

# Scaling Digital Labor

A look into the technologies enabling the digital transformation of enterprise business processes, their implications at scale, and the end-to-end design thinking needed to get there.

# Introduction

We live in an exponential world. The rate of disruption across the global marketplace, from the startup boutique to the Fortune 500 titan, continues to accelerate. The safe, stable industries of the past with thick barriers to entry are now easily accessible by the next clever innovator with a great idea and the passion to pursue it. Some industries are at risk of total obsolescence.

As commerce is conducted more and more within the digital realm, the propagation of innovation is exponentially faster. With parallel advancements in Digital Labor technologies across process automation, artificial intelligence, process mining and orchestration, analytics, and enterprise integration technology, the entire scope of service fulfillment is in the crosshairs.

In this publication, we will explore what it means to digitize and transform business processes by deploying these tools and adopting the methodologies that go along with them, as well as what it takes to transform legacy operations into holistic digital service platforms executed by scalable Digital Labor platforms. It's not just about better-faster-cheaper, it is about rethinking the way work is done to build top-line growth, embark into new markets, and deliver exponential value to customers.

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# The Digital Labor Toolkit

Advances in key information processing technologies have allowed for the wide scale digitization and automation of once entirely manual business workflow.

The machines around us are getting smarter. The term “Artificial Intelligence”, or AI, has been used for decades now as a catch-all term for humanity’s inevitable silicon-based creation capable of comprehension beyond the limits of our biology.

In the world of IT Innovation, AI has stolen many of the headlines of past years with marketers using the term ad nauseam to describe how their platform is smarter than its predecessors. Gartner’s Hype Cycle, shown below, showcases many of the emerging technologies posed to impact our economy along with respective maturity over time and the level of market expectations over time. Several AI-related technologies, like Virtual Assistants and Deep Neural Nets, top this curve, indicating the amount of attention these technologies receive is disproportionate to the level of relevance they have currently on our business landscape.

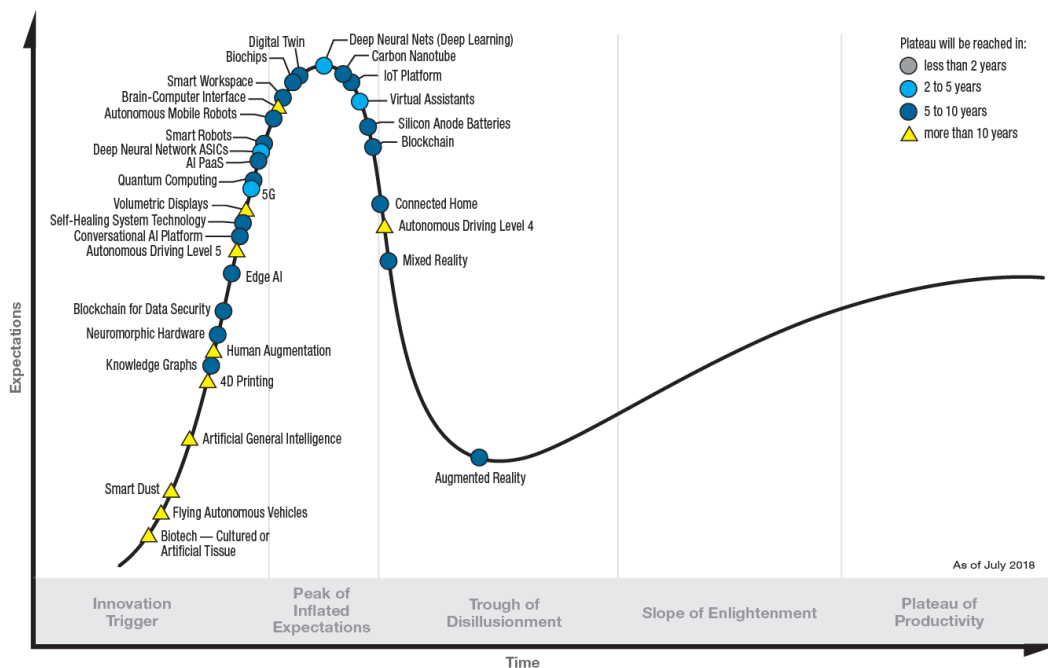
This isn’t to say these trends aren’t important. Most of the technological advances highlighted below will transform entire industries. But, it is important to realize that the keys to

innovation rely on more than just what makes the headlines. This illustration helps to discern between the hype and the reality to better understand how long it might take before legacy models are disrupted from the wake of innovation.

Understanding “when” allows one to make more informed decisions about building transformation roadmaps for their business. What remains is the question of which tools and methodologies are best suited to enable that future vision.

In this publication, we will consider AI, other “smart” tools, as well as a key subset of existing process optimization methodologies that don’t even make the Hype Curve. We’ll explore not only what it takes to make them viable investments individually, but also what it takes to drive insight into what happens when we recombine them effectively. Together, these form a “Digital Labor Toolkit”, a cohesive set of technologies and design principles that allow for the deployment of digital platform solutions that rely on each other and work in unison together to be able to scale business transformation and ultimately redefine entire end-to-end business processes.

**Gartner Hype Cycle for Emerging Technologies**



Source: Gartner (August 2018)



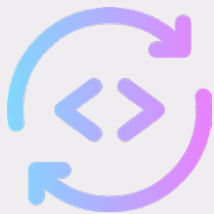
In the analysis to follow, we will cover a myriad of best practices, design principles, success factors, and the like, but will be grounding everything around a key set of tools and methodologies that enable businesses to go “digital”. The Digital Labor Toolkit has six major elements: robotic process automation, cognitive computing, process orchestration, agile enterprise information management protocols, enterprise-grade middleware/API’s, and big data & analytics.

For the avoidance of doubt, the scope of this publication is limited to the impact these technologies will have on business processes that are based on knowledge work, that is, any set of tasks that relies on the exchange, management, analysis, or creation of information. File management, finance reconciliation, order tracking, claims adjustments... an ever-growing portion of the tasks involved within an enterprise, both back office and front office, rely solely on the exchange

of data and the software-based systems that support those datasets, or at the very least rely on analog forms of each process (physical contracts, handwritten orders, etc.) that have the potential to be virtualized. Many Fortune 500 companies have initial investments made into each of these tools and methodologies listed below, but there seems to be a general sentiment of growing frustration as executives reflect on initial forays into process digitization and automation due to an unsolved problem: *The question of scale*.

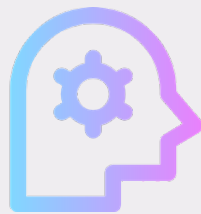
The promise of success from a pilot project can be misleading to leaders who expect similar proportional output at scale as volumes increase towards a greater impact across a business’ various verticals and functions. Scaling up a digital solution to global enterprise capability requires another level of nuance in terms of solution design, as the notion of scale brings with it new factors that can make or break a project.

## Elements of the Digital Labor Toolkit



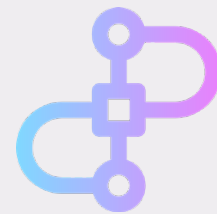
### Robotic Process Automation

Also known as “RPA”, this technology involves scripting engines meant to mimic repetitive tasks performed on a computer, typically involving the recording of keystrokes and user interactions with desktop applications, web forms, or other user interfaces. RPA is designed to work with almost any interface, making the platform technology-agnostic.



