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ABSTRACT

Robotic Process Automation (RPA) is a new breed of software robots designed to automate services through processing structured data by following rules. The research examines how RPA is being deployed at Royal DSM, the Dutch multinational company, in its global financial shared services organization. Here, like many other companies, DSM adopted RPA as the next transformation lever beyond centralization, standardization, and relocation to a lower cost region. DSM's first phase of automation "robotized" its financial close processes for three of its global business groups. Phase I happened quickly – within a few months. Phase II scaled the RPA adoption by migrating another six business groups on to the RPA platform. This article details the multi-faceted business results DSM achieved, the crucial role of a suitable software provider, and eight key lessons from the DSM experience that other companies can learn from.

1. INTRODUCTION

Robotic Process Automation (RPA) is a form of software that can be applied to structured data, and stable, repetitive, rules-based processes (or sub-processes) that produce deterministic outcomes. However, there are over 39 RPA software providers, and the software tools tend to have different characteristics and uses. The advantages of RPA, and the reasons for dramatic uptake in 2016/17, are the "lightweight IT" aspects – RPA tends to be cheap, quick to implement, and does not lock up IT (information technology) resources. RPA is also designed to be configured by subject matter experts instead of IT programmers, and interfaces with existing systems of record the way a human does, through the application user interface.

including FTE (full-time equivalent) savings, increased service quality (because software robots execute exactly as configured to do), increased service delivery speed, and redeploying human talents to more challenging work. These business benefits, however, can only be achieved with proper governance. DSM epitomizes the emerging recognized best practices for achieving business benefits. These best practices include senior management support, control by business operations/ shared services, talent redevelopment, and change management to prepare the organization for changes caused by automation [Lacity and Willcocks (2015, 2016a, b), Lacity et al. (2015), Willcocks and Lacity (2015a, b, c, d, 2016), Overby (2016)].

Table 1: Royal DSM's RPA capabilities at a glance

	TIME FRAME	PERCENTAGE OF MANUAL TASKS AUTOMATED	NUMBER OF AUTOMATED PROCESSES	SCALE	RESULTS
PHASE 1	July to November 2015	89%	19	Migrated 3 business groups, comprising 60 company codes	• Faster financial close – from over 2 weeks to just 3 days • Increased accuracy and compliance
PHASE 2	February to August 2016	89%	25	Migrated 6 business groups, comprising 130 company codes	• 45 FTEs freed up for more valuable work • RoI in 9 months

The technology we look at in this case is slightly different. To deliver scalability, resilience, and security, Redwood Software's[2] preferred method is to interact with core ERP and other systems through APIs and other standard integration methods. In instances where there are no interfaces, they can use desktop interfaces. To provide end users/subject matter experts, instead of IT programmers, with the easiest method for configuring robots Redwood Software's design allows robots to be fed with business parameters, which are external to the technical robot definitions themselves. These include time zone, period, year, company code, account selection, cost centers, allowed deviations, exchange rate type (month end rate, month average rate), rules for provisions, and any parameter that comprises part of the process that the robot performs.

DSM, like other early adopters we studied, achieved multi-faceted business results from deploying RPA,

In this article, we describe DSM's successful implementation of RPA, using Redwood Software. We compare DSM's practices and challenges with other RPA adoption cases we studied. Companies still considering RPA adoption can learn valuable insights from DSM and from other earlier adopters. To underline the business value achievable with RPA, we begin this article with the end results. In August 2016, DSM was deploying over 60 software "process robots" to automate about 89% of the manual tasks associated with its financial close process (Table 1). DSM earned a positive return on investment (RoI) within nine months. DSM shrank its financial close process from 15 to three days using RPA. Since, then DSM has moved to automating other financial and accounting operations.

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[2] Redwood Software is a software company with a mission "to help organizations achieve 'The Robotic Enterprise™'" www.redwood.com

2. ROYAL DSM – THE BUSINESS CONTEXT FOR ROBOTIZATION

To put the RPA journey into context, we explain here DSM's business background. DSM is a multinational company operating in 50 counties and headquartered in Heerlen in the Netherlands. It operates in three industries: health, nutrition, and materials. The company produces vitamins, carotenoids, premixes for food and feeds, enzymes, minerals, cultures and yeasts, pharmaceuticals, bio-plastics, and coating resins, to name but a few of its products. DSM is recognized as an innovator in biomedical materials, advanced biofuels, bio-based chemicals, and solar systems [de Haas (2016)]. Its motto is "bright science, brighter living." In 2015, DSM earned profits of €88 million on €11.5 billion in sales. It employed 20,750 people worldwide, of which 23 percent work in the Netherlands.[4]

In August of 2011, DSM's CEO, Feike Sijbesma, announced the intended changes to DSM's organizational and operating model: "with the aim of creating a more agile, focused and cost-efficient organization, with a stronger business and market focus and globally leveraged support functions."[5]

Part of this strategy included the expansion of shared business services. DSM had already created global shared services for IT and human resources (HR). It next aimed to add financial services.

