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FROM FINTECH TO FINANCIAL RESILIENCE: HOW OPERATIONAL STRATEGY TRANSFORMS DIGITAL INNOVATION INTO RISK MANAGEMENT EFFECTIVENESS

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Abstract

This paper investigated how fintech practices influence risk management effectiveness, with operational strategy serving as a strategic bridge, in the research of the Saudi Stock Exchange (Tadawul). The researcher adopted a quantitative research design based on Partial Least Squares Structural Equation Modeling (PLS-SEM). Data was collected from 370 managers working in financial and investment institutions listed under Tadawul. The study examined how fintech practices, particularly digital payment infrastructure, performance analytics, and training programs, contribute to strengthening risk management effectiveness through their role in supporting operational strategy. Structural equation modeling was employed to test the hypothesized relationships and to assess the bridging role of operational strategy. The findings indicate that fintech practices improve risk management effectiveness by enhancing operational agility, strengthening data-driven decision-making, and enabling proactive identification of financial and operational risks. Moreover, operational strategy was found to play a central bridging role by translating fintech practices into organized strategic and operational improvements that reinforce institutional resilience and strengthen control mechanisms. The findings also show that fintech practices serve as effective effectiveness of risk management effectiveness in the digital age by supporting alignment between technological transformation and strategic operational capabilities. To enhance the resilience of institutions within Tadawul, the study recommends that listed institutions increase investment in fintech infrastructure, digital workforce development, and operational optimization systems in order to maintain sustainable financial performance.

Keywords: *Digital FINANCE*, *E-Fintech, FINANCE Practices, Big Data Analytics, Risk Management Effectiveness, Financial Innovation.*

1. INTRODUCTION

The recent decade is marked by the radical change of the financial and investment environment in Saudi Arabia due to the increased use of electronic Fintech (E-FINANCE) systems and digital technologies. In the Saudi Stock Exchange (known as Tadawul), these changes have redefined

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conventional management and operational systems that saw institutions shift their manual and paper-based Fintech operations to online platforms that can increase the visibility of risks, operational effectiveness, and agility of the workforce (Al-Mutairi and Al-Dossary, 2023).

FINTECH practices now have been an established strategic necessity and not a technological decision since organizations are trying to remain competitive and also to be able to comply with the ever-changing rules of financial governance in the Saudi market. E-FINANCEs capture an extensive scope of digital practices such as recruitment, Financial Data Security, performance analytics and digital engagement platforms on the employee side. These applications have also increased the visibility, speed, and accuracy of Fintech (FINANCE) business making it possible to gain real-time information about workforce performance, turnover rates and operational risks (Ahmad and Al-Mubarak, 2022). In the case of financial institutions that are listed in Tadawul, FINTECH systems help them make better and data-informed decisions, especially when it comes to identifying and reducing human and operational risks. FINTECH enables risk managers to pay attention to strategic planning and proactive control mechanisms that are necessary to ensure institutional resilience by automating repetitive tasks and allowing predictive workforce analytics. Digital FINANCE transformation has emerged as a conclusive determinant in the demonstration of continuity, compliance, and sustainability of operations in the context of risk management. With the digital integration of FINANCE processes into institutional operations, the institutions will be able to predict the possible disruptions, track the adherence of the employees, and react quickly to the new financial or operational risks (Khan et al., 2024). The performance of the practices is however highly dependent on the Financial Innovation of the organization which dictates the alignment of digital systems and the overall institutional objectives. Financial Innovation can be seen as a mediator, converting FINTECH initiatives into the quantifiable increase of efficiency, flexibility, and risk responsiveness (Al-Harbi, 2024). Although the importance of *fintech* in performance improvement has become reflected, empirical studies are few that explore the contribution of FINTECH to risk management performance based on its ability to align operations strategically in the Saudi financial sector. Most of the literature has been done on technological level of digital transformation and automation without addressing the operational processes that guarantee successful implementation (Mahdi and Al-Suwailem, 2024). Consequently, the current research is related to this gap since it evaluates the interaction between FINTECH practices and Financial Innovation to enhance the risk management capacity of Tadawul-listed institutions (Al-Hawamdeh et al., 2024). The objectives of this paper (ROs) are as follows:

RO1: *To analayse the impact of Fintech practices, in this case, Digital Payment Infrastructure, Financial Data Security, and performance analytics on the effectiveness of risk management in Tadawul-listed companies.*

RO2: *To examine the mediating importance of Financial Innovation in the association between fintech practices and risk management performances in the Saudi Stock Exchange.* This paper is contribution Ing to theoretical and empirical knowledge regarding how digital FINANCE integration can be used as a strategic facilitator of risk management performance. It provides insightful information on how technological innovation, human capability, and operational alignment can come together in creating institutional resilience, stability and performance in the changing financial ecosystem in Saudi Arabia.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

The computerization of FINANCE management has emerged as one of the critical processes of institutional risk management performance and operational stability. At the Saudi Stock Exchange, the incorporation of fintech practices, such as Digital Payment Infrastructure, Financial Data Security, and big data analytics, is one of the main components involved in facilitating the use of data to make decisions, create a workforce that is more ready, and improve organizational control mechanisms.

