Robotics & Artificial Intelligence / Machine Learning

Unlocking the Automation Prize in Finance

Saad Kaliya

April 13, 2019

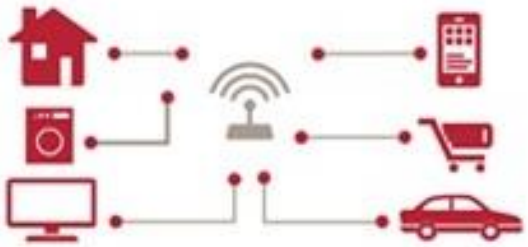
Digital Transformation and technological advancements

Major technologies being adopted include the following:

Blockchain

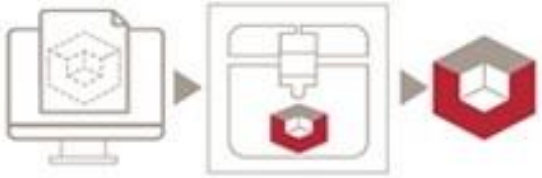
Drones

Internet of Things



Robots

3D Printing



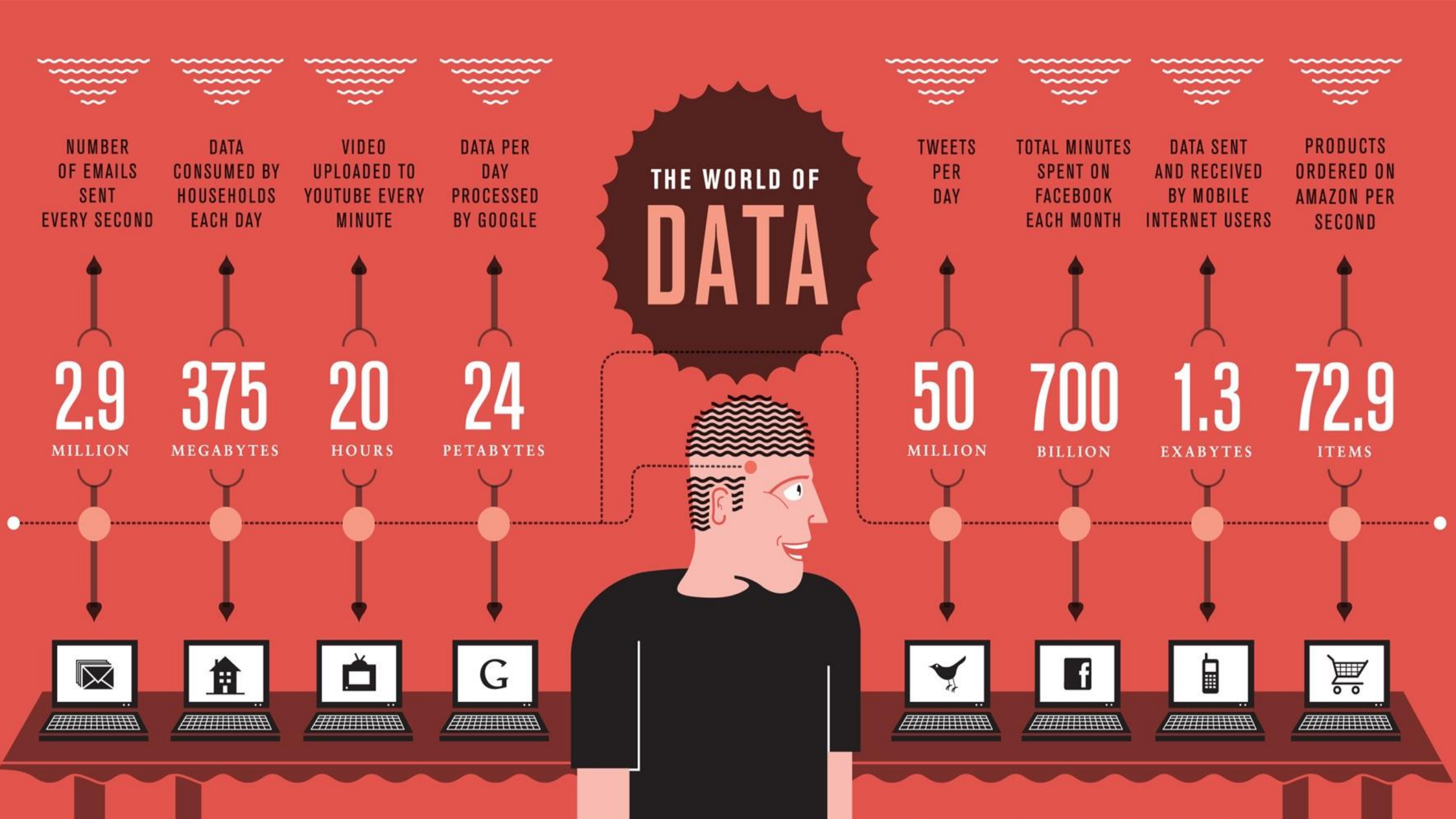
Virtual reality

Augmented Reality

Artificial intelligence

Digital Transformation and technological advancements

THE WORLD OF DATA



90%

OF ALL THE DATA IN THE WORLD HAS BEEN GENERATED OVER THE LAST TWO YEARS, 2.5 BILLION GB OF NEW DATA IS GENERATED EVERYDAY