3. FINANCIAL SHARED SERVICES (FSS) LAUNCHES IN 2012

DSM's FSS journey began in 2012. After considering several sourcing and location options, DSM rejected outsourcing and decided instead to have five regional business service offices and one large captive center in Hyderabad, India. The captive center would create the dual benefits of lower costs through labor arbitrage while still keeping the employees engaged with and connected to DSM. The FSS plan called for all of DSM's business units to be migrated to the financial shared services within four to five years. Why so long? Like most multinational companies, the main challenge was standardization. DSM's history includes many mergers and acquisitions (M&As) that bring along their legacy systems and processes. DSM, for example, had several Enterprise Resource Planning (ERP) platforms, including 13 different SAP implementations.

"Our purpose is to create brighter lives for people today and generations to come. We use our unique competences in health, nutrition and materials to create solutions that nourish, protect and improve performance."

[DSM 2015 Annual Report][3]

FSS decided to build a seamless gateway on top of the legacy systems rather than bear the expense of implementing one global ERP platform. This quickened implementation and FSS was able to migrate 130 company codes to which robotics were applied across Europe, Asia Pacific (including China), and the U.S. by 2015. In 2015, the CEO requested that FSS speed-up the remaining migrations. A new global improvement program called "Arjuna"[6] was started. The Arjuna project aimed to propel FSS to be in the top quartile of the world's best global shared services performers. DSM had room to improve; a recent benchmark indicated that its credit management was performing at the 45th percentile and its accounts payable and account to report services were performing at the 65th percentile. For example, DSM was taking 15 days for financial close when top performing companies were closing in 3.28 days. FSS's mantra became "F for First time right, S for Simplification, and S for Standardization."

Theo de Haas, Senior Business Partner Group Services for FSS, and his senior staff examined the practices used by top performers. They attended seminars and increasingly heard that top performers do three things [de Haas (2016)]:

1. They make greater use of process and technology-related best practices.

2. They move non-essential activities out of the critical path so they can be managed and resolved during the month.

3. They automate many traditional clerical manual tasks with RPA.

In particular, RPA was being touted as a new breed of software robots, designed to be used by subject matter experts, and that it interacted with existing systems of

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[3] Source: 2015 DSM Annual Report, http://bit.ly/2uPTYan
[4] https://en.wikipedia.org/wiki/DSM_(company)
[5] DSM 2011 Annual Report available, http://bit.ly/2vkGlgY
[6] "Arjuna" is a Hindu word that translates into "ruler," "one who guides," or "one who is not un-victorious." It is also the name of the third Pandava brother in Hinduism (source: https://en.wikipedia.org/wiki/Arjuna).

record. But the FSS leadership had many questions: is RPA secure? How long do RPA implementations take? How will RPA interact with the ERP systems? De Haas decided to assess the RPA concept, thus beginning DSM's robotization journey.

4. ROYAL DSM'S ROBOTIZATION JOURNEY

Like most organizations, FSS began their RPA journey with a proof of concept (PoC). This aimed to assess the financial and technical feasibility of RPA. The FSS leadership decided to examine the financial close process as the test case. Would automation produce business benefits? The team in FSS's Indian captive center examined the number of manual steps it took for the period end close process. There were an astounding 485,000 manual activities per month in the financial close process. Humans were not only doing the transactions, but also pausing to document each step to ensure compliance. de Haas and his team estimated that they could easily automate 60% of the manual tasks and achieve the target RoI. Furthermore, the quality would improve because the software robots would follow all the rules.

Convinced of its financial value, de Haas approached the Chief Financial Officer (CFO) with the RPA proposal. According to de Haas, the CFO asked him how he would guarantee the close. He recalled her saying: "Don't come back in two months and say to me, 'we have the month-end figures, but don't ask us if the figures are correct because we don't know anymore because the robots are doing it.'"

Hence, any RPA solution would require built-in controls and checkpoints to verify that the process ran correctly. FSS decided to build a test solution and turned to its existing software provider, Redwood Software, for help.

5. FSS SELECTS REDWOOD SOFTWARE AS ITS RPA PROVIDER

Redwood was an obvious fit with DSM. DSM's FSS was already using SAP Financial Closing Cockpit and knew that Redwood already helped to automate many of this system's background tasks. FSS also knew that Redwood offered RPA tools. FSS valued that Redwood was focused on financial services and had deep subject matter expertise. Redwood Software's sales team understood in detail how journal entries, reconciliations, and other financial processes work: *"With Redwood, we*

talked to financial people. We did not talk to software people. Redwood knows how financial processes work." – Theo de Haas, Senior Business Partner Group Services, FSS.

