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Robotic Process Automation Readiness Barriers and Enablers in South Africa's Energy Supply Chain

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Abstract

South Africa's energy industry faces ongoing challenges including power shortages, ageing infrastructure, and supply chain inefficiencies, while, limited empirical evidence exists on how organisations in this industry prepare for Robotics Process Automation (RPA) adoption. This study examines the RPA readiness barriers and enablers within the supply chain of South Africa's energy industry. The research adopts a qualitative design grounded in the Technology-Organisation-Environment (TOE) framework and the Awareness, Desire, Knowledge, Ability, Reinforcement (ADKAR) change management model to connect technological capability with individual and organisational readiness for change. Data were gathered through semi-structured interviews with 18 professionals representing eight stakeholder groups, including supply chain managers, IT specialists, process improvement leads, and employees affected by automation. Four key readiness barriers emerged: readiness gaps (61 mentions), organisational misalignment (158), infrastructure strain (83), and job security and resistance (60). Corresponding enablers included leadership accountability, RPA governance and alignment frameworks, readiness checklists, structured communication protocols, KPI frameworks, capability audits, investment planning, psychological safety, and regulatory alignment mechanisms. The integration of TOE and ADKAR offers a novel dual-lens perspective that extends existing knowledge. The findings provide practical guidance for managers and policymakers seeking to strengthen organisational systems and structures with human readiness factors in emerging economies.

Keywords: Robotic Process Automation (RPA), readiness, supply chain, barriers, enablers, energy industry, South Africa, TOE, ADKAR

1. INTRODUCTION

Supply chains in South Africa continue to experience pressures that undermine efficiency and stability. Tshifhumulo, et al. [1] show that logistics delays, supply disruptions, financial constraints, and technological failures remain persistent risks

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that weaken performance. the conditions affect growth and sustainability, particularly in the energy industry where supply chain reliability is central to maintaining economic performance and supporting social stability. Within this context, Robotic Process Automation (RPA) has been identified as a means of reducing manual effort and increasing process efficiency. Shamsuddoha, et al. [2] demonstrate that automation reduces repetitive human interventions and strengthens operational reliability, while Waduge, et al. [3] highlight that reliability and accuracy improve when adoption is supported by compatibility checks and scalable infrastructure.

Although the benefits are well recognised, evidence from emerging economies indicates that technology investment alone is insufficient. Bagheri and van de Wetering [4] argue that successful adoption depends on organisational readiness, including leadership commitment, governance alignment, and cultural fit. Similarly, Patrício, et al. [5] stress the importance of regulatory clarity and workforce involvement in achieving sustainable outcomes. Empirical findings suggest that RPA readiness is multidimensional encompassing technological, organisational, and institutional conditions that require structured management.

In South Africa's energy industry, the challenges are amplified. Molepo, et al. [6] identify structural inefficiencies, leadership turnover, workforce resistance, and regulatory uncertainty as key barriers in the national energy system. While their focus is on the broader energy transition, the same constraints limit automation in supply chains where operational efficiency and compliance are critical. Bhagwan and Evans [7] underscored the urgency of digital transformation goals in South Africa, however, there remains limited empirical evidence on how readiness barriers manifest in this context or how they may be addressed through enabling practices.

This study responds to that gap by examining RPA readiness barriers and enablers within the supply chain of South Africa's energy industry. The research objective is to examine how technological, organisational, and environmental factors interact to shape readiness for RPA and to identify the enabling practices that can strengthen this readiness. Drawing on evidence from eighteen semi-structured interviews, the analysis identifies readiness barriers across technological, organisational, and environmental dimensions through the Technology-Organisation-Environment (TOE) framework [8] and links them to enabling conditions that can alleviate their effects through the awareness, desire, knowledge, ability and reinforcement (ADKAR) change management model [9]stages .

The study makes three contributions. First, it identifies barriers specific to the South African energy supply chain, grounded in the experiences of practitioners. Second, it maps the barriers to enablers that provide actionable insights for

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strengthening readiness. Third, the integration of TOE and ADKAR offers a novel dual-lens perspective that extends existing knowledge. This integrated perspective provides managers and policymakers with empirically grounded and actionable guidance to strengthen governance, communication, cultural engagement, leadership visibility and alignment and regulatory coherence; thereby enhancing RPA readiness in emerging economies. The study is guided by the research question: What are the key barriers and enablers influencing RPA readiness within the supply chain of South Africa's energy industry?

2. METHODS

A qualitative research design was adopted for this study, chosen for its suitability in exploring organisational, cultural, and technological complexities that shape RPA readiness [10]. A qualitative approach allows for in-depth engagement with stakeholders, generating nuanced insights into barriers and enablers that would not emerge through quantitative methods. The focus on lived experiences of practitioners in the South African energy industry's supply chain makes this approach particularly appropriate [11].

The research process followed a systematic sequence to ensure transparency and methodological rigour from data collection through to analysis. Each stage was designed to align with the study objective and maintain consistency in data handling and interpretation. Figure 1 presents the research workflow from data collection to thematic analysis, outlining the key stages undertaken in this study.

