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THE IMPACT OF SDLC FRAMEWORK INVOLVEMENT TO THE CRITICAL SUCCESS FACTORS OF ROBOT PROCESSING AUTOMATION DEVELOPMENT

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ABSTRACT

The advancement of technology, aim to eliminate human involvement especially by the upcoming of robot development and adoption that particularly exist to eliminate the iterative activities. One of robot development called Robot Processing Automation (RPA) that developed in order to take over the repetition of human's administrative tasks. The adoption of RPA in the industries provide many advantages which on of the most essentials are efficiency of working activities. One studies conduct the research of RPA adoption towards the market potential, and the result shows it has significant impact for industries cost. On the other hand, the high market potential not running parallel with the implementation successful rate. This study will conduct a systematic review of the critical success factor of RPA Adoption. There are so many framework that able to conducted in implement the RPA. So that, to gain a specific research of the implementation, author will identify the research by analyzing the most popular implementation framework, which is SDLC.

Keywords : *Critical Success Factor, Implementation Success , RPA Adoption, SDLC Framework, Systematic Literature Review.*

1. INTRODUCTION

Technology works dynamic and adaptive. This fact proves that the technology itself has become such an important extant from industry itself because other than its dynamic and adaptive behaviour, technologies are also able to recognize the current condition and environment of these industries. Though technology remain change and develop, technology can always provide an ease to support the industrial activity. Robot Processing Automation or well known as RPA is one of technology development with great potential, it is defined as technology development that able to convey the demand from the industry to enhance the efficiency and effectiveness during the industry's activities. This fact works parallel with the potential demand of RPA in the future. Forrester Research took a survey back in the early 2021s and found that RPA had a market potential of $2.9 Billion, while the RPA market potential only around $250Million. Forrester mentions that they conducted research into two different types of RPA services and RPA software. They identified that in 2025 the RPA software potentially able to save cost over $6.5 Billion, while the RPA Services is expected to reach more potential three times bigger which the value will reach around $16.0 Billion [1]. Regardless the fact that the demand of RPA in the industry is significant, but the adoption of RPA Implementation is advance. Survey conducted by Ernst and Young, that 30% until 50% of RPA project are fail [2]. Case in point, there is one company that developed RPA for complaint-handling. On the other hand, there an error coding during the development process which result complaint backlog from the project team. Additionally, E&Y also identified the effect of a failed RPA implementation, which would drive a company's security into risks where it is identified that many anonymous hackers have a

chance to launch a cyberattack from bots launched that warn the company's sensitive data.

Related to above phenomenon, proves that industry has a mandatory to select the most suitable framework to be utilized during the implementation process of the RPA in industries or organization, and the most popular one of these frameworks is Software Development Life Cycle (SDLC). This framework considered to be most popular one because its accuracy and strong precision in analyze the business process engineering in industry [3]. The reason why this framework has perfect accuracy in the industry is because SDLC has many types of methodologies that are able to choose based on the business/ industry condition or process. This is what interacts with the author to explore further the role and the success factor of SDLC in the implementation process of Robot Processing Automation in industries/ organizations. Besides the framework selection, defining the criteria the of Critical Success Factors (CSFs) is also critical for the successful of the RPA Implementation Process. To achieve RPA Implementation success, the following are research topics this study tends to address:

1. Does SDLC involvement can provide benefits during the development of RPA?
2. Which criteria does the SDLC framework impact the critical success factors (CSFs) the most?

Which SDLC methodology is the most preferred to enhance the Critical Success Factors (CSFs) criteria of RPA Implementation

2. THEORETICAL BACKGROUND

Robot Processing Automation (RPA) or "automation" is an emerging form of clerical process automation technology based on the notation of software robot workers that are integrated with Artificial Intelligence technology [4]. RPA is highly potential technology adoption in the future that perceived can tackle human error as an impact of their involvement [5]. Regardless of it high cost of adoption, many organization faces a lack of adequate selection of appropriate frameworks [6]. So that, to tackle this phenomenon, it is mandatory for industry to ensure the type of RPA that would like to implement. In the practical implementation, there are two types of RPA. These types known as attended and unattended [7] :

