

Probing the Effects of Robotic Process Automation (RPA) System Ability on Work Productivity in the Banking Industry: A Case Study

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Abstract

The purpose of this research is to explore various dimensions used to measure the Robotic Process Automation (RPA) system ability and its effect on work productivity in the banking sector within Misr Bank. The sample size was 380 individuals, and their characteristics were analyzed as control variables. Therefore, the research relied on two types of methods, the first is using a questionnaire and the second is quantitative criteria. The research variables were divided into three types of variables, the first type of variable is the independent variable including the dimensions of using (RPA) which measures the RPA system's ability to process work and the RPA system's ability to avoid the system risks, and the second type of variable includes dependent variable, using the criteria that measure Work productivity which measured by maximizing work efficiency and minimizing work losses and the third type of variable is the control variable which measures by the criteria of RPA users, Gender, Age, Job position, Major tasks and Years of work experiences. The findings showed that there is partial acceptance using quantitative criteria, while the rest of the hypotheses were completely accepted. The research recommends the need to generalize the use of the RPA system in all banks operating in Egypt because of its positive role in improving work productivity.

Keywords: Robotic Process Automation, RPA, Work Productivity, System Ability, Banking Industry.

Introduction

Recently, more companies have turned to machine learning systems in various processes (Aguirre and Rodriguez., 2017), and the use of robotic process automation is one of the machine learning tools (Ansari *et al.*,2019), that are used to get rid of tedious tasks, and free corporate employees to focus on higher value work to

improve work productivity. (Vijai *et al* .,2020) There are many tasks facing the customer such as account gap, mortgage disposition, and loan process area unit, which take a long time to be completed; Using RPA technology, process times for these job area units can be significantly reduced, thereby doubling customer satisfaction. (Ashtikar and Humbad.,2022)

The RPA software in the banking industry was created to perform many tasks, including installing desktops, installing different end-user device—level software robots, developing an artificial intelligence workforce, and providing virtual assistance. (Sharma and Choubey.,2021) With RPA, computers can do things like enter data, collect information, and process payments, just as an employee would. RPA will also do this quickly and efficiently, increasing productivity and reducing overhead costs for the company. (Ashtikar and Humbad.,2022) Robotics in the banking industry is used as powerful RPA software to Install desktops, install different end-user device—level software robots, develop an artificial intelligence workforce, and provide virtual assistance. (Sharma and Choubey.,2021)

Regarding banking operations, the RPA program can perform many tasks, such as Account origination, Accounts receivable, Account payable, Deposit processing, Mortgage processing, Surrenders, Loan processing, Lapse, Underwriter support, Collections, Customer service, Investment processing, Cheque processing, Employee onboarding and off-boarding, Billing and Service desk. (Vijai et al.,2020)

Therefore, the RPA system has significantly impacted the banking industry. Because banks play a distinct role in managing large amounts of information, RPA can save time by removing repetitive tasks from human hands. It also leads to reducing the volume of errors and eliminating financial and production losses, thus raising the bank's productivity. (Kumar and Balaramachandran.,2018) Despite the importance of the RPA system in banking industries worldwide where automation tools are used to assist human operations in conducting their jobs., However, the banking industry is only in the initial evolution of RPA. (IBS Intelligence, 2019) So the results of its application and its role in improving work productivity in Egyptian Banking institutions are not yet clear., the current research paper seeks to identify

