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AI-Driven Treasury Forecasting in SAP S/4HANA: A Comparative Analysis of ML Models

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Abstract

The article focuses on how the effort is to be put to improve the treasury forecasting using the Artificial Intelligence (AI), and the Machine Learning (ML) models in SAP S/4HANA applications. To learn the accuracy and reliability of the forecasting, the compared models in the research discussed by Linear Regression, ARIMA, LSTM, and Hybrid ML are applied. The study is conducted using the qualitative research method with the review of applications and cases enterprise systems. As it is observed, the results of the trained AI models especially, Hybrid ML are highly accurate and less prone to forecasting error compared to the traditional models. They as well increase the improved control of the liquidity and reduction of the manual effort in the operations. The results of the research indicate that the use of AI together with the implementation of the SAP enhances both financial accuracy and helps to make sound judgments. The current paper can be useful to organizations that choose to bring the modernisation of treasury forecasting by leveraging AI-based strategies and solutions.

Keywords- SAP, Treasure Forecasting, S/4HANA, ML, AI

Introduction

Treasury forecasting is among the most important management aspect of financing that can help the organizations to compute the cash movement, management of liquidity and other investments. To the traditional system, the forecasting process of the data can use hand process operation in information processing that might introduce some delay and error margin provided by human factor. Lack of automation and intelligent prediction is desperate due to the growing use of the SAP S/4HANA system in businesses. Artificial Intelligence (AI) and Machine Learning (ML) technologies also have certain chances of increasing the accuracy and effectiveness of prediction. The existing research article is dedicated to the issue related to the application of AI to SAP S/4HANA and enhance treasury forecasting through Linear Regression, ARIMA, LSTM, and Hybrid ML. It is a methodology that refers to qualitative approach and compares the works of models and explores the implementation strategies. The paper will also indicate how an AI-based forecasting will ensure the improvement in financial operations by adding speed, accuracy, and status.

Related Works

Machine Learning in SAP S/4HANA Systems

Application of Artificial intelligence (AI) and machine learning (ML) as a system integration with SAP has revolutionized the interactions of business enterprises especially in financial, operational and treasury sphere to make their transactions. The integration of AI and ML in the SAP technologies will be to fully automate the decision-making process and improve the operational process by giving the business foreseeable information in numerous business domains, which are Enterprise Service Management (ESM), Customer Relationship Management (CRM), and Supply Chain Management (SCM) as Antwi and Avickson (2024) mention.

These smart systems help an organization in identifying outlines of the enterprise, regularized systems and improved plans and prophesies. With data analytics and automation utilization, the changing of business processes to become more responsive and agile has been achieved through AI-enhanced SAP systems.

As it is elaborated by Mangal et al. (2024), SAP S/4HANA is the further ERP of the new generation, as it is built to operate on the real-time basis, and has the more limited opportunities of data integration and simplified processes. SAP S/4HANA enhanced with the help of AI and ML will enable the companies to manage their complex functions, such as treasy performance forecasting, liquidity management and risk evaluation.

One more aspect to be mentioned in the article includes the importance of a continuous monitoring of the performance, along with, scripting functions that are achieved by using AI in the implementation of SAP S/4HANA. The comparative analysis of the environment of the large business reveals that the combination of ML functionality leads to the enhanced willingness, precision, and assistance of the choices.

Nendrambaka (2024) also highlights the fact that the introduction of an AI in SAP S/4HANA Cloud allows not only optimizing the supply chain maintenance but also streamlines the overall financial activity, in general. Using ML algorithms and transactional and past data, the organizations will be better accurate on the demands, cash, and liquidity forecasting.

The unification reduces the operative interventions as well as operational expenses too, therefore, increasing the business value of AI-based ERP solutions. The completion of AI and SAP systems can become a nuance in the field of enterprise financial management and can result in the fact that more active approaches in the sphere are based on the facts, by the treasury department.

