

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



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# The Journey Today





# Cognitus – In a Nutshell



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



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



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



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



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



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

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# Outlook of Industry 4.0

How Industry 4.0 Looks Like Today?



**Intelligencia**  
WHERE RESEARCH MEETS INDUSTRY



The builder of next generation experts



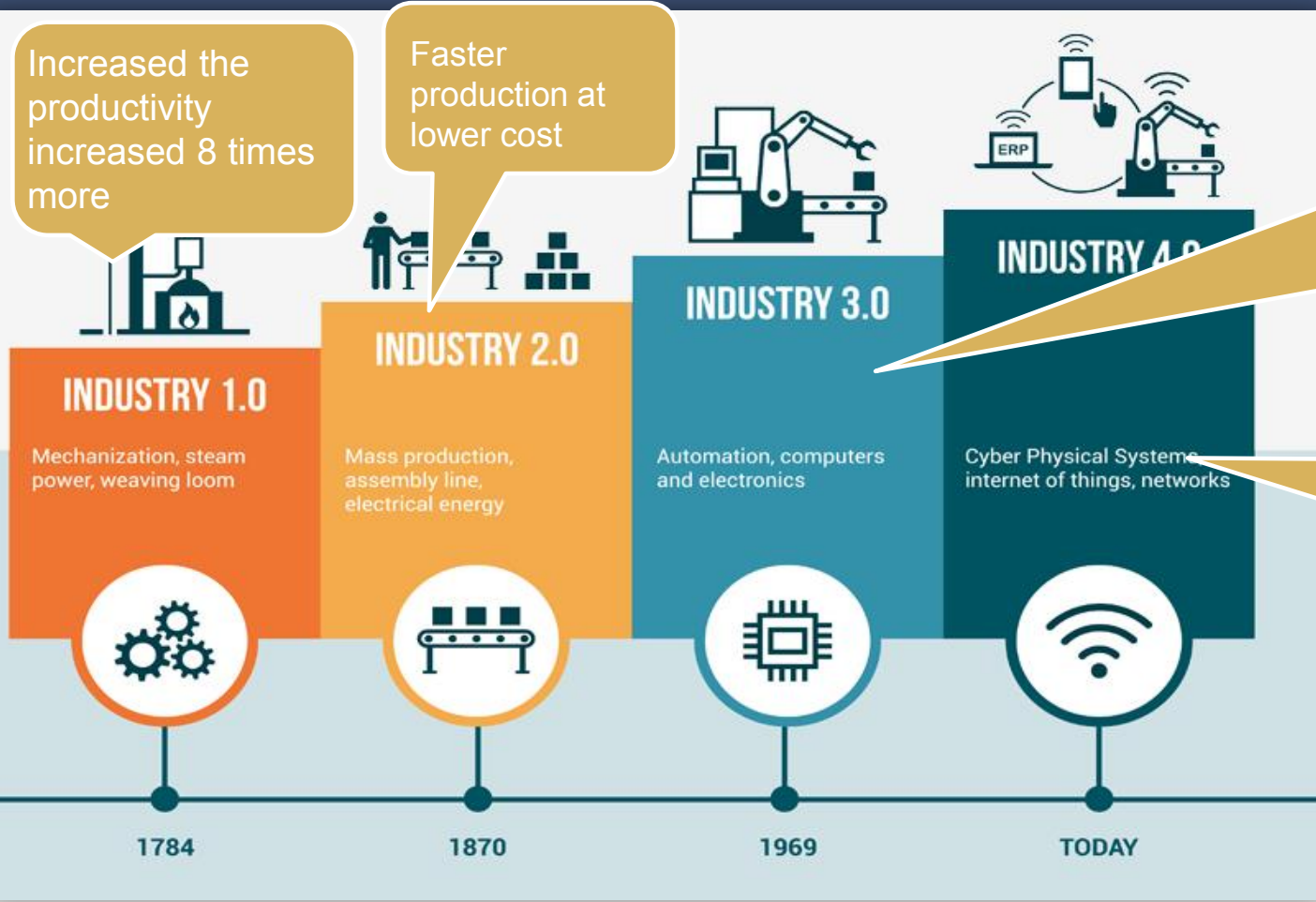
# Outlook of Industry 4.0

Increased the productivity increased 8 times more

Faster production at lower cost

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

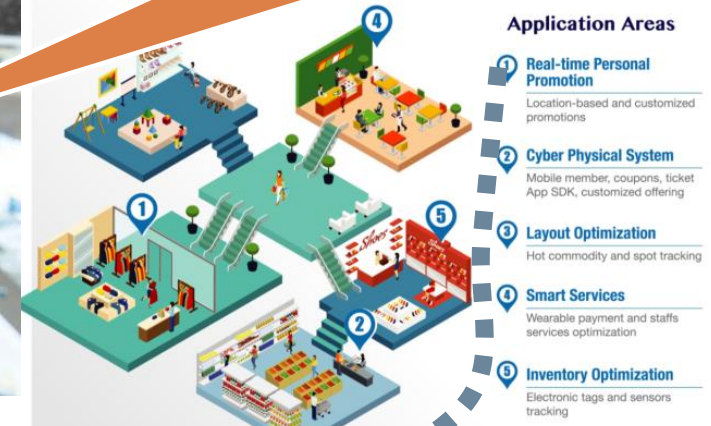
Production systems, components and people communicate via a network and production is nearly autonomous





# 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.



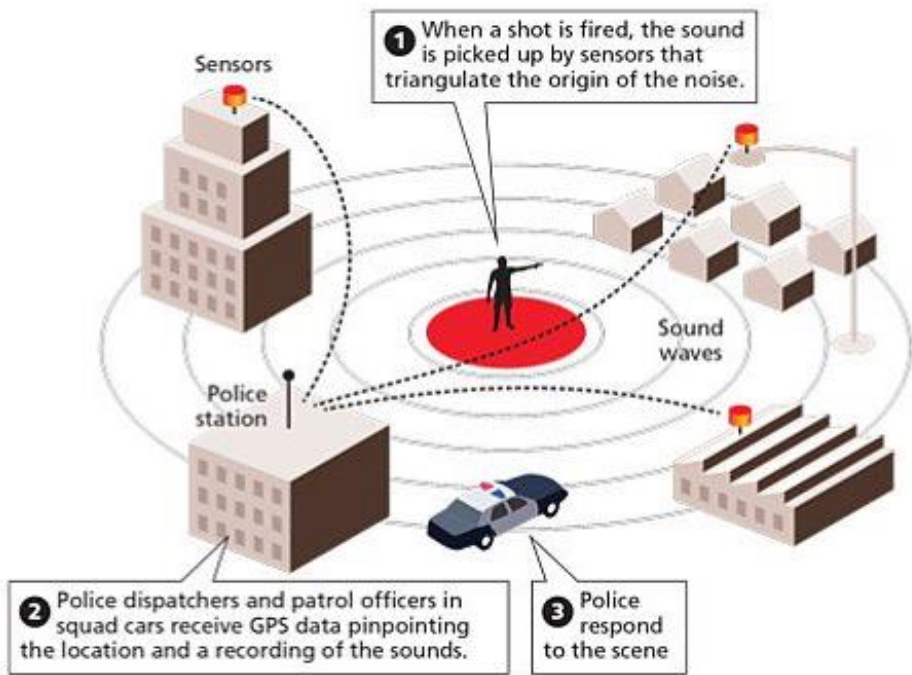
Retail 4.0 will change the shopping experience entirely. T System is pioneering smart ecosystem for retail sector.







