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INTELLIGENT AUTOMATION IN CAPITAL MARKETS

NEW TOOLS FOR A SMARTER MIDDLE AND BACK OFFICE

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This is an authorized excerpt from a Celent report profiling providers of intelligent automation solutions in capital markets. The reprint was prepared for Broadridge, but the analysis has not been changed. For more information on the full report, please contact Celent at info@celent.com or aray@celent.com.

CONTENTS

- Executive Summary 1
 - Key Research Questions..... 1
- Intelligent Automation In Capital Markets 2
 - Adoption and Use Cases 4
 - Benefits of Applying Intelligent Automation 5
- The Solution Provider Landscape 6
- Broadridge Profile 6
- Conclusion..... 9

EXECUTIVE SUMMARY

KEY RESEARCH QUESTIONS

- 1** *What factors are driving the need for smarter automation in capital markets?*
- 2** *What are the use cases of intelligent automation in middle and back office?*
- 3** *Who are the leading providers of intelligent automation solutions?*

The capital markets landscape has been transformed in the last decade. Technology has emerged at the forefront of the capital markets industry because it lays the foundation for successfully executing business and operating strategies. Technology can be an enabler of innovation and disruption, but **complex legacy systems and architecture continue to be a drag on performance, especially in the middle and back office, which is a critical source of operational inefficiencies. There is a dire need for improving levels of automation and straight-through processing in this area.**

New technology such as robotic process automation (RPA), artificial intelligence (AI), and machine learning (ML) — loosely grouped together and referred to as intelligent automation — promises to offer significant operational and efficiency improvements. **Their scope and level of adoption in the mid-back office are rapidly expanding as new and domain specific use cases emerge by the day.** Application of intelligent automation is already underway in many labor-intensive processes.

- Several processes in the trade lifecycle can benefit from application of intelligent automation.
 - Trade allocation, settlement, reconciliation and exception handling, corporate actions dissemination and processing are all labor-intensive functions and are ripe for application of intelligent automation.
 - These functions are seeing emergence of intelligent automation tools that eliminate a significant amount of manual tasks by automating information extraction, assembly, enrichment, classification, advanced analytics, language processing and communication analysis, reporting, compliance, and audit trail.
- Client lifecycle management is another labor-intensive process.
 - Many use cases are emerging in KYC, onboarding, account and trade supervision, due diligence, investigation, and reporting workflows.
 - Intelligent automation empowered tools streamline information extraction and collation for efficient due diligence, while cognitive tools provide new insights for conducting risk assessment and case investigation.

The landscape of intelligent automation solution providers in capital markets consists of different types of players and is rapidly evolving. **Almost every large capital markets firms and many mid-tier institutions are already using or running pilot projects involving intelligent automation.** The benefits can be enormous and come in several ways, such as reduction of manual efforts, freeing up capital and human resources, productivity improvements, better performance monitoring and capacity utilization, and superior compliance.

INTELLIGENT AUTOMATION IN CAPITAL MARKETS

Key Research Question 1

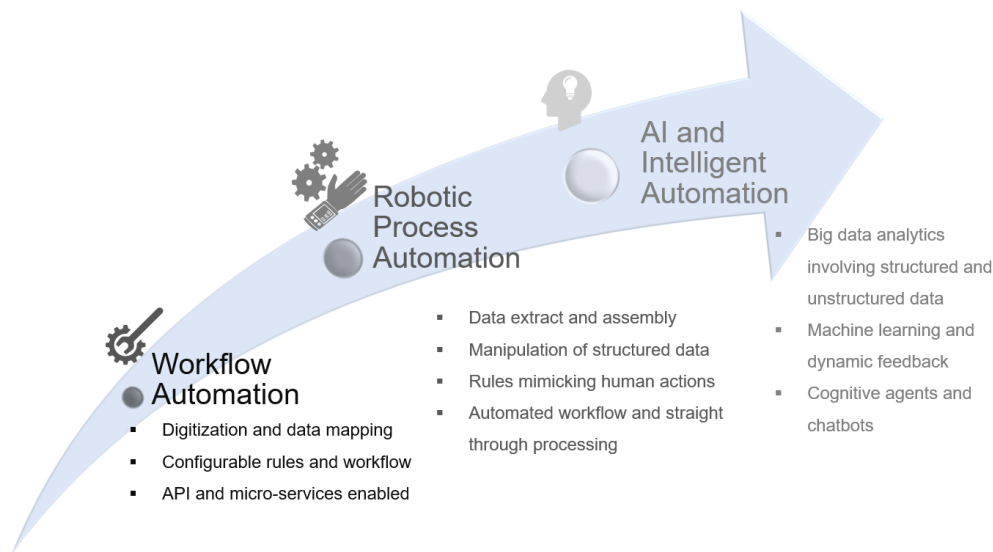
What factors are driving the need for smarter automation in capital markets?

