AI in Treasury Management: Enhancing Bank's Treasury System for Budget Execution in the Medium Term

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Abstract: *Artificial intelligence (AI), which has become more famous in demand in the global financial as well as other industries, has influenced human life's many aspects. In the context of technology adoption of Treasury Systems of Banks (TSB), various studies have been conducted by researchers. But, for budget executions, a small amount of studies have been conducted on the impact of AI in the TSB. Hence, this research investigated the AI functional model impacts on the banks' TS for budget execution in the medium term to fill this study gap. By using a convenience sampling technique, data has been gathered from 349 respondents in metro cities in India. As per the outcome, "AI Awareness", "AI Ethical principles", "Deep Learning (DL)", "Machine Learning (ML)", and "robotics" had a positive and significant association with banks' TSs for budget execution in the medium term. Moreover, as per the hypothesis testing, hypothesis 2 had significantly gained the highest relationship between the functional model of AI and the TSB.*

Keywords: Treasury management system, Budget execution, Artificial intelligence, Medium term, Banking sector

1. Introduction

AI and other models of ML and DL have emerged as disruptive technology during the last two decades, which transforms the way financial institutions operate and serve their customers [1, 2, and 3]. On the treasury side, large organizations are helped to manage their cash and working capital by the banks that are on innovation's leading edge with new - age technologies [4]. But, the financial crisis was caused since the undesirable outcomes were caused by the poor Treasury Management System (TMS). Medium - term budget execution planning, which serves as a kind of resource base for multi - year cost estimates, is a plan of budget revenues and expenditures for many years in the banking system [5]. Treasury Management (TM) occupies a significant position and shifted its focus from transactional operations to assisting organizational strategies and enhancing cash efficiency in the banks [6, 7, and 8]. In Figure 1, a diagrammatic representation of TSB is shown.

Figure 1: Treasury management system

Volume 13 Issue 3, March 2024
Fully Refereed | Open Access | Double Blind Peer Reviewed Journal
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Paper ID: SR24712003517   DOI: https://dx.doi.org/10.21275/SR24712003517   1906

Statement of the problem

TM for budget execution in the medium term is becoming tedious with the progression in the business. Hence, the functional models of AI can be used for various treasury functions in the banking system in recent developments [9, 10]. Previously, diverse researchers have worked to display AI's significance and its functional model of ML, DL, and other digital technologies for banking performance. Many research efforts on effective organizational performance and various techniques have been implemented to enhance the effectiveness of TM in the medium term. Nevertheless, for budget execution, there is a paucity of established works on the appropriateness of AI models' impacts on TM, particularly in the banking sector. Moreover, in the banking institutions in India, the researcher observed that various TSs are largely unknown by the effective practices of AI. This creates the need for further examination into the issue to gain an advantage from a robust discussion on the implications for improvement in developing the subject.

Research questions

Thus, stemming from the issue, this study sought to provide answers to the given research queries,

- How is AI used effectively for TM for budget execution in the banking sector's medium term?
- What is the effect of the bank's adaptation of the AI practices' functional model of digital technology to the TSs and its operational performance?
- This research was directed by objectives like,
- To investigate the AI use effectively for TM for budget execution in the banking sector's medium term.
- To explore the bank's adaptation of the functional model of AI practices of digital technology to the TSs and its operational performance

The remaining part is arranged as: section 2 addresses the existing literature review; Section 3 builds the research methodology; section 4 depicts the result as well as; section 5 concludes the paper with future research scope.

2. Related Literature Review

Teresia W. Gatimu [11] aimed to examine TM effects on Financial Performance (FP). From 43 licensed commercial banks, questionnaire data was collected. The study was evaluated based on a descriptive research design. Moreover, the relationship between the variables has been analyzed through linear regression analysis. As per the outcome, Risk Management (RM), investment strategies, funding strategies, and liquidity management were adopted by commercial banks. But, the questionnaire of data collection was a limitation. A few respondents were reluctant or else unwilling to partake.

Michael Njoroge Mburu [12] focused on exploring the treasury RM efficiency on commercial banks' FP. Moreover, the role of credit RM's influence on banking performance was examined. Here, a total of 157 commercial banks were considered and the selected samples were analyzed through a stratified sampling technique. Both qualitative and quantitative methods have been adopted. As per the findings, the relationship between currency RM and credit RM had a significant and positive impact on FP, i. e.0.131 and 0.968. It

was inadequate only to commercial banks owing to financial and time constraints; but, the same results were not generalizable to other banks.

