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A New Approach To Automating Services

While many white collar workers may feel threatened by service automation, companies that thoughtfully automate services are finding that the worries are overblown. By pairing humans and robots, companies can deliver better services for less, and jobs can become more interesting.

By

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The Leading Question: How do companies automate services in ways that benefit customers, employees and other stakeholders?

Findings:

- They treat service automation as a means to enabling a more comprehensive enterprise strategy.
- They help stakeholders understand the benefits of service automation and how it affects them.
- They distribute service automation capability across the entire enterprise.

For more than 130 years, managers have been busy at work systematically trying to convert humans into robots by structuring, routinizing, and measuring work, all under the guise of organizational efficiency.[1] The automation software that is being developed today by companies such as Blue Prism, Celaton, UiPath, Redwood, and Automation Anywhere enables a reversal of this process. We can use robots to amplify and augment distinctive human strengths, enabling large economic gains and more satisfying work. However, given the widespread skepticism and fears about how many types of employment will fare in the future, managers are in a difficult spot. Media headlines such as the "Rise of the Robots: Technology and the Threat of a Jobless Future"[2] and "A World without Work"[3] only serve to fuel the anxiety.

Although the term "robot" connotes visions of electromechanical machines that perform human tasks, the term as it relates to service automation refers to something less threatening: software that performs the repetitive and dreary service tasks previously performed by humans so that humans can focus on more unstructured and interesting tasks. Service automation includes a variety of tools and platforms that have various capabilities. While conducting research for this article, we interviewed people who used a variety of terms to discuss service automation (see **"About the Research"**). To help make sense of the landscape, we classified the tools along a service automation continuum based on specific types of data and processes (see **"The Service Automation Landscape"**).

This article focuses on robotic process automation (RPA)-- the tools and platforms that deal with structured data, rules-based processes, and deterministic outcomes. In the case studies we conducted on service automation adoptions, the vast majority involved RPA. We focused on this area (as opposed to the more recent and more advanced automation technology known as "cognitive automation," or CA) because this is where most companies begin their service automation journeys[4].

How do companies apply RPA? There is a wide range of service tasks suitable for RPA. Companies we studied used RPA to automate structured tasks associated with validating the sale of insurance premiums, generating utility bills, creating news stories, paying healthcare insurance claims, and keeping employee records up to date—to name but a few cases. Consider the example of Xchanging,[5] a London-based business process and technology services provider that offers services to clients across a variety of sectors. For one of its clients in the insurance sector, Xchanging processes insurance premiums so insurance brokers can get paid. When brokers sell an insurance policy, they submit notices using a variety of inputs (email, fax, spreadsheets, etc.) to Xchanging, which manages the multi-step process of validating the sale.

Previously, Xchanging's human operators managed the transactions manually. They organized the data, checked it for completeness and accuracy, worked with insurance brokers to correct errors, extracted other necessary data from online sources, and then created and posted the official sales records. Humans still handle the unstructured parts of the work, such as formatting the inputs into structured data, passing the data to the robots, and interacting with insurance brokers. However, the RPA software runs the structured parts of the process, including finding the errors, retrieving the online data, creating the official sales record, and notifying brokers when the process is complete. Whereas it used to take a team of humans several days to complete 500 notices, today a properly trained robot working with the humans can do that in around 30 minutes without any errors.[6] The software can be scaled up and down to meet changing workloads. Beyond this particular process, Xchanging has developed an enterprise-wide service automation capability in other areas as well, which has been deployed both on clients' processes as well as on its own.

By early 2016 Xchanging had moved well beyond its initial foray into service automation, automating 14 core processes and deploying 27 software robots that were processing 120,000 transactions per month, saving an average of 30 % on each automated process.

