Analysis on Barriers to Implementation of RPA: An Interpretive Structural Modelling (ISM) Approach

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ABSTRACT

Digital transformation is playing a critical function in various industries worldwide and transforming the manner in which establishments deliver products, conduct operations and fulfil orders. What if we can optimise the business enterprise's typical manual or repetitive processes and reduce costs, all without making a first-rate IT funding or hiring a new team of workers? RPA is being used in different industries to automate and boost up tasks that have been done manually. The primary objective of this study is to understand the interaction between different barriers that happen to occur before the RPA implementation takes place, thus preventing firms from transforming their manual processes digitally. The literature review gathered along with expert's opinions obtained through various focused interviews conducted with managers and executives from varied backgrounds helped in determining the relationship between various different barriers and build a reachability matrix. This matrix has been used to conduct Interpretive Structural Modelling Analysis. The results obtained from the ISM analysis holistically assist in deriving the driving power and dependence of various crucial barriers. Thus, providing insights about which barriers to prioritise before potentially implementing Robotic Process Automation to manual processes.)

Keywords

Robotic Process Automation, Optimisation, Interpretive Structural Modelling, MICMAC

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Introduction

The major perception about Robotic Process Automation has been more or less related to physical robots performing complex tasks in the manufacturing sector. What many people do not realise is that RPA is the automation of manual processes through the pursuit of software bots. There is no interference with the legacy system in place, since RPA as a technology is not invasive. In fact, it interacts with the processes within the presentation layer thus mimicking human actions.

Uipath considers RPA as the technology that can be enabled by anyone and everyone. The bots can be put to use to emulate redundant and repetitive activities in order to automate back-office operations thus achieving cost-savings and high-efficiency. In today's day and age robots dominate most, if not all digital workforces (Uipath, 2017). According to a survey conducted by Deloitte, about 53 percent of the respondents agreed to have already started their RPA operations. This is expected to increase to 72 percent by next year and may achieve near universal adoption within next five years. 78 percent of those who have already implemented RPA into their organisations are ready to significantly increase their investments in next three years (David Wright, 2017).

The advancement of RPA has reached a point where it is moving from traditional back-office operations to more complex processes. RPA can seamlessly automate non-value-added tasks by complementing the current workforce. Thus achieving, high accuracy, improved productivity and major cost reductions. Despite so many benefits and a promising potential for a brighter future, several companies are still struggling to implement RPA and garner those benefits. In order to make the adoption process easier and elevate the companies to pursue their vision, a comprehensive systematic model is required that depicts a clear structure to understand and prioritise the issues effectively (Rajesh Attri, 2013).

As per (Hindle, 2018, p. 6) about 30-40 percent of the attempts fail owing to selection of unsuitable candidate processes, overlooking possible optimisation of the process and neglecting the infrastructure that already exists for IT (Dutta, 2016, pp. 6-7). Obtaining buy-in from the stakeholder, inclusion of people from various roles and departments and evaluation of possible benefits and impacts of RPA with them, assessing and prioritizing processes, and checking vendor related aspects are all crucial to implementation of RPA. Neglect of appropriate planning efforts can cause the RPA implementation attempt to fail. This is often termed as project or launch risk (Hindle, 2018, p. 7) and includes unrealistic project estimates and focusing solely on the possible benefits, disregarding the baseline of processes.

This study uses Interpretive Structure Modelling to analyse the relationship between these variables to come up with a model that will help identify the mutual influence among these barriers. This will eventually help in transforming vague and ill-defined ideas or mental models into more structured and clear systems (Rajesh Attri, 2013). Following a survey of the literature on Robotic Process Automation in various countries including India, the most important barriers to implementing RPA have been identified. The aforementioned survey in conjunction with the opinions collected from experts via. telephonic interviews formed the basis for obtaining our relationship matrix, which in turn formed the basis of our ISM model. Below mentioned are the major aims of the study:

1. To identify and rank the barriers to

implementation of RPA

2. To find out the interaction of identified barriers using ISM

3. To discuss the managerial implication of this research

Literature Review

The lack of available literature on this topic is one of the main reasons for this study. There is relatively little research and academic work regarding barriers to implementation of RPA. This makes the requirement gathering process somewhat challenging. Still, there is good potential to uncover novel findings regarding the hurdles that hinder RPA implementation.