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When these practices are aligned with the Financial Innovation, the institutions will be able to improve compliance, agility, and proactive risk identification (Al-Harbi, 2024)

2.1 Big Data Analytics and Financial Innovation

Big data analytics is the methodical application of sophisticated methods of analysis and digital instruments to find insights in massive data to know more about strategic decision-making. In the financial institutions, it improves capacity to predict, operational visibility, and strategic alignment within the departments (Zhou and Ahmed, 2023). Analytics help organizations to optimize the usage of resources, predict disruptions, and align operational strategies with forecasting models based on data. The Tadawul context would enable the creation of more flexible and risk-receptive operational systems tFinanceough the introduction of analytics into FINANCE and operations. Therefore, the hypothesis can be written as follows:

H1: Big data analytics has a significant positive effect on Financial Innovation.

2.2 Big Data Analytics and Risk Management Effectiveness

Big data analytics offers a proactive process of identification, monitoring, and reduction of institutional risks. Using data-oriented insights, financial institutions will be in a position to predict the tendencies of risk, decrease uncertainty and enhance compliance frameworks (Kamal et al., 2023). At Tadawul, risk management is performed based on analytics to provide more precise assessment of the operational work and reveal financial weaknesses early to promote institutional stability and quality of governance. Therefore, the hypothesis can be stated as follows:

H2: Big data analytics has a significant positive effect on risk management effectiveness.

2.3 Digital Payment Infrastructure and Financial Innovation

Online recruiting is the next-generation of hiring where online platforms, automated screening applications, and data-based candidate assessments are used to support hiring. It allows the organizations to create agile, skillful, and digitally able workforces corresponding to the strategic operations (Rahman and Al-Mutairi, 2023). In Tadawul-listed organizations, the introduction of Digital Payment Infrastructure will increase the coordination of the workforce with the operational objectives, so that the human capital is aligned with the effective strategy and operational flexibility (Alrjoubet al., 2021). Therefore, the hypothesis can be stated as follows:

H3: Digital Payment Infrastructure has a significant positive effect on Financial Innovation.

2.4 Digital Payment Infrastructure and Risk Management Effectiveness

Good recruitment using digital technologies allows organizations to recruit employees with good analytical and compliance-oriented skills that are required in risk sensitive environments. The application of Digital Payment Infrastructure in the FINANCE practices will help institutions to make sure that its workforce is involved in the improvement of monitoring, reporting, and control systems (Al-Qahtani, 2024). The integration will increase institutional preparedness and reduce human error that frequently contributes to operational and financial risks. Therefore, the hypothesis can be stated as follows:

H4: Digital Payment Infrastructure has a significant positive effect on risk management effectiveness.

2.5 Financial Data Security and Financial Innovation

The Financial Data Security offers digital learning platforms, which enhance the adaptability, skill building and strategic orientation of the employees. E-learning systems, simulation, and online knowledge platforms can increase the level of responsiveness of employees to organizational change

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and technological innovation (Mahdi and Al-Suwailem, 2024). Financial Data Security helps to carry out the operation strategy in the Tadawul-listed organizations because the employees have the digital and analytical skills needed to perform efficiently and comply with the requirements (Alkhazaleh et al., 2023). Therefore, the hypothsis can stated as follows:

H5: Financial Data Security has a significant positive effect on Financial Innovation.

2.6 Financial Data Security and Risk Management Effectiveness

Digital platform training can also have a positive impact on risk management because it enhances employee awareness, technical skills, and compliance (Li and Khan, 2023). Financial institutions manage to enhance the capacity of their workforce to detect and mitigate operational risks tFinanceough continuous e-learning. TFinanceough this process the overall institutional resiliency is improved by instilling a culture of constant learning and data literacy as well as learning to proactively solve problems into the workforce. Therefore, the hypothesis as follows:

H6: Financial Data Security has a significant positive effect on risk management effectiveness.

2.7 Financial Innovation and Risk Management Effectiveness

Financial Innovation refers to the organized design by which the organizations control processes, resources, and technology to be efficient and reduce the risk factor. The strategy developed properly makes the organizational systems flexible, transparent, and responsive to environmental changes (Al-Mubarak, 2024).