- Attended RPA : The attended RPA is one RPA types that runs the computer and finishes the part of tasks that performing, mostly this type is implemented for the front office tasks. Managers are able to orchestrate the tasks between people and bots. Attended RPA also able to coordinate across internal resources. The workflow using this attended RPA is started with the employees that trigger and interact with the bot, which means that the RPA bots be ready if it is activated by employees. This type also runs on workstations or private servers
- Unattended RPA : The Unattended RPA is used when the organization doesn't need any representative to monitor the robot's performances which has mostly been used for automating back-office tasks. Mostly the unattended RPA operates on a preset schedule and is trigger by logic. Similar to attended RPA, unattended RPA can work on workstations or private servers in the cloud.

In addition, the addresses of RPA types can be done when the industry is able to identify the activity that would like to integrate. When these types are identified, then the process will through the development process. During the development of RPA, the understanding of project planning is necessary which discuss related to a short period time, high quality and most importantly low cost. RPA aims to provide a deliverable to substitute human involvement in the iterative activity, so this means that RPA will become the part of a business process. If developers developed the RPA with low quality, this would be fatal for the company's business process. The RPA implementation should align with business and IT procedures. So, to maintain the high quality of RPA implementation, the project team must define the critical factor of RPA implementation. The deliverable by analyzing these factors is to make the implementation process maintained with a standard and to give certainty of successful implementation. There is research conducted to define the Critical Success Factor (CSF) matrix for RPA implementation [8], and the result is found as table below :

Table 1 : Critical Success Factor in RPA Implementation Criteria

Category	Critical Success Factor
Planning	Business Plan and Vision
	Project Management
Support-Internal	Top Management Support
	Center of Excellence
	User Training and Education
	IT Support
Support-External	RPA Vendor
	RPA Partner
Change Management	Change Mangament
Governance	Monitoring and Security
	Quality Assurance
	User Acceptance Test
Process	Process Redesign
	Process Selection

Critical success factors (CSFs) provide guidance that concern types of variables that will manage the success of the development. In summary, the above table concludes the factors that affect the success of RPA Implementation. These factors are gained from the vary of industries field by analyzing the big picture of their current condition. Furthermore, the identification of CSFs followed with framework selection. RPA needs technical support to manage systematic procedures in the development process [9].

One of the most popular RPA Implementations is SDLC [10]. Each of the methodologies on SDLC involves a different framework and different steps in software development. This part of the paper will discuss the framework, steps of each methodology and also its advantage and disadvantage. The methodology that involved, are Lean methodology, Agile methodology, Waterfall Methodology, DevOps, Spiral Methodology and V-model methodology:

1. Lean

Based on its concept, lean is a concept that aims to increase the process by eliminating some activities that do not provide value, in order to gain people-work productivity to be able to work in an efficient and effective way [11]

2. Agile Methodology

Agile is one of the SDLC methodologies that runs iteratively in the process. Each iteration in agile requires a different duration, which is based on the industry and business condition, yet the duration of agile development cost 1-4 weeks. Agile is mainly called as a framework, because several methods that can be utilized based on the requirement. Agile focus on rapid development based on user demand. In its development agile has distinguished its framework into several types, which are Scrum, Kanban, Extreme Programming, and Adaptive Project Framework (APF):

2.2.1. Scrum

Scrum provides a comprehensive method during the work lifecycle of software development. Scrum is an empirical process in which all kinds of decisive decisions are able to be defined based on experience and experimentation. Scrum has three pillars which are transparency, inspection and adaptation. The identification of these pillars is important to support the concept of work iteratively. The process of scrum framework is acted by several actors that had been known as scrum master, product owners, and developers who are accountable to ensure the process of the scrum.

2.2.2. Kanban

Kanban is a workflow management method to define, manage, and improve the services that utilize visual work, so that can enhance efficiency and continuity.