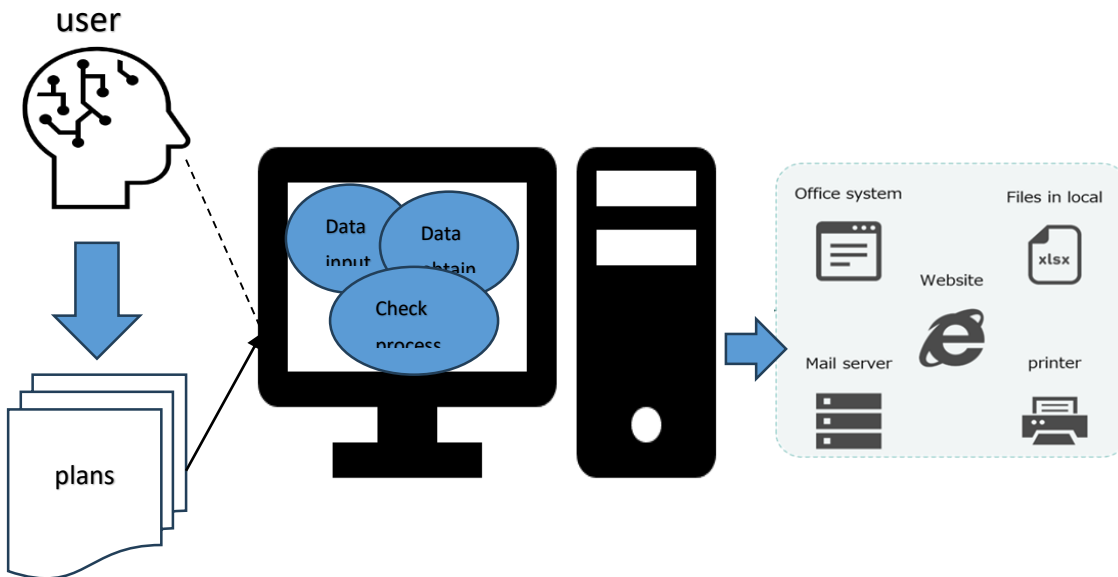
the dimensions that are being used to measure the Robotic Process Automation (RPA) system ability and its effect on work productivity in the banking sector using the case study approach on the Misr Bank.

Literature Review and Theoretical Framework

Robotic Process Automation

Robotic process automation is a software tool that can simulate human action with a high level of accuracy. (Albert and Ilan.,2022) Where the program can perform tasks that are repetitive or difficult for a person to implement. (Ashtikar and Humbad.,2022) RPA refers to the use of artificial intelligence and machine learning technology to increase the ability to handle high-volume, repeatable tasks that previously required humans to perform. (Willcocks *et al.*,2015)

The RPA system used for distributed substations depends on the use of a common process rather than sampled values (SV) for currents and voltages, as well as replacing a large part of the multimedia messages Service (MMS). This will reduce data traffic and provide an increase in the throughput of concurrent stations. Besides increasing the speed of protection devices and reducing error rates. (Mokeev et al .,2020) Reliance on the RPA system can also be measured by determining the system's ability to process work requests immediately, confirm that the required data was entered correctly, Responses to the results of the treatment, ensuring that it is more accurate than entering the data manually and reducing the time taken to verify the data entered. (Eura.,2020).



Source: Winactor., July (2023), Robotic Process Automation
www.winactor.biz/en/rpa/rpa.html

Figure (1) Using RPA to automate business processes previously performed by humans.

There are many ways that RPA can lead to risks if not handled effectively. Therefore, the system's ability to confront these potential risks must be determined. (Wang.,2021)

- **Design risk:** Not every process or task is suitable for automation. Repetitive, time consuming, and rule-based processes are the ideal areas for applying RPA. If the bank chooses an unsuitable process, the RPA application will not deliver enough value to the investment.
- **Data-security risk:** RPA technology needs to maintain many organizational passwords and credentials to access various information of employees, customers, and suppliers by accessing databases and performing operations. The tampering or theft of that data through the access of unauthorized users, such as internal bank employees, RPA vendors and hackers accessing the bank's internal databases, network servers, and cloud storage through the RPA platform, may lead to confidential data through the RPA platform and link data sources without permission and damage their specified functionality.

- Bank system inherent risk: Because RPA controls other software through user interface (UI) interaction, the use of RPA is highly dependent on the bank's existing software infrastructure, which is part of the bank's IT infrastructure, as soon as problems occur in the existing platform or it is not kept up to date, RPA should diagnose the problem and finds solutions. Otherwise, the RPA system will stop working and cause operational disruptions.