Rosemary Entiwah Nketia [13] aimed to identify TM efficacy on selected rural banks' profitability in Ghana. A sample of a study has been gathered from 54 workers from the 12 rural banks in Ghana using a purposive sampling technique. Here, for the result evaluation, both the quantitative and descriptive research designs have been used. Ultimately, the liquidity management strategy, funding strategy, and RM strategy had positive and significant relations with the chosen rural banks. But, the investment strategy does not significantly impact the profitability of the banks. Also, the survey results might not accurately reflect the TM practices, and the study was limited only to banks in rural areas.

Savastieieva Oksana et al. [14] examined the process of treasury services for managing budget execution based on blockchain technology. Moreover, for financial transactions, the international experience and practices of employing multi - functional as well as multi - level information blockchain technology were detected. As per the study findings, the distributed ledger technology usage might cause considerable simplification of the treasury servicing process of budget execution at all levels. Moreover, financial transactions were automated by modern information technologies through contractual relations.

Dedi Sopandi [15] explored the state budget (APBN) funds' expenditure process with the state treasury and budget (SPAN) at the treasury service office in Denpasar. The effective, transparent, efficient, and accountable budget funds were analyzed by applying the SPAN implementation to the management of APBN funds. The factors of internal support became great commitment to the leadership; in addition, it also achieved KPPN Denpasar's all ranks. Then, external support factors were supervision; also, routine guidance was done by the Directorate General of Treasury's regional office.

Otemu et al. [16] analyzed the implications of treasury single account as well as transparency in public sector financial management in Nigeria. A foundation for the substantial treasury single account implementation and adoption was explored based on applying various kinds of theoretical frameworks of socio - economic accounting. Unnecessary borrowing costs, linkages, and recurrent expenditure of TSA were minimized since treasury single account's implication on the economic department effectively benefits the financial management and eventually plows back into the economy control frauds. But, the study result was based on financial management in Nigeria. Thus, the findings' generalizability might occur in other geographical regions or contexts.

David Martinez Escalada and Hristo Balabanov [17] examined the digital technologies' adoption of the 4th Industrial Revolution within large treasury departments. Then, the opportunities and challenges and their effects on treasury operations were investigated. The result was evaluated based on the qualitative and interpretive

Volume 13 Issue 3, March 2024
Fully Refereed | Open Access | Double Blind Peer Reviewed Journal
www.ijsr.net

Paper ID: SR24712003517   DOI: https://dx.doi.org/10.21275/SR24712003517   1907

approaches. The result of the study showed that the innovation - driven culture and fostering of a willingness to change became effective technology integration in multiple departments. Finally, the approach of digital transformation and strategic priorities for the treasury department was effectively updated with growing technologies and optimized treasury functions. But, the study sample was very low.

3. Research Methodology

3.1 Research Design

This study's goal is to explore AI's impact on enhancing banks' TS for budget execution in the medium term. The relationship betwixt the study variables and TM for banks' budget execution and the operational performance was analyzed grounded on a descriptive research study. This research design facilitates making inferences about the study variables and making valid conclusions. In Figure 2, the conceptual framework's pictorial depiction is depicted.
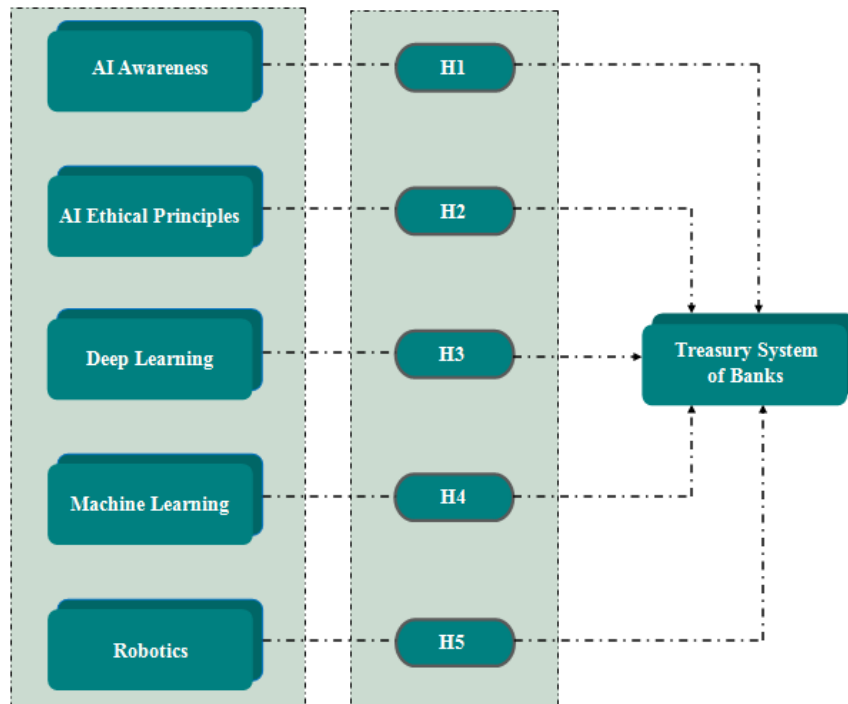

Figure 2: Conceptual framework of research phases

3.2 Target population

Here, the population is targeted from the 400 respondents from the several banks in several metro cities in India. The reason for selecting the respondents from the banking sector was to attain an excellent result and to balance a scale of data analysis.

