



Advanced Content Intelligence

Accelerating Digital Transformation with
AI-Powered Advanced Content Intelligence

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Introduction

The evolution of enterprise automation

While the opportunity to adopt RPA has captured the attention of many organizations, as they compete in the digital first world, there is a distinct shift among forward-looking enterprises towards intelligent automation. The shift is from initial projects to automate transactional processes only to including more judgement-oriented tasks as well. This movement along the continuum of automation technologies maps a clear shift from adoption of pure Robotic Process Automation (RPA) and Robotic Desktop Automation (RDA) technologies to these combined with Artificial Intelligence (AI).

Intelligent automation technologies use a variety of capabilities such as Machine Learning (ML), computer vision, text analytics, and Natural Language Processing (NLP).

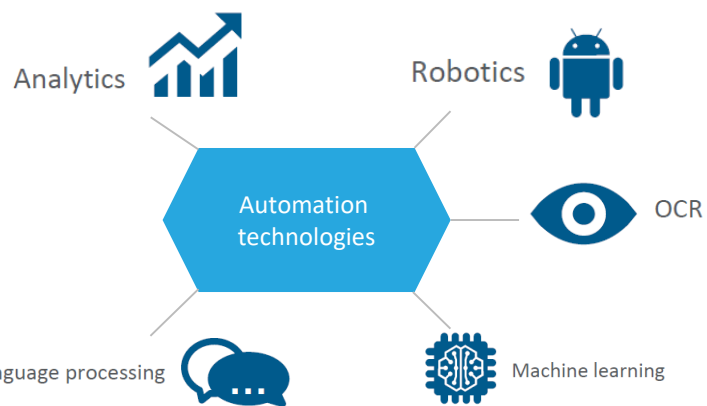


EXHIBIT 1

Key Automation technologies

Source: Everest Group (2018)

As AI is maturing, more productized solutions are emerging in the market. One of the key categories of such “packaged” solutions emerging within AI is Advanced Content Intelligence (ACI).

This is the subject of this paper. The aim is to provide an understanding of this emerging technology and how it blends the power of these AI technologies to enable organizations to build a smart digital workforce.

This paper focusses on the following topics –

- Evolution of AI technologies and introduction to ACI
- Key drivers fueling the growth of ACI technology
- ACI solution capabilities and how it compares with traditional Optical Character Recognition (OCR) solutions and traditional Content Intelligence (CI) solutions
- Unlocking business benefits through ACI
- Impact of ACI to fuel cognitive automation
- Challenges to adoption of ACI solutions
- Key factors to consider for enterprises to successfully adopt ACI technology

With business drivers fueling the need for ACI solutions, we expect ACI to play an important role in providing an entry point for organizations seeking to employ AI-based automation. It can help enterprises transform their businesses by giving robots the next set of intelligent skills to handle a wider array of use cases.

Evolution of AI technologies

Technologies that enable automation solutions have witnessed significant advances in recent years, enabling more processes to be automated to a higher level. Some of the technological advances are at the intersection of structured and unstructured data. An increasingly frequent use case is where RPA intersects and interoperates with AI-based automation solutions. Many organizations, having realized the benefits of RPA, have started to look at this intersection to automate content-related processes, e.g. those that handle incoming documents and emails, in addition to those that handle simple transactions that are typically stored in a database.