In contrast, according to Theo de Haas, many other RPA providers pitched the technical capabilities of their products instead of their ability to optimize financial processes. Redwood is also fully implemented with SAP – a big advantage from FSS's perspective given that they were running global financial services on 13 versions of SAP. Redwood's VP of Worldwide Marketing, Simon Shah, confirmed the DSM analysis: *"What seemed to resonate with DSM is that we spoke both the language of robotics and the language of finance. Our robots communicated directly with ERP, while shielding business users from the technicalities – all within a much larger strategic framework from the outset."*

The technical feasibility of RPA was tested on the month end close process for one of DSM's business groups, Engineering Plastics. The PoC team replicated a previous month's end close using Redwood Software's RoboFinance® solution. The software robots executed the business rules and monitored and documented each step in the process. Engineering Plastics confirmed that the software robots produced the exact same figures, but did so much quicker. According to Mohammad-Sajjad Hussain, Lead Business Process Expert for DSM Business Services India: *"We worked closely with Engineering Plastics. Since it was the first time, we gave them a lot of support so in the end they didn't feel that this change was out of control. They were quite satisfied. They didn't see any difference in the ways of working after automation. They didn't see any side effects or have to do a lot of corrections or extra work because of automation."*

The PoC team proved the financial and technical feasibility of RPA. FSS launched a two-phased implementation plan.

PHASE I: JULY TO NOVEMBER 2015

Phase I aimed to automate financial close for three business groups. DSM created an RPA project team that comprised FSS and Redwood employees. FSS assigned three people: two business process experts and a program manager. Redwood assigned four people: three technical software experts and a financial expert. The financial expert from the Redwood team was to examine the proposed process redesign to be sure it would follow best practices and could be performed by the software robots.

Much of the initial work focused on documenting tasks performed by humans in enough detail to be specified as rules for the software. Humans can execute tasks with less detailed instructions than software robots because humans know how to fill in the gaps in instructions. For example, where there is an intercompany imbalance during a reconciliation process, from experience a user might instinctively know which companies have been incorrectly posted to. A robot, however, will have to be configured to trawl through all the companies to locate the incorrectly posted item. Despite this, the robot will process at a much faster speed than the user. Hussain explained: *"Existing documents are for users who unconsciously perform the activities and often they don't even refer to them. But when you are trying to implement robotics, you are asking a robot to do a task…it will not understand based on documents [designed for humans]. So your documentation should be as detailed as possible, and of course, [embody] a clear understanding of what would be the impact before the task and after the task."*

The RPA team also had to redesign the process for automation so that the robots and humans were not constantly passing steps to one another. This required resequencing some activities, pulling some processes out to be performed at another time, or eliminating inherited tasks from legacy processes that were no longer needed (see "Redesign Work" in Lessons Learned section for details). Redwood was also very helpful during process redesign because their experts helped FSS understand industry best practices.

Just as FSS had done with Engineering Plastics, FSS closely involved the three business groups to verify that the software robots were executing tasks as expected. For this phase, FSS included extra checkpoints in the software to build trust and to gain stakeholder buy-in.

By the end of Phase I, FSS had exceeded its business case by automating 89% of its manual tasks. Quality also improved. de Haas offered the example of booking journal entries. Prior to robotization, journal entries came in on spreadsheets or emails to be processed by humans. After robotization, journal entries were input directly into the software robots. The robots evaluate the entry, post it, and send it back to the business units without human intervention: *"Nobody's touching it. Everything is done automatically through the robot, which of course is good because of speed but also the quality. …Previously we still had discussions like, 'book a thousand Euros,' and somebody else said, 'no, no, it*

was 10,000 Euros, you didn't hear me well.' Those kind of issues are gone now." – Theo de Haas

Phase I was completed in November 2015. FSS focused on year-end close before beginning Phase II.

PHASE II: FEBRUARY TO AUGUST 2016

Phase II sought to bring six more business groups onto the RPA platform. In total, 130 country codes from across the business groups were to be migrated to RoboClose®, which added many more users to the RPA program. For this phase, FSS had learned enough about the software to take charge of implementing the business rules. The team built three templates for three of the six business groups, configured the software, and ran user acceptance tests by April 2016. Once again, the robots worked as expected and the three business groups went live the following month. As FSS's RPA team gained more experience, their ability to onboard new companies accelerated: *"We're now in a situation that we can do one whole company code per week. We will set the business rules, we'll test it, and we do a full production in one week which is, if you look from an automation point of view, it's unheard because it's not something you do with an SAP implementation. You don't do an SAP implementation in a week."* – Theo de Haas.

The remaining three business groups were migrated a few months later.

BUSINESS RESULTS FROM PHASES I AND II

"We went globally live for Europe, for China, for APAC, for the US. We didn't have any glitches…it worked like a charm." – Theo de Haas

As highlighted in the Introduction (Table 1), DSM achieved multiple business benefits from automation, including FTE savings and faster delivery of financial close from 15 to three days. As a consequence of automation, fewer humans were needed to perform the month-end close process. In total, about 45 fewer FTEs were needed to complete the process. The human work that remained was shifted away from doing transactions to more value-added monitoring, auditing, and judging the results. Excess labor has been redeployed to other tasks when feasible.