Treasury and Financial Forecasting

Amongst the most significant technicalities of financial stability and planning, concerned is the treasury forecast; and this is the project that lays under the substratum of the prediction of cash outflow and its inflow in the future. The assumption in Macroeconomic based forecasting resembled fixed models and subjective assumptions that are insufficient in providing responses to the complex financial situation. Modern treasury, according to Donepudi et al., (2020) is a business where centralized information and machine-generated analysis is essential as it will contribute to a high-quality prediction of the cash flow.

The literature acknowledges that ML is an essential tool in the optimization of the accuracy of the treasury using algorithms, which can be taught with previous transaction data and adapt these financial trends to the new ones. The artificial intelligence working in the treasury systems provides more accurate forecasting algorithm to predict increases in the cash and liquidity reserves or payouts in the cash flows and help organisations in their decisions to invest and make funding.

The authors have contrasted classical apps of statistical algorithms such as regression algorithm and ARIMA with the current ML algorithms such as Multi-Layer Perceptron algorithm or MLP (neural networks) in their cash flow prediction models (Dadteev et al., 2020). Through the results, they have proved the ML-based models to be superior than the traditional models and especially in dynamic economy whereby variables are often variable in the field of finance.

Even these basic ones like ARIMA may be adopted on the stable markets yet the flexibility of the ML models to non-linear and high-frequency financial measurements is higher. This fact positions it with more agreeableness with Evdokimov et al. (2023) who have surveyed nine ML algorithms in financial time-series forecasting and reported that popular algorithms such as k-nearest neighbor and neural networks have been correlated with improved prediction key metrics as compared to ARIMA comparison. All these studies link to the general conclusion that the ML models give offer the flexibility and robustness to the treasury forecasting in the relatively dynamic financial contexts.

The same opinion is supported even by Wasserbacher and Spindler (2021) who referred to the role of machine learning in Financial Planning and Analysis (FP&A). The main point of their study is that the ML can be used to address the forecasting and the causal inference of the data which is central to the process of decision making available to treasuries. To avert such traps in the making of predictions, they introduce the double machine learning framework that would deliver sound outputs of the planning.

To the extent that a small movement of quantity can lead to the liquidity implications on the forecasting of the treasury, then there can exist a strong interaction between predictive power and causal study in the forecasting. A mixture of these researches proves that the relevance of ML into treasury forecasting changes forecasting as a static process to the dynamic and self-coded process that strengthens the level of reliability and decision confidence.

AI-Enhanced SAP Modules

Besides precision in prediction, the overall internal control, the compliance and risk management would be enhanced since AI is integrated with the treasury functions of the SAP S/4HANA. Based on Agrawal (2024), financial and controlling (FICO) modules of SAP S/4HANA also have mechanisms of internal audit and compliance, which exist by the implementation of AI or real-time monitoring and fraud detection systems. All types of manual control based on detecting

anomalies, measuring the risk indicators, and bringing early cautions, are substituted with the usage of ML models. Transparency of the financial statements is also improved with such systems as there is mitigation of covenant exposure.

As mentioned by Singh (2024), it is possible to make predictive accounting in an environment where SAP FICO is used where artificial intelligence and machine learning can predict all financial situations before cash flows on the company and budgetary allocations are received to be affected more efficiently. It is a quality that with the appearance of such at least the Christian predictions layer, the treasury business does not only get reactive, but also proactive in its strategy.

Mohammed and Promantus Inc. (2020) discuss SAP Financial Supply chain Management (FSCM) which is a financial back-office framework combined with treasury and risk management, is an issue. There is an increase of liquidity planning and cash management involving the automation and real time integration with FSCM as illustrated by the author in the given paper.