Xchanging wasn't alone in experiencing benefits from RPA. Similar gains were repeated at other organizations we studied. Beyond the business benefits of positive one-year returns on investments experienced by all of the companies we studied, RPA automations improved service speed and quality, expanded service availability to 24 hours, and increased regulatory compliance, all because software robots executed structured tasks precisely and quickly—and did so without the need to eat or sleep. When the software robots were partnered with humans, the combined human-robot teams were high performing; robots easily scaled to take on more volume of structured work while humans filled in the gaps that required on-the-fly problem solving and hands-on customer care.

By studying early adopters and organizations that deployed software robots, we saw how companies could generate tangible benefits via service innovations. They achieve benefits in three ways: 1.) By developing a service automation strategy that is supported by top management; 2.) By initiating effective processes that deliver value to customers and employees; and 3.) By building enterprise-wide skills and capabilities. Managers interested in capturing the benefits of service automation need to pursue all three avenues.

Developing a Service Automation Strategy

Companies that captured the full benefits of service automation had a long-term view. Whereas some users approach service automation as a way to achieve quick wins for the business, we found that companies that undertake it as part of a broader and more integrated business strategy were able to achieve more substantial gains.

Service automation enables a broader business enterprise strategy. Based on our experience, the businesses that had the best outcomes didn't have a service automation strategy *per se*; instead, they had strategies that defined the organization's long-term goals, such as creating a more flexible workforce, or expanding services without expanding headcount. These strategies were driven by management and enabled, in part, by service automation; it was a key component of the business transformation.

The Associated Press (AP), which in 2014 began offering its newspapers and other media organizations automated corporate earnings reports, provides a good example. For several years, the AP was losing money and was therefore eager to find ways to expand its news coverage without increasing costs, and also to enhance its brand. Lou Ferrara, the company's vice president for business and sports news, spearheaded a service automation initiative. In researching opportunities, he found that reporters preferred to cover stories that required creativity, and this was how they added the most value. Most reporters hated highly-structured assignments such as reporting on corporate earnings. By automating the corporate earnings reports, the AP could expand its coverage at no additional cost. In fact, the volume of earnings reports rose from 300 reports per quarter when humans wrote them to 4,700 reports with a software robot. In addition to producing more content, the automation freed up three full-time equivalents. The company's unionized journalists kept their jobs, and clients were happy with the quality and the quick delivery. Once the AP introduced the automated corporate reports, it initiated a similar automation of college sports news.

Strategic service automation requires support from senior management.

Organizations where the C-suite supports and promotes service automation tended to achieve more strategic benefit from service automation than those where the support is at the divisional or IT level. Without support from the top, there isn't sufficient breadth of influence or application, and people from other parts of the organization may treat it as a curiosity.

To illustrate this point, consider the experience of a major European gas and electric utility that we studied. Eager to improve its service and control its operating costs to reduce the need for rate increases, senior management, led by the company's CEO, embraced automation beginning in 2008. One nagging issue the utility had grappled with was how to verify the meter readings submitted by household residents on paper rate

cards or by phone or collected by hired contractors. After meter readings were submitted, this information was digitized and entered into a system that asked if they made sense. Did the readings fall within normal energy consumption ranges? Was there anything incongruous about them (e.g., a user was adding electricity to the grid rather than consuming it)? The outliers were spit out as exceptions and sent to humans for verification. Some meter readings were easy to sort out; others required calling customers. With RPA, only the truly unusual cases required human intervention; the utility was thus able to reduce the number of humans from 30 to about 12. Besides FTE savings, the company was able to improve quality, consistency, and speed of problem resolutions. By early 2016, the utility was deploying more than 300 "robots," which allowed it to automate about 25% of its back office work on meter management, customer billing, account management, consumption management, segmentation and exception processing.