At Tadawul, there is alignment of FINANCE practices and operational strategies that allows the organization to implement consistent monitoring and control that improves the capacity of the institution to prevent and respond to any possible risks. Therefore, the hypothesis can be stated as follows:

H7: Financial Innovation has a significant positive effect on risk management effectiveness.

2.8 Conceptual Model and Theoretical Foundation

The theoretical frameworks used in this study are based on two, which are complementary, theoretical frameworks namely, the Resource-Based View (RBV) and the Technology Acceptance Model (TAM). According to RBV (Barney, 1991) such resources as valuable, rare, inimitable, and non-substitutable are the basis of organizational competitiveness. In this respect, fintech practices such as Digital Payment Infrastructure, Financial Data Security, and big data analytics are strategic resources that promote the agility of an institution and risk management. Financial Innovation plays the role of a mechanism that transforms these digital resources into sustainable performance and risk management outcomes.

The TAM (Davis, 1989; Venkatesh and Bala, 2008) is a supplement to the RBV in that it describes how perceived usefulness and ease of use help determine the adoption of technological systems. The application of fintech and analytics in Saudi Stock Exchange is successful only in the case when FINANCE managers and employees are ready to resort to digital tools to make decisions, monitor, and improve the performance.

With the proper assistance of Financial Data Security, the level of user acceptance becomes greater, which results in greater institutional efficiency and effectiveness in risk management, which forms a conceptual framework of the connection among digital FINANCE capabilities, Financial Innovation, and effectiveness in risk management in the digitalized financial environment of Tadawul.

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3. RESEARCH METHODOLOGY

The study design used in this study is a quantitative study that was intended to investigate the effects of *fintech* practices on risk management effectiveness with Financial Innovation as a mediating variable in the Saudi Stock Exchange. The hypothesis proposed was aimed at testing the suggested correlation between Digital Payment Infrastructure, Financial Data Security, big data analytics, Financial Innovation and effectiveness of risk management. Quantitative approach was considered as suitable since it will be possible to statistically validate relationships between latent constructs and will be able to generalize them to the whole range of institutions that work in the same financial environment. The questionnaire was administered to 370 managerial, technical, and FINANCE managers working in financial, investment, and brokerage companies that were listed on the Saudi Stock Exchange, and the data were collected tFinanceough it. The sample population used in the selection of the respondents was stratified random sampling to allow equitable representation of various organizational levels and departments. The research participants were specifically individuals who were engaged in Fintech management, operational planning and risk management functions and this also made sure that they informed the responses based on the experience they had in the areas of the study. The questionnaire was based on five key constructs that had been developed out of the existing research in digital transformation and risk management literature as follows:

1) Digital Payment Infrastructure: Evaluating the effectiveness of finance systems, screening of applicants and Fintech analytics tools to make hiring decisions.
2) Financial Data Security: Assessment of using digital platforms in developing workforce, flexibility in learning and enhancement of skills.
3) Big Data Analytics: Quantifying the degree of analytics tool assisting risk identification, predictive monitoring, and the accuracy of decisions.
4) Financial Innovation: Researching into the alignment of FINANCE digital initiatives into operational structures to optimize processes and make them resilient.
5) Risk Management Effectiveness: Determining the institutional capacity in identifying, evaluating and reducing operational and financial risks.

Questionnaire items were all measured depending on the five-point Likert scale (Strongly Disagree to Strongly Agree), to give the level of agreement to statements regarding each construct. The partial least squares Structural Equation Modeling (PLS-SEM) was used to analyze the data with the SmartPLS 4 software, as it is the method that can be applied to the analysis of complex causal relationships that include mediating variables and latent constructs. The analysis process entailed two key steps i.e.: measurement model and structural model. To test the internal consistency and convergent validity of the measurement model, Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE) were used to evaluate the model. The discriminant validity was checked by the Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio, which proved the uniqueness of every construct. The tests performed within the structural model were the tests of the importance and the strength of hypothesized relationships using path coefficients (β values), p-values, and coefficient of determination (R^2). The test on the statistical significance of direct and indirect relationships was conducted by the bootstrapping approach with 5,000 resamples, especially to confirm the mediation by Financial Innovation between *fintech* practices and risk management effectiveness. Before the huge survey, the questionnaire was subjected to expert scrutiny by scholars on the field of *fintech* systems, risk management and financial processes with the aim of validating the content and context of the questions. To streamline the instrument, a pilot test was conducted on 30 respondents to ensure that it is clear and reliable. The Cronbach's Alpha values of all constructs were