DATA IS THE NEW OIL, AND INTELLIGENT INFORMATION IS THE NEW CURRENCY

Data- and intelligence-driven enterprises win*

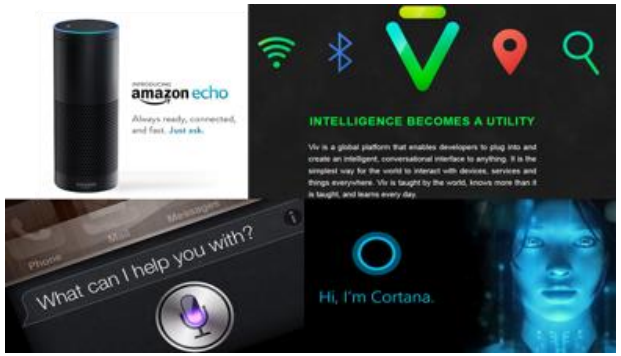
AI – Everywhere & Anywhere

"The ability of a machine to replicate intelligent human behavior"

Artificial Intelligence is becoming ubiquitous intelligence *with the ability to see, hear, speak, smell, feel, understand gestures, interface with your brain, and dream*

AI that can See

AI that can Speak



AI that can Hear

Microsoft Xiaoice AI Can Replace Weathermen

AI that can Feel

AI that can Smell

AI that can Move

AI in disrupting businesses, creating new services and redesigning business models

Disrupting your Core Business

Automate your business processes & augment your decision making before other disruptors do it to you

Innovating with New Services

Innovate with new products and services for your customers based on big data, analytics and AI

Redesigning your Business Model

Fundamentally redesign your business model or disrupt adjacent markets based on your core capabilities

Examples

Legal and accounting firms are using robotic and cognitive process automation, and blockchain to disrupt and re-engineer their business processes

ROSS LATHAM & WATKINS LLP

Electronic retailers are using extensive transactional and behavioral customer data to offer them new ways of trying, experiencing and purchasing their products

amazon alexa Baidu 百度

Auto manufacturers are rethinking their business model as 'Personal Mobility' service providers instead of manufacturers of vehicles to exploit autonomous cars and car share/ride share trends

MAVEN DriveNow

AI is becoming an essential component for enabling analytics maturity

	Backward-looking		Forward-looking		
	Descriptive Analytics	**Diagnostic Analytics**	**Predictive Analytics**	**Prescriptive Analytics**	**Adaptive & Autonomous Analytics**
Analytics Maturity Spectrum	**Describe, summarize and analyze historical data (What happened?)**	**Identify causes of trends and outcomes (Why it happened?)**	**Predict future outcomes based on the past facts and future simulations (What could happen?)**	**Recommend 'right' or optimal actions or decisions (What should be done?)**	**Monitor, decide, and act autonomously or semi-autonomously (How do we adapt to change?)**
Benefits of AI	• Descriptive and diagnostic analytics can be enabled with **assisted intelligence** by using AI to uncover patterns in large, complex datasets • AI also is pivotal for tapping into unstructured data sources such as text, audio, video, and images		• Predictive and prescriptive analytics can be enhanced with **augmented intelligence** to provide deeper insight into the implications of decision making • Useful techniques include agent-based simulation, reinforcement learning, etc.		• Adaptive analytics are driven by **autonomous intelligence** • AI learns with new information over time

Increasing Sophistication & Impact

Companies are starting their AI investments in automation, with long-term thinkers also exploiting augmented/autonomous AI

Automated Intelligence	Assisted Intelligence	Augmented Intelligence	Autonomous Intelligence
• Automation of **repetitive tasks** that include both manual and cognitive aspects	• AI techniques **enhance the efficiency** of activities across the business value chain, but **machines do not dynamically adapt to changing data**	• Computational algorithms begin to adapt to changing data; **machines** do not automatically make decisions, however they **put humans in the best place to make decisions**	• AI techniques used by businesses to **automate the decision making process** with the absence of human intervention

Low risk - Quick wins happening right now → *Degree of Advancement* → *High risk - Big bets, transforming business models*

What do we mean by "machine learning"

"Learning is any process by which a system improves performance from experience"

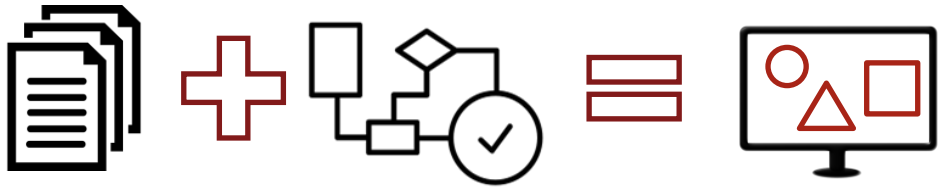
Machine Learning is discipline of AI, concerned with computer programs that automatically improve their performance through experience"

- **Develop algorithms that draw inferences and make predictions based on data**
- **Evolved from pattern recognition and computational learning theory. Related to DATA MINING and STATISTICS.**
- **Benefits are automation, being unbiased, being able to improve over time**

There's no institution in the world that cannot be improved with machine learning."
Herbert Simon, Nobel Prize (Economics)

How is this anything new?

