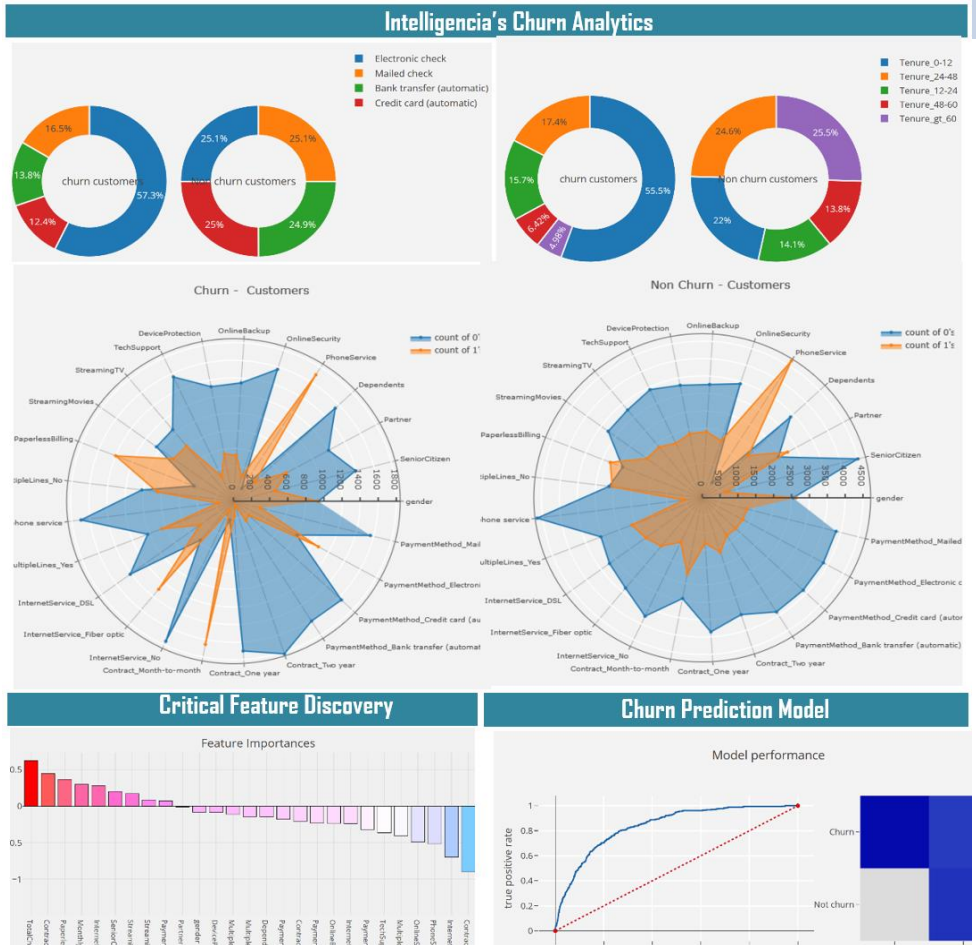


Customer 360 Analytics



- **Deep Integration of Data**: The Data Integrator combines and enriches data about the customer from social channels, customer feedback, customer service centers, and others.
- **Deep and Wide Analysis Customer Behavior:** Hawk-I provides and predicts customers buying or consumption behavior.
- **Customer Interaction:** Hawk-I visualizes customers interactions through different channels.
- **Customer preference through market-basket analysis:** Hawk-I extracts customer preference between products and services, a pair of products, a pair of services, etc.