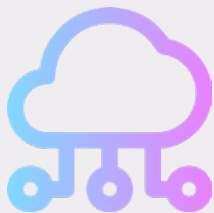
### Cognitive Virtual Agents

A series of technologies comprising software meant to mimic human thought patterns in order to automate tasks that require higher order critical thinking, processing of unstructured data (e.g. natural language), and creative problem solving. Cognitive Computing makes up one focus within the various fields comprising “Artificial Intelligence”.



### Process Mining & Orchestration

Process Orchestration combines digitized process maps and guided workflows to automate, or at the very least facilitate, the execution of a business process. This is done through managing handoffs between tasks, a tight integration between in scope systems, tracking overall throughput status, and providing active alerting to bolster productivity.



### Enterprise Information Mgmt.

More of an art or science rather than a “tool”, but Enterprise Information Management (EIM) is nonetheless essential to scaling digital deployments across an organization and allowing for the agile delivery of relevant data. EIM is a set of practices that govern how master data taxonomies, data lakes, and other data elements are built and maintained.



### Middleware & API Framework

Enterprise Middleware is the “plumbing” of an organization, governing the way disparate applications, servers, databases, backend micro-services, exchange platforms, active dashboards, and countless other systems speak with one another. API’s, or Application Programming Interfaces, provide doorways for this exchange of information.



### Big Data, Analytics, & AI/ML

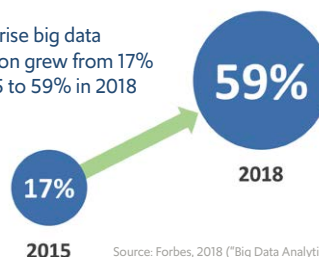
Big Data refers to the vast data stores that are generated and collected from digital assets or the digital footprints of analog activities. Applying advanced analytics and AI/ML to Big Data allows for hypothesis testing of suspected patterns between interrelated objects, actions, events, or other unstructured data, delivering new insights into business operations.



### Adoption of Big Data Analytics Increases

As the value of the digital exhaust of enterprise operations became more known, investments in deep data science capabilities have grown in recent years.

Enterprise big data adoption grew from 17% in 2015 to 59% in 2018



Source: Forbes, 2018 (“Big Data Analytics Adoption Soared In The Enterprise In 2018”)



### INSIGHTS IN DEMAND

Consistently regarded as the most in-demand tech job in America, the shortage of data scientists continues to exist with an estimated gap of 150,000 positions unfilled by the end of 2018. This number could grow to over 1 million open positions at the current rate within the next 1-2 years if there is not a significant influx of new talent into the market. Average salaries for data scientists in North America are about \$110,000.

33%

successfully scaled digital projects

Source: 2019 Gartner CIO Agenda Survey of 3000+ respondents

63%

of RPA projects miss deadlines

Source: 2017 Deloitte Survey of 400+ respondents ("The robots are ready. Are you?")

50%

of firms have a Chief Data Officer

Source: 2018 Forrester Survey of 2,879 data and analytics decision makers ("Global Chief Data Officer and Chief Analytics Officer Survey Q4 2018")

54%

of global workforce will require significant reskilling by 2022

Source: 2018 World Economic Forum study ("The Future of Jobs Report")

25%

of current jobs may be eliminated due to automation by 2030

Source: 2019 Bain & Company report ("Labor 2030: The Collision of Demographics, Automation and Inequality")

14%

of entire global workforce will need to switch occupations by 2030 to avoid obsolescence

Source: 2017 McKinsey Global Institute study ("Jobs Lost, Jobs Gained: Workforce Transitions in a Time of Automation")

## Understanding the Customer Journey

Before going deeper into the Digital Labor Toolkit components specifically, we must first establish the right foundation to explore the nuances of scale. Whether they think they do or not, many technologists propose "silver bullet" solutions to address many business problems. The ideal solution, in the idealist vision, is a piece of software that addresses all of a stakeholder's goals and pain points in a seamless fashion. Easy, out-of-the-box, and quick to adopt with an even quicker ROI. Just as everything may look like a nail to someone selling hammers, vendors of digital platforms tend to overestimate the power of software alone when considering client transformation, leading organizations towards applying solutions that may not impact the problems at the scale they hoped it would. It is compelling to think this way, naturally. From a seller's perspective, the notion that their product is turn-key is all too attractive to the increasingly desperate buyer looking to affect their bottom line in the fastest way possible to remain competitive in today's cutthroat marketplace. The shortsightedness of many software technology implementations lacking richer solution design typically result in an attractive proof-of-concept that excites leadership, but when it comes to integrating and scaling into a production environment, roadblocks inevitably materialize to halt progress.

There is an argument to be made that this is a result of the traditional method of "starting small", and then scaling up. What we see as an emerging trend in approaching technology adoption, process optimization, and transformation more broadly, is a new way of setting the up-front context. This context is based on first understanding the "Customer Journey". Too often, projects that pose the threat of disruption to a legacy environment do not incorporate the proper due diligence of the effect the project will have on the end user, stakeholder, or customer. The truth is, true transformation starts with the customer or consumer of a business process, and requires working backwards from that point to understand what elements enable the journey that stakeholder travels through when interacting with the broader service landscape.

More often than ever, firms specializing in the art of "design thinking" are sprouting up to help companies think through how to design products, services, or new implementations with the context of this customer journey, typically relying on extensive prerequisite work on mapping out an accurate current state map of business processes, the journeys and personas that customers travel through and occupy, respectively, to contrast against what a future operational vision might look like. While not revolutionary at surface value, what the practice of design thinking gets right, and what makes it so impactful, is the idea that end-to-end process should act as the foundation for all transformation activities. This foundation acts as a springboard for other, more tactical projects to begin. The difference in this model, however, is that these tactical initiatives now have an explicit tie to a larger narrative and do not suffer from the irrelevance and improbable scalability other projects might have where there is an absence of clear visibility into the downstream effects of transformation. Without knowing the proximity between proposed process changes and other aspects of business operations, it becomes difficult to assess and assign both risk and potential reward. Take for example the

act of digitizing the claims management process. Especially for larger corporations that have the burden of using older, legacy systems and siloed, functional, and regional workflow, driving increased efficiency in claims processing is of great importance to business leaders due to the potential linkage to issues with product quality or hindered customer experience. The opportunity of increasing throughput as well as increasing efficacy in the early identification and prioritization of claims that need immediate attention are very often "low-hanging fruit" for a business looking to use digital platforms to change the way they interact with customers. Approaching this goal by spot optimization can help modernize bloated legacy workflow, but doing so without either up-front or parallel journey mapping (for all personas involved in the process) doesn't allow for a richer picture to be painted of the downstream effects these changes will have. One of the outcomes of design thinking and equipping a process-focused mindset, however, is the ability to map out the tertiary repercussions of back office operations on front office efficacy and delivery. For example, RPA that helps to organize and match claims documentation to customer master data helps to reduce the labor involved, but will this have any effect on the true bottlenecks that hold up claims from being processed in a timely fashion in the first place? Understanding personas up-front and the effects innovation will have on them provides better context when building a transformation program.