2.2.3. Extreme Programming

Extreme Programming or popularly called XP, is one of the agile approaches and type to develop software based on agile, which mostly be used by small scale projects since the project perceive as concise-procedure work

2.2.4. Adaptive Project Framework (APF)

The Adaptive Project Framework is one of the agile types that is mostly used for IT Implementation and development. Its characteristic usually needs flexibility and high adaptation

3. Waterfall

Waterfall is one of agile framework that emphasizes linear end-to-end process in that staggered manner as project schedule. Each linear sequence produces deliverables increment of the software development. Yet, the linear sequence must be done from one process to another. There are 5 principal stages of the waterfall model [12], there are Requirement Analysis, System and Software Design, Implementation and Unit Testing, Integration and System Testing, Operation and Maintenance.

4. DevOps

DevOps is a combination of two words which are Development and Operation which these words mean development operation. DevOps is a concept developer to coordinates between the developer team and the operation team so that these teams can more efficient and effective. The mindset that built of DevOps is coordination between team that can be done in a short-time and do not require many lists of questions. The development will conduct Analyze, Edit, Build, Test and Debug. While Operation will conduct Monitor, Audit, Diagnose, Tune, and Feedback. These values will synchronize and combine to become one flow.

5. Spiral Methodology

This methodology is known as a combination model between prototyping and waterfall. Industry recognizes this methodology to face a huge-scope project and during the implementation, it will provide precise processing model based on the user's needs. The outer spiral utilizes the waterfall methodology approach after the requirement engaged, on the other hand, permit the ability to maintain sustainable growth.

6. V-Models

V-model is one of the agile linear unique development methodologies defined in SDLC. This model focus on a systematic process approach which is similar to a waterfall process. Though its initial process is designed the progress is continued through more detailed steps, which lead to implementation and coding, and eventually looping to the initial process until the whole testing is done. During the initial phase, terms and system analysis be done to determining features and user requirements. Similarly, as waterfall, the process of v-models requires much time.

This paper will conduct a research review related to RPA Implementation with SDLC. To occur a relevant and desired topic, the author used one of the tools which is the PRISMA method. The Preferred Reporting Items for Systematic Review and Meta-Analysis PRISMA is one of the popular systematic literature Review techniques for conducting a systematic reviews that can ensure all recommended information able to capture. It has been designed primarily for conducting a systematic review that able to be evaluated for included studies. PRISMA contributes to assure the quality of the review process.

To analyze the literature eligibility retrieved from web electronic databases, First, the researcher must retrieve the whole literature that exists in the databases this process is called Identification. In this process, the researcher will categorize the literature gathered into Google Scholar and Scopus. Second, the researcher will manage the screening process that will eliminate the ineligible literature. The ineligible criteria for this stage are duplication, unrelated topic literature, undesired language, and so on. Next, the stages which eligibility. In the eligibility, the literature that will be included are a journal that are assessed by full text, which means that the literature able to be accessed thoroughly, not only the abstract and short summary. And the last stage is inclusion which this stage will define the studies and literature included in the meta-analysis. In this case, the meta-analysis must be relevant to the result of SLR process.

3. METHODOLOGY

PRISMA Methodology has 4 systematic processes to filter excluded pieces of literature. Those processes are Identification, Screening, Eligibility and Inclusion:

3.1. Identification

The identification phase is the initial process of the PRISMA methodology. This phase is such a milestone process of the literature review. In addition, this step will scope the literature to be related to the required keywords. The literature scope is leverage to determine and select the topic and to align with the objective. During the development of this paper, the author identified and gathered the relevant paper systematically from web electronic databases (google scholar and ResearchGate) by limiting the timeframe from 2018 until 2022. The selection of literature identified peer-reviewed theses, dissertations, studies and articles in English to ensure accurate information. To provide broad and eligible related literature, the author manages a strategy by defining this keywords of this literatures. The keyword searched in the electronic databases are RPA Implementation Framework, RPA Development Methodology, SDLC Study case, SDLC Methodology in Project, and RPA Implementation with SDLC. The selection of references will be eligible if the search provides data that related yo these keywords. After generating the keywords as defined, the database provides 18270 literature (n=18270) gathered either from Researchgate or google scholar. From google scholar, searched with the keyword "robot processing automation RPA framework methodology" (n=5270) and "SDLC implementation project case" (n = 13000) gathered from google scholar. On the other hand, there were 205 literature (n = 205) that discussed "Robot Process Automation methodology" which was gathered from ResearchGate Database, and about 115 literature (n=115) that discussed "System Development Life Cycle Implementation Project Case".

