Keynote: Artificial intelligence in the public sector. Applications, scenarios, use

Victor de la Torre, Senior Research Fellow, Fujitsu
What is Artificial Intelligence?

Artificial Intelligence is defined as:

- Computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.
- Such systems have many advantages over humans which make them desirable in industry:
  - The ability to perform repetitive tasks accurately
  - Can deal with large quantities of data much quicker
  - Information does not have to be in human readable form
  - Can operate in dangerous environments.
A bit of history

A.I. TIMELINE

1950
**TURING TEST**
Computer scientist Alan Turing proposes a test for machine intelligence. If a machine can trick humans into thinking it is human, then it has intelligence.

1955
**A.I. BORN**
Term “artificial intelligence” coined by computer scientist John McCarthy to describe “the science and engineering of making intelligent machines.”

1961
**UNIMATE**
First industrial robot. Unimate goes to work at GM replacing humans on the assembly line.

1964
**ELIZA**
Pioneering chatbot developed by Joseph Weizenbaum at MIT holds conversations with humans.

1966
**SHAKEY**
The “first electronic person” from Stanford, Shakey is a general-purpose mobile robot that reasons about its own actions.

1969
**WINTER**
Many false starts and dead-ends leave A.I. out in the cold.

1997
**DEEP BLUE**
Deep Blue, a chess-playing computer from IBM defeats world chess champion Garry Kasparov.

1998
**KISMET**
Cynthia Breazeal at MIT introduces Kismet, an emotionally intelligent robot insofar as it detects and responds to people’s feelings.

1999
**AIBO**
Sony launches first consumer robot pet dog AIBO (AI robot) with skills and personality that develop overtime.

2002
**ROOMBA**
First mass-produced autonomous robotic vacuum cleaner from iRobot learns to navigate and clean homes.

2011
**SIRI**
Apple integrates Siri, an intelligent virtual assistant with a voice interface, into the iPhone 4S.

2011
**WATSON**
IBM’s question answering computer Watson wins first place on popular $1M prize television quiz show Jeopardy.

2014
**EUGENE**
Eugene Goostman, a chatbot convincingly passes the Turing Test with a third of judges believing he is human.

2014
**ALEXA**
Amazon launches Alexa, an intelligent virtual assistant with voice interaction that completes shopping tasks.

2016
**TAY**
Microsoft’s chatbot Tay goes rogue on social media making inflammatory and offensive racist comments.

2017
**ALPHAGO**
Google’s A.I. AlphaGo beats world champion Ke Jie in the complex board game of Go, notable for its vast number (2^{192}) of possible positions.

Source: Digital intelligence Today

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Some AI myths & facts

- **Myth:** Superintelligence by 2100 is inevitable
  - **Fact:** It may happen in decades, centuries or never. AI experts disagree & we simply don't know

- **Myth:** Superintelligence by 2100 is impossible
  - **Fact:** It may happen in decades, centuries or never. AI experts disagree & we simply don't know

- **Myth:** Only Luddites worry about AI
  - **Fact:** Many top AI researchers are concerned

- **Myth:** AI turning evil
  - **Fact:** It may happen in decades, centuries or never. AI experts disagree & we simply don't know

- **Myth:** AI turning conscious
  - **Fact:** It may happen in decades, centuries or never. AI experts disagree & we simply don't know

- **Myth:** Robots are the main concern
  - **Fact:** Misaligned intelligence is the main concern: it needs no body, only an internet connection

- **Myth:** AI can't control humans
  - **Fact:** Intelligence enables control: we control tigers by being smarter

- **Myth:** Machines can't have goals
  - **Fact:** A heat-seeking missile has a goal

- **Myth:** Supernaturalism is just years away
  - **Fact:** It's at least decades away, but it may take that long to make it safe

- **Actual worry:** Supernaturalism is just years away
Overview of value to customer

Outcomes of Digital Transformation

- Increased Revenue: 46%
- Strengthened Competitiveness of Products: 36%
- Improved Customer Relationships: 44%
- Transformed Business Models or Processes: 30%
- Improved Efficiency or Reduced Cost: 35%
- Improved Employee Satisfaction: 22%

Target Areas for Digital Transformation within customers surveyed, align to ‘Who’ for AI

How AI Could Help the Public Sector?