Customer Churn Analytics



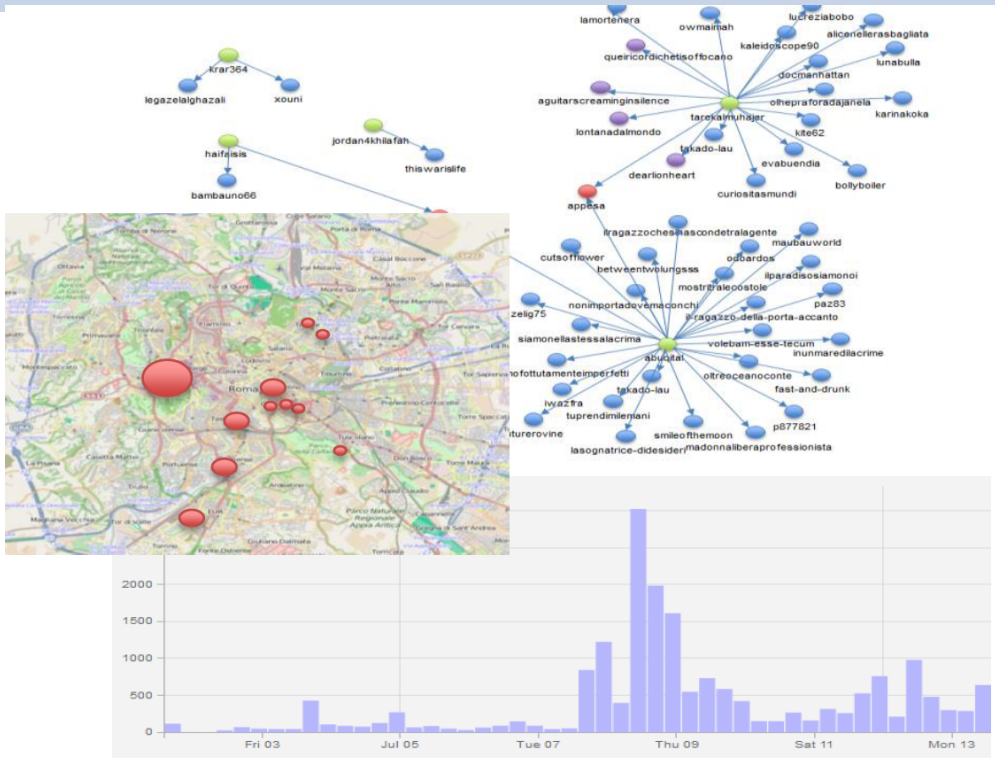
- **Data Manipulation**: Manipulates data such as dealing with missing values, transformation, separating numerical and non-numerical values, and separating churn and non-churn users.
- **Data Preprocessing**: Enables pre-processing data such as level encoding, scaling numerical data, merging scaled values for numerical data, duplicating columns, etc.
- **Data Preparation**: Enables performing data preparation tasks such as dimensionality reduction.
- **Exploratory Analysis**: Enables users to explore data such as variable (e.g., senior citizen, dependent, partner, phone service, internet service) distribution and discovering correlation matrix.
- **Churn Prediction**: Discover the essential features of products, services, and customers and identify all potential churn.

Customer Journey Analytics

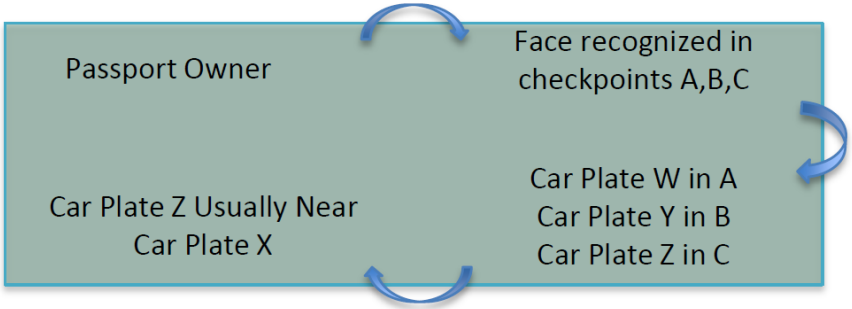
- **Powerful Data Processing Engine**: The data processing engine can aggregate, cleanse, wrangle structured and unstructured data.
- **Statistical Scoring Model**: The analytics visualizes a percentage of customers using specific touchpoints/channels.
- **Customer Segmentation**: It can segment customers over the usage of touchpoints.
- **Causal Model**: It enables users to perform causal analysis precisely why a customer uses a touchpoint.
- **Comprehensive Visualization**: A powerful visualization engine is integrated to communicate with results comprehensively.
- **Scalable**: It is a highly scalable solution and hence can accommodate and analyze any volume of data.
- **Customizable**: It can be customized based on customer requirements and also based on target application domains such as Banking and Telecommunication.