3.2. Screening

At the end of the identification phase, the author will step into the screening process. In this step, the author will screen and filter the irrelevant literature. To screen the irrelevant literature, the author should make criteria for the excluded literature. Based on the Screening process, it is defined that there are 18220 that will be excluded, whether, from Google scholar or Scopus, which means that there is 50 pieces of literature left that should be reviewed to find relevant literature, the breakdown is defined as below:

3.2.1 Literature Duplication

Literature duplication is a phenomenon where the literature is gathered from several different sources. During the development of this paper, there are duplications found while retrieving the literature. It can be defined by the title and conference/ publisher similarity. There is 1281 literature either from SDLC and RPA found that have a duplication. So that, the literature that screened as duplication will be excluded from the review process.

3.2.2 Irrelevant Keyword

The next screening process is to identify an irrelevant keyword that will impact the literature's accuracy. As identified in the initial process, the keyword of this paper are Robot Processing Automation RPA Framework Methodology, SDLC implementation project case, Robot Process Automation methodology and System Development Life Cycle Implementation Project Case. Considering the keyword that have been defined, the author identifies that there is 16499 irrelevant topics of literature, which means that this literature must be gotten rid to process the next step.

3.2.3 Language

Language focus of the literature review is on English language literature. The reason of limiting the language is to occur accurate information and perspective. Base on the current literature, author screened that there are 440 literature

that using foreign language, which then will be excluded for literature review

3.3. Eligibility

After screened the excluded literature where do not pass the criteria, the next step that should be done is to define the eligibility of the literature. In this process, author will done a literature review by dividing the topic into 2 huge categories. First one is the RPA implementation the second one is SDLC implementation in a project. There are a lot of discussion and research conducted regarding the implementation of RPA and the study case that conducted SDLC methodology. These literature review study, aim to provide an insightful thought of related topic and provide more ideas to gain successful research. The RPA implementation is not easy as thought, so that there are a lot of framework involved as a choice for implementing the RPA based on the current condition. This part will define the RPA implementation successful story by conducting literature review that related to the RPA implementation using frameworks. The literature reviews conducted 50 different literatures from different source. The above literature provides selection data that contain information regarding the project type and its methodology development. The timeframe of these literature is gathered from 2018-2022 to provide updated and validated information for the research purposes. These literatures sourced from the credible source that has been indexed. As stated on the literature, there are many kinds of methodology that can be used as framework to implement the RPA. Developers can utilize these methodologies based on industries condition and situation. But, comparing these methodologies to SDLC, the SDLC provide more comprehensive, efficient and systematic approach in developing the RPA. On the other hand, that tabel also time define the SDLC involvement in a project. SDLC is one of methodology that provide systematic approach to develop the system.

3.4. Inclusion

The last step of literature review is Inclusion. In this step, author will exclude the literature which do not relevant with title. The keyword of title in this paper is RPA implementation with SDLC methodology. So that, after identified the previous paper, author eliminate 40 literatures amongst them, and choose 10 literatures that relevant with the title. These table will provide the list of literature review that related with the paper's title, and then, author also provide the analyzation of SDLC methodology role utilization that improve and enhance the critical success factor (CSF) that previously identified.

There are a lot of RPA implementation framework and methodology that can be conducted to gain success implementation. Yet, amongst the framework and methodology that exist, SDLC is one of the most favorite to use. Besides, its ease of usability, the methodology of RPA is able to adapt with any kind of business and industry condition. This can be happened because SDLC has vary instances framework. The technique for identify CSF of RPA implementation with SDLC methodology by conducting literature review of study case of RPA implementation that involve SDLC framework.

