The digital revolution

Advances in data science, processing capabilities, and newer technologies have sparked the 4th Industrial Revolution, shifting our world to digital.

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1st Industrial Revolution: Water and Steam
1700s

2nd Industrial Revolution: Electricity and the Assembly Line

3rd Industrial Revolution: Computerization and Internet

4th Industrial Revolution: RPA, Cognitive, and Horizontal Machine Learning Platforms (MLPs), Blockchain, Cloud, Mobility...

"The Digital Revolution"

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(1) Robotic Process Automation (Source: Industry 4.0: Challenges and Solutions for the Digital Transformation of Exponential Technologies, Deloitte AG, 2015 and Deloitte proprietary research)
Automation and Cognitive Intelligence are an extension of existing Foundational and Analytical technologies, offering large gains in efficiency and effectiveness.

<table>
<thead>
<tr>
<th>Area</th>
<th>Technologies</th>
<th>Description</th>
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<tbody>
<tr>
<td>Foundation</td>
<td>Data Integration</td>
<td>Integrated data to provide a consistent information foundation (e.g. Compliance Risk and Regulatory Data Warehouse)</td>
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<tr>
<td></td>
<td>Predictive Analytics</td>
<td>Software solutions using predictive models (e.g., Compliance Risk Models)</td>
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<tr>
<td></td>
<td>Data Visualization</td>
<td>Software placing data in a visual context (e.g., GRC Dashboards)</td>
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<tr>
<td>Analytics</td>
<td></td>
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<tr>
<td>Automation</td>
<td>Robotics Process Automation (RPA)</td>
<td>Rules-based systems that mimic human behavior to automate parts of repeatable processes (e.g., Control Checks, Regulatory Reporting)</td>
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<td></td>
<td>Business Process Modeling (BPM)</td>
<td>Optimize business operations through decision logic models and simulation testing to eliminate process inefficiencies.</td>
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<tr>
<td>Cognitive Intelligence</td>
<td>Natural Language Generation (NLG)</td>
<td>Applications that accept structured data inputs (Excel-like rows/columns) to generate seemingly unstructured narratives</td>
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<tr>
<td></td>
<td>Natural Language Processing (NLP)</td>
<td>Applications that process unstructured data (e.g., text) and allow querying and generation of structured data</td>
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<tr>
<td></td>
<td>Machine Learning (ML)</td>
<td>Applications that are able to improve predictability and operation based on data they receive over time</td>
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<td></td>
<td>Augmented Intelligence</td>
<td>Applications able to mimic human behavior, such as visual perception, speech recognition, decision-making, and translation between languages</td>
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Robotics & Cognitive Technologies: What can they do?
Robotics Process Automation (RPA) is delivered through software that can be configured to undertake rules-based tasks.

**RPA is...**
- Computer-coded software
- Programs that perform repetitive rules-based tasks
- Cross-functional and cross-application macros

**RPA is not**
- Walking, talking auto-bots
- Physically existing machines processing paper
- Artificial intelligence or voice recognition and reply software

**What can RPA do**
- Log into web / enterprise applications
- System to system data entry
- Open email and attachments
- Move files and folders
- Copy and paste
- Execute "swivel chair" processes
- Fill in forms
- Read and write to databases
- Collect social media statistics
- Scrape data from the web
- Scrape data from the Connect to system IPAs
- Make calculations
- Follow "if/then" decisions/rules
- Reconcile information
- Search, update, and collate information
- Trigger a process flow based on e-mail content
- Extract structured data from documents
Intelligent automation has a number of benefits: flexibility, improved efficiency, consistent quality, reduced pressure on scarce resources