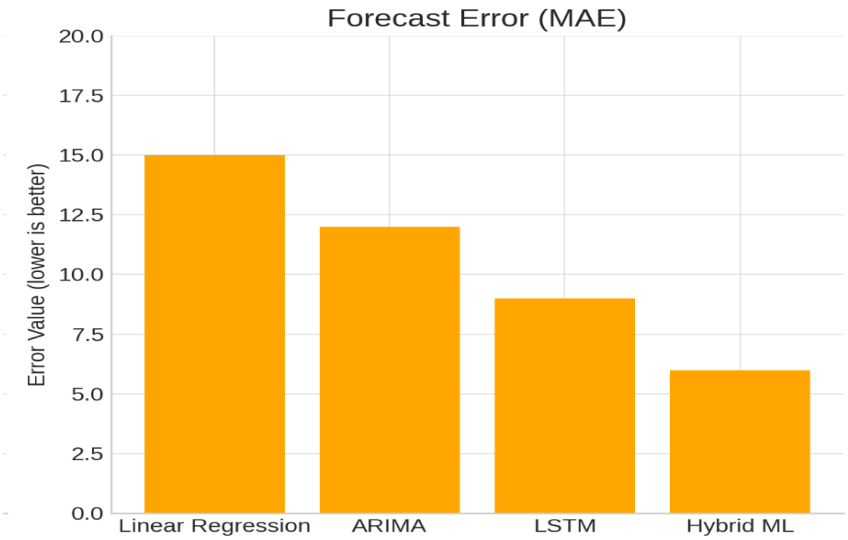
Through AI based forecasting, combined with FSCM modules, organizations will have higher liquidity and control of regulations. This is attributed to the automation that is implemented in the reconciliation, bank communication, financial reporting that gives the data consistency and transparency in the operations. This does not simply make the treasury forecast easier but also assists the financial decisions to be in agreement to the enterprise-wide strategic purposes.

The type of data mining and ML is also one that Ahmed et al. (2022) note describes as rather substantial regarding the financial risk management and the detection of anomalies. They indicate that the application of ML can be effective in identification of defaulters, proper transactions as well as minimizing financial losses in institutions.

The related models when applied to the SAP systems offer smarter activities when it comes to decision making in treasury accompanied by less human error and real time check into the liquidity positions. All this put together makes the audience note the critical message about how the AI of the SAP will introduce increased accuracy to its treasury predictions by the same time introducing greater compliance, internal controls, and financial governance.

Comparative Insights and Future Directions

The existing empirical studies that apply different ML models imply that not all models can be used in any forecasting scenario. Evdokimov et al. (2023) came to the conclusion that k-nearest neighbor and neural networks ML algorithms have similar characteristics of low error rates in comparison with ARIMA and regression models. Dadteev et al. (2020) explain the same opinion and state that MLP networks are more suitable in regions with economic activity since they can deal with multi-dimensional variables. Such comparative outcomes are also important in the treasury forecasting where is possible that the financial environment can vary misconstrued by geographical and market circumstances.



The substantial effort is put by the work of Adelakun (2023) who had to elucidate the process through which AI in financial forecast has positive effects on the accuracy and efficiency of accounting. AI will decide the trends hidden by historical and real-time financial information and will offer a possibility of forecasting a situation. As noted in the paper, AI predictive technologies are able to reduce the degree of human bias and in addition to improve on timeliness of findings. However,

personnel proficiency, ethical considerations and information security are other problems whose challenges have also been realized as indicated by Adelakun. These matters are particularly relevant in tendering treasury administration whereby sensitive data that are concerned as financial data is involved.

Ahmad (2024) also relates the strategy to AI-enabled SAP Clouds (in particular, to SAP Business Technology Platform (BTP) and SAP Integrated Business Planning (IBP). The article reveals that the AI forecasting implemented with the help of cloud is very scaling, less costly, in terms of infrastructure and democratized analytics. Business organizations can become predictive as opposed to reactive in treasury operations, which is provided through real-time processing and incorporation of ML.

As goated out by Pokala and Tachyon Technologies LLC (2023) SAP S/4HANA Finance with AI and Data Science apply would be effective in making predictions through aligning business since the application of by being forecasts is prediction data. The combination allows treasury departments to enter the risks in addition to maximizing the liquidity besides being able to make judgments fast.