## Transformation Led by Process, not Technology

Transforming a legacy business environment, no matter the scale, must have a foundation in a process-led view of the world. The old adage that breaking business elements down into people, process, and technology is a superior method of categorical analysis still holds up, but we believe that process, above all else, provides the scaffolding a business needs to operate. It is the nervous system of inputs, outputs, logic, and overall service design, with people and technology lending themselves as mere methods of execution. For this reason, transformation that begins with a process-led foundation ensures a stronger, more stable foundation on which future transformation and measured disruption can execute effectively. If designed effectively, business process goes beyond the printed Visio diagram pinned to the wall of the cubicle meant to act as merely a guide, and moves to become an active, dynamic governance engine for a business' operations.

In the world of process optimization, automation, and orchestration, there is an ongoing war to establish the dominant terms, patented trademarks, and buzzwords we use. Task automation, Process Automation, , Smart Process Automation, Intelligent Process Automation, Digital Business Automation... These are all phrases being used by the world's leading technology and advisory firms to describe very similar (and sometimes equivalent) technologies and methodologies. The terms above are meant to highlight platforms that govern and orchestrate "swivel-chair" automation, administer the streamlining of processes, facilitate the integration between applications and people, while also handling the workflow mapping needed that underlies BPM environments . Within our Digital Labor Toolkit, we reference this element as "Process Orchestration".

Process Orchestration goes beyond traditional BPM techniques that focus more so on management principles, and advances to include these active elements to be semi-autonomous in its execution. A good example to highlight what we mean by "active" is to examine a subset of advanced process mapping methodologies: Process Mining. Juxtaposed against the aforementioned Visio diagram with its static view of the world, Process Mining utilizes various machine learning algorithms and statistical models to parse the raw telemetry that is created by employees, customers, other workgroups, and applications through the simple course of doing business. Some examples could include timestamped e-mail metadata from an Exchange server, or batch processing logs from SAP. These digital footprints tell a story about what is really happening at a granular, operational level. Process Mining products today are able to transform this telemetry into relevant insights about how processes are performed in reality, exposing any existing bottlenecks, feedback loops, moments of non-compliance, or other opportunities for further efficiencies. Employing process-first thinking and leveraging tools like process mining and orchestration provide a guided path forward towards scalable digital labor deployments by eliminating the fog of war hindering businesses from seeing what's coming next.

## Competing in the Experience Economy

In an age dominated by behemoths like Amazon that compete on cost and speed, the era of the boutique, experience-driven enterprise has begun. The implication of digital business models and services inherently create a concentration of potential "winners" who survive the coming wakes of disruption. Why go to a store if you can get the same item on Amazon at a better price shipped the next day, saving the hassle of the trip, and most importantly, time? When the value proposition of a business relies solely on cost competition, speed, and distribution, the introduction of new digital adversaries provide an existential threat at every turn. As a counter, an additional implication of these digital delivery models is that because of the dissolving barriers to entry to new markets and the time needed to implement new services becoming compressed, innovative business leaders can shift to offering more targeted, customized, and personalized services for their customers without laying out an unreasonable amount of capital. Competing on optimizing and personalizing customer experience (CX) adds a unique differentiator between the Fortune 500 behemoth and the smaller start-up looking to steal market share.

As the mobile app market continues to set the bar for what constitutes a rich experience, more and more focus will be placed on CX design to determine how to craft digital platforms to achieve this outcome. The elements affecting and driving an "experience" are numerous, but there is one key element that is absolutely foundational to viable service design: the user interface. A good UI goes a long way in driving engagement with and adoption of new digital platforms. Much of the experience we have as humans interacting with any service starts and ends with the UI layer, and it's the element that delivers the first impression and elicits the first emotional reaction to a product or service. As the smartphone app market matures and competition intensifies, the patience the average

user will have for poor design or performance only decreases with time. More than ever before, effective, digital, self-service fulfillment channels are favored over more analog methods of issue resolution of inquiry into basic information about some product or service. The last thing we want to do in our personal lives is to talk to a human or submit a ticket when a problem occurs if there is a quick, reliable, and easy-to-use self-service alternative to solving the issue. However, the opposite is true in many legacy business environments that lack similarly advanced and reliable portals. At the end of the day, CX must be the target that should be maximized when considering service improvements or transformation programs. When planning new initiatives, ask yourself: Am I improving internal operations at the expense of the customer? Am I relieving any burdens of complexity or speed of service delivery? How am I measuring CX indicators to ensure project success?

## Fail Fast, Fail Early, Fail Often

It's one thing to talk about customer journey mapping and process redesign, and another thing to actually execute it in practice. It takes time, which is why the value of skunkworks philosophies are more important than ever for those responsible for driving innovation in their firms. The need to drive a culture of constant experimentation with new technologies underlies a strategy designed to stay ahead of the curve. Part of our new reality is that there is no being "done" with transformation - companies that survive the coming wave of disruption will exhibit cultures that accept ongoing change is the new normal. This doesn't just go for technology, but for roles and management practices as well due to the evolution of service delivery models, both internal and external. Another reason behind this need for a more agile culture ready to is the reality that there is no digital silver bullet. One technology may be hot today, but it may be something very different tomorrow. Beyond technology, the increasing pace of change is affecting the way we think about human roles, the evolution of skills, and the internal employee experience. In a world defined by rapid digital change, firms must empower their employees through programs, communications, and new opportunities that help promote the idea that change is the new normal. To the degree that these efforts become under-prioritized, the lack of or outright resistance to the adoption of new tools will hinder the business benefits of technology investments, and more broadly lead to a stagnant digital agenda. True user adoption is an essential ingredient to any transformation.

In parallel to the effort to change the hearts and minds of those within the company, there is a battle for new prospects outside of the company to enable the change in the first place. As the horizon for relevant skillsets becomes harder to determine and augmented by the shortening window of relevancy for each skill, there is an increasingly scarce pool of prospects able to become professional practitioners of the tools and methodologies outlined in this report. The battle for skills is highlighted well in the field of Data Analytics, Cognitive Science, RPA, and Cyber Security. As innovation leaders consider the culture they look to affect, they must offer more than just a high wage for tomorrow's SME's and ensure they build an attractive workplace for new prospects to flourish and drive real impact.



# Putting the Digital Labor Toolkit into Action

Siloed, tactical investments in each of these capabilities is not enough for effective broad, end-to-end digital transformation. To be successful, any disruptor of legacy process needs a blueprint showing how these capabilities augment one another and a roadmap for how they can scale together in parallel.



## Key questions to consider:

**Where do I start?**

- Investment options
- Organizational readiness

**What's the scope?**

- People, process, technology, and data
- Legacy service design vs. digital

**How do I scale?**

- Enterprise-wide benefits realization
- OCM and barriers to adoption

As we unpack the various elements of the Digital Toolkit, it is important to remember what problems these tools address. What becomes apparent is that in isolation, these tools can affect change and drive optimization of process in pockets of the workplace ecosystem, but as each of the tools become introduced and leverage one another, that impact multiplies. The whole becomes greater than the sum of its parts.