Traditional Programming



Input Data + Algorithm = **Output**

Human defines set of rules (algorithm) which transform the input data into the output

Machine Learning

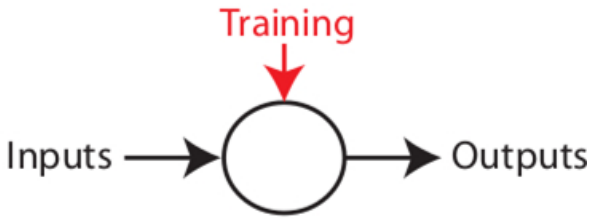
Input Data + Output = **Algorithm**

Machine infers the algorithm based on large amounts of input and output examples

Three types of machine learning

Supervised

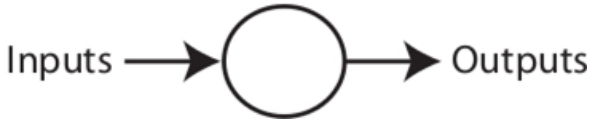
Pre-labeled data trains a model to predict new outcomes



(ex: Classification, Regression)

Unsupervised

Non-labeled data self organizes to summarize patterns



(ex: Clustering, Dimensionality Reduction)

Reinforcement

Model learns from interacting with the environment

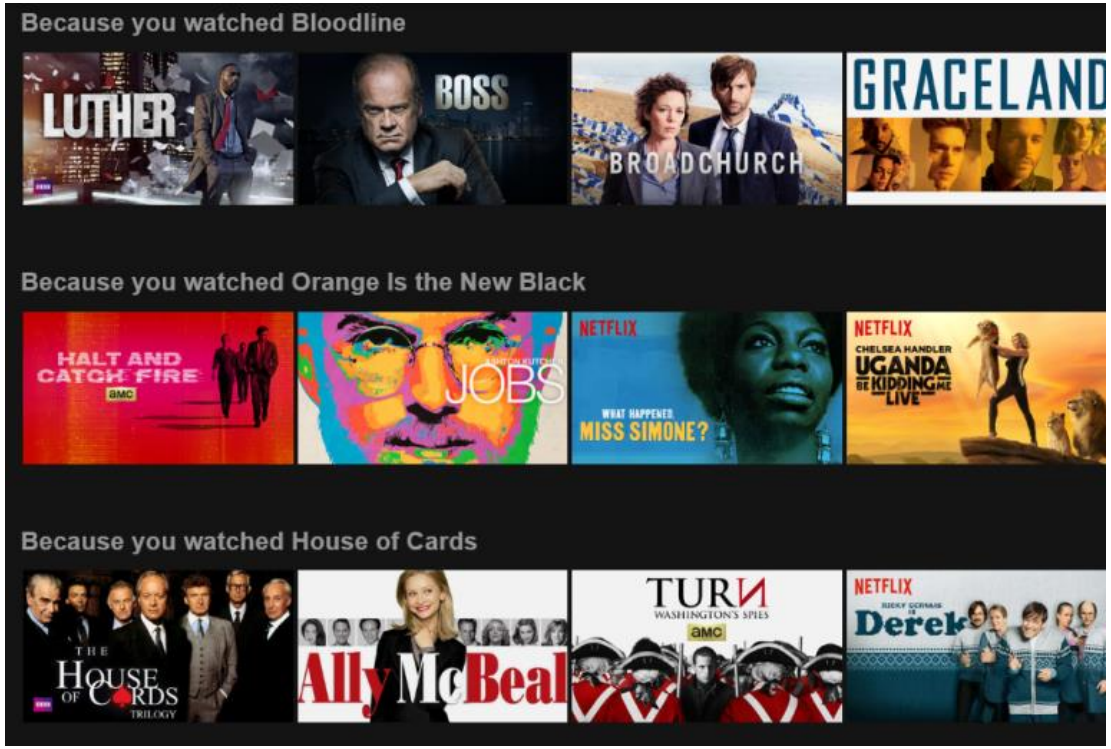
(ex: Skills Acquisition, Real Time Decision Making)

Netflix knows your favorite movies

Netflix uses **machine learning** to personalize content recommendations to keep viewers engaged and drive subscriber retention

Machine Learning

Personalized content recommendations and data-driven original content creation



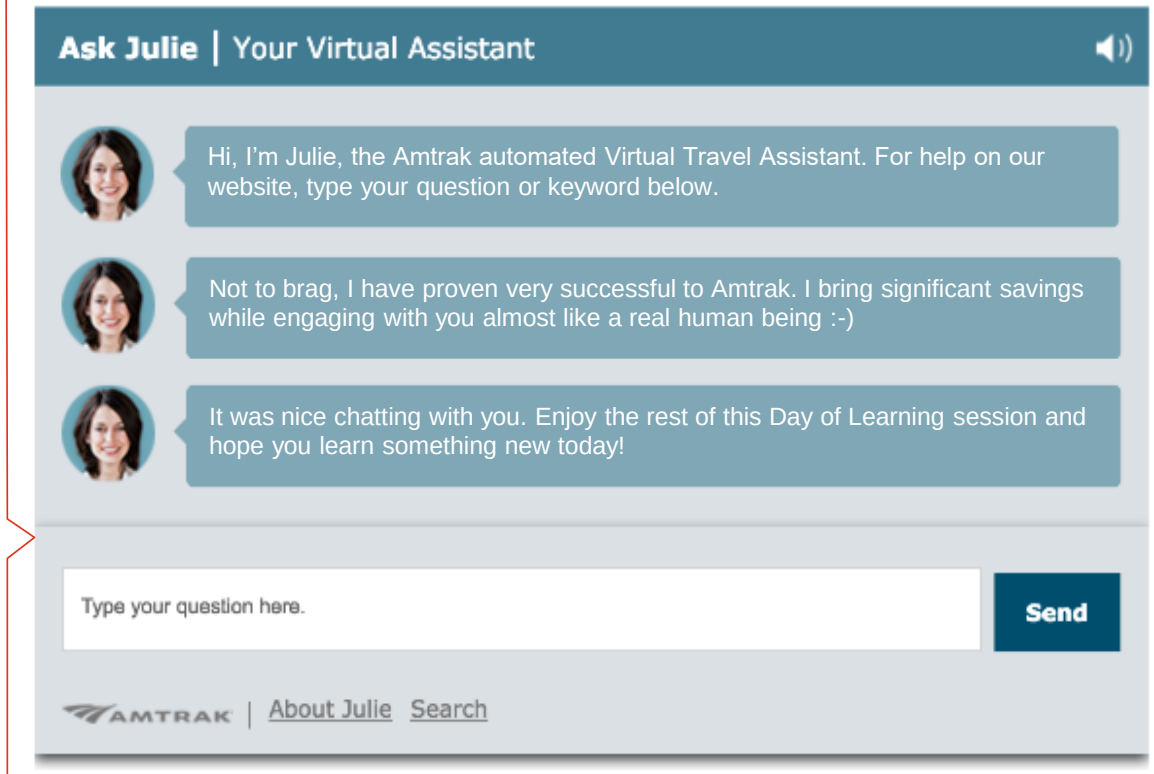
3-4x
higher take up on personalized content