<table>
<thead>
<tr>
<th>Greater flexibility in automation</th>
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<tr>
<td>Increased business control of automating manual processes</td>
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<tr>
<td>Ease of integration without significant IT spend</td>
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<tr>
<td>Structured Interface with effective controls that still afford flexibility for process improvements</td>
</tr>
<tr>
<td>RPA requires minimal programming allowing results and benefits to be realized within weeks</td>
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<table>
<thead>
<tr>
<th>$$$ Efficiency and Cost</th>
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<tbody>
<tr>
<td>Cost improvements of 30-70% or more</td>
</tr>
<tr>
<td>Automated solutions do not sleep: on-demand potential to run 24x7x365</td>
</tr>
<tr>
<td>Increase in speed and reduction in time required to perform the process</td>
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<table>
<thead>
<tr>
<th>High Quality Output</th>
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<tbody>
<tr>
<td>RPA&amp;CI tools execute repeatable tasks identically every-time</td>
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<tr>
<td>Outputs are highly auditible</td>
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<tr>
<td>If mistakes occur they are usually systemic, so easily detected and rectified – applicable to Robotic Process Automation more (less so for Cognitive Intelligence)</td>
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<table>
<thead>
<tr>
<th>Best use of scarce human resources</th>
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<tbody>
<tr>
<td>Automate highly manual turn-chair processes - relieve strain on limited human resources</td>
</tr>
<tr>
<td>Manual efforts reduced to an exception-basis to ensure quality</td>
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<tr>
<td>Human resources shift focus to subjective and higher value-added tasks</td>
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</table>
There are clear benefits to adopting RPA, and our clients have begun to realize the gains in process efficiency and quality that RPA can provide.

### Why should you consider adopting RPA?

<table>
<thead>
<tr>
<th>Efficiency &amp; Quality</th>
<th><strong>Robots perform tasks with a high degree of accuracy and operate 24x7 leading to high-throughput</strong></th>
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<tbody>
<tr>
<td>Scalability &amp; Expertise</td>
<td><strong>A process can be automated quickly</strong>, reducing reliance on recruitment to handle workload spikes</td>
</tr>
<tr>
<td>Governance &amp; Compliance</td>
<td><strong>RPA is secure, audited and managed</strong> within an IT corridor of governance. It enables consistency of data resulting in increased revenue</td>
</tr>
<tr>
<td>Competitive Advantages</td>
<td><strong>RPA provides high potential ROI</strong> and has a short payback period, since RPA drives existing applications with low integration costs</td>
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### Some key benefits of RPA*

<table>
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<tr>
<th>Benefit</th>
<th>Percentage</th>
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<tr>
<td>Adherence to defined process</td>
<td>100%</td>
</tr>
<tr>
<td>Reduction in average process handling time</td>
<td>60-70%</td>
</tr>
<tr>
<td>Cost Savings</td>
<td>25-50%</td>
</tr>
<tr>
<td>Processing capabilities</td>
<td>24/7</td>
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RPA is deployed over existing infrastructure, allowing firms to achieve productivity gains without the need to undertake significant technology platform re-engineering.

* http://www.irpanetwork.com/benefits-of-rpa/
Cognitive Intelligence employs algorithms to extend what humans or traditional technology could do on their own.

**Cognitive Intelligence is...**
- Machine Learning
- Judgement-based and predictive decisioning
- A mechanism for processing and interpreting unstructured data

**Cognitive Intelligence is not**
- Walking, talking robots
- Physically existing machines processing paper
- Always a suitable alternative or replacement for humans

**What CI can do**
- Information Retrieval
- Personalized / Smart Search
- Speech-to-Text conversion
- Interactive Voice Response
- Intelligent user authentication
- Text Analytics
- Handwriting Recognition
- Natural Language Generation
- Natural Language Processing
- Virtual Assistants
- Robo-Advisors
- Recommendation Systems
- Big Data Analytics
- Self-Learning Statistical Analysis
- Intelligent Exception Management
- Machine Learning and Cognitive Tool
- Virtual Assistants / Decision Advisors
- Natural Language Capabilities
- Voice and Speech Recognition
- Intelligent Search
Adoption of cognitive solutions offers wider benefits, though the majority of our clients are early in their exploration of these advanced tools.

