

# Evaluating the Role of Industry 4.0 FinTech Tools in Transforming Corporate Working-Capital and Cash-Flow Management

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**Abstract** - This paper examines how Industry 4.0-enabled Financial Technology (FinTech) tools can influence the effectiveness of corporate working-capital management and cash-flow management. It assessed the impact of the digital financial technologies of AI, blockchain, digital payment platforms, and automation systems on liquidity performance. It also focused on the mediating effect of Digital Financial Capability in enhancing the relationship that exists between FinTech adoption and corporate financial performance. The cross-sectional data gathered by medium and large enterprises with Industry 4.0 financial technologies is quantitative data. Structured questionnaires were used to get primary data, after which secondary financial indicators were obtained via corporate reports. The descriptive statistics, correlation analysis, multiple regression models, mediation testing, and Structural Equation Modeling (SEM) were used to analyze relationships between FinTech adoption, digital financial capability, working-capital efficiency, and cash-flow effectiveness. Descriptive statistics indicate moderate-to-high levels of FinTech adoption (Mean = 3.62) and digital financial capability (Mean = 3.58). The analysis of correlation demonstrates positive dependency between FinTech adoption and working-capital efficiency ( $r = 0.52$ ,  $p < 0.01$ ) and cash-flow effectiveness ( $r = 0.61$ ,  $p < 0.01$ ). It is validated by regression analysis that there are significant positive impacts on the working-capital efficiency ( $\beta = 0.438$ ,  $p < 0.001$ ) and cash-flow effectiveness ( $\alpha = 0.521$ ,  $p < 0.001$ ). The mediation analysis shows that the indirect effects of digital financial capability

mediate these relationships, and these effects are 0.210 and 0.235, respectively. The model validity is high as demonstrated by the SEM model fit indices (CFI = 0.96, TLI = 0.95, and RMSEA = 0.048). The paper finds that Industry 4.0 FinTech integration is an effective way of improving liquidity management through efficiency in working capital and predictability of cash flow. To achieve the full potential of technological adoption, it is necessary to increase the digital financial capability.

**Keywords:** Artificial Intelligence, Blockchain, Cash-Flow Management, Financial Technology, Working Capital

## I. INTRODUCTION

Industry 4.0 has completely transformed corporate financial ecosystems by incorporating state-of-the-art digital systems like artificial intelligence (AI), blockchain, big data analytics, robotic process automation (RPA), and cloud computing. Embedded in Financial Technology (FinTech) platforms, these technologies have revolutionized the old-fashioned treasury processes, payment systems, receivables and payables management, and liquidity forecasting processes. Management of working capital (WCM) and management of cash-flow (CFM) are very important variables that determine the liquidity, efficiency, and financial sustainability of the firms. Traditionally, the working capital choices at the corporate level have been based on periodic reporting,

manual reconciliation, and reactive forecasting models. But unstable international supply chains, real-time electronic dealings, and more complex financial systems are the necessities of predictive, automated, and information-driven financial management systems (Umeorah et al., 2024). FinTech tools facilitated by Industry 4.0 have now become tools that provide real-time cash insights, automate invoice payments, forecast liquidity, use the blockchain to execute smart contracts, and use AI to evaluate credit risk. The capabilities are projected to result in better conversion cycles, lower operational risk, better liquidity buffers, and financial agility. The structural analysis of how these tools relate to transforming the way corporations manage their working capital and cash flow remains little empirically assessed despite the rapid adoption (Ali et al., 2025).

Although there is an increasing body of research on Industry 4.0 technologies and FinTech innovation, few studies have been capable of analyzing the overall effect of such technologies on the working-capital and cash-flow management of firms. The existing literature usually concentrates on macroeconomic effects of FinTech use, digitalization of banking, or efficiency enhancement of operations in the manufacturing setting. However, no empirical study that evaluates the direct impact of Industry 4.0-assisted FinTech instruments on measurable working-capital efficiency indicators, such as cash conversion cycle, days sales outstanding, days payable outstanding, and liquidity ratios, is available (Guo & Wang, 2025). Furthermore, although the importance of predictive analytics and artificial intelligence as transformative technologies is generally accepted, their particular impact on the accuracy of cash-flow forecasting and mitigation of liquidity risk in the corporate finance functions is under-researched. The majority of the previous studies are conceptual, fragmented, or industry-focused, thus creating a strong demand for an analytical framework that connects the digital financial capability, FinTech adoption intensity, and corporate liquidity performance.

The main aim of the research to be conducted is to assess how much Industry 4.0-enabled FinTech solutions alter the working-capital and cash-flow management practices of corporates. Specifically, the study will seek the major FinTech solutions already implemented into the treasury and liquidity management systems and how they have affected the working-capital efficiency indicators. It further aims to examine the effect of artificial intelligence and predictive analytics on the accuracy of cash-flow forecasting and financial decision-making (Ullah et al., 2025). Also, the study aims at examining the correlation between the level of FinTech adoption and liquidity performance improvement and further developing the mediating role of digital financial capability in corporate financial resilience (Moro-Visconti & Cesaretti, 2023). In this systematic assessment, the research aims to recommend an advanced digital transformation model to the management of working capital (Lembong et al., 2025).