# Outlook of Industry 4.0



Police 4.0: Smart technologies are changing investigation landscape.

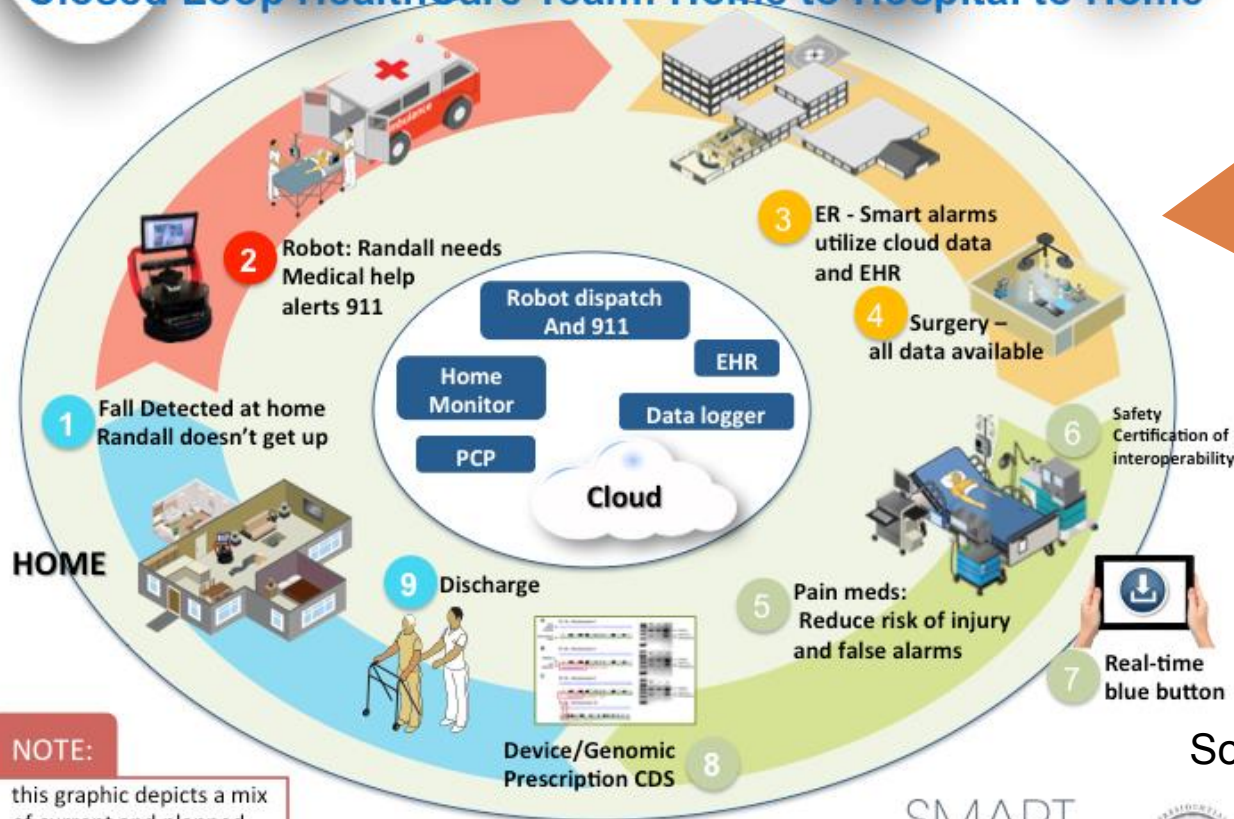
New York Police Department, China, and Dubai Police implemented Police 4.0 Ecosystem.





# Outlook of Industry 4.0

## Closed Loop HealthCare Team: Home to Hospital to Home



**NOTE:**  
this graphic depicts a mix of current and planned capabilities.

### 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,

### Now & Tomorrow

3G, 4G, 4.5G



Network & Services  
Quality of Experience,  
Capacity, Capability,  
Scalability, etc...



Social Network



5G...  
Connected World



Smart Phone



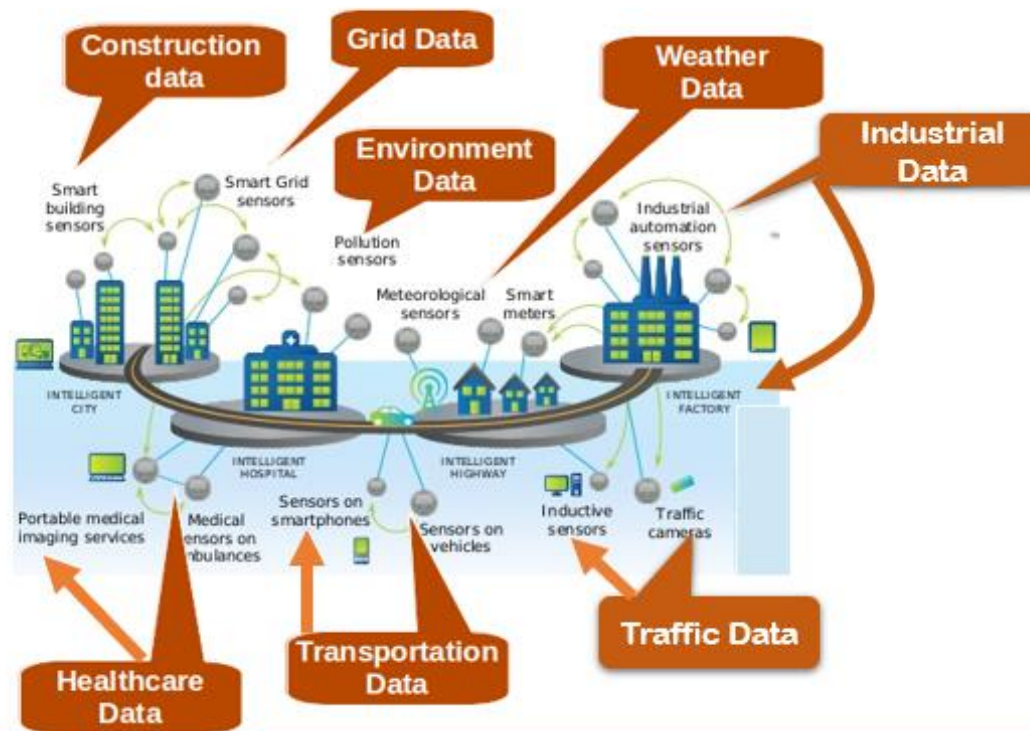
Diverse Services,  
Applications, Devices,  
Spectrum &  
Deployment





