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Contents

Digitalisation and entrepreneurial dynamism in South Africa: Evidence from a seemingly unrelated regression approach

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Keywords
Digitalisation, Self-Employment, Unemployment, Seemingly Unrelated Regression (SUR), Foreign Direct Investment (FDI), Labour Market Dynamics.

Abstract
This paper investigates the structural impact of digitalization on South Africa's labour market, focusing on the interdependence between self-employment (as a proxy for entrepreneurship) and unemployment. Using annual data from 1996 to 2024, a Seemingly Unrelated Regression (SUR) framework is employed to jointly estimate the determinants of changes in both outcomes, thereby exploiting the significant cross-equation error correlation confirmed by a Breusch–Pagan test. The results reveal a disruptive dual effect of digitalization. ICT penetration significantly reduces self-employment while simultaneously increasing unemployment in the short run, consistent with technology-induced displacement effects. The analysis also confirms that entrepreneurship in South Africa is largely necessity-driven, as rising unemployment leads to higher levels of self-employment, but this does not translate into job absorption. Trade openness has a weakly positive effect on self-employment, suggesting modest entrepreneurial opportunities from global integration. Strikingly, foreign direct investment (FDI) is positively and significantly associated with unemployment, implying that FDI may initially be directed toward capital-intensive sectors or involve restructuring processes that temporarily displace workers. These findings highlight critical policy implications. There is an urgent need for targeted digital skills training and reskilling, the establishment of a dual-track entrepreneurship support system that differentiates between necessity- and opportunity-driven ventures, and a strategic focus on attracting labour-intensive, inclusive FDI. Collectively, the results provide empirical evidence that digitalization, if left unmanaged, may exacerbate short-run unemployment but, with the right policy mix, can be harnessed to drive inclusive and sustainable economic growth.

Introduction

Entrepreneurship plays a critical role in fostering inclusive economic growth, creating employment opportunities, and addressing income inequality in emerging economies such as South Africa (Herrington et al., 2021). As the global economy undergoes a digital transformation, digitalization has emerged as a potential enabler of entrepreneurship by lowering entry barriers, reducing transaction costs, and broadening market access (Nambisan, 2017). In South Africa, where structural unemployment remains a persistent challenge and youth unemployment exceeds 45% (Statistics South Africa, 2024), the ability of digital tools and infrastructure to stimulate entrepreneurial activity is of increasing policy relevance.

Digitalization, defined as the integration of digital technologies into economic and social processes, has transformed how businesses are conceived, launched, and scaled. From mobile money platforms and cloud-based services to e-commerce ecosystems and AI-driven customer engagement tools, the digital landscape has widened the scope for both necessity-driven and opportunity-driven entrepreneurs (Zhu et al., 2020). This transformation is particularly crucial in developing economies where traditional financial and infrastructural constraints limit formal business development. In South Africa, initiatives such as the Digital Economy Masterplan and the expansion of mobile broadband infrastructure signal the state's recognition of digital transformation as a lever for job creation and self-employment (Department of Communications and Digital Technologies, 2022).

Despite the growing policy emphasis on digital inclusion, empirical evidence on whether digitalization has translated into higher levels of entrepreneurship in South Africa remains scarce. Most existing studies focus on firm-level case studies or qualitative assessments (Chigona & Licker, 2008;

Mungai & Ogot, 2012), with limited econometric analysis at the macroeconomic level. Moreover, the complex interrelation between digitalization, self-employment, and unemployment necessitates a modelling framework that captures the interdependencies between these labour market outcomes.

This paper addresses this gap by examining whether digitalization is associated with increased entrepreneurship in South Africa, using the number of self-employed individuals as a proxy. The analysis employs a Seemingly Unrelated Regression (SUR) model to simultaneously estimate the effect of digitalization on entrepreneurship and unemployment, while controlling for macroeconomic and institutional factors such as GDP growth, FDI and education. By focusing on a system of equations rather than a single equation model, this approach allows for the efficient estimation of interrelated outcomes, acknowledging the dual role of digitalization in job creation and displacement.

The study contributes to both the theoretical and policy discourse on digital transformation in emerging economies by offering empirical insights into the structural drivers of entrepreneurship in the digital era.

Theoretical literature review

Entrepreneurship, a multifaceted concept, has evolved significantly across various theoretical perspectives. Understanding these foundational theories is crucial for examining how digitalization might influence entrepreneurial outcomes, especially in dynamic emerging economies like South Africa. One prominent perspective, championed by Schumpeter (1934), defines entrepreneurs as agents of "creative destruction" who introduce novel products, processes, and markets. From this viewpoint, digitalization acts as a powerful enabler, providing innovative tools and platforms such as fintech, e-commerce, and mobile applications that significantly reduce the cost and complexity associated with launching new ventures. Here, digital infrastructure serves as a catalyst for innovation-led entrepreneurship, fostering differentiation and market disruption.