Table 2 : Literature that describe SDLC involvement in developing RPA.

No	Title	Author	Year	SDLC Framework	SDLC Methodology to improve CSF
1	A governance model for managing Robotics Process Automation (RPA)	Altynay [13]	2019	Agile	Planning (Business Plan and Vision), Process (Process Redesign)
2	Value-Driven Robotic Process Automation (RPA) A Process-Led Approach to Fast Results at Minimal Risk	Mathias Kirchmer and Peter Franz [14]	2019	Agile	Planning (Business Plan and Vision), Process (Process Redesign)

3	Workflow Methodology Development of RPA Solution for A Vietnamese Bank: A Case Study of Korkia Oy	Duc Tran and Thu Ho [15]	2018	Waterfall	Business Plan and Vision, Process Selection
4	Implementation Of Business Process Automation Methodology And Technology	Henri Kuqali [16]	2022	Agile (Scrum)	Project Management, User Acceptance Test,
5	DevOps: A Historical Review and Future Works	Mayank Gokarna and Raju Singh [17]	2021	DevOps	Top Management Support , Center of Excellence, RPA Partner
6	Robotic Process Automation: Contemporary themes and challenges	Rehan Syeda, Suriadi Suriadi , Michael Adams, Wasana Bandaraa, Sander J.J. Leemans, Chun Ouyanga, Arthur H.M. ter Hofstedea, Inge van de Weerdb, Moe Thandar Wynna & Hajo A. Reijers [18]	2019	Agile	Project Management, Process Selection
7	The Robotic Process Automation Handbook; A guide to Implementing RPA Systems	Tom Taulli [19]	2020	Lean (Six Sigma)	Project Management, Change Management Center of Exellence, User training and education
8	Challenges Of Robotic Process Automation Adoption In Banking and Financial Services	Dr Kadambini Katke, Professor, MBA & Dr Virupaksha Goud G [20]	2019	DevOps	Project Management, IT Support,
9	Improving Browser-Based UI Test Automation	Perttu Laamanen [21]	2018	Waterfall & Agile (Kanban)	Process Selection, Monitoring and Security,
10	Robot Process Automation : A Systematic literature Review	Hägner, David [22]	2020	Agile	Planning (Business Plan and Vision), Process (Process Redesign)

