“The banks that don't invest in AI will lose ground and will have a long, difficult catchup process”

Daniel Pinto
JPMorgan co-president
# Content

01 What is Artificial Intelligence? .................................................. 04
02 AI at a glance ........................................................................... 05
02 AI in Banking ........................................................................... 10
03 AI Utilization ........................................................................... 12
04 AI Application .......................................................................... 14
05 Financial Impact of AI .............................................................. 15
06 Venture Capital Investments in AI ............................................. 16
07 Global Leadership in AI ............................................................ 17
08 AI Challenges in 2018 .............................................................. 18
09 Artificial Intelligence in Saudi Arabia ....................................... 19
10 Final Thoughts ........................................................................... 21
11 About UCG .............................................................................. 22
What is Artificial Intelligence?

Artificial Intelligence (AI) refers to technologies capable of performing tasks that normally require human intelligence. AI applications such as video suggestions, product recommendations, spam filters and navigation systems have already become part of our day-to-day lives.

Artificial Intelligence Domains

Cognitive Automation is based on software bringing intelligence to information-intensive processes such as handwriting recognition tools.

Cognitive Engagement refers to engaging in effortful tasks with purposiveness and strategy use making cognitive investment in learning, and engaging in metacognition and self-regulated learning (e.g., voice recognition automated systems, gamification).

Cognitive Insights allow to detect real time key patterns and relationships from large amount of data across multiple sources to derive deep and actionable insights.

Sources: Deloitte (2017)
Artificial Intelligence at a glance:

Revenues from the AI market worldwide from 2016 to 2025 (in U.S. MM)

<table>
<thead>
<tr>
<th>Year</th>
<th>2016</th>
<th>2017*</th>
<th>2018*</th>
<th>2019*</th>
<th>2020*</th>
<th>2021*</th>
<th>2022*</th>
<th>2023*</th>
<th>2024*</th>
<th>2025*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>3,222</td>
<td>4,819</td>
<td>7,345</td>
<td>11,284</td>
<td>17,268</td>
<td>25,996</td>
<td>37,987</td>
<td>53,231</td>
<td>70,972</td>
<td>89,847</td>
</tr>
</tbody>
</table>

Growth of the AI market worldwide from 2017 to 2025

<table>
<thead>
<tr>
<th>Year</th>
<th>2017*</th>
<th>2018*</th>
<th>2019*</th>
<th>2020*</th>
<th>2021*</th>
<th>2022*</th>
<th>2023*</th>
<th>2024*</th>
<th>2025*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year-on-year growth</td>
<td>149.58%</td>
<td>152.42%</td>
<td>153.62%</td>
<td>153.03%</td>
<td>150.54%</td>
<td>146.13%</td>
<td>133.33%</td>
<td>126.6%</td>
<td></td>
</tr>
</tbody>
</table>

Sources: Statista, Tractica
Artificial Intelligence at a glance:

Robotic/intelligent process automation (RPA/IPA) and AI automation spending worldwide from 2016 to 2021 by segment (in U.S. Bn)

<table>
<thead>
<tr>
<th>Year</th>
<th>Robotic process automation</th>
<th>Intelligent process automation</th>
<th>AI business operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>0.7</td>
<td>4.8</td>
<td>0.3</td>
</tr>
<tr>
<td>2017*</td>
<td>1.1</td>
<td>6.2</td>
<td>0.4</td>
</tr>
<tr>
<td>2018*</td>
<td>1.6</td>
<td>7.5</td>
<td>0.6</td>
</tr>
<tr>
<td>2019*</td>
<td>2.0</td>
<td>8.9</td>
<td>0.8</td>
</tr>
<tr>
<td>2020*</td>
<td>2.4</td>
<td>10.2</td>
<td>1.0</td>
</tr>
<tr>
<td>2021*</td>
<td>2.7</td>
<td>11.5</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Cumulative revenue of top 10 use cases/segments of AI market worldwide, between 2016 and 2025 (in U.S. MM)