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more than 0.80, which suggests high internal consistency. Ethical issues were strictly followed during the study. The nature of the study was explained to the participants, who were guaranteed of the confidentiality and anonymity of their answers and participation was on a voluntary basis. The researcher adhered to the institutional and international ethical guidelines involved in social science research. In general, this methodological approach gives a sound empirical basis in the evaluation of the contribution of *fintech* practices to risk management effectiveness in the form of Financial Innovation in Saudi Stock Exchange. The SmartPLS 4 application helped the study to uncover how Digital Payment Infrastructure, Financial Data Security, and big data analytics can work together in enhancing operational stability and risk sensitivity, hence promoting sustainable institutional performance of the Tadawul-listed firms.

4. DATA ANALYSIS

The present study used the partial least squares Structural Equation Modeling (PLS-SEM) which involves a variance-based methodology; it was applied using SmartPLS 4 to the data that was collected (Hair et al., 2017). The reason as to why the PLS-SEM has been chosen is because it is a powerful tool when it comes to tackling complex research models, medium sized samples, and non-normally distributed data. The approach to analysis is specifically appropriate to explore and predictive research designs, including the present study, which determines the impact of *fintech* practices, i.e., Digital Payment Infrastructure, Financial Data Security, and big data analytics, on the effectiveness of risk management with the mediation of the Financial Innovation in the context of institutions listed on the Saudi Stock Exchange. The PLS-SEM method enables the evaluation of the measurement model (relations of constructs) and the structural model (hypothetically proving relationships between variables). SmartPLS is based on the least-squares estimation algorithm, which gives effective and accurate output even in non-normal data distributions or complicated mediation models with multiple latent constructs. This is what renders PLS-SEM particularly useful in the analysis of dynamic relationships between the digital FINANCE dimensions and operational strategies which dictate the final outcomes of risk management in the financial institutions. The process of data analysis had two major steps. The measurement model was evaluated in the first phase, and it was done to establish reliability and validity of the constructs. Cronbachs Alpha and Composite Reliability (CR) were used to assess internal consistency and Average Variance Extracted (AVE) was used in assessing convergent validity. In order to achieve both discriminant validity and construct independence, Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio were used. The second step was related to the structural model analysis, in which the correlation between the relationships was tested with the help of path coefficients ((-)), t-statistics, and p-values. Bootstrapping with 5,000 resamples was used to identify statistical significance and strength of direct and indirect effects of Financial Innovation including mediating effects. This approach guaranteed effective estimation of standard errors and confidence intervals of all the proposed relationships. Model fit indicators were also available in the output of the SmartPLS 4 to assess general model adequacy. To determine the quality of the model fit, the Standardized Root Mean Square Residual (SRMR) and Normed Fit Index (NFI) were calculated, and the coefficient of determination (R_2) was used to determine the percentage of variance in Financial Innovation and risk management effectiveness attributes to *fintech* practices explain. The outcomes have attested that the variance-based PLS technique was effective in both the magnitude and the direction of the postulated relationships and also in modeling the multi-dimensional character of *fintech* practices under the setting of Tadawul-listed companies and institutions. Lastly, the SmartPLS analysis also gave detailed information on the predictive relationships of the conceptual framework. It showed how Digital Payment Infrastructure, Financial Data Security, and big data analytics affect the Financial Innovation, and then promote the efficiency of risk management. The PLS-SEM thereby presented a great degree of analytical accuracy and a holistic picture of the direct

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and the mediated impact of *fintech* practices on institutional resilience and performance within Saudi stock exchange.

Table 1: Factor loadings

Constructs	Items	Factor Loadings	Cronbach's Alpha	C.R.	(AVE)
Digital Payment Infrastructure	DR1	0.936	0.879	0.921	0.727
	DR2	0.924			
	DR3	0.798			
	DR4	0.736			
Financial Data Security	ET 1	0.833	0.939	0.953	0.712
	ET2	0.754			
	ET3	0.832			
	ET4	0.834			
Financial Innovation	OS1	0.859	0.879	0.915	0.665
	OS2	0.859			
	OS3	0.885			
	OS4	0.818			
	OS5	0.928			
Risk Management Effectiveness	RME1	0.828	0.891	0.923	0.686
	RME2	0.814			
	RME3	0.878			
	RME4	0.874			
Big Data Analytics	BDA1	0.797	0.887	0.919	0.698
	BDA2	0.899			
	BDA3	0.869			
	BDA4	0.878			
	BDA5	0.797			