90%
members watched original content

$1B
in annual savings

10%
of revenue spent on AI in 2015 ($650M)

Meet Julie, Amtrak's New Virtual Assistant



Helps customers find information on:

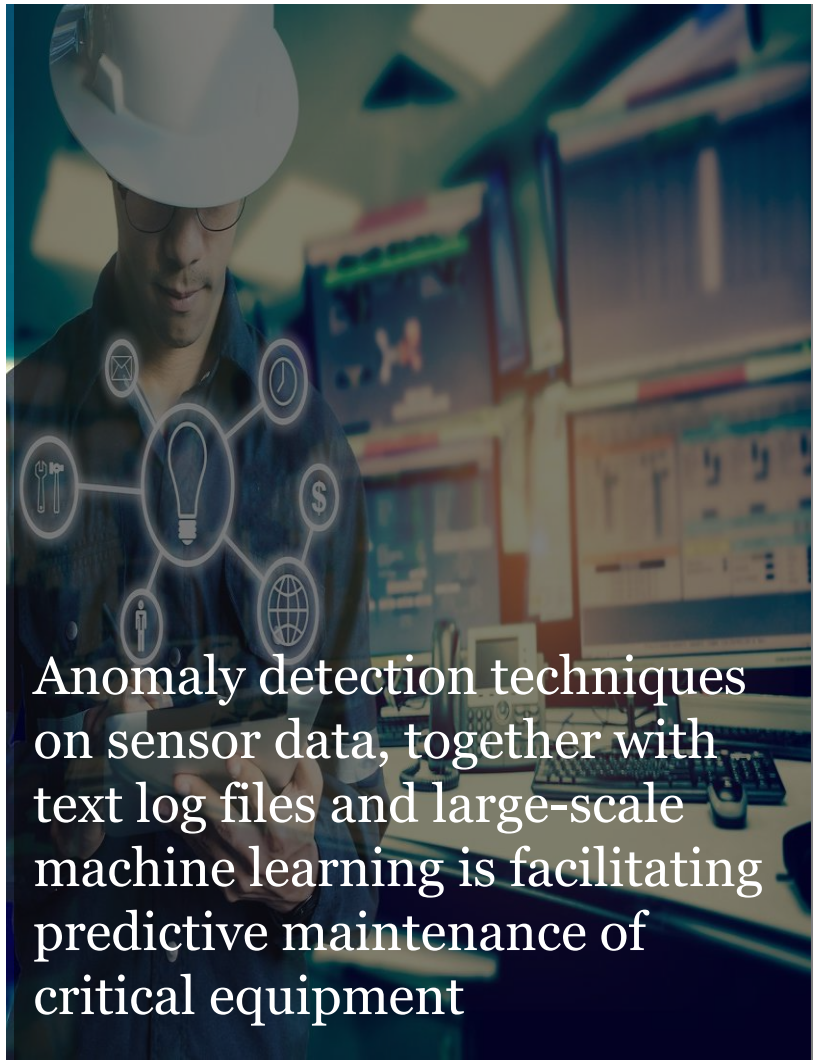
- Making a reservation
- Amtrak's rewards program
- Finding station and route information
- A variety of other areas