For example, as the majority of Fortune 500 companies embark on their RPA journey, many start small, as they should, to experiment with the technology and prove out its efficacy before exposing their bots to production systems. RPA bots by themselves drive great efficiencies in cycle time and spot cost reduction. However, as those same businesses invest in API gateway solutions, RPA scripts which typically are restricted to front-end interactions with application interfaces can now integrate with backend API calls as needed, expanding the breadth and width of the potential for task automation. Likewise, as analytics and machine learning capabilities are matured, aspects

of work process roles that were previously out of scope for automation can be targeted as ML is used to detect patterns in seemingly unpredictable and unstructured datasets, ultimately acting as the pigeonholing tool that rigid software applications like RPA need to kick off work appropriately.

These tools augment one another, allowing for more end-to-end aspects of workflow to be transformed together rather than having a flood of point solutions that never deliver on the promises of ROI at scale. Deciding where to start, what scope to target, and how to scale cannot be done in a vacuum for one project at a time. To achieve scalability, those responsible for process optimization, innovation, and IT need to consider these questions in the context of a larger transformation program. The hurdles involved with standing up and governing such a program towards continued success go far beyond the technical issues inevitably encountered in building out the Digital Toolkit, and stretch to encompass redefining company, culture, and even the nature of work itself.



## Robotic Process Automation (RPA)

RPA refers to simple excerpts of computer scripts designed to perform repetitive business processes the same way a human would, thereby automating standard workflows humans conduct through interacting with various applications and portals, like simple data entry, data handling, reconciliation, and basic reporting. RPA differs from typical autonomous microservices running in the background behind workstations or servers as all of the commands are executed directly through front-end application interfaces.

These “bots” are not AI - they are dumb, rigid, and not adaptive enough to work effectively with unstructured variables or an IT environment in flux. Due to the speedy turnaround of projects and the low amount of capital needed to get started, investments in RPA are a great way for a firm to “get their foot in the door” to demonstrate the potential of digitizing processes and reducing reliance on human labor for repetitive functions.

Admittedly, the reality of RPA implementations has not lived up to the hype over the past couple years. We'd like to highlight two main drivers behind this trend, with the first being a misunderstanding of scope. RPA automates tasks, not people or entire processes. Without employing the rest of the Digital Labor Toolkit, RPA may be very beneficial, but from the perspective of end-to-end digitization, bots will only ever race to the next “red light” in a process, referring to the more complex tasks out of scope for what RPA can address. To truly automate entire functions, a broader integrated toolset is needed to stitch together RPA's front-end scripts with more advanced functionality sitting in backend core systems. Secondly, there tends to be a shortsighted view of the business case. To summarize it simply, benefits realization in the form of cost reduction will not materialize immediately as headcount effects are minimal until process digitization and redesign at scale is addressed. In most cases, RPA's benefits manifest as greatly decreased cycle time and increased quality. This is an increase in productivity rather than the full replacement of human labor. Until advanced analytics, cognitive systems, and a broad integration platform are utilized in tandem, cost compression can be somewhat limited.

## Cognitive Virtual Agents

Most of us have had a range of experiences using Apple's 'Siri' or many of the other virtual assistants widely available to consumers today. Like Siri, the 1<sup>st</sup> generation of consumer-grade chatbots that have saturated websites, FAQ pages, service desks, and even the devices in our homes have, at best, delivered convenient insights to address our most trivial questions, and at worst, been an unwelcome annoyance blocking us from reaching the humans we're really looking for to handle our requests.

These tools are not intelligent. In most cases, tools like Siri utilize sophisticated keyword matching and identification algorithms to guess at the intent at human speech in order to search for relevant data or execute basic services available through integrations with other backend systems. Much of the innovation in the consumer space has been on the strength of voice recognition to deal with unclear or inconsistent user speech quality.

True cognitive virtual agents go beyond the realm of advanced chatbots. “Cognitive” refers to the type of programming design used to mimic our own cognition, involving the use of algorithms inspired by the structure of human thought processes. Tomorrow's cognitive systems are able to decipher complex, unstructured natural language with nuanced context to extract true meaning and intent, rather than guessing at what the intent of any spoken or written statement is by relying on keywords and if/else decision trees.

The shift between these two types of intelligent agent services is fundamental to understanding how AI more generally is advancing. Leading enterprise cognitive agent platforms, like IPsoft's "Amelia", rely more heavily on semantic and episodic memory networks, evoking images of the more advanced neural networks found in the human brain.

By using machine learning and advanced NLP, cognitive agents will be able to scale with the dynamic nature of today's complex enterprise environments. Having a cognitive front-end to rest of tomorrow's digital services will be increasingly important as end users seek more intimate, relevant, and accessible methods of interaction.

## Process Mining & Orchestration

Of the classic breakdown of business components consisting of People, Process, Technology, the category most consistently overlooked is Process. The record of business process typically exists as static documentation used as a guide for employees or as training aides for new hires. Often times, workflow diagrams and work instructions exist as an ideal state of operation, the master reference for how a function ought to conduct its business, but does not necessarily an honest reflection what happens in reality. Inevitably, what develops around the ideal, standardized process are workarounds, bottlenecks, changes to key roles, shadow IT support, and the unofficial appointment of the go-to SME's each team leverages to advise them when something is needed in a pinch. Humans are adaptive and can thus pick up the pieces of a poorly planned business process network, but it's that same tribal knowledge helping a company conduct it's day-to-day business that becomes the chains that hold back a digital organization.

Like humans, an effective business process management platform needs to be active and adaptive. "Active" in this case refers to the idea of process itself existing as an active element in the IT ecosystem. On the front end of process discovery, mapping, and design, new tools like process mining help to build process maps that are inherently tied to real-world actions by tracking timestamped metadata to discover how a business operates task by task, in real time. Similarly, leading enterprises are investing in next-generation, smart process orchestration platforms, which serve to integrate together process notation, source applications and systems, as well as key employees and workgroups, all in order to track status and automatically guide workflow end-to-end. This is where "Adaptive" is accounted for. By mapping out how process is tied to real-world active elements, orchestration platforms can provide the scaffolding needed to run entire businesses. With each process element digitized vs. an over-reliance on tribal knowledge process orchestration engines can serve as the backbone to digital transformation, giving a lens into the status of any operation regardless of granularity, and tying together people, technology, and the data sources that they rely on.

## Enterprise Information Management

If Process provides the scaffolding in which an enterprise operates, Data is undoubtedly the lifeblood of the enterprise running through that construct. As most of the other elements of the Digital Labor Toolkit manifest as literal tools, next-generation approaches to Enterprise Information Management (EIM) exist more so as a set of protocols and design principles meant to govern data, information, and knowledge, enabling the adoption and scale of digital platforms. More so a symptom of older organizations as well as large ones built through merger & acquisition activities, the exaggeration of enterprise "siloes" is a great example to explore to see why a poor approach to EIM can suffocate a business. Due to regional differences, varying needs between business units, or the legacy environments used by separate functional departments, siloes inevitably sprout up. The technology footprint each silo leaves in its wake creates an equal amount of complexity within the world of data management. Too often, any material modernization of data architectures only occurs when change events happen to require them, like the consolidation of functions or the introduction of new enterprise applications. These deployments may enable ongoing change, but do not address the underlying need for global data management solution resilient to the pollutants of new software investments.