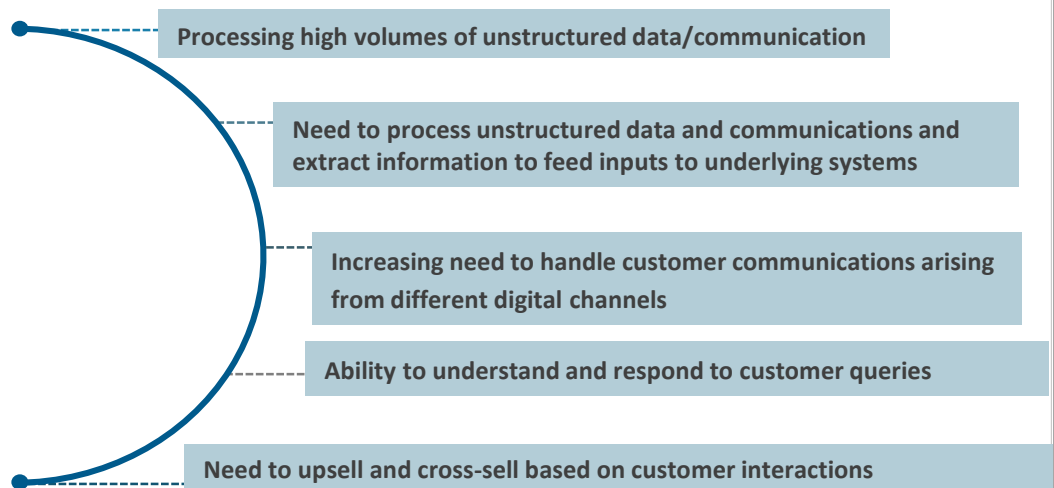
AI-based cognitive automation includes ACI which offers the ability to capture, classify, categorize, efficiently extract, enrich & process or contextually understand information from unstructured text-based data sources such as emails, tweets, contracts, handwritten documents, pdf documents, fax, scanned documents, images, etc. and feed the output generated into downstream applications or other processes. Technologies used for this type of capability include computer vision, NLP including Natural Language Understanding (NLU) and Natural Language Generation (NLG).

A digital workforce, comprising RPA robots with cognitive capabilities can reduce the manual effort and improve the efficiency of the human workforce. The reduction in manual processes can increase operational agility in changing business environments. Various business problems that organizations face today can be solved by deploying solutions that have the capability to process unstructured data and text-based communications. Consequently, these business requirements, as illustrated in Exhibit 1, are fueling the need for and adoption of ACI solutions.

EXHIBIT 2

Business requirements fueling need for adoption of ACI solutions

Source: Everest Group (2019)



ACI solutions can provide organizations the capability to understand customer communications in real-time. Furthermore, enterprises can gain insights into customer satisfaction levels by analyzing the sentiment in their interactions, to provide better services, and stay ahead of the curve in addressing changing customer requirements.

Key drivers fueling the growth of ACI technology

Automation solutions with compelling features and functionalities that combine RPA with AI technologies are emerging in the market. Over the last year or so enterprises have expressed growing interest in leveraging these intelligent solutions to accelerate the impact of automation.

ACI technology encompassing AI capabilities such as ML, computer vision, NLP and NLG has the potential to enable enterprises overcome one of the key limitations of standalone RPA that revolves around use-cases involving unstructured data. The variety in format of documents and constantly changing templates has made template-based automation approach costly and ineffective.

Although, it is still early days for it, ACI technology is expected to evolve in the coming years and gain traction due to a number of factors from both enterprise and vendor perspective.

Enterprise side drivers

- Organizations looking for ways to automate more content-centric use cases
- Greater maturity of enterprises having benefitted from RPA
- Increasing amounts of unstructured data and content coming from external sources with organizations having no or limited control over the structure and the format of the data
- The need for achieving increased consumer engagement to drive business

Vendor side drivers

- Emergence of more productized solutions in the market that can be deployed / implemented with minimal training
- Packing of solutions into consumable "skills", often accessible from within RPA robots
- App-based ecosystems around digital platforms
- Deeper integrations with other digital capabilities
- Increased focus on building reusable and purpose-driven solutions

RPA has raised the automation bar for many enterprises. Some activities are simple enough to automate with RPA because they are repetitive, and rules based, but organizations still face many challenges when it comes to automating content centric processes.

Strong enterprise demand to personalize customer experience and automate use-cases involving content, coupled with increasing focus from vendors to package their solutions into consumable skills that can be seamlessly integrated into advanced automation solutions is expected to drive ACI technology in next 2-3 years.

Advanced Content intelligence vs. traditional OCR solutions and CI solutions

Advanced Content intelligence lies at the convergence of business intelligence and content management.