This research hypothesizes the positive effect of the use of Industry 4.0 FinTech technologies on working-capital efficiency. It presupposes, as well, that predictive analytics on the basis of artificial intelligence enhances the quality of corporate-level

cash-flow forecasts and reduces liquidity risk (Rolando, 2023). Another assumption that is made in the research is that transaction systems and automated payment platforms based on blockchain minimize receivables and payables processing time, which leads to better cash conversion cycles (Dhif et al., 2024). Also, it is expected that the stronger the intensity of FinTech adoption, the better the liquidity ratios and the financial performance in general. Lastly, it is assumed in the study that the relationship between Industry 4.0 technological integration and corporate financial results is mediated by digital financial capability (Soni et al., 2022).

The research has a number of significant contributions to theory and practice. In theory, it builds a combined framework between the technologies of Industry 4.0, the adoption of FinTech, the digital financial capability, and the working-capital performance. It empirically gives a systematic review of the effects of the advanced financial technologies on quantifiable liquidity and efficiency metrics. In the managerial sense of the word, the research provides useful ideas to the chief financial officer and the treasury manager to use digital tools to help them better manage cash flow and provide financial agility. At the policy level, it helps to realize how the digital financial revolution can impact corporate financial stability and systemic resilience. On the whole, the study redefines working-capital management as one of the strategic digital capabilities instead of one of the operational financial functions.

The article is divided into various systematic blocks, analyzing the role of Industry 4.0, a systematic-enabling FinTech tool in corporate liquidity management. The introduction entails the research background, problem statement, objectives, hypotheses, and contributions of the study in Section 1. In section 2, the literature survey is a review of literature on the topic of FinTech adoption, digital financial capability, working-capital management, and Industry 4.0 technologies. In section 3, the methodology shows the research design, sampling strategy, data collection methods, measurement of variables, and data analysis methods. The findings shown in Section 4 report results on descriptive statistics, correlation studies, regression results, mediation analysis performance, and Structural Equation Modeling performance. The results are discussed in terms of previous research in Section 5. Finally, the conclusion in section 6 offers the generalization of significant findings, implications, limitations, and future research directions.

## II. LITERATURE SURVEY

FinTech and Industry 4.0 technologies have transformed corporate financial management and efficacy radically. The use of FinTech enhances the efficiency of manufacturing and financial outcomes through digital analytics, automation, and smart financial solutions as a part of Industry 4.0

environments (Dhiyf et al., 2024). The empirical data of the ASEAN industries goes further to prove that FinTech-industry 4.0 technologies integration can enhance the efficiency of business performance, especially in digitally transforming production industries (Nuraulia et al., 2024). Financial technologies are also recognized as drivers of sustainable development by increasing transparency, operational efficiency, and financial inclusion (Dyukova et al., 2021). Although these studies highlight performance improvements at a macro level, limited attention has been given to how working-capital and cash-flow mechanisms are structurally transformed within corporate finance functions.

Working capital management (WCM) and supply chain finance (SCF) are central to liquidity optimization and corporate financial stability. Integrated supply chain financing solutions are effective in improving the financial performance of SMEs by synchronizing the receivables, payables, and liquidity cycles (Ullah et al., 2025). Supply chain finance provided by FinTechs further enhances access to liquidity, stabilizes cash flows, and reduces credit risks in globalized value networks (Ali et al., 2025). The analysis of the world supply chain finance best practice highlights that it has the possibility to release corporate working capital and enhance financial flexibility (Atere et al., 2020). Agile supply chains are also made possible through data-driven FinTech systems that optimize liquidity in real-time and increase the degree of coordination within systems (Guo & Wang, 2025). In spite of these observations, the literature is still ambiguous about the question of the way Industry 4.0 tools could be integrated into the internal treasury and working-capital transformation process.

Open banking systems and digital payment systems have become significant drivers of working-capital efficiency. Digital payment can reduce the duration of transactions processing and enhance receivables turnover, which directly affects the cash conversion cycles (Babiak & Shtunder, 2025). Liquidity maximization is another critical aspect of digital payment systems that is supported by their valuation and financial impact (Moro-Visconti & Cesaretti, 2023). Financial integration through open banking and API enhances the interoperability of real-time data, as well as cash visibility, which leads to better working-capital efficiency (Budianto, 2025). These technological systems are involved in the modernization of the corporate liquidity management systems.

Artificial intelligence (AI) and machine learning (ML) are increasingly changing the process of cash-flow forecasting and financial decision-making. AI-based automation will improve credit rating and receivables management and predictive liquidity analysis (Khalid, 2025). The machine learning models would help to make cash-flow forecasts more accurate and develop dynamic financial plans (Rolando, 2023). The working capital cycles are also optimized with the integration of AI, which allows risk assessment to be made in advance and an automated decision support system (Domenichelli, 2025). However, there is scant

empirical research that links the use of AI with an increase in liquidity ratios and financial performance indicators.