2.1. Implementation Costs

The all-out expense of proprietorship is another significant perspective that ought to be assessed before picking any RPA tool. It relies upon different factors, for example, seller expenses, individual permit charges, cost of usage, support and that's just the beginning. Any organization might want to begin little and afterward scale, (10xDS, 2019) thus the assessment of the expense of RPA apparatus considering the organization's RPA guide is totally essential.

2.2. Optimisation of process before implementation

It is imperative to analyse and visualise the process, to understand the functioning and the bottlenecks involved. As rightly said by Bill Gates, automating unsystematic and cumbersome processes amplifies their inefficiencies. Before implementing the bots, it is crucial to streamline and optimise the processes in order to maximize RPA capabilities. also touches upon the need to standardize the processes before getting into RPA launch (Protiviti, 2019).

2.3. Proactive monitoring and control

Presently, bots are unable to monitor themselves and don't naturally adjust their practices any updates in the business rules. Nonetheless, the sets of business rules continually evolve, with new standards are included, and prevailing guidelines are refreshed or taken out. Thus, with the use of bots, there is a possibility of them producing wrong outcomes because of their dependence on outdated principles, prompting performance degradation after some time. Early recognition of the above is fundamental to limit errors and to deploy, as quickly as time permits, the appropriate control systems (Syed, 2020). Moreover, adjusting to changes in business rules proactively is important.

2.4. Lack of infrastructure

As per a report by Deloitte, numerous IT groups are just barely starting to completely acknowledge how unique the deployment of RPA technologies are to conventional IT frameworks and its expected effect on the role of IT Teams. There have been medium complexity nature RPA execution plans extending from about a month as long as 24 weeks. Although, as the complexity increases there is a possibility that automation becomes unsuitable monetarily. As IT groups learn and adjust to the progressions needed to execute automation and innovate effectively, the pace of RPA implementation accelerates quickly (Richard Horton, 2018).

2.5. Data Privacy and cyber security requirements

Like any innovative arrangement, RPA can open organizations to more prominent digital dangers. Organisations that don't unify the turn of events and don’t centralise the RPA supervision put themselves, alongside their clients and providers, at serious risk. (S. Burnett, 2018) For security of the bots, the underlying advancement of every application, just as any modifications are made, has to be reported. Every application ought to have a review trail indicating how it was manufactured and by whom, what it does, and who rolled out any changes.

2.6. Difficulty in deciding best application and RPA Tool

It is inaccurate to hastily assume that all RPA platforms perform the same. In actuality, the approaches taken by the different tools and their interactions with the different technologies are quite varied (Protiviti, 2019). One must consider aspects like whether a remote desktop software would be needed to communicate with the system, the make of the ERP system in use, or whether surface automation is mandated because of absence of APIs. Another important consideration is whether certain processes will still need manual intervention or can the automation function totally unattended.

2.7. Stakeholder Buy-in

Not recognizing partners and not speaking with them in a supportive manner typically brings about disappointment. IT’s essential contribution is required so as to guarantee stable execution and improve delivery (Beers, 2018, p. 2) (Kroll, 2016, p. 24). To gain the full support and trust of all the stakeholders with full commitment, a continuous synergy between business and different functions should be established.

2.8. Lack of operational knowledge and RPA Skill

In numerous organisations, positive RPA reception is additionally driving to improvement or acquiring of new skills: RPA architects, designers acquainted with the RPA tools, and robot administrators are new jobs where there are scarcely any subject matter experts. Respondents, especially those at the beginning phase of their RPA venture, report (David Wright, 2017) "Absence of RPA assets/abilities/ability/aptitude" as a key challenge. However, it isn't simply RPA-explicit authority abilities that are required: project management, change management skills are crucial too.

2.9. Managing Scalability

Bot systems, on a smaller scale are usually simpler to set up and manage. But as the utilisation of bots grows in an attempt to solve a larger set of problems, their behaviour can become unpredictable, and an ideal solution unachievable (Srivastav, 2016) RPA implementation remains a challenge because of adaptability issues. Creative strategies and techniques are expected to beat the current obstructions to enterprise adoption on a large scale.

2.10 Picking the wrong process for automation

One of the chief challenges for fruitful RPA implementation is picking the right processes as a candidate to be automated. A proper standard for such selection is missing. Currently existing frameworks are generally evolved by explicit RPA tool providers with limited anecdotal proof, and might be biased (Syed, 2020). Hence, a formal, orderly and proof based procedure to decide the suitability of processes for RPA is needed.