Deep Link Analytics

Powerful correlation analysis



- Geographic relations
- Time based relations
- Relations among different objects (Vehicles>Owners>Faces)
- Geographic Anomalies
- Time Anomalies



Criminal Intelligence 4.0

Smart Glass: Facial-recognition glasses that can identify suspects within milliseconds.

Real-time license number and plate detection: It can detect the license place and recognize the license number.

Real-time hazardous object detection: It can identify person for access to a building, detect a weapon as it's being wielded

Criminal Intelligence 4.0

Easier

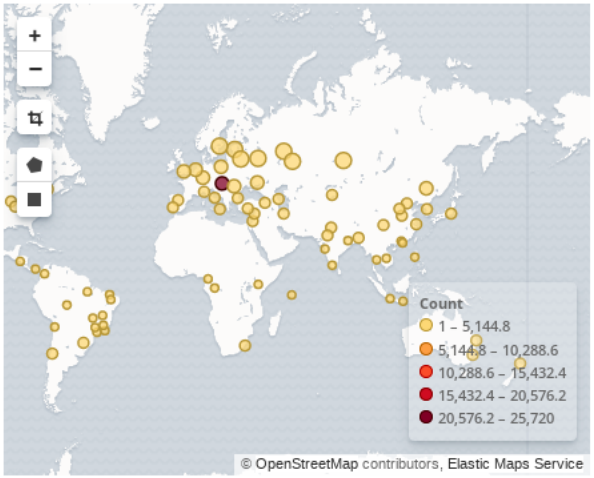
Thermal Camera

Goal

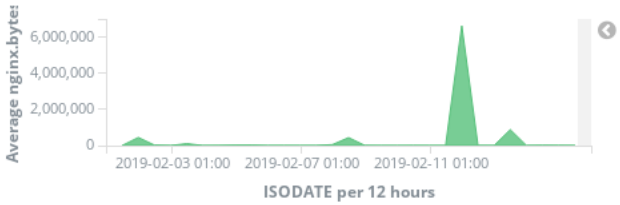
Challenging

WebServer Log Analysis

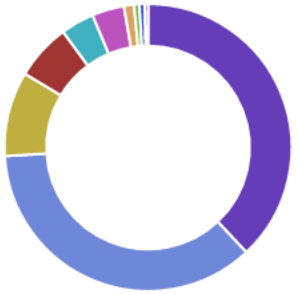
NGINX Client IP Map



NGINX Average bytes



NGINX TOP 10 Response codes



NGINX Top5 Agents

List of Agents	Count
Mozilla/5.0 (Macintosh; Intel Mac OS X 10.14; rv:65.0) Gecko/20100101 Firefox/65.0	13,791
Mozilla/5.0 (Linux) mirall/2.3.3 (Nextcloud)	13,166

NGINX Top5 404 resp. / IP

Client IP	404s
172.20.0.1	497
111.231[redacted]	356
123.207.[redacted]	356
47.98[redacted]	355
106.13[redacted]	355