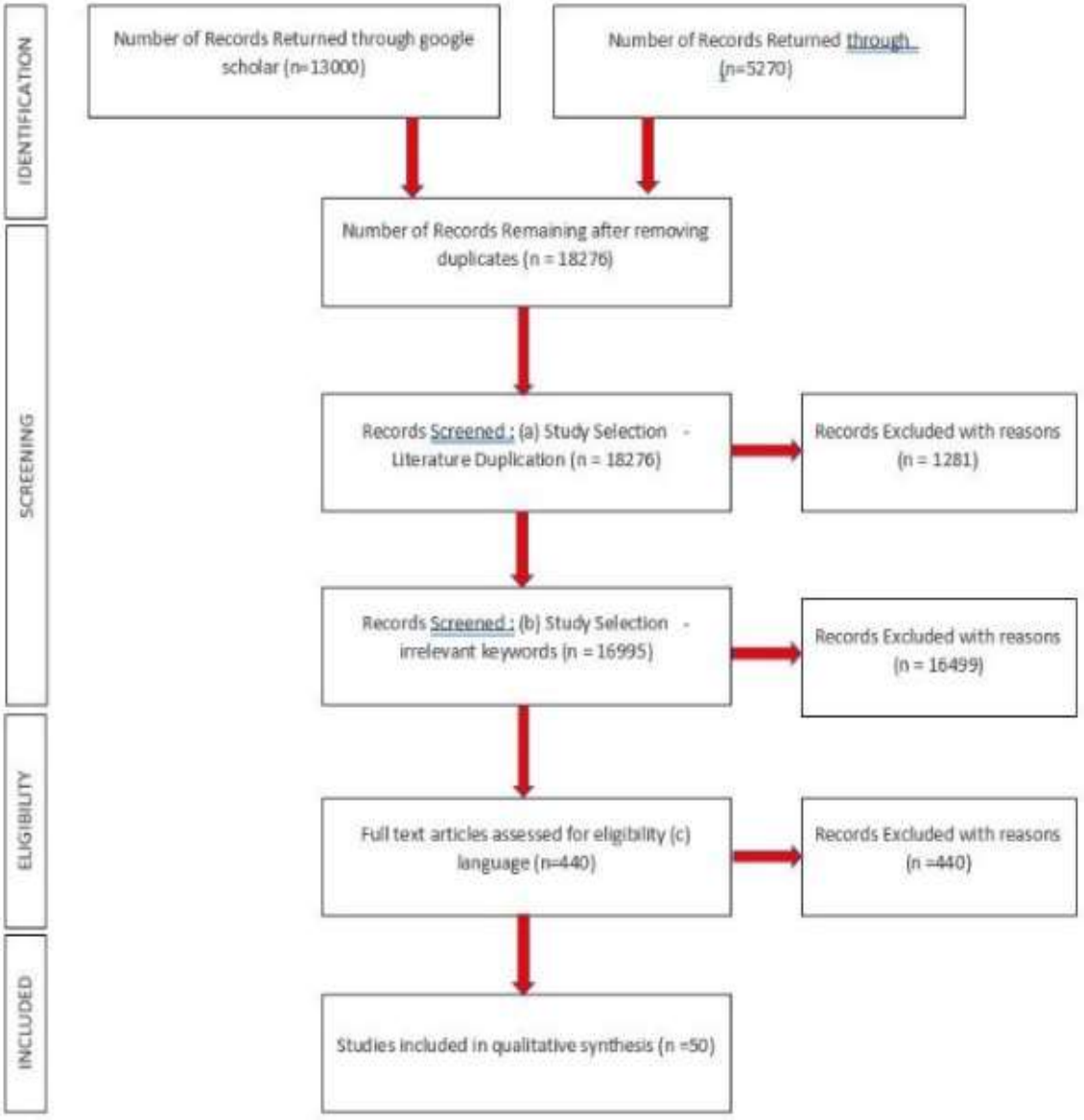
Based on above table, it stated that there are 10 literatures found which related to CSF of RPA Implementation with SDLC Methodology. The literature review consists of:

1. Number
2. Title
3. Author
4. Year
5. SDLC Framework
6. SDLC Methodology to improve CSF

4. RESULT & DISCUSSION

4.1. Result of Literature Review

Figure 1: PRISMA methodology to review RPA Implementation with SDLC



Based on the first literature, explains that most company find a barrier on how to manage the RPA. The key to manage a successful RPA lies in a proper governance, yet it has to provide clear processes and business vision. The organization believe that agile provides the best solution for developers to integrate business communication that aligned with business vision and business continuous improvement [13]. In a practical contribution, this study provides clear overview of governance on managing the RPA with agile framework. Relating the content to the CSFs criteria this literature clearly state that Agile will work and impacts to the Planning Category specifically in Business Plan and Vision and Process Category specifically in Process Redesign. Although, this research has no empirical information regarding how the RPA

development with agile can improve the development process.

The second literature which titled "Value-Driven Robotic Process Automation (RPA) A Process-Led Approach to Fast Results at Minimal Risk" [14] perceived that RPA has become one of digital enablers which has been applied and discussed in the organizations. Unfortunately, 30%-50% organizations fail on implementing the RPA. This literature will discuss how the RPA potential in improving the business opportunities if organization able to develop RPA successfully with clear vision and purpose. The development process will leverage Agile principle that perceived as the focus on the right process to automate, consider the business process improvement and manage the end-to-end process context. Relating the subject to the CSFs Criteria, this literature provides information that based on the condition, agile manage to focus on Project Management and Process Selection. But, author doesn't provide detail information of agile involvement during the implementation process.