Robotic Process Automation and Work Productivity

Many factors lead to increased work productivity, including creating a useful and modern work environment. (Arminas *et al.*,2021) work productivity refers to the worker's ability to produce the products expected from the job. work productivity can generally be measured based on the quantity produced per hour During the specified production target. (Nur et al.,2017) The inclusion of RPA technology in the banking industry in 2020 contributed to an increase in productivity to reach \$1.57 billion. (Oshri and Plugge.,2021) Experts expect that Robotic process automation in the coming years will have an influential and strong role in the finance sector in the business world. (Asatiani and Penttinen.,2016) Willcock's study showed the implementation of RPA has contributed to reducing personnel costs by 50 percent. Communications, utilities, and financial services failures also decreased by 50 percent. (Willcocks *et al.*,2015)

Thekkethil study indicates that the main goal of robotic process automation in banks is increasing the ability to reduce repetitive work in the bank. While RPA contributed to reducing operational costs by 30% - 70%; RPA helps reduce the workforce and maximize Cost-effectiveness by helping banks minimize operating costs and save time and expense by around 25-50%.and Improve operational efficiency where RPA can make the operations faster and makes the processes productive and efficient. (Thekkethil *et al.* ,2021)

Kaswan's study showed the implementation of RPA increases work productivity by reducing headcount by assigning responsibility to robot workers, which reduces operational costs and makes jobs more efficient and accurate. (Kaswan *et al.* ,2023)

Although a literature review suggested that RPA offers many benefits and opportunities such as business improvement efficiency ; (Fernandez *et al.*,2023) and increased productivity while relieving employees of redundant, routine tasks, Eura's (2020) study showed some opposite results, three daily routine tasks were

reassigned to RPA bots, which is the average time it takes to complete the task. Manually and with RPA bots showed no difference. But this work is still at an early stage in fact, the adoption of RPA bots in front office bank staff in retail Bank branches was executed for only three months on average. (Eura.,2020) Ashtikar and Humbad(2022) study indicates that Robotic Process Automation (RPA) implementation in the banking and insurance industries reduces manual tasks that are repetitive in efforts to progress the BFSI industry's digital transition and provides people opportunity to perform meaningful, higher-value work. (Ashtikar and Humbad.,2022) Balasundaram and Venkatagiri's (2019) study indicates that the RPA improves HR productivity and cost savings by automating manual and repetitive tasks. (Balasundaram and Venkatagiri.,2019) Ashtikar and Humbad(2022) Research also indicates that 73% of compliance officers believe that following the RPA will help to improve compliance by reducing expensive FTEs and raising compliance quality, in addition to promoting productivity by eliminating boring tasks and involving employees in work that requires human intelligence. (Ashtikar and Humbad.,2022)

Maček's study showed that the RPA is programmed to complete repetitive and labor-intensive tasks. RPA has been proven to deliver technologically advanced solutions to companies around the world that can lower costs, increase efficiency, and improve quality. In efforts to remain competitive in the market, RPA has become a powerful and competitive tool for companies spanning a range of different industries. (Maček et al.,2020) So, with the right use case chosen and a well-thought-out configuration, RPA in the banking and financial industry can significantly quicken core processes, lower operational costs, and enhance productivity, driving more high-value work (Gavrilchik.,2022).

Misr Bank

Misr Bank is an Egyptian state-owned bank, that was established in 1920 to serve as a pilot project of outstanding importance for achieving economic growth. It has expanded the range of digital banking services. Electronic payment services through banking services and products Safe, reliable, versatile, and best in class. (Banque Misr,2021)The bank has total assets estimated at 1583 billion Egyptian pounds, and its profits exceed 23.5 billion pounds. The volume of the bank's transactions with individuals and small institutions is about 121 billion pounds and

with medium and large institutions 486 billion pounds. The following table shows the size of the bank's activity:

Table. (1) the activity size of Banque Misr

| Number of branches | Number of clients | Number of Employees | Number of Business Development Centers (BDS) | SME customer base | Number of E-Wallet users |
|--------------------|-------------------|---------------------|--|-------------------|--------------------------|
| 779 | 13,000,000 | 20,658 | 15,623 | 180,000 | 2,430,000 |

Source: Banque Misr., Annual-Reports.,2020-2021.p.17

<https://www.banquemisr.com/-/media/Annual-Reports/ANNUAL-REPORT-AR-2020-2021>

Misr Bank received 67 advanced ratings awards in 2022, the most notable was the Best Brand for Digital Banking Services award in Egypt from Global Brands Magazine 2022., As well as an award for leadership in digital innovation from the international company IDC for research. (Global Brands magazine.,2022)