2.11. Exception Handling

Bots are by and large not coded with adequate guidelines to deal with the different run-time exceptions that can emerge. The causes can vary from something in the UI (for example diverse resolutions of the screen or format), an update to framework association (for example the utilization of an alternate system required in taking care of an atypical situation) to an adjustment in business rules (for example unique considerations with respect to particular kinds of clients). Subsequently, bots may quit working or progress to an off-track way, prompting the requirement for human mediation (P. Hallikainen, 2018), (S. Burnett, 2018), (ACCA, 2015). Although, manual interventions act to decrease or nullify the advantages looked for from the implementation of RPA. Innovative, framework guided, and automated exceptions dealing with systems and architecture are expected to augment the advantages RPA offers so the guaranteed quantifiable profits can be garnered.

2.12. Organisational Challenges

In numerous organizations the current business measures depend on complex chains of processes including different endorsement activities, contractual workers, customers and convoluted processes. Such organizations regularly use legacy systems, which were created with the ascent of new business needs (Wiesław Kopec, 2018). These custom arrangements are frequently rule-based and kept up by various outer contractual workers. Such software can be fragmented in nature as different processes are portioned into different software arrangements, which regularly are not viable with either the current principles, or even each other and must be kept up through steady fixing (Syed, 2020). At the point when automation is conveyed with RPA arrangements, they are regularly neither instinctive nor easy to understand, and inclined to blunders. Simultaneously, various organisations need sufficient information about their own business measures, particularly on taking care of special cases and taking into consideration easy routes and sidesteps to successfully fabricate such robots all alone.

Research Methodology:

ISM was created by Warfield (J.W, 1974). It intends to hierarchically arrange components related with a framework. Utilizing ISM, a structured model is created for the components related with the framework based on their connections. The excellence of this model lies in depicting the structure of the (probably complex) issue under examination, in designs as well as words. The philosophy of ISM goes about as the tool for enforcing the direction and order on the multifaceted nature of connections within the various components of the framework. ISM functions as an intelligent learning measure which allows us to organize the various related variables into a structured model. A model framed in this way depicts the make of an unpredictable issue or a problem, a field of study or framework, in a carefully planned example including illustrations just as words (Sage, 1977), (Rajesh Attri, 2013).

3.1. Barrier Identification/Elements that are relevant to the problem:

The factors that are supposed to be studied or modelled are identified.

3.2. Creation of SSIM (Structural Self-Interaction) Matrix:

Relationship among the variables is identified by preparing a structural self-interaction matrix. The relationship among pairs of variables or barriers is identified by conducting expert interviews and surveys.

3.3. Creation of Reachability Matrix:

This matrix is formed by converting the SSIM Matrix into an initial reachability matrix which helps in analysing the transitivity between the relationships. The transitivity means that if a barrier B1 drives another barrier B2, and in turn the barrier B2 drives yet another barrier B3, then we conclude that B1 drives B3 as well.

3.4. Level Partitioning:

Each barrier or factor is assigned a level, by making antecedent set and reachability set. The reachability set of a factor includes that very barrier and other factors that it will drive. The antecedent set of a factor also contains the factor itself, and other factors which will drive that factor. Then, we find the intersection of the two sets for each factor. The first level is assigned to a factor with identical intersection and reachability sets and it is omitted from the subsequent iterations. This level-partition process is iterated till a level is assigned to each factor.

3.5. Creation of Digraph:

An initial ISM with respect to each barrier's assigned level and FRM is drawn. Followed by this, a final ISM model is formulated by removing transitivity between the various factors.

3.6. MICMAC Analysis:

MICMAC analysis stands for “Matrice d’Impacts croises-multiplication appliqúe an classment”. For this analysis, all factors are bifurcated into four parts on the basis of their Dependence Power and Driving Power, namely, autonomous factors, linkage factors, independent factors and dependent factors (Faisal, 2010).