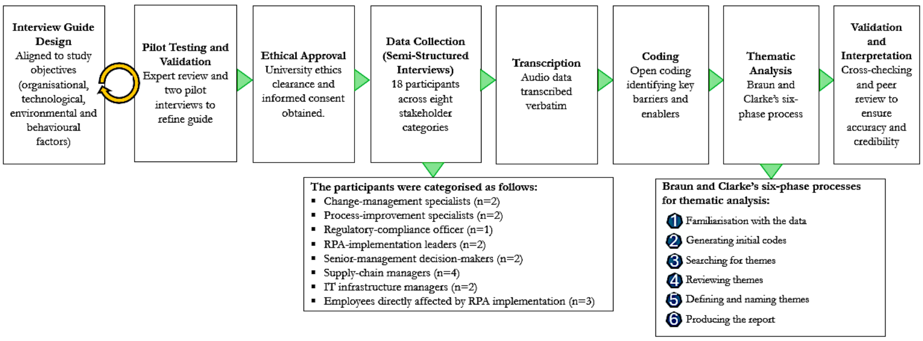

Figure 1. Research workflow data collection to thematic analysis (Researcher)

2.1. Data collection

Data collection in the form of interviews took a semi-structured approach, supported by flexible, open-ended inquiry Patton [12] explored technological, organisational, environmental and behavioural readiness factors. The approach was adopted as it enables a balanced consistency with flexibility, allowing

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participants to elaborate on their unique perspectives while ensuring coverage of key themes [13]. The interview guide underwent expert review and pilot testing to ensure clarity, content validity, and relevance. Two pilot interviews were conducted with professionals familiar with automation in energy supply chains, and minor refinements were made to improve flow and wording. Ethical clearance was obtained from the university's research ethics committee before data collection. All interviews were recorded with participant explicit consent.

2.2. Sampling

Purposive sampling was applied to ensure inclusion of participants with direct involvement in or exposure to RPA initiatives [12]. Eighteen participants were selected, representing eight stakeholder categories: supply chain managers, IT infrastructure managers, process improvement specialists, change management specialists, regulatory compliance officers, senior decision-makers, RPA implementation leads, and employees affected by automation. The diversity of roles provided a comprehensive view of readiness conditions across technical, organisational, and behavioural dimensions [14]. The sample size was deemed sufficient to achieve data saturation, as no new themes emerged after the fifteenth interview. The research was conducted within a large South African energy organization whose supply chain operations are directly impacted by inefficiencies, regulatory pressures, and workforce concerns [7]. Concentrating on one organisation allowed for an in-depth exploration of readiness dynamics within a consistent cultural and operational context. However, this single-organisation scope presents a limitation regarding generalisability to the broader industry, which is acknowledged in this study.

2.3. Data Analysis

Interview recordings were transcribed verbatim and thematic analysis was applied in a six-phase process: familiarisation, coding, theme generation, review, definition, and reporting [15]. Both inductive and deductive coding were employed. The inductive approach allowed themes to emerge directly from participant narratives, while the deductive process ensured alignment with the TOE framework and the ADKAR change management model. This dual analytical lens enabled the interpretation of both structural (TOE) and behavioural (ADKAR) aspects of readiness. Data were coded using ATLAS.ti, supported by reflexive notetaking and peer debriefing to enhance credibility [16].

Coding and theme refinement were performed iteratively while triangulation across stakeholder categories supported transferability of findings [15]. Triangulation across stakeholder groups supported transferability, while an audit trail ensured confirmability [17]. Codes were systematically reviewed and consolidated into

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thematic clusters based on conceptual relationships, recurring patterns, and contrasts across participant roles. The thematic analysis produced four overarching themes that represent the primary barriers to RPA readiness. Each theme comprised a distinct group of codes and accompanying descriptive insights derived from the interview data. Figure 2 presents the coding-to-theme development mapping, showing how initial interview codes were categorised, refined, and synthesised into four overarching themes representing key barriers to RPA readiness.

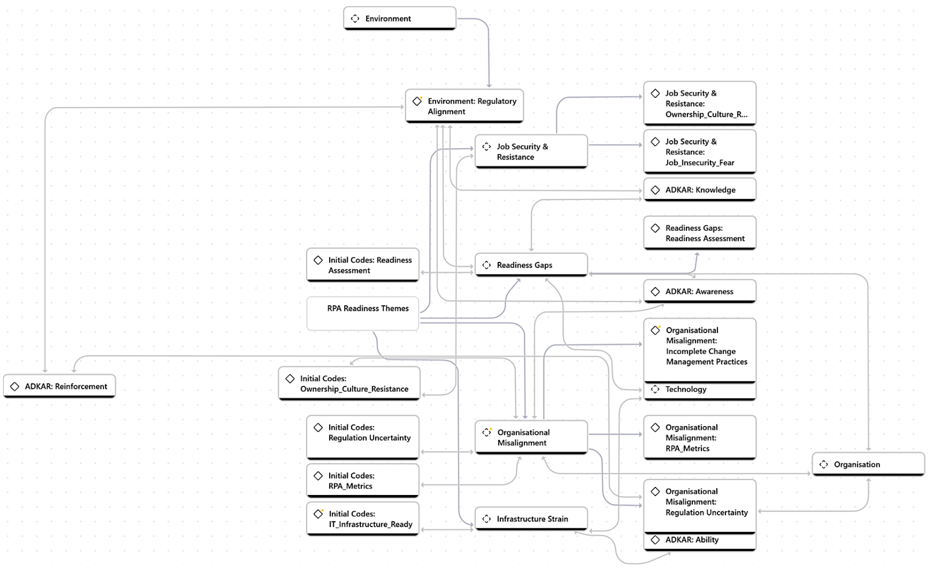

Figure 2. Coding-to-theme development mapping (Researcher)

To demonstrate the relative emphasis of these themes across participants roles, Figure 3 presents the frequency distribution of the four main readiness barriers, highlighting how perceptions varied among participants.

