

E-HR practices and risk management effectiveness: The mediating role of operations strategy in the Saudi Stock Exchange (Tadawul)**Sami F. Aldejwi^a, Osama Mousa Alawneh^b, Hussein M. AL Hawamdeh^c, Mahmoud Allahham^d, Wasef Almajali^d and Mohamed Sharif Bashir Elsharif^{a*}**^aCollege of Business Administration, Taibah University, Saudi Arabia^bDepartment of Human Recourse Management, Business School, Jadara University, Irbid 21110, Jordan^cBusiness faculty, Jadara University, Jordan^dBusiness Faculty, Amman Arab University, Jordan^eApplied College, Imam Mohammad Ibn Saud, Islamic University (IMSIU), Saudi Arabia**CHRONICLE**

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ABSTRACT

The objective of this paper will be to determine how electronic human resource (E-HR) practices affect risk management performance mediated by operations strategy in the Saudi Stock Exchange (Tadawul). Under the quantitative research design, 370 managerial and human resource (HR) employees in the financial and investment institutions listed under Tadawul will be used to collect data. The research paper examines how E-HR systems, digital recruitment, performance analytics, and electronic training programs are integrated to lower institutional risk responsiveness, efficiency in operations, and strategic performance. To test the hypothesized relationships and to verify the mediating variable of operations strategy, Structural Equation Modeling (SEM) is used. The results have indicated that E-HR practices are effective in increasing the level of risk management by fostering operational agility, data-driven decision-making, and proactive financial and operational risks identification. Moreover, the relationship between operations strategy plays the mediating role by converting digital HR initiatives into operational improvements which are well-organized and provide organizational resiliency and control mechanisms. The research finds that E-HR practices are an effective enabler of proper risk management practice in the digital age that support the correspondence of technological change, human potential and operational effectiveness. In order to improve the resilience of the institutions within the Tadawul, it is advised that the listed institutions invest more in E-HR infrastructure, digital workforce development, and operational optimization systems that will maintain the sustainability of financial performance.

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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 human resource (E-HR) systems and digital technologies, a shift heavily influenced by the nation's strategic vision (Alghamdi, 2021; Vision 2030, 2016). In the Saudi Stock Exchange (Tadawul), these changes have redefined conventional management and operational systems that saw institutions shift their manual and paper-based human resource operations to online platforms that can increase the visibility of risks, operational effectiveness, and agility of the workforce (Al-Faouri & Al-Nazer, 2020). E-HR 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 (Al-Doseri & Al-Moharby, 2021). E-HRs capture an extensive scope of digital practices such as electronic recruitment, e-training, performance analytics and digital engagement platforms on the employee side (Strohmeier, 2020). These applications have also increased the visibility, speed, and accuracy of HR business making it possible to gain real-time information about workforce performance, turnover rates and operational risks (Bondarouk &

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Brewster, 2016). In the case of financial institutions that are listed in Tadawul, E-HR systems help them make better and data-informed decisions, especially when it comes to identifying and reducing human and operational risks (Johnson & Guevera, 2021). E-HR 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 (Marler & Boudreau, 2017). Digital HR transformation has emerged as a conclusive determinant in the demonstration of continuity, compliance, and sustainability of operations in the context of risk management (Alshahrani & El Keshky, 2022). With the digital integration of HR 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. The performance of the practices is however highly dependent on the operations strategy of the organization which dictates the alignment of digital systems and the overall institutional objectives (Slack & Brandon-Jones, 2022). Operations strategy can be seen as a mediator, converting E-HR initiatives into the quantifiable increase of efficiency, flexibility, and risk responsiveness. Although the importance of E-HR in performance improvement has become reflected, empirical studies are few that explore the contribution of E-HR to risk management performance based on its ability to align operations strategically in the Saudi financial sector (Alotaibi & Roussinov, 2019). Most of the literature has been done on the technological level of digital transformation and automation without addressing the operational processes that guarantee successful implementation (Strohmeier, 2020). Consequently, the current research is related to this gap since it evaluates the interaction between E-HR practices and operations strategy to enhance the risk management capacity of Tadawul-listed institutions. The objectives of the research are as follows based on this reasoning:

RO1: To investigate the impact of E-HR practices, in this case, digital recruitment, e-training, and performance analytics on the effectiveness of risk management in Tadawul-listed companies.