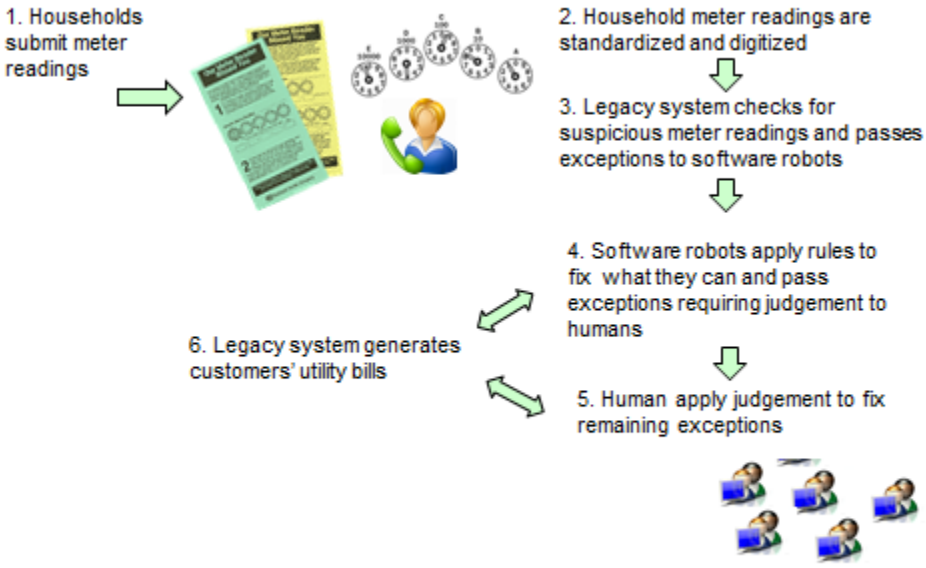


Figure X: Humans and robots working together to generate utility bills
The utility company verifies household meter readings before generating a customer's utility bill. After RPA was applied to the process in step 4, the software robots could handle enough exceptions to free up 60 percent of the humans from this task. The remaining humans work on the really unusual exceptions.

In this organization, the CEO became an evangelist for the transformation programs and the role technologies, including RPA, contributed to them. He gave regular pep talks to divisional managers about the strategic importance of RPA to the future of the company, which has played a critical role internally.

Service automation can deliver multiple benefits. Organizations can use service automation to generate multiple business benefits. Indeed, we found that if companies focus entirely on cost savings, they run the risk of missing opportunities to improve the customer experience and the satisfaction of their employees.

Consider the example of Telefónica O2, the number two telecommunications services company in the United Kingdom. The company is owned by Spain's Telefónica, which has operations in Europe, Asia, and the Americas. Some of Telefónica O2's managers expected automation to result in major opportunities to reduce the employee head count, accelerate response time to customer queries and activation of phone services, and reduce the number of customers calls inquiring about service status. In 2010, it began by automating the structured tasks associated with two processes. The first process involved updating the digital records to reassign a customer's phone number from his/her old phone to a new phone. The second was the process used for applying a pre-calculated credit to a customer's account.

Within five years, Telefónica O2 had automated nearly 35% of its back office services. In 2015, the company's software robots were processing between 400,000 and 500,000 transactions each month. For some customer-facing processes (e.g., phone activation), turnaround times that previously took days were cut to just minutes. What's more, the automation enabled workforce flexibility. To support a new product launch, for example, the "robotic" workforce could be doubled almost instantly, and then scaled back after the initial market surge.

Organizations seeking to automate services have multiple sourcing options. A peculiarity of our research sample was that all 14 of the organizations we examined adopted service automation themselves and relied on the help of a service automation tool provider to get started. For example, when the major European gas and electric utility first adopted RPA, its tool provider (Blue Prism) trained about four client employees and provided mentoring, consulting and co-development for the first set of automated processes. Initially, the RPA team composition comprised about 80 percent from the RPA tool provider's staff to 20 percent of the utility's staff. By the time the utility adopted its fifth process nine months later, the ratio had flipped. However, based on our survey data (and our prior research on business process outsourcing)[7], we think it's important for organizations that are considering RPA and other service automation technologies to evaluate a broad spectrum of sourcing options to determine what meets their needs best. The options include:

- ***Insourcing:*** buying service automation software licenses directly from a service automation provider.

