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Robotic Process Automation and Employee Outcomes: A Quantitative Study of Role Changes, Work-Life Balance, and Job Opportunity

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Abstract

This study investigates employees' perceptions of the impact of Robotic Process Automation (RPA) on their roles, work-life balance, and job opportunities in a Thai state enterprise. The study employed a quantitative approach, collecting data from 171 employees who experienced RPA implementation using a structured questionnaire. The data were analyzed using descriptive statistics and the Paired Samples t-test. The findings revealed significant differences in employees' perceptions of role changes and work-life balance before and after RPA implementation. Employees reported increased assignment of challenging and skill-intensive tasks, as well as improved work-life balance, particularly in terms of reduced overtime work and better physical and mental health. However, no significant difference was found in employees' perceptions of threatening job opportunities. The study contributes to the literature by providing insights into the impact of RPA on employees in a developing country context and offers practical recommendations for organizations to manage the workforce implications of automation. Future research should investigate the long-term effects of RPA on employee outcomes and explore the generalizability of the findings to other industries and cultural contexts.

Keywords: Robotic process automation; RPA; Role change; Work-life balance; Job opportunity

1. Introduction

Technological advancements have profoundly impacted global and Thai societies in various ways. As digital transformation unfolds [1], organizations recognize the necessity of integrating technology and digital strategies to establish foundational goals, manage businesses, and adapt work processes. This adaptation enhances work efficiency and introduces significant competitive challenges. Traditional management methods often fall short in keeping pace with these rapid changes, necessitating a shift towards digital organizations [2]. Historically, human labor has been the cornerstone of organizational progress, a trend that continues into the present and is expected to persist into the future. However, humans have consistently developed tools and machines to reduce errors in work processes. One critical technology in the transition to the digital age is Robotic Process Automation (RPA), which is being increasingly adopted in business operations [3]. RPA is a software tool that simulates human behavior, effectively serving as a digital employee that works alongside human colleagues. It automates repetitive tasks that follow clear patterns or rules, tasks which were traditionally performed manually by humans using computers [4]. This automation frees up employees to focus on tasks that add more value [5], thereby fostering opportunities for career advancement [6] and enhancing job satisfaction. Ultimately, it contributes to improved quality of life for individuals, their families, and their organizations [7].

In today's intensely competitive business environment, organizations must adopt RPA to not only survive but also to

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boost their capabilities [8-10]. This strategic adaptation swiftly improves work processes, reduces the time spent on routine tasks [11], and decreases costs by reallocating employees to more skill-intensive roles. It emphasizes the importance of decision-making, problem-solving, and interpersonal skills [12]. However, some employees may face an increased workload as they take on additional responsibilities, such as preparing data for RPA implementation. Additionally, if the organization fails to adequately prepare for RPA use—such as not converting data collection formats to digital files—the technology's effectiveness is limited, as RPA functions best with digital data [13]. Consequently, employees might feel demotivated due to the challenges associated with implementing changes within the organization [14].

The implementation of RPA in organizations can impact employees' work and personal lives both positively and negatively [15]. In addition, the success of RPA usage may not meet expectations initially, or not until the organization advances sufficiently to compete effectively in business, compared to those that do not use RPA [16]. Therefore, organizations need to be cognizant of employees' perceptions and reactions to the implementation of RPA within the organization. Research conducted by Engberg and Sordal; Simek and Sperka; Waizenegger and Techatassanasoontorn; Filgueiras et al. [17-19] revealed that a cohort of employees exhibited enthusiasm and embraced the advantages of RPA. They believed that RPA would enhance work efficiency by reducing time, alleviating repetitive workloads, and providing more time for tasks that require specialized skills, among other benefits. However, according to the research conducted by Fernandez and Aman [11], another group of employees expressed concerns about adapting to new technology. They experienced increased workload due to the necessity of overseeing robot-generated work and feared potential job losses resulting from organizations implementing RPA.