During the year 2021, Misr Bank implemented the Success Factors SAP system, to achieve Digital transformation and automation of HR sector operations such as recruitment and the selection of candidates for employment, and the Bank developed the recruitment process using Internationally accredited assessment tools for selection and screening of job applications in collaboration with Egyptian Banking Institute and Con Ferry Company. (Banque Misr,2021)

the bank signed a letter of understanding with Microsoft Egypt to obtain the first open innovation program in the Egyptian market, to allow a jump in the growth of emerging companies in the field of financial technology. In 2021, the Bank's Information and Communications Technology Sector succeeded in launching a messaging system Text, which allows interactive communication between beneficiary customers and recipients, through any of the various banking channels. The sector also introduced (RPA) technology to automate the robotic process to reduce human resource errors and save work time to maximize work outputs. (Banque Misr,2021).

Research Problem and Questions

The researcher conducted an exploratory study to identify the extent of Egyptian banks' reliance on the RPA system by conducting personal interviews with the information systems managers of four banks, Misr Bank, the National Bank of Egypt, Cairo Bank, and Alexandria Bank. This study took two months, including the period of obtaining approvals and conducting interviews. The researcher concluded that Misr Bank is the only bank that relies on the RPA system and began implementing it at the beginning of 2021, while other banks are looking forward to benefiting from it soon. Therefore, the assessment of using the RPA system and its effect on work productivity associated with it is largely ambiguous. So, the research seeks to try to answer the following questions:

- 1-What is the level of the RPA system ability in the Misr bank?
- 2-What is the level of work productivity associated with the RPA system in the Misr Bank?
- 3-What is the effect of the RPA system's ability on work productivity in the Misr Bank?

Research Objective

The research aims to verify the achievement of the following three objectives.

- 1- Determine the level of the RPA system ability in the Misr bank.
- 2-Determining the level of work productivity associated with the RPA in the Misr bank.
- 3- Examining the effect of the RPA system ability on work productivity in the Misr bank.

Research Hypotheses

The research seeks to verify the following hypotheses:

- 1- There is no significant difference in the factors determining the RPA system ability in the Misr bank.
- 2- There is no significant difference in the factors determining the work productivity associated with the RPA system in the Misr bank.

3- There is no significant effect of the RPA system's ability dimensions on work productivity in the Misr bank.

Research Justifications

- 1- There are three main Justifications for conducting this research that were determined through previous studies and the exploratory study:
 - There is a limited number of documented studies on global databases conducted on the RPA system around the world and its impact on activities and performance. (Fernandez et al.,2023)
 - Despite the importance of the RPA system in improving the level of productivity, its application in the banking industry remains in its early stages. (IBS Intelligence, 2019&Kumar and Balaramachandran.,2018)
 - The initiative of Misr Bank to implement the RPA system is considered the first in Egypt, despite its relative newness, within the limits of what the researcher found through the exploratory study.
- 2- The population size included 1,136 employees, which represents the total number of employees in 44 branches, including all administrative levels, out of the total number of employees in the bank, which includes 20,658 in all 779 branches of the bank, according to the data obtained from the bank under study.
- 3- Quantitative criteria were used to verify the questionnaire results, considering that the RPA implementation was in the year 2021, data was taken for the previous year, 2020, and the following year, 2022, divided by months. The Wilcoxon test was used for two reasons: First, because the quantitative data that was relied upon is not subject to a normal distribution. Second, to review the test results according to the study (Asatiani and Penttinen., 2016).