3.3 Sampling

The convenience sampling technique, which is applied for the data collection, is a non - probability sampling. Here, due to convenient accessibility and proximity, the subjects are selected. Hence, a convenience sampling approach was wielded to cover 400 respondents from the banking sector in India.

3.4 Data collection procedures

Here, primary along with secondary data have been collected. Via structured questionnaires, primary data has been collected. From budget execution reports, articles, journals, magazines, books, newspapers, etc, the secondary data has been taken. Respective banks' treasury managers

were the respondents. A questionnaire was sent via email. The data collection took approximately three months to complete, and the sampled employees were invited to participate in a secure online survey.

3.5 Data analysis

Here, descriptive statistics tools were used. A total of 400 questionnaires were distributed in the process of data collection.349 questionnaires were filled and returned. After evaluating the collected data, the missing values and the outliers were removed, and valid responses were considered for satisfactory research. Out of 349 respondents, most of the respondents were male (221), and the sample considered the age category of 20 to above 60 years old. The questionnaire was designed by employing a 5 - point Likert scale. For exploring the relationship between the variables, regression analysis has been employed.

4. Result and Discussion

Here, the confirmatory factor analysis of AI impact on TSs for budget execution and the descriptive statistics of the

variables have been identified. Then, through Structural Equation Modeling (SEM), the hypothesis of the study has been analyzed, and the regression analysis has been analyzed and discussed.

4.1 Impact of AI on the development of treasury systems for budget execution

The evolutionary development process has been altered by the treasury bodies' structure and functional features. A few variables that effectively impact the development of TSs for budget execution are shown in below Table 1.

Table 1: Adoption of AI for the operational performance of treasury systems

Variables	Item	Item loading	CA
AI Awareness (AIA)	AIA1 - Living in the workflow	0.948	0.951
	AIA2 - Support the development of applications	0.950	
AI Ethical principles (AIP)	AIP1 - Cultivating cooperative or collaborative treasury operations	0.977	0.975
	AIP2 - Ensures the maintenance of integrity for budget execution	0.971	
Deep learning (DL)	DL1 - Improves treasury system and overall banking performance	0.944	0.946
	DL2 - Improves workforce knowledge	0.941	
Machine learning (ML)	ML1 - Improves treasury operation system and banking environment	0.932	0.939
	ML2 - Improves workforce engagement through algorithms	0.924	
Robotics (RB)	RB1 - Utilize IT resources with improved workforce competencies	0.970	0.967
	RB2 - Increases revenues and profitability	0.936	

The results of confirmatory factor analysis on the various constructs of AI, such as AI Awareness, AI Ethical principles, DL, ML, and robotics have been examined [18]. Through convergent and discriminant validity, the instrument validity and reliability have been assessed. To calculate the scale items' reliability, Cronbach's Alpha (CA) has been utilized. The measuring instrument is rather acceptable as well as reliable since every construct's reliability is above 0.70. Thus, the variable "AI Ethical principles" achieved the highest CA value, which is 0.975, and the item "Cultivating cooperative or collaborative treasury operations" obtained the highest factor value (0.977) than the other variables.

4.2 Descriptive Statistics - Mean and standard deviation

For the selected variables of AI Awareness, AI Ethical principles, DL, ML, and robotics, a descriptive statistical analysis of mean along with standard deviation was estimated; in addition, it is shown in Table 2.