Knight (1921), along with Foss and Klein (2012), highlight the entrepreneur's critical role in making decisions under uncertainty, particularly regarding resource deployment and forecasting future market conditions. In the rapidly evolving digital economy, where technological shifts heighten uncertainty, sound entrepreneurial judgement becomes paramount in selecting appropriate platforms, technologies, and target markets. This perspective complements the Theory of the Firm by positioning the entrepreneur as the central decision-maker who allocates capital even in the absence of complete information. Further elaborating on Coase's theory of the firm, Foss, Klein, and colleagues (2005; 2012) argue that entrepreneurial judgement is fundamental to a firm's existence and its boundaries. In digital contexts, entrepreneurs can choose between integrating functions, like in-house digital development, or leveraging decentralised, platform-based models such as Shopify or WhatsApp Business. The availability of digital tools directly influences these strategic boundary decisions, consequently reshaping the very nature of the firm in response to evolving cost structures and market access.

Kirzner (1973), representing the Austrian perspective, views entrepreneurship as the innate ability to identify previously unnoticed opportunities. In the digital age, these opportunities are often embedded within algorithmic trends, vast datasets, or shifting online consumer behaviors. Digital tools, including Google Trends, e-commerce analytics, and social media sentiment analysis, significantly amplify the scope for opportunity discovery by making information more accessible and actionable.

Building on psychological and cultural theories, some scholars, like Sarasvathy (2001), propose that entrepreneurship is rooted in imagination—the capacity to envision new realities, products, or services. Digitalisation significantly enhances this creative capacity by offering novel modes of expression, such as digital art, app design, and virtual marketplaces. For instance, in South Africa's informal sector, young entrepreneurs are leveraging platforms like TikTok, Instagram, and WhatsApp not merely as communication tools, but as dynamic and creative business platforms.

From a Penrose (1959) viewpoint, entrepreneurship is conceptualized as the effective organisation and management of resources. Digital technologies strongly support this managerial role by enhancing coordination, automating routine tasks, and facilitating lean operations. Tools like inventory management apps, cloud accounting software, and digital HR platforms empower small businesses to operate efficiently, even with limited staff and capital.

Finally, some perspectives frame entrepreneurship as the exercise of charismatic leadership and personal influence in mobilising people and resources, as highlighted by Weber (1947) and Burns (1978). Digital platforms, including YouTube, LinkedIn, and livestreaming applications, provide powerful channels through which entrepreneurs can build personal brands and mobilise social capital. In contexts where formal institutions may be weaker, such "digital charisma" becomes a potent resource for gaining legitimacy and achieving traction.

Empirical literature review

To fully grasp the intricate relationship between digitalisation and entrepreneurship, it is essential to review existing empirical evidence from various global contexts, considering their diverse economic and digital maturity levels. This section provides a systematic overview of selected studies across six continents, highlighting their methodological approaches, the variables employed, and their key findings. This review aims to pinpoint existing research gaps that the present study seeks to address, particularly concerning South Africa and the application of system estimation techniques.

In Africa, research by Asongu and Nwachukwu (2018), utilising the Generalized Method of Moments (GMM) across 49 African countries from 2000 to 2012, explored whether ICT penetration fostered inclusive human development. They found a positive association between proxies for digitalisation, such as mobile phone subscriptions and internet penetration, and entrepreneurship-related development indicators. However, a limitation of their work is the use of a broad human development index rather than direct entrepreneurial metrics like self-employment, and the pan-African aggregation may obscure unique country-specific dynamics, such as South Africa’s distinct digital-financial ecosystem. Conversely, Ndou et al. (2021) employed a qualitative approach with semi-structured interviews and thematic analysis to study digital entrepreneurship in Egypt, revealing that mobile payment systems and social media significantly supported informal business start-ups. While offering rich insights, this qualitative study lacks generalisability and does not establish causal links between digital infrastructure and entrepreneurial activity.