+25% more online bookings

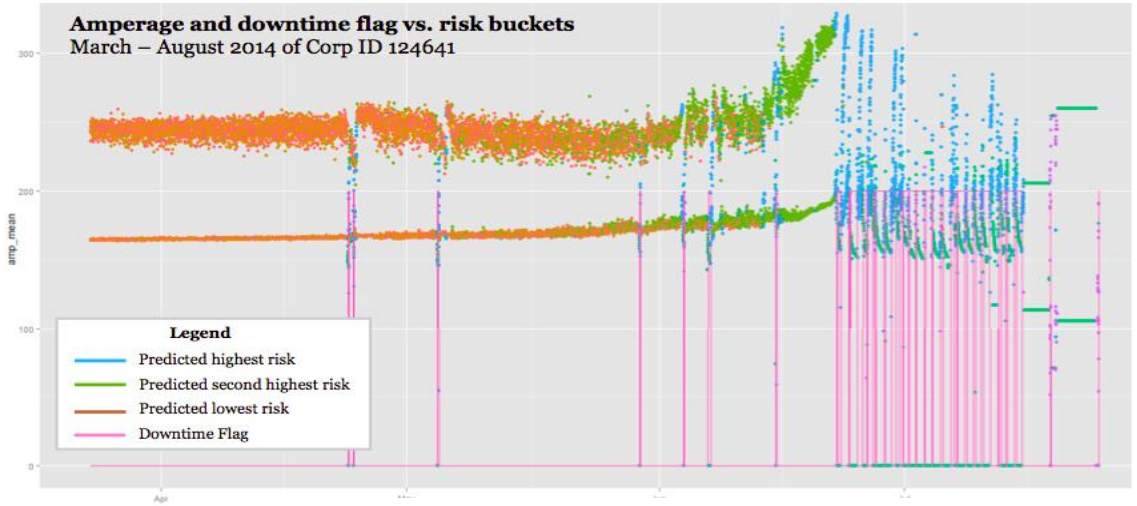
+30% revenue per booking

+50% user engagement growth

Predictive Maintenance & IoT – Anomaly Detection



Example Project: Osprey Data Analysis of the probability of failure in oil well pumps



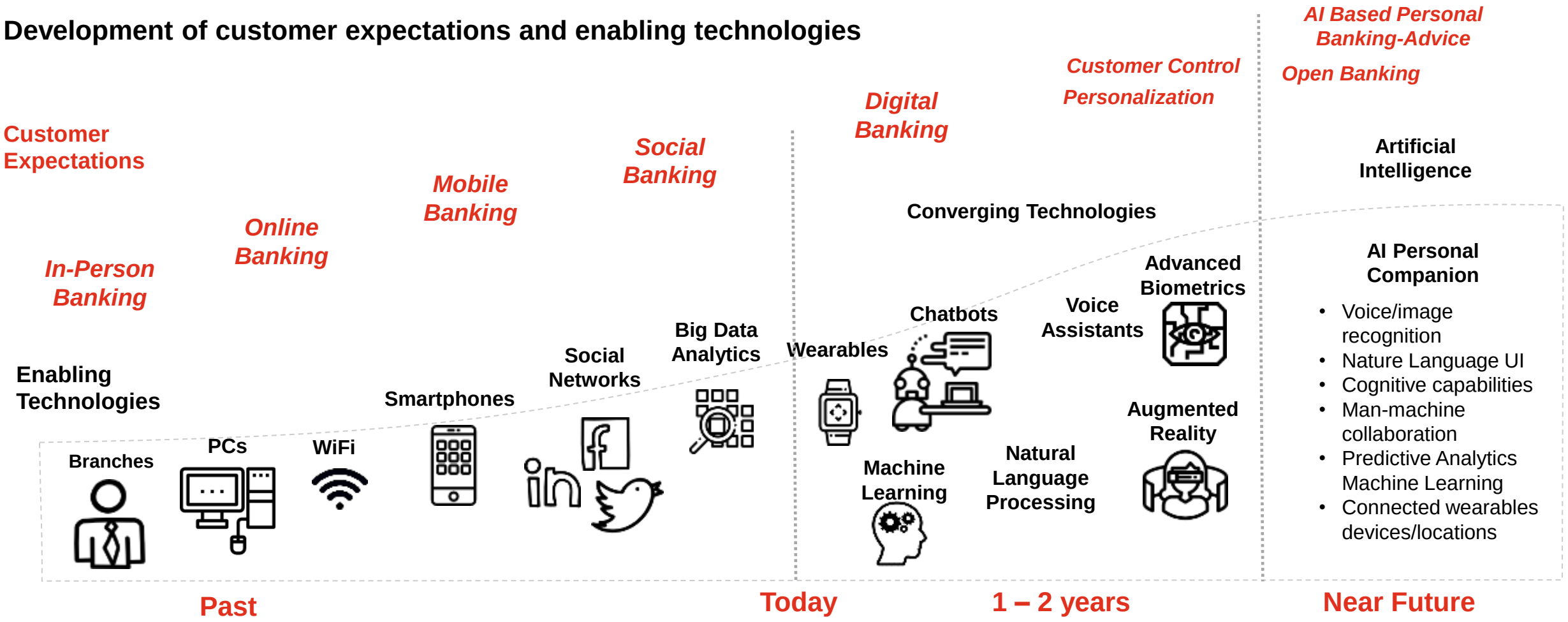
Industries with the Greatest Potential

- Manufacturing and Industrial
- Smart Cities
- Automotive, Fleet, and Telematics
- Utilities

80% of IoT-based economic benefit expected by 2020
- Machina Research

1. Source: Industrial Internet of Things: Unleashing the Potential of Connected products and Services. World Economic Forum. January 2015

AI and Machine Learning to reshape how banks do business



Artificial Intelligence - Potential Applications

- *Customer segmentation*
- *Up-sell and Cross-sell scoring*
- *Churn reduction*
- *Demand forecasting*
- *Channel profitability models*
- *Cost of Acquisition models*
- *Sentiment analysis*
- *Resource Capacity utilization*
- *Portfolio risk measures*
- *Compliance Alerts and Indicators*
- *Fraud detection and prevention*
- *Business profitability models*

What is Robotics Process Automation (RPA)

Robotic process automation (RPA) is the application of technology that allows employees in a company to configure computer software or a "**robot**" that sits on top of existing systems and interprets existing applications to perform tasks normally performed by a human, using rule-based processes.

The Institute for Robotic Process Automation (IRPA)

As a non-intrusive, technology agnostic and high reusable capability, robotic automation can take a number of forms and work across many different technologies.