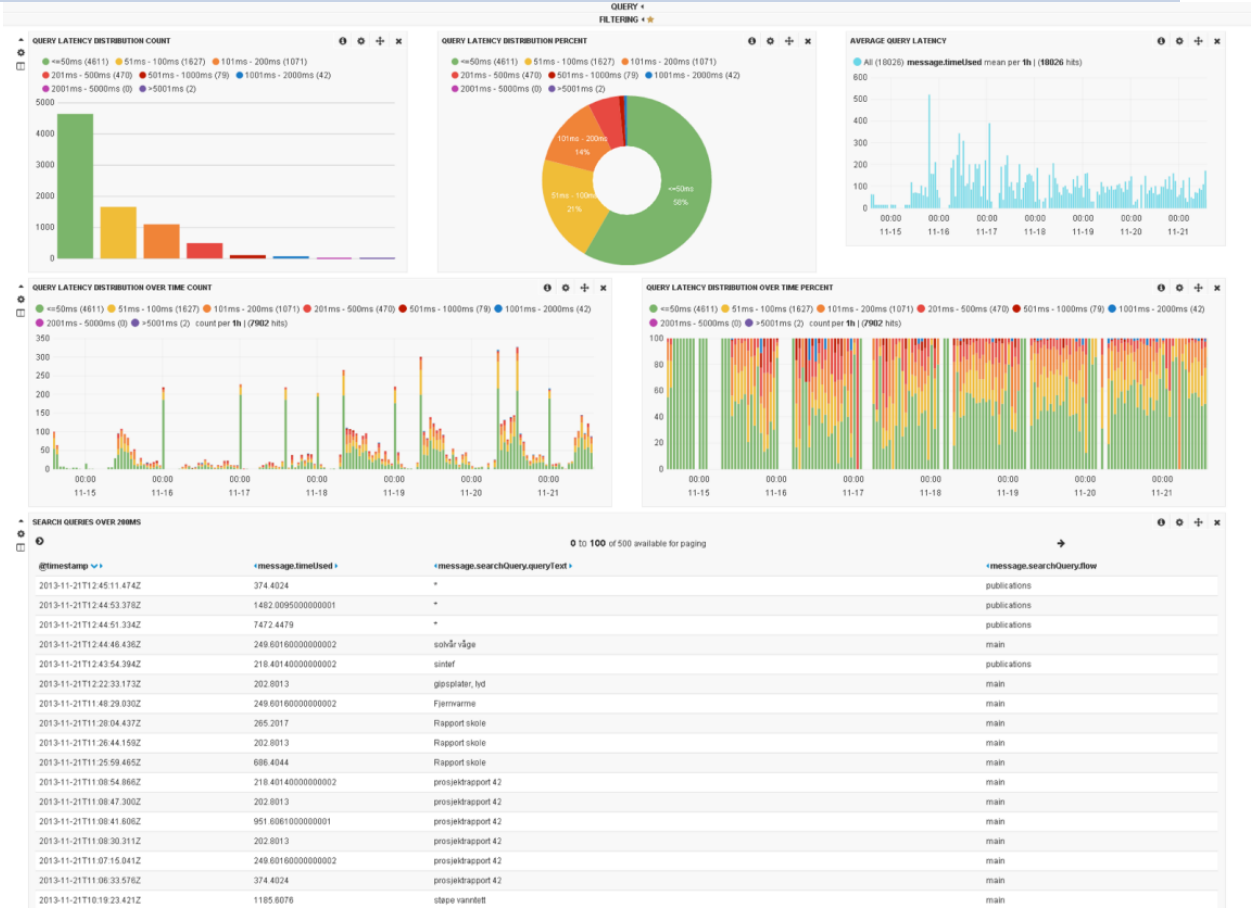
NGINX Top10 HTTP user

Username	Count
Missing	43,238
-	19,611
[redacted]	16,644
[redacted]	7,960
[redacted]	4,772
[redacted]	2,699

NGINX Top5 Requested URLs

Requested URLs	Count
/oc/remote.php/dav/files/[redacted]	7,012
/oc/ocs/v2.php/apps/notifications/api/v2/notifications	5,959
/oc/remote.php/dav/files/[redacted]	4,603
/oc/remote.php/dav/files/[redacted]	4,161
/oc/remote.php/dav/files/[redacted]	2,389

Query Log Analysis



4

The Reality About Big Data & AI Projects

Let's Face It

The Reality About Big Data Projects

- **The Reality About Big Data Analytics Projects**
  - **July 2019**: VentureBeat AI reports 87% of data science projects never make it into production
  - **Jan 2019**: NewVantage survey reports 77% of businesses report that "business adoption" of big data and AI initiatives continues to represent a big challenge for business. That means 3/4 of the software being built is apparently collecting dust. Ouch.
  - **Jan 2019**: Gartner says 80% of analytics insights will not deliver business outcomes through 2022 and 80% of AI projects will “remain alchemy, run by wizards” through 2020.