Legacy technology, siloed operations, and a spaghetti of in-house and outsourced solutions have resulted in a complex web of technology architecture that cannot address growing volumes, increasing digitalization, and evolving regulatory requirements, and is becoming inefficient and expensive to maintain.

The pursuit for improving automation levels goes back a long time in the capital markets. Success has been achieved in some areas, but a lot remains to be done. Growing digitalization across trade and client lifecycle in recent years means **lack of automation at any stage of processing can be a critical source of inefficiency and risk**. Business volumes are growing, and in many cases require real-time (or near real-time) processing capabilities which leaves little room for manual processing across the value chain. New technology developments offer many tools for improving automation, as can be seen from Figure 1.

- Simple digitization can be a critical lever for firms that are at an early stage of the automation journey. While most sell side institutions are relatively mature by now, level of automation can vary depending on asset class, or functional area, such as derivatives or structured products processing, or client onboarding.
- Conventional rules-based workflow automation, and new technology such as cloud, API, and microservices can also help improve automation.

Figure 1: New Levers Are Emerging in Capital Markets Firms' Continuous Pursuit for Automation



Source: Celent

The biggest focus in the pursuit for improving automation is currently seen on leveraging next-generation automation tools such as RPA, smart agents, cognitive tools, AI, and

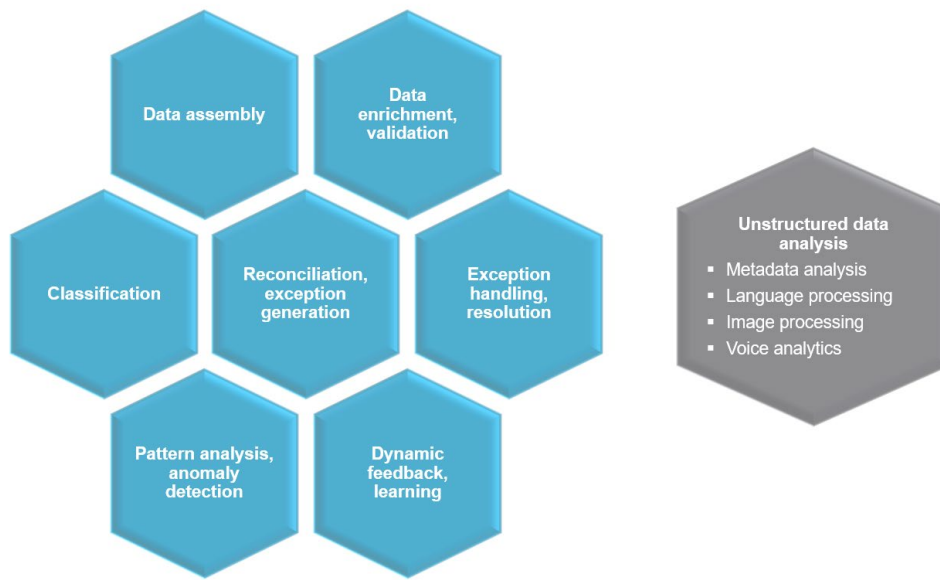
machine learning. At a high level, these disparate tools can be thought of as belonging to a spectrum with basic RPA at one end and highly sophisticated machine learning solutions at the other, and many other techniques falling in between the two.