The answer to this growing issue exists in a myriad of data architecture technologies as well as pure management principles. A commitment towards building and maintaining integrated master data taxonomies moves legacy architectures towards more augmented data management operations exposing the potential that more advanced AI/ML technologies bring around metadata management. These advances help promote the veracity and the velocity of information. We are moving from a siloed world of legacy data warehouses and broken information service delivery processes to a world of seamless, trusted, real-time access to information. The set of next-generation EIM protocols that include agile cloud infrastructure, data fabric design, autonomic warehousing, and containerization techniques, all contribute a crucial element standing up the foundation upon which other digital platforms can stand upon to scale and create real change.



## “Magic” Middleware & API Frameworks

Tied at the hip with an effective EIM strategy is a pervasive, self-tuning middleware framework stitching together people with the applications and data they rely on. An enterprise middleware platform could be imagined as an exchange server between these parties, carrying commands, requests, and various information packets based on environmental needs.

APIs are Application Programming Interfaces. In an overly simplistic nutshell, they are the backend doors that many software entities offer as open pathways for information exchange or transfer. These backend communications are either handled by a central middleware platform or directly between the two or more systems exchanging information. If RPA is automation that exploits front-end user/application interfaces, middleware platforms and API scripts handle much of the microservice automation at the back-end.

The future of back office automation consists of a marriage of RPA, a flexible and scalable middleware backbone, an set of targeted AI-enabled services, and a saturation of microservices leveraging APIs and other discoverable, machine-readable databases.

For some software companies who sell a suite of applications that make up a larger ecosystem, incentives sometimes align towards limiting middleware connectivity through closed APIs, or APIs that are fully open to outside developers to leverage, with the purpose to keep development in-house so the firm can incentivize more “work” and attention can be spent in the developer’s universe.

The benefit of APIs go beyond backend automation as well as they have transformed the way we develop and maintain the presentation layer of certain user/customer portals. “Experience APIs” are used webpages, apps, or other portals to define certain visual, active elements on the interface. This means that apps that leverage Experience APIs can present a dynamic set of options and services based on environmental variables, like user actions and clickthrough behavior, giving developers new, adaptive ways to engage users of these systems and more effective ways to incentivize certain actions.



## Big Data, Advanced Analytics, & AI/ML

The core of the recent advances in narrow artificial intelligence (AI) as its roots in data science, in particular the marriage between traditional statistical analytics methods with new algorithms designed to teach models meant to learn through experience. The latter refers to machine learning (ML), a branch of computer science focusing on models that learn from experiential circumstance (whether explicit or natural) versus traditional, rules-based programming written by humans. Instead of trying to tell the machine how to interpret data and the environment, we simply tell it parameters for how the models should classify data, find patterns, or learn on their own. These approaches rely on vast amounts of input data as “fuel” for the model in order to train them - this is why “Big Data” is so important - with so much data available to us in an interconnected world, we are able to test hypotheses that would have been impossible in previous years.

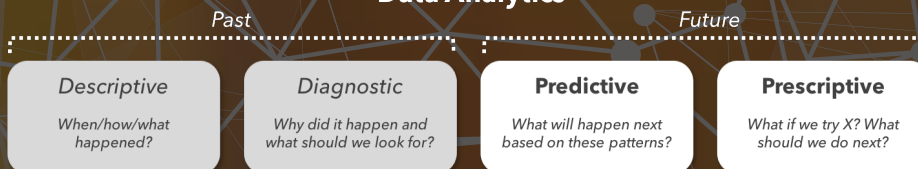
For these technologies to really take off, they need to be trained extensively. The human brain processes about 1MB of information every second, which does not seem like a lot compared to the world’s most powerful machines, but what we have are extensive neural networks that have been crafted over the millennia to be effective, efficient learning machines, only interpreting what is needed to keep us alive. With artificial intelligence, we start from scratch, and instead can choose in which manner a model should learn by picking between algorithms that find linkages between defined inputs and outputs (supervised learning), or through forms of accelerated machine Darwinism that evolve model characteristics over time in response to rewards (reinforcement learning).

Some of the most promising ML algorithms, like Deep Learning, have been based on neural networks. Deep Learning in particular relies on multilayered neuronal-trees that break up vast amounts of input data and easily extrapolates increasingly complex insights about said data. In combination with traditional explicitly programmed probabilistic models, machine learning provides a powerful set of tools for analysts to use to quickly learn about complex datasets, effectively unlocking the “blackbox” of AI.

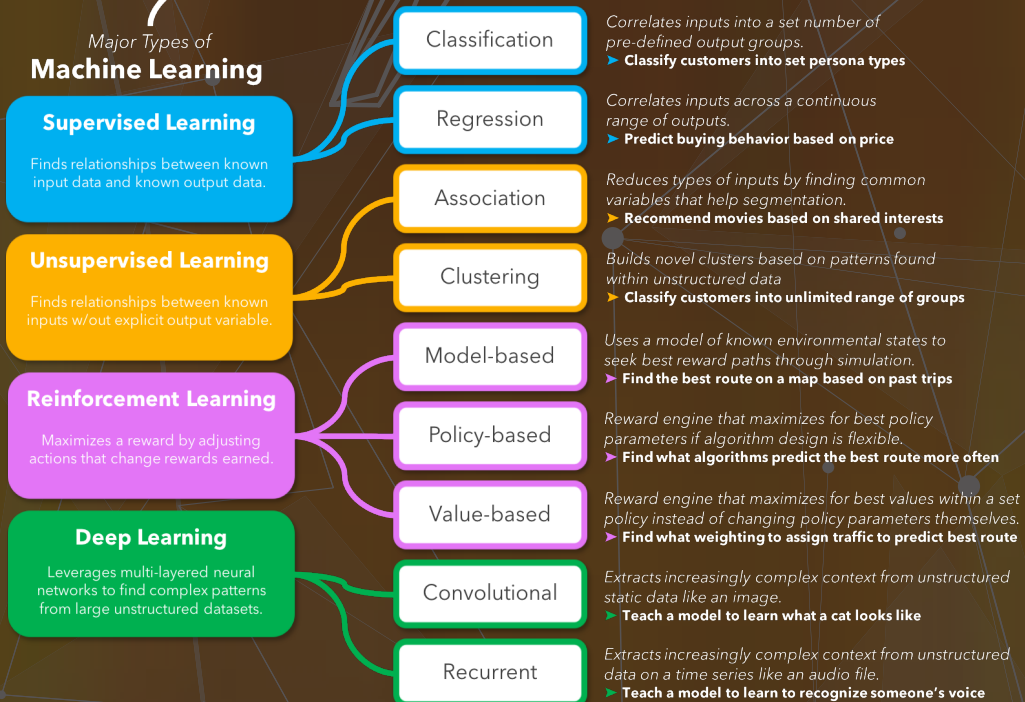
# Unpacking Machine Learning

Machine learning (ML) involves the use of various statistical models powered by predictive algorithms designed to detect patterns in datasets automatically without the aid of explicit programming or processing instructions from humans. The use of machine learning tools typically requires training an algorithm to learn over time by optimizing its own output values based on new input data or experience. These models differ from traditional statistics regarding purpose (ML is built to make predictions and recommendations about the future) as well as strengths (ML sacrifices interpretability for more accurate predictive accuracy).

