Technology and Innovation: Blockchain, Robotics and Machine Learning

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Corporate & Investment Bank

J.P. Morgan
Agenda

Robotics & Machine Learning
Blockchain
Our technology platform enables new innovative capabilities

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<th>Capabilities</th>
<th>Benefits</th>
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<tr>
<td>Robotics</td>
<td>✓ Operational efficiency</td>
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<td></td>
<td>✓ Risk mitigation</td>
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<td>✓ Revenue enhancement</td>
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<td>Machine Learning</td>
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Robotics and Machine Learning can augment our employees, enabling better decision making
Robotics can increase efficiencies and free up resources

......through deployment of BoTs across various stages of complexity continuum

**Task Bots**
Can mimic human actions to help automate manual, repetitive and time consuming business processes. Task Bots are ‘best at’ rules-based tasks that rely on structured data.

**Meta Bots**
Can do everything that a Task Bot can do, but they can also be extended for complex, multi-system dependent processes.

**IQ Bots**
Can integrate with cognitive components. IQ Bots are ‘best at’ managing through fuzzy rules and recognizing patterns of semi-structured data.
Setting up your organisation to use this technology

**Governance Model**
- Governance Committee – members across technology and the business
- Business Case criteria – what processes qualify for consideration
- Prioritization Standards – what delivers the most value to the business (internal vs external)
- Controls – delivery, technology, operations, compliance and risk

**Choosing the right type of BoT using a set of qualification criteria**

- **Screen based tasks**
- **Manual data entry, copy/paste, basic calculations, script/macro replacement**
- **Cross checking to systems, websites, other data points**
- **Pulling information or documents from systems**
- **Basic decision making**
- **Maker functions**
The robotics program is already delivering...

Operational Efficiency
- Faster payment processing rates and greater accuracy
- Increase scale that gives the ability to react to change more quickly

Predictive analytics solutions
- Improved forecasting accuracy
- Better decision making
Machine Learning offers even greater potential to transform our businesses...conceptually modelled on the human brain... automating more sophisticated work bringing greater benefits

Structure of a Neuron

Structure of Artificial Neural Networks (ANN)

Contract Intelligence (COIN)

Today
Manually review hundreds of unique contracts
~ 360,000 hours per year

Tomorrow
Machine learning will enable processing beyond human scale
Near real time results
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<td>Robotics &amp; Machine Learning</td>
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<td>Blockchain</td>
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**BlockChain: Cryptocurrencies, Distributed Ledger & Smart Contracts**

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<th>Cryptocurrencies</th>
<th>Distributed Ledger</th>
<th>Smart Contracts</th>
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<td>Type of digital currency in which encryption logic is used to regulate the generation of currency and verify the transfer of funds</td>
<td>A distributed database introduced with Bitcoin which records a continuously growing transaction block with inter-linkages</td>
<td>Self executing computable contracts residing on Blockchain which can verify fulfilment of conditions and execute contracts</td>
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**Regulatory purview of Cryptocurrencies is still not clear.** Possible emergence of cryptocurrencies as settlement or exchange currencies in the medium to long terms

**Focus area for banks and financial institutions is Blockchain as a Distributed Ledger and Smart Contracts**
### Key Features

<table>
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<th>Implications</th>
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<tr>
<td>Reduced need for a trusted third-party</td>
<td>Potential for new, efficient, global transaction processing systems without central authority</td>
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<td>Trust in the veracity of ledger data is maintained by the technical protocol itself, without reliance on an external governing authority</td>
<td>Middle office processes can be simplified and further automated</td>
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<td>Distributed information</td>
<td>Efficient, near-instant value transfer</td>
</tr>
<tr>
<td>Operational risk due to IT failure or cyber attacks is reduced</td>
<td>Real time settlement reduces risk and frees capital for more efficient allocation</td>
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<tr>
<td>Prevents double-spending</td>
<td>Improved data transparency and audit trails</td>
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<tr>
<td>Ownership of tokenized digital assets can be recorded on a distributed ledger such that it is possible to verify uniqueness of the asset</td>
<td>Transactions records and logs can be accessed by clients, control functions and regulators in a streamlined process</td>
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<tr>
<td>Consistent and auditable</td>
<td>Minimization of systemic risk due to single points of failure</td>
</tr>
<tr>
<td>Distributed ledgers house all transactions within one standardized network since inception</td>
<td>Information is evenly distributed and accessible, with modern encryption standards and better data standardization</td>
</tr>
<tr>
<td>Customizable</td>
<td>Transparency and immediacy</td>
</tr>
<tr>
<td>Smart contracts can be used to model complex business logic and asset classes while maintaining verifiability of asset class specific standards</td>
<td>Transactions can independently be verified at any point in time</td>
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<td>Permissioned ledgers can capture all these features while limiting participation in the network to known entities only</td>
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**Distributed ledger technology has the potential to fundamentally change:**