	CMS1 Gr=24	CMS2 Gr=17	EA1 Gr=24	EA2 Gr=10	EA3 Gr=29	ITM1 Gr=39	ITM2 Gr=11	PIS1 Gr=24	PIS2 Gr=27	RCO1 Gr=12	RIL1 Gr=26	RIL2 Gr=17	SCM1 Gr=44	SCM2 Gr=16	SCM3 Gr=18	SCM4 Gr=19	SMDM1 Gr=10	SMDM2 Gr=15
○ Infrastructure Strain Gr=83	1	2	5	0	7	12	1	8	7	2	9	6	9	1	5	3	2	3
○ Job Security & Resistance Gr=60	4	1	6	4	3	0	3	4	10	4	4	1	8	0	2	1	3	2
○ Organisational Misalignment Gr=158	8	11	10	7	13	10	4	8	6	6	10	6	20	13	5	10	4	7
○ Readiness Gaps Gr=61	4	1	1	0	5	17	2	6	4	0	3	2	7	1	2	4	0	2

Figure 3. Code frequency of readiness themes across roles (Researcher)

2.4. Underpinned theoretical models

This study applied the TOE framework [8] and the ADKAR change management model [9], to interpret RPA readiness themes. TOE is used to examine structural dimensions, while ADKAR highlights behavioural dimensions. The framework

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offers a holistic structure for evaluating readiness, balancing technological capability, organisational maturity, and environmental responsiveness Lacity and Willcocks [18] as shown in Figure 3.

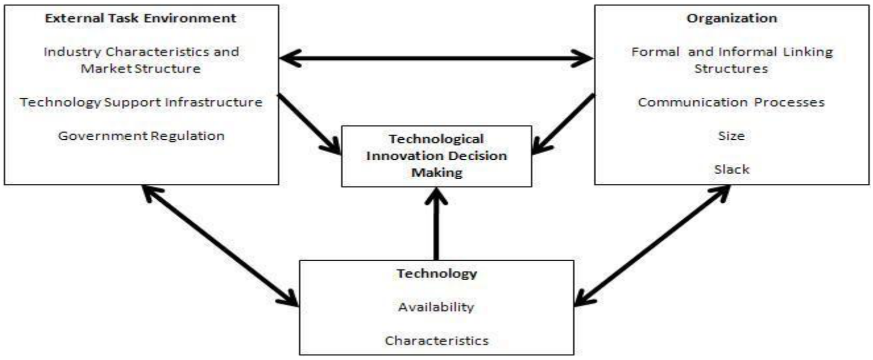

Figure 4. Technology-Organisation-Environment (TOE) (Depietro et al., 1990)

The ADKAR change management model serves as a recognized approach for guiding organisations through change processes [9, 19]. In this study, it is used to structure and assess individual readiness for RPA through the stages of change as presented in Figure 5.

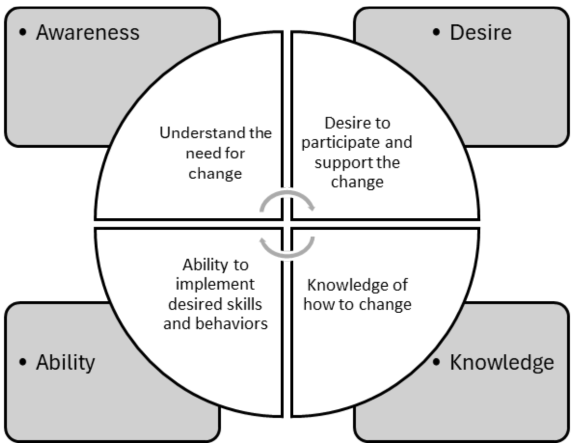

Figure 5. ADKAR change management model (Hiatt, 2006)Hiatt [9]

Each stage of ADKAR can be influenced by RPA readiness factors captured in the TOE framework. Awareness is shaped by technology, organization, and environment. Desire is similarly multidimensional. Technological opportunities that demonstrate efficiency benefits can increase willingness to adopt RPA [20]. Knowledge is influenced by technical training, skills and capability building tools, as robust IT systems provide the foundation for learning [21]. Ability depends on

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both internal and external readiness conditions. Technologically, system performance and scalability determine whether employees can apply knowledge effectively [22]. Reinforcement also spans all three dimensions. Technological monitoring of RPA performance validates continued use [20].