Table 2: Descriptive Measures

Variables	Mean (M)	Standard deviation (SD)	No. of Constructs
AI Awareness	3.82	1.03	2
AI Ethical principles	4.04	0.99	2
Deep learning	3.70	0.87	2
Machine learning	3.62	0.95	2
Robotics	3.91	0.85	2

As per 5 AI sub - construct's mean values evaluation, "AI Ethical principles" was the regularly deployed sub - construct with 4.04 mean value and 0.99 SD [18]. But, The variable of "ML" had the lowest mean value of 3.62; thus, it was the low frequently wielded sub - construct. As per the study findings, these factors significantly contributed to the development of TSB for budget execution. In Figure 3, the descriptive statistics of variables are diagrammatically specified.
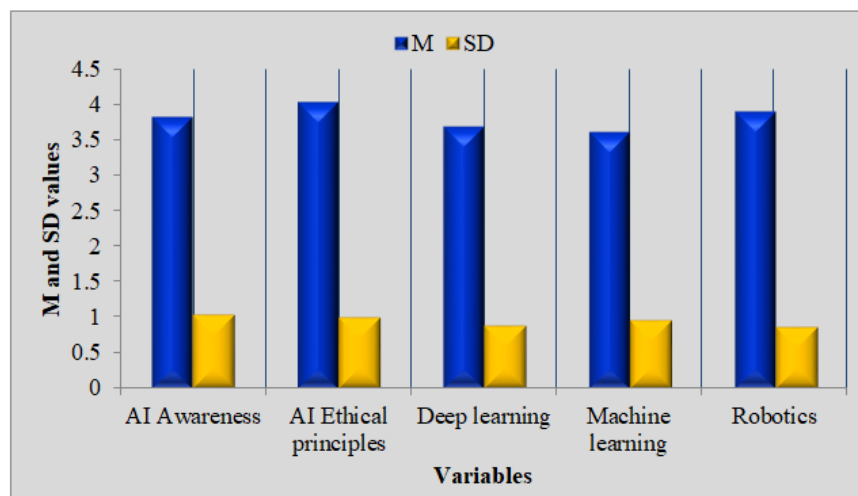

Figure 3: Graphical illustration of descriptive statistics

4.3 Hypothesis development

H1: AI awareness had a significant impact on TS's development for budget execution

H2: AI ethical principles had a significant impact on TS development for budget execution

H3: DL had a significant impact on TS development for budget execution

H4: ML had a significant impact on TS development for budget execution

H5: Robotics had a significant impact on TS development for budget execution

Table 3: Testing of hypothesis

Hypothesis	Path coefficient	β	p - value	Result
H1	AIA→TSB	0.555	0.005	✓
H2	AIP→ TSB	0.591	0.001	✓
H3	DL→ TSB	0.536	0.000	✓
H4	ML→ TSB	0.495	0.002	✓
H5	RB→ TSB	0.580	0.000	✓

The significant level at p =.05

The results of the generated hypothesis using SEM are depicted in Table 3. The β - value and p - value have been examined for each hypothesis. The variable that attained a considered fit of T - statistics at 1.96 or above is considered a positive and significant relationship. For budget execution in the medium term, all the generated hypotheses have attained a positive relation with the development of the TSB. H2 is highly associated with TSB (β=0.591, p=0.001) when compared with the other hypothesis; while, H4 obtained the lowest significant value, i. e. (β=0.495, p=0.002). In Figure 4, a SEM analysis model is depicted.