- **Robotic process automation**, in its most basic form, enables automatically capturing information from different applications, performing basic manipulation with mainly structured data, and sending outputs and triggers to other digital systems.
- Its main application lies in mimicking human actions for automating tasks that are basic in nature, rules-based, and repeatable; indicative tasks include data assembly from different and disparate sources, basic analytics, auto operations such as email and basic chat bots, and so on.
- Innovations in technology are making RPA tools more sophisticated empowering them with cognitive capabilities and giving rise to new types of robots.
 - **Task bots** are the most basic form of RPA and perform simple but repetitive processes involving structured data as described above.
 - **Meta bots** are more advanced and can be integrated between systems using API and microservices to automate larger scale and more complex processes that involve bidirectional processing involving multiple systems.
 - **AI or IQ bots** are powered with intelligence that can analyze and make decisions based on vast amounts of data and can learn over time and improve performance; digital assistants are a prime example of this.
- **Artificial intelligence** is an umbrella term used to describe several analytical techniques. AI, in the context of this report, can be described as a range of cognitive programs and applications that analyze different types of data (structured or unstructured; numbers, text, voice and/or image; in one language or in many) similarly to what the human brain would do, but on a very large scale and at a higher speed than a normal brain, but also in ways that are far beyond the capabilities of traditional and often rule-based software used in capital markets.
- **Machine learning** is a subset of AI that provides systems the ability to automatically learn and improve from experience without being specifically programmed by a human.

These intelligent automation tools can perform many tasks from basic to complex, as highlighted in Figure 2.

- Task bots can help in information gathering from different internal or third-party systems, websites, research reports, PDFs or HTML sources, emails, social media, or archived data. They can assemble the extracted data and file standardized reports in specified formats.
- Intelligent tools can check for data completeness and flag missing or inaccurate data, and cognitive capabilities can empower them to suggest repair or resolve breaks and mismatches. Automation tools can be trained to classify data, for example identifying fields such as date, counterparty details, currency, jurisdictions, and so on.
- Exception handling and repair — a prime use case in reconciliation — can benefit from intelligent automation where systems can learn from previous and ongoing experience.
- Pattern analysis is a critical element in exception handling; it can also be used to find patterns in numerous other cases such as trading or communication pattern for surveillance, risk monitoring, anti-money laundering, and so on.
- Natural language processing (NLP) is a special field dealing with unstructured data and text information and has numerous applications. It goes beyond lexicon-based analysis and can identify context in texts, images, or other unstructured data sets. It is used in chatbots and communication, document analysis, communication surveillance, media analysis, sentiment analysis, and so on.

Figure 2: Intelligent Automation Tools Can Perform Many Tasks from Basic to Complex



Source: Celent

**Key
Research
Question**

2

What are the use cases of intelligent automation in middle and back office?

Application of intelligent automation is underway in many labor-intensive processes in trade management such as trade allocation, monitoring, settlement, reconciliation, and corporate actions. Onboarding and KYC is another critical source of inefficiency also witnessing many use cases.

ADOPTION AND USE CASES

The automation techniques can be applied in several areas in capital markets operations. Especially mid and back office functions are ripe for their application because there are many repetitive low-level knowledge tasks in trade processing and client lifecycle management in the mid-back office.

Trade Allocation

Intelligent automation can be used in several stages, such as triggering the process at scheduled time, extracting data from different sources in various formats, converting semi- or unstructured data into structured format, identification and classification of the extracted data, and sending the output to other applications for further processing. These can drive significant improvements in automation, straight-through processing rates, process efficiency, and infrastructure utilization, and save time, efforts, and costs.

Reconciliation

Automation tools can be incorporated in several stages in the reconciliation process such as data mapping, data completeness checks, and creation of matching rules based on experience. Historic breaks can be analyzed using supervised or unsupervised learning

so that the system can automatically suggest reasons for breaks and can be used to resolve breaks automatically or with limited human supervision. These can help improve STP rates, efficiency, and accuracy, speed up trade processing, and free up resources. Complete digitalization of the process will allow closely monitoring operational metrics that can help identify bottlenecks for further efficiency improvement.

Corporate Actions

Intelligent automation tools can be used to extract data from corporate actions announcements, classify and process them using NLP techniques. The tasks can be scheduled at specific times of day by using task bots which can also automate notification to counterparties and distribution of dividends, interest, etc. Some vendors report being able to improve processing time from hours to seconds and reduce manual efforts by over 80%.