3. RESULTS AND DISCUSSION

The findings concur with international evidence that emphasizes capability audits, leadership accountability, communication and regulatory clarity as prerequisites for RPA readiness. The analysis revealed four central barriers to RPA readiness in the South African energy industry supply chain: infrastructure strain, job security and resistance, organisational misalignment, and readiness gaps. Each barrier was mapped to enablers using the TOE framework and the ADKAR model. The mapping of barriers to enablers was grounded in the empirical evidence provided by participants. The responses illustrate how organisational, technological and regulatory conditions shaped readiness, and how specific tools and practices could mitigate the constraints. Selected excerpts are presented below to demonstrate the lived experiences that support the mapping.

3.1. Infrastructure strain barrier (Technology dimension)

The main technological barrier was infrastructure strain, caused by outdated systems, unstable networks, and the absence of forward investment planning. Infrastructure strain reflected disparities in digital maturity, legacy constraints, downtime, and lack of investment planning. Participants described lengthy and frequent disruptions due to system outages and highlighted absent roadmaps for transitioning from on-premises to cloud. Farinha, et al. [21] and Saukkonen, et al. [22] caution that insufficient investment and weak integration undermine scalability. Participants experienced persistent failures, network instability and performance issues and a lack of investment planning for migration from on-premise to cloud.

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RPA has subsequently lost six months, fallen apart within the inventory team, so we are back to doing things manually. 58:285 ¶ 205 in EA3
Currently it's really bad and the reason why I state that it's because due to system changes system upgrades  58:283 ¶ 203 in EA3
Another challenge it was cost, you know, to automate is not that cheap 59:219 ¶ 239 in ITM1
the cost effectiveness has definitely been a challenge in our environment 61:177 ¶ 454 in PIS1
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Enablers included the use of RPA performance audit tools to compare baseline and post-implementation metrics such as throughput, errors, cycle time, and stability; infrastructure compatibility assessments and investment planning templates covering legacy fit, integration testing, and environmental constraints,

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strengthened information technology controls; and consideration of artificial intelligence to enhance system intelligence and scalability.

> *specific focus areas, infrastructure. Do an assessment to say, OK The infrastructure available. Is it? Is it mature enough? Is it consistent in in all the areas?* 128:26 ¶ 499-500 in Research Interview 2 Model evaluation SMDM
> *Certain infrastructure, we can implement a cloud-based solution. And then you can also look at the on premise solution and do some cost analysis based on the infrastructure strain and the investment that is required* 126:16 ¶ 571 in Research Interview 2 Model evaluation_SCM1

The practices promote awareness and ability by enabling proactive monitoring and reinforcement of system performance. Within TOE, this theme reflects the technology dimension, while in ADKAR it aligns with knowledge (understanding infrastructure needs) and ability (building scalable technical capacity).

3.2. Job security and resistance barrier (Organisational dimension)

The findings highlight the psychological and cultural barriers tied to automation. Employees often viewed RPA as a threat rather than an enabler, fuelling defensive behaviours. Job insecurity and resistance was fuelled by fear of redundancy, reluctance to share knowledge, and anxiety about the unknown. Employees described RPA as a threat to employment, echoing Syed, et al. [23] and Bhagwan and Evans [7], who emphasize cultural and psychological resistance as central readiness barriers.

> *a lot of people were very hesitant to even attend those because they were too scared that their jobs will be taken away from them* 56:394 ¶ 640-641 in EA1
> *people have this thing of owning ownership, owning a process and owning information as well. There's not enough information sharing because people want to own it. It makes them feel irreplaceable. Yeah, it's a culture I found here.* 54:317 ¶ 405-406 in CMS1

To mitigate this, the identified enablers include strategies for cultural buy-in to promote employee engagement, the creation of psychological safety to reduce fear and resistance to change, and conflict-management strategies to address tensions that arise during automation transitions. These initiatives foster open dialogue, trust, and collaboration, encouraging employees to participate in automation projects rather than resist them.

Within the TOE framework, these enablers form part of the organisational dimension, addressing cultural and human-resource readiness. In the ADKAR model, they align with the desire stage motivating employees to embrace change and the ability stage building confidence and behavioural capability to operate effectively in an automated environment.

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Buying into them also would be a thing of ensuring that the end users do not feel that their jobs are going to be on the line, but buying in, it is more to accomplish our objectives and missions of the company 126:15 ¶ 547 in Research Interview 2 Model evaluation SCM1
you need to make sure that the employees are feeling psychologically safe there is also cultural buy in into sharing and documenting and availing RPA scenarios. 118:16 ¶ 149 in Research Interview 2 Model evaluation EA1
what I have not seen is how will you deal with the conflict management which can arise from employees. If the model the model can deal with how you deal with conflict management. 126:19 ¶ 673 in Research Interview 2 Model evaluation SCM1
the only problem that it can be change management, because for people to adopt this tool (RPA) they need to have more knowledge, they need to be trained. 120:18 ¶ 714 in Research Interview 2 Model evaluation ITM
Training and support. It is key one and they need to understand how the RPA works and also implement the governance and compliance 59:269 ¶ 633 in ITM1

3.3. Organisational misalignment barrier (Organisational dimension)

Organisational misalignment arose from generic readiness assessments, weak governance fit, and inconsistent leadership commitment. Leadership turnover disrupted continuity, undermining strategic alignment and slowing implementation. Bhagwan and Evans [7] similarly note that misalignment between strategic priorities and operational realities hinders automation success.