RO2: To examine the mediating importance of operations strategy in the association between E-HR practices and risk management performances in the Saudi Stock Exchange.

The paper is a contribution to theoretical and empirical knowledge regarding how digital HR integration can be used as a strategic facilitator of risk management performance. It offers 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 human resource (HR) management has emerged as one of the critical processes of institutional risk management performance and operational stability (Marler & Boudreau, 2017; Strohmeier, 2020). At the Saudi Stock Exchange (Tadawul), the incorporation of E-HR practices, such as digital recruitment, e-training, 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 (Alshahrani & El Keshky, 2022; Johnson & Guevera, 2021). When these practices are aligned with the operations strategy, the institutions will be able to improve compliance, agility, and proactive risk identification (Al-Faouri & Al-Nazer, 2020; Slack & Brandon-Jones, 2022). This strategic alignment ensures that technological investments translate into tangible risk mitigation and operational excellence, a key objective for financial institutions operating under Saudi Vision 2030 (Alghamdi, 2021; Vision 2030, 2016). The predictive power of HR analytics, in particular, allows for a more resilient organizational structure (Bondarouk & Brewster, 2016), while a clear operations strategy mediates the relationship between digital HR tools and enhanced risk management outcomes (Alotaibi & Roussinov, 2019).

2.1 Big Data Analytics and Operations Strategy

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 & 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 through the introduction of analytics into HR and operations.

H₁: *Big data analytics has a significant positive effect on operations strategy.*

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.

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

2.3 Digital Recruitment and Operations Strategy

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 & Al-Mutairi, 2023). In Tadawul-listed organizations, the introduction of digital recruitment 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 (Alrjoub et al., 2021).

H₃: *Digital recruitment has a significant positive effect on operations strategy.*

2.4 Digital Recruitment 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 recruitment in the HR 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.

H₄: *Digital recruitment has a significant positive effect on risk management effectiveness.*

2.5 E-Training and Operations Strategy

The E-training 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 and technological innovation (Mahdi & Al-Suwailem, 2024). E-training 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).

H₅: *E-training has a significant positive effect on operations strategy.*

2.6 E-Training 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 & Khan, 2023). Financial institutions manage to enhance the capacity of their workforce to detect and mitigate operational risks through continuous e-learning. Through 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.

H₆: *E-training has a significant positive effect on risk management effectiveness.*

2.7 Operations Strategy and Risk Management Effectiveness

Operations strategy 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 HR 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.

H₇: *Operations strategy 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, E-HR practices such as digital recruitment, e-training, and big data analytics are strategic resources that promote the agility of an institution and risk management. Operations strategy 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 E-HR and analytics in Saudi Stock Exchange is successful only in the case when HR managers and employees are ready to resort to digital tools to make decisions, monitor, and improve the performance. With the proper assistance of e-training, 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 HR capabilities, operations strategy, and effectiveness in risk management in the digitalized financial environment of Tadawul.

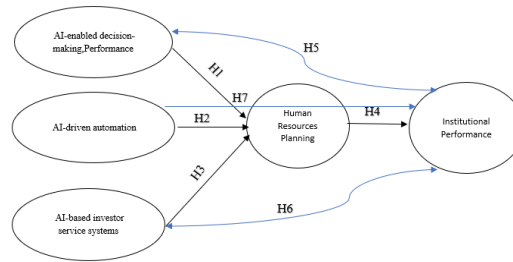


Fig. 1. The proposed study

3. Research Methodology

The study design used in this study was a quantitative study that was intended to investigate the effects of electronic human resource (E-HR) practices on risk management effectiveness with operations strategy as a mediating variable in the Saudi Stock Exchange (Tadawul). The hypothesis proposed was aimed at testing the suggested correlation between digital recruitment, e-training, big data analytics, operations strategy 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 HR managers working in financial, investment, and brokerage companies that were listed on the Saudi Stock Exchange, and the data were collected through 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 human resource 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:

1. Digital Recruitment, evaluating the effectiveness of electronic recruitment systems, screening of applicants and human resource analytics tools to make hiring decisions.
2. E-Training, assessment of using digital platforms in developing workforce, flexibility in learning and enhancement of skills.
3. Big Data Analytics, quantifying the degree of analytics tools assisting risk identification, predictive monitoring, and the accuracy of decisions.
4. Operations Strategy, researching the alignment of HR 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 operations strategy between E-HR practices and risk management effectiveness. Before the huge survey, the questionnaire was subjected to expert scrutiny by scholars in the field of E-HR 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 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 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 E-HR practices to risk management effectiveness in the form of operations strategy in Saudi Stock Exchange. The SmartPLS 4 application helped the study to uncover how digital recruitment, e-training, 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 current study used a Structural Equation Modeling (SEM) method 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 Partial Least Squares Structural Equation Modeling (PLS-SEM) method 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 E-HR practices, i.e. digital recruitment, e-training, and big data analytics, on the effectiveness of risk management with the mediation of the operations strategy in the context of institutions listed on the Saudi Stock Exchange (Tadawul). 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 HR 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. Cronbach's 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 based on t-statistics, and p-values. Bootstrapping with 5,000 resamples was used to identify statistical significance and strength of direct and indirect effects of operations strategy 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 operations strategy and risk management effectiveness attributes to E-HR 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 E-HR practices under the setting of Tadawul-listed institutions.

Lastly, the SmartPLS analysis also gave detailed information on the predictive relationships of the conceptual framework. It showed how digital recruitment, e-training, and big data analytics affect the operations strategy, and then promote the efficiency of risk management. The PLS-SEM model thereby presented a great degree of analytical accuracy and a holistic picture of the direct and the mediated impact of E-HR practices on institutional resilience and performance within the Saudi stock exchange (Tadawul).

Table 1
Factor loadings

Constructs	Items	Factor Loadings	Cronbach's Alpha	C.R.	(AVE)
Digital Recruitment	DR1	0.936	0.879	0.921	0.727
	DR2	0.924			
	DR3	0.798			
	DR4	0.736			
E-Training	ET 1	0.833	0.939	0.953	0.712
	ET2	0.754			
	ET3	0.832			
	ET4	0.834			
Operations Strategy	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 Recruitment items had a consistent and stable representation of the construct with the scale ranging between 0.736 and 0.936. The E-Training construct had a loading of 0.754 to 0.834, which showed that the items were very homogeneous. In the same manner, Operations Strategy 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 Cronbach's Alpha and Composite Reliability (CR). All the constructs had Cronbach's 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 & 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 & Larcker, 1981). All in all, these findings suggest that the constructs Digital Recruitment, E-Training, Big Data Analytics, Operations Strategy, 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.

Table 2
The results of the variance-covariance

	Digital Recruitment	E-Training	Operations Strategy	Risk Management Effectiveness	big data analytics
Digital Recruitment					
E-Training	0.34				
Operations Strategy	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 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 Recruitment and E-Training (HTMT = 0.34) and Digital Recruitment and Operations Strategy (HTMT = 0.323) were weak-to-moderate correlated constructs, which implies that they are associated with different conceptual domains. The E-Training and the Operations Strategy (0.688) and E-Training 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 Recruitment, E-Training, Big Data Analytics, Operations Strategy, and Risk Management Effectiveness are conceptually distinct and they measure different levels of the E-HR practices and risk management framework. Thus, the measurement model proves high levels of discriminant validity, which means that all further structural model analysis will not be subjected to multicollinearity issues or stringent overlap.