The review of related research highlights that while there is extensive study on the effects of using Robotic Process Automation (RPA) in international contexts, much of the research has been conducted in Thailand. For instance, the studies by Vichuparkornkul and Weeradaecha [20-21] primarily explored preparatory aspects of RPA implementation. Additionally, various international studies have documented both positive and negative impacts of RPA on employees. However, there are scant studies on how RPA affects employees' work-life balance [14]. This oversight indicates a gap in understanding the holistic impact of RPA on employee well-being. Therefore, this research will focus on employees' perceptions of RPA's impact on their roles, work-life balance, and job opportunities within a Thai state enterprise. The findings will not only help organizations integrate RPA more effectively but also understand its implications on employees, enabling better management strategies. Ultimately, this could support retaining valuable employees over the long term [22]

2. Literature review

The research study on the impact of RPA on role changes, work-life balance, and job opportunity perceptions involves a thorough literature review conducted by the researcher. This review encompasses various documents on concepts, theories, and related literature, serving as a guideline for the study. The details are as follows:

2.1. Robotic process automation (RPA)

RPA is fundamentally defined as software that mimics human behavior to perform repetitive tasks efficiently and accurately. Phoprom [23] characterizes RPA as software robots designed by humans to execute various decision-making processes, thus minimizing errors attributable to human involvement. These systems are capable of operating continuously, enhancing productivity by functioning 24 hours a day. Further expanding on this definition, Costa, Mamede, and da Silva [24] describe RPA as an automation technology that supports businesses by automatically executing routine tasks that follow clear, predefined formats. This automation frees up employees to focus more on value-added activities, thereby optimizing workforce efficiency.

2.2. Change of roles

According to Fernandez, Aman, and Omar [25], the change of roles refers to a shift in the responsibilities or duties of employees towards tasks that demand high-level skills such as data analysis, strategy development, service design, and social interaction with customers, both internal and external to the organization. These tasks can only be performed by humans; the RPA system cannot execute them. This is consistent with Fersht and Slaby [26], who defined a change of roles as involving the allocation of employees to more high-value, engaging work. This work typically entails analysis, problem-solving, and the management of complex tasks. Additionally, Cooper et al. [27] asserted that a change of roles entails shifting the nature of employees' work from routine tasks to more value-added activities, emphasizing the utilization of higher analytical thinking skills. This transition not only creates new opportunities for career advancement but also enhances job satisfaction among employees.

2.3. Work-life balance

Singlaw [28] defined work-life balance as the effective management of time between personal life and work to attain equilibrium, leading to happiness at work and success in one's professional responsibilities. This aligns with Sangsavang's [7] definition, which emphasizes the capacity to harmoniously manage personal and work time without conflicts, aiming to establish equilibrium in life and enhance the quality of life for oneself, family, and the organization. Additionally, Ratna and Kaur [29] suggested that work-life balance pertains to an individual's equilibrium between workload and lifestyle, where

work demands should not encroach upon personal life to the extent that it compromises one's happiness.

2.4. Job opportunities

Fernandez and Aman [14] conducted a research study on the influence of RPA on the acceptance of financial and accounting employees. The research results indicated that one significant factor influencing employee acceptance is the perception of threatened job opportunities, reflecting employees' concerns about RPA replacing their jobs. This finding aligns with the work of Lakay and Mlambo [30], who examined RPA and manpower in financial institutions. Their analysis revealed that employees across many financial institutions expressed heightened concerns regarding job security after the implementation of RPA within their organizations.

2.5. Related research and hypothesis development

A review of related literature suggests that RPA may positively impact employees. Aydiner, Ortakoy, and Ozsurunc [13] studied employee perceptions of the increase in value-added activities due to RPA, noting time and cost efficiencies. They discovered that employees became more aware of value-added activities as their roles evolved from routine to analytical tasks. Despite these shifts, the demand for employees remained stable, with no significant reduction in labor costs. Harjumaaskola [31] also explored RPA's impact from users' perspectives, finding that RPA was seen not as a threat but as a tool enhancing work efficiency and facilitating skill advancement.

Siderska, Alsqour, and Alsaqoor [16] examined employee attitudes towards RPA in technology services. Their findings suggest that while RPA cannot replace human workers, it supports them by reducing routine, time-consuming tasks and promoting more creative and analytical roles. Additionally, Fernandez and Aman [14] investigated how RPA influences employee acceptance. Their results indicated that RPA does not replace strategic, decision-making, or collaborative tasks but rather complements them by generating more complex and valuable tasks, potentially enhancing career advancement and work-life balance.