6. WHAT'S NEXT FOR RPA?

FSS has both near-term and long-term plans for automation. In the near-term, DSM's Latin America business units that use Oracle as their ERP system

will be migrated to the RPA platform for financial close. Eliminating some of the extra checkpoints that were put in to build confidence during the startup phase will also further optimize the financial close automation. de Haas said, *"We can start optimizing by taking some controls out… we now trust how it works."*

Thus far, automation has been applied to the tasks performed by the captive center in India, where 80% of the financial close processes take place. But recall that FSS also has regional business centers that perform the other 20% of activities. Might some of these activities be automated as well? Hussain thinks so: *"There are also critical activities that are performed in the business. So we feel that we can bring these automation solutions over there and see if there is something that can be automated. We would then require the involvement of the business and make sure that all the businesses performed the activities similarly."*

Beyond financial close, FSS is considering RPA for accounts payable, accounts receivable, and credit management. As de Haas explained: *"RPA is here to stay so it's not something that will go away. It's not hype, it's not something that will pass in three or four months."*

Next, we discuss the DSM case and compare its lessons with our prior RPA case studies.

7. CASE DISCUSSION AND LESSONS LEARNED

What might other organizations considering RPA learn from DSM? We discuss four lessons pertaining to **project management** – managing the phases of the automation program, and four lessons pertaining to **change management** – managing the stakeholders affected by change including senior executives, business groups, employees working in shared services, and the IT function. We see project management as *"doing the thing right"* and change management as *"doing the right thing"* [Lacity (2008)].

Best practices for project management include (1) letting business operations lead RPA, (2) picking the right automation approach, (3) selecting the right implementation provider, and (4) redesigning processes to maximize the benefits and minimize the risks of automation.

7.1 Let business operations lead RPA

Potential service automation adopters often ask, *"Where is service automation launched – in business operations, IT or in outsourcing provider firms?"* Across our 15 RPA client adoption stories, 13 automation programs were led by business operations groups, including shared services groups, and two were led by IT. RPA's appeal is that the tools are designed to be used by subject matter experts (SMEs) rather than by IT programmers. In fact, as we have noted, it is more accurate to say that RPA users *configure* the software robots rather than *program* the robots. RPA recognizes that it is cheaper, better, and faster to train SMEs to do their own automations rather than have SMEs explain their deep domain understanding to an IT software developer who then explains it to a team of IT coders. Because RPA tools are designed for SMEs, RPA adoptions are primarily initiated and led by business operations. At DSM, de Haas explained why FSS led the project:

"It's not an IT project, it's a business project with a small IT component. 99% of the project is about business rules; it's about making sure that the processes work so we did it with business process experts."

7.2 Pick the right RPA approach: screen automation versus process automation

During the course of our research we have learned that by mid-2016 over 40 software providers were marketing their tools as RPA. But these providers have very different approaches to automation. Some offer quick and cheap solutions that are deployed on desktops. These tools are suited for organizations that want to democratize the workforce and allow individuals to control the automation of their own work. Other RPA providers, including Redwood, aim to automate enterprise transactions on a platform that is secure, available, and controlled. For DSM, this latter approach fit their needs because they aimed to automate financial close – an extremely important process to control and secure.

de Haas also advised prospective RPA buyers to consider the total cost of ownership, not just the cost of the RPA software license. Screen automation software is typically cheaper and easier to learn than process

automation software, but total costs of automation need to consider the full development and long-term maintenance costs. de Haas explained: *"A lot of RPA vendors are really just doing screen scraping, which requires a lot of maintenance if you want to change it. I think the biggest advantage that we have with Redwood is that everything is controlled by business rules. So my advice to companies who really want to do this is you should do process automation and not screen automation. If you do this at the screen level, probably you'll wind up be having even more problems that erode into your savings because you have huge maintenance on your hands."*

Neil Kinson, Chief of Staff for Redwood, concurred. According to Kinson, companies should be aware that screen automation tools could result in *"a plethora of point solutions dealing with individual micro-process or meta-robots that becomes unmanageable. If you roll out a new version of ERP, suddenly you'll break all of your robots, or at least you have to retrain them. And more importantly, it's very difficult for the IT function to quantify and define and control those changes."*

This is something we have also observed in several case studies examined in our new research since February 2016.

7.3 Pick the right implementation partner

Once organizations pick an RPA approach, they also have to pick an RPA tool and an implementation partner, which may or may not be one and the same. Picking the tool is actually the easy part. A number of advisory firms now have RPA practices to advise clients on technical capabilities and total cost of ownership for the more established RPA tools. The harder part is picking the right implementation partner. The right partner needs real subject matter expertise and enough excess talent to devote FTEs with those rare skills to the client organization for the entire engagement. Implementation partners also need prior experience with the tool and they should be willing to help the client build a mature RPA capability so the client can function independently after the engagement.