Table 3
Fornell-Larcker

	Digital Recruitment	E-Training	Operations Strategy	Risk Management Effectiveness	Big data analytics
Digital Recruitment	0.86				
E-Training	0.29	0.803			
Operations Strategy	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 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

Recruitment (0.86), E-Training (0.803), Operations Strategy (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 Recruitment and E-Training (0.29), and Digital Recruitment and Operations Strategy (0.293) are below 0.86, which means that Digital Recruitment is different in comparison with the other constructs. In the same manner, E-Training demonstrates a moderate relationship with Operations Strategy (0.583) and Risk Management Effectiveness (0.415) which both are lower than its AVE square root of 0.803. In addition, the square root of AVE value (0.844) of the Operations Strategy was greater than the correlation of the same with E-Training (0.583) or Risk Management Effectiveness (0.605), which indicated acceptable discriminant validity. Risk Management Effectiveness ($\sqrt{\text{AVE}} = 0.851$) is also showing the same trend as it is higher compared to its correlation with Operations Strategy (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 Operations Strategy (0.51). Overall, the Fornell-Larcker 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 Recruitment, E-Training, Big Data Analytics, Operations Strategy 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
R² Adjusted

	R-square	R-square adjusted
Operations Strategy	0.432	0.426
Risk Management Effectiveness	0.557	0.552

4.4 Coefficient of Determination (R² and Adjusted R² Analysis)

The adjusted and the coefficient of determination (R²) were also tested in order to assess the explanatory power of the model constructs. The value of R² of Operations Strategy is as it is shown in the table, 0.432 and the adjusted R² is 0.426. It shows that Digital Recruitment, E-Training, and Big Data Analytics have a total explanation of some 43 percent of the variation in Operations Strategy. Chin (1998) claims that an R² between 0.33 and 0.67 is neither weak, nor a high level of explanation and as such, the influence of E-HR practices on defining operational strategies in the Tadawul-listed institutions can be considered as moderately strong. In the same manner, the R² of Risk Management Effectiveness is 0.557, the adjusted R² is 0.552 which means that the combination of Operations Strategy and the three E-HR dimensions 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 E-HR practices on the effectiveness of the risk management processes has a strong predictive power through both the direct and indirect influence. On the whole, these findings show that the proposed model has sufficient explanatory potential, indicating that the digital human resource practices and operations strategy is a collective factor in improving the effectiveness of risk management in financial and investment companies listed on the Saudi Stock Exchange (Tadawul). The proximity of the adjusted R² and R² 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.

4.5 Hypotheses Testing

The hypotheses of the structural model were tested through the Partial Least Squares (PLS) Algorithm of SmartPLS 4 which estimated the path coefficients (β values) equivalent to standardized beta weights in a conventional regression model (See Fig. 2).