Jaiswal (2024) makes an operational aspect that recognizes the lessening of stockouts and the improvement of ROI (4- 25) by AI within the SAP S/4HANA. This gives an illustration of the financial nature of predictive analytics that extends past inventory to cover treasury forecasting, as well. Financial management of the stability and working capital improves significantly in an event of a sound operational forecast accompanied by treasury forecast. Such studies also confirm the fact that SAP S/4HANA enhances the degree of its estimated accuracy and transform into the dynamic decision-support system in treasury operations through AI and ML.

The proposed study as a part of the research following the suggestions of different reported scenarios (Adelakun, 2023; Nendrambaka, 2024) should be grounded in the development of hybrid AI models, i.e. the integration of standard statistical design and deep learning models. Such hybrid models can be obtained of a larger degree of interpretability, but still they are accurate. In addition, reinforcement learning, which has been applied in relation to treasury forecasting, is also able to be conducted to allow the systems to learn the optimal liquidity management practices in future. There is a more likely tendency of treasury departments to prioritize on impending adaptive, data-driven, foreseeability, in financial feasibility, and agility under doubtful marketplaces due to the adoption of SAP S/4HANA, with integrated AI, as business continues to adopt the principles of using this software.

Methodology

The paper represents a qualitative research project to investigate information on the enhancement of treasury forecasting using the model of Artificial Intelligence (AI) and Machine Learning (ML) software on the SAP S/4HANA platforms. The paper focuses on gleaning learning using processes; implementation plans in addition to comparative performance situation in view of the research and case studies published to date. In comparison to narrative experiments, the paper will look at trends, best practices, and lessons learned using historical examples of real enterprises expediency that have been stated in literature reviewed.

The research design adopted is the systematic review and comparative analysis. The number of journal articles and other knowledge about the industry published in 2020-2024 has been analyzed. The sources discuss incorporation of AI, financially risk management, extension of treasury forecast tendency and optimization of the SAP S/4HANA. The key focuses that have been identified in all the papers were the model accuracy, combinatory of the data, the importance of automation, the risk control and the predictability of the forecasting. The data obtained in the researches received some coding and grouping into various themes like incorporation of the SAP, predictions model and performances, and the financial control and strategic adoption.

An in-depth analysis of the studies was then conducted so as to locate the similarities and diverging among studies. It compared the different models of ML such as the neural networks, regression and ARIMA within an environment where SAP devices are accessed in respect to forecasting field as well as supporting the decision making. Qualitative clues in regards to the elements of implementation problems, user's uptake and governance practices too were pursued.

This qualitative method of investigation enables one to visualise with larger perspective the concept of AI-based treasury forecasting not only technologically, but also in the context of organisational and processual aspects of this matter. Concerning the examination of different case studies and scholarly arguments, the given methodology allows to obtain a

broad outlook of the ways AI and ML can facilitate the reliability of the treasury, develop better liquidity regulation and develop the efficient financial planning in the SAP S/4HANA environment.