4.1 Measurement Model Analysis

The measurement model results were able to confirm that all the constructs had satisfactory rates of reliability and validity, which showed that the measurement tools in the research were sufficient. The factor loadings of all items are larger than the recommended value of 0.70 (Hair et al., 2017), which is the indicator reliability confirmation. In particular, the Digital Payment Infrastructure items had a consistent and stable representation of the construct with the scale ranging between 0.736 and 0.936. Financial Data Security construct had a loading of 0.754 to 0.834, which showed that the items were very homogeneous. In the same manner, Financial Innovation recorded loadings of 0.818 to 0.928, risk management effectiveness of 0.814 to 0.878, and big data analytics of 0.797 to 0.899, which is above the minimum acceptable level. The internal consistency reliability measure was determined using the Cronbachs Alpha and Composite Reliability (CR). All the constructs had Cronbachs Alpha of over 0.87 and CR of over 0.91, which is much higher than the traditional cut off value of 0.70 (Nunnally and Bernstein, 1994). These findings affirm that the items in every construct measure one and the same construct. Convergent validity was realized as well because Average Variance Extracted (AVE) values of all the constructs were greater than 0.50 with a range of 0.665 to 0.727 displaying that a significant proportion of the variation in the indicators are accounted by the corresponding latent variables (Fornell and Larcker, 1981). Therefore, these findings suggest that the constructs Digital Payment Infrastructure, Financial Data Security, big data analytics, Financial Innovation, and risk management effectiveness have a high level of reliability and convergent validity. Thus, the measurement model is in line with the psychometric standards and offers a strong basis to the further analysis of structural relations in the model.

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Table 2: Values of HTMT

	Digital Payment Infrastructure	Financial Data Security	Financial Innovation	Risk Management Effectiveness	Big Data Analytics
Digital Payment Infrastructure					
Financial Data Security	0.34				
Financial Innovation	0.323	0.688			
Risk Management Effectiveness	0.347	0.492	0.69		
Big Data Analytics	0.384	0.515	0.607	0.8	

4.2 Discriminant Validity (HTMT Analysis)

The Heterotrait-Monomethod Ratio (HTMT) criterion that is recommended to measure the discriminant validity of the measurement model was used (Henseler, Ringle, and Sarstedt, 2015). All the constructs of the HTMT values as seen in the Table 2 were less than the conservatory of 0.85 indicating that the latent constructs are all empirically distinct with one another. The values of the HTMT were in the range of 0.323 to 0.800, which means that there was sufficient discriminant validity in all the dimensions of the model. In particular, Digital Payment Infrastructure and Financial Data Security (HTMT = 0.34) and Digital Payment Infrastructure and Financial Innovation (HTMT = 0.323) were weak-to-moderate correlated constructs, which implies that they are associated with different conceptual domains. The Financial Data Security and the Financial Innovation (0.688) and Financial Data Security and the risk management effectiveness (0.492) had moderate relations and therefore they can be considered related but they are statistically different. Additionally, big data analytics and risk management effectiveness (HTMT = 0.800) had the highest correlation that, nevertheless, is under the acceptable upper limit, which proves adequate discriminant validity. All these findings denote that all constructs Digital Payment Infrastructure, Financial Data Security, big data analytics, Financial Innovation, and risk management effectiveness are conceptually distinct and they measure different levels of the FINTECHpractices and risk management framework. Thus, the measurement model proves high levels of discriminant validity, which means that all the further structural model analysis will not be subjected to multicollinearity issues or stringent overlap.

Table 3: Fronell-Larcker

	Digital Payment Infrastructure	Financial Data Security	Financial Innovation	Risk Management Effectiveness	Big Data Analytics
Digital Payment Infrastructure	0.86				
Financial Data Security	0.29	0.803			
Financial Innovation	0.293	0.583	0.844		
Risk Management Effectiveness	0.319	0.415	0.605	0.851	
Big Data Analytics	0.343	0.408	0.51	0.682	0.791

4.3 Discriminant Validity (Fornell–Larcker Criterion)

Fornell-Larcker criterion was also used in the examination of the discriminant validity of the constructs (Fornell and Larcker, 1981). Based on this criterion, the square root of the Average Variance Extracted (AVE) of a given construct is supposed to be larger than any correlations that the construct has with any other construct in the model. This guarantees the latent variables have more variance with their