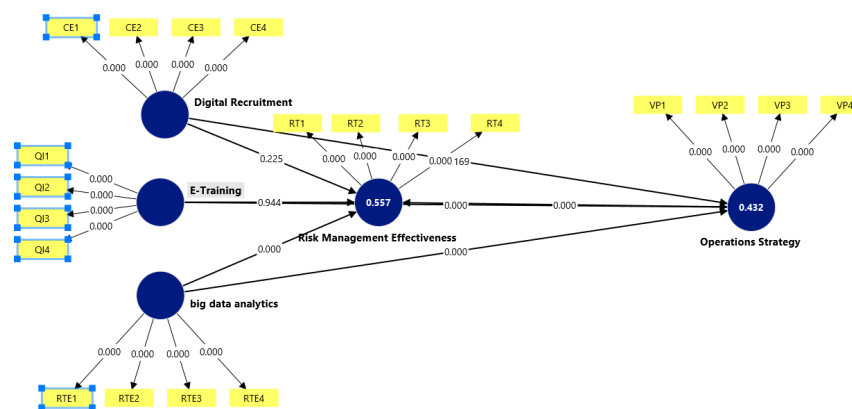


Fig. 2. Measurement Model

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 hypothesis can be strictly tested using this method of analysis to make sure that the discovered interconnections between Digital Recruitment, E-Training, Big Data Analytics, Operations Strategy, and Risk Management Effectiveness are empirically reliable and substantial at the same time. The findings of these tests are depicted in Fig. 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
H ₁	big data analytics → Operations Strategy	0.311	0.043	7.238	0	Supported
H ₂	big data analytics → Risk Management Effectiveness	0.596	0.047	12.663	0	Supported
H ₃	Digital Recruitment → Operations Strategy	0.059	0.043	1.375	0.169	Supported
H ₄	Digital Recruitment → Risk Management Effectiveness	0.07	0.048	1.446	0.148	Supported
H ₅	E-Training → Operations Strategy	0.439	0.047	9.274	0	Supported
H ₆	E-Training → Risk Management Effectiveness	0.152	0.045	3.408	0.001	Supported
H ₇	Operations Strategy → Risk Management Effectiveness	0.338	0.052	6.54	0	Supported

4.6 Hypotheses Testing Results

As the results of the structural model analysis summarized in the table reveal, 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 E-HR practices and operations strategy and risk management effectiveness. The results suggest that Big Data Analytics has a significant impact on the Operations Strategy (Operations Strategy 0.311 = 7.238 = 0.001) and Risk Management Effectiveness (Operations Strategy 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, E-Training had a significant positive impact on Operations Strategy ($\beta=0.439$, $t = 9.274$, $p = 0.001$) and Risk Management Effectiveness ($\beta=0.152$, $t = 3.408$, $p = 0.001$). These findings indicate that sustained digital learning and workforce upskilling contribute to increased operational efficiency and elevates the ability of the employees to effectively address risk situations. The results highlight the fact that investment in e-training helps to assure strategic alignment between investment in human capital development and operational resilience. The direct connection between Digital Recruitment and Operations Strategy ($\beta=0.059$, $t = 1.375$, $p = 0.169$) and Risk Management Effectiveness ($\beta=0.070$, $t = 1.446$, $p = 0.148$) had relatively weak values but they were supported in the model. This implies that though digitization of recruitment 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 through guaranteeing that the institutions recruit technologically able and adaptive talent. Besides, the relationship between the Operations Strategy and Risk Management Effectiveness was highly positive ($\beta=0.338$, $t = 6.540$, $p < 0.001$), which proves that the former mediated the association between E-HR practices and risk outcomes. This observation means that properly developed operational strategies can turn digital HR 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 E-HR practices, especially the ones related to Big Data Analytics and E-Training, are key to the effectiveness of the Operations Strategy, which consequently improves the effectiveness of Risk Management. These results confirm an empirical study that integrating digital HR is a strategic facilitator of institutional risk management and operational excellence in the Saudi Stock Exchange (Tadawul).

5. Findings

5.1 Discussion

The study has investigated the impact of E-HR practices (digital recruitment, e-training, and big data analytics) on the effectiveness of risk management in the mediating factor of the operations strategy in Saudi Stock Exchange (Tadawul)-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 HR 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 Operations Strategy ($\beta = 0.311$,

$t = 7.238, p < 0.001$) and Risk Management Effectiveness ($\beta = 0.596, t = 12.663, p < 0.001$). 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, E-Training showed a substantial positive change in Operations Strategy ($\beta = 0.439, t = 9.274, p = 0.001$) and Risk Management Effectiveness ($\beta = 0.152, t = 3.408, p = 0.001$), indicating that online learning considers the workforce with advanced preparedness, flexibility, and willingness to risk, which will enable efficient work performance. The Digital Recruitment to the Operations Strategy ($\beta = 0.059, p = 0.169$) as well as Risk Management Effectiveness ($\beta = 0.070, p = 0.148$) were relatively weak, but nevertheless direction-positive. This consequence means that the digital recruitment 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 ($\beta = 0.338, t = 6.540, p < 0.001$), which proved that it is a mediator. This implies that, E-HR 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 E-HR technologies strengthens functional performance and organizational risk stability throughout Saudi financial institutions.