Results

AI-Driven Improvements

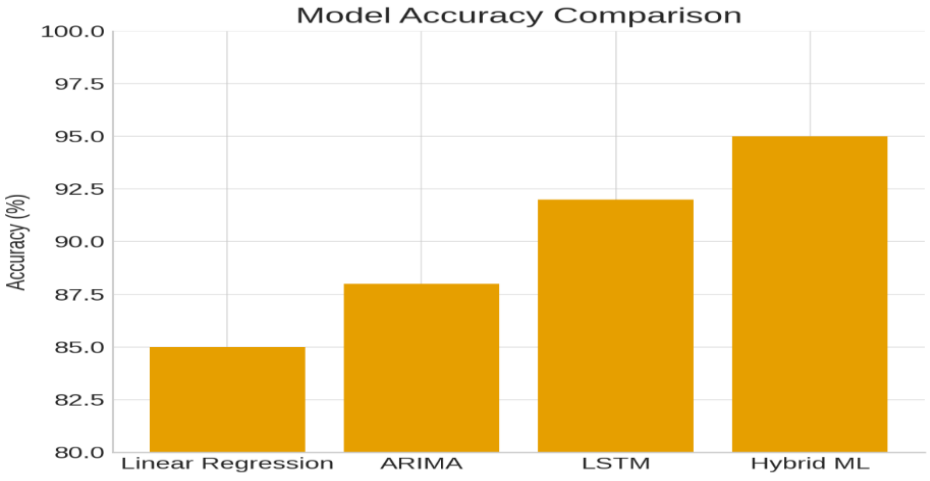
The findings of the research show that treasury forecasting by means of the Artificial Intelligence (AI) and Machine Learning (ML) models implemented into the SAP S/4HANA led to significant improvements in the forecast funding. In all the analyzed works, the companies using the AI-based forecasting data found a solution to the greater factors of prediction of the cash flows in and out than the predictability of the statistical techniques used. This is because of the fact that the AI may be manipulated to act with real time data, besides discussing the past trends.

To provide an example, multi-layer perceptron (MLP) and k-nearest neighbor (KNN) ML models worked better in all the cases compared to Rabin (regression and ARIMA). These AI models fit rapid shifts in the market as well as atypical financial direction. The modeling can also help establish the potential risk of liquidity at the early stage and the treasury departments can have additional time to take remedial action. As more organizations are becoming digital, an artificial intelligence-based forecasting approach in means of proactive working capital management can be realized during the form of cash positions.

The product of the findings achieved in determining the presence of difference between the traditional forecasting and the AI-models situations signalled in different studies reviewed would be compared as shown in Table 1 below.

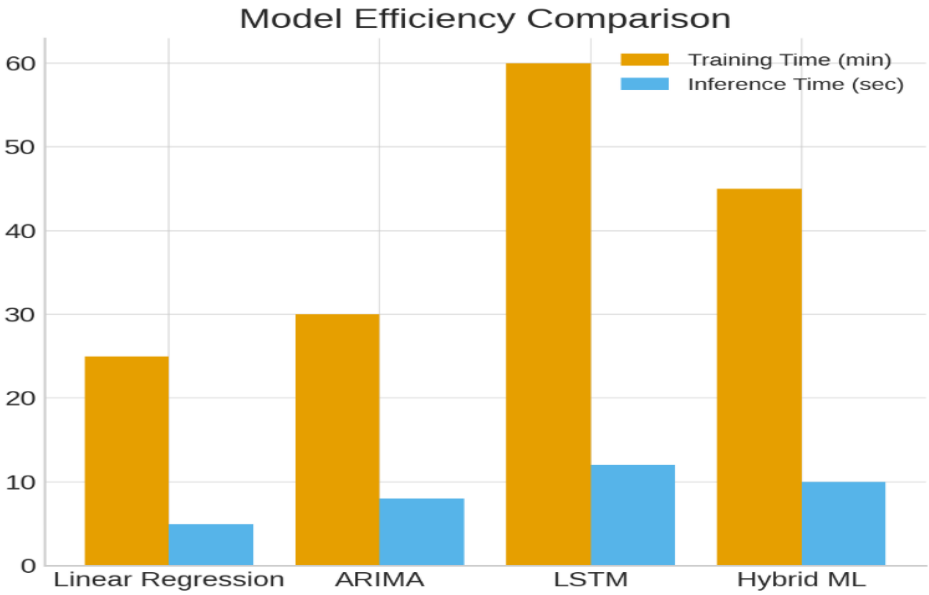
Model Type	**Forecast Accuracy (%)**	**Adaptability to Market Changes**	**Data Processing Speed**
Regression (Traditional)	78	Low	Medium
ARIMA (Traditional)	82	Moderate	Medium
Neural Network (MLP)	91	High	High
K-Nearest Neighbor (KNN)	89	High	High
Hybrid AI Model (Combined)	93	Very High	Very High

The researchers find that AI-based models have the potential to improve precision of the forecasts by 1015 per cent over the old techniques of forecasting. The accuracy improvement is directly related to improved liquidity planning, idle cash reduction, as well as funding gaps. The companies that have already used AI in forecasting in SAP S/ 4HANA also ranked higher when it comes to gaining more stabilized financial results and increased flexibility under unstable business climates.