If real estate success is all about, *"location, location, location."* then RPA success is all about "subject matter experts, subject matter experts, subject matter experts." The focus on SMEs is also why DSM selected Redwood; Redwood helped FSS tweak its processes based on industry best practices, not just on what FSS was currently doing. Mohammad-Sajjad Hussain – Lead Business Process Expert, DSM

Business Services India, explained: *"Redwood has finance experts and they have good knowledge about industry best practices. So when we were explaining our way or working, we were also confronted with their expert outsider view. They asked us why we do these things. So that was a challenge but also a learning for us."*

Sometimes implementation providers oversell, leading to higher costs or project delays. As one famous outsourcing theory argues, providers are incentivized to behave opportunistically, that is to pursue self-interest with guile and to make *"false or empty, that is self-disbelieved, threats and promises."*[7] Research has shown that the risks of provider opportunism can be mediated with strong contractual governance, but rigorous contract negotiations and contract monitoring increase transaction costs.[8]

Another way to mitigate opportunism is to invest in strong relational governance based on mutual obligations, trust, and co-commitment.[9] DSM credits the good relationship with Redwood, in part, because of its prior relationship, but also to the fact that Redwood's RPA sales team was also part of the RPA delivery team. This ensured that the sales people did not over-sell, over-promise, or over-commit. DSM interviewees also praised Redwood's subject matter expertise and cooperation. Hussain said: *"The engagement with them was excellent. They had very good expert knowledge and they were very patient and we all worked well together."*

This endorsement is particularly impressive given that the Redwood team was remotely located. Hussain continued: *"We weren't all sitting in a room face-to-face, but we worked well in a virtual environment. Amongst us, we have the understanding that if we see any issues or we see something that's not going well, that we communicate to each other. We partnered with them very well, even though it was a virtual team, we never felt that we are distant from them or that we don't understand each other."*

Next, we address **change management,** and how best to address the concerns of senior executives and business unit leaders, the employees working in shared services, and the IT function.

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[7] The idea of vendor opportunism comes from Transaction Cost Economics, a theory about make or buy decisions that assumes providers will take advantage of customers if given the opportunity to do so [Williamson (1975)]

[8] For example, Williamson (1979, 1991) argues that contractual governance can mitigate the risks of vendor opportunism.

[9] For a review of the empirical research on relational governance, see: Lacity et al. (2016).

7.5 Show RPA's capabilities to senior managers and business units

Decades of research identify senior management support as a critical factor for project success.[10] Automation programs are no different – the client organizations in our study achieved, with C-suite support, the most strategic benefits from service automation. At DSM, the Director of FSS was quick to gain the support of the CFO during the PoC phase. The CFO's major concern was that any automation needed to have built-in audit trails to show exactly what the software robots were doing at each step in the process. Similarly, the business units also wanted confirmation of compliance by any work being done by software robots.

While the RPA program team quickly became convinced that the robots would not go rogue, senior managers and business unit managers needed more sustained evidence before trusting the software robots. de Haas explained: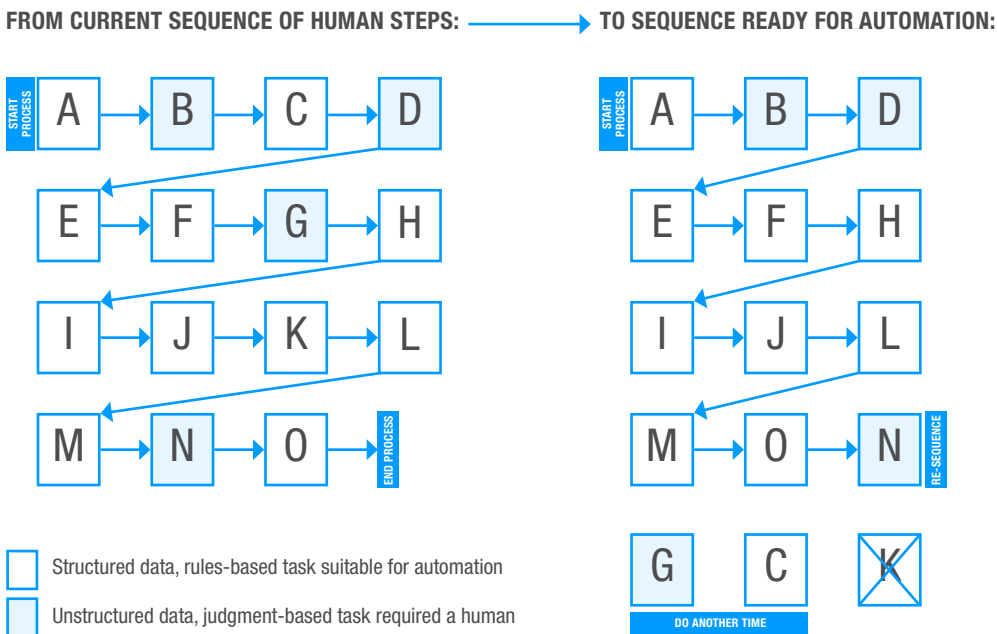 *"Because trust is one of the key things you need when you do RPA, it cannot be a black box. It's really necessary for people to build the trust that the robot is not making mistakes or screwing up figures."*

Hussain added that building up this trust delayed the project a bit, but that this aided user acceptance. He said: *"People had to test them and certify that they are comfortable that the robot is doing exactly what they would do manually. So, it took some weeks for them to understand what the robot is doing."*

7.6 Prepare retained employees

Like all our RPA case studies, FSS had to define what the new organization would look like after robotization. The immediate task was to define which tasks software robots would do and which tasks the remaining employees would do. Furthermore, the employees needed to be trained on how to work with robots. In general, the employees working with the software robots welcomed automation. Hussain said: *"It's about working with the new tools so that it's something*