I'm not being negative against managers or anything of that sort, but they are also very rigid and old school in sometimes in their thinking to keep things the way we know it 56:409 ¶ 1099 in EA1
Then again you look at the energy retail side they have totally different tone 56:408 ¶ 1322 in EA1
We need to think about how other business units, not only the energy division but also let's say, RPA, and the chemical division, and guess how they could potentially use the bot 58:290 ¶ 541 in EA3
even if you look at like our VP as well, like he's old school, he's blunt. He yeah, he wants to see the hammer and the nail. like don't tell me a robot's gonna pick it up and nail it 56:401 ¶ 1319 in EA1
Our culture is so bad that it also speaks into change management. If you ready have your mind made-up, it doesn't matter how effective the change management is. You already made-up your mind. You know? 54:312 ¶ 389-390 in CMS1
Top management must get people excited 54:326 ¶ 564 in CMS1
What I think will be really good is if we have maybe more of a management Involvement for management also to drive this 58:314 ¶ 1326 in EA3

The accounts point to weak governance, cultural alignment and inconsistent leadership support. Enablers identified are executive accountability and visible sponsorship to ensure leadership commitment, an RPA governance and alignment framework to standardise oversight and decision-making, and a skills and resource matrix to define specialist expertise and optimise engagement timing throughout automation initiatives, which correspond to ADKAR's desire and knowledge stages, as leaders foster motivation and role clarity.

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you need to consider the executive buy in because you need to get some sponsor from them 59:266 ¶ 1187 in ITM1
A lot of support from leadership is required and sought 68:285 ¶ 936 in SCM1
when you get the top structures to say from the executive Vice president down to Senior Vice President up to the officer level when you get commitment from the management. And then when it becomes part of their KPI that within a year they should have implemented this type of innovation and then they should have saved this much money because of this innovation. And that makes it easy for the implementation to take place 57:170 ¶ 1353 in EA2
I think the idea of single accountability is important 73:161 ¶ 1108 in SMDM2

RPA governance and alignment framework were emphasised. Participants pointed out that governance frameworks must exist at organisational level. While others noted the risk and governance external influence and considerations.

it's governance and security is key in the in the digital era that we are in 61:200 ¶ 1192 in PIS1
with all the automation initiatives. So you can also look at the operational efficiency and financial impacts and process and governance or also you must make sure that it's aligning to our organisational strategic alignment 59:267 ¶ 397 in ITM1
with our stakeholders, the external stakeholders, we need to look at that in terms of why do I need to do this? So we need to we need to look at how we can structure something so that it doesn't impact them on a negative basis because they could come back and push back and say no, I don't want to do this that also from a risk management and a governance perspective 58:320 ¶ 1245 in EA3

The interventions foster knowledge and reinforcement by ensuring stability and strategic continuity. In TOE, the issue sits within the organisational dimension, while ADKAR highlights desire (leadership building motivation) and knowledge (clarifying processes and roles) as the critical readiness levers.

3.4. Readiness gaps barrier (Organisational, Environmental dimensions)

Readiness gaps were the most prominent, reflecting weaknesses in both regulatory alignment and leadership support. Participants noted that change management was left to departmental managers without formal expertise, resulting in fragmented communication and inconsistent reinforcement. Unclear regulatory guidance compounded the issue by creating uncertainty about compliance requirements and slowing project implementation. The findings resonate with Fernandez and Aman [24], who argue that leadership accountability and structured communication are essential to sustain momentum, and with Intachomphoo, et al. [25], who highlights regulatory ambiguity as a readiness constraint.

People don't know what the benefits are of this new process or system. Then they are reluctant to use it. 55:347 ¶ 938 - 939 in CMS2

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When you are implementing such kind of system, you need to have an effective training, and people needs to get training you know and change management. 59:218 ¶ 229 in ITM1
They want to implement something that will also cater to us so, employee readiness and organisational culture. It will also be key, and also change management and resources. 59:257 ¶ 1478-1479 in ITM1
change management is left to your maybe senior managers of the departments and not everyone is a change manager 54:299 ¶ 234 in CMS1

Regulatory uncertainty further compounded the issues, with participants noting that compliance was often introduced late in the automation cycle, which could lead to delays and rework.

There, it's one legislation that I can think of that limits us then to scale out globally when you have a solution 54:330 ¶ 430 in CMS1
I mean like regulators for them, what they're interested in is the integrity of data that you share with them. 68:274 ¶ 1092 in SCM1
data protection and privacy laws, data privacy, intellectual property protection, the IP, it's also crucial 59:241 ¶ 1012 in ITM1
I'm not sure with the regulation or is it maybe just a company policy that that's required? 60:210 ¶ 1294 in ITM2
I'm not aware of any legal or regulatory requirement for the adaptation 63:98 ¶ 436 in RCO1