Research Design

The research relied on the descriptive analytical method to determine the level of the RPA system ability and evaluate the work productivity associated with it, in addition to identifying the effect of the RPA system ability on work productivity. Therefore, the research was designed as follows:

1- Research Variables

There are three basic variables for the research: the independent variables, the dependent variables, in addition to the control variables, as reflected in the following model:

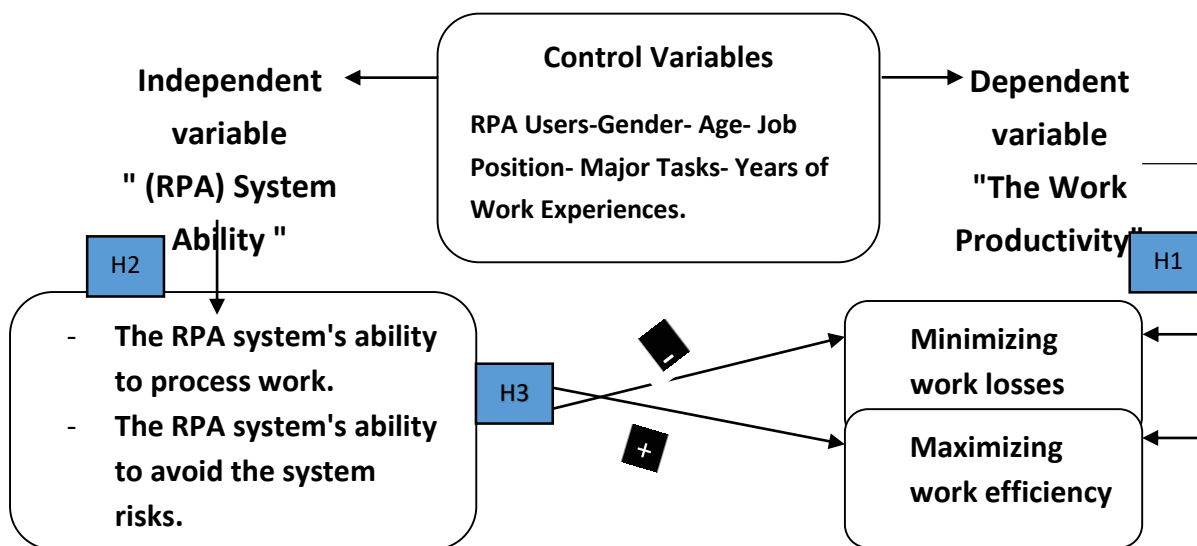


Figure (2): Research Model

Source: Prepared by the researcher by referring to contemporary studies and literature in the field of study

Research Population and Sample:

Through the exploratory study conducted by the researcher, it was found that Misr Bank is the only bank that began using RPA technology in its work tasks. Therefore, the study will be limited to only 44 branches of Misr Bank distributed throughout Egypt, the total number of employees in the bank branches under study reached 1,136 employees, including all administrative levels in the branches. A Random

sample size of 380 individuals was drawn from employees of those financial branches of the bank using the Sample Size Calculator program which was identified by the following equation:

Where:
$$n = \frac{z^2 \times \hat{p}(1-\hat{p})}{\varepsilon^2}$$

n is the sample size

z is the standard normal value corresponding to the desired level of confidence

ε is the margin of error

ĥp is the population proportion.

Table No. (2) Study population and sample

| Study population | Study sample | Distributed questionnaires | Excluded questionnaires | Analyzable questionnaires | Percentage of analyzable questionnaires to distributed questionnaires |
|------------------|--------------|----------------------------|-------------------------|---------------------------|---|
| 1136 | 380 | 427 | 46 | 381 | 89.2% |

Data Collection:

The research relied on two methods of data collection, the secondary data which covers the theoretical side by reference to books, research, and specialized periodicals, in addition to the statistics collected; and the Primary data which covers the applied side of the research, The questionnaire tool was used to collect data from the research sample; It had three sections; the first dealt with demographic(control variables) aspects of respondents, including RPA Users, Gender, Age, Job Position, Major Tasks and Years of Work Experiences which consisted of 6 questions. The second section dealt with questions about the independent variable (RPA System Ability) which consisted of 9 items;6 items to measure the ability to process work and 3 items to measure the ability to avoid the system risks; The third section related to the dependent variable (Work Productivity) which consisted of 14 items;8 items to measure the minimizing work losses and 6 items to measure the maximizing work efficiency. In addition to using two quantitative indicators to judge the dependent

variable, which is the ratio of operating costs to total costs was calculated to express the variable (Minimizing work losses), and operating efficiency was calculated by the number of actual working hours to the number of planned working hours to express the variable (Maximizing work efficiency).