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Revenue (MM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine/vehicular object detection/identification/avoidance</td>
<td>8,987</td>
</tr>
<tr>
<td>Static image recognition, classification, and tagging</td>
<td>7,643</td>
</tr>
<tr>
<td>Patient data processing</td>
<td>7,259</td>
</tr>
<tr>
<td>Algorithmic trading strategy performance improvement</td>
<td>6,394</td>
</tr>
<tr>
<td>Localization and mapping</td>
<td>5,951</td>
</tr>
<tr>
<td>Predictive maintenance</td>
<td>5,714</td>
</tr>
<tr>
<td>Prevention against cybersecurity threats</td>
<td>5,385</td>
</tr>
<tr>
<td>Converting paperwork into digital data</td>
<td>5,371</td>
</tr>
<tr>
<td>Year-on-year growth</td>
<td></td>
</tr>
<tr>
<td>Intelligent recruitment and HR systems</td>
<td>5,295</td>
</tr>
<tr>
<td>Medical image analysis</td>
<td>5,111</td>
</tr>
</tbody>
</table>

Sources: Statista, Tractica
Artificial Intelligence at a glance:

Revenues from the artificial intelligence for enterprise applications market worldwide, from 2016 to 2025 (in U.S. MM)

Sources: Statista, Tractica

Revenues from the artificial intelligence market worldwide, from 2016 to 2025, by region (in U.S. MM)
Artificial Intelligence at a glance:

Size of the chatbot market worldwide, in 2016 and 2025 (in U.S. MM)

![Chart showing the size of the chatbot market worldwide, with projections for 2025.]

Total funding of startup companies working in the artificial intelligence (AI) market worldwide, as of March 2016, by category (in U.S. Bn)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine learning (applications)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.66</td>
</tr>
<tr>
<td>Natural language processing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.52</td>
</tr>
<tr>
<td>Computer vision (general)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.49</td>
</tr>
<tr>
<td>Machine learning (general)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.39</td>
</tr>
<tr>
<td>Smart robots</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.33</td>
</tr>
<tr>
<td>Computer vision (applications)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.24</td>
</tr>
<tr>
<td>Virtual personal assistants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.22</td>
</tr>
<tr>
<td>Gesture control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.19</td>
</tr>
<tr>
<td>Speech recognition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.12</td>
</tr>
<tr>
<td>Recommendation engines</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.05</td>
</tr>
<tr>
<td>Video content recognition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.03</td>
</tr>
<tr>
<td>Context aware computing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.02</td>
</tr>
</tbody>
</table>

Sources: Statista, Tractica
Artificial Intelligence at a glance:

Industries targeted by big data analytics application developers, as of 2016

- Internet of Things (IoT) 15.1%
- Professional, scientific, and technical services (non-
- Telecommunications 10%
- Manufacturing (non-computer related) 9.6%
- Finance or insurance 9.4%
- Arts, entertainment, and recreation 6.2%
- Medical and health-care 5.3%
- Retail/wholesale 5.3%
- Education/academic 4.1%
- Government (non-military) 3.8%
- Transportation - other than automotive 3.8%
- Utilities/energy 3.8%
- Automotive 3%
- Robotics 3%
- Construction/heavy industrial 2.8%

Sources: Statista, Forbs
AI in Banking

Machine Learning and Natural Language Processing (NLP) are two main components of AI used in Financial Industries

Machine Learning

- A sequence of algorithms to solve a problem which optimizes automatically through experience.
- Machine learning technology provides insights about data without needing to pre-program algorithms.
- Machine learning deals with (automated) optimization, prediction and categorization.

Natural Language Processing

- NLP allows computers to analyze structured and unstructured data, such as images, audio, and text.
- This allows firms to automate service functions previously requiring manual intervention.

Key Industry Drivers

Computing Power
80% of the recent advances in AI are due to Increase in computing power

Growth of Data
Growing at a rate of 40% & expected to reach 44tr gigabytes by 2020

Rise in corporate VC investment
VC Funding in AI increased by 80%

Open Source Platforms
Google, OpenAI, Facebook, Baidu

Sources: Statista
AI in Banking

Banks do not realize the potential of more than 80% of the total data collected.

Credit Underwriting
• Speeding up lending decisions while potentially limiting incremental risk.
• Analyzing structured, semi-structured, and unstructured data.
• Overcoming the historical credit barrier enables banks to broaden lending portfolios.

Anti- Fraud and Risk
• Real-time sensing and improved ability to spot anomalies.
• Ability to learn from an AI-identified suspicious activity to enhance transaction monitoring and KYC (Know Your Customer) platforms.