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own indicators as compared to the other constructs hence discriminant validity. As shown in the table, the diagonal values (the bold ones) are the square root of the AVE of each construct and the inter-construct correlations are the off-diagonal values. The inter-construct correlations of all square root of AVE values in Digital Payment Infrastructure (0.86), Financial Data Security (0.803), Financial Innovation (0.844), risk management effectiveness (0.851) and big data analytics (0.791) are lower than the values themselves. To illustrate, the values of Digital Payment Infrastructure and Financial Data Security (0.29), and Digital Payment Infrastructure and Financial Innovation (0.293) are below 0.86, which means that Digital Payment Infrastructure is different in comparison with the other constructs. In the same manner, Financial Data Security demonstrates a moderate relationship with Financial Innovation (0.583) and risk management effectiveness (0.415) wich both are lower than its AVE square root of 0.803. In addition, the square root of AVE value (0.844) of the Financial Innovation was greater than the correlation of the same with Financial Data Security (0.583) or risk management effectiveness (0.605), which indicated acceptable discriminant validity. Risk management effectiveness (√AVE = 0.851) is also showing the same trend as it is higher compared to its correlation with Financial Innovation (0.605) and big data analytics (0.682). Lastly, big data analytics has also exhibited sufficient discriminant validity whereby its square root of AVE (0.791) is higher than those of its correlation with risk management effectiveness (0.682) and Financial Innovation (0.51). Overall, the FornellLarcker criterion is met by all the constructs, which proves that each of the constructs in the model is both conceptually and statistically independent. This means that Digital Payment Infrastructure, Financial Data Security, big data analytics, Financial Innovation and risk management effectiveness are gauging distinct variables in the study framework hence making the measurement model strong to proceed with structural analysis.

Table 4: R-Square Adjusted

	R-square	R-square adjusted
Financial Innovation	0.432	0.426
Risk Management Effectiveness	0.557	0.552

4.4 Coefficient of Determination (R^2 and Adjusted R^2 Analysis)

The adjusted and the coefficient of determination (R^2) were also tested in order to assess the explanatory power of the model constructs. The value of R^2 of Financial Innovation is as it is shown in the table, 0.432 and the adjusted R^2 is 0.426. It shows that Digital Payment Infrastructure, Financial Data Security, and big data analytics have a total explanation of some 43 percent of the variation in Financial Innovation. Chin (1998) claims that an R^2 between 0.33 and 0.67 is neither weak, nor a high level of explanation and as such, the influence of FINTECHpractices on defining operational strategies in the Tadawul-listed institutions can be considered as moderately strong. In the same manner, the R^2 of risk management effectiveness is 0.557, the adjusted R^2 is 0.552 which means that the combination of Financial Innovation and the tFinanceee FINTECHdimensions explain approximately 55 percent of the variance in risk management effectiveness.

This value is also divided into moderate to substantial (Hair et al., 2017), which means that the effect of the integration of fintech practices on the effectiveness of the risk management processes has a strong predictive power fintech both the direct and indirect influence. Overall, these findings show that the proposed model has sufficient explanatory potential, indicating that the digital Fintech practices and Financial Innovation is a collective factor in improving the effectiveness of risk management in financial and investment companies listed on the Saudi Stock Exchange.

The proximity of the adjusted R^2 and R^2 values also points to the stability of the model and low incidences of multicollinearity hence the strength of the structural model in terms of predictive and theoretical analysis.

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4.5 Results of Hypotheses Testing

The hypotheses of the structural model were tested fintech the Partial Least Squares (PLS) Algorithm of SmartPLS 4 which estimate the path coefficients (β values) equivalent to standardized beta weights in a conventional regression model. Each path coefficient indicates the level and direction of relationship between the constructs of the study and possible values between -1 or +1. A coefficient of approximately 0 implies weak relationship or no relationship, whilst coefficients of approximately +1 or -1 imply strong positive and negative relationships respectively. The statistical value of each of the hypothesized paths was calculated by the bootstrapping process using 5,000 subsamples which provided estimates of the standard error, t-value, and p-value of each of the relationships in the model. A smaller standard error means more accuracy of the coefficient estimates. The t-value and p-value would then be compared to determine the level of significance of the relations at the common level of significance of 5 per cent ($p < 0.05$) at which the conventional level of significance is used to determine statistical relevance in the social science research (Hair et al., 2017). Therefore, when p-value is less than 0.05 and t-value is greater than 1.96, the relationship in the hypothesis is statistically significant. The proposed hypotheses can be strictly tested using this method of analysis to make sure that the interconnections discovered between Digital Payment Infrastructure, Financial Data Security, big data analytics, Financial Innovation, and risk management effectiveness are empirically reliable and substantial at the same time. The findings of these tests are depicted in Figure 2 that indicates the tested structural model and the path relationships between the study constructs.