- ***Insourcing and consulting:*** buying licenses directly from a service automation provider and engage a consulting firm for services and configuration.
- ***Outsourcing with a traditional business process outsourcing (BPO) provider:*** buying service automation as part of an integrated service delivered by a traditional BPO provider.
- ***Outsourcing with a new provider:*** buying service automation from a new outsourcing provider that specializes in service automation.
- ***Cloudsourcing:*** buying service automation as a cloud service (still emerging).

In our survey we found that insourcing enabled client organizations to achieve high levels of control and allowed them to keep whatever cost savings they generated. However, there were benefits from the other options as well. For example, many traditional business process outsourcing (BPO) providers have developed significant automation capabilities. The benefit of engaging an experienced service provider is that it often has a full suite of integrated services that combine low-cost offshore labor, process excellence, change management experience, and technology expertise. Newer companies also specialize in service automation. Whereas traditional BPO providers integrate automation into their overall service delivery, the new players are laser-focused on helping customers learn about and apply the new breed of RPA tools. One of the most dramatic possibilities involves placing software robots in the cloud, where they can be copied and deployed across the network. Indeed, if it can take months to train a software robot to master a complex task, it may only take a few minutes (or seconds) to transfer its capabilities to another software robot in the cloud.

Initiating Effective Automation Processes

Once executives have developed their strategies, they must enable execution. First, it's necessary to have committed middle managers to help deliver the service automation vision. Second, it's important that business operations rather than IT lead the service automation initiative; business operations are in the best position to identify processes most suitable for automation and to prioritize projects that will most positively impact customers and staff. However, business operations should involve IT professionals early to avoid risks to the organization, such as exposing customer data. Along the way, companies need to pay close attention to internal communications to inform employees about the service automation strategy, timing, and effects (hopefully positive!) on employees.

Having sponsors, program champions, and program managers. A successful RPA project requires multiple levels of management support. First, projects need sponsors—people who initiate the idea, underwrite the resources, and push for its adoption and use. Depending on the company's ambitions, the sponsor might be part of the C-suite or a middle manager is charge of a department such as shared services. Whereas the sponsors

might only spend 2% to 3% of their time on the project, the program champion takes a more hands-on role, spending anywhere from 40% to 80% of their time communicating the vision, maintaining motivation among team members, and interacting with stakeholders, including senior management. In addition, service automation projects need strong program managers who know how to get the projects delivered within budgets and schedules. At Xchanging, the project sponsor was the CEO of the company's insurance business; the project champion, for his part, had lots of experience in leading lean process projects; he served as both project champion and program manager.

Leading with business operations. People preparing to embark on service automation projects often ask, "Where should service automation originate—in business operations, IT, or outsourcing provider firms?" Among the client adoption stories featured above, Xchanging, AP, Telefónica O2, and the utility worked and launched service automation in business operations. Since we are studying the automation of business processes (not the automation of IT processes), it makes sense that business operations lead service automation. [8]

Business operations are in the best position to select candidate tasks within processes suitable for automation. Business operations know which processes fit the minimum criteria of automating only tasks that use structured data, have explicit and well-documented rules, churn out high transaction volumes, and are stable.[9] As we saw earlier with the European utility and Xchanging's work with its insurance customer, business operations selected the structured and rules-based tasks associated with an end-to-end process that were automated, leaving the tasks requiring judgment and social interaction for humans. Business operations are also in the best position to prioritize automation projects that will yield the best outcomes for customers and employees.