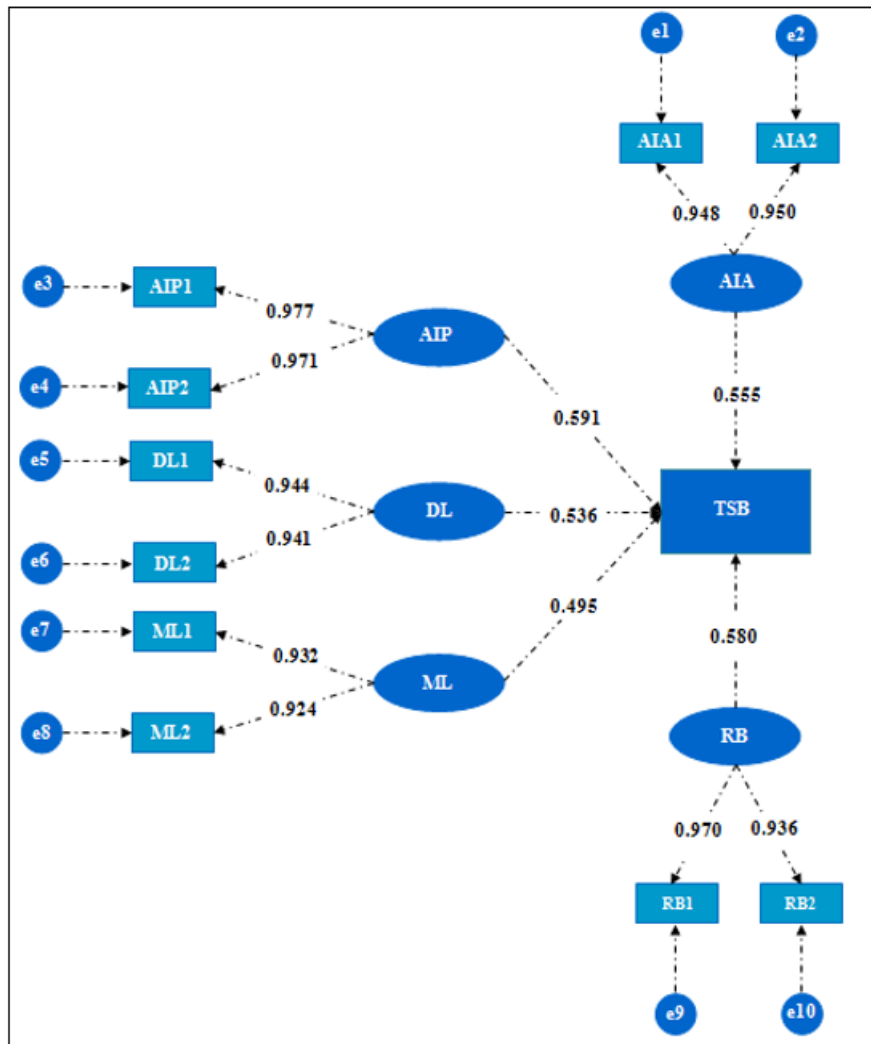**Figure 4:** Measurement model of SEM

4.4. Regression Analysis

The significant relationship among the constructs has been investigated through regression analysis to explore the statistical concepts of variables, which is depicted in Table 4 [11, 18].

Table 4: Model Summary

Model summary					
Model	R	R^2	Adjusted R^2	Estimated std. error	Durbin Watson
1	0.803[a]	0.723	0.697	0.64115	2.03
a. Predictors (Constant)					
b. Dependent variables (Treasury system of banks)					

Thus, the presented system depicts an extremely positive level of correlation, the obtained R is 0.803. Further, the R2 depicts total variation amounts in the dependent variable, i. e., 0.723. Then, the estimation of 69.7% represents the performance development TSB of budget execution in the medium term explained by five indicators factors (AI Awareness, AI Ethical principles, DL, ML, and robotics).

5. Conclusion

This study aimed to explore the AI functional model's impact on the development of TSB for budget execution in the medium term. By employing SEM, a hypothesis of a

Volume 13 Issue 3, March 2024
Fully Refereed | Open Access | Double Blind Peer Reviewed Journal
www.ijsr.net

Paper ID: SR24712003517   DOI: https://dx.doi.org/10.21275/SR24712003517   1910

study has been developed and tested. As per the study, for budget executions, hypothesis 2 has achieved the highest significant relationship (β=0.591, p=0.001) between AI ethical principles and the TSB. Moreover, as per the regression analysis, all the constant variables were positively associated with the TSB, where 69.7% of estimates were explained by selected variables. Hence, the adoption of AI in TMS that is in line with the banking sector was found to be developing financial and operational performance. However, the study was limited to certain variables with a limited size of a sample. The study will focus on examining more AI impact variables of TSs for budget execution as well as identifying the challenges that take place during the implementation process in the future.

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Volume 13 Issue 3, March 2024
Fully Refereed | Open Access | Double Blind Peer Reviewed Journal
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Paper ID: SR24712003517   DOI: https://dx.doi.org/10.21275/SR24712003517   1911

Author Profile

Ardhendu Sekhar Nanda is an accomplished Fintech Expert in Treasury management & data services, with two decades of diverse experience across the financial services and technology sectors. As a senior executive for esteemed global firms, he has leveraged his expertise in Treasury management services along with Data modelling, alongside Investment Banking, Wealth Management, Risk Management, and various other domains. In addition to his strategic vision and analytical capabilities, Ardhendu is widely recognized for delivering AI enabled innovative solutions to complex Treasury Management services, Regulatory reporting and leading initiatives to successful outcomes. His profound understanding of technology innovation and its implementation has played a pivotal role in bridging the gap between technological advancements and business goals. With expertise in analytics, design, and strategic vision, he has pioneered and guided product strategy for a comprehensive suite of applications for Treasury Management Services. Ardhendu is recognized for his leadership in mentoring, process optimization, product design, and strategic consulting; all of which have catalyzed positive organizational transformations. Ardhendu possesses an impressive educational background with Bachelor of Engineering in Electrical and instrumentation Engineering and currently pursuing master's degrees Business consulting and data analytics, along with certifications in specialized disciplines; indicating a unique combination of domain expertise, technical acumen, and managerial excellence. His profound insights and comprehensive skill set enable him to contribute significantly to transformative changes within the fintech industry