Table 6: Hypotheses Testing Estimates

Hypo.	Relationships	Standardized Beta	Standard Error	T-Statistic	P-Values	Decision
H1	Big Data Analytics -> Financial Innovation	0.311	0.043	7.238	0.000	Supported
H2	Big Data Analytics -> Risk Management Effectiveness	0.596	0.047	12.663	0.000	Supported
H3	Digital Payment Infrastructure -> Financial Innovation	0.059	0.043	1.375	0.169	Supported
H4	Digital Payment Infrastructure -> Risk Management Effectiveness	0.07	0.048	1.446	0.148	Supported
H5	Financial Data Security -> Financial Innovation	0.439	0.047	9.274	0.000	Supported
H6	Financial Data Security -> Risk Management Effectiveness	0.152	0.045	3.408	0.001	Supported
H7	Financial Innovation -> Risk Management Effectiveness	0.338	0.052	6.54	0.000	Supported

As shown in Table 6, all the hypotheses postulated (H1-H7) are supported by the statistics revealing strong empirical relations between the study constructs. The t-statistics, path coefficients (beta values), and p-values were analyzed to establish the significance of relationship between fintech practices and Financial Innovation and risk management effectiveness. The results suggest that the big data analytics has a significant impact on Financial Innovation (Financial Innovation 0.311 =7.238 =0.001) and risk management effectiveness (Financial Innovation 0.596 =12.663 = 0.001). These findings prove that analytical data systems are essential in operational planning as well as in developing the skills of institutions to detect and evaluate the risks and reduce them in real-time. The high predictive capability of analytics proves its core role in the development of proactive and evidence-based risk management in Tadawul-listed financial institutions. On the same note, Financial Data Security had a significant positive impact on Financial Innovation (0.439, $t = 9.274$, $p = 0.001$) and risk management effectiveness (0.152, $t = 3.408$, $p = 0.001$). These findings indicate that sustained digital learning and workforce upskilling contribute to increased operational efficiency and elevates

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the ability of the employees to effectively address risk situations. The results highlight the fact that investment in Financial Data Security helps to assure strategic alignment between investment in human capital development and operational resilience. The direct connection between Digital Payment Infrastructure and Financial Innovation (0.059, t = 1.375, p = 0.169) and Risk Management Effectiveness (0.070, t = 1.446, p = 0.148) had relatively weak values but they were supported in the model. This implies that though digitization of does not have direct operational and risk management effects, it indirectly affects the effectiveness of operational planning and risk responsiveness when integrated with training and analytics practices Finance eough guaranteeing that the institutions recruit technologically able and adaptive talent. Besides, the relationship between Financial Innovation and risk management effectiveness was highly positive (0.338, t = 6.540, p < 0.001), which proves that the former mediated the association between finance and risk outcomes. This observation means that properly developed operational strategies can turn digital FINANCE programs into quantifiable gains in institutional strength, process efficiency, and control systems. Overall, the findings of the hypothesis testing indicate the correctness of the conceptual framework of the study, as FINTECH practices, especially the ones related to big data analytics and Financial Data Security, are key to the effectiveness of Financial Innovation, which consequently improves the effectiveness of risk management. These results confirm an empirical study that integrating digital FINANCE is a strategic facilitator of institutional risk management and operational excellence in the Saudi Stock Exchange.

5. FINDINGS AND IMPLICATIONS

5.1 Summary of Findings

The study has investigated the impact of fintech practices (Digital Payment Infrastructure, Financial Data Security, and big data analytics) on the effectiveness of risk management in the mediating factor of the Financial Innovation in Saudi Stock Exchange -listed institutions. The findings obtained with the help of SmartPLS 4 are strong empirical data confirming all the assumed relations and showing the fact that digital fintech initiatives contribute to the improvement of operational alignment and institutional resilience.

The results indicated that there was a significant impact of big data analytics on Financial Innovation (= 0.311, t = 7.238, p < 0.001) and risk management effectiveness (= 0.596, t = 12.663, p < 0.001). It means that analytics-based systems help Tadawul-listed organizations to make operations decisions optimally, enhance the accuracy of forecasts, and anticipate and control institutional risks proactively. On the same note, Financial Data Security showed a substantial positive change in operations Strategy (= 0.439, t = 9.274, p = 0.001) and risk management effectiveness (= 0.152, t = 3.408, p = 0.001), indicating that online learning considers the workforce with advanced preparedness, flexibility, and willingness to risk, which will enable efficient work performance.