Trade Monitoring

AI systems can be used to learn from previous patterns and red-flag probable mistakes, going beyond simple rules-based monitoring. Supervised and unsupervised learning can be used for improving prediction accuracy, faster error spotting, loss prevention, and continuous improvement. AI solutions can learn from how erroneous trades were resolved previously, and automatically propose if new breaches should be approved. These will boost productivity and optimize use of capital.

KYC, Onboarding

Intelligent automation can be embedded in onboarding workflows from information collection through to reporting. AI can be used for document or media analysis, identifying networks and patterns in investigation and decision-making. Advanced analytics can help improve risk assessment methodologies and segmentation, incorporate dynamic updates, and enable frequent monitoring. These help in faster onboarding, improving customer experience, risk assessment, and regulatory compliance.

Trade and Conduct Surveillance

Trade surveillance is very siloed and driven by rules-based algorithms that generate high volumes of false positives. AI tools can easily identify new and complex patterns, across asset classes. Meta data analysis, linguistic analysis, phonetic and behavioral analysis can improve communication surveillance. Automating investigation workflows using RPA can reduce costs and human resource requirements.

There are many more use cases and the universe of use cases is growing by the day. Almost every large capital markets firm and many mid-tier institutions are already using or running pilot projects involving intelligent automation.

BENEFITS OF APPLYING INTELLIGENT AUTOMATION

The benefits of applying intelligent automation can be enormous.

- Reduction of manual efforts is the biggest benefit which not only ramps up processing time but also frees up human and financial capital for productive use. Up to 60 to 80% reduction in human efforts has been reported in certain use cases.
- Allowing staff to focus on higher-value tasks also improve productivity and quality.
- Smart automation tools are less intrusive on existing IT and infrastructure; they reduce the need for large-scale projects and associated investment needs.
- Digitalization ensures complete audit trail and allows firms to closely track capacity utilization and identify process bottlenecks for further optimization.

- Application of intelligent automation tools in risk and compliance not only improves efficiency and productivity metrics, but also enables better risk assessment, faster decision-making, and superior compliance.

THE SOLUTION PROVIDER LANDSCAPE

Key Research Question

3

Who are the leading providers of intelligent automation solutions?

Core RPA and AI software or platform providers, consulting and outsourcing service providers, and domain-specific solution providers are all developing intelligent automation use cases in capital markets. Fintechs are emerging with automation embedded solutions with applications in trade processing and client lifecycle management functions.

The landscape of intelligent automation solution providers to capital markets consists of different type of players and is rapidly evolving.

- The first category consists of **core RPA and AI software or platform providers**.
- While some banks can work with these software or platforms using in-house resources, many prefer to work with their **consulting partners — such as the large audit and consulting firms, IT, and business process outsourcing companies** — with whom they have worked for a long time and who can help them design and optimize internal operations.
- Therefore, we see the providers belonging to the first category forging partnerships with these players. The IT outsourcing and business process outsourcing players are also incorporating automation solutions within their suite of offerings — either leveraging the software or platforms in the first category or their proprietary automation platforms and solutions. In this way they are helping their clients benefit from application of automation without having to go through the complex process of buying, implementing, and managing the platforms themselves.
- **Domain-specific solution providers** in the capital markets are also incorporating automation tools — either within existing applications or by developing new ones to drive efficiency and productivity.
- **Startups and fintechs** are emerging with automation and cloud-native solutions with applications in trade processing and client lifecycle management functions.

BROADRIDGE PROFILE

Broadridge provides post-trade processing technology and managed services in capital markets, where it delivers fixed income and repo processing for 18 of the 23 primary dealers, equity processing for seven of the ten largest global investment banks, and full managed services for over 40 clients in North America. As part of its technology simplification and modernization initiatives, Broadridge has been investing in Artificial intelligence (AI), including Machine Learning (ML) and Robotic Process Automation (RPA), and combining them with its scale and expertise for further improving efficiency in post-trade operations. Their focus is investing in cognitive applications that connect ML

and RPA to automate end-to-end workflows and drive significant operational improvements. Broadridge's approach to AI/ ML/ RPA involves three components:

- Incubating in an internal environment: deploying ML and RPA technology within managed services to test and demonstrate AI applications in post-trade.
- Developing production ready applications: integrating ML and RPA functionality into Broadridge offerings.
- Co-innovating with clients: providing clients an “on-ramp” to AI by mutualizing the cost of development, training, and infrastructure.