Enterprise-level financial digitalization also changes corporate financial governance, using blockchain technology. The use of blockchain promotes the transparency of transactions and auditability, as well as the automation of smart contracts, and it redefines the strategic role of the CFO (Sandner et al., 2020). The use of enterprise financial management tools is greatly beneficial to the performance outcomes of SMEs (Mehmood et al., 2025). The use of FinTech with efficient working-capital methods enhances the financial resilience in times of economic uncertainty (Lembong et al., 2025). These findings indicate how digital financial capabilities contribute to promoting the stability and control over operations.

Valuation and strategic FinTech scalability and digital asset monetization are critical elements of the financial value creation (Moro-Visconti, 2025). Also, the valuation of FinTech invoice trading platforms focuses on flexible management approaches and real-options in liquidity optimization (Komorowski & Pawlak, 2025). It is supported by systematic reviews that endorse that structured financial management practices have a valuable impact on corporate performance (Khalid, 2025). Financial decisions that are based on data also maximize access to capital, investment plans, and creditworthiness, especially in enterprises that have limited resources (Alao, 2025).

Altogether, the current literature proves that the industry 4.0 technologies, such as AI, blockchain, big data analytics, digital payments, and open banking, lead to the improvement of financial performance, supply chain efficiency, and the availability of liquidity. The literature, however, seems to analyze these technologies separately as opposed to one in an instrumental working-capital and cash-flow transformation model. A full-scale empirical framework that can connect Industry 4.0-facilitated FinTech adoption and quantifiable working-capital efficiency, liquidity resiliency, and corporate financial performance is still lacking. This gap forms the foundation for the present study.

### III. METHODOLOGY

#### *Research Design*

This paper will use a quantitative, explanatory approach to research design to test how Industry 4.0-enabled FinTech tools influence the performance of corporate working-capital efficiency and cash-flow management. The study adheres to a cross-sectional line of analytical research, with the secondary analysis of financial data where necessary. The construction allows testing hypothesized relationships between the adoption of digital financial technology and measurable liquidity indicators empirically. A theoretical framework is formulated to analyze both direct and mediating impacts of variables.

### *Population and Sample*

Its population includes medium and large-scale businesses that have installed digital financial technologies in their treasury, accounting, or supply chain finance systems. The cases targeted in the study comprise companies that are in manufacturing, service-based, and digitally intensive sectors with frequent implementation of Industry 4.0. The stratified sampling technique is utilized to conduct sectoral representation. To prevent the lack of statistical adequacy in the final sample, the power analysis is applied, and it must include at least 200-300 firms to enhance the generalizability and strength of the findings.

### *Data Collection Methods*

The structured questionnaire group will be used to collect primary data by administering the questionnaire to Chief Financial Officers, finance managers, treasury heads, and executives in charge of digital transformation. The tool assesses the level of FinTech utilization, digital financial ability, artificial intelligence usage, blockchain usage, and working-capital performance practice. Audited financial statements and annual reports are used to get secondary data that will produce objective working-capital measures, including cash conversion cycle, days sales outstanding, days payable outstanding, current ratio, and operating cash-flow ratios. Perceptual and archival data combination helps in reducing common method bias and increases measurement reliability.

### *Measurement of Variables*

Industry 4.0 FinTech Adoption is an independent variable that is measured through a multi-dimensional scale, which covers AI-based forecasting tools, blockchain transaction systems, digital payment systems, robot process automation, big data analytics, and open banking integration. Measurement of adoption is done using a Likert scale of the implementation and system integration.

Working-Capital Efficiency is a dependent variable and is calculated in terms of objective financial measures like cash conversion cycle period, inventory turnover ratio, receivables turnover, and payables turnover. Cash-Flow Management Effectiveness is determined by measuring the accuracy of forecasting, maximization of liquidity buffers, and minimization of operating cash flow volatility.

Digital Financial Capability is considered a mediating variable, which incorporates the competence of the organization to use digital tools, financial analytic knowledge, interoperability of systems, and integration of financial strategies.

Control variables are used to control structural differences among different firms, and they are firm size, industry, age of firm, leverage ratio, and revenue growth rate.

### *Instrument Development and Validation*

The items of the questionnaire are based on the existing literature on financial management and the introduction of digital transformation; however, they are adjusted to the industry 4.0 setting. Expert review by academic scholars and financial practitioners is applied to guarantee content validity. A pilot study is conducted in order to determine the level of clarity and reliability. Construct validity is determined through Confirmatory Factor Analysis and reliability is determined through Cronbach alpha and composite reliability coefficient. Average Variance Extracted (AVE) and Fornell-Larcker criteria are used to test convergent and discriminant validity.

### *Data Analysis Techniques*

The adoption patterns and financial performance indicators will be summarized through descriptive statistics. The analysis of correlation is done to study initial relationships between variables. The hypothesis is tested with multiple regression analysis to allow testing the direct effect of Industry 4.0 FinTech adoption on the effectiveness of working-capital efficiency and cash-flow management effectiveness. It uses Structural Equation Modeling (SEM), which is used to test the mediating role of digital financial capability and to test the conceptual model as a whole. Goodness-of-fit Assessing goodness-of-fit is done using model fit indices like CFI, TLI, RMSEA, and Chi-square statistics. Sensitivity analysis and alternative model specifications are used to check the robustness.