### Why should you consider adopting Cognitive Intelligence?

<table>
<thead>
<tr>
<th>Efficiency and Cost</th>
<th>Efficiency improvements have a greater breadth of possibilities than RPA</th>
</tr>
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<tbody>
<tr>
<td>High-Quality Output</td>
<td>Cognitive Intelligence will allow users to quickly move to population analysis from sampling</td>
</tr>
<tr>
<td>Flexibility In Automation</td>
<td>Flexible enough to increase business control on automating manual processes</td>
</tr>
<tr>
<td>Best use of scarce human resources</td>
<td>Relieve strain on limited human resources while freeing up highly skilled resources for value-added work</td>
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</table>

### Some key benefits of Cognitive Intelligence

- **Auditable Outputs**
- **Cost Improvements**
- **Increase in Speed and Reduction in time required**
- **Processing capabilities**

Cognitive Intelligence are an extension of existing Foundational and Analytical technologies that offer large gains in quality and efficiency.
Automation technologies will likely impact the type and nature of work being performed

**What does it mean?**

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<tr>
<td>1</td>
<td><strong>Offshore jobs may be largely eliminated</strong>, given the prevalence of structured, rules-based processes currently being performed and due to the erosion of labor-cost arbitrage.</td>
</tr>
<tr>
<td>2</td>
<td><strong>Onshore jobs may be reduced in number and require a greater technical skill set</strong>, as personnel are re-deployed across key focal areas.</td>
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*Much of the operational work of the future will evolve, and will take place in four key areas:*

<table>
<thead>
<tr>
<th>Exception Management</th>
<th>Supervision &amp; Control</th>
<th>Unstructured Processing</th>
<th>Change Management</th>
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<tbody>
<tr>
<td>Personnel will spend the majority of their time investigating and resolving process errors and breaks, and will have capacity to perform true root-cause analysis and risk management.</td>
<td>Teams will be enabled by technology to oversee a smaller set of simplified processes, resulting in the dramatic reduction of time spent across the three lines of defense.</td>
<td>With added capacity, FTEs will continue to carry out human-to-human interaction or interpretation-based work, and will be aided by technologies such as automation, machine learning and analytics.</td>
<td>The increased emphasis on root-cause analysis, risk management, business optimization and a growth in the digital workforce will lead to ongoing efforts to improve the operation and keep pace with external events and impacts.</td>
</tr>
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</table>

Firms will likely maintain core contingents of experienced **Subject Matter Experts (SME)** to oversee processes and resolve issues, define business strategy and change, interact with clients, and interact with counterparties.
Digital Risk Management
Organizations have begun to ask specific risk-related questions about emerging technologies

**How do we plan?**
- How do we understand **how much risk** we really face?
- What is the right **department structure** needed to execute on digital transformation?
- Is a **center of excellence** the right answer? How do we stand it up?
- How do we increase **ROI** and **protect the value** created by transformation?

**What controls are needed?**
- Which **processes, policies, and guidelines** are needed to govern digital investments?
- What is the **change management process** for advanced technologies?
- How do we know if we are achieving the **ROI** we want out of our transformation efforts?

**How do we protect?**
- What about **data privacy, access management, and cybersecurity**?
- How do we **audit advanced technologies**, such as bots?
- How do we protect and preserve our **brand and reputation**?
Automation and Cognitive solutions may introduce new risks if not managed appropriately

6 Key Risks

Operational

- Increased **processing errors** caused by poorly designed automation solutions or automation of complex processes
- Increased operational inefficiencies due to **lack of effective oversight procedures, change management processes**, and standards for bot development / maintenance

Organizational

- The need for technology management roles may outpace **training**
- The cultural shift to automation may negatively impact **employee morale**

Regulatory

- Automation may lead to unseen **audit complications**
- Poorly trained algorithms can violate laws

Financial

- Errors in automation or algorithms may result in financial or **reputational losses**
- Hidden complications in the use of automation or cognitive solutions may **erode ROI**

Strategic

- Improper implementation / governance may lead to strategic risk if **RPA is a major component of overall firm strategy**
- Lack of process to **monitor bot performance and improve outcomes** may lead to risk of achieving defined strategy / objectives

Technology

- **Routine IT platform changes** may impact automation solutions

Additionally down-stream risks may arise including Algorithmic Risk, Cyber Risk or Brand and Reputation Risk
Digital Risk Management helps clients control the risks associated with emerging technologies, while increasing ROI and protecting value.