The participants accounts reveal that gaps in communication, reinforcement, and regulatory clarity weaken readiness. Enablers suggested include the use of readiness checklists to standardise pre-implementation preparation, structured communication protocols to coordinate activities across teams, and readiness assessments supported by KPI frameworks to track progress and performance. Post-implementation support involved defined ownership for incident response, change control, and regression testing with regular stability reviews. In addition, RPA regulatory alignment and governance mechanisms were strengthened through the inclusion of formal compliance roles within teams, clear entry criteria, established contact points, and documented advisory procedures to ensure ongoing accountability and regulatory consistency.

mechanisms for regulatory alignment, but is it regulation with respect to Internet of Things, AI or general business environment regulation 117:16 ¶ 589 in Research Interview 2 Model evaluation SCM2
I would say the Environment, the regulatory alignment, because we will be dealing with Sarbanes Oxley (SOX) and you know external people that will come to audit what we are doing. So, and if there's no clear alignment or understanding what we are doing ourselves, how are we going to then impart that knowledge to them? 118:8 ¶ 565 in Research Interview 2 Model evaluation EA1

ITM1 advised to consider privacy and cyber security impact even before starting RPA. While SCM1 reinforced the need for structured communication and performance measurements.

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So data protection and privacy laws, data, data privacy, intellectual property protection, the IP, it's also crucial, so those are the things that you need to put into consideration and also cybersecurity best practice 59:268 ¶ 1003 in ITM1
Once you start sharing those KPI's framework and you have a structured communication so that is awareness and reinforcement and would give the initiatives, that sustainability 126:18 ¶ 631 in Research Interview 2 Model evaluation SCM1
people don't read emails and then from you excite we'll take the initiative to go to the users and do your roadshows 54:301 ¶ 257 in CMS1

SMDM suggested readiness checklists that include who does what. While SCM2 and SCM3 added that there is a need for support after implementation.

So I think if you convert it to all those component into checklists, it's a nice mechanism to say ok we've looked at all the components 128:11 ¶ 613-614 in Research Interview 2 Model evaluation SMDM
So I would say the communication ,the awareness on the change was done but the post implementation I'm not sure how far and how long then did that take place 70:303 ¶ 864 in SCM3
So you need to be able to do like post production deployment and revisiting the reporting of those processes 69:243 ¶ 138 in SCM2

Within TOE, the issues reflect both organisational and environmental dimensions. In ADKAR, the issues align with Awareness (clarity of objectives and compliance obligations) and Reinforcement (maintaining momentum through consistent communication and oversight). the mechanisms ensure ability and reinforcement through proactive compliance integration

3.5. Barrier and enabler mapping

The interconnected nature of the barriers and enablers necessitates viewing readiness as an integrated system rather than a set of isolated organisational challenges. Table 1 presents the mapping of the identified barriers to their corresponding enablers across the technological, organisational, and environmental dimensions of the TOE framework, aligned with the ADKAR stages of change. This mapping illustrates how each enabler directly addresses its associated readiness constraint while simultaneously reinforcing broader organisational capability, leadership alignment, and behavioural readiness.

Table 1. RPA Readiness Themes, Barriers and Enablers (Researcher)

TOE Dimension	Barrier	Enablers	ADKAR Stage
Technology	Infrastructure strain	Capability audits; infrastructure assessment templates; IT controls; costed investment plans	Knowledge, Ability

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TOE Dimension	Barrier	Enablers	ADKAR Stage
Organisation	Job security & resistance	Structured communication; leadership visibility; psychological safety; cultural buy-in strategies; conflict-management mechanisms	Desire, Ability
Organisation	Organisational misalignment	Executive accountability; coordinated leadership; cross-department planning and alignment frameworks	Desire, Knowledge
Organisation / Environment	Readiness gaps	Proactive regulatory alignment; governance frameworks; compliance assurance mechanisms	Awareness, Reinforcement

3.6. Interrelationships among barriers and enablers

To deepen understanding, the study examined how the barriers influenced one another across technological, organisational, and behavioural domains. The analysis revealed strong interdependencies and cascading effects. Organisational misalignment and readiness gaps were found to amplify infrastructure strain, as unclear governance and fragmented planning delayed investment in technological capacity. As SCM2 explained that a readiness survey was performed post implementation, but it was generic; it never captured the specific needs of each area, which later caused delays in infrastructure planning and budgeting. Similarly, ITM1 noted that system outages and network failures are worsened by unclear governance and poor coordination between IT and business.

The findings suggest that poor organisational coherence directly weakens technological reliability, a pattern also reported by Farinha, et al. [21], who observed that fragmented leadership delays infrastructure modernisation in energy-sector automation. Job insecurity and resistance were similarly intensified when communication breakdowns and leadership instability occurred together. EA1 recalled that a lot of people were very hesitant to even attend awareness sessions because they were scared their jobs would be taken away, while CMS1 remarked that people were unsure what to expect or who was driving the change, so most just kept doing things the old way. Leadership turnover further compounded the challenges: as one process lead observed that when leadership changes, priorities shift, and RPA projects are paused or abandoned. the reactions mirror international evidence from Syed, et al. [23] and Bhagwan and Evans [7], who found that perceived job threat and weak communication are among the strongest predictors of cultural resistance to automation.