Machine learning program may be better, cheaper, faster, or more accurate than humans at tasks that involve lots of data, complicated calculations, or repetitive tasks with clear rules.
In particular

<table>
<thead>
<tr>
<th>Types of Government Problems Appropriate for AI Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resource Allocation</strong></td>
</tr>
<tr>
<td>• Administrative support is needed to speed up task completion</td>
</tr>
<tr>
<td>• Inquiry response times are long due to insufficient support</td>
</tr>
<tr>
<td><strong>Large Datasets</strong></td>
</tr>
<tr>
<td>• Dataset is too large for employees to work with efficiently</td>
</tr>
<tr>
<td>• Internal and external datasets can be combined to enhance outputs and insights</td>
</tr>
<tr>
<td>• Data is highly structured with years of history</td>
</tr>
<tr>
<td><strong>Experts Shortage</strong></td>
</tr>
<tr>
<td>• Basic questions can be answered, freeing up time for experts</td>
</tr>
<tr>
<td>• Niche issues can be learned to support experts in research</td>
</tr>
<tr>
<td><strong>Predictable Scenario</strong></td>
</tr>
<tr>
<td>• Situation is predictable based on historical data</td>
</tr>
<tr>
<td>• Prediction will help with time-sensitive responses</td>
</tr>
<tr>
<td><strong>Procedural</strong></td>
</tr>
<tr>
<td>• Task is repetitive in nature</td>
</tr>
<tr>
<td>• Inputs/outputs have binary answer</td>
</tr>
<tr>
<td><strong>Diverse Data</strong></td>
</tr>
<tr>
<td>• Data includes visual/spatial and auditory/linguistic information</td>
</tr>
<tr>
<td>• Qualitative and quantitative data needs to be summarized regularly</td>
</tr>
</tbody>
</table>

There will be a shift in the tasks executed by the current workforce towards a value-driven approach. New skills will be required, more value will be created.
How much savings can AI in government generate?

**High investment**
(Tasks speed up by 200%)

- Hours freed: 1.2 billion hours
- Potential savings: $41.1 billion

**Low investment**
(Tasks speed up by 20%)

- Hours freed: 96.7 million hours
- Potential savings: $3.3 billion

**Person-hours per year for task**

| Time | 7 | 5 |

O*NET program has been surveying workers on how much time is devoted to each task.

Observing the same tasks at two different points in time shows changes in labor allocated to that task.

Source: https://www2.deloitte.com/content/dam/insights/us/articles/3832_AI-augmented-government/figures/3832_fig1.png
Super-empowered workers

Automation frees up 25% of labor hours for more complex tasks

Cognitive insights allow workers to be more productive and effective, extending their abilities

The result: A super-empowered worker!

Zinrai: an End to End Offering

Fujitsu Zinrai is a full set of Artificial Intelligence Solutions and Services

- Business Solutions
  - Data Analytics
  - PaaS
  - IoT
  - Fujitsu Tech.
  - Partner Tech.

- Consulting – Co-creation – Integration – Operation

- Infrastructure
  - K5, PRIMEFLEX, 3rd Party clouds (e.g. MS Azure, AWS)
Let’s talk about some real examples
Approach to Solution Development: The Co-Creation Model

**Ignite**
Working with sponsors to define business outcomes sought and potential areas for Co-creation

**Focus**
Agreeing the scope of innovation activity linked to a challenge faced by the business

**Imagine**
Understand the challenge and identify ‘crowdsource’

**Explore**
Crowdsource ideas for solutions

**Select**
Prioritize and evaluate ideas

**Prototype**
Run a Proof of Concept or Pilot
Fast implementation with XpressWay

- Business case validated early to confirm **business benefits**
- Quick and simple to prove for any potential use case
- Low risk phased rollout
- Continuous improvement through proactive support.

- **Candidate Use Case Identification**
- **Outline Business Case**
- **Configuration & Test**
- **Pilot**
- **Step 1: Feasibility study (~1 week)**
- **Step 2: Proof of Value (~3-4 weeks)**

**Discover**

- **Evolve**
- **Apply**
- **Prove**

- **Continuous Improvement**
- **Adapt & Extend**
HIKARI. Intelligent Healthcare

Co-creation example with two Public hospitals in Spain
San Carlos hospital

- Main University Hospital of Madrid
- ~ 5,000 professionals
- ~ 950 beds,
  - ~ 35,000 inpatients/year
- ~ 400 consultation rooms,
  - ~ 880,000 outpatients/year
Initial focus on mental health

Years lived with disability (YLDs)

- Neuropsychiatric disorders rank as the first cause of years lived with disability (YLD) in Europe, accounting for 36.1% of those attributable to all causes.

  - Unipolar depressive disorder ... 11% of all YLD, the leading chronic condition in Europe.
  - Alcohol-related disorders rank third in Europe ... 6.4% of all YLD.
  - Anxiety disorders rank sixth .... 4% of all YLD.
HIKARI Technologies

Natural Language Processing & conversational interfaces

Machine and Deep Learning models

Image recognition
San Carlos Hospital Trial

- 30 Patients
- 5 Doctors
- 33,251 Patients in total
- FLE Knowledge Graph Model v1.0
- Accuracy
  - Suicide Risk 0.83
  - Alcohol 0.83
  - Cannabis 0.87
  - Cocaine 0.97