# Outlook of Industry 4.0

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



Barcelona, January 2014



Vienna







# 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



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# 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

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

Interfaces and 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



# 3

## The Power of Data and Analytics for Industries

Data keeps intelligence inside



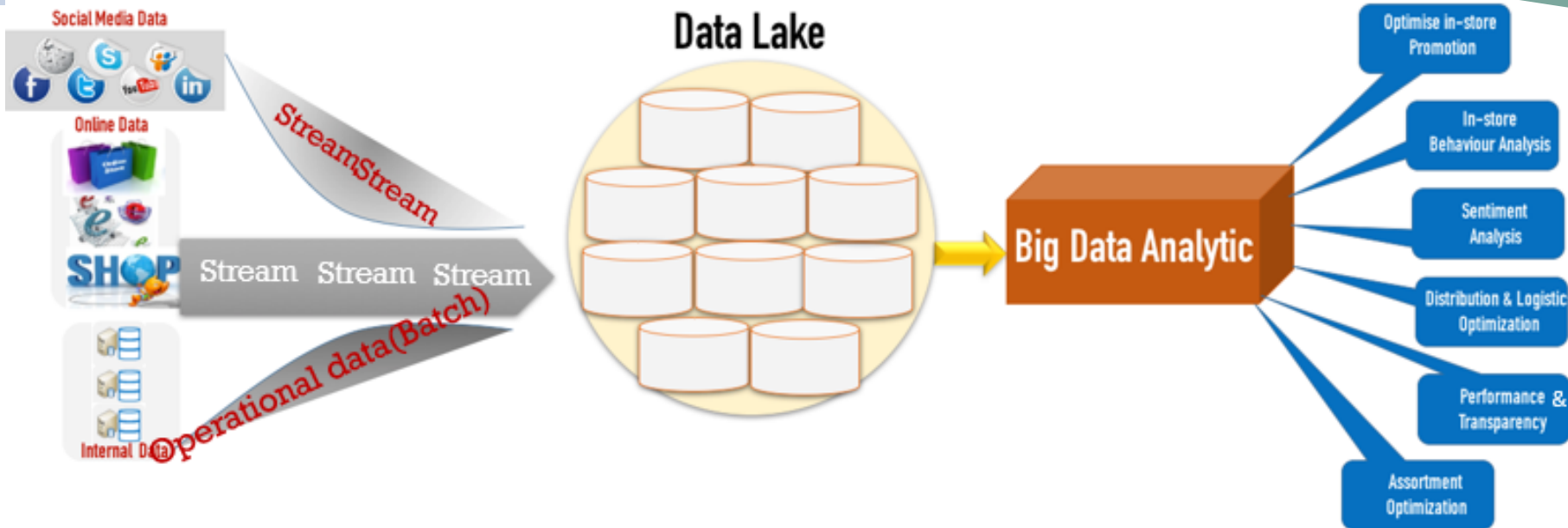
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# The Power of Data and Analytics

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

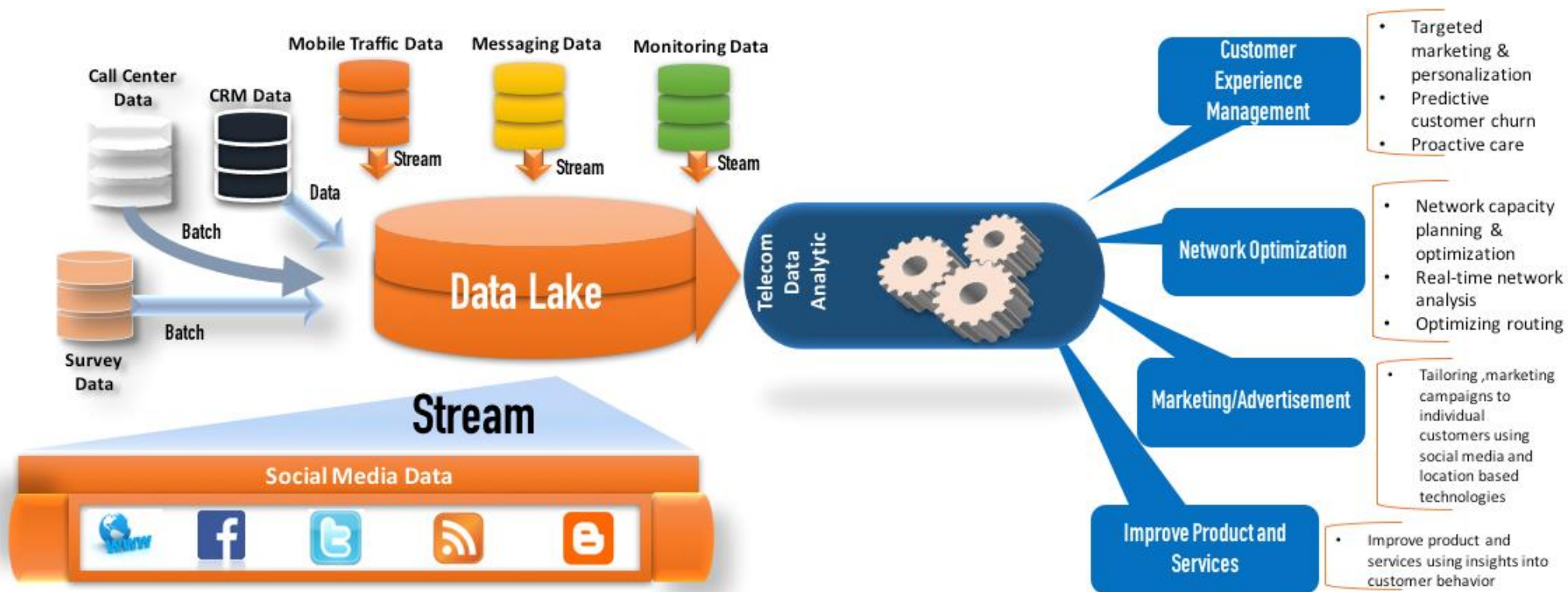


<p>The promotional offers can be optimized using Big Data Analytics.</p>	<p>Customer buying behavior in stores can be analyzed efficiently</p>	<p>Customer opinion are analyzed to extract their sentiments on products.</p>	<p>Distribution network could be optimized. Logistics route is optimized.</p>	<p>The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

## Deep Learning Enabled Advanced Analytics



Data Cleaning

## Aggregated Big Data (Multi-modality, Non-structured, Multi-format)



Networking Technique (Fieldbus, Industrial Ethernet, MTConnect, etc.)