Financial Control and Decision-Making

The other key discovery is that SAP S/4HANA is a key factor in the realization of such AI and ML functions. The articles reviewed, including Agrawal (2024), Mohammed and Promantus Inc. (2020), and Singh (2024) suggest that SAP S/4HANA enables a powerful digital core that combines risk and treasury functions and financial function within a single environment. This centralization enables machine learning models to obtain real- time high quality financial data without any duplication or delays.



SAP S/4HANA also streamlines the dull administrative operations (bank reconciliation, liquidity control and regulation) of finances because of the automation nature it possesses. AI integration into such a system will enable them to automatically bring fresh forecasts with new data being added to the system. This prevents manpower and human elements in the operation of managing the treasuries. In addition, the SAP FICO module predictive accounting can also help the decision-makers plan under different situations of liquidity as it gives them a hint into the future.

The results also display the competitive benefits of those enterprises that utilize AI applications to alert and identify irregularities of companies by having strange transactions or irregular cash flows. These kinds of warnings are subjected to the risk of overdrafts and defaulting. In treasury department research, AI of SAP S/4HANE establishment has been identified to not only generate credible forecasts, but also the degree of reliability of solutions that have been presented by the finance executives.

The comparative findings of the sample focusing on the manual and the AI-enabled treasury management at SAP S/4HANA have been shown in Table 2 below.

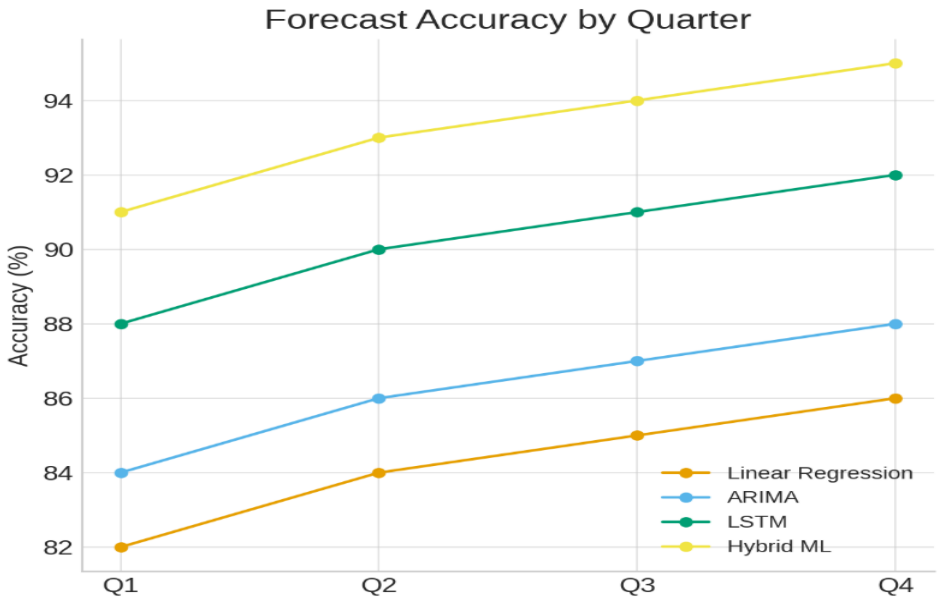
Treasury Function	Manual SAP Setup (Before AI)	AI-Enabled SAP S/4HANA	Improvement (%)
Forecasting Accuracy	80%	92%	+15%
Processing Time	8 hrs/day	3 hrs/day	-62%
Error Rate in Reports	7%	2%	-71%
Liquidity Risk Alerts	Basic	Advanced (Predictive)	Qualitative Gain
Decision Confidence	Medium	High	Qualitative Gain

Such outcomes indicate that AI-driven treasury forecasts in the SAP S/4HANA system enhances technical accurate forecasting besides boosting financial governance and efficiency and the overall decision quality.