Figure 1: Optimizing the sequence of steps in an end-to-end process

FROM CURRENT SEQUENCE OF HUMAN STEPS: ⟶ **TO SEQUENCE READY FOR AUTOMATION:**

☐ Structured data, rules-based task suitable for automation

☐ Unstructured data, judgment-based task required a human

Note: The left-hand side of the figure depicts an end-to-end process with 15 steps currently being done by a human. Some of those steps, depicted with clear boxes, entail structured data and rules based processes, such as looking up data fields in an existing system of record. Some tasks, depicted with blue boxes, require judgment, interpretation, or problem-solving skills. When examining this process for automation, only the clear boxes are suitable for RPA, but the current sequencing would require the human to intervene four times. To optimize the sequence for automation, an RPA team might realize that some tasks are not needed and can be eliminated (like task K depicted on the right hand side), some tasks can be pulled out of the process and done at another time (like tasks G and C), and some tasks that require human intervention might be batched (like B and D) or re-sequenced (like N).

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[10] These references show years of research tying senior management support to project success: Standish Group (2015), Sabherwal et al. (2006), Lacity (2008), Nelson (2007).

exciting for people who are just used to doing the activities manually."

Neil Kinson, Chief of Staff for Redwood, added: *"So RPA is not just about taking FTEs out, it was about raising the level from pure transactional to more rewarding work, creating a higher quality of work."*

7.7 Ease transition for redundant employees

Across our RPA cases, the topic of redundancy is always sensitive. Organizations like to share the stories of upgrading the skills of the retained employees or taking on more work without adding more headcount. The reality is that as RPA scales, many companies need fewer employees. Companies need to develop plans for redundant employees. Across our cases, organizations either waited for natural attrition to gradually ratchet down headcount, offered early retirement, or offered career counseling for redundant employees that could not be deployed to other jobs within the organization.

At DSM, the majority of people were reassigned to higher value tasks, such as reporting and redesigning processes. de Haas explained: *"People want to do that [take on more challenging work] but also of course, we assess them to also make sure that they really can make that step. We also give them the chance of doing it."*

Some redundant people, mostly middle managers, were offered professional career counseling and used the

opportunity to pursue lifelong dreams (for example, in one case, helping orphans). The long-term challenge is to figure out the career paths in shared services for the next decade. This is so important that we have devoted an entire section on the topic (see RPA Challenges below).

7.8 Bring IT on board early

Across our 15 RPA cases, business operations questioned when or if to bring in the IT department. Some RPA champions in our other case studies initially excluded IT at the onset for two reasons: (1) service automation was seen as a business operations program since it required process and subject matter expertise, not IT programming skills, and (2) fears that IT would beleaguer the adoption with bureaucracy. In most such instances, however, clients found, in hindsight, that IT has an important role to play. Clients learned the importance of involving the IT department from the beginning so that IT can help validate the RPA software as enterprise-worthy, manage how software robots access existing systems, and manage the infrastructure so that it is available, secure, and scalable [Overby (2016)].

At DSM, FSS informed the Global IT Leadership Team after the robots were in production during May of 2016. FSS gave the IT leaders a demonstration of the product, explained how it worked, and showed them the business results in terms of cost savings and quality improvement. According to de Haas, the CIO was very

impressed with the speed of project delivery and the results. Why didn't FSS bring IT in the loop earlier? As noted above, FSS considers robotization to be a business project, not an IT project. But eventually IT needs to be informed and needs to help manage the production software.

Redwood took the lead for educating DSM's IT department because it was in a better position to explain the technical requirements of the software than FSS. Edwin Klijsen, Director of Financial Transformation for Redwood, explained the role of IT in RPA: *"The business user will drive the solution but at a certain point, of course, IT also has roles within this; it's an IT solution in the end, so there needs to be maintenance and support and input also from IT side."*

Klijsen also concurred that IT needs be brought in early in the process: *"When considering enterprise grade robotic solutions then collaboration with IT is a must. Any enterprise class robotic system needs to meet the IT security and governance requirements of the organization."*

8. FUTURE RPA CHALLENGES: CASE REFLECTIONS

In addition to the best practices emerging from our research, there are also "future of work" challenges with which all companies are grappling. In the long-term, what career paths do companies offer humans after robotization so that organizations retain enough knowledge and keep the humans engaged? What will happen to employees working in low cost countries? What is the corporate responsibility and duty to them? There are no easy answers, but we discuss some of these issues below.

8.1 Career paths in shared services after robotization

What will the career paths for internal employees look like in a world full of software robots? All the companies in our study asked this question, and certainly DSM is concerned about the future skills it will need in a highly robotized environment. We note that this question has been raised many times before in the context of outsourcing. In our outsourcing research on hundreds of companies collected over two decades, companies asked, *"What will the career paths for our internal employees look like in a world full of outsourced labor?"* We think the answer to both questions is the same.