Automation of client interaction
• Virtual assistants called Chatbots that help customers transact or solve problems.
• Using natural language processing enables mobile apps and ATM machines to interact by Sight, voice, and text.
• Generating customer insights used for personalizing communication, advice, offers and services.
• The increasing usage of chatbots is correlated with the increased usage of messaging applications. Meanwhile 83% of the Saudi population uses messaging applications.
• Over 70% of bank consumers in Saudi Arabia are digitally self-directed or multichannel.

Nearly the top 20% of back-office work accounts for 85% of the cost.

85% of customer interactions are expected to be automated by 2020.

Source: Gartner, Oracle, Mckinsey
## AI Utilization

### The wealth of data makes finance industry perfect for the use of AI

Even though the rapid growth of robo-advisors is a good example of the increased penetration of AI in the wealth management industry, it represents only the very basic model of the technology’s potential.

<table>
<thead>
<tr>
<th>Wealth management use of AI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kensho (Goldman Sachs)</strong></td>
</tr>
<tr>
<td>• It uses machine learning to help find correlations responsible for movements in stock and currency prices.</td>
</tr>
<tr>
<td>• Answers questions such as “How do defense stocks react to terrorism incidents in Europe?” or “How do populist votes affect local currencies?”.</td>
</tr>
</tbody>
</table>

| **Sqreem (Wells Fargo, BlackRock, UBS, and Deutsche Bank)** |
| • It uses deep learning to analyze data on people’s digital activity to predict which products and services they’re most likely to want. |
| • Protects companies against financial crimes through algorithms that can detect anomalies relating to illicit behavior. |

| **Aladdin (BlackRock)** |
| • It is based on open source technology and uses NLP to analyze large volumes of data from documents such as news stories and broker reports. |
| • Analyses data on trade activity in order to detect complex patterns and predict the transactions most likely to fail. |
| • It can also gather satellite images, to see how full a retailer’s parking lot is and then correlate that data to the company’s revenue and stock price. |

| **Bridgewater Associates** |
| • The world’s largest hedge fund is building an AI engine to automate the entire functioning of the company and eliminate human emotional volatility. |
| • Called the “Book of the Future” the system is being run by David Ferrucci, one of the leading developers on IBM’s Watson computer. |

Sources: Statista,
## AI Utilization

*The wealth of data makes finance industry perfect for the use of AI*

Chatbots will be responsible for over **$8 billion** annual cost savings by **2022**.

### Front office use of AI

<table>
<thead>
<tr>
<th>Bank</th>
<th>Description</th>
</tr>
</thead>
</table>
| JPMorgan | • Using machine learning to analyze legal documents and to extract important data points and clauses through a platform named **COiN**.  
  • Extracting 150 relevant attributes from 12,000 annual commercial credit agreements in seconds.  
  • Saving 360,000 hours per year under manual review. |
| Bank of America | • An assistant chatbot called **Erica** to help clients through text and voice via mobile application .  
  • Pay bills and send money to friends and family.  
  • Provide credit report updates, provide balance information, and suggest how to save money |
| OCBC Bank (Singapore) | • Home and renovation loan chatbot Named **Emma**.  
  • Available on desktops, laptops and smart mobile devices.  
  • Three months of development to fully address customer questions.  
  • Closed $70 million in home loans in eleven months. |
| Hang Seng Bank (Hong Kong) | • **HARO** and **DORI**, two chatbots communicating in Chinese and English.  
  • HARO handles general inquiries about the bank’s products and services via online and mobile application.  
  • DORI is in charge of searching dining discounts and making recommendations, through Facebook messenger application. |

Source: JPMorgan, Juniper, Bank of America
**AI Applications**

Artificial intelligence application across financial services

Fintech AI Applications

<table>
<thead>
<tr>
<th>More Mature</th>
<th>Payment</th>
<th>Banking</th>
<th>Capital Markets</th>
<th>Investment Management</th>
<th>Insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Mature</td>
<td>Chatbots</td>
<td>Voice Assistant</td>
<td>Authentications and Biometrics</td>
<td>Monitoring</td>
<td>Anti-Fraud and Risk</td>
</tr>
<tr>
<td>Front Office</td>
<td>Complex Legal &amp; Compliance Workflow</td>
<td>Credit Underwriting</td>
<td>Alternative Data in trading and Asset Management</td>
<td>Risk Underwriting</td>
<td>Smart Contract Infrastructure</td>
</tr>
<tr>
<td>Middle Office</td>
<td>Back Office</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Customer comfort with AI chatbot service worldwide 2017, by service