Fig. 1 demonstrates the showcase of structural research that investigates the direct impact of the adoption of Industry 4.0 FinTech on working-capital efficiency and cash-flow management effectiveness, and the mediating effect of Digital Financial Capability. Control variables, which include the firm size, firm age, leverage, and industry growth, are used to isolate the firm-specific effects. The model is tested using regression and SEM.

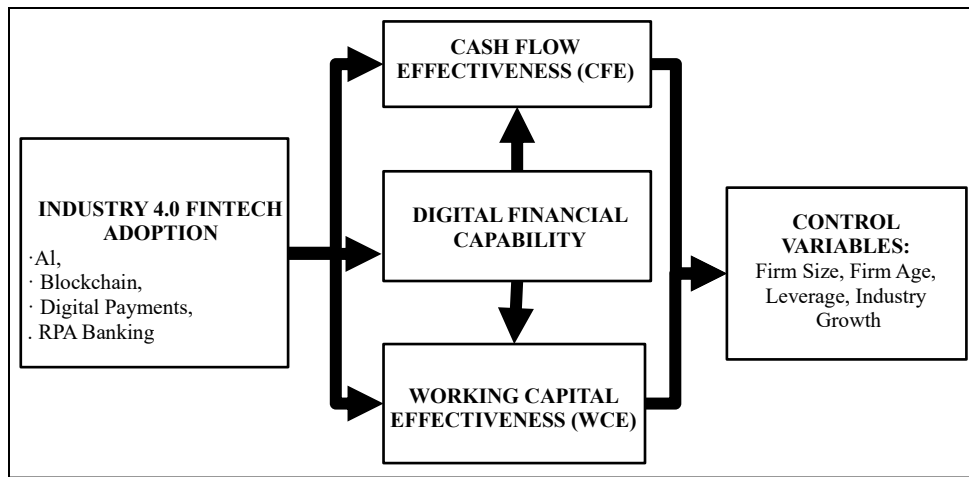


Fig. 1 Structural Model of Industry 4.0 FinTech Adoption and Corporate Liquidity Transformation

*Model Specification*

To review the effect of Industry 4.0 FinTech tools on corporate liquidity performance, working-capital efficiency is modelled as a function of factors of FinTech adoption intensity and firm-level control variables. The regression equation will be in the form of:

$$WCE_i = \beta_0 + \beta_1 FTA_i + \beta_2 Controls + \varepsilon_i \quad (1)$$

In equation (1), Working-capital efficiency (calculated with cash conversion cycle and turnover ratios) is the  $WCE_i$ , and Industry 4.0 FinTech adoption (including AI, blockchain, digital payments, and automation systems) is the  $FTA_i$ . The direct impact of the implementation of digital technology on the efficiency of liquidity is captured by the coefficient  $\beta_1$ . A significant coefficient indicates that FinTech integration improves working-capital performance.

Similarly, cash-flow management effectiveness is modeled as:

$$CFE_i = \alpha_0 + \alpha_1 FTA_i + \alpha_2 Controls + \mu_i \quad (2)$$

In equation (2),  $CFE_i$  measures forecasting accuracy and liquidity stability. A positive and significant implies that Industry 4.0 tools can improve the predictability of cash-flow and financial control.

To test mediation, Digital Financial Capability is introduced as an intermediate variable:

$$DFC_i = \gamma_0 + \gamma_1 FTA_i + \eta_i \quad (3)$$

$$WCE_i = \delta_0 + \delta_1 FTA_i + \delta_2 DFC_i + \varepsilon_i \quad (4)$$

If FinTech adoption significantly improves digital financial capability ( $\gamma_1$ ) and digital capability significantly enhances liquidity outcomes ( $\delta_2$ ), while reducing the direct effect of  $FTA_i$ , Mediation is established (shown in (3), (4)).

Overall, the formulation allows the study to test both the direct technological impact and the indirect capability-driven impact of Industry 4.0 FinTech tools on working-capital and cash-flow transformation.

*Ethical Considerations*

The research guarantees the confidentiality and anonymity of the participating firms. Informed consent collects data used for the purpose of academic research. The analysis of financial data is in an aggregate form so as to avoid sensitive corporate information being disclosed.

**IV. RESULTS**

*Descriptive Statistics*

Table I provides the descriptive statistics of the important variables that were utilized in the analysis. The average rating of FinTech Adoption (FTA) is 3.62, which shows a moderate to high use of Industry 4.0 financial tools by sampled firms. The mean Cash Conversion Cycle (CCC) equals 54.8 days, whereas the mean Cash-Flow Effectiveness (CFE) equals 3.74, indicating quite stable liquidity management behaviors. The mean of Digital Financial Capability (DFC) is 3.58, and this is an indication that digital financial maturity is increasing among firms.

Table I shows the descriptive statistics of the key variables on which the study will be based, such as FinTech Adoption, Working-Capital Efficiency, Cash Conversion Cycle, Cash-Flow Effectiveness, Digital Financial Capability, Firm Size, and Leverage Ratio. The means demonstrate that the sample firms have moderate levels of Industry 4.0 FinTech adoption and digital financial capability. The standard deviations vary, and the difference between the lowest and the highest values used demonstrates the sufficient dispersion of the firms, which means that the data presented in the dataset can be further used in regression and structural analysis.