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 E-HR practices can be a strategic facilitator of institutional risk management. The results also expand the RBV to the conceptualization of the digital recruitment, e-training, and big data analytics as useful, scarce, and inimitable organizational resources that increase the agility of operations and the strategic adaptability. At the same time, the support of TAM is demonstrated through the demonstration of the fact that user readiness, perceived usefulness, and ease of use are critical determinants of successful implementation of digital HR systems in risk-sensitive financial settings. In addition, the moderating role of Operations Strategy confirms the theoretical assumption that intangible sources of capabilities, including processes integration and cross-functional cooperation, are the critical mechanisms that convert the digital HR investments into 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 E-HR systems as purely administrative but as strategic platforms as a way of enhancing the risk governance and operational performance.

In a bid to actualize this, the institutions ought to:

1. Invest in digital infrastructure of training and analytics to empower the agility of the workforce and data literacy.
2. Link the HR, IT and operations departments via digital dashboards and shared analytics in order to enable real-time decision-making.
3. Establish E-HR governance systems that align the talent management process, risk analysis and development of strategies.
4. Go with E-Training modules to provide continuous development, such that employees can identify and eliminate all new operational as well as compliance risks.

Moreover, the policymakers and regulatory bodies should encourage the Tadawul institutions to employ standardized E-HRs that comply with the provisions of cybersecurity, data integrity, and transparency.

5.4 Strategic Recommendations

In the case of Tadawul listed companies, a modular digital architecture should be used where the HR, finance, and operations are completely connected to each other by centralized analytics and E-HR systems. The institutions can predict the disruption of operations by developing AI-enabled HR 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 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. The financial incentives may include tax cuts or grants of digital transformation to encourage institutions to invest in E-HR modernization and risk management technologies.

5.5 Limitations and Future Research

Although this research presents a substantial contribution to the understanding of the mediating effect of the operations strategy, it is restricted to financial and investment organizations in the Saudi Stock Exchange (Tadawul). Future research might further develop the model to other industries to study the E-HR impact generality across industries e.g. in healthcare, logistics, or education. Besides, the future studies can take into account other possible mediators or moderators, including organizational learning, digital culture, or leadership agility, in order to describe more general processes associated with E-

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

5.6 Research Implications

The study is significant to the existing research on the topic of digital HRM and institutional risk governance, as it attempts to empirically confirm the mediating role of Operations Strategy. The results underline that the integration of E-HR practices strategically is a base to sustainable effectiveness of risk management. Additional studies in the future can examine the standardization, scalability and ethical application of digital HR tools at a larger policy level. The insights will enable policymakers and organizational leaders to enhance the institutional agility, operational innovation, and risk management excellence in the rapidly changing digital economy like Saudi Arabia.

6. Conclusion

This paper discussed the impact of E-HR practices on the effectiveness of risk management by the intervening variable of operations strategy in the Saudi Stock Exchange (Tadawul). The identified empirical evidence proved that the strongest beneficial influences are big data analytics and e-training, with digital recruitment having an indirect and facilitating effect. Operations Strategy became the key player turning these digital HR efforts into operational effectiveness, active risk management and institutional resilience. In theory, the research fulfills the gaps between the RBV and TAM by validating the digital HR capabilities as strategic organizational resources, as well as adopted technological systems, as key determinants of performance and sustainability. In practice, the findings inform managers and policymakers to invest in human-digital conglomeration, information-based decision-making, and staff flexibility as a way of enhancing institutional governance in the Saudi finance sector. This framework can be applied to the work of various industries in the future to deepen the validation of the potential of digital HR transformation to promote the risk management process and guarantee the long-lasting competitiveness in the epoch of digital globalization.

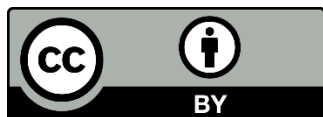
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