In North America, Chen et al. (2019) analysed data from the U.S. Panel Study of Entrepreneurial Dynamics to examine the impact of digital tools (e.g., cloud software, digital ads) on firm survival. Using probit and logit models, they found that early adoption of digital tools significantly improved start-up survival rates. While micro-level data allows for precise analysis of firm behaviour, it limits macroeconomic interpretation, and their reliance on self-reported digital adoption raises measurement reliability concerns. Forman and Goldfarb (2016), using a difference-in-differences approach, assessed broadband’s effects on entrepreneurial density across U.S. counties, finding that broadband access increased new business formation, particularly in low-density rural areas. Although this study robustly addresses causality through its quasi-experimental design, it assumes broadband availability equates to usage, which might overstate effects in digitally excluded communities.

Moving to South America, Soto-Acosta et al. (2020) investigated SMEs in Colombia and Brazil using partial least squares structural equation modelling (PLS-SEM). Their findings indicated that digital orientation positively influences innovation, which, in turn, boosts entrepreneurial performance. A constraint of this study is its focus on formally registered SMEs, thereby excluding informal entrepreneurship, which is prevalent in many Latin American economies.

In Asia, Li et al. (2020) examined the effect of mobile payments on entrepreneurship in rural China using a two-stage least squares (2SLS) model with county-level panel data. Their study found that mobile payment platforms increased self-employment by improving market access and reducing transaction costs. While effectively addressing endogeneity and using direct measures of entrepreneurship, the results are context-specific and may not translate to economies with more complex labour markets or greater digital divides. Similarly, Mitra and Abubakar (2023) analysed the digital economy’s effect on start-up activity in India using panel vector autoregression (PVAR), discovering that short-run digital shocks produced long-run effects on entrepreneurial growth. While their dynamic model effectively captures lagged effects, the chosen proxies (e.g., website domain registrations) might not fully encompass broader entrepreneurial ecosystems.

In Europe, Elia, Margherita, and Passiante (2020) conducted a multi-country study using the European Digital Entrepreneurship Scoreboard, employing panel fixed-effects models to assess how digital infrastructure influences early-stage entrepreneurial activity. While offering comprehensive data coverage and robust estimation, their focus on EU states with relatively high digital readiness limits relevance to less developed digital economies. Autio et al. (2018) analysed data from 28 European countries using multilevel regression, finding that digital platform usage (e.g., Airbnb, Uber) correlated positively with entrepreneurial intentions, particularly among youth. While the behavioural focus is important, intentions may not always translate into actual business creation, and the study might underestimate structural barriers like capital access or policy constraints.

Finally, in Australia and Oceania, Maritz and Donovan (2019) conducted a survey-based study in Australia, assessing digital transformation readiness among entrepreneurs. Using regression and factor analysis, they found that digital self-efficacy strongly predicts entrepreneurial resilience and adaptation. While innovative in linking digital skills to entrepreneurship, this study relies on perceptual data and does not assess broader economic outcomes such as job creation or GDP impact.

This systematic review reveals a need for studies that directly examine the macroeconomic impact of digitalisation on entrepreneurship in specific emerging economies, such as South Africa, while simultaneously accounting for interconnected labour market dynamics through system estimation techniques. The extensive review of global empirical literature reveals a general consensus that digitalisation exerts a positive influence on entrepreneurship. However, a critical gap in the existing body of research becomes apparent. Specifically, there is a notable scarcity of studies that concentrate on South Africa's macroeconomic data through time-series approaches. Furthermore, the majority of existing research implicitly treats digitalisation as an exogenous variable, failing to model its simultaneous effects on both self-employment (as a proxy for entrepreneurship) and unemployment. This overlooks the potential for an interconnected dynamic between these crucial labour market indicators within a digitally evolving economy.

To address this methodological void, the present paper proposes the application of a Seemingly Unrelated Regression (SUR) model. This approach offers a significant methodological innovation by enabling the simultaneous estimation of the interdependence between entrepreneurship and unemployment in the context of a digitally transforming economy. This capacity to model such intricate interdependencies is largely absent from the currently reviewed literature, thereby positioning this study to offer a more comprehensive and nuanced understanding of how digitalisation shapes labour market and entrepreneurship dynamics in South Africa.

Theoretical Justification of the SUR Model

The Seemingly Unrelated Regression (SUR) model, developed by Zellner (1962), is a system of linear equations designed to estimate multiple regression equations that may have different dependent variables and possibly different sets of explanatory variables but whose error terms are contemporaneously correlated. This correlation across equations implies that information from one equation's disturbances can improve the efficiency of estimates in another — a property that ordinary least squares (OLS) does not exploit when equations are estimated separately.

In classical regression analysis, the Gauss-Markov theorem assumes that the error terms are independently and identically distributed (i.i.d.). However, in multi-equation systems where the dependent variables are conceptually or structurally related, this assumption often fails. SUR corrects for this by estimating the equations jointly and accounting for cross-equation error correlations.