Enterprises deal with large amounts of data in varying forms. The need to manage content effectively has made it imperative to have content in digitized format. OCR solutions were developed primarily to cater to this need of converting content into digital format. However, digitizing content was just the first step. The need to then classify these digital documents and extract business relevant data from them still remained a human-intensive task.

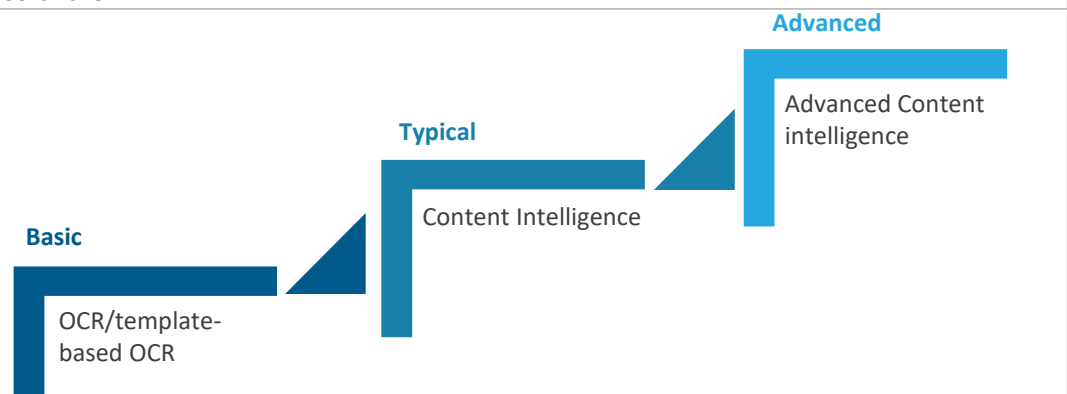
This paved the way for traditional CI solutions which could capture data from various types of semi-structured documents and sources such as pdfs and scanned documents. However, the channels through which organizations interact with their customers and other stakeholders are evolving at a rapid pace. Although CI solutions possess some basic ML and computer vision capabilities, they lack the ability to process unstructured sources of data such as images and handwritten documents and require frequent manual intervention to extract data accurately from semi-structured sources.

Increasing need among enterprises to process content, be it in structured, semi-structured or un-structured format triggered the demand for ACI technology. If OCR/Intelligent OCR is the first step to digitizing content followed by CI solutions, AI driven ACI is way up at the top of the staircase. Exhibit 3 highlights the key differences between these three categories of software.

EXHIBIT 3

Evolution of “Enterprise Content Processing(ECP)” solutions

Source: Everest Group (2019)



- | | | |
|--|--|--|
| <ul style="list-style-type: none"> • Capable of digitizing content present on a physical document, scan, or an image. • Takes a template driven approach and needs to be trained again for varying templates | <ul style="list-style-type: none"> • Can capture data from semi-structured documents such as email, text, pdfs and scanned documents • With basic ML and computer vision capabilities, it can classify the documents into categories and extracts relevant data for further processing • Can deal with large volumes and variety of data but lack the ability to process handwritten documents or low quality images • Lack NLU capabilities | <ul style="list-style-type: none"> • Can process completely unstructured data in the form of images, handwritten documents, etc. in addition to structured and semi-structured data • With NLU capabilities, ACI solutions can process natural language and also generate natural language responses • Sentiment and tone analysis capability provide ability to generate responses as a human agent would do |
|--|--|--|

While depicted as distinct categories in the exhibit above, these technologies are more of a continuum today as the market is evolving with various products offering a combination of these functionalities and capabilities.

ACI solution capabilities

The real value of ACI lies not just in its omni-channel capture capability or in the ability to extract data or classify documents but also in generating insights, employing deep learning or ML and NLP as the underlying technology. It takes a content-based, rather than layout or template-based approach to documents.

Advanced Content Intelligence solutions provide value beyond traditional CI solutions, both in terms of input data that can be processed and outputs that can be generated. Where CI can extract relevant information from semi-structured sources, it is not capable of processing content in unstructured form. ACI solutions can overcome this challenge and process completely unstructured content and also derive insights from it.