Data Analysis and Model Development:

4.1 ISM Methodology:

In the ISM approach, expert opinion from focused interviews and discussions is utilized in building up the pairwise relations between the factors. In this study, around 7 specialists from the RPA and Automation background were consulted. In view of this, logical connection between the barriers is created. In view of the accessible writing and specialists' assessment the logical relations between the barriers are as below. Four symbols, V, A, X and O are utilized to indicate the course of connection between the factors/barriers i and j:

V: Means i assists with accomplishing j A: Means j assists with accomplishing i

X: Means i assists in accomplishing j, and vice versa

O: Means neither i helps accomplish j, nor the other way round

Table 1 lists the relevant relationships acquired among different barriers through SSIM

After SSIM creation, another binary matrix is created, also known as reachability matrix. Here the symbols used previously are substituted with 1 and 0 values.

Table 1: Structural Self-Interaction Matrix (SSIM) for barriers

	12	11	10	9	8	7	6	5	4	3	2	1
1	A	A	A	A	A	V	V	A	A	A	A	X
2	A	A	A	A	O	V	O	A	O	O	X	
3	A	O	A	A	O	V	O	A	O	X		
4	O	V	A	V	O	V	V	A	X			
5	O	V	O	V	V	V	V	X				
6	A	A	A	A	A	O	X					
7	A	A	O	A	A	X						
8	O	V	V	V	X							
9	A	V	A	X								
10	O	V	X									
11	A	X										
12	X											

For the creation of initial reachability matrix (IRM) the following steps are followed:

- $If\, SSIM[i,j] = V, then\, IRM[i,j] = 1\, and\, IRM[j$
- $If\, SSIM[i,j] = A, then\, IRM[i,j] = 0\, and\, IRM[j$
- $If\, SSIM[i,j] = X, then\, IRM[i,j] = 1\, and\, IRM[j$
- $If\, SSIM[i,j] = O, then\, IRM[i,j] = 0\, and\, IRM[j$

The obtained IRM is shown in Table 2.

Table 2. Initial Reachability Matrix for Barriers

	1	2	3	4	5	6	7	8	9	10	11	12
1	1	0	0	0	0	1	1	0	0	0	0	0
2	1	1	0	0	0	0	1	0	0	0	0	0
3	1	0	1	0	0	0	1	0	0	0	0	0
4	1	0	0	1	0	1	1	0	1	0	1	0
5	1	1	1	1	1	1	1	1	1	0	1	0
6	0	0	0	0	0	1	0	0	0	0	0	0
7	0	0	0	0	0	0	1	0	0	0	0	0
8	1	0	0	0	0	1	1	1	1	1	1	0
9	1	1	1	0	0	1	1	0	1	0	1	0
10	1	1	1	1	0	1	0	0	1	1	1	0
11	1	1	0	0	0	1	1	0	0	0	1	0
12	1	1	1	0	0	1	1	0	1	0	1	1

In the wake of acquiring the underlying reachability network, the transitivity property must be evaluated to acquire the final reachability matrix. This implies that for an intermediate matrix M, if $M[i, j] = 1\, and\, M[j, k] = 1,$ $then\, M[i, k] = 1.$

With the above in mind, the reachability matrix is prepared. 1* values are inculcated to account for any gaps in the responses gathered during preparation of basic self-instructional lattice. After using the property of transitivity as depicted above, the final reachability matix is obtained.

The sum of all elements along a row gives us the driving power of the barrier associated with that row. A similar sum along the columns gives us the dependence power of the associated barrier. The Final Reachability matrix is shown in the Table 3 below.

Table 3: Final Reachability Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	Driving Power
1	1	0	0	0	0	1	1	0	0	0	0	0	3
2	1	1	0	0	0	1*	1	0	0	0	0	0	4
3	1	0	1	0	0	1*	1	0	0	0	0	0	4
4	1	1*	1*	1	0	1	1	0	1	0	1	0	8
5	1	1	1	1	1	1	1	1	1	1*	1	0	11
6	0	0	0	0	0	1	0	0	0	0	0	0	1
7	0	0	0	0	0	0	1	0	0	0	0	0	1
8	1	1*	1*	1*	0	1	1	1	1	1	1	0	10
9	1	1	1	0	0	1	1	0	1	0	1	0	7
10	1	1	1	1	0	1	1*	0	1	1	1	0	9
11	1	1	0	0	0	1	1	0	0	0	1	0	5
12	1	1	1	0	0	1	1	0	1	0	1	1	8
Dependence Power	10	8	7	4	1	11	11	2	6	3	7	1	

From the FRM, we calculate the level partitioning for each barrier using the level iteration process specified in the ISM methodology section. The resultant Level Hierarchy is shown in the Table 4 below.