Pinpointing what you're trying to achieve and how it will play with customers and/or employees. Many new technologies overpromise and under deliver. Before you embark on a service automation project, make sure stakeholders (e.g., customers or employees) are attracted to the supposed benefits. In the case of the AP's automated earnings reports, customers liked the idea of expanded corporate earnings coverage, and journalists were positive about the reframing of their job responsibilities.[10]
Consider VHA, a health care network of not-for-profit hospitals based in Irving, Texas. VHA provides services such as centralized procurement, which results in lower costs than the individual hospitals could negotiate on their own. VHA's RPA champion identified a business need: the business operations staff was spending substantial amounts of time searching the Internet for product specification data. So VHA decided it would automate the information-search process and link it to procurement. The savings came

quickly: In a few short months, the automated process pulled more than 360,000 product descriptions from the Internet, freeing business staff to work on other activities relating to sales and revenue generation. By targeting a painful and visible task, the company not only received buy-in from employees. It also stirred more enthusiasm for increased service automation in general.

Involving IT early. IT is an important contributor to the success of an automation program, as some early adopters of RPA learned the hard way. Initially the RPA champions from several companies, including Telefónica O2's champion, attempted to introduce service automation without involving IT. With hindsight, they found that shortsighted; bringing the IT department into the process at the start is useful. Executives at Telefónica O2 and other companies in our study explained that they didn't seek input from IT upfront for two reasons: (1) they saw service automation as a business operations program because it required process and subject-matter expertise, not IT programming skills; and (2) they worried that IT would add too much bureaucracy and slow the rate of adoption. However, IT can vet service automation software to ensure that it is safe, develop access rules to prevent software robots from exposing sensitive data, and maintain software robots on a safe, fully backed-up infrastructure. Based on what we saw, the pluses from including IT early far outweighed the minuses. As an executive at one service provider noted: "The minute we engage with business owners, we insist on speaking with the IT function. When we talk to IT, we explain that we have a product that is designed to appease their requirements for security, scalability, auditability, and change management."

Recognizing that many employees are wary about the impacts of automation. Across our case studies, we saw companies using service automation tools to automate repetitive and boring work. In the organizations we studied, we did not hear of any layoffs directly attributable to service automation. Jobs were reconstructed, and expanded, rather than wholly automated[11]. Often companies redeployed internal employees to other business activities; service automation allowed them avoid expanding their headcount. In the companies we studied, we found staff not feeling threatened by automation but instead appreciating having fewer repetitive tasks, and opportunities to assume more customer-facing responsibilities.

Nevertheless, it's common for employees to be apprehensive about the potential impacts of service automation on their jobs—and it's naive for executives to think otherwise. Prior research has found that communicating the intended effect on jobs early in the process is critical. In an information vacuum, employees tend to overestimate the ill effects; in some cases, staff members have panicked and even sabotaged new initiatives.[12]

Therefore, it's important for companies to be as forthcoming as possible about the implications for employees. Xchanging, the business-process provider, takes an open approach to internal communications, using internal newsletters and regular presentations and roadshows. These made RPA developments visible quickly to everyone working on the company's insurance staff. Management tries to make sure that operations teams are engaged in supporting projects and that they understand what service automation means in terms of opportunities six to 12 months down the line.

Building Mature Service Automation Capabilities

For many companies in our study, the goal was to build an enterprise-wide automation capability. They wanted automation to become part of the fabric of their business, much like computers and the Internet have infiltrated all organizational processes. Accomplishing this requires an internal, centralized command center to serve as a shared organizational resource. Staffing a command center requires organizations to rethink talent development. A mature service automation capability requires constant learning. It has several feedback loops that serve to strengthen the capability over time.

Establish a Command Center

The main duties of a command center are demand management, feasibility assessment, development of business cases for each automation project, project prioritization, automation development, automation implementation, monitoring, and support, and continuous improvement. A centralized command center also establishes standards and best practice and tracks the business performance of service automation.