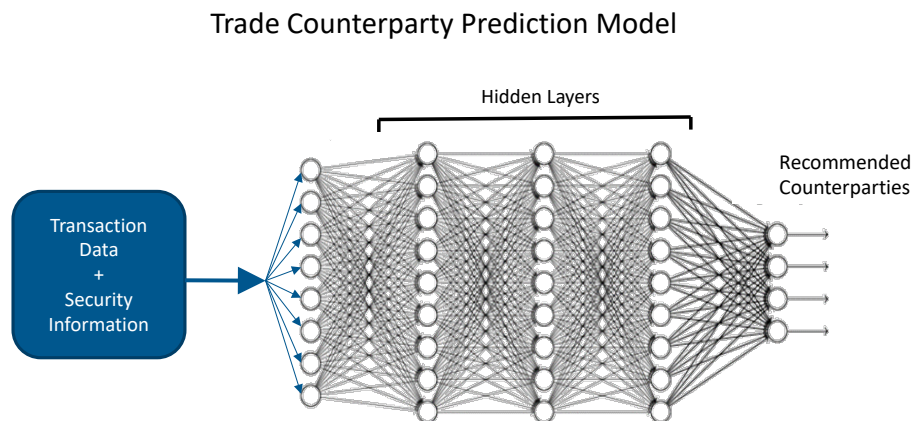
Broadridge has developed several use cases that apply AI/ ML/ RPA in the front, middle and back-office; below are a few examples:

Trade Analytics for Illiquid Securities

One use case developed by Broadridge is focused on illiquid securities. With the advent of the Dodd-Frank Act, dealers are finding it more challenging to act as the buy-side's primary source for corporate bond liquidity. However, Broadridge believes that by carefully analyzing which securities their clients have traded, dealers can more effectively identify natural buyers and sellers within their trading network and provide their clients with the liquidity they need to run their businesses.

Broadridge has developed a solution for dealers that analyzes their historical trading patterns with their clients and provides them insights into who is likely to be a buyer or a seller of a specific security as it comes across the desk. Each dealer's trade history is analyzed in isolation, so the insights they receive are based exclusively on their trades with their customers. This analysis enables them to prioritize the calls they make to each one of their customer contacts and increases the likelihood of quickly finding the right buyer for the security. The solution also assigns client-specific “liquidity scores” for each potential trading opportunity using Deep Learning (a more advanced form of ML) and neural networks to generate these insights. Broadridge is currently testing the solution with multiple dealers and incorporating their feedback and plans to launch in production after testing is complete.

Figure 3: Application of Deep Learning in Trade Analytics



Source: Broadridge

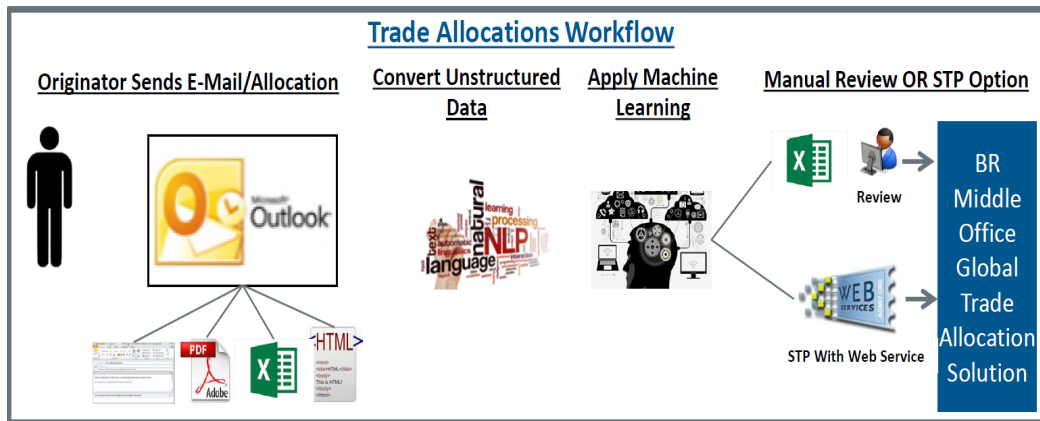
Global Trade Allocations Powered by ML and RPA

Another use case developed by Broadridge is in its middle-office global trade allocation solution. While trade allocation is relatively automated, around 25–30% of overall trade volumes are still not entirely automatically settled through STP. Also, the process has to deal with different formats (e.g., emails, PDFs, Excel, HTML, word documents, or screenshots) and unstructured data before settlement. This complexity is a key driver for

manual overheads and many banks maintain teams of associates for conducting these tasks.