Table 4: Level Hierarchy Matrix

S#	Barriers	Driving Power	Dependence Power	Level
6	Difficulty in deciding best application/RPA Tool	1	11	1
7	Stakeholder Buy-in	1	11	1
1	Implementation costs	3	10	2
2	Optimisation of Processes before automation	4	8	3
3	Proactive Monitoring and Control	4	7	3
11	Exception Handling	5	7	4
9	Managing scalability	7	6	5
4	Lack of infrastructure	8	4	6
12	Organisational Challenges	8	1	6
10	Picking the wrong process for automation	9	3	7
8	Lack of operational knowledge /RPA Skill	10	2	8
5	Data Privacy and cyber security requirements	11	1	9

Results:

5.1 MICMAC Analysis:

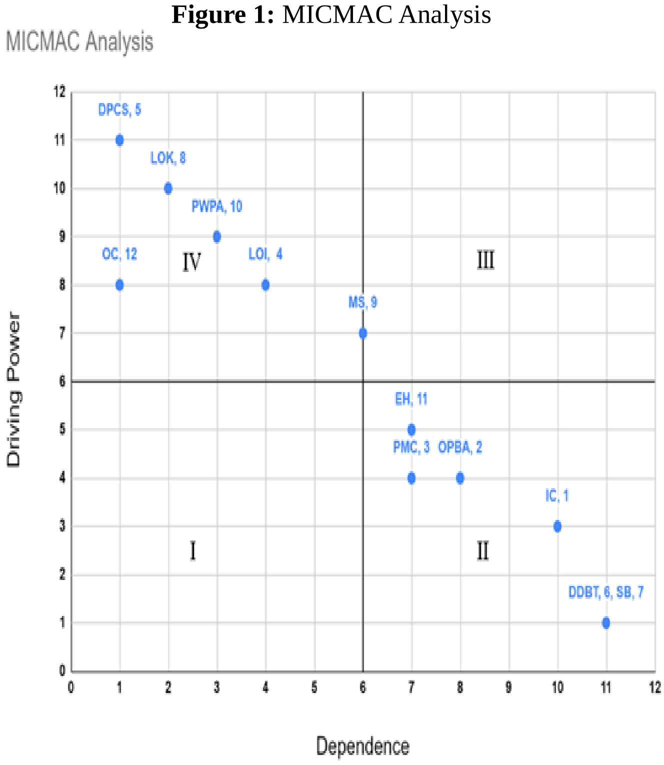
MICMAC is utilized to look at the quality of the driving force and dependence intensity of barriers to implementing RPA (Faisal, 2010). The RPA barriers are ordered into four quadrants, on the basis of their driving and dependence power, as appeared in Table 4.

The four clusters of Barriers to Implementation of RPA are:

Autonomous variables: The variables which neither possess a strong driving power nor are strongly dependent, fall into this category. In the current instance of study none of the barriers were seen to be autonomous. These are represented in quadrant I of the graph (Mahmood Ahmad, 2019).

Dependent variables: These factors are weak drivers but are strongly dependent. Barriers like Implementation Cost (IC), Optimisation of process before automation (OPBA), Proactive Monitoring and Control (PMC), Difficulty in deciding best RPA tool (DDBT), Stakeholder Buy-in (SB), Exception Handling (EH). These are represented in quadrant II of the graph.