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Enablers such as structured communication protocols and executive accountability acted as cross-cutting mitigators that addressed multiple barriers simultaneously. SCM2 explained that if employees know in advance how RPA affects job roles, they are more likely to co-operate, while EA1 added that executive accountability can hold leaders responsible for delivering RPA priorities. the interventions reduced uncertainty, stabilised leadership expectations, and encouraged participation. As one decision-maker summarised that when executives stay visible and consistent, people start to trust the process and share ideas for automation. Comparable findings in European and Asian studies [20, 26]. confirm that visible sponsorship and open communication create reinforcing feedback loops between organisational culture and technological adoption.

The interconnections observed indicate that RPA readiness improvement is systemic and iterative. Leadership instability can magnify technological strain, while regulatory uncertainty can prolong misalignment and readiness gaps. Conversely, enablers such as structured communication and regulatory alignment have cascading positive effects, simultaneously stabilising culture, infrastructure, and governance. Figure 6 illustrates the interconnections between the identified readiness barriers and their corresponding enablers within the TOE and ADKAR frameworks. It shows how technological, organisational, and environmental barriers are mitigated through enablers aligned with the ADKAR stages of awareness, desire, knowledge, ability, and reinforcement. The figure highlights that the relationships are multidirectional, with enablers such as executive accountability, structured communication, capability auditing, and regulatory alignment addressing multiple barriers simultaneously. This visual representation demonstrates that RPA readiness is achieved through the integration of structural capability and behavioural change, where progress in one dimension reinforces readiness across the others.

The four barriers demonstrate that readiness in the South African energy supply chain is shaped by both structural and behavioural conditions. Mapping barriers to enablers through TOE and ADKAR provides a systematic response to the research question, showing how challenges in technology, organization and environment can be mitigated by practices that build awareness, motivation, knowledge, ability and reinforcement. the findings confirm international evidence on automation readiness reported by Farinha, et al. [21], who emphasize capability audits and structured infrastructure planning, and by [22], who caution that weak integration and underinvestment undermine scalability. The insights also align with Bhagwan and Evans [7], who note that cultural resistance and organisational misalignment impede digital transformation in South Africa, and with Syed, et al. [23], who highlight that workforce reluctance and defensive behaviours are global barriers to RPA. Consistent with global findings, effective RPA readiness depends on accountable leadership and transparent communication to sustain

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organisational alignment [24]. Regulatory uncertainty remains a significant external factor influencing the pace and stability of automation initiatives [25].

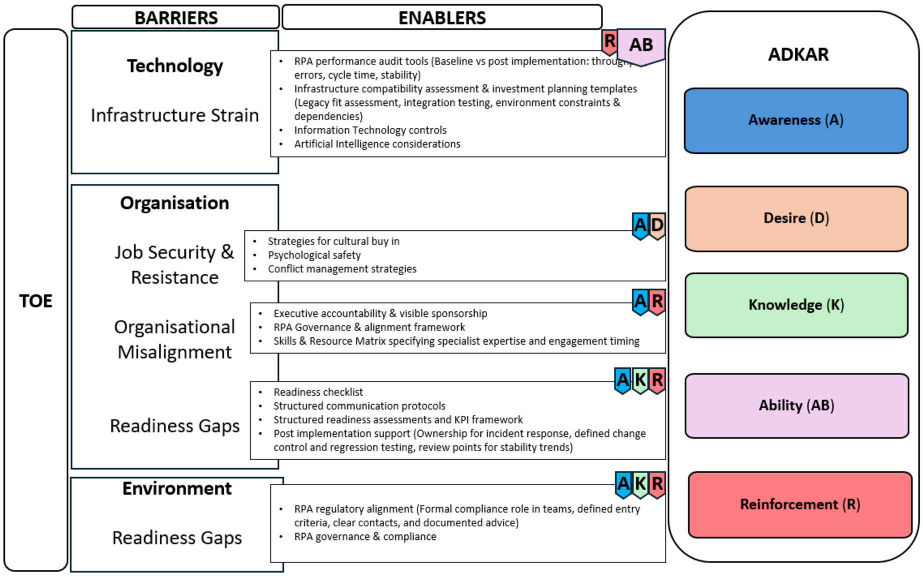

Figure 6. Barriers and Enablers through integrated TOE and ADKAR framework (Researcher)

3.7. Implications for policy and managerial practice

The findings indicate that RPA readiness requires coordinated action across organisational, technological, and environmental systems rather than isolated technical initiatives. Participants consistently emphasised that automation efforts failed when leadership, communication, and governance operated in silos. These views highlight that readiness depends on the integration of governance, culture, and capability. For management, this implies embedding executive accountability for RPA performance, establishing transparent communication frameworks, and standardising readiness assessment tools to identify issues early. Embedding regulatory alignment as a prerequisite for RPA readiness from the outset of automation initiatives to ensure operational stability, maintain compliance, and prevent costly post-implementation adjustments is crucial.

From a policy perspective, the evidence suggests that organisations would benefit from clear automation and data-governance guidelines, supported by formal readiness standards. Participants observed that reactive engagement with regulators often delayed projects, necessitating the need for a more proactive and collaborative approach. Policy measures that promote early consultation, consistent audit requirements, and knowledge sharing platforms across the energy

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industry could strengthen the regulatory environment for automation readiness. Such alignment between policy and organisational practice would enable more consistent governance and facilitate sustainable RPA adoption across the energy supply chain.