Among all of our cases, the utility company as the most mature service automation capability, provides the best example of a centralized command center, which it calls a Center of Excellence (CoE)[13]. The CofE at the utility managed the high demand for automations coming from customer transformation programs and from operational teams across all business divisions. Candidate processes were put through the pipeline where the CofE assessed their automation worthiness. The CofE, in cooperation with the requesting business operations area, developed a business case if automation looked promising. With clear instructions on how the process worked and what the transaction times were, CofE produced a project initiation document, to be signed off by business users, automation developers, and other invested parties. The CoE developed the automation solutions, tested them, and controlled the software robots once they were doing real work on real data.

A centralized command center can efficiently reuse components and multi-skills robots to scale quickly and to reduce development costs. For example, by reusing components, such as teaching a robot to logon to a particular system or to prepare a customer email blast from a customer database, the European utility's CoE was able to reduce its development times by between 30% and 40%. As the company built a library of robotic processes, it reused them on other automation projects. The RPA software provider explained further how component reuse lowered his client's development costs:*"It's a self-fulfilling prophecy. The more processes you automate, the more objects you build in your robotic library. The more reuse you get, the more economic it is to assemble and deliver the new processes."*

Rethinking talent development and skills needed for an enterprise automation capability. As organizations build automation capabilities, they need to rethink the skill sets needed to perform business services. They should have a clear idea of the skillsets for the various service automation roles. Two new roles required for RPA are RPA developers to build automation solutions and RPA controllers to schedule, run, and monitor the software robots. For example, the utility company set out to recruit RPA developers from its own operations staff with a strong understanding of the business, process experience, , and preferably systems analysis backgrounds. According to the RPA project manager at the utility, the most important requirement was the ability to extract logical structures from chaotic business data to build algorithms. IT skills were also seen as critical. He noted, *"We're not IT staff, but we have staff with IT skills."*

To staff its control room with RPA controllers, for instance, the utility targeted people who were organized, methodical, and logical and had a consistent approach to work. It also needed people with good communication skills because these individuals interacted with business operations people when they spotted any issues or anomalies. At peak times, two human controllers orchestrate the work of 300 software robots that produce an output equivalent to that of more than 600 people.

Beyond the skills of the command center staff, the skills of the retained human workforce also need consideration. If robots are doing all of the repetitive and structured tasks, it means that the remaining humans increasingly need more creativity, problem-solving skills, judgement and emotional intelligence to tackle the unique, emergent and unstructured tasks.

The Future Of Work

There have been plenty of predictions about the effects of automation on the nature of human work. Some pundits have predicted that automation will take over more and more functions, leaving very few tasks for humans other than lawn mowing and hairdressing[14]. Based on our case study and survey research, we anticipate a different future for the automation of knowledge work[15]. In the next five years, we think that more and more workgroups will be composed of both human and robotic FTEs, each performing tasks for which they are best suited. The robots will very quickly extract, consolidate, and re-arrange data for humans to assess and act upon upon. Humans will deal with new business requirements (which humans may eventually teach to the robots), trouble-shoot and problem solve unstructured issues, and positively envision and build customer services and relationships. We are already seeing some of this this today, but going forward robots won't need as much pre-configuration or as much detailed instruction as tools evolve and as RPA moves to the cloud.

Many case study participants told us the next horizon was to tackle unstructured data with CA automation tools. They want robots to read unstructured text, such as text messages or emails, and decipher what it means. Robots are very fast—they have the ability to process huge amounts of unstructured data and present an interpretation in real time would be a big step forward for customer service. In practice, this would mean that an agent on the phone with a customer could ask a robot to mine huge amounts of data to help customers solve problems in seconds. The present state of service automation puts us on the path towards this vision. How fast we get there will be a function of management imagination, design and implementation capability.