The process of collecting data from the bank branches took six months, which included the researcher obtaining approvals to obtain the required data. Thus, the total time taken to collect data was approximately eight months, including data from the exploratory study, which took two months. Survey questions and instruments were loaded onto the Google forms and collected electronically, in addition to the personal interviews that the researcher held with a group of managers within the bank to collect the quantitative data required. The questions were divided on a five-point Likert scale as follows (very agree 5, agree 4, neutral 3, disagree 2, disagree at all 1) to measure the sample members' responses to the questionnaire questions. Therefore, the relative weight of each response score will be equal to 20%, and thus the range value becomes equal to 80%, calculated as a range= $(5-1)/5=80\%$. Accordingly, the degree of response indicated by the mean is determined as follows:

Table No. (3) The degree of response

| Range | degree of response |
|-----------|--------------------|
| 1: 1.8 | very low |
| 1.81: 2.6 | Low |
| 2.61: 3.4 | Middle |
| 3.41: 4.2 | High |
| 4.21: 5 | very high |

Data Analysis:

The Statistical Package for Social Science (SPSS V.22) program was used to analyze the obtained questionnaire data, with a Reliability of 95% confidence. Demographic variables (control variables) were analyzed using ratios and frequencies; according to a test of the first and second hypotheses, descriptive statistics were used to calculate the mean and standard deviation to identify the degree of difference between the dimensions included in each variable. The third hypothesis was tested using regression analysis and calculating the T-statistic and F-statistic for the variables, in addition to using the correlation coefficient to measure the relationship between the dependent and independent variables and the coefficient of determination to measure the strength of the model used in the regression. To

verify the results of the third hypothesis using quantitative criteria, the Wilcoxon test was used for two linked samples, and the Z value was found before and after implementing the RPA system in the branches of Misr Bank.

Research Results:

1-Validity and Reliability:

Validity means analyzing whether the questionnaire measures what it is intended to measure. To verify this, the survey questionnaire was peer-reviewed by specialists in the field of business administration and business systems, in addition to conducting correlation tests for the questionnaire variables, which indicates the validity of all items for the independent and dependent variables, and the results were as follows:

Table No (4). Internal Validity and Reliability of variables

| Variables | | Number of Items | Correlation | Cronbach's alpha coefficient |
|------------------------------------|---|-----------------|-------------|------------------------------|
| <u>Dependent variable</u> | Minimizing work losses | 8 | 0.891* | 0.824 |
| | The Work Productivity Maximizing work efficiency | 6 | 0.950* | 0.863 |
| <u>Independent variable</u> | Ability to process work | 6 | 0.869* | 0.706 |
| | The (RPA) system's ability Ability to avoid the system risks | 3 | 0.799* | 0.871 |

*Significant at 5% level

Reliability refers to the consistency or stability of a measurement. (Segal and Coolidge.,2018) Cronbach's alpha coefficient was used, which indicates that the reliability of the questionnaire is strong at ($\alpha > 0.7$). (Collins.,2007) It is clear from the previous table that Cronbach's alpha coefficients were higher than 0.7. So, the results indicate the reliability of all questionnaire items for all variables.

2- Results of Demographic variables (Control Variables) analysis for the Research Sample:

The control variables identifying the characteristics of the research sample (RPA Users, Gender, Age, Job Position, Major Tasks, and Years of Work Experience) were analyzed as follows:

Table No (5). Analysis of control variables

| Characteristics | N | % |
|--------------------------------|-----|-------|
| <u>RPA Users</u> | | |
| • user | 311 | 0.818 |
| • Non-user | 69 | 0.182 |
| <u>Gender</u> | | |
| • Male | 268 | 0.705 |
| • Female | 112 | 0.295 |
| <u>Age</u> | | |
| • 20 < age ≤ 30 | 11 | 0.029 |
| • 30 < age ≤ 40 | 196 | 0.516 |
| • 40 < age ≤ 50 | 115 | 0.302 |
| • age > 50 | 58 | 0.153 |
| <u>Job Position</u> | | |
| • Manager | 113 | 0.297 |
| • assistant manager | 164 | 0.432 |
| • employee | 103 | 0.271 |
| <u>Major Tasks</u> | | |
| • Investment processing | 28 | 0.073 |
| • Financing Processing | 229 | 0.603 |
| • Customer services | 67 | 0.177 |
| • Technical services | 41 | 0.108 |
| • Other | 15 | 0.039 |
| <u>Work Experiences</u> | | |
| • 5 < years ≤ 10 | 108 | 0.284 |
| • 10 < years ≤ 20 | 147 | 0.387 |
| • years > 20 | 125 | 0.329 |