3.8. Practical guidance for managers implementing RPA

Managers seeking to improve readiness for RPA could view automation as an organisational transformation rather than a technological upgrade. The study showed that readiness improves when leadership is visible, communication is structured, and employees are involved early in automation planning. One manager emphasised that early communication helps employees understand how automation will affect their roles, making them more willing to participate, while another highlighted that creating psychological safety is essential for building trust and acceptance before introducing RPA. The insights highlight that readiness depends on building trust and cultural acceptance alongside technical competence.

Practical actions include establishing clear accountability for RPA outcomes, ensuring that communication plans are standardised across departments, and introducing structured readiness checklists to coordinate activities and track progress. Post-implementation monitoring should be routine to sustain ability and reinforcement through feedback and learning. Managers also need to embed compliance expertise within automation teams to ensure that regulatory and ethical standards are met consistently. By combining governance structure, employee engagement, and proactive compliance, organisations can strengthen both the technical and human dimensions of RPA readiness, creating a foundation for continuous improvement and sustainable automation within the energy supply chain.

3.9. Implications for research

This study provides several implications for future research on RPA readiness. The findings demonstrate that readiness is not a single-stage condition but a dynamic interaction of technological, organisational, and behavioural factors that evolve together. Future studies should therefore move beyond isolated analyses of technology adoption and explore longitudinal and cross-industry assessments that capture how readiness develops over time. The integration of TOE and ADKAR offers a novel dual-lens perspective that it extends existing knowledge This integrated perspective provides managers and policymakers with empirically grounded and actionable guidance to strengthen governance, communication, cultural engagement, leadership visibility and alignment and regulatory coherence; thereby enhancing RPA readiness within resource-constrained energy environments.

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Scholars may extend this approach by incorporating additional dimensions such as leadership maturity, regulatory influence, or workforce learning to deepen understanding of readiness dynamics. Moreover, while this research focused on the South African energy industry, comparative studies across other emerging economies could reveal contextual similarities and variations in governance, culture, and infrastructure capability. The study's empirical insights offer a foundation for developing quantitative instruments to measure readiness maturity across organisations. The enablers such as communication structures, leadership accountability, and regulatory alignment can inform the construction of diagnostic tools and performance indices for future evaluation of automation readiness and resilience.

4. CONCLUSION

This study investigated the Robotic Process Automation (RPA) readiness barriers and enablers within the supply chain of South Africa's energy industry. Anchoring the analysis in empirical evidence from the South African energy supply chain, the study identified barriers shaped by organisational, infrastructural and regulatory realities and mapped them to enablers that directly address the conditions. Four barriers were identified: infrastructure strain, organisational misalignment, job security and resistance, and readiness gaps each constraining the sustainability of RPA initiatives in this context. Using the TOE and ADKAR frameworks, the barriers were systematically linked to enablers such as leadership accountability, structured communication, readiness assessment frameworks, capability auditing tools, and regulatory alignment mechanisms. The study demonstrates that readiness is shaped not by technology alone but by the interaction of structural, cultural, and regulatory conditions. Integrating the TOE and ADKAR frameworks enabled a holistic understanding that connects organisational systems with behavioural dynamics, extending current knowledge through evidence from an emerging economy and advancing analysis beyond generic accounts of automation readiness. The findings carry important implications for both policy and practice. For managers, readiness should be institutionalised through visible leadership, clear accountability, and early employee involvement. Structured communication, psychological safety, and continuous post-implementation review were found to build trust and reinforce change. For policymakers, the results highlight the need for consistent automation guidelines, proactive regulatory consultation, and frameworks that align compliance with innovation to support sustainable automation in critical industries. Future research should focus on testing and refining the proposed readiness framework across other energy organisations or emerging economies to determine its transferability. Comparative and longitudinal studies could further explore how readiness evolves over time and identify enablers that are context-specific versus those that are universally applicable. The study

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concludes that strengthening RPA readiness requires coordinated leadership and structured communication within the organisational dimension of the TOE framework to foster desire and psychological safety among employees, encouraging active participation in automation initiatives. Leadership accountability, cultural buy-in strategies, and conflict-management mechanisms were shown to enhance trust and mitigate resistance, reinforcing ability and reinforcement through confidence and stability during change. Within the technological dimension, capability audits, infrastructure assessment templates, and IT controls developed the knowledge and ability needed to ensure operational reliability and performance. The environmental dimension highlighted that proactive regulatory alignment and governance frameworks are essential for building awareness and sustaining compliance, reducing ambiguity that often disrupts progress. Together, these findings confirm that RPA readiness is a socio-technical process shaped by the interaction between structural capacity, behavioural alignment, and regulatory assurance. The integration of TOE and ADKAR offers a novel dual-lens perspective that captures how awareness, desire, knowledge, ability, and reinforcement are activated across organisational, technological, and environmental dimensions. Overall, the research provides empirically grounded and practical guidance for managers and policymakers seeking to institutionalise readiness through leadership visibility, cultural engagement, and regulatory coherence, thereby enabling sustainable digital transformation within resource-constrained energy environments. The research thus offers empirical and practical insight into how energy organisations in emerging economies can enhance RPA readiness.

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