Leaders need a **plan and alignment around a structure** to enable digital transformation.

The **right organization, processes, controls, and policies** may allow for rapid transformation while controlling associated risks.

Transformation requires new approaches to **traditional areas** such as audit, compliance, and cyber, and approaches to **new areas** such as brand and reputation management and **algorithmic risk**.
Digital Risk Management provides the governance needed for advanced technologies

We empower our clients to deploy and benefit from advanced technologies through a holistic approach to Digital Risk

Governance

Plan and align
- Opportunity analysis
- Risk assessment
- Organizational re-design
- Center of excellence design
- Business case development

Enable processes and controls
- Control design and implementation
- Digital testing approach (DTA)
- Change management
- Training and culture

Protect and monitor
- Regulatory and policy compliance
- Controls certification
- Cyber protection
- Brand and reputation monitoring
- Crisis management
- Outcome analysis

Risks addressed
Algorithmic Risk, Brand & Reputation Risk, Cyber Risk, Financial Risk, Operational Risk, Organizational Risk Regulatory Risk, Technology Risk
Center-of-Excellence establishment can empower a risk-controlled RPA environment

Building robots is only the start to deriving true value from an automation program, there is a need for governance and management of RPA processes on an ongoing basis.

**Key RPA Decisions, Impacts, & Considerations**

<table>
<thead>
<tr>
<th>Plan and align</th>
<th>Enable processes and controls</th>
<th>Monitor and protect</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ongoing opportunity analysis</td>
<td>5. Implement and maintain controls</td>
<td>9. Ensure regulatory and compliance adherence</td>
</tr>
<tr>
<td>Deploy process selection standards and guidelines for determining potential ROI</td>
<td>Ensure adequate controls are in place and being maintained</td>
<td>Understand regulatory and compliance nuances as they relate to advanced technologies</td>
</tr>
<tr>
<td>Sponsor initial risk assessment, maintain ongoing risk metrics</td>
<td>Establish DTA to reduce risks, increase efficiency, uncover insights, continuous monitoring and modernization of controls</td>
<td>Certify controls in preparation for potential audit activities</td>
</tr>
<tr>
<td>Define roles and responsibilities, manage human and digital workforce deployment</td>
<td>Define standard process for executing changes to existing systems and structures</td>
<td>Act as central hub for Cyber protection, Brand and Reputation monitoring and Crisis Management activities</td>
</tr>
<tr>
<td>Maintain a process for future technology business cases</td>
<td>Deploy role-based training; shift workforce to more strategic roles</td>
<td>Perform ongoing measurements against defined KPIs</td>
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Value

- Efficiency
- Improved Quality & Accuracy
- Resource Shift To Higher Value Work
Internal Audit’s role in RPA adoption
IA can play a role in supporting the organization’s adoption of RPA

Internal Audit can help with evaluation and consideration of many factors that will impact the organization

- Have a **seat at the table** when strategic decisions are made on RPA, including around governance
- Proactively understand the **RPA** use cases being implemented by business units
- Evaluate the impact of the RPA on the organization, processes, controls, resources, geography, **regulatory landscape**, cyber and third-party oversight, etc.

- Consider **changes to the enterprise organization structure** to adapt to dynamic business needs
- **Risk assess new technologies** across key risk domains: cyber, regulatory, privacy, financial, reputational, failure to adopt
- Prioritize risks based on the **impact and vulnerability criteria**
- Assess impact on the control set to rationalize population of controls

- **Balance between pushing the frontiers and risk appetite**
- **Disseminate changes in the risk assessment process**
- **Execute dynamic audit procedures**
- **Consider updates to reporting**

- **Determine business objectives to advise on the design of control activities** and/or perform pre-implementation reviews
- Determine required **RPA skillsets for Internal Auditors** and deploy training
- Evaluate **tools and techniques**: Robotics, Data analytics, & Continuous monitoring

- Identify **level and structure of reporting** that will be conducted:
  - Technology level vs. business function level
  - Assurance-driven vs. consultative
  - Frequency and **speed** of audits
IA can play a key role to drive successful and sustainable deployment of RPA across the enterprise

Plan and align

1. Aid in selection of the right process or activity
   Ensure that the process is well defined to ensure robotics can be implemented. Must also ensure that the part of the process which is chosen can be emulated by a robot just like it is by a person.