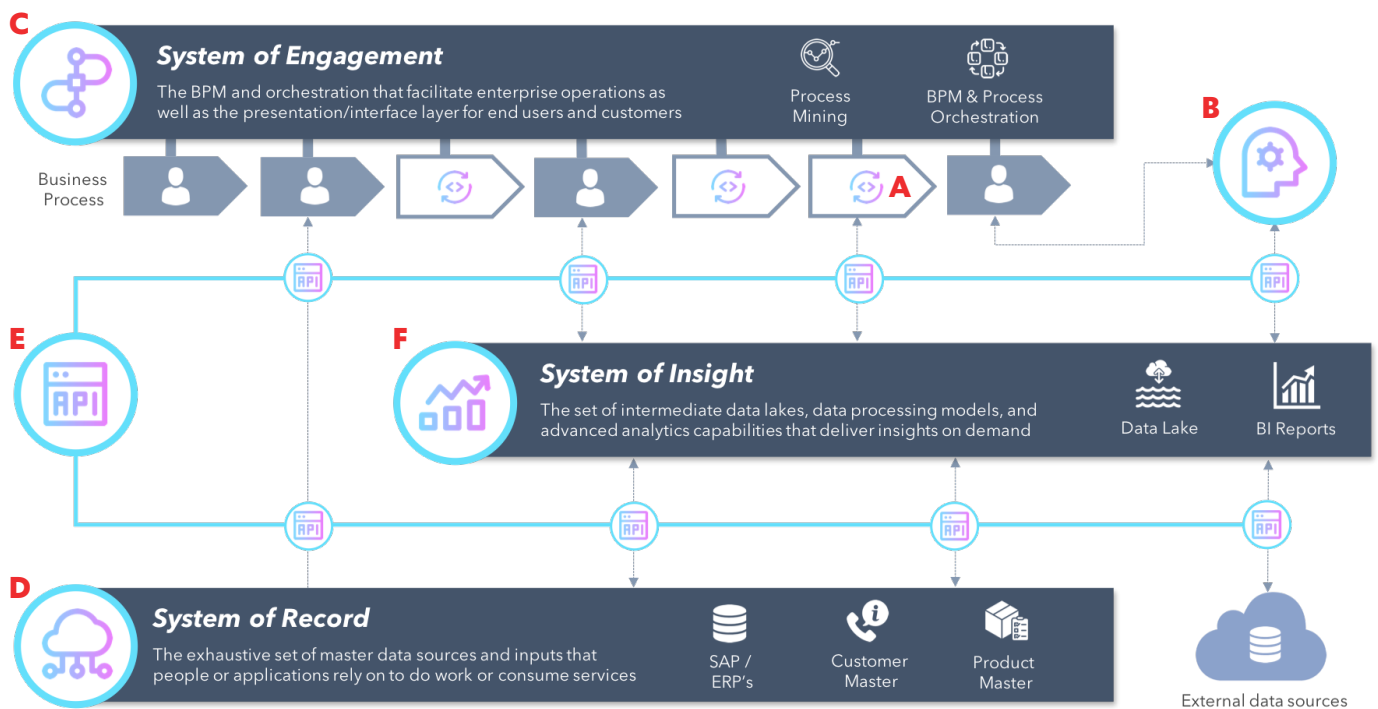
## Major Types of Data Analytics



## Major Types of Machine Learning







## Piecing it together

The digital toolkit interlaced within enterprise systems of record, insight, and engagement.

### A | RPA, the automation of business process tasks

It is important to view bots as a way to automate "tasks" vs. entire processes. Certain tasks, based on factors like rules-based decision-making and the involvement of structured inputs/outputs, lend themselves to RPA, but RPA cannot be the sole source of process digitization overall. Bots can interact with applications and data the same way we do, or can integrate with APIs and other backend methods when needed to do work.

### B | Cognitive virtual assistance for end users

Cognitive computing shines as a front-end method for users to interact with underlying applications and information assets. When clarity is needed for a user performing a task, or if a requestor/customer requests a service, cognitive agents can interpret those needs and interact with other digital entities on behalf of the user or customer due to tight integration with systems of insight, even invoking automation when necessary.

### C | Process mgmt. and the System of Engagement

Business processes are what stems ultimate demand and delivery needs for the entire digital apparatus shown above, meaning digital transformation must be approached from the process down. Smart orchestration tools help to actively integrate BPM tools with underlying platforms, assist in orchestrating from one task to the next, and provide the end-to-end visibility and the context needed for digital deployments like RPA.

### D | Data management and the System of Record

If the System of Engagement is the lens through which the digital transformation of enterprise workflow can be seen, the System of Record provides the foundation. EIM and broader knowledge management protocols, taxonomies, cataloguing, and MDM make up the data "scaffolding" through which higher-order insights can be derived and ultimate work can be done. Without it, process digitization cannot be achieved at scale.

### E | API/Middleware, the "glue" of the digital toolkit

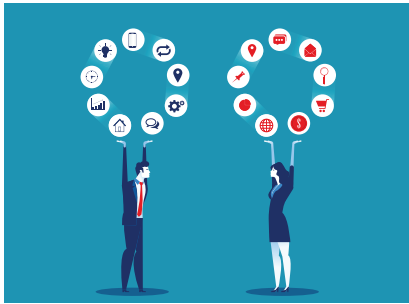
Standardizing and simplifying the ways people, process, and technology interact and integrate allows for the seamless flow of information. Enterprise integration/middleware platforms achieve this through API gateways, EDI, and other exchange protocols to open up the "back doors" between assets, the same doors used for data transfer/fetching operating at machine speed. API integrations are typically stable and scalable.

### F | Big data, analytics, and the System of Insight

A process-focused mindset is the first step to achieving the context needed for digital transformation, but the next step is planning for scale. Proving out new technologies or new methodologies typically start in the back office, providing the buffer needed to experiment without increasing visible or tangible risk to customer-facing operations. For that reason, it is still a great place to begin investing in the tools and methodologies.

# Making Smart Investments

Building out a Digital Toolkit that's ready for use at enterprise-scale takes time. The process requires an evolution of not only technological capability but also sourcing models, delivery models, and partnerships. Common hurdles that may stifle initial pilots can deliver serious blows to a change agenda, but ensuring the right mandate, setting the right scope, and establishing the right operating model can pave the path forward.



## Building the Right Operating Model

**Sourcing:** The first question to ask is whether to build or buy - and often, the answer is both. Having multiple channels ensures a sourcing strategy that can adapt to differing solutions in the marketplace. Regarding maturity of sourced service structures, ensure that the scope of services is as close to a managed service or outcome-based agreement as possible to allow for better control and flexibility. A strong engagement with the outside marketplace provides the opportunity to source the right talent and build partnerships with the right vendors and consortiums;

**Delivery:** Similar to above, ensuring a multi-pronged delivery structure allows for a dynamic way to deal with different enterprise customers and stakeholders and provides the agility needed to scale digital labor solution. Work with cross-functional leaders (and be sure to hire/partner with those who have extensive cross-functional experience) in order to get ahead of growing scrutiny and regulated process requirements, building them into published standards wherever possible.

**Governance:** If the scope is global and end-to-end, a global service management mindset is needed, or at least a cochaired council with the GSM organization if one exists. Governance teams should ensure work is tied to sound business cases and maintain funding and budgeting requirements on an ongoing basis.