Pattern



Data



## 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.

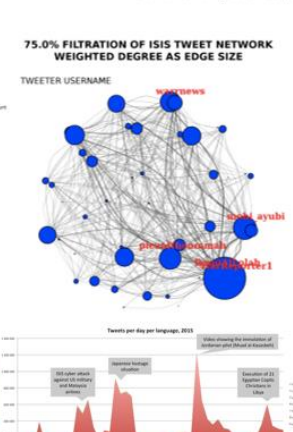
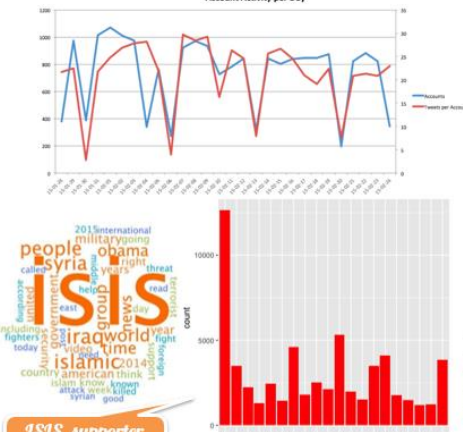
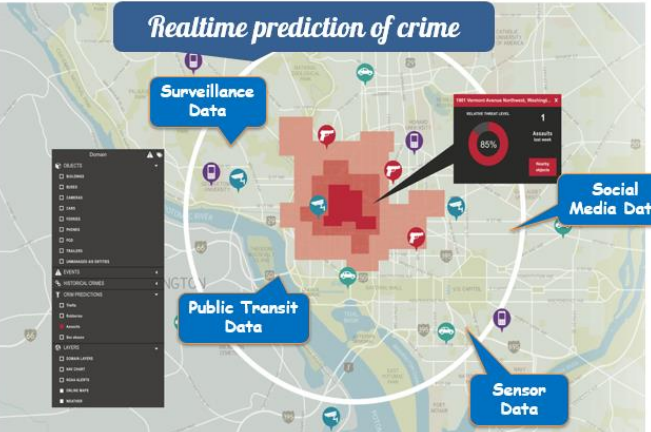


Source: Jinjiang Wang





# 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

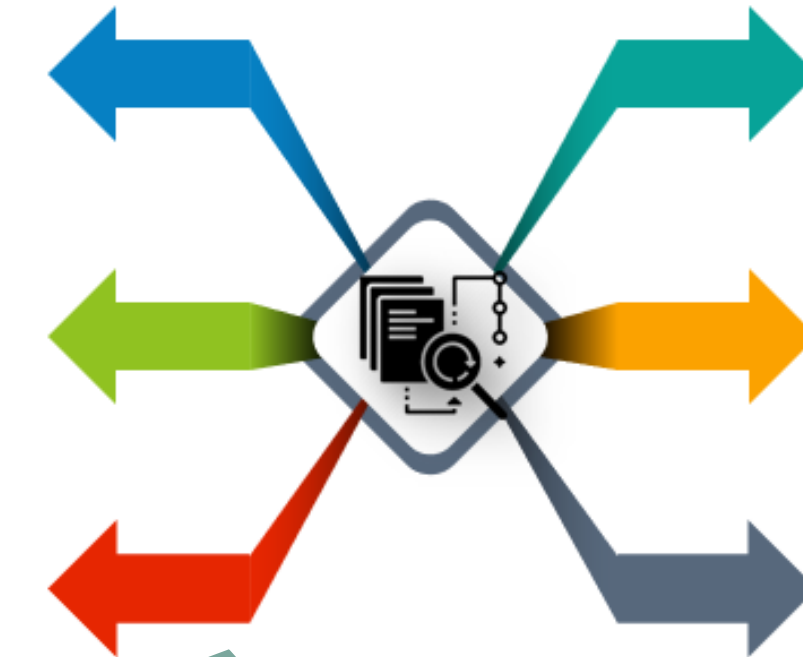
Through the analysis of data collected from transport authorities, you can study the patterns that will result in decreased traffic congestion and help transport authorities come up with intelligent ways to manage and monitor transport within the city.

## 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 majority impacted areas and what type of upgrades are needed. Through proper analysis, investments can be made accordingly in the required fields.