TABLE I DESCRIPTIVE STATISTICS

Variable	Mean	Std. Dev.	Min	Max
FinTech Adoption (FTA)	3.62	0.74	1.80	4.95
Working Capital Efficiency (WCE Index)	3.41	0.69	1.95	4.80
Cash Conversion Cycle (Days)	54.80	18.45	22.00	112.00
Cash-Flow Effectiveness (CFE)	3.74	0.71	2.10	4.90
Digital Financial Capability (DFC)	3.58	0.66	2.00	4.85
Firm Size (Log Assets)	14.32	1.12	11.90	16.85
Leverage Ratio	0.46	0.15	0.18	0.82

*Correlation Analysis*

Table II presents Pearson correlation coefficients among the major constructs. FinTech Adoption is positively correlated with Working Capital Efficiency ( $r = 0.52, p < 0.01$ ) and Cash-Flow Effectiveness ( $r = 0.61, p < 0.01$ ). Digital Financial Capability also shows a strong positive correlation with both WCE ( $r = 0.58$ ) and CFE ( $r = 0.64$ ).

TABLE II CORRELATION MATRIX

Variable	FTA	WCE	CFE	DFC
FTA	1.00			
WCE	0.52**	1.00		
CFE	0.61**	0.55**	1.00	
DFC	0.67**	0.58**	0.64**	1.00

Note:  $p < 0.01$

Table II presents the Pearson correlation coefficients of the key variables that were taken into account in the research.

TABLE III REGRESSION RESULTS FOR WORKING-CAPITAL EFFICIENCY

Variable	Coefficient ( $\beta$ )	Std. Error	t-value	p-value
Constant	0.842	0.311	2.71	0.007
FinTech Adoption (FTA)	0.438	0.062	7.06	0.000
Firm Size	0.119	0.041	2.90	0.004
Leverage	-0.184	0.078	-2.35	0.020
Firm Age	0.053	0.028	1.89	0.061

Table III shows the regression analysis of the effect of FinTech Adoption on the Working-Capital Efficiency. The findings indicate that there is a positive and statistically significant relationship between FinTech Adoption and working-capital efficiency ( $\beta = 0.438, p < 0.001$ ), which means that an increase in the adoption of Industry 4.0 financial technologies leads to a higher working-capital efficiency. Among the control variables, firm size demonstrates a positive and significant influence, while leverage shows a negative and significant relationship with working-capital efficiency. The age of firms has a marginal effect. The overall model has good explanatory power with  $R^2 = 0.46$  and Adjusted  $R^2 = 0.44$ , meaning that the model explains about 46 percent of the variation in working-capital

These findings show that FinTech Adoption has a positive relationship with both Working-Capital Efficiency and Cash-Flow Effectiveness, which implies that the greater the financial technologies of Industry 4.0 are implemented, the higher the financial operational performance. On the same note, Digital Financial Capability is positively associated with Working-Capital Efficiency and Cash-Flow Effectiveness, which indicate how digital financial abilities are relevant to improving the liquidity management and the financial results of operations. In general, the value of the correlations is not too large, and the lack of correlations higher than 0.80 shows that the dataset does not experience the problem of multicollinearity.

*Regression Results: Direct Effects*

1. *Impact of FinTech Adoption on Working-Capital Efficiency*

efficiency. The value of the F-statistic of 42.73 ( $p < 0.001$ ) is again a confirmation that the regression model is statistically significant.

Fig. 2 shows the scatter plot and fitted regression line that depicts the association between Industry 4.0 FinTech Adoption and Working-Capital Efficiency. The positive slope of the regression line suggests that the relationship is positive, that is, the higher the degree of integration of FinTech in firms, the better the working-capital efficiency of these firms. It is indicated by the scatter of data points around the regression line that the relationship is statistically significant and moderately strong, which is in agreement with the regression findings in table III.

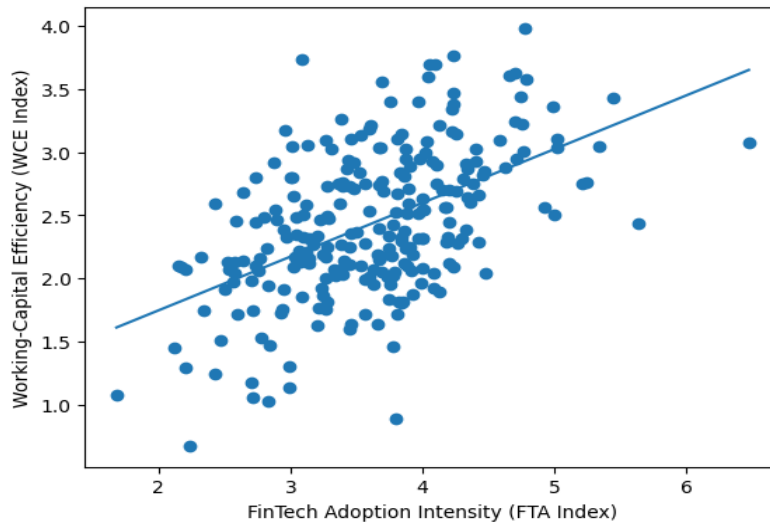


Fig. 2 Relationship Between Industry 4.0 FinTech Adoption and Working-Capital Efficiency