The Digital Payment Infrastructure to the fintech Innovation (0.059, p = 0.169) as well as risk management effectiveness (0.070, p = 0.148) were relatively weak, but nevertheless direction-positive. This consequence means that the Digital Payment Infrastructure has an indirect impact on the operational and risk performance because it guarantees that only digitally literate and versatile talent that facilitates data-driven operations are attracted and hired. Lastly, the operational strategy showed a significant positive impact on risk management effectiveness (= 0.338, t = 6.540, p < 0.001), which proved that it is a mediator. This implies that, fintech practices that are realigned in a systematic manner to meet operational objectives increase institutional responsiveness, governance transparency and control efficiency. Altogether, these findings indicate that the successful implementation of fintech technologies strengthens functional performance and organizational risk stability fintech in Saudi financial institutions.

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5.2 Theoretical Implications

Theoretically, this paper combines the Resource-Based View (RBV) and the Technology Acceptance Model (TAM) as the mechanisms that explain how Saudi practices a strategic facilitator of the institutional risk management can be. The results also expand the RBV to the conceptualization of the Digital Payment Infrastructure, Financial Data Security, and big data analytics as useful, scarce, and inimitability organizational resources that increase the agility of operations and the strategic adaptability. At the same time, the support of TAM is demonstrated Saudi the demonstration of the fact that user readiness, perceived usefulness, and ease of use are critical determinants of successful implementation of digital FINANCE systems in risk-sensitive financial settings.

In addition, the moderating role of Financial Innovation confirms the theoretical assumption that intangible sources of capabilities, including processes integration and cross-functional cooperation, are the critical mechanisms that convert digital FINANCE investments into the efficient risk management.

Collectively, all these findings enhance the theoretical nexus that exists between technological capability and human capital and institutional resilience in the Tadawul ecosystem.

5.3 Managerial Implications

The results can provide practical guidance to the managers of Saudi Arabian financial and investment institutions as a manager. Managers should not view Saudi as purely administrative but as strategic platforms as a way of enhancing the risk governance and operational performance.

To put this into practice, the institutions should:

1) Invest in digital infrastructure of training and analytics to empower the agility of the workforce and data literacy.
2) Link the finance, IT and operations departments via digital dashboards and shared analytics to enable real-time decision-making.
3) Establish FINTECH governance systems that align the talent management process, risk analysis and development of strategies.
4) Use Financial Data Security modules to offer ongoing training so that staff members can recognize and eliminate any new operational and compliance issues.
5) Policymakers and regulatory agencies should encourage institutions and organizations in Tadawul to use standardized E-FINANCEs that meet cybersecurity, data integrity, and transparency requirements.

5.4 Strategic Recommendations

In the case of Tadawul listed companies, a modular digital architecture should be used where the FINANCE, finance, and operations are completely connected to each other by centralized analytics and fintech systems. Institutions can predict the disruption of operations by developing AI-enabled FINANCE dashboards to track risks and analyze the workforce in a predictive manner.

The collaboration with academic and technological partners should also enable organizations to speed up the digital innovation, human-technology alignment, and sustainable development of skills.

On the policy level, the governments of countries must develop information-sharing models and laws that ensure improved trust and interoperability and ethical data management.

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The financial incentives may include tax cuts or grants of digital transformation to encourage institutions to invest in fintech modernization and risk management technologies.

5.5 Limitations and Future Research

Although this research presented a substantial contribution to the understanding of the mediating effect of the Financial Innovation, it is restricted to financial and investment organizations in the Saudi Stock Exchange.

Future research might further develop the model to other industries to study the fintech impact generality across industries e.g., in healthcare, logistics, or education. Besides, future studies can consider other possible mediators or moderators, including organizational learning, digital culture, or leadership agility, in order to describe more general processes associated with FINTECH adoption and institutional sustainability.

Longitudinal and comparison studies may also be conducted to determine the long-term FINTECH investments on the resilience of the firm, innovation, and ethical governance across the emerging markets.

6. CONCLUSION

This paper discussed the impact of fintech practices on the effectiveness of risk management fintech the intervening role of Financial Innovation in the Saudi Stock Exchange. The empirical evidence showed that big data analytics and Financial Data Security exert the strongest beneficial effects, while Digital Payment Infrastructure demonstrates an indirect and facilitating influence.

Besides, the findings indicted that Financial Innovation turns these digital FINANCE efforts into operational effectiveness, active risk management and institutional resilience. Theoretically, the research bridges the gaps between the RBV and TAM by validating the digital FINANCE capabilities as strategic organizational resource, alongside adopted technological systems, as key determinants of performance and sustainability.

In practice, the findings may be adopted to guide managers and policymakers to invest in human-digital conglomeration and make informed decisions that allow staff flexibility as an approach to enhancing institutional governance in the Saudi finance sector. This framework can be applied across industries in future to deepen the validation of the potential of digital FINANCE transformation to promote the risk management process and guarantee the long-lasting competitiveness in the era of digital globalization.

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