ACI solutions possess and employ cognitive skills at every step of the enterprise content processing value chain. They have the ability to intelligently capture information from central and distributed locations, identify different types of content, classify them, extract business critical data and entities, validate extracted information using business rules, process extracted information to generate insights and deliver desired output. ACI solutions exhibit capabilities across content processing value chain:

Input ingestion capability:

Capability to ingest data from multiple sources in varying formats is one of the key value propositions of an ACI solution. An ACI solution must be compatible with multiple input sources such as enterprise electronic databases, websites, portals, physical documents, mobile devices, fax and emails to capture data in real-time.

Inputs to a content intelligence system can be categorized predominantly into two major categories –

- **Structured/semi-structured** – These include excel/form-based structured content e.g. KYC data, and semi-structured content, e.g. in the form of invoices. In such cases, it is easier to train the system with fewer documents to reach higher accuracy
- **Unstructured** – These include unstructured documents such as contracts and unstructured communication such as raw text, tweets, emails

Capability to classify, extract and process input data:

After acquiring the input data, an ACI solution classifies the input document using text mining capability and stores the document in the corresponding location. It then recognizes and interprets the input.

An ACI solution then employs ML algorithms to identify the data to be extracted based on the type of input document and extracts relevant information. ACI solutions are more resilient to changes in templates and quality of input document and have the capability to extract business-relevant data even if the layout of the input document changes.

Capability to generate structured output or natural language responses :

ACI solutions have the capability to generate insights based on extracted information. The extracted information can then be either fed into downstream applications like ERP/CRM systems, RPA robots, content management systems or databases in structured form or analyzed using sentiment and tone analysis to generate expected responses.

ACI aims to harvest data from content present in any customer channel (including handwritten documents) and transform unstructured content into structured, actionable information that can be delivered seamlessly into downstream business systems such as ECM, ERP, CRM, BPM and into RPA robots.

It's the intelligence component that enables not just classification and extraction of unstructured content from raw texts, tweets and emails but also perform sentiment analysis and predictive analytics on the extracted content and generate responses accordingly.

These different functionalities are powered by AI technologies as illustrated in exhibit 6.