From the third literature, titled "Workflow Methodology Development of RPA Solution for A Vietnamese Bank: A Case Study of Korkia Oy" [15] shows how the waterfall concept able to improve the Vietnamese Bank's project in RPA implementation. This research gives an overview about the RPA existence in Financials industries. During the development process, author perceive that based on their case, the waterfall concept delivers process description and analysis, requirement gathering, process roadmap design and process development. Even so, this journal has lack information of how the integration of SDLC can impacted the whole process of project development.

The fourth literature review conducted data from Implementation of Business Process Automation Methodology And Technology [16] the literature uses agile scrum methodology as implementation framework. Author finds that the Project Management and User Acceptance Test during the process, which stated on "Cycles are kept short (one to four weeks), and the development team focuses on adapting to the current business environment." For project management from planning category and "With Scrum and its continuous feedback approach from the project team towards the source of the business requirements, may it be internal or external to the business, the team is able to deliver on a regular basis adapting to the needs of their stakeholders and customers. In Scrum this activity called the Feedback loop and is the essence of the framework" for User Acceptance Test from Governance category. Though, the critique that can be addressed from the research conducted is, that the the author didn't mention much about the beneficial of the SDLC methodology utilization for RPA development, instead author only focus on the technical concept of SDLC methodology.

The next literature review conducted data from DevOps: A Historical Review and Future Works [17]. The literature uses DevOps as framework. Author mention that DevOps is an extended version of Agile. DevOps enables the continuous integration of all processes involved in product development and so all the process is done by a single team throughout the cycle. DevOps not only improves collaboration and communication instead, it also fast and continuous delivery, regular updates, increases reliability. Yet, the research has weak information on how DevOps integrates the end-to-end processes, since the literature only provide information around DevOps benefit in communication during the project, instead the literature should also inform how the technical concept of DevOps utilization.

The sixth literature review conducted from Robotic Process Automation: Contemporary themes and challenges [18]. The author finds that there are certain issues that challenged developers during the deployment of RPA. So in this research, author will identify the empirical CSFs that can be applied to tackle implementation issues. And one of the CSFs stated that developers must concerned about the frameworks. Author suggests agile, because it stated that agile can improve the time efficiencies and completeness. It can be identified that agile is most suitable for Planning category especially Project Management and Process category especially Process Selection. Unfortunately, this research only concern about these two categories and do not discuss further about rest of CSFs Category.

The seventh literature review conducted from The Robotic Process Automation Handbook; A guide to Implementing RPA Systems [19]. This literature uses lean with six sigma approach as framework. The literature uses lean that typed six sigma, the researcher found

"Lean, Project team get the focus on the elimination of waste and other inefficiencies and Six Sigma helps with data and statistics. A typical approach is to first use lean and then go to Six Sigma." Six sigma itself uses common framework which called DMAIC (Define, Measure, Analyze, Improve, Control). This statement relevant to enhance Project Management from planning category, Change Management Center of Excellence from support internal. But, author unable to find clear information about how beneficial the Six Sigma implementation in the integration process of RPA.

The eighth literature review conducted is Challenges of Robotic Process Automation Adoption In Banking and Financial Services [17]. This literature perceive RPA aim to increase the operational efficiency. To gain the objective, RPA must be well developed. So that, based on their organization condition, they uses DevOps approach as a framework for project case. The reason is to have a balance and synergy communication between operational and development. Banking and financial services is very sensitive with customer profile, so that need security and clear communication in order to develop new system. However, there is also some critique that can be addressed to this literature, because the segmentation of RPA Implementation is to small (only in banking industry), so there is no much information on how the success story of DevOps in any other industries.

The ninth literature review conducted from Improving Browser-Based UI Test Automation [21] From the literature, the author observing the development process change from waterfall to Kanban, while developing the RPA. Information obtained that the author find that Kanban model provides easier to track development phases which stabilized maintainability of the test automation. Kanban also supports the author to maintain the dynamicity of test data that impacts on the test automation process later. From the literature, it also defined that there is lack information on the condition and benefit when the author used waterfall, and It also doesn't provide much detail for the study case condition.

The last literature review conducted from Intelligent System Design and Application [22] in which this literature provides reason of agile utilization in RPA implementation that will impact the business process and the process redesign, which related to critical success factors.