![Customer comfort chart](chart)

Source: Autonomous, Statista
Financial Impact of AI

Financial Industries represent upwards of $1 trillion in projected cost savings

In the US, 2.5 million financial services employees are exposed to AI technologies in front, middle and back office

2.5 M Employees

<table>
<thead>
<tr>
<th>Employees</th>
<th>Industry</th>
<th>Front office</th>
<th>Middle office</th>
<th>Back office</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 M</td>
<td>Banking industry</td>
<td>70%</td>
<td>10%</td>
<td>20%</td>
</tr>
<tr>
<td>460 K</td>
<td>Investment Management industry</td>
<td>75%</td>
<td>10%</td>
<td>15%</td>
</tr>
<tr>
<td>865 K</td>
<td>Insurance industry</td>
<td>43%</td>
<td>35%</td>
<td>32%</td>
</tr>
</tbody>
</table>

Source: Autonomous
**Venture Capital Investments in AI**

*Ten-fold investment growth in the last five years.*

### Market Impact

- Fintech and Insurance are emerging as the hottest category of AI, having recorded over 30 deals according to Q1’17.
- Three-fourths of every invested dollar is going to a subsector that has strong credentials to serve the financial services industry.

### Global Investments

- In 2017, the US remained the most attractive region for VC funding in AI.
- Driven by China, Asia has also emerged as an exciting region.
- In 2017, Asia managed to surpass Europe by funding volume.

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Source: Deloitte, Statista, CB insight
Global Leadership in AI

U.S. still has the highest number of AI startups, but China secured more funding in 2017

Leading Countries in AI

• U.S. dominates globally in terms of number of AI startups and total equity deals, but gradually losing its global deal share.
• China Promoting AI plan across sector like agriculture, logistics, and military applications, with a main focus on facial recognition and AI chip technologies.
• Taking the patent activity as a measure of R&D effort, Chinese patents published are 6x what they are in US on deep learning.

China’s rise in AI Industry

• 9% of global deal share in 2017
• Accounted for 11.3% of global AI startups equity funding share in 2016.
• In 2017 the equity funding share increased to 48%.
• Surpassing the U.S. share of funding of 38% for the first time.
• The Chinese government plans to reach parity with US on AI by 2020 and become the world leader by 2030

Source: CB insight
## AI Challenges in 2018

**Considering the progress of Artificial Intelligence, it is still in the nascent stages for a number of challenges**

### Issues with AI implementation
- Hyper optimism: leading teams to work without clear ROI aiming towards impossible goals.
- Difficulty of identifying the areas needed to work with AI vendors and identifying leading vendors.
- AI systems are as good as the data it learns from.

### Barriers to overcome
- Consumer trust
- Regulatory acceptance

### Identifying business cases for AI requires
- Deep understanding of current AI technologies
- Grasping the technology limitations
- Clear knowledge of current processes of their division

### Difficult to integrate cognitive projects with existing processes and systems

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficult to integrate cognitive projects with existing processes and systems</td>
<td>47%</td>
</tr>
<tr>
<td>Technologies and expertise are too expensive</td>
<td>40%</td>
</tr>
<tr>
<td>Managers don’t understand cognitive technologies and how they work</td>
<td>37%</td>
</tr>
<tr>
<td>Cant get enough expertise in the technology</td>
<td>35%</td>
</tr>
<tr>
<td>Technologies are immature</td>
<td>31%</td>
</tr>
<tr>
<td>Technologies have been oversold in the marketplace</td>
<td>18%</td>
</tr>
<tr>
<td>None of these</td>
<td>6%</td>
</tr>
</tbody>
</table>

Source: PWC
Artificial Intelligence in Saudi Arabia

Banks and Institutions will need to adapt with the Saudi Vision 2030

Initiatives to enable AI

- $500bn NEOM project is set to transform the Kingdom into a leading global AI innovation and trade hub.
- Saudi Federation for Cyber Security & Programming and Google co-signed final accord to establish five Google Innovation Hubs to enable Saudi tech competencies.
- MOUs and partnerships with IBM, Microsoft, Stanford university, and Ironet cybersecurities to enable Saudi human capital.
- Establishing Prince Mohammad Bin Salman College For Cyber Security, Artificial Intelligence And Adv. Technologies

Implementations of AI

- 24/7 Crowd Control of Hajj and Umrah pilgrims using computing vision to monitor and provide real-time data and analytics.
- Partnering with a British healthcare tech company Babylon to provide accessible and affordable healthcare via chatbots in the kingdom.
- 65% of CEOs in Saudi are considering the integration of basic automated business processes with AI and cognitive systems compared with 52% of CEOs from Global countries.