EXHIBIT 6

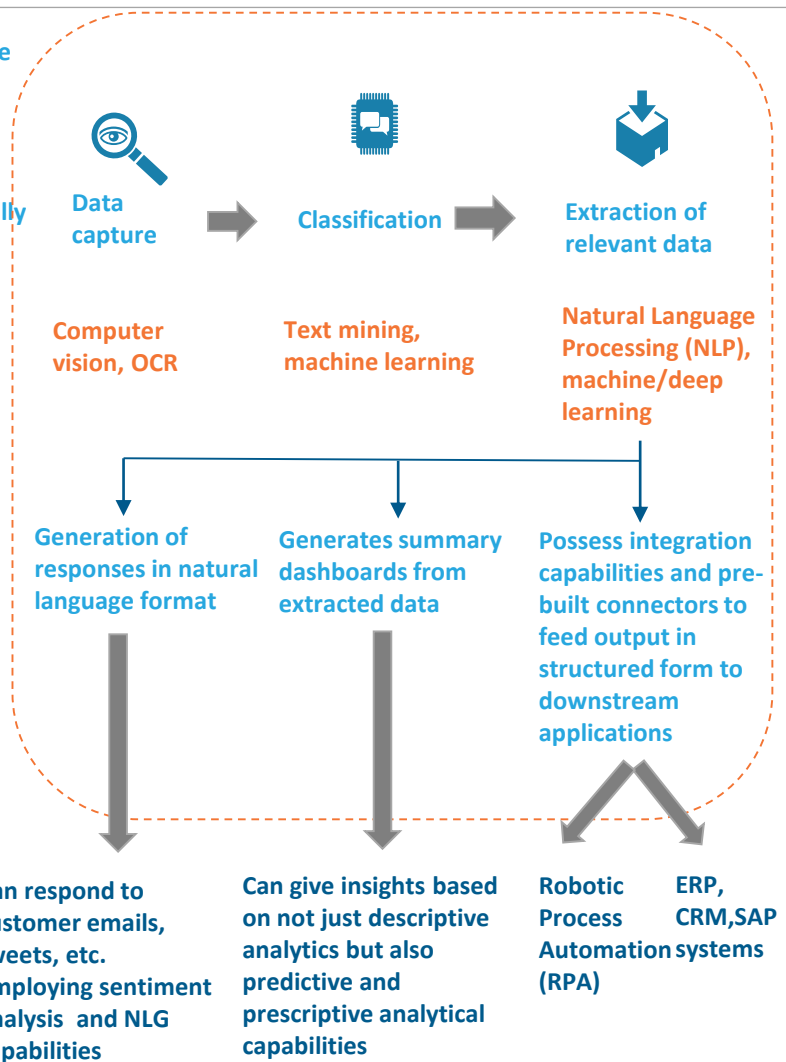
ACI solution Capabilities

Source: Everest Group (2018)

Input sources – Real time customer interactions through tweets, emails, documents Including pdfs, scanned forms with fields manually filled; handwritten documents, pictures

Underlying AI technologies

Output formats





Bidirectional integration with enterprise databases, RPA platforms and enterprise content management systems would enable ACI solution to store the output into database or ECM for archival and reporting purposes or feed it as input into RPA robots making them capable of handling content-centric uses-cases. Solutions offering pre-built connectors to feed output into these applications would ease the integration and drive faster-adoption by enterprises.

“The first step in exceeding your customer's expectations is to know those expectations.”
 – Roy H. Williams, Marketing Consultant and Writer

Unlocking benefits through ACI

Advanced Content intelligence technology provides several benefits, which are expected to drive enterprise adoption of these solutions. Some of the key benefits include:

Areas of impact	
	<ul style="list-style-type: none"> • Cost savings – reduced overheads, higher workforce productivity • Improved accuracy without manual intervention • Augmented security – by routing content to correct directories and controlling permissions • Consistent and faster deployment of security procedures on all inbound content, safeguarding against data loss and security breaches • Faster turn-around times resulting in improved straight through processing • Ability to handle multi-variant formats/templates of business documents • Streamlined document tracking • Improved compliance and governance – can link content to an audit trail that assists in compliance with government regulations and maintain precise retention of records and other sensitive data
	<ul style="list-style-type: none"> • Enhanced customer experience and engagement • Faster time to market for new and innovative products and services by enabling faster transfer of information into content management, ERP and other business systems where it can be searched, analyzed, acted on • Evolving business models based on market demand

Often communications and documents between enterprise’s internal and external stakeholders can be phrased in many different ways and can contain errors including spelling and grammar mistakes. Rather than searching for keywords, an AI-based self-learning ACI solution can use NLU capabilities to reliably interpret the nature of a correspondent’s communication, regardless of errors or colloquialisms.

Key use cases

ACI has found its applications across different industries / processes

Industry/ Functions	Sample use case
F&A	• Income tax processing; financial statements processing; annual reports; invoice processing, purchase orders, sales orders
Logistics	• Customs declarations, proof of delivery, waybills, HA/DR processing, certificates of origin
BFSI	• Mortgage lending, opening accounts, trade confirmation, claims, policy administration, opening accounts, contract management
Healthcare	• Patient onboarding, electronic medical records, and processing physician referrals, managing regulation related documents
Government	• Customs, information governance, election systems

EXHIBIT 5

Automation technologies

Source: Everest Group (2019)

Advanced Content intelligence to fuel cognitive automation

While ACI on its own can greatly benefit organizations, it can uncover many more use cases when combined with various other next-gen technologies like –

- Analytics
- ECM – full text indexing, document management, multi-channel capture
- Conversational intelligence
- BPM/workflow
- RPA