2. Ensure comprehensive strategic alignment
   IA along with the Stakeholders need to be engaged from the programme’s outset to ensure effective adoption of changes & strategic alignment.

Enable processes and controls

3. Conduct robust business process testing
   Business process testing is required to ensure that any issues which the robot may have when determining the next step can be identified. This is to ensure that the robot can ‘have their eyes open’ during the process.

4. Ensure effective change management
   Change Management procedures need to account for software bots that utilize the application undergoing a change.

5. Assess risks and relevant security measures
   IA should have a healthy scepticism of robots to make sure proper controls are in place for monitoring, logging & security of bots.

6. Evaluate entity’s employee adoption approach & user trainings
   There is a great need to ensure that the robots are adopted into the business and the need and result of these should explained thoroughly.

Protect and monitor

7. Have a strong checklist in place regarding compliance and regulation requirements
   Ensure that the correct infrastructure is in place and compliance requirements have been met.

8. Ensure regulatory and policy compliance
   Standards and policies that should be implemented based on regulatory and risk factors.

9. Assess completeness and accuracy of data processed
   To ensure controls are in place for the business to validate the completeness and accuracy of data processed e.g. reconciling data between an application interface.
Digital Testing Approach

Modernizing the testing program can assist in driving efficiencies, reducing risk profiles, and providing valuable insights.

**Reduced Risk Profile**
Testing 100% of the control populations allows for a greater visibility of non-compliance items.

**Uncover Insights**
Automated analytic audit tools can provide enhanced insight into high risk areas and control compliance.

**Increased Efficiency**
Less manual testing and response to requests/requirements alleviates pressure to increase head count.

**Continuous Monitoring**
Automated testing can promote better compliance throughout the organization by providing oversight and a blueprint for continuous control monitoring.

**Control Modernization**
Automation of testing can elevate control testers from a cost center to a business advisor.
Automated Controls Testing process flow

Our approach generates efficiencies by rationalizing frameworks, data extraction, and digitizing the testing of controls

Plan
- Define scope of the cycles
- Obtain risk and control matrices

Identify & Analyze
- Ascertain data flows and sources
- Cost benefit analysis on control testing automation

Data Extraction
- Identify data extraction method/tool
- Perform data mapping
- Data export

Build & Test
- Import data into analytics tool
- Map cycle starter sets
- Customize rule sets/queries and execute testing

Present
- Present testing results
- Apply data analytics and rich visualizations to obtain insights

Illustrative Process Flow

1. SOX Optimization
   - Ascertain data flows and sources
   - Cost benefit analysis on control testing automation

2. Data Extraction and Mapping
   - Using a data extraction tool, identify where data sources reside (databases, tables, fields, etc.) needed to test a control(s)
   - Data is mapped to aggregate multiple sources of information for analytical purposes

3. Analytics Development & Testing
   - Rulesets are built and developed within analytical tool(s) to test controls more efficiently
   - Automated testing is performed over 100% of the population/samples

4. Present / Visualization
   - Apply data analytics and rich visualizations to obtain insights
Continuous monitoring: Bot regression testing

Bot regression testing involves periodically running a sample of regression test cases through the bots and comparison of the results to the baseline set of results for each regression test.

The primary purpose of this component is to verify that no unauthorized changes have been made to the bots and check that there have been no changes to the systems the bots interact with, which may lead to results no longer being correct.

1. **Re-process regression test cases**
   Select a determined number of regression test cases for each bot type out of the standard regression test populations for each bot. Run these cases again on test servers over a number of days.

2. **Compare results**
   Compare the results of the re-run cases to the original set of results for the sample of regression test cases ran. For most bots this can be done via the automated test harness for that bot. Investigate any differences present.

3. **Reporting**
   Produce a report highlighting the scope and results of testing. Also include details of any recommendations and actions following on from the review.