AI is expected to contribute $135.2bn by 2030 or 12.4% of Saudi GDP

"The fourth industrial revolution we are witnessing today will be a key factor in realizing the vision of the Kingdom 2030"

His Excellency the Minister of Communications and Information Technology Eng. Abdullah bin Amer Al-Sawah

Source: SPA, KPMG
Artificial Intelligence in Saudi Arabia

Banks and Institutions will need to adapt with the Saudi Vision 2030

UCG recommends that banks and institutions should actively work on building and executing AI adoption strategies to sustain long term growth by increasing efficiency at a lower cost rate.

Understanding Phase

1. Understand agenda and targets with a bottom up approach.
2. Assess back office use cases like credit underwriting, risk underwriting, alternative data in trading and asset management to be disrupted.
3. Assess Middle office use cases like risk mitigation, credit analysis, Compliance to be disrupted.
4. Develop AI use cases.
5. Define metric for measurements against baseline.

Designing Phase

6. Identify source data, both internally and externally to improve AI engine
7. Design to support employee tasks before fully automating systems.
8. Build, test and deploy system functionality.
9. Start learning process by training and testing the system.
10. Deploy to pilot phase with limited users.
11. Define deployment scope and plan.
12. Develop KPIs

Deployment Phase

13. Increase pilot functionality to additional users
14. Add data sources to train and improve system.
15. Monitor and assess the system performance.

Source: UCG Analysis
Final Thoughts

Policy makers & financial institutions should start exploring opportunities to use AI technology to enhance their oversight capabilities.

- Policy makers should assess options to ensure the safety and security in the sharing of data, and evaluate mechanisms to address ethical considerations, tradeoffs, and protections.
- Furthermore, the impact of AI technologies on employment, training, and education should be carefully evaluated through exploring alternative regulatory technological approaches and experimental sandboxes.
- Financial institutions can increase AI adoption rate by accelerating their efforts to implement real-time analytics capabilities to improve the process of fraud detection technologies.
- Portfolio managers should integrate AI technologies into their systems and operations to introduce automated advising services capable of making more sophisticated investment choices.
- There is an opportunity for financial institutions to develop targeted products and services by utilizing AI technologies to better understand consumer behavior and generate product recommendations to promote financial products, by recommending credit cards, investment opportunities and other products to the consumers most likely to purchase them.

Source: UCG Analysis
About UCG
United Consulting Group

About

UCG is a management and financial consulting firm that started in 2006, UCG focuses on: providing value added- measurable services to our clients. We support our clients in revenue growth, cost cutting, process improvement and capability building. UCG’s culture is built on the notation of providing practical solutions for our clients to achieve sustainable growth.

We bring both strategic and specialized functional expertise: we deliver value to organizations by breaking down silos, assessing the real issues and optimizing their business models.

Our people come from different backgrounds, but they all focus on delivering real results. Some of our specialties, include strategy & transformation, finance & investment advisory, governance, productivity management, and start-up & small business consulting.

Our Focus

UCG offers specialized services to a number of different industry sectors. Among the many covered by the company are the financial, transportation, technology, manufacturing, retail, healthcare, sports and the government sectors. Since our culture focuses on practical and achievable results, our consultants are hand picked from the industry and all of our senior members have real experience in developing or leading complex businesses in Saudi and abroad.

Specializations and Services

- Investment Advisory
  - Mergers and Acquisition
  - Fund Structuring and Management
  - Investment Advice
  - Business Valuation and Due Diligence

- Strategy and Transformation
  - Restructuring and Productivity
  - Corporate Governance
  - Financial Planning
  - Family Constitution

- Small Business Consulting
  - Market Research and Feasibility studies
  - Business Modelling and Financial Planning
  - Boot Camps
  - Coaching and Startup programs
  - Startup investment pitching
Some of our clients
Thank you