Conversely, Dahiyat [32] highlighted potential negative impacts of RPA, studying its expected influence on audit quality through the perspective of Jordanian auditors. Resistance to change emerged as a significant challenge. Similarly, Fernandez and Aman [11] found that RPA implementation could instill fear among employees, particularly concerning job security and technological adaptation.

Reviewing the literature and related research has led to the development of the following hypotheses and research concepts, illustrated in Fig. 1.

H_1: The change in roles of workforces differs between before and after RPA implementation.

H_2: The work-life balance of workforces differs between before and after RPA implementation.

H_3: The perceived threat to job opportunities of workforces differs between before and after RPA implementation.

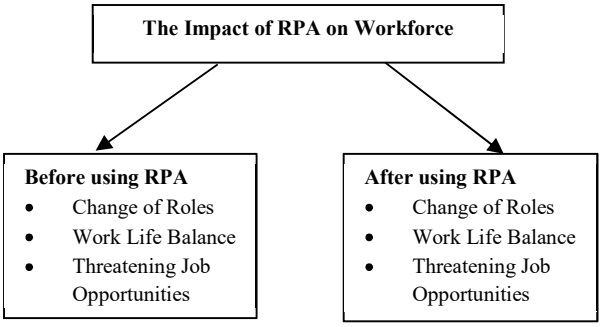

Fig. 1. Research concept framework.

3. Research Methodology

3.1. Data Collection and Measurement

This research adopted a quantitative approach to examine the impact of RPA on the workforce within a state enterprise, aiming to fulfill its research objectives. The population for this research comprised employees in a state enterprise who experienced the RPA system, totaling 296 individuals out of the entire organization's workforce of 3,577 employees (data as of October 31, 2018). The population under study consists of employees from five distinct departments within the state enterprise. The researcher employed the purposive sampling method from departments that used RPA and then a convenience sampling method from employees within those agencies. Using the formula developed by Krejcie and Morgan [33], with a confidence level of 95% and a tolerance interval of 5%, the researcher determined the sample size to be 168.

The questionnaire, designed as the primary data collection tool, comprises five distinct sections. Part 1 focuses on gathering personal data from respondents and consists of eight questions. Part 2 includes questions concerning changes in roles, developed from the research by Pannarai; Aydiner, Ortakoy, and Ozsurunc [34,13], with a total of seven questions. Part 3 delves into inquiries related to work-life balance, developed based on studies conducted by Sangsavang; Miankerd; Putri and Amran [7,35-36] comprising seven questions. Part 4 addresses queries regarding threatening job opportunities, developed from research by Vichuparkornkul; Abdullah and Fakieh [20,37], encompassing five items. The questions in parts 2 to 4 are rated on a five-level Likert scale

Subsequently, the reliability of the variables in sections 2 to 4 of the questionnaire was assessed through a pilot study involving 30 employees who had experienced RPA implementation. A structured questionnaire was used for this purpose. The analysis revealed that the Cronbach's alpha coefficients for all sections of the questionnaire exceeded 0.70. Therefore, it can be concluded that the reliability of the data within the questionnaire is within acceptable limits.

3.2. Data analysis

To analyze the research data, we employed two main statistical techniques. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize the personal information of the sample group. For inferential analysis, the Paired Samples t-test.

4. Results

The data were collected from a sample group consisting of 171 individuals. The completed questionnaire responses were analyzed. These participants held positions at the employee level and had involvement both before and after the use of RPA. A study was conducted on the personal data of 171 employees of a specific state enterprise organization, both before and after RPA was implemented. The results showed that 149 participants (87.10%) were female, and 117 participants (68.40%) were between the ages of 26 and 35. Additionally, 84 participants (49.10%) had a master's degree, and 90 participants (52.60%) had 5-10 years of work experience. Furthermore, 140 participants (81.90%) were employed in accounting and finance.

Hypothesis H1 was tested using a paired samples t-test with a 95% confidence interval. It was found that the role changes in work before and after the use of RPA had a statistically significant difference at the 0.05 level. After using RPA, the mean increased from 3.93 to 4.14. This finding aligns with the analysis of individual questions, which showed that the mean increased after using RPA (Table 1).

Table 1. The comparison of differences between before and after using RPA in change of roles.