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

## 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

### BBI Dashboard

Customer Profile Analysis

First Name	Last Name	Age	Marital	Job	Residence	Contact	Action
John	Smith	42	Single	Pharmacist, hospital	8201 Smith Lane	63.976.356	
John	Smith	43	Single	Accountant, chartered	476 South Drive Suite 111	67.342.439	
John	Smith	45	Single	Adult nurse	1234 Clark Drive	58.985.684	
John	Smith	47	Married	Technical sales engineer	701 Pennington Trail Apt. 574	76.874.593	
John	Agarwa	41	Divorced	Sales engineer	98710 Redwood Creek Suite 622	60.827.375	
John	Agarwa	37	Married	Product designer	545 Market Springs Apt. 388	63.762.833	
John	Harris	53	Divorced	Business designer	38371 George Martin	5.891.725	
John	Harris	56	Single	Financial planner	125 Market Street Apt. 824	62.762.137	
John	Abbas	47	Divorced	Maintenance engineer	52991 Stoumen Junction Apt. 628	67.286.329	
John	Adams	41	Single	Business office	22763 Oak Hills	74.871.462	
Michael	Lopez	36	Married	Health information services manager	1122 Oakley Drive	91.776.942	
Michael	Lopez	40	Married	Pharmacist, hospital	188 Market Center Suite 635	53.944.736	
Michael	Lopez	47	Divorced	Hospital doctor	862 Travis Square	22.746.369	
Michael	Davis	38	Married	Engineer, building services	6213 Johns West Suite 122	62.348.347	
Michael	Davis	40	Divorced	Customer manager	2194 Central Massachusetts Apt. 519	75.526.797	
Michael	Hernandez	38	Divorced	Commercial/development supervisor	8164 Campbell Lodge Apt. 986	24.138.857	
Michael	Hernandez	39	Married	Physiological scientist	241 Juan Bridge Suite 883	57.268.899	
Michael	Stewart	42	Divorced	Address worker	6076 Terry Lodge	42.808.314	
Michael	Stewart	37	Married	Higher education careers adviser	65117 Patrick Road	83.847.291	
Michael	Adams	38	Divorced	Research scientist, medical	8164 Oakley Drive	57.271.893	
David	Adams	42	Married	Planning and development supervisor	2918 Andy Turner Suite 814	69.826.276	
David	Adams	42	Divorced	Analyst, coordinator	20889 Sutterly Light Suite 376	73.776.211	
David	Barnes	44	Single	Architectural technologist	71207 Raven Point	3.953.236	
David	Barnes	37	Married	Engineer, petroleum	64627 Betty Lundy Suite 785	1.943.383	
David	Barnes	47	Single	Computer	61633 Shea Court	69.272.518	
Robert	Anderson	38	Divorced	Physiotherapist	4812 Zachary Valley Apt. 117	26.365.624	
Robert	Anderson	40	Married	Teacher, music	708 Brandt Road	38.712.291	
Robert	Anderson	47	Single	Dietitian, general practice	8918 Cluffy Square	62.734.281	
Robert	Miller	40	Married	Administrative	82862 Lake Drive	76.964.887	
Robert	Miller	47	Married	Teacher, English as a foreign language	6485 Michael Overton Suite 973	74.485.811	
Robert	Richardson	40	Married	Designer, textile	6818 Overton Center Apt. 987	34.886.497	
Robert	Richardson	31	Married	Investment manager	58401 Riverside Throughway Suite 482	9.476.476	
Robert	Baker	38	Single	Pharmacist, analysis	64711 Red Mountain Apt. 188	83.840.752	
Robert	Brady	49	Married	Physiotherapist, occupational	1141 Grandview Lane	61.447.467	
William	McIntosh	40	Single	Event organizer	54295 Valencia Expressway Suite 778	8.826.428	
William	McIntosh	37	Married	Sports therapist	407 Peters Point	54.747.884	
William	Peterson	47	Single	Programmer, systems	1311 Ryan Middle	93.306.469	
William	Peterson	40	Divorced	Insurance broker	62711 Ashvale Ferry	60.693.897	
William	Tucker	47	Divorced	Minerals, geological	21883 Nevada Circle	42.722.345	
William	Tucker	47	Married	Librarian, public	5583 Angelle Lundy Apt. 077	92.945.426	
William	Alvarez	47	Married	Surgeon, rural practice	5857 Geneva Park	37.286.326	
William	Anderson	38	Married	Pharmacist, hospital	44134 Moha Hills	43.292.392	
Christopher	Anderson	49	Divorced	Health designer	233 Angles Extension Apt. 475	64.963.887	
Christopher	Berry	44	Single	Planning and development supervisor	39120 Schaffer Ferry	23.885.358	
Christopher	Berry	44	Married	Animal nutritionist	87548 North Rapid	48.493.363	
Christopher	Bradshaw	37	Single	Optometrist	67792 Peters Point Apt. 371	4.213.812	
Christopher	Bradshaw	36	Married	Pharmacist	262 Moore Common	76.713.376	
Jennifer	Carroll	40	Single	Medical representation	5342 Miller Turnpike Suite 442	64.764.635	
Jennifer	Carroll	40	Single	Visual merchandiser	842 Ames Bridge	33.493.370	
Jennifer	Johnson	38	Divorced	Geographical data processor	447 Gray Road	24.891.458	
Jennifer	Johnson	31	Married	Administrative officer, education	78996 West Lane Suite 981	71.313.314	

### BBI Dashboard

Transaction Activities

Total number of transaction: **2,685**

Transaction location: Map showing activity across Asia (China, India, South Korea, Japan, etc.)

Transaction per period: Line chart showing activity over time.

ID	Action	Amount	Level
7d7f010c-2739-409f-b463-876c5847575c	Withdraw	128	1
7d7f010c-2739-409f-b463-876c5847575c	Withdraw	172	1
7d7f010c-2739-409f-b463-876c5847575c	Withdraw	360	1
7d7f010c-2739-409f-b463-876c5847575c	Withdraw	384	1
7d7f010c-2739-409f-b463-876c5847575c	Withdraw	587	1
7d7f010c-2739-409f-b463-876c5847575c	Deposit	374	1
7d7f010c-2739-409f-b463-876c5847575c	Deposit	668	1
7d7f010c-2739-409f-b463-876c5847575c	Deposit	880	1
833d9108-5842-4071-8908-044276413631	Withdraw	896	1
833d9108-5842-4071-8908-044276413631	Withdraw	475	1
833d9108-5842-4071-8908-044276413631	Withdraw	896	1
833d9108-5842-4071-8908-044276413631	Withdraw	901	1