The Reality About Big Data Projects

- **The Reality About Big Data Analytics Projects**
  - **Nov. 2017**: Gartner says 60% of #bigdata projects fail to move past preliminary stages. Oops, they meant 85% actually.
  - **Nov. 2017**: CIO.com lists 7 sure-fire ways to fail at analytics. “The biggest problem in the analysis process is having no idea what you are looking for in the data,” says Tom Davenport, a senior advisor at Deloitte Analytics (source)
  - **May 2017**: Cisco reports only 26% of survey respondents are successful with IOT initiatives (74% failure rate) (source)

Key Reasons Of Failure

Poor Communication

Poor communication is the primary contributor to project failure one third of the time, and can have a negative impact on project success more than half the time

Leadership troubles

Harvard Business Review indicates that a data strategy helps organisations "clarify the primary purpose of their data and guides them in strategic data management." Astoundingly, according to management consultants McKinsey, 30% of organizations have no data strategy"

Lack of Skills

The lack of skills in organisations contributes 30% of the failure. This affects or takes effect on several level:

- not having the digital leadership mindset to drive strategy
- Line managers not understanding the data they have within them
- Rest of the company, not understanding the lingo of analytics

Ambitious intentions

Nearly all companies that embark on becoming data-driven organisations or digital transformation initiatives are too ambitious. They either spend millions of dollars on infrastructure or claim a framework for analytic or digital transformation that might not be wholly sustainable or stable

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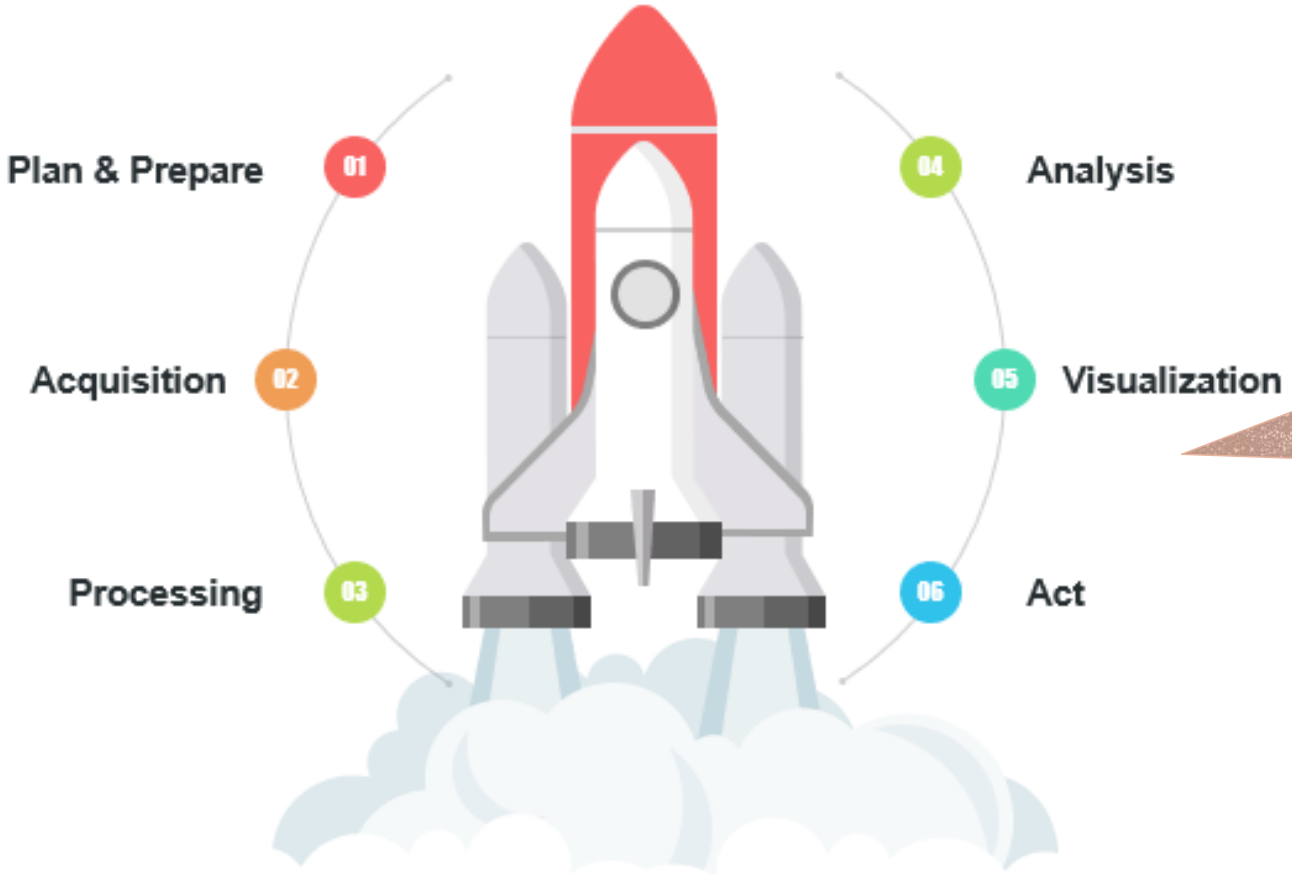
What Lessons We Learned?