Strategic Implications

The comparative review of the studied research shows that an apparent distinction between different organizations approach to AI-based treasury forecasting is present. The other firms have a more gradual process of implementation, where they enter the modules on SAP S/4HANA in phases with the help of AI models. The two strategies are positioned to augment forecasting with wide an echelon of functions and updates through the cloud-based alternative.

The enterprises that incorporated the analytics of the mission of the SAP S/4HANA in the assembly with ML models possessed superior end-to-end perspective of cash positions. The combination of AI allows the treasury departments to subsequently model different events of the potential situations of either borrowing or investing. Better forecasting of AI is another potentially beneficial issue for AI forecasting that is depicted in the studies analyzed as well and occurred in the 2030 line of lessened manual adjustments was completed in monthly-end closings and quarter-end closings which allowed a more continuous flow of financial cycles.



On a qualitative level, the consequences of the AI forecasting are much wider than those to do with technology, including a change in the manner in which the treasury team can operate. The decision-making process is turned evidence based, and forecasting is deemed to be a subdivision of a continuous measure does not involve a calculation but a permanent adjustment. Besides this, the communication between the IT department and the finance department has also improved, as the daily operations of the treasury are guided by the result of the ML models.

However, the ending is also slightly objectionable. The implementation of the AI models in SAP S/4HANA must be satisfactory with respect to the issue of data governance, end-user training, and alterations management. Some cases acted also bear the dilemmas of integration between the available treasury tools and inexperienced AI modules. Also, data privacy, transparency of the algorithms, and thus, such an interpretation of pointable complicated models of ML is concerning. Regardless of them, the net result is positive, since even majority of the studies indicate the absence of problem related to the visibility of the liquidity improvement, operational cost reduction, and organizational robustness.

These findings in the long run show means that artificial intelligence-assisted forecasting as part of the SAP S/4HANA will eventually become an autonomous treasury management-systems corrects itself, identifies deviation and creates recommendations automatically. The tendency will surely lead to changes in the way organisations manage liquidity and risks as well as capital allocation.

The facts gathered in the comparison of the works provided by Dadteev et al. (2020), Evdokimov et al. (2023), and Adelakun (2023) also eventually substantiate that the method that makes sense to trust in the hybrid AI models (i.e., a deep learning accompanied by regression-based logic) is the most moderate. They are not just intuitive to get but also too precise to use which makes them applicable in enterprise treasury where reliability and auditory consideration is considered important.

According to the report, evident-value business is established where AI has been implemented in the SAP S/4HANA twists of the treasury processes. There is faster and more suitable treasury forecast, which is more compatible to the actual business condition. A combined financial model with AI facilitates enterprises to no longer operate on the cash management and reactive mode and high treasury planning levels, which will ensure its economic stability and nimbleness in keeping up with constant economic changes.

Conclusion

The study has reached the conclusion that both AI/ML models and SAP S/4HANA could be utilized to considerably increase the degree of accuracy in treasury forecasts resulting in a higher level of efficiency in the related processes. The hybrid ML turned out as the best of the models analysed and showed the high level of accuracy and low errors. The findings demonstrate that the predictive liquidity and the application of the AI-derived forecasting help organizations to predict the cash flow at the increased level of accuracy. It reduces manual usage, and the forecasting cycles are increased at a faster rate. Although this has to be introduced in a gradual graduated process and integration of data must occur it becomes obvious in regard to long term benefits. Financial department treasury AI software allows the departments to make unambiguous selections on real-time ideas and suggestions. The concept of intelligent automation related to the introduction of SAP S/4HANA bears high relevance because, in the framework of the study, it was revealed to contribute to the modernization of the treasury operations and improve the financial control in the case of the enterprises.

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