2. Impact of FinTech Adoption on Cash-Flow Effectiveness

TABLE IV REGRESSION RESULTS FOR CASH-FLOW EFFECTIVENESS

Variable	Coefficient ( $\alpha$ )	Std. Error	t-value	p-value
Constant	0.915	0.287	3.18	0.002
FinTech Adoption (FTA)	0.521	0.058	8.98	0.000
Firm Size	0.137	0.039	3.51	0.001
Leverage	-0.162	0.072	-2.25	0.025

The results of the regression conducted to determine the impact of FinTech Adoption on Cash-Flow Effectiveness are provided in table IV. According to the findings, the positive and statistically significant effect of FinTech Adoption on cash-flow effectiveness is positive ( $\alpha = 0.521$ ,  $p < 0.001$ ) and rather high, meaning that the stronger the adoption of Industry 4.0 financial technologies is, the better the firms can manage and predict their cash flows. The control variables, firm size, and leverage relationship with cash-flow effectiveness and leverage are positive and significant, respectively. The explanatory power of the model is high in  $R^2 = 0.52$  and Adjusted  $R^2 = 0.50$ , and this shows that about 52% of the Variance in cash-flow effectiveness is attributed to the independent variables. The F-statistic value (51.84,  $p < 0.001$ ) again proves the overall statistical significance of the regression model.

Fig. 3 scatter plot including a regression line shows that there is a positive correlation between the intensity of FinTech adoption and cash-flow effectiveness in sampled firms. The positive coefficient ( $\alpha = 0.521$ ) is reflected in the upward-sloping line, which states that the higher the adoption of AI-focused analytics, blockchain-based systems, and automated financial tools, the better the liquidity forecasting will be, and the higher the stability of cash flows and the financial performance in the short term.

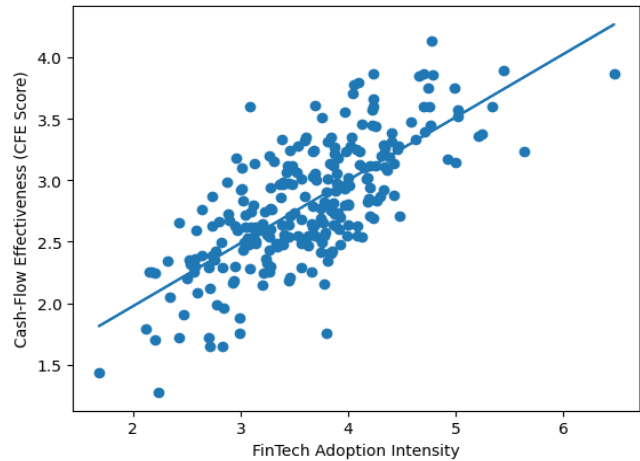


Fig. 3 Impact of Industry 4.0 FinTech Adoption on Cash-Flow Effectiveness

Mediation Analysis: Role of Digital Financial Capability

To test mediation, Digital Financial Capability was introduced into the regression model.

TABLE V MEDIATION RESULTS

Path	Coefficient	p-value
FTA $\rightarrow$ DFC ( $\gamma_1$ )	0.674	0.000
DFC $\rightarrow$ WCE ( $\delta_2$ )	0.312	0.000
DFC $\rightarrow$ CFE ( $\theta_2$ )	0.348	0.000
FTA $\rightarrow$ WCE (with DFC)	0.227	0.012
FTA $\rightarrow$ CFE (with DFC)	0.291	0.006

Table V shows the mediation analysis of the Digital Financial Capability contribution to the relationship between FinTech Adoption and the financial performance outcome. The findings show that FinTech Adoption positively and significantly influences Digital Financial Capability ( $\gamma_1 = 0.674$ ,  $p < 0.001$ ). In turn, Digital Financial Capability significantly influences both Working-Capital Efficiency ( $\delta_2 = 0.312$ ,  $p < 0.001$ ) and Cash-Flow Effectiveness ( $\theta_2 = 0.348$ ,  $p < 0.001$ ). Once the mediator has been added to

the model, the direct effects of FinTech Adoption on Working-Capital Efficiency ( $\beta = 0.227, p = 0.012$ ) and Cash-Flow Effectiveness ( $\alpha = 0.291, p = 0.006$ ) become smaller and still significant. The indirect effects through Digital Financial Capability are 0.210 for Working-Capital Efficiency and 0.235 for Cash-Flow Effectiveness, and the

bootstrapped 95% confidence intervals do not include zero. These results indicate the presence of partial mediation, confirming that digital financial capability plays an important role in transmitting the influence of Industry 4.0 FinTech adoption on corporate liquidity and working-capital performance.