## Targeting the Right Scope

**Assessments:** Opportunity assessments help provide a global view of where the low-hanging fruit lie within an organization (as well as the more complex problem areas, depending on what one might be looking for). Additionally, maturity and readiness assessments can be conducted to paint a picture of the appetite for change at any given time. All of these efforts, like the design principles of the technology deployments themselves, start with a deep process analysis to shed light on how global workflows interact with and affect one another.

**Quick Wins:** Start small and place many bets. Many startup innovation centers fail due to picking the wrong pilot or test cases - but what criteria can and should be considered? The answer, as in most cases, is "it depends". For RPA, high volume, repetitive, low risk tasks lend themselves to initial pilots, but for more complex tasks that require cognitive/AI/ML tools, something end-user facing with higher visibility should be considered.

**Plan for Scale:** Even if you start small, any innovation team should plan for scale and constantly pressure test every part of the solution at peak load, from the technical architecture to the sourcing model. Sourcing models and commercial contracts will change as scale increases so a multi-year roadmap should be understood ahead of time to track evolution.



## Ensuring the Right Mandate

**Executive Support:** Funding and an executive mandate for change may be the most important point to make in this paper, as nothing else matters without these elements. A top-down initiative for change complements the grass-roots movement from the bottom-up that will increase as you evangelize your solution. In ideal scenarios, material incentives for change should be adopted to ensure loyalty to the program and encourage active participation and support from key stakeholders.

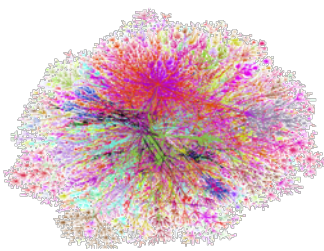
**Partnerships:** Find as many friends as possible. Change is something naturally resisted, and a set of partners across business units, regions, and functions provide the cross functional support network needed to drive adoption and excitement for change past a critical "make or break" point. A partnership with IT is absolutely essential if the innovation program office sits within a business unit or function to ensure continued technical integrity and visibility into environmental shifts that could materially affect your deployments in production.

**Cultural Maturity:** The internal marketing program behind the new and exciting innovation to come is almost as important as the technical solutions themselves. Driving adoption and promoting a culture of change as stated before is essential part of any digital transformation strategy. End users and customers alike should be targeted to ensure adoption versus fear.

# The Politics of Data

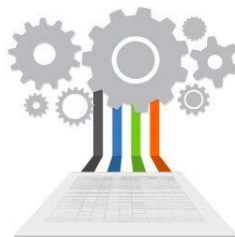
Data is the lifeblood of the modern enterprise. The key differentiator between obsolete business models and new digital business models can be highlighted by the approach to understanding and valuing data as a vehicle for which new services and insights can be derived, though remnants of legacy thinking can cause the evolution of data strategies a potentially difficult journey to embark on.

## The Lifecycle of Enterprise Data



### Capture Unstructured Data

The collection of data (external extant or internally produced) in its raw form.



### Process and Prepare Datasets

Data storage, file sharing and permissions management, and hosting protocols.



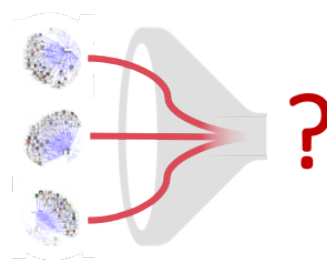
### Catalogue into Structured Data

Secondary labeling, categorization, data cleansing, and tertiary dataset creation.



### Discover Patterns & Anomalies

Use of statistics and ML techniques to automatically find emergent patterns.



### Build Hypotheses

Hypothesis testing based on discoveries and goals of business leadership.



### Derive New Insights

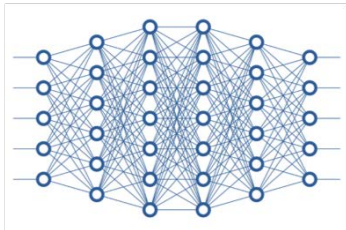
From continued hypothesis testing, feedback, and fine-tuning of data models.

We are seeing an emergence of the data-driven enterprise. For companies that were born in the digital age, the principle that data should underpin decision-making, both strategic and tactical, may seem obvious, but firms burdened by legacy systems and data management protocols often do not see data as the truly strategic asset that it is. Firms that both understand this but also invest the time, people, and resources to get it right firstly enjoy short term benefits, like increased velocity of information, user/consumer trust, ease of access, customer experience, and an empowered end-user base. On a longer timeline, thinking and planning business activities with the conscious awareness of the enterprise data lifecycle above helps a company think digitally and become better data stewards. An emerging field of "Digital Asset Management" is being adopted that promote the values, management best practices, and design principles of handling data and delivering novel, relevant, and actionable insights to business leaders. As cultures evolve to think along these lines, the lifecycle of data from raw and unusable to key insights ready to act upon will tighten, bringing us closer to truly dynamic, data-driven business operations, and will serve as the active metabolism for the enterprise.

The politics of data emerges as one of the leading barriers to making this transition due to numerous common themes, typically revolving around a lack of clear decision rights, data ownership, stakeholder alignment, as well as poor data hygiene causing a pollution of the master taxonomies and organizational mappings. It may seem like a difficult problem to solve when there are overlapping and continuously shifting management structures across business units, regions, and shared functions, all with the potential to lay a claim on what can and should be done with specific datasets. What results is a siloed environment continuously plagued by stunted operational agility, redundant workflows, lack of unified global visibility, project delays, perpetual master data discrepancies, and ultimately a reduced customer and end user experience.

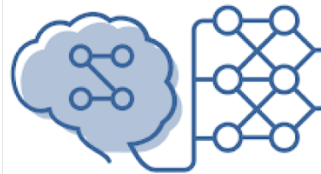
Less a technical hurdle and more of a social/political one in reality, awareness of this issue is increasing. Once these hurdles are overcome, data management constructs will evolve from IT-managed business elements to strategic corporate assets, and serve as the prerequisite foundation to advanced analytics, new business insights, and entirely transformed enterprise business models. These business models can be designed to tie together end-to-end business processes, user/customer journeys, and the data lifecycle itself in order to draw a tighter linkage to a relevant, visible digital footprint at any point in time. Technical advances are pushing this forward as well, with lean and scalable constructs data fabric computing and minute containerization tools help to democratize and simplify data storage, access, sharing, and ongoing hygiene in order to promote more frictionless data flows. As a great example of the recombinant nature of the Digital Labor Toolkit, machine learning algorithms can be used as a data management tool themselves in the form of a big data analytical proxy for humans who cannot keep up with the scale of data being produced. Larger and larger portions of a data scientist's role are being handled by advanced ML algorithms that help form a great partnership between man and machine. It's an example of task automation that does not eliminate labor, but empowers the end users (data scientists) themselves. A cohesive Digital Asset Management strategy extends this empowerment to all employees, from executives to entry-level positions, and even customers, by allowing for the easy, effective access of data and insights in a way that is engaging and ubiquitous.