4.2. Lesson Learned

At the end of this literature, there are some benefit that perceived by the utilization of SDLC as a methodology for RPA implementation to enhance critical success factor. The benefit can be summarized as below:

Table 2: The benefit of SDLC Adoption in RPA Development

No	SDLC Framework	Critical Success Factor Criteria		Benefit for the RPA Implementation
		Category	Entity	
1	Agile	Planning	Business Plan and Vision Project Management	1. Agile enhance the business planning. It is because its iterative flow, so that the vision and project planning can idetify clearly as it process done perpetually. 2. Since the intial step of agile is plan, it means that agile provide gentle time for team to plan their project. The initial step can be identified by providing the artifact documents (project charter, PERT etc) that figure out information of project vision. 2. Agile can upgrade the coordination amongst the center of excellence team since during the workflow, it works iteratively, so that each of step, every role have a chance to communicate regarding the development updates. 3. Agile has the best framework to enhance analyzation process, either for redesign or selection. It provides a systematic approach of the
		Internal Support	Center of Excellence	
		Process	Process Redesign Process Selection	

				process organization and eliminate insufficent process.
2	Waterfall	Planning	Business Plan and Vision,	1. Waterfall enhance the business planning and business vision since the intial process is requirement gathering, so that, it can support the development team to describe requests and their visions towards the project team. 2. Waterfall also boost the process selection step that manage the project team to analyze and and maintain the process organization. 3. Waterfall also keep data more secure as the process is done at a single time and enhance intensive monitoring process because of its single time process.
		Process	Process Selection,	
		Governance	Monitoring and Security,	
3	DevOps	Planning	Project Management	1. DevOps provide best framework for project planning as it is focus to maintain a communication amongst project team 2. DevOps engage much participation amongst stakeholders as it is synergize the communication between operational and developers, which means that it provide many involvement from stakeholders (top management, operational, developers, users, etc) 3. DevOps provides external support in communicate and synergize by invoking the RPA partner during the process of development
		Support Internal	Top Management Support Center of Excellence IT Support	
		Support External	RPA Partner	
4	Lean	Planning	Project Management,	1. Lean provide enhancement for the project process because it eliminates unefficient process 2. Lean give comprehensive framework so that can reduce much cost 3. Lean enhances team and stakeholders communication as it oriented in efficiency 4. Lean perfect in change management project, because it analyzes gap between old and new system.

To sum up all information and literature gathered, the table below will show the impact of SDLC framework leverage to critical success factors as referred to table 1. The mode. The value will be occurred from the number of entities that mentioned at table 3. On the other hand, percentage will be obtained by calculating the ratio between value against total value. In conclusion, it stated that the project management come up to be such the most critical factor that has to be concerned while implementing RPA using SDLC methodology.

Table 3 : CSFs criteria that impacted because of the Involvement of SDLC

Category	Critical Success Factor	Count of getting mentioned in the literature review (impacted)	Percentage
Planning	Business Plan and Vision	2	14,3%
	Project Management	3	21.4%

Support-Internal	Top Management Support	1	7.1%
	Center of Excellence	2	14,3%
	User Training and Education	0	0%
	IT Support	1	7.1%
Support-External	RPA Vendor	0	0%
	RPA Partner	1	7.1%
Change Management	Change Management	0	0%
Governance	Monitoring and Security	1	7.1%
	Quality Assurance	0	0%
	User Acceptance Test	0	0%
Process	Process Redesign	1	7.1%
	Process Selection	2	14,3%

5. CONCLUSIONS

As stated on above percentage, the Project Management is the most success factor that very impacted by the involvement of SDLC with percentage rate 21.4% amongst the other fields. Project management covers the end-to-end process of implementing process, which means it works systematically from end to the end. The initial activity of project management is to define the planning of the project. In this activity, project team will identify budgeting, time, and activity. Furthermore, other critical activity in project management is in testing. In this activity, project team will provide the RPA blueprint, in order to check the quality of the RPA development and fix any bugs that identified.

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