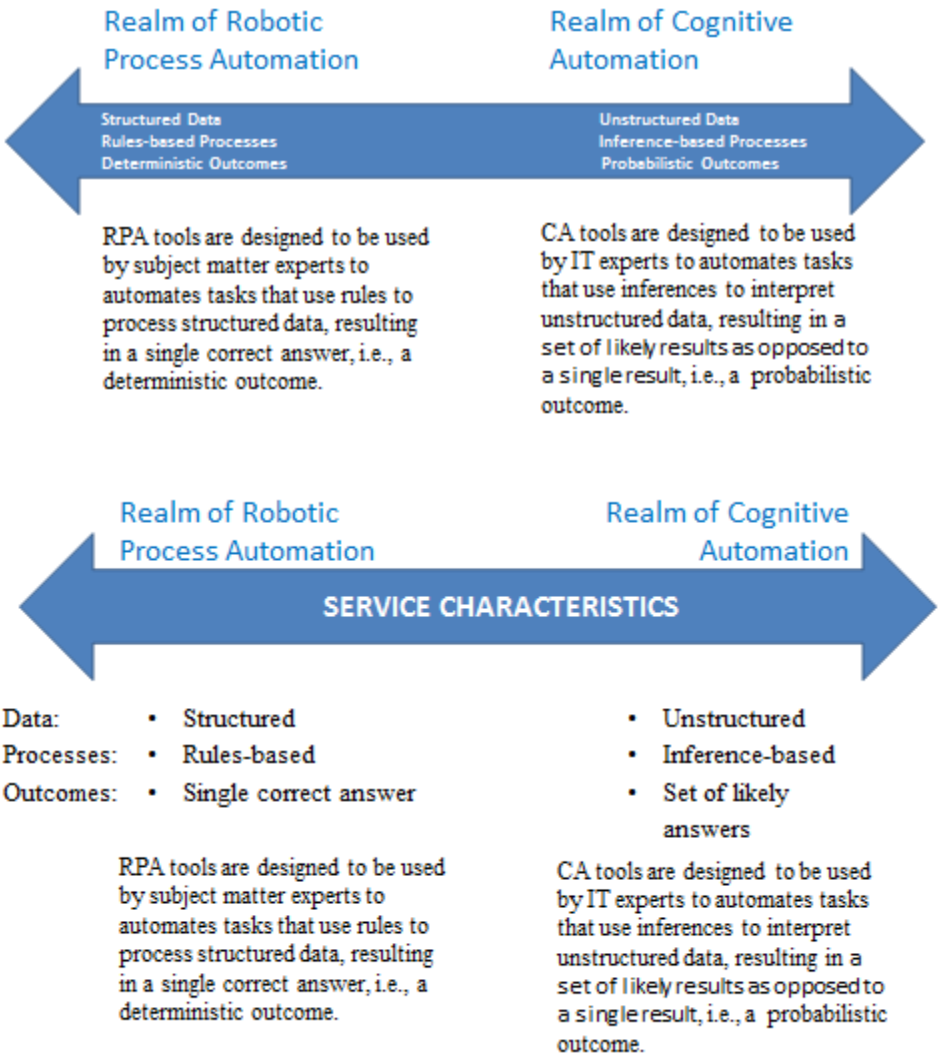
SIDEBAR 1 – About the Research

We conducted empirical research on service automation to answer two questions: 1.) Why are clients adopting service automation and what outcomes are they achieving? And 2.) what practices distinguish service automation outcomes? To answer these questions, we conducted two surveys of outsourcing professionals attending the International Association of Outsourcing Professionals outsourcing world summits in 2015 and 2016, and conducted interviews with 48 people, including service automation adopters, software providers, and management consultants across the major business sectors. In the course of our research, we collected 16 service automation adoption stories: 14 companies adopted RPA; two adopted CA tools. Depending on the subjects' availability and preferences, we conducted interviews in person, over the phone, and through email. We posed a number of questions pertaining to their service automation adoption, the business value delivered, and lessons learned. We also interviewed software provider representatives to discuss their companies' automation capabilities, challenges they help their clients overcome, and the future they envisioned for service automation. We asked advisors questions pertaining to client service automation adoption, effects on outsourcing, automation tool capabilities, and the future of work as a consequence of automation. Of the 16 research sites we focused on, seven were headquartered in the United Kingdom, five in the United States, and one each in Germany, France, the Netherlands and Russia. The organizations represented 11 industries, including healthcare, energy, telecommunications, media, financial and accounting services, and transportation, demonstrating that service automation is affecting a broad range of industries.