Broadridge has combined RPA and ML technology to take in trade allocation requests embedded in unstructured formats and automatically process the allocations. The solution leverages RPA technology to initiate and monitor the process across stages. The first step is converting the unstructured data into structured format leveraging NLP and OCR techniques; next, ML techniques are used to identify patterns assisted by learnings from historical data sets for complete resolution and automatic processing. The solution is designed to run at start- or end-of-day and the system output can be sent to middle office professionals for review or integrated directly with web services for complete STP. Broadridge has been using this capability as part of its managed services offering.

Figure 4: Trade Allocation Automation Solution Schematic



Source: Broadridge

Automation Deployment in Managed Services

Broadridge is also extensively deploying RPA, NLP, and ML for its more than 40 managed services clients to drive increased service levels and mitigate risk.

- On RPA, Broadridge is taking a hybrid approach towards development, empowering end users to engage in developing digital labor/ bots alongside experienced core developers, all governed by a center of excellence to drive standardization and best practices. Several processes across multiple functional areas including payment processing, projections, settlements, break resolution, and reconciliations are being automated to improve processes across dividends, DTC settlements, Fed settlements, purchase and sales, among others.
- On ML, Broadridge has set up an in-house center of excellence to drive use cases across the enterprise. They have developed an e-mail categorization solution leveraging ML capabilities, which is deployed in the back-office. Using NLP, the solution converts e-mails from unstructured to structured data. The ML models are trained to recognize key phrases to classify e-mails through supervised learning. Previously, this task was done through dedicated e-mail classifier personnel who had to manually go through hundreds of emails looking for specific requests and classify them. According to Broadridge, the ML solution can classify e-mails with over 95% accuracy; those that are unclassified go through an ML self-learning process.

Over the next 12-18 months, Broadridge's focus will be to continue to drive the three components of their AI approach and implement additional use cases in production.

The full Celent report contains detailed profiles of 13 providers of which the profile of Broadridge is included in this authorized excerpt.

CONCLUSION

As seen from the several use cases, intelligent automation-enabled solutions can greatly help capital markets firms improve efficiency in mid-back office operations, which has been a critical source of inefficiency and bottleneck for a long time. **The promises are enormous, but there are critical considerations for realizing the full potential of the new technology.**

Achieving the right mix of automation, outsourcing, and offshoring will be important, especially because most capital markets firms have by now developed a complex mix of outsourced and offshore solution. The whole arrangement needs to be rearchitected for optimal benefit; otherwise savings achieved through automation tools may not be reflected in the overall processes. In this regard it will be important to accurately measure the benefits realized from automation — not only for the specific functions automated, but also how that reflects onto overall operations.

Data and infrastructure management will be important. Basic RPA is less intrusive on IT and infrastructure and therefore is easy to implement. But AI and ML solutions will have higher requirements on data management.

Skill and resourcing will be another important consideration. New technology, especially advanced AI and ML techniques, can require a different mix of talent from existing ones. Firms should have a clear strategy whether building new teams to manage them or engaging with a vendor or service provider would be optimal.

Sourcing and partner selection will therefore be important. Managing core software or platforms with in-house resources may be best for some organizations, while others will seek to leverage the economies of scale and expertise of external providers under a managed service model, which relieves them from the grinds of implementation and ongoing maintenance.

Some firms have been early movers in this regard and are already using intelligent automation tools in capital markets mid-back office. Many others are currently at a stage of exploration, having recently completed pilots and proofs of concept. We expect many of them will be taken into production in 2019 and beyond. Celent will be closely tracking the developments and update its research as more use cases emerge.

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