### BBI Dashboard

Credit Risk Analysis

1,767 469

1,381 469 386

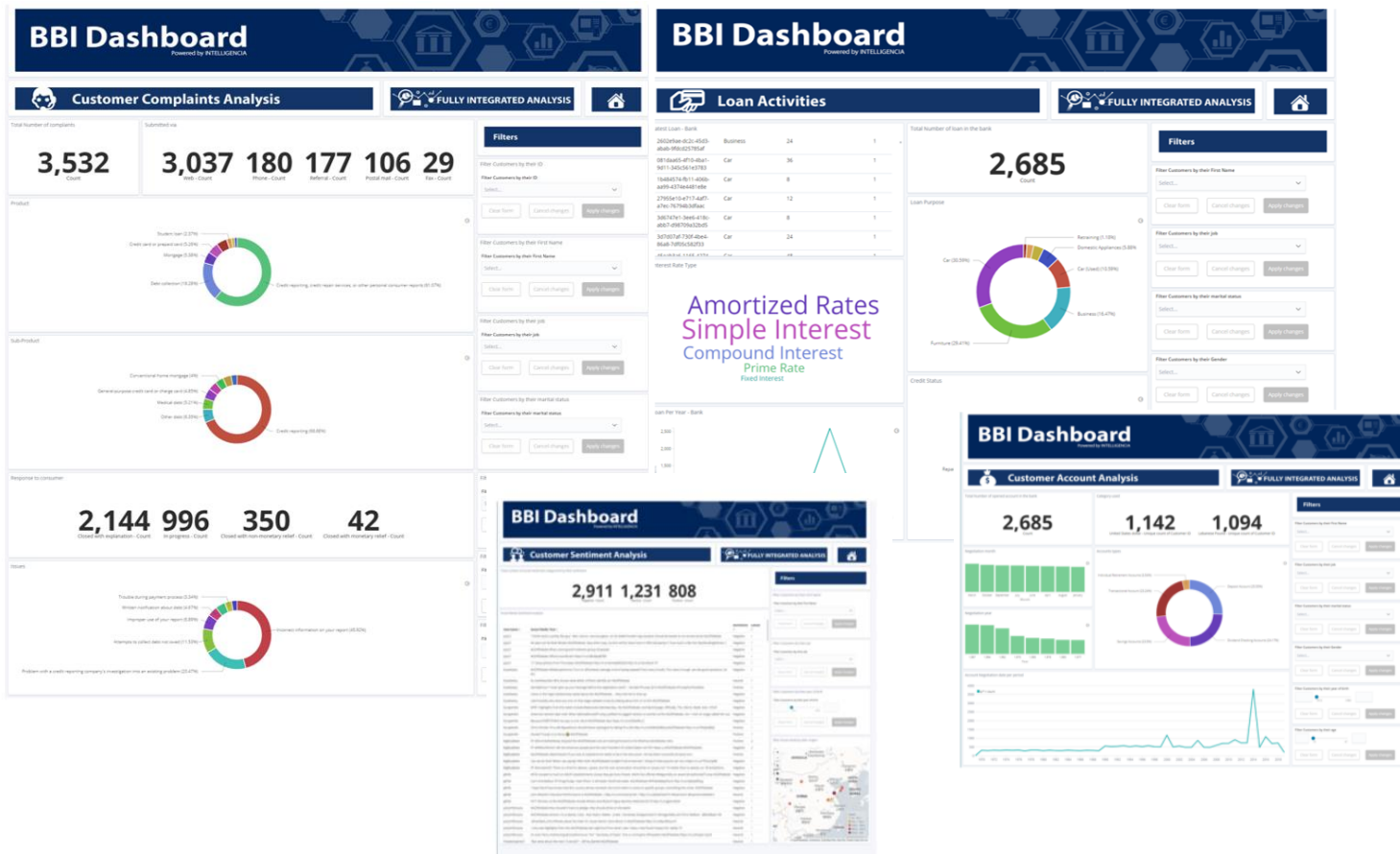
Summary table with columns: ID, Action, Amount, Level, etc.







# Customer 360 Analytics



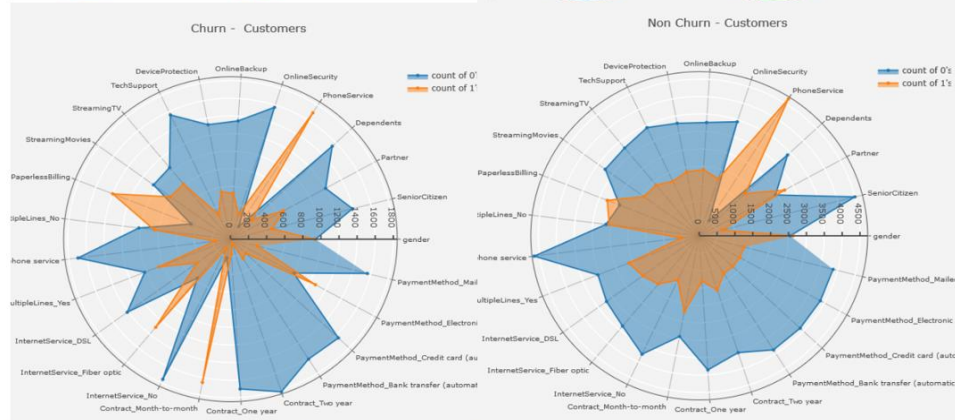
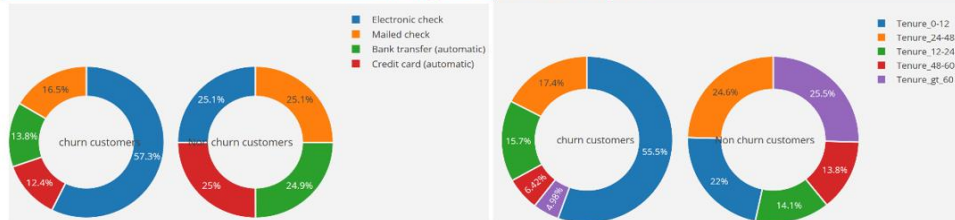
- **Deep Integration of Data:** The Data Integrator combines and enriches data about the customer from social channels, customer feedback, customer service centers, and others.
- **Deep and Wide Analysis Customer Behavior:** Hawk-I provides and predicts customers buying or consumption behavior.
- **Customer 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.