- The systems, processes and infrastructure used to exchange, settle and record financial transactions
- The scope of assets available for investment, trading and custody
Market views and potential applications

Public views

“…one of the most **disruptive innovations** since the advent of the Internet”

-- McKinsey, “Beyond the Hype: Blockchains in Capital Markets”

“… a truly **new way to organize financial transactions** and information…”

-- Oliver Wyman, “Distributed Ledgers in Capital Markets”

“… **industry hype** has been unprecedented, but also generally **uncoordinated** up to this point…”

-- DTCC, “Embracing Disruption”

“… **many challenges need to be overcome**. This will take not only years but hundreds of millions if not billions of investment dollars…”

-- Tabb Group, “Blockchain Clearing and Settlement: Crossing the Chasm”

Potential applications

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<th>E-commerce &amp; Manufacturing</th>
<th>Trading Platforms</th>
<th>App Development</th>
<th>Authentication &amp; Authorization</th>
<th>Healthcare</th>
</tr>
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<td>A Smart Contract IT portal executing order fulfillments</td>
<td>Digital security trading for ownership and transfer</td>
<td>Proof of ownership of modules in app development</td>
<td>Provides digital identity that protect consumer privacy</td>
<td>Decentralized patient records management</td>
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Source: Autonomous December 2015 survey
Use Case – J.P. Morgan Network Payments

Overview

A new1 service offering—enabling any J.P. Morgan account holding client to remit funds to any other J.P. Morgan account holding client:

- In real-time
- For any supported currency
- At any time
- 365 days a year
- From any J.P. Morgan location to any J.P. Morgan location

Benefits

J.P. Morgan’s overall network position

- International representation in 32 countries
- Account services in multiple currencies
- Providing FX in 120+ currencies

Current settlement process

- Settled within prescribed cut-off times
- Subject to third party bank deductions or charges
- No confirmation of settlement to creditor
- Settlement delay
- Limited reference data

J.P. Morgan Network Payments Opportunity

- Real-time payments within J.P. Morgan Network across 32 branches
- Internal Settlement across distributed ledger network
- No Clearing/Correspondent timing restriction

Client benefits

- Near real-time settlement across entire J.P. Morgan Network
- 24 / 7 / 365 processing window
- End-to-end track and trace transparency
- Any J.P. Morgan supported currency
- Elimination of third party bank charges or deductions
- Reduced transaction fees
- Settlement assurance

1 2017+ new build
Distributed Ledger - beyond network payments

Our vision for the payment ecosystem

- We anticipate continued applications beyond Network Payments
- The technology may affect entire payments financial architecture in the future to provide additional benefit for clients
- Implementation will require industry cooperation, regulatory acceptance and additional testing
- Banks, central banks, payment regulatory bodies and infrastructure providers performing R&D to understand implications

Use Case – Project Ubin (Singapore)

- Build a domestic payments prototype for inter-bank obligations (for domestic and international banks operating in Singapore) using the Singaporean Dollar ($S) and DLT and backed by central bank deposits – Singapore will be the first financial market in Asia to achieve this and the Singaporean dollar will be the first Asian currency to be put on a distributed ledger
- Build a DLT platform and internal capability for MAS and market participants in Singapore as a precursor to tackling two key business challenges – cross-border payments and cross-border securities – in a later phase of work
- Test whether DLT can improve on the properties of the MEPS+ system in terms of:
  - Efficiency – Can operational efficiencies be driven in the Singaporean domestic payments systems
  - Resilience – Can the resilience of the overall systems be increased to reduce the risk of overloading due to high volume, misrouting or prevent security breaches
- Explore impact of immediate, deferred and deferred net settlement and settlement certainty on operational and counterparty risk
Roadmap

Blockchain industry-wide impact timeline

2018-2020
DTCC Conference
Participant Poll – 'Industry scale production-ready pilot of a major process' – 60+% 

2021
Autonomous Research –
'16 billion cost savings and $6 billion of capital release at Investment Banks 

2020-2025
DTCC Conference
Participant Poll – 'Major impact on securities settlement' 

2025
Morgan Stanley –
'assets to proliferate onto Blockchain'

2020
Morgan Stanley – 'shared infrastructure will emerge beyond initial PoC groups' 

2022
Santander / Oliver Wyman –
'infrastructure costs in x-border payments, securities trading & reg compliance to fall by $15-20B' 

2020-2025
DTCC Conference
Participant Poll – 'Major impact on securities settlement' 

J.P. Morgan view

- **Technology Development**: Resolution of critical technological challenges (e.g., scalability, privacy, latency) in **2-3 years**

- **Ecosystem Development**
  - **At least 5 years** before DLT solutions dominate operating model/market structure (i.e., >30%) in a major asset class, due to competing models & nascent standardization
  - **>7 years** before regulatory & legal frameworks sufficiently address blockchain/DLT to enable mass adoption

- **Internal Solutions**: Likely to start emerging in **2-3 years**
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