Figure 1: MICMAC Analysis



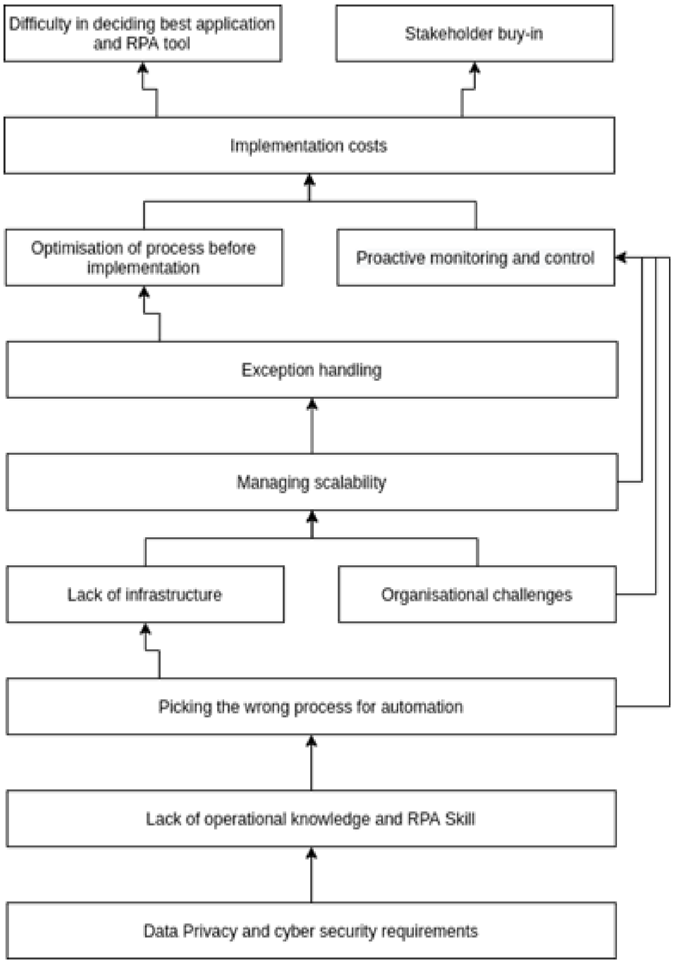
Linkage variables: Linkage variables are strongly dependent and are also strong drivers. These elements are not stable, such that any tampering of these variables will impact the rest of the factors and furthermore will have a feedback on to themselves (Mahmood Ahmad, 2019). Only one barrier is available in this category that is Managing Scalability (MS). These are represented in quadrant III of the graph.

Independent variables: Independent variables are characterised as weakly dependent strong drivers (Mahmood Ahmad, 2019). A factor with an exceptionally solid drive power, is known as the 'key factor', and is present in either the independent or the linkage variables. Barriers like Lack of Infrastructure (LOI), Picking the wrong process for automation (PWPA), Lack of operational Knowledge/RPA skill (LOK), Organisational Challenges (OC) and Data Privacy and Cyber Security (DPCA) fall in this category. These are represented in quadrant IV of the graph.

5.2 ISM Structure:

Based on the research conducted for the identification and analysis of the barriers to implementation of RPA, the overall ISM model can be formulated. The model is representing with the help of a Diagraph as shown below:

Figure 2: Model depicting relationship between various RPA barriers based on ISM



Conclusion

Interpretive Structural Modelling (ISM), gives a systematic structure and a direction to the non trivial issues, and paints for the stakeholders a holistic view of the circumstance and the factors included. ISM transforms indistinct, and inadequately explained mental models of frameworks into obvious and structured and well articulated models, which can help us locate the key or most important barrier related to issue. A robust strategy can hence be developed after the identification of key issues.
The barriers which are the strongest drivers (and hence possess the ability to strongly influence other barriers) should be prioritised first. Barrier 4; Lack of Infrastructure, Barrier 5; Data privacy and cyber security, Barrier 8; Lack of Operational Knowledge, Barrier 10; Picking the wrong process for automation, Barrier 12; Organisational Challenges that are found to be at the higher levels of the model are crucial ones. They should be regarded as the underlying cause for the rest of the barriers.
There are no barriers belonging to the autonomous category. Only one barrier is seen to fall in the linkage category, that is Barrier 9; Managing Scalability. Therefore, among all selected barriers, only this barrier is unstable and need to be studied carefully. In case this barrier is affected, the entire system can be affected.
Barrier 1; Implementation costs, Barrier 2; Optimisation of Process before Automation, Barrier 3; Proactive monitoring and control, Barrier 6; Difficulty in deciding best RPA tool, Barrier 7; Stakeholder Buy-in, and Barrier 11; Exception Handling, which are at lower levels of the model are dependent barriers. Other barriers can easily influence them.

Scope for Further Research:

This examination included finding the connection between the different barriers to implementation of RPA. Further investigation should be possible on the procedures that can be utilized for each one of these factors, to guarantee a desirable outcome. The factors mentioned in this examination are not enough, and there are a lot more factors that can be included for investigation too.
Also, this model has not been factually approved. Basic Structural Equation Modeling (SEM) can test the legitimacy of hypothetical models and hence can be applied to the presented model to ascertain its correctness

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