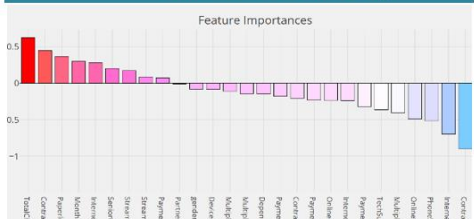


# Customer Churn Analytics

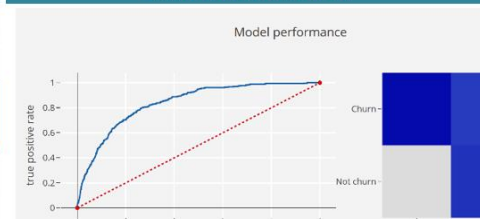
## Intelligencia's Churn Analytics



## Critical Feature Discovery



## Churn Prediction Model



- **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

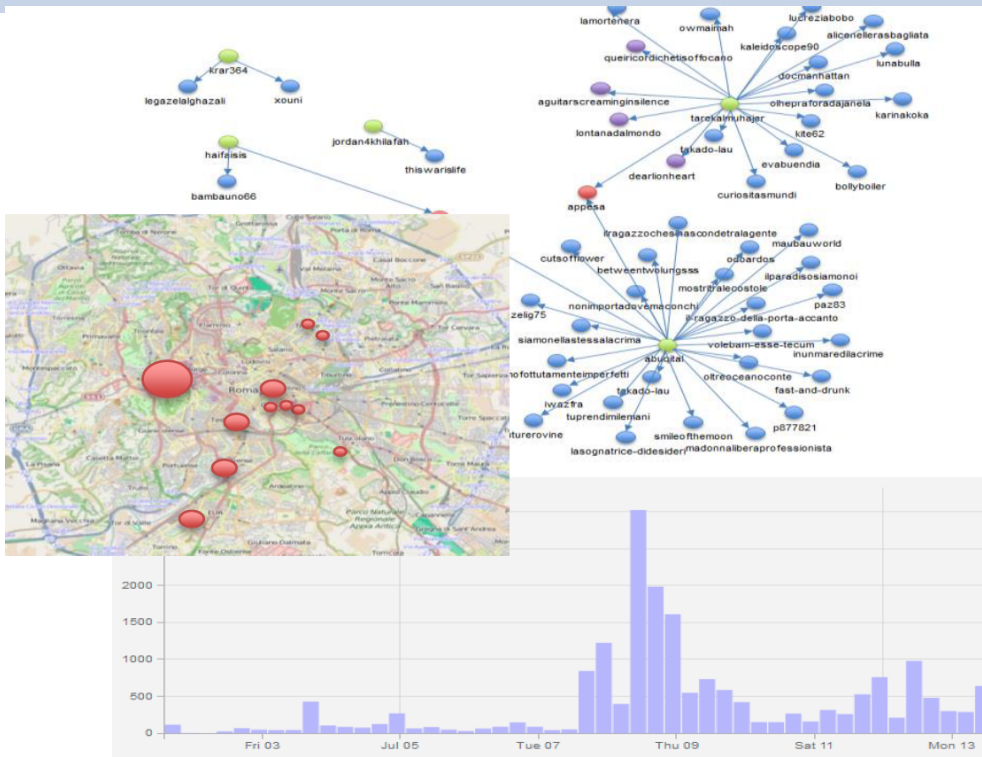


- **Powerful Data Processing Engine:** The data processing engine can aggregate, cleanse, wrangle structured and unstructured data.
- **Statistical Scoring Model:** The analytics visualizes a percentage of customers using specific touchpoints/channels.
- **Customer Segmentation:** It can segment customers 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

Passport Owner

Face recognized in checkpoints A,B,C

Car Plate Z Usually Near  
Car Plate X

Car Plate W in A  
Car Plate Y in B  
Car Plate Z in C



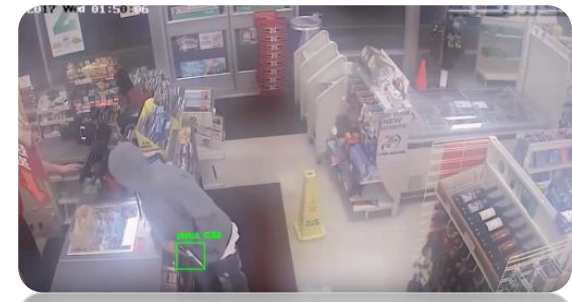
# Criminal Intelligence 4.0



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



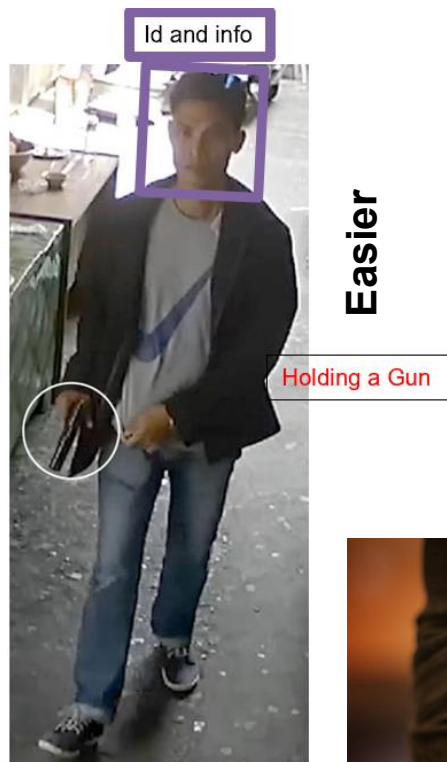
**Real-time license number and plate detection:** It can detect the license plate and recognize the license number.