The results of the previous table indicate that most of the research sample uses the RPA system in various tasks, especially tasks related to financing processing; most of them are men and most of them work at the manager or assistant manager level, and approximately 82% of the research sample is limited to the average age period between 30 and 50 years. Also, most years of experience range from 10 to 20 years.

3- Hypothesis Testing:

Hyp1: There is no significant difference in the factors determining the RPA system ability in Misr Bank.

It is clear from the following table No. (6) that the mean related to the variable ability to process work is considered higher than the mean for the variable avoids the system risks, which indicates an increase in the degree of the RPA system ability compared to its ability to avoid potential risks.

Table No (6). Mean and standard deviation of RPA system ability

| Variables | Mean | S. D | Average % | Agreement degree | Ranking |
|-----------------------------------|------|------|-----------|------------------|---------|
| Ability to process work | 3.23 | 0.70 | 64.60 | Middle | 1 |
| Ability to Avoid the system risks | 2.63 | 1.0 | 52.60 | Middle | 2 |
| RPA system ability | 2.93 | 0.85 | 58.57 | Middle | |

The results of Table (6) refer to the mean and standard deviation of the RPA system ability variables regarding the ability to process work and the ability to avoid the system risks are close to a moderate degree of agreement. Therefore, the first hypothesis can be accepted.

Hyp2: There is no significant difference in the factors determining the work productivity associated with the RPA system in the Misr Bank.

It is clear from the following table No. (7) that the mean related to the variable maximizing work efficiency is considered higher than the mean for the variable minimizing work losses, which indicates an increase in the degree of achieving work efficiency compared to minimizing work losses.

Table No (7). Mean and standard deviation of The Work Productivity

| Variables | Mean | S. D | Average % | Agreement degree | Ranking |
|------------------------------|------|------|-----------|------------------|---------|
| Minimizing work losses | 2.0 | 0.84 | 40.0 | Weak | 2 |
| Maximizing work efficiency | 2.44 | 0.83 | 48.80 | Weak | 1 |
| The Work Productivity | 2.16 | 0.81 | 43.18 | Weak | |

The results of Table (7) refer to the mean and standard deviation of the Work Productivity variables regarding minimizing work losses and maximizing work efficiency are close to a weak degree of agreement. Therefore, the second hypothesis can be accepted.

Hyp3: There is no significant effect of the RPA system ability dimensions on work productivity in the Misr Bank.

$$Y = -0.181c + 0.258X_1 + 0.297X_2$$

The following table indicates that there is a moderate positive correlation according to the Pearson correlation coefficient between the (RPA) system ability dimensions as an independent variable and work productivity as a dependent variable, thus increasing the ability of RPA system operations, in addition to its ability to avoid potential operational risks, will contribute to an above-average degree in increasing work productivity.

Table No (8). Linear regression analysis of work productivity

| The (RPA) System's ability Y | F test | | R | R ² | Constant | X** | T-test | | |
|-----------------------------------|---------|---------|-------|----------------|----------|----------------|--------|---------|--------------|
| | F value | P-value | | | | | B | T value | Significance |
| Ability to process work | | | | | | X ₁ | 0.258 | 4.642 | significant |
| Ability to avoid the system risks | 85.328 | *0.001 | 0.669 | 0.447 | -0.181 | X ₂ | 0.297 | 6.822 | significant |
| Total | | | | | | | 0.541 | 12.487 | significant |

*Statistically significant at the 5% significance level

** X refers to the work productivity (X₁ Minimizing work losses) and (X₂ Maximizing work efficiency)

The results of the previous table also indicate that the significant level p-value is less than 1%, and therefore there is a statistically significant effect of the RPA system ability on work productivity in the branches of the Misr bank under study. This is also evident from the strength of the model used in terms of the coefficient of determination, which reached a value of 0.447. It is also clear from the following table No. (9) that there is an effect of all variables of the (RPA) system ability on all variables of the work productivity, and according to the coefficient of determination the strength of the model is limited, but the results indicate that according to the value of B, the variable avoid the system risks has a higher effect in all minimizing work losses and maximizing work efficiency.