Transitioning to software robots (or to BPO providers) can be tough on workers in the retained organization if steps are not taken to help them succeed in the new environment. Their roles will often shift and they will find themselves charged with managing and coordinating the work done by others rather than executing tasks. But the real aim should be focusing and empowering staff on customer service and business enablement. Too many times the employees are bogged down in the drudgery of transaction execution rather than exploiting the data collected to improve business operations. Kinson explained: *"It's a classic positioning model but it continues to be true that very few finance functions have the time and capacity to provide the insight to the business that the numbers are telling them. Their entire capacity and effort is making sure their auditors are happy and the numbers are produced in the time available and that they're accurate enough so that the CFO doesn't get in trouble."*

Automation can help free up employees for more valuable tasks, the consequence of which will be a new organizational design for shared services; a design shaped like a *"diamond"* instead of a *"pyramid"* (Figure 2) [Lacity et al. (2014)].

Pyramids are heavily populated with employees, most of whom are at the bottom of the pyramid doing transactional work. The benefit of this design is that employees continually build valuable, organization-specific experience as they are promoted higher up the pyramid. The pyramid model is strong on retained knowledge, but it is also costly. Shared services managers trying to recruit college graduates must compete with RPA or BPO providers who can court them with far richer career paths and many more peers. The model also tends to rely on staff augmentation with expensive domestic workers to fill in skills gaps, and to scale up resources. A significant class of middle managers who manage both employees and supplemental staff also characterizes the pyramid model.[11] Diamond-shaped retained organizations replace the heavy bottom of the pyramid with robots. Machines perform many transactional activities that were once performed by employees now. There are fewer middle managers needed, a view also predicted by de Haas: *"Robotization will affect the middle layer. I think a lot of those activities for instance, in our case it's putting in an invoice into a system or sending out letters to a supplier saying, 'your invoice needs to be*

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[11] We first identified the shift from pyramids to diamonds in Chapter Six of Lacity and Willcocks (2015b).

resubmitted.' Robots will do all that. People won't do that anymore so they have to reskill themselves to a higher level and we also have to face that a lot of those people in the middle layer are not able to do that or have no appetite of doing that."

But one statistic from our RPA research foretells a possible future with fewer middle managers supervising lower level employees: in one U.K. utility, only two human beings were needed to manage 300 software robots that were performing the work of 600 FTEs [Willcocks and Lacity (2016)]! Our own view is that the type and number of tasks in the middle layer will increase, not least because the cognitive automation that many see replacing tasks in the middle layer may be uncommercial, technically unready, and more difficult to get up and running, at least over the next three years, than many are predicting.

The diamond-shaped organization needs more subject matter experts, quality assurance, and governance skills to coordinate services with internal business units and with RPA and BPO providers. de Haas predicts that the humans who have these skills will be transient, with rich careers across organizations rather than within a single organization. He said: *"Highly educated people that are extremely flexible, that have a change mentality will work in many companies. We won't get people that work 25 and 30 years for a company. I believe that they will work on projects and when the project is complete,* *then there's nothing of interest, so they move onto the next company."*

The benefits of the diamond-shaped retained organization are lower costs, access to providers with best-of-breed skills, and greater flexibility because robots can more easily adapt to increases or decreases in service volumes.

8.2 Impact on labor in India and other low cost locations

Another major concern people share is the potential impact of automation on jobs in low cost countries like India. Initially, India's vibrant ITO and BPO sector grew based on the value of lower cost labor. In a highly automated world, labor arbitrage is no longer a compelling value proposition. Among our 15 RPA case studies, four had operations in India. DSM and Xchanging had captive centers in India and both companies chose to house their RPA programs in the Indian captive centers. de Haas, as previously stated, estimated that 99% of an RPA project entails defining business rules, which requires deep subject matter expertise. This is why FSS chose to implement RPA in the Indian delivery center; Hyderabad is where the most of the SMEs on financial close are located. Locating the software robots near the SMEs seems optimal because processes need both human expertise and robots to function as a team to be most effective.

Figure 2: Transforming shared services from pyramids to diamonds

FROM PYRAMID STRUCTURES ⟶ TO DIAMOND STRUCTURES
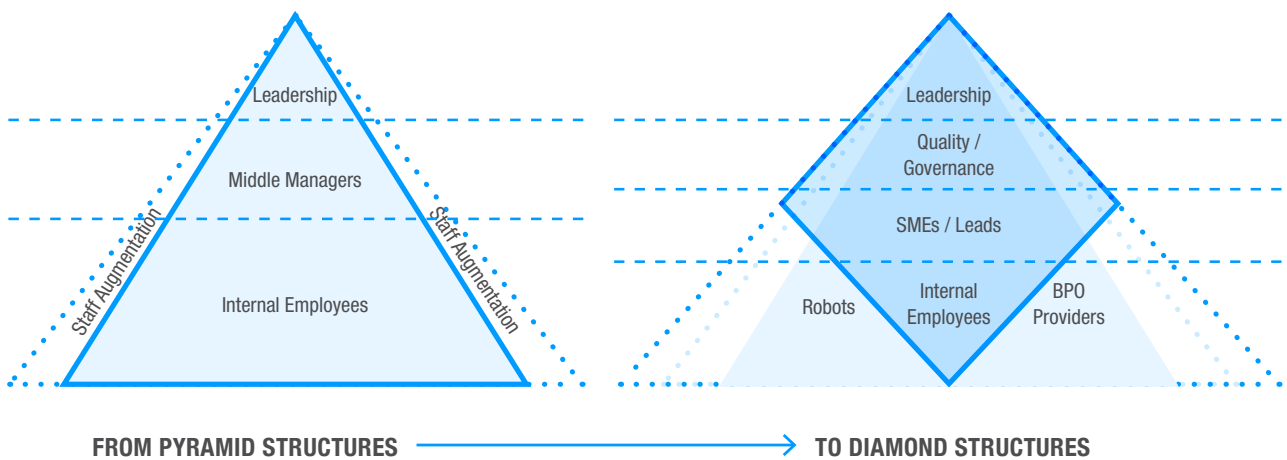
Note: The figure of the pyramid and diamond was adapted with permission from Jim Lammers of Express Scripts and from Sandy Ogg of Unilver.