**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



Goal



**Challenging**

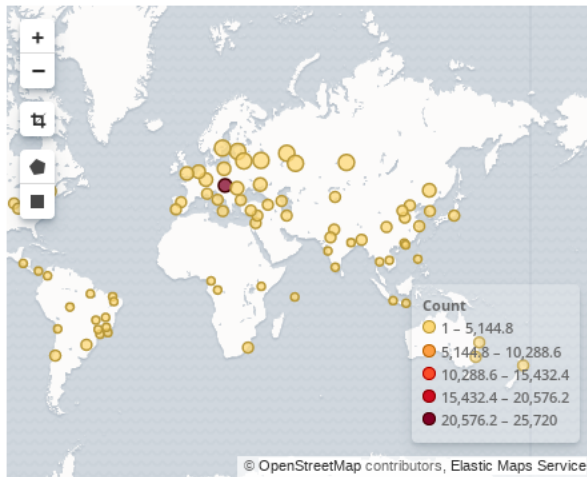




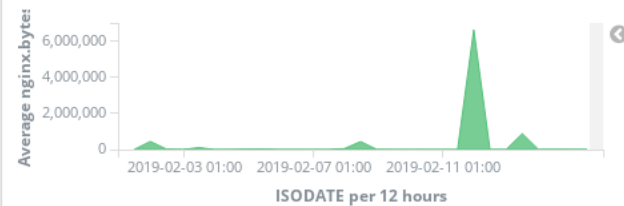


# WebServer Log Analysis

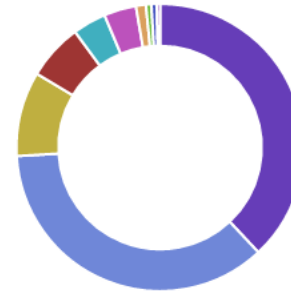
NGINX Client IP Map



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

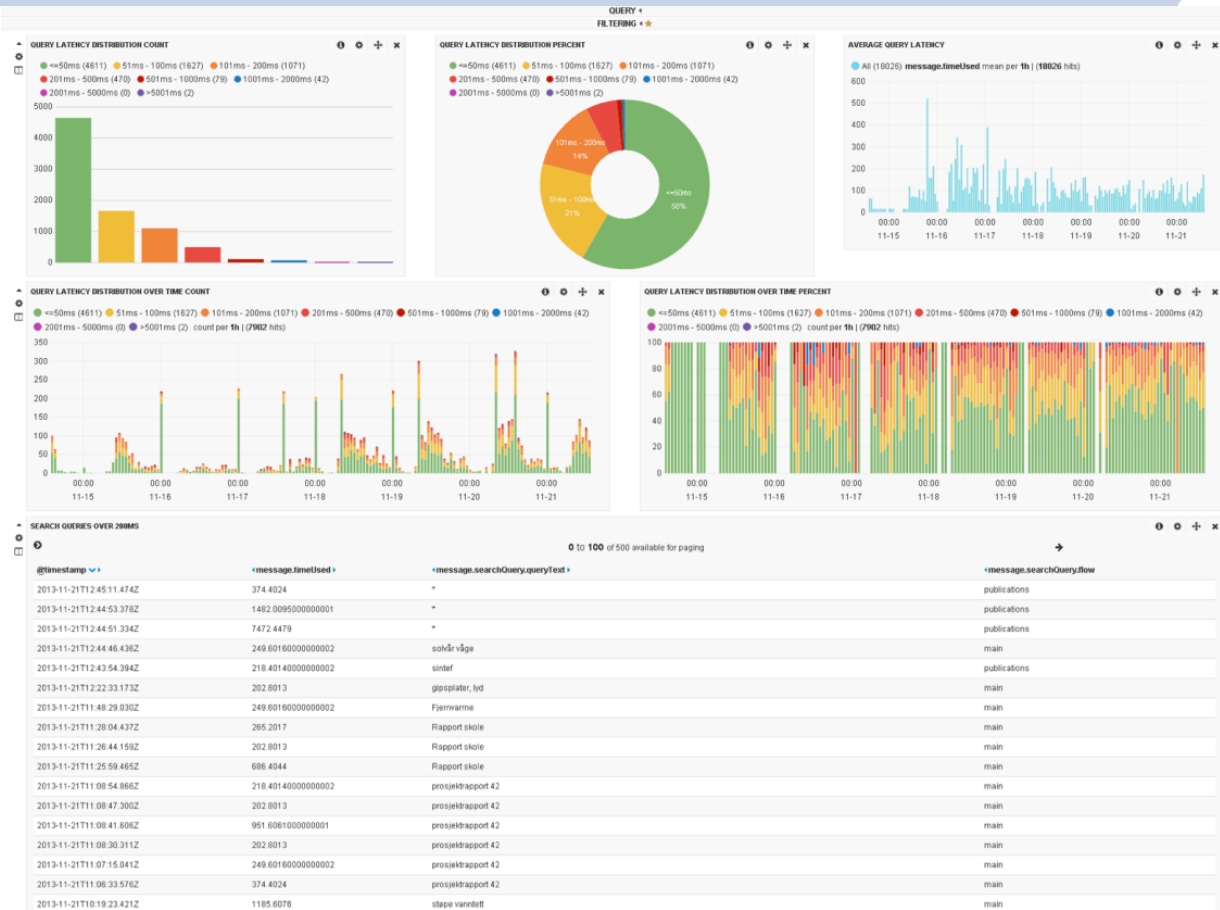
Username	Count
Missing	43,238
-	19,611
[REDACTED]	16,644
[REDACTED]	7,960
[REDACTED]	4,772
[REDACTED]	2,699

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

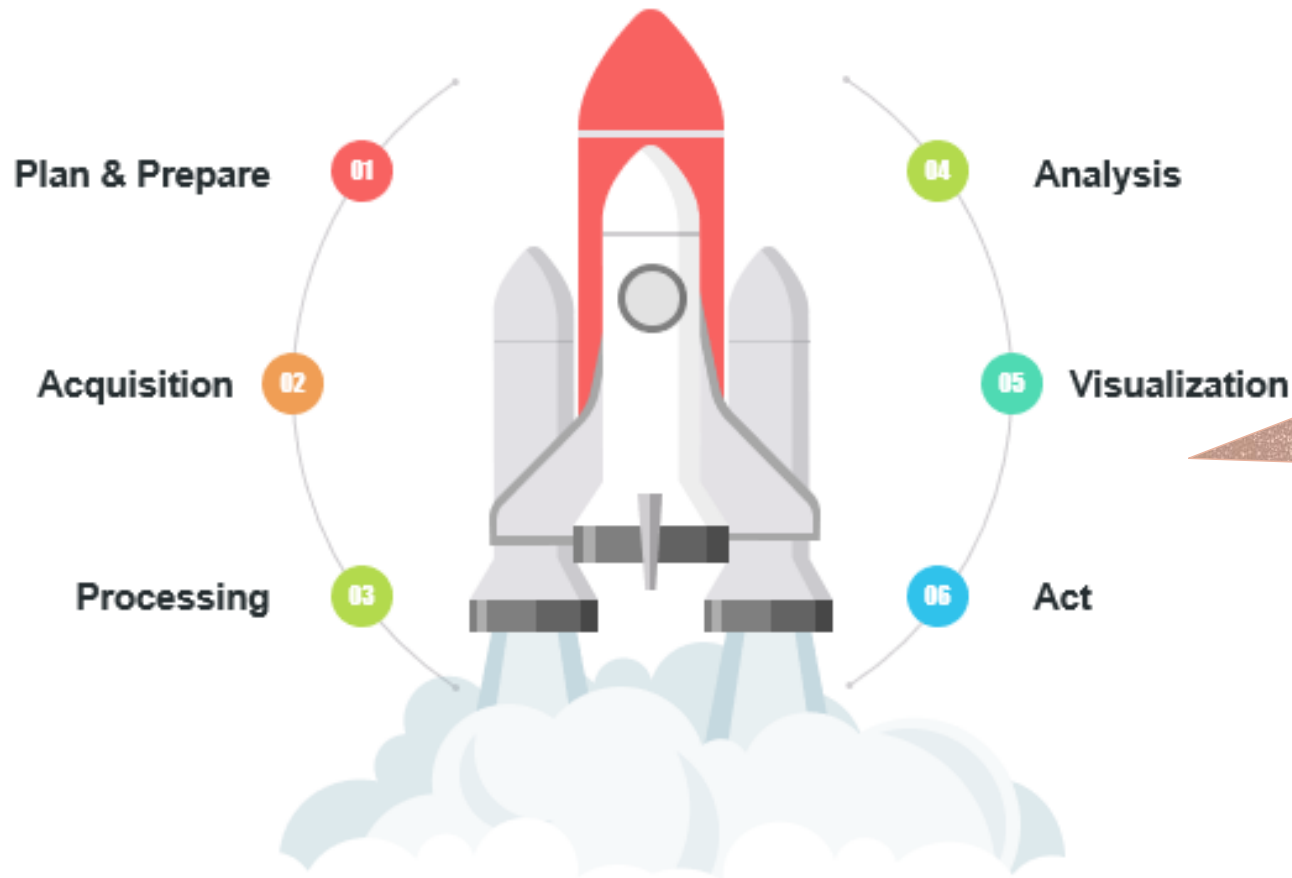
5

## 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.