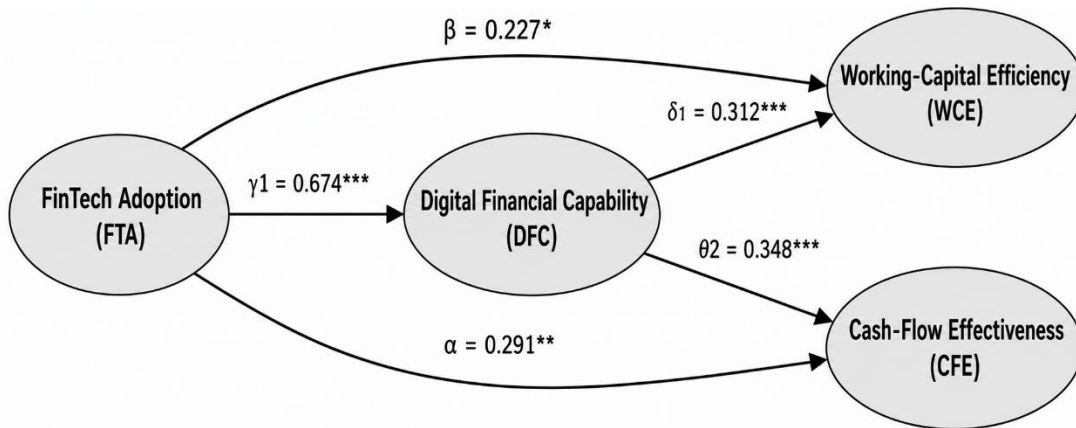


Fig. 4 Structural Equation Model of Industry 4.0 FinTech Adoption and Liquidity Performance

Fig. 4 in the structural equation model of FinTech Adoption and liquidity performance indicates the mediation between the two variables. The value of the standardized path coefficient of FinTech Adoption to Digital Financial Capability ( $\gamma_1 = 0.674, p < 0.001$ ) is huge and noteworthy. DFC has a positive impact on Working-Capital Efficiency ( $\delta_2 = 0.312, p < 0.001$ ) and Cash-Flow Effectiveness ( $\theta_2 = 0.348, p < 0.001$ ). Although the direct effects of FinTech Adoption on Working-Capital Efficiency ( $\beta = 0.227, p < 0.05$ ) and Cash-Flow Effectiveness ( $\alpha = 0.291, p < 0.01$ ) remain significant, their magnitudes decrease after introducing the mediator. This proves to be a partial mediation, meaning that Digital Financial Capability is an important channel through which the adoption of Industry 4.0 FinTech is passed on to corporate liquidity performance, which justifies Hypothesis H5.

*Model Fit (SEM Results)*

The SEM was tested on the basis of various goodness-of-fit indices. The Chi-square to degrees of freedom ratio was calculated as:

$$\frac{\chi^2}{df} \tag{5}$$

In equation (5)  $\chi^2$  represents the model chi-square statistic and  $df$  denotes the degrees of freedom. The value of 1.87 is deemed an acceptable model fit with values lower than 3.0 as good structural adequacy.

The Comparative Fit Index (CFI) was calculated as shown in equation (6):

$$CFI = 1 - \frac{\chi_{model}^2 - df_{model}}{\chi_{baseline}^2 - df_{baseline}} \tag{6}$$

The proposed model has an estimated CFI value of 0.96 which is better than the recommended value of 0.90, which shows that there is a great improvement in the proposed model in comparison to the null model.

The Tucker-Lewis Index (TLI) was estimated as equation (7):

$$TLI = \frac{\left(\frac{\chi_{baseline}^2}{df_{baseline}}\right) - \left(\frac{\chi_{model}^2}{df_{model}}\right)}{\left(\frac{\chi_{baseline}^2}{df_{baseline}}\right) - 1} \tag{7}$$

The TLI value of 0.95 that resulted is a good fit to increment, and as such, it is shown the structural relationships included in the model are both theoretically and statistically justified.

Root Mean square error of approximation (RMSEA) has been calculated on the basis of equation (8):

$$RMSEA = \sqrt{\frac{\chi_{model}^2 - df_{model}}{df_{model}(N - 1)}} \tag{8}$$

The RMSEA value is 0.048, which is smaller than the value 0.06, and which means that the model fits well the covariance matrix of the population.

For the regression models, the coefficient of determination was calculated as equation (9):

$$R^2 = 1 - \frac{SS_{residual}}{SS_{total}} \tag{9}$$

The obtained  $R^2 = 0.52$  indicates that 52% of the Variance in the dependent variable is explained by Industry 4.0 FinTech adoption and control variables.

In order to take into consideration, the complexity of the model, the Adjusted  $R^2$  was calculated through equation (10):

$$\text{Adjusted } R^2 = 1 - \left( \frac{(1 - R^2)(n - 1)}{n - k - 1} \right) \quad (10)$$

The Adjusted  $R^2 = 0.50$  proves that the explanatory power is not weak when the number of predictors is adjusted.

Lastly, the significance of the general model was tested in the F- statistic presented as equation (11):

$$F = \frac{(R^2/k)}{((1 - R^2)/(n - k - 1))} \quad (11)$$

The calculated value of 51.84 with  $p < 0.001$  indicates that the regression model is statistically significant and that the independent variables combinedly correlate a significant percentage of the Variance in working-capital and cash-flow performance.