### Humans cannot scale with today's velocity and volume of data



- Advances in AI/ML have given us new ways to augment data management practices
- Machine learning can consume, classify, and interpret large datasets at scale
- Humans retain governance principles input/output design, but not the heavy lifting needed for ongoing hygiene and integration

### AI/ML can handle big data workloads, but data needs to be AI-ready



- Despite lacking scale, humans are dynamic enough to deal with consistent complexity for data definition, access, correlation, and utilization
- This complexity must be addressed before AI/ML can be considered to help with data hygiene & analytics
- The adoption of new data ingestion and taxonomy management protocols must be established to allow data to become usable fuel for AI to use

What does it mean to be AI-ready? In the realm of digital labor solutions, especially around more advanced AI products, The timeline of ROI and general ambiguity around business cases can cause anxiety among practitioners. Organizational readiness and maturity are often overlooked by those looking to get ahead of the adoption curve and often ignored by those who don't believe in the long term viability of solutions that cannot deliver on simple business cases. Dealing with the foundational data elements that govern workloads is an issue defined by scale, for we are producing more data every year than all previous years of our history, combined. It is an issue of our inability to appreciate exponential growth curves with the only solution being AI/ML algorithms that are equally scalable. Digital Asset Management practices should augment and stabilize data handling protocols, so they can be exposed to the AI/ML tools that are able to big data and the insights hidden in its exponentially growing complexity.



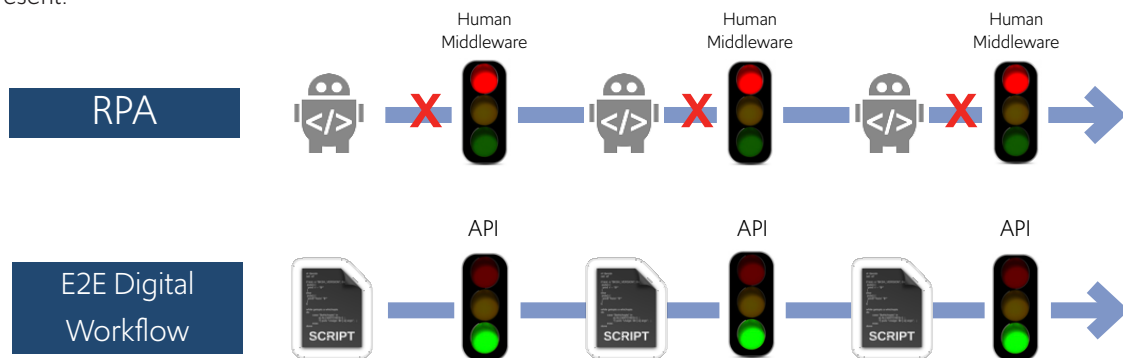
*"Our intuition about the future is linear. But the reality of information technology is exponential, and that makes a profound difference. If I take 30 steps linearly, I get to 30. If I take 30 steps exponentially, I get to a **billion**."*

**Ray Kurzweil**  
Inventor and Futurist



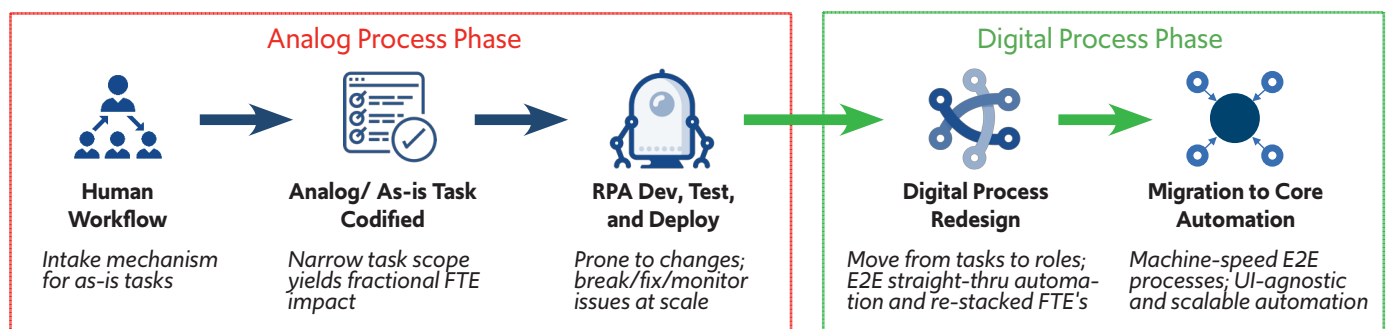
# Stop Racing to a Red Light

In summary, the various elements of the Digital Labor Toolkit all play a role in addressing the end-to-end lifecycle of people, process, and data as they navigate and alter throughout the course of business. Spot solutions will produce modest benefits, but will be an under-representation of what can be expected at scale when a full solution is embraced. Without the end-to-end workflow addressed, you are only racing to the next red light in traffic, and have failed to remove human barriers for what should be machine-to-machine straight-through processing. Let's take RPA as an example to illustrate the point. Spot RPA deployments insert themselves into legacy, analog workflow which was designed for humans, thus none of the "red lights" in the environment, will be removed. Each bot by itself will reduce cycle time for it's portion of the process, but overall cycle time will in most cases be largely unaffected. When the process is fully redesigned around an end-to-end digital workflow, automation is bolstered by more direct backend integrations and other services, effectively removing and isolating red lights in the environment where humans must be present.



## Evolution from Edge to Core Automation

RPA is very effective alone because of its low cost and speed to deploy, with the latter only possible due to there being no inherent changes to process, by design. RPA interacts with the systems a business relies on the same ways a human would, through front-end apps and portals. This could be described as automation "on the edge". The second workflow shown above relies more heavily on "core automation", or solutions that leverage tighter integrations and API's in the backend, a design that is more disruptive and takes longer to implement, but achieves a much more resilient and scalable digital process design, and thus should be the eventual end state for all RPA.



## Looking Ahead + Vendor Partners to Watch

Looking ahead, what these various tools and methodologies are leading to is a new cohesive digital services ecosystem defined by a digital "mesh" of systems that are intelligent, integrated, and autonomous. Intelligent systems will be able to monitor dynamic operating environments, identify patterns in real time, and act on them proactively. Cognitive assistance on the front end will humanize interactions between us and the tools that we use. Autonomous systems will execute backend tasks, enable immediate self-tuning and auto-healing, as well as the delivery of end user requests at machine speed. Lastly, integrated systems will eliminate the siloes that naturally form between datasets and varying environments, allowing for frictionless movement of workflow, information, and ideas. We predict a unification of many of the piece-parts of the Digital Labor Toolkit as solution provider offerings mature. Integrated AI/automation platforms (IPsoft's iDesk), function-specific service orchestration suites (SFDC, ServiceNow), major ERP/Cloud and "system of record" providers (SAP, Oracle, Microsoft, IBM/Redhat), and major managed service integrators (IBM, Accenture, Microsoft, TCS, Cognizant, Wipro, etc.) currently offer the most compelling solutions to fill the gaps needed for designing and deploying end-to-end Digital Labor at enterprise scale. These technologies have the potential to upend entire industries, redefine the work we do, and force a self-reflection of our own human condition as our inventions continue to push the boundaries of machine intelligence.

## Contacts



**TJ Young**

Consultant

[tj.young@rumjog.com](mailto:tj.young@rumjog.com)



**Bart Gallo**

Consultant

[bart.gallo@rumjog.com](mailto:bart.gallo@rumjog.com)



[www.rumjog.com](http://www.rumjog.com)

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