Key characteristics to distinguish it from traditional automation include:

Simulation

It mimics the actions that a person would take while using a computer for a process.

Connectivity

Performing work like a person, it can use multiple systems without the need for costly IT integration.

Repetition

Rule-based processes can be repeated consistently and indefinitely without mistakes.

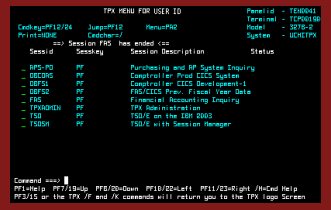
Software-based

Running on basic infrastructure or a PC, it is much simpler and faster to deploy than traditional IT solutions.

What is the OPPORTUNITY ?

Paper Based Transactions

Broken IT Systems



Complex Legacy Systems

Exceptions Transaction and Judgmental Decision

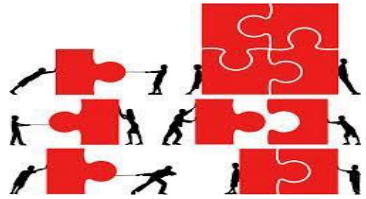
Unstructured Information

Resulting in Repetitive Manual Processes

Data Entry

Hoping across multiple screens to read or update relevant customer details

Verification, validation and comparison of data across multiple sources



Decision making Rule or Judgment

Letter Generation and Email communications

What does RPA deliver and where does it sit in the Digitization agenda?

RPA is just one of your options for digitization

RPA is…

- Configurations that automate manual, repeatable tasks
- Algorithms that solve specific problems
- Software 'robots' that plug into, and access, existing business software
- Workflow enabled interaction

RPA is not…

- A humanoid robot
- Something that can entirely replace humans
- Something that replicates human cognitive functions… yet
- Purely just another cost play

RPA - Demand and Forecast

Why enterprises want automation?

Digital Agenda

Introduce new products, services, with a focus on fast experience.

New Ways of Working

Disruption of traditional operating models with agility

Scale and Efficiency

Improve efficiency and operational excellence to support scale and speed

Legacy Platforms

Resolve heavy reliance on a complicated landscape of legacy systems and processes

What will RPA achieve?

45% of roles

Will be **able to be automated** to some degree in the near future

24/7

the virtual workforce RPA creates is **flexible, scalable and always on**

300%

Typical ROI for organisations that implement **RPA**

In the top 5

RPA has been rated **a top 5 opportunity** for **C-levels** in large organisations

5:1

Ratio of the work **one robot can do compared to a human** colleague

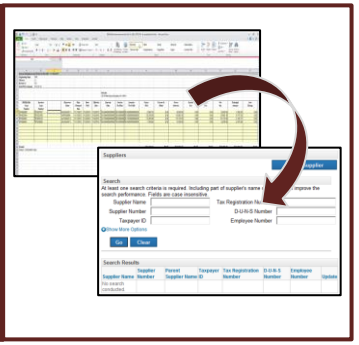
Not just $

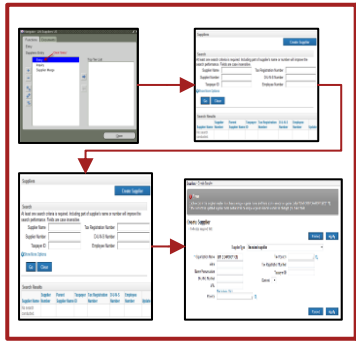
RPA reduces **errors**, **security risks** and increases **value added activities**

Activities software Robots do well

Data entry/extract in multiple systems

- Access multiple programs (e.g. Excel and Oracle)
- Find record information from Excel based on a set of criteria
- Copy and paste information into Oracle



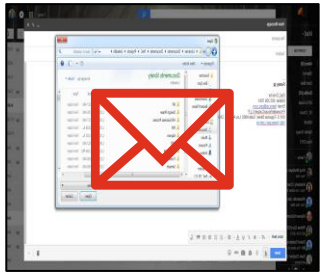


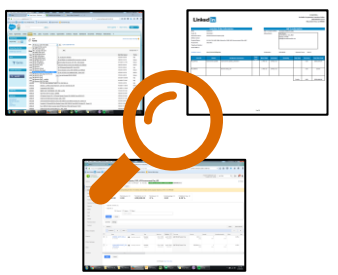
Data entry within in same system

- Complete data entry with navigation through a series of screens
- Go to multiple screens to collect information and summarize it

Notifications

- Send email notifications with proper attachments after an activity is completed based on pre-defined rules and time
- Monitoring of email box to trigger activities
- Contact users via Hangouts or Sametime



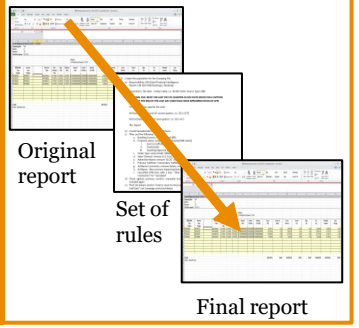


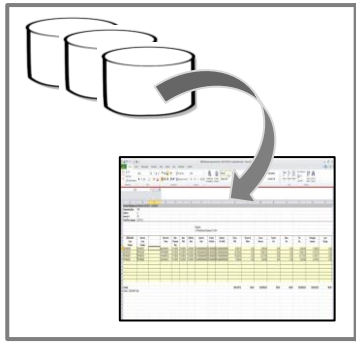
Data validation in multiple systems / OCR