Two of our cases, a European utility and a U.K.-based telecommunication company, had outsourced to BPO providers in India. They were among our earliest RPA adopters back in 2008. Both initially tried to partner with their BPO providers to do or to help with automation, but the FTE-based contracts, the BPO provider business models, and perhaps other undisclosed reasons resulted in the clients taking back the processes. Both these companies chose to reshore processes after RPA. The implication seems clear enough: Indian-based providers need to adapt, a message often conveyed in the Indian media.

We offer two insights here. First, the Indian-based providers are also innovating, which will increase their value propositions and bring new opportunities for growth. Indian-based BPO and ITO providers like Infosys, Wipro, TCS, and Tech Mahindra have all introduced automation to produce FTE savings. Hence, although fewer people will be needed for low-level, structured, and rule-based tasks, more jobs could be created for mid-level, unstructured, and creative tasks. According to Som Mittal, president of NASSCOM: *"Growth in future will be driven by new services/solutions and not more of the same. The industry has started to make significant investments in tools, technology and talent to build appropriate solutions and communicate the value proposition"* [Phadnis (2013)].

Second, many young and educated Indian professionals do not want the boring, repetitive jobs that Western-based organizations send offshore. In 2008, we published the first study that examined the reasons for the high turnover rates in Indian-based BPO and ITO providers, which were reported at the time to be as high as 80% in the IT services sector and as high as 100% for Indian call centers [Gupta (2001, Mitchell (2004, 2005)]. Based on interviews, we found that turnover was significantly related to task variety and complexity [Lacity et al. (2008), Iyer, V. (2011)]. A strong theme throughout the interviews was that Indian professionals want challenging jobs, just like their U.S./Western counterparts. The professionals who were most dissatisfied with their Jobs were mostly upset about the lack of task variety and low skill set utilization. For example, one participant complained: *"I have been put into testing and coding and now it is kind of maintenance phase. Now I am not able to use my skill set much. I am not satisfied with the kind of work I am doing. Every alternate day I go to my manager and I tell him that I am not satisfied with the kind of work I am getting and I need more challenging work so I can improve my skills."* Another interviewee complained, *"I just fix errors.…..I utilize only 20% of my knowledge."* Kinson also corroborated that Indian professionals want interesting work: *"India has significant attrition because Indian employees earn multiple degrees, they've earned MBAs, and they're just not satisfied doing low level work."*

9. CONCLUSION

RPA really took off during 2016 and 2017, with an estimated 100% annual growth rate for the 2006-18 period [Burnett (2016)]. The Royal DSM–Redwood case demonstrates the challenges, implementation lessons, and multiple organizational benefits possible from this rising phenomenon. It also demonstrates how, like several other service automation tools available, Redwood robotics can be scaled to enterprise level. Indeed, the second half of 2016 found DSM extending robotization well beyond its initial investment into financial close processes and its Indian shared service center. And beyond financial close, FSS was looking to robotize accounts payable, accounts receivable, and credit management.

The DSM case makes clear, however, that when it comes to achieving business benefits good management, amplified by new technology, really does make the difference. We identified eight action principles in the case: let business operations lead RPA; pick the right RPA tool; select the right partner; redesign work; show RPA tools to senior managers and business units; prepare retained employees; ease transition for redundant employees; and bring IT on board early. At DSM, these formed the strong foundation for growing and scaling service robotization in the enterprise globally. These findings gel very well with our findings in previous shared service cases.The Royal DSM case also demonstrates that RPA is best treated as a strategic long-term investment and not as a one-off tactical initiative. Strategically, this brings to the fore several challenges that we, at the time, emphasized less in earlier cases. As we discussed above, strategic use of RPA requires careful thought, and much preemptive focus on future work design, change management, and the skills implications and human-machine balance for the emerging workforce. Our wider evidence so far, documented in our recent book and many papers [Willcocks and Lacity (2016), Willcocks (2016), Lacity and Willcocks (2016c)], is that service automation, applied strategically to scale across multiple processes, will reshape how work is achieved, its location, and the human skills mix needed, against a context of ever rising information workloads for organizations.These were certainly the major issues Royal DSM and Redwood were concerning themselves with, as they considered future robotization in the Royal DSM global financial shared service operations.

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