ML/DL models tested in a field trial
<table>
<thead>
<tr>
<th>ID</th>
<th>Age</th>
<th>Gender</th>
<th>Diagnosis</th>
<th>Risks</th>
<th>Behaviors</th>
</tr>
</thead>
<tbody>
<tr>
<td>20084397</td>
<td>65</td>
<td>Female</td>
<td>Comorbidities: obesity, hypertension, dyslipidemia</td>
<td>No known complications</td>
<td>None</td>
</tr>
<tr>
<td>20061596</td>
<td>25</td>
<td>Male</td>
<td>Hypertension, hypercholesterolemia</td>
<td>No known complications</td>
<td>None</td>
</tr>
<tr>
<td>20023076</td>
<td>23</td>
<td>Male</td>
<td>Hypertension, hypercholesterolemia</td>
<td>No known complications</td>
<td>None</td>
</tr>
<tr>
<td>20033747</td>
<td>50</td>
<td>Male</td>
<td>Comorbidities: obesity, hypertension, dyslipidemia</td>
<td>No known complications</td>
<td>None</td>
</tr>
<tr>
<td>21034270</td>
<td>51</td>
<td>Female</td>
<td>Hypertension, hypercholesterolemia</td>
<td>No known complications</td>
<td>None</td>
</tr>
<tr>
<td>21028685</td>
<td>36</td>
<td>Female</td>
<td>Hypertension, hypercholesterolemia</td>
<td>No known complications</td>
<td>None</td>
</tr>
<tr>
<td>21270416</td>
<td>28</td>
<td>Male</td>
<td>Comorbidities: obesity, hypertension, dyslipidemia</td>
<td>No known complications</td>
<td>None</td>
</tr>
</tbody>
</table>
What the customer says

https://youtu.be/NIDNmwYMjAE
Regtech. Artificial intelligence for regulators

- First steps into the Authorization process automation
Authorisation background

- By law, UK firms that provide financial services must be authorised or registered by the FCA, as well as some individuals in those firms.

- Who needs authorisation?
  - Financial services firms: banks, credit unions, and insurance firms.
  - Consumer credit firms
  - Investment firms
  - Benchmark administrators
  - Payment services and e-money firms
  - Innovative firms
Authorisation workflow

[Diagram showing the steps of an authorisation workflow]

Authorisation workflow

1. Firm sends application form and pays fee.
2. FCA informs firm about assigned case officer.
3. FCA checks application against internal and external regulatory information.
4. FCA applies minimum threshold conditions to firm’s business.
5. FCA makes a decision on the application: successful or unsuccessful.

https://www.fca.org.uk/firms/authorisation/process
Authorisation workflow

75000 applications 2016-17

Incoming firm application and fee

Assign case officer

Check application against internal and external information

Apply minimum threshold conditions

Make decision

Successful application

Firm / individual desists

Unsuccessful application

Subsequent application

Conditions

- Has the firm adequate financial resources?
- Was the firm already authorized by a regulator in another EEA member state?
- Approved Persons Regime
- Firm purpose
- Firm leadership
- Firm rewarding schemes
- Firm governance arrangements

https://www.fca.org.uk/firms/authorisation/process
Authorisation workflow

75000 applications 2016-17

Incoming firm application and fee

Assign case officer

Check application against internal and external information

Apply minimum threshold conditions

Make decision

Sources of information

- Information provided by the Firm
- Market research and intelligence
- Complaints data from external sources
- Previous experience with similar firms
- Interviews

Firm / individual desists

Unsuccessful application

Successful application

Subsequent application

https://www.fca.org.uk/firms/authorisation/process
Implementation challenges
Figure 14. Top barriers that impede the organization from taking advantage of digital trends

- Too many competing priorities: 41%
- Insufficient funding: 37%
- Security concerns: 32%
- Lack of an overall strategy: 31%
- Lack of organizational agility: 27%
- Insufficient technical skills: 23%
- Lack of entrepreneurial spirit, willingness to take risks: 19%
- Lack of understanding: 19%
- Lack of collaborative, sharing culture: 13%
- Legislative and legal constraints: 11%
Try to achieve digital maturity

<table>
<thead>
<tr>
<th></th>
<th>Early</th>
<th>Developing</th>
<th>Maturing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy</strong></td>
<td>Aimed at cost reduction</td>
<td>Aimed at improving customer experience and decision making</td>
<td>Aimed at fundamental transformation of processes</td>
</tr>
<tr>
<td><strong>Leadership</strong></td>
<td>Lacks awareness and skills</td>
<td>Digitally aware</td>
<td>Digitally sophisticated</td>
</tr>
<tr>
<td><strong>Workforce</strong></td>
<td>Insufficient investment</td>
<td>Moderate investment</td>
<td>Adequate investment</td>
</tr>
<tr>
<td>development</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>User focus</strong></td>
<td>Absent</td>
<td>Gaining traction</td>
<td>“Central” to digital transformation</td>
</tr>
<tr>
<td><strong>Culture</strong></td>
<td>Risk averse; disintegrated</td>
<td>Risk tolerant; accommodates innovation and collaboration</td>
<td>Risk receptive; fosters innovation and collaboration</td>
</tr>
</tbody>
</table>

Zinrai enables Digital Transformation

By selecting the right project to be enabled by Zinrai AI Approach, will pave the way of your digital transformation.
shaping tomorrow with you