- Identify fields in multiple systems and conduct data validation
- Optical Character Recognition (OCR) technology to extract fields from PDF and scans

Data manipulation / calculation / formatting

- Perform data clean up based on pre-defined rules which include getting input from various systems
- Calculate and format final financial report





Access databases and systems via APIs

- Bots can not only interact with systems like we do (with a keyboard and mouse) but also at a more technical level, like a computer

Types of RPA

Assisted

- Partial automation with additional user input
- RPA bot completes half of a form, while the user completes the other half

Unassisted

- End-to-End Robotic Automation of the business process with User scheduling and managing workloads
- RPA bot completes the whole form and the user pushes the form to the next step in the business workflow

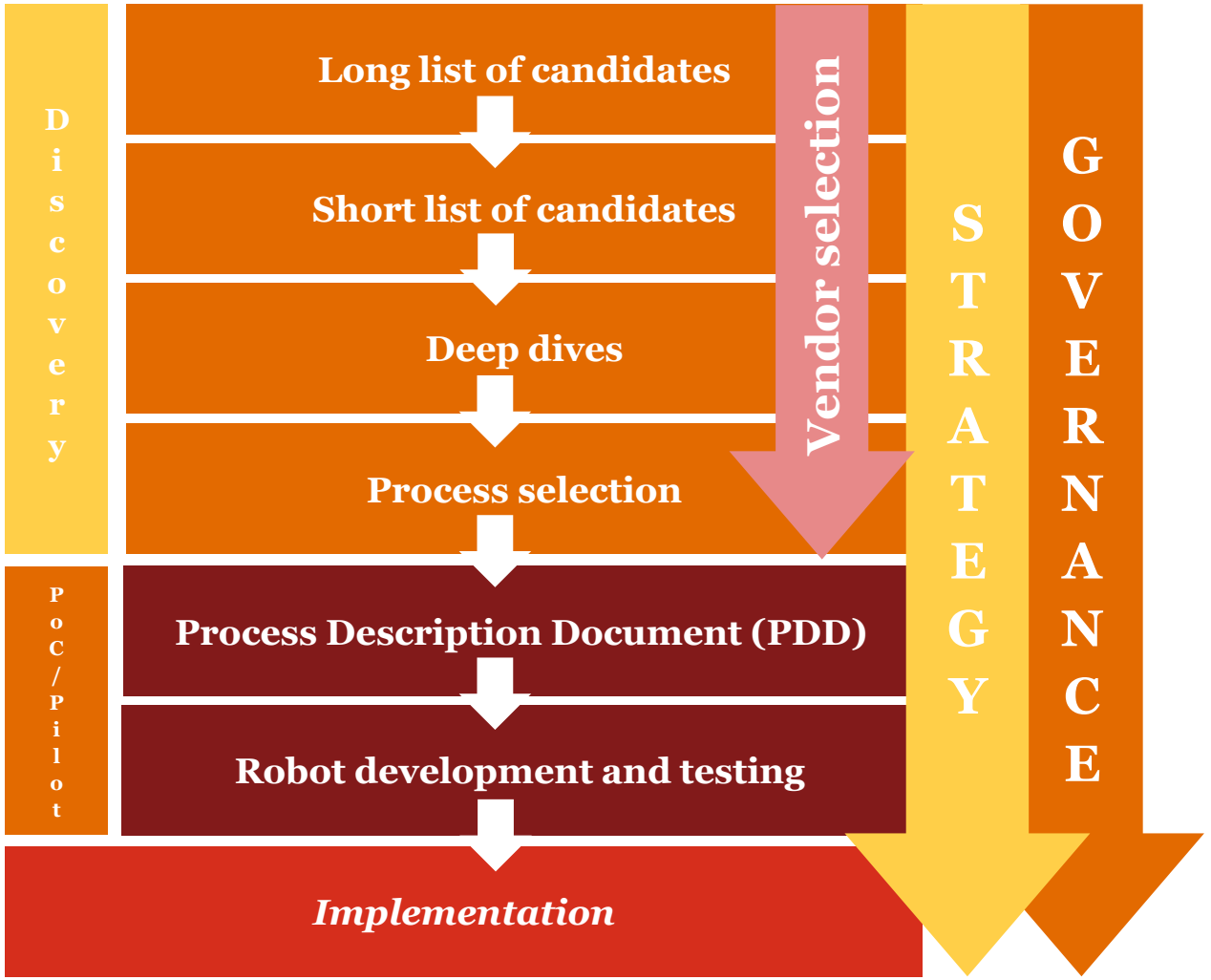
Autonomous

- End-to-End Robotic Automation with scheduling and control managed by another robot
- RPA bot completes the whole form and another bot pushes the form to the next step

Cognitive

- End-to-End automation of tasks that involve judgement and artificial learning
- RPA bot completes the whole form and another bot pushes the form to the next step, while learning throughout the process

RPA Project Life Cycle for Business Analyst



Robotics Process Automation - Potential Applications

Health Care

- *Billing and claims processing*
- *Patient referral system*
- *Insurance processing*
- *Patient care management*
- *Patient scheduling*
- *Revenue cycle management*