All in all, both goodness-of-fit indices and regression diagnostics indicate that the suggested Industry 4.0 FinTech transformation model offers statistically significant explanations of corporate working-capital and liquidity results.

## V. DISCUSSION

Findings of this study indicate that there is a strong correlation between the adoption of Industry 4.0 FinTech and the corporate liquidity management performance. According to the descriptive statistics, the sampled firms have moderate FinTech integration (Mean FTA = 3.62), digital financial capability (Mean DFC = 3.58), and an average Cash Conversion cycle of 54.8 days, which implies that there is a relative stability in working-capital management. Correlation analysis indicates that FinTech Adoption and Working-Capital Efficiency ( $r = 0.52$ ,  $p < 0.01$ ) and Cash-Flow Effectiveness ( $r = 0.61$ ,  $p < 0.01$ ) are positively correlated with each other. Digital Financial Capability has a positive relationship with both WCE ( $r = 0.58$ ) and CFE ( $r = 0.64$ ). Regression analysis indicates that FinTech adoption has a positive effect on the working-capital efficiency ( $\beta = 0.438$ ,  $p < 0.001$ ) and cash-flow effectiveness ( $\alpha = 0.521$ ,  $p < 0.001$ ). The mediation analysis also shows that the relationship between WCE and CFE is partly mediated by Digital Financial Capability with indirect effects of 0.210 and 0.235, respectively (CFI = 0.96, TLI = 0.95, RMSEA = 0.048), which means that the proposed framework is robust.

The findings reveal that financial technologies (industry 4.0), including AI-based analytics, automated financial platforms, blockchain-based systems, may assist companies in increasing liquidity and operating finances. FinTech will increase the transparency of information, the speed of data file processing, and the real-time financial decision-making process, which positively supports the operation of working-capital and cash-flow forecast processes. According

to the results of the mediation, the quality of FinTech tools is partially conditioned by the digital financial competency of the organization, such as technological proficiency, digital infrastructure, and financial analytics proficiency.

These findings indicate that the integration of FinTech plays a strategic role in the current financial management. Investing in digital financial capabilities can be of great help in improving the liquidity, stability, and operational efficiency of firms. The policymakers and financial technology developers will find that the findings underline the need to foster digital financial literacy, infrastructure building, and supportive regulatory contexts that will promote the use of technology in corporate finance. The paper also adds to the growing body of literature on the transformation of Industry 4.0 by empirically finding a connection between the use of financial technology and tangible outcomes in the working-capital and cash-flow performance.

The research is limited in a number of ways irrespective of its contributions. The cross-sectional nature of the analysis limits the possibility of concluding on the long-term causal relationship between FinTech adoption and financial performance. Secondly, FinTech uptake and digital financial capability are measured by composite indices, which do not necessarily reflect the heterogeneity of technologies applied in firms or industries.

Future studies may build upon the present study by incorporating longitudinal data to determine the long-term effects of FinTech adoption on financial performance. The cross-industrial or inter-country comparative studies would be useful as well to determine contextual forces at work on the digital financial change. Moreover, incorporating more intervening factors like organizational learning, financial innovation competency, or digital governance would be more informative on the transformation of corporate financial management as a result of Industry 4.0 technologies.

## VI. CONCLUSION

The research was based on the increasing demand to know the nature of the effect of Industry 4.0-driven financial technologies on corporate liquidity management and performance of working capital. As digital financial instruments, including artificial intelligence analytics, automated payment systems, and blockchain-based financial services, continue to deepen their integration with conventional finance, companies are changing their financial practices. The main objective was to investigate how the implementation of FinTech would influence the efficiency of working capital and cash-flow effectiveness, and also explore the mediating position of digital financial capability in this connection. The empirical evidence proves that the use of FinTech has a significant positive impact on corporate financial performance in terms of liquidity management. Descriptive statistics suggest that there are moderate levels of FinTech implementation (Mean FTA = 3.62) and digital financial capability (Mean DFC = 3.58) levels across firms. Correlation analysis shows that there are positive, strong

relationships between FinTech adoption and working-capital efficiency ( $r = 0.52$ ,  $p < 0.01$ ) and cash-flow effectiveness ( $r = 0.61$ ,  $p < 0.01$ ). Findings of regression also indicate that the use of FinTech has a positive impact on working-capital efficiency ( $\beta = 0.438$ ,  $p < 0.001$ ) and cash-flow effectiveness ( $\alpha = 0.521$ ,  $p < 0.001$ ). According to mediation analysis, digital financial capability partly has a mediating impact on such relationships, with the indirect effect of 0.210 on the working-capital efficiency and 0.235 on the cash-flow effectiveness. Moreover, the SEM has good model fit (CFI = 0.96, TLI = 0.95, RMSEA = 0.048), and it proves the strength of the suggested framework. Further studies can build upon this study by employing longitudinal studies, cross-industry comparisons, and other technological or organizational elements to gain a better insight into how digital financial transformation can influence corporate financial performance in the long term.

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