Robotics & Artificial Intelligence / Machine Learning
Unlocking the Automation Prize in Finance

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Digital Transformation and technological advancements

Major technologies being adopted include the following:
Digital Transformation and technological advancements

63% are investing in new technologies to enhance existing products/services

44% are concerned about the speed of technology change

63% are hiring, but struggle to find the right skills

28% who are planning to reduce headcount attribute it to automation or other technologies
Data is the new oil, and intelligent information is the new currency.

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

“The ability of a machine to replicate intelligent human behavior”

AI – Everywhere & Anywhere
### 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 | Electronic retailers are using extensive transactional and behavioral customer data to offer them new ways of trying, experiencing and purchasing their products | 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 |
**AI is becoming an essential component for enabling analytics maturity**

<table>
<thead>
<tr>
<th>Analytics Maturity Spectrum</th>
<th>Benefits of AI</th>
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<tbody>
<tr>
<td>Backward-looking</td>
<td>- Descriptive and diagnostic analytics can be enabled with <strong>assisted intelligence</strong> by using AI to uncover patterns in large, complex datasets</td>
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<tr>
<td>Diagnostic Analytics</td>
<td>- AI also is pivotal for tapping into unstructured data sources such as text, audio, video, and images</td>
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<tr>
<td>Forward-looking</td>
<td>- Predictive and prescriptive analytics can be enhanced with <strong>augmented intelligence</strong> to provide deeper insight into the implications of decision making</td>
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<tr>
<td>Predictive Analytics</td>
<td>- Useful techniques include agent-based simulation, reinforcement learning, etc.</td>
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<tr>
<td>Prescriptive Analytics</td>
<td>- Adaptive analytics are driven by <strong>autonomous intelligence</strong></td>
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<tr>
<td>Adaptive &amp; Autonomous Analytics</td>
<td>- AI learns with new information over time</td>
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**Increasing Sophistication & Impact**

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

<table>
<thead>
<tr>
<th>Automated Intelligence</th>
<th>Assisted Intelligence</th>
<th>Augmented Intelligence</th>
<th>Autonomous Intelligence</th>
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<tbody>
<tr>
<td>Automation of repetitive tasks that include both manual and cognitive aspects</td>
<td>AI techniques enhance the efficiency of activities across the business value chain, but machines do not dynamically adapt to changing data</td>
<td>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</td>
<td>AI techniques used by businesses to automate the decision making process with the absence of human intervention</td>
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</table>

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**

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

<table>
<thead>
<tr>
<th>Input Data</th>
<th>Algorithm</th>
<th>Output</th>
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**Machine Learning**

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

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<th>Output</th>
<th>Algorithm</th>
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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.

**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

Amtrak created a chatbot to extend telephone based customer service support

Natural-Language Processing

+25% more online bookings

+30% revenue per booking

+50% user engagement growth

Hi, I'm Julie, the Amtrak automated Virtual Travel Assistant. For help on our website, type your question or keyword below.

Not to brag, I have proven very successful to Amtrak. I bring significant savings while engaging with you almost like a real human being :)

It was nice chatting with you. Enjoy the rest of this Day of Learning session and hope you learn something new today!

Helps customers find information on:

- Making a reservation
- Amtrak's rewards program
- Finding station and route information
- A variety of other areas
Predictive Maintenance & IoT – Anomaly Detection

Anomaly detection techniques on sensor data, together with text log files and large-scale machine learning is facilitating predictive maintenance of critical equipment.

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

AI and Machine Learning to reshape how banks do business

Development of customer expectations and enabling technologies

**Customer Expectations**

**Enabling Technologies**

**In-Person Banking**

**Online Banking**

**Mobile Banking**

**Social Banking**

**Digital Banking**

**Converging Technologies**

**Artificial Intelligence**

**AI Based Personal Banking-Advice**

**Open Banking**

**Customer Control Personalization**

**Past**

**Today**

**1 – 2 years**

**Near Future**

**Client Control**

**Big Data Analytics**

**Wearables**

**Chatbots**

**Voice Assistants**

**Advanced Biometrics**

**Augmented Reality**

**Machine Learning**

**Natural Language Processing**

**In-Person Banking**

**Branches**

**PCs**

**WiFi**

**Smartphones**

**Social Networks**

**Social Banking**

**AI Personal Companion**

- Voice/image recognition
- Nature Language UI
- Cognitive capabilities
- Man-machine collaboration
- Predictive Analytics
- Machine Learning
- Connected wearables devices/locations
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.

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

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

**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**

<table>
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<tr>
<th>Basic</th>
<th>Automation</th>
<th>High</th>
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<tr>
<td>Natural Language Processing (NLP)</td>
<td>Algorithmic Business</td>
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**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
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

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

Scale and Efficiency
Improve efficiency and operational excellence to support scale and speed

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

- Long list of candidates
- Short list of candidates
- Deep dives
- Process selection
- Process Description Document (PDD)
- Robot development and testing
- Implementation
- Vendor selection

Discovery

Governance

Strategy
Robotics Process Automation - Potential Applications

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

**Health Care**
- 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
In the end

“Everything that can be automated, will be automated.”

Shoshana Zuboff