Telecommunication

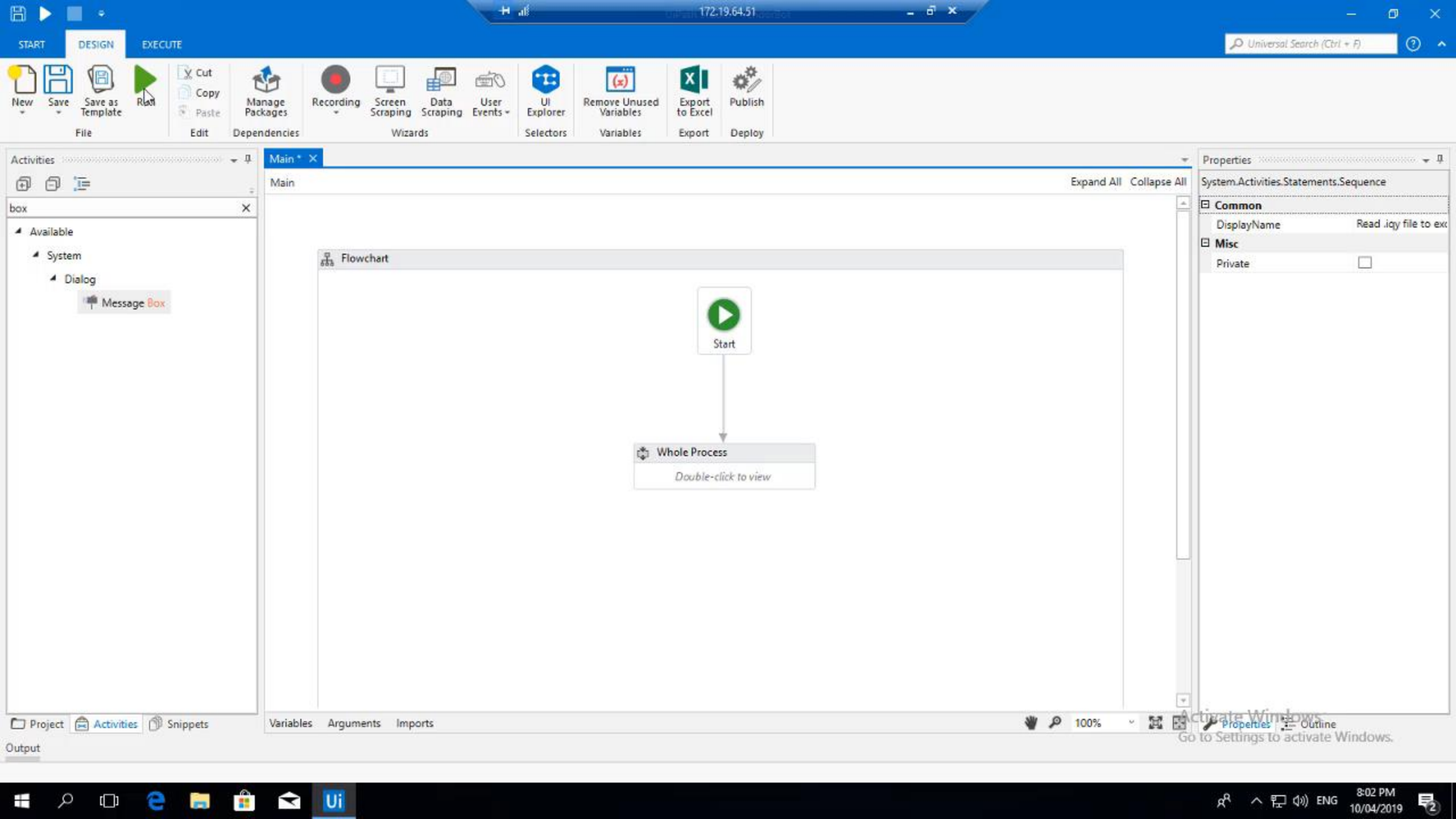
- *Number allocation and claims processing*
- *Billing queries and dispute management*
- *Revenue assurance*
- *Turn-up, configuration, and complete service testing*

Financial Institutions

- *Customer on boarding*
- *Know your customer (KYC)*
- *Tax status*
- *Exchange rate calculations*
- *Bank reconciliations*
- *Customer Communications (chat bots, email agents)*

Energy and Utilities sector

- *Meter reading applications*
- *Billing applications*
- *Customer records management*
- *Demand response applications*
- *Smart grid applications*
- *Compliance based applications*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DESIGN
EXECUTE
Universal Search (Ctrl + F)
New
Save
Save as Template
Run
Cut
Copy
Paste
Manage Packages
Recording
Screen Scraping
Data Scraping
User Events
UI Explorer
Remove Unused Variables
Export to Excel
Publish
File
Edit
Dependencies
Wizards
Selectors
Variables
Export
Deploy
Activities
box
Available
System
Dialog
Message Box
Main *
Main
Expand All
Collapse All
Flowchart
Start
Whole Process
Double-click to view
Properties
System.Activities.Statements.Sequence
Common
DisplayName
Read .iqy file to exc
Misc
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Project
Activities
Snippets
Variables
Arguments
Imports
100%
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Output
Activate Windows
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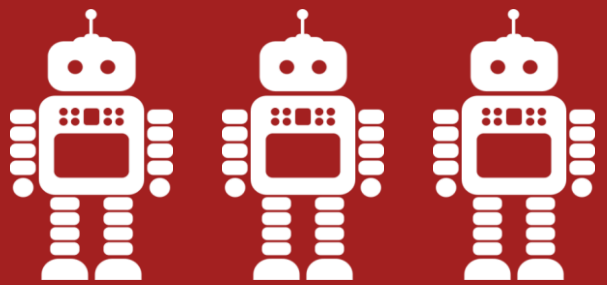
10/04/2019

In the end

"Everything that can be automated, will be automated."



Shoshana Zuboff