Respondents' Opinions	Before using RPA		After using RPA		t-value	p-value
	$\bar{x}$	S.D.	$\bar{x}$	S.D.		
Change of roles	3.93	0.57	4.14	0.58	-4.89	0.00*

* Statistically significant at the 0.05 level

The hypothesis H2 was tested using a paired samples t-test with a 95% confidence interval. It was found that work-life balance before and after using RPA had a statistically significant difference at the 0.05 level. After using RPA, the mean increased from 3.48 to 3.82 (Table 2).

Table 2. The comparison of differences between before and after using RPA in work-life balance.

Respondents' Opinions	Before using RPA		After using RPA		t-value	p-value
	$\bar{x}$	S.D.	$\bar{x}$	S.D.		
Work-life balance	3.48	0.72	3.82	0.67	-7.56	0.00*

* Statistically significant at the 0.05 level

Furthermore, we tested hypothesis H3 using a paired samples t-test with a 95% confidence interval. It was found that there was no statistically significant difference in perceived job threats before and after using RPA at a significance level of 0.05 (Table 3).

Table 3. The comparison of differences between before and after using RPA in threatening job opportunities.

Respondents' Opinions	Before using RPA		After using RPA		t-value	p-value
	$\bar{x}$	S.D.	$\bar{x}$	S.D.		
Threatening job opportunities	3.32	0.72	3.33	0.83	-0.10	0.92

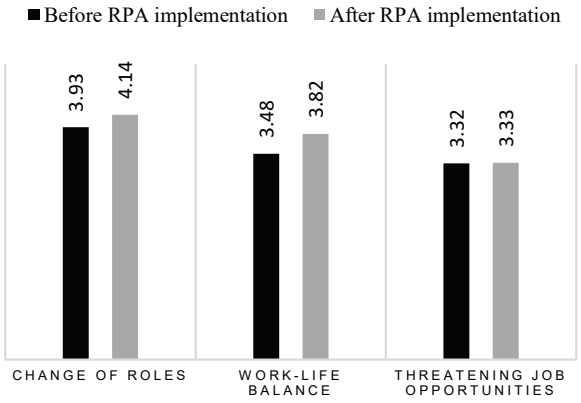

Fig. 2. Comparison of the mean differences in role changes, work-life balance, and perceived threats to job opportunities before and after RPA implementation.

5. Discussion and conclusions

The impact of RPA on the workforce has been significant, leading to noticeable changes in employee roles towards decision-making, problem-solving, and interpersonal skills. This shift aligns with the findings of Aydiner, Ortakoy, and Ozsurunc [13], which highlighted an enhancement in perceived value-added work, enabling employees to transition from routine tasks to more analytical roles. Similarly, Harjumaaskola [31] observed that RPA facilitated a role transition to more skill-intensive tasks, contributing to career growth. Furthermore, the implementation of RPA has improved work-life balance, which encompasses better management of work and personal time, thus leading to enhanced job satisfaction and responsibility [14]. This improvement is attributed to RPA's ability to reduce workload and save time, allowing employees to allocate less time to repetitive tasks. Moreover, this study also found that RPA does not adversely affect employees' perception of job opportunities, supporting Varghese's [38] findings that with adequate and appropriate knowledge, employees view RPA positively as it enhances efficiency without replacing their roles.

In conclusion, this study provides empirical evidence of RPA's impact on employees' roles, work-life balance, and job opportunities within a Thai state enterprise. The findings indicate significant enhancements in role challenges and skill requirements post-RPA implementation. Additionally,

employees reported an improved work-life balance characterized by reduced overtime and better physical and mental health. However, unlike some previous studies, no significant difference was observed in employees' perceptions of job threat pre- and post-RPA implementation.

These findings underscore important considerations for organizations implementing RPA. It is crucial for managers to actively communicate RPA's benefits and support employees in adapting to new roles and responsibilities. Organizations should also monitor the effects of RPA on workload and well-being to prevent increased job demands or stress. Furthermore, emphasizing the complementary nature of RPA to human labor can help highlight how automation enhances rather than replaces human expertise.

Despite its contributions, this study has limitations, notably its focus on a single state enterprise, which restricts the generalizability of the findings. Future research should explore RPA's impact across different industries and cultural settings to garner a more comprehensive understanding. Additionally, the cross-sectional design of this study limits causal interpretations. Longitudinal studies are needed to assess the long-term effects of RPA on employee outcomes.

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