This research was conducted with the support and funding of the Outsourcing Unit at the London School of Economics and Political Science, Blue Prism and Information Systems Group.

SIDEBAR 2 – The Service Automation Landscape

The proliferation of software tools and terms to describe software designed to automate services can be very confusing. The same term is often used by different software companies to automate completely different types of services. To help make sense of the service automation landscape, we suggest avoiding the jargon and instead focus on the service characteristics the tools are designed to help automate. We consider two broad classes of service automation tools, the Realm of Robotic Process Automation (RPA) and the Realm of Cognitive Automation (CA). Each class of tools is designed to deal with specific types of data and processes (see Figure 1).



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[1] For a history of the evolution of work from craft to mechanization, see J. Trevor (2016), "Work and the Robot Revolution" http://www.sbs.ox.ac.uk/school/news/work-and-robot-revolution

[2] M. Ford, (2015) Rise of the Robots: Technology and the Threat of a Jobless Future, Basic Books, New York."

[3] D.Thompson, (2015), "A World Without Work," The Atlantic, July/August, pp. 5061.

[4] A detailed analysis of types of work that can be automated and where this is leading is provided in T. Davenport and J. Kirby (2016) Just How Smart Are Smart Machines? *MIT Sloan Management Review,* 57, 3, 20-25

[5] Our interviews at Xchanging were done in 2015. We note that CSC bought Xchanging on May 5 2016; See the announcement at: http://www.csc.com/newsroom/press_releases/136959-csc_completes_xchanging_acquisition

[6] By May 2015 it was taking the robot five minutes to deal with 25 LPANS, which formerly took a human two hours and five minutes to do.

[7] M. Lacity, M., and L. Willcocks, (2012), *Advanced Outsourcing Practice: Rethinking ITO, BPO, and Cloud Services*, Palgrave, London.

[8] Several of our research participants were adamant that business operations own the automation program, including Paul Donaldson, the RPA champion at Xchanging when he said *"It's in the innovation/business part very deliberately. I'm quite protective that it shouldn't sit in the technology arm. My concern would be if you made it a technology project, you would over-engineer the process and you would end up delivering very little."* The point is punctuated by Adrian Guttridge, Executive Director, Xchanging Insurance, "*The technologists will back it up and provide support but it's got to be business driven, otherwise it would be perceived as being done to, not by, the business."*

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[10] Source: "The Impact of Robotic Process Automation on BPO," presentation at the Automation Innovation Conference, New York City, December 10, 2014.

[11] See also M.Chui, J.Manyika and M. Miremadi (2015) Four Fundamentals of Workplace Automation. *McKinsey Quarterly,* November 1-9. Their review suggests this finding will be more widely the case part of jobs, rather than whole jobs will be automated. The focus should be not on whole jobs, but on activities and processes and how they can be reconstructed as a result of automation.

[12] See Practice 4 on pages 20-22 in M. Lacity and J. Rottman (2008), *Offshore Outsourcing of IT Work*, Palgrave, United Kingdom.

[13] Like the utility company, most of the companies in our study named the centralized RPA command center a "Center of Excellence".

[14] An alternative view on the abiding value of multiple human capabilities is provided by T. Davenport and J. Kirby (2016) *Only Humans Need Apply*. Harvard Business Press, Boston. See also G. Colvin (2015) *Humans Are Underrated: What high achievers know that brilliant machines never will.* . Nicholas Brealey, London

[15] A comprehensive review of automation and the future of work studies, together with detailed projections about impacts on work design, outsourcing, and future processes appears in L. Willcocks and M. Lacity (2016). *Service Automation, Robots and The Future of Work*. (SB Publishing, Stratford), chapter 10