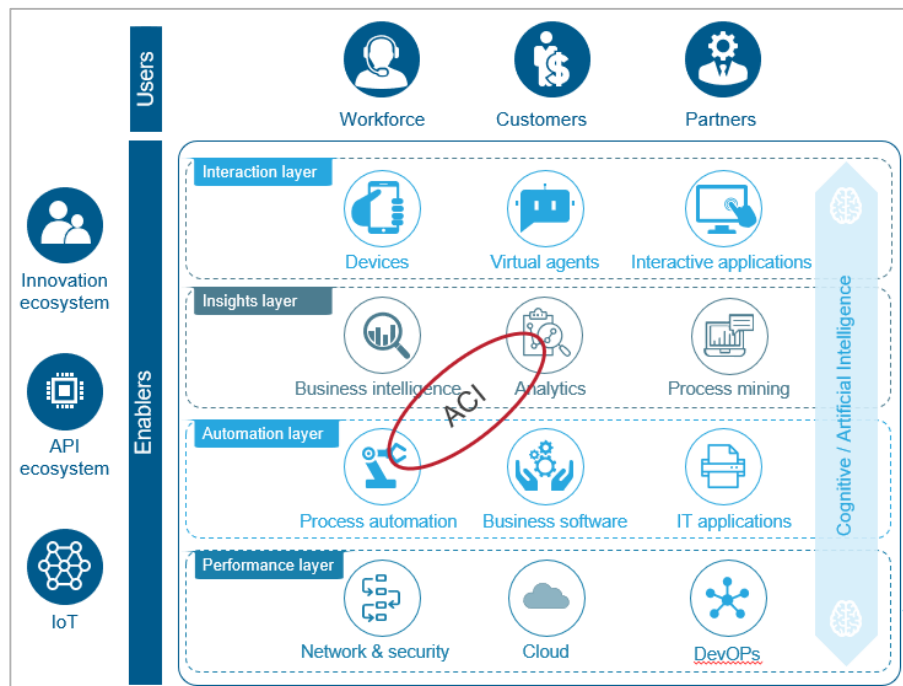
Combination of ACI with these technologies in a “digital” ecosystem can act as a starting point for intelligent automation wherein robots with cognitive skills can apply text analysis to identify entities; understand facts and events accurately; build stories across documents; process emails, financial statements, contracts; detect the relationship between entities, such as who is the seller or the buyer in a contract; and classify large volumes of unstructured data.

Such capabilities when integrated with RPA can build a new skill set in the robots including basic skills such as OCR, and advanced cognitive skills such as classification of documents and extraction of important information.

EXHIBIT 7

Role of ACI in adding value to enterprise digital capabilities

Source: Everest Group (2018)



To continue to fuel the adoption and scaling of RPA and the value it delivers, organizations using it will need to look toward technologies and solutions that deliver an added level of content intelligence to enable them to automate high-value content centric processes.

Most enterprises today deal with disparate systems and siloed data. RPA can act as the go-between in such cases, ensuring that the ACI system is fed the correct input data. Subsequently, the output data of the system can also be directed to the appropriate workflows through RPA.

Challenges to adoption of ACI solutions

Advanced Content intelligence technology while still in its early stages, is fast evolving. While organizations recognize the need and potential of capabilities that a ACI solution can provide, they may face several challenges to successfully adopt these solutions.