Table No (9). Linear regression analysis of Minimizing work losses and Maximizing work efficiency.

| The (RPA) System's ability Y | F test | | R | R ² | Constant | X** | T-test | | |
|--|---------|---------|-------|----------------|----------|----------------|--------|---------|--------------|
| | F value | P-value | | | | | B | T value | significance |
| ability to process work | | | 0.530 | | | | 0.193 | 3.166 | significant |
| avoid the system risks | 78.219 | *0.001 | 0.641 | 0.363 | -0.275 | X ₁ | 0.346 | 7.246 | significant |
| ability to process work | | | 0.509 | | | | 0.258 | 3.932 | significant |
| avoid the system risks | 56.394 | *0.001 | 0.571 | 0.312 | 0.099 | X ₂ | 0.308 | 6.006 | significant |

*Statistically significant at the 5% significance level

** X refers to the work productivity (X₁ Minimizing work losses) and (X₂ Maximizing work efficiency)

The quantitative criteria for operational performance were used before and after implementing the RPA system to identify the impact of its application on work productivity, where the ratio of operating costs to total costs was calculated to express the variable minimizing work losses, and operating efficiency was

calculated by the number of actual working hours to the number of planned working hours to express the variable maximizing work efficiency.

According to the Wilcoxon test for two linked samples and finding the Z value for all variables, the comparison is made according to its significant value, P-value, and the highest percentage is determined using the averages after confirming the significant difference.

Table No (10). Wilcoxon Signed Ranks Test

| The Work Productivity | Wilcoxon Z | P – value | Mean Rank (before and after) | | Significance |
|-----------------------------------|-------------------|------------------|-------------------------------------|---|---------------------|
| Minimizing work losses | -1.992 | 0.046* | 1 | - | Significant |
| Maximizing work efficiency | -0.944 | 0.345 | 2 | - | non-significant |
| | | | 3.67 | + | |

*Statistically significant at the 5% significance level

The results of the previous table indicate that when comparing work productivity for the two variables before and after implementing the RPA system, it was found that there are significant differences only for the variable minimizing work losses, at a b-value equal to 0.046 in favor of after, which is less than the 5% level of statistical significance. Therefore, the third hypothesis can be partially accepted.

Conclusion and Recommendations:

The research studied the ability of one of the machine learning systems, which is the RPA system, and identified its impact on work productivity in Misr Bank. The research results included the following:

- 1- The mean value of the RPA system ability variables is very close, and they all came with a moderate degree of acceptance, therefore the hypothesis is accepted that There is no significant difference in the factors determining the RPA system ability within Misr bank.
- 2- The mean value of the work productivity variables is very close and all of them came with a weak degree of acceptance, and therefore the hypothesis is accepted that There is no significant difference in the factors determining the work productivity associated with the RPA system in the Misr bank.
- 3- According to the results of the questionnaire of the study sample using the F-statistic and the T-statistic, the effect of the RPA system ability dimensions on work productivity was significant at the 5% level of significance, while using quantitative

criteria to identify the degree of change in work productivity before and after implementing the RPA system using Wilcoxon test, the effect was partial and therefore the third hypothesis is partially accepted that there is no significant effect of the RPA system ability on work productivity in the Misr bank.

These results agreed with the results of the research of: (Oshri and Plugge.,2021), (Asatiani and Penttinen.,2016), (Willcocks et al.,2015), (Thekkethil et al.,2021), (Kaswan et al.,2023), (Fernandez et al.,2023), (Maček et al.,2020), (Ashtikar and Humbad.,2022), (Balasundaram and Venkatagiri.,2019), (Gavrilchik.,2022) While the results of the research differed partially with study (Eura.,2020).

The research recommends the need to generalize the use of the RPA system throughout the banking sector in Egypt because of its positive effects on work productivity; Especially since banks in Egypt, except Misr Bank, have not yet relied on it, according to the survey study conducted by the researcher.

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