The Truth

What Lessons We Learned?



You continuously learn about each phase of the Big Data analytics journey driven by the data science and AI spaceship.

What Lessons We Learned?

Plan & Prepare

Planning and Preparation are Critical!!

- Understand and Prepare Business Goal
- Prepare Good Business Cases
- Plan your platform

Communication/Collaboration

Strategic Alliance with Executive Stakeholders

Data analysis done right is not about technology. It's about business. Before you start any big data analytics project, you first need to secure the support of the company's executive stakeholders.

Acquisition

Focus on Relevance Rather Than Quantity

Don't bother with huge datasets simply to indulge your clients. Use relevant data samples instead – results will be the same, while costs will be much lower.

Processing

Focus on quality

Data that's inaccurate, poorly formatted, or obtained from dodgy sources can kill even the most carefully planned big data project

Analysis

Choose Your AI Horse Carefully

You can simply impress your audience and add a unique zing and appeal to your Presentations. Easy to change colors, photos and Text.

Visualization

Choose the right pattern for comprehensive Communication

You can simply impress your audience and add a unique zing and appeal to your Presentations. Easy to change colors, photos and Text.

What Lessons We Learned?

Data quality – non negotiable

"[The classic phrase is] s*** in = s*** out, but with artificial intelligence it is even stronger because it's s*** in = total mess out

Manage expectations

"You must manage expectations. Many people talk about artificial intelligence without really understanding what's behind it, It's a very wide domain – you have image recognition, natural language processing, machine learning etc..

Always understand your artificial intelligence

"You must [always] understand your artificial intelligence. I mentioned the black box – if a company is promising you some magic with a black box, don't believe them. You are going into a dangerous area because you have really to be in control of the [intelligence].

Both humans and machines are needed to deliver the best result

Your AI always gets smarter with the help of human intelligence.

Don't fall into the one tool to rule them all trap

If you buy a hammer, you want everything to be a nail. Companies want to buy a single tool for the job.

Transfer learning can kickstart machine learning efforts in organizations

Transfer Learning is here, and it's fantastic. Companies can shortcut the process of developing algorithms by using a model that was trained for a specific task as the starting point for developing a new model for a different job.