- Lack of sophisticated solutions:** As this market is in very nascent stage, solutions available in the market also lack some of the key capabilities such as handling handwritten documents, images and seamlessly integrating with enterprise systems. This poses a serious challenge for enterprises looking to adopt ACI technology to understand content coming from such sources. Quality and consistency of the solution in managing variations in documents types, formats is a key requirement from a ACI solution.
- Lack of availability of data:** Both data volume and variety are essential to achieve a good level of accuracy in case of ACI solutions. It is important to have the capability to integrate and label data stored in disparate systems and application silos to enhance applicability of the solution.
- Limited availability of resources and talent:** Human workforce with deep technological knowledge and functional expertise is needed at vendor's side to develop a robust solution that can be seamlessly integrated with the enterprise systems. Enterprises also need workforce who possess knowledge to understand the capabilities of the solution and skills to implement and scale adoption of the solution. Potential of ACI solutions can be realized only when enterprises are able to acquire or develop relevant talent.
- Unclear business case and inability to achieve scale :** Enterprises often find it difficult to identify suitable business cases. Investing in technologies such as ACI with limited clarity on how it can be integrated with existing systems to solve for the identified use-case might make the entire initiative prone to failure.
- Fear of risks getting introduced into the business such as legal risks, security and compliance:** ACI solutions like other AI solutions raise both security and regulatory risks. As ACI solutions deal with all kinds of enterprise content coming from both internal and external stakeholders, it becomes even more important to ensure that sensitive information is dealt cautiously.
- Lack of product training:** Although this appears as a challenge on enterprise's side in terms of inability to adopt and implement ACI solutions and lack of clarity on how the solution fits in the overall process workflow , it actually emerges due to lack of product training and support services available from ACI technology vendors. Apart from developing a robust product, it is important that vendors improve their training and create more avenues for business users to learn and implement the solution successfully.

Key factors to consider for enterprises to successfully adopt ACI technology

Digital transformation is a journey. Different organizations may be in different stages of the journey, and hence need to regularly evaluate factors which would define success. Below are some common factors to consider to make the journey of implementing ACI solution a successful one:

Development of business case and setting realistic expectations:

Enterprises need to develop a clear business case, identify appropriate opportunities and ensure that the IT infrastructure is in place for a ACI solution to work effectively. They need to understand the scope of the solution and what it is that they want it to do. It is all too easy to confuse ACI with OCR with some advance document processing capabilities, which is much simpler to deploy.

Sourcing of the right solution for the identified use-case:

Enterprises need to look for a solution that offers seamless integration with underlying enterprise systems. The solution must be capable of ingesting data from various channels which the enterprise has employed to communicate with its stakeholders across different Lines of Businesses (LOBs).

Preparing data for the ACI solution to works:

Like any other AI solution, ACI solutions also need large amount of data to achieve the desired accuracy for critical business uses. Efforts to deploy ACI solution at scale might fail if they do not have enough data to train the solution or if data is not prepared or labelled properly to be ready to feed into the ACI solution.

Adopting an integrated approach rather than a siloed adoption of ACI:

Enterprises need to look for ways to employ ACI solutions so that it helps to not just seamlessly manage and process content but also gain strategic benefits. Enterprises need to consciously avoid deploying ACI solutions as point solutions in silos within the organization's different business units, and take an integrated approach to its adoption so that it helps gain more strategic benefits such as imparting skills to the digital workforce to enable end-to-end process automation of content-centric use-cases.

Resource planning and skill development:

Finding the right skills for developing, managing, and running ACI can be challenging. In addition to internal talent, it is advisable to bring in external help to get started on the cognitive journey. This could be in the form of hand-holding to get the project getting started and set on course.

Change Management:

Implementing ACI solution should lead to significant effort elimination. This could be seen as a job loss threat by some stakeholders and result in opposition to the deployment. Reassuring the groups that will be impacted about how the change will be managed and what new opportunities might emerge could eliminate some of this resistance. Individuals impacted, could be trained to manage and implement ACI solution or retrained to do other work, consequently reducing the hiring needs of the organization.

Future Outlook

Digital transformation has always been more of a journey wherein many enterprises have adopted RPA as one of the enablers of the digital journey. In many cases it has served as a good starting point for automation, but the effort should not stop there. Over time more and more interactive robots with intelligent skills will be deployed to handle more complex processes.

While standalone RPA can deliver some business benefits, enterprises need to adopt a holistic approach to accelerate the impact of automation from tactical gains to more strategic business benefits. A concerted effort towards combining RPA and intelligent technologies like ACI can play an integral role in achieving end-to-end automation. In this era of unprecedented opportunity, ACI presents one of the more promising means of taking advantage of AI for process automation to realize significant business impact.


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