The general form of an SUR system is as follows:

$$yi = Xi\beta i + \varepsilon i, for\ i = 1,2, \ldots, M \quad (1)$$

Where:

- yi: T×1 vector of dependent variables for equation i
- Xi: T×Ki matrix of regressors
- βi: Ki×1 vector of parameters
- εi: Error term, assumed to follow a multivariate normal distribution across equations, i.e.,

$Cov(\varepsilon i, \varepsilon j) = \Sigma ij \neq 0 for\ some\ i \neq j$
(2)
The system can be expressed as:
$Y = X\beta + \varepsilon$ (3)
where $\varepsilon \sim N(0,\Omega)$, and Ω is a block-diagonal variance-covariance matrix with off-diagonal elements capturing contemporaneous correlation.
The GLS (Generalized Least Squares) estimator under SUR is:

$$\widehat{\beta_{SUR}} = \left(\sum_{i=1}^{M} X_i' \Sigma^{-1} X_i\right)^{-1} \left(\sum_{i=1}^{M} X_i' \Sigma^{-1} y_i\right) \quad (4)$$

There are several theoretical reasons to prefer SUR in this paper. Entrepreneurship and unemployment are interrelated labour market outcomes influenced by overlapping factors such as macroeconomic shocks, digitalisation trends, or institutional quality. Estimating them separately risks omitting useful information from their joint distribution. The application of a Seemingly Unrelated Regression (SUR) model offers several distinct advantages for this study, particularly in the context of examining the interplay between digitalisation, entrepreneurship, and unemployment in an emerging economy.

Firstly, SUR provides efficiency gains over Ordinary Least Squares (OLS). When the error terms across different equations are correlated, SUR yields more efficient and unbiased estimators compared to separate OLS estimations. Given that digitalisation is likely to influence both self-employment and unemployment in an interdependent manner, the SUR model is uniquely positioned to capture these simultaneous effects more effectively than individual single-equation regressions.

Secondly, SUR is particularly adept at handling partial endogeneity and policy interaction. In emerging economies, public policies related to digitalisation, employment, and entrepreneurship are frequently implemented in a coordinated fashion. Consequently, exogenous shocks or policy interventions in one domain can contemporaneously impact others. SUR models are designed to account for this interconnected policy structure without necessitating a full-blown simultaneous equation model, thereby offering a more nuanced understanding of policy effectiveness.

Thirdly, SUR presents a robust alternative to traditional multivariate regression. Unlike multivariate regression, which assumes that all dependent variables are part of a single system sharing a common set of predictors, SUR allows each dependent variable to have a distinct set of predictors while still estimating them jointly. This characteristic is particularly advantageous for this study, as the determinants of entrepreneurship and unemployment, while overlapping, are not identical, enabling a more precise specification of each relationship.

Finally, the use of SUR is supported by strong precedent in development economics. This methodology has been widely applied in macro-development literature, demonstrating its utility and reliability in various complex economic analyses. Notable applications include public finance (e.g., modelling tax revenue and expenditure equations), labour markets (e.g., analysing employment and wage systems), and comprehensive policy analysis (e.g., jointly estimating education and health outcomes). This established track record reinforces the suitability of the SUR model for investigating the intricate relationships under consideration in this research.

Model Specification

To capture the joint dynamics between self-employment and unemployment, we specify a system of two equations estimated using the Seemingly Unrelated Regressions (SUR) approach. Both equations include the same set of explanatory variables, with the key difference being the dependent variable.

1. **Entrepreneurship Equation (Self-Employment as Proxy)**

$$SE_t = \alpha_1 + \beta_1 ICT_t + \beta_2 GDPG_t + \beta_3 HCI_t + \beta_4 UEMP_t + \beta_5 UrbanPop_t + \beta_6 FDI_t + \beta_7 TradeOpen_t + \varepsilon_{1t} \quad (5)$$

2. Unemployment Equation

$UEMP_t = \alpha_2 + \beta_1 ICT_t + \beta_2 GDPG_t + \beta_3 HCI_t + \beta_4 SE_t + \beta_5 UrbanPop_t + \beta_6 FDI_t + \beta_7 TradeOpen_t + \varepsilon_{2t}$ (6)

Where:

Table 1: Explanation of the variables

Symbol	Description
SE_t	Number of self-employed individuals (proxy for entrepreneurship)
$UEMP_t$	Unemployment rate
ICT_t	Digitalisation proxy (e.g., mobile broadband subscriptions per 100 people)
$GDPG_t$	Real GDP growth rate
HCI_t	Human Capital Index (proxy for education or literacy rate)
$UrbanPop_t$	Urban population share
FDI_t	Foreign direct investment (net inflows as % of GDP)
$TradeOpen_t$	Trade openness (exports + imports as % of GDP)
ε_{1t}, ε_{2t}	Equation-specific error terms

Equations (5) and (6) are estimated simultaneously using SUR to account for possible correlation of error terms across equations. This system specification allows us to jointly analyse the determinants of self-employment and unemployment while exploiting cross-equation information for efficiency gains. SE_t appears as an explanatory variable in Equation (6) to capture its influence on unemployment, and $UEMP_t$ appears in Equation (5) to capture necessity entrepreneurship effects.

The above equations are based on the following key assumption:

$Cov(\varepsilon_{1t}, \varepsilon_{2t}) \neq 0$ (7)

Indicating contemporaneous correlation between the disturbances of both equations, which justifies the use of the SUR model in this analysis.

Presentation of the results

The analysis in this paper begins by testing the data series for stationarity. The method of stationarity test used is Dickey-Fuller Generalised Least Squares (DF-GLS).

DF-GLS Stationarity test

Table 2 presents the results of the Dickey-Fuller Generalized Least Squares (DF-GLS) unit root tests for a set of economic and policy variables. The null hypothesis in each case is that the variable has a unit root (i.e., is non-stationary). A rejection of the null hypothesis (based on approximate p-values) indicates that the series is stationary. Where a variable was found to be non-stationary in levels, its first-differenced form was also tested and typically found to be stationary, confirming an integration order of I(1). These findings are useful for model selection in econometric analysis, such as SUR estimations.

Table 2: DF-GLS Stationarity Results

Variable	Model	Lags	Test Statistic	p-value
ICT	with constant and trend	including 0 lags of (1-L)ICT	-2.11439	0.418
d_ICT	with constant and trend	including 0 lags of (1-L)d_ICT	-5.83156	0.000 ***
GDP_Growth	with constant and trend	including 2 lags of (1-L)GDP_Growth	-2.13495	0.418
d_GDP_Growth	with constant and trend	including 0 lags of (1-L)d_GDP_Growth	-9.19102	0.000 ***
Unemployment	with constant and trend	including 0 lags of (1-L)Unemployment	-1.70235	0.665
d_Unemployment	with constant and trend	including 0 lags of (1-L)d_Unemployment	-5.52291	0.000 ***
Trade_Open	with constant and trend	including 0 lags of (1-L)Trade_Open	-3.40528	0.042 **
Urban_Pop	with constant and trend	including 0 lags of (1-L)Urban_Pop	-1.33968	0.876
d_Urban_Pop	with constant and trend	including 0 lags of (1-L)d_Urban_Pop	-5.69263	0.000 ***
FDI	with constant and trend	including 0 lags of (1-L)FDI	-5.38806	0.000 ***
Self_employed	with constant and trend	including 0 lags of (1-L)Self_employed	-1.78729	0.618
d_Self_employed	with constant and trend	including 0 lags of (1-L)d_Self_employed	-5.63015	0.000 ***
HCI	with constant and trend	including 0 lags of (1-L)HCI	-5.47956	0.000 ***

*Note: p-values are followed by significance stars. *** = 1% significance, ** = 5% significance, * = 10% significance.*

The Augmented Dickey-Fuller (ADF-GLS) test was applied to all variables under the null hypothesis of a unit root. Each variable was tested with a model specification that included both a constant and a deterministic time trend. The lag structure was selected based on a modified AIC criterion. The objective was to establish whether the time series variables are stationary in levels or require differencing. The Augmented Dickey-Fuller (ADF-GLS) stationarity tests reveal that several key variables, including ICT, GDP growth, unemployment, urban population, and self-employment, are non-stationary in levels, as their test statistics do not reject the null hypothesis of a unit root at conventional significance levels. Conversely, trade openness is stationary at the 5% level, and both FDI and HCI are highly stationary at the 1% level. Once first differences are taken, all previously non-stationary variables become strongly stationary with p-values below 1%, confirming that they are integrated of order one, I(1). These findings imply that the dataset contains a mixture of I(0) and I(1) variables. In the context of the SUR framework, which estimates multiple equations jointly and exploits contemporaneous correlation of the error terms across equations, the presence of mixed orders of integration does not pose a problem as long as the equations are correctly specified. Using differenced series for the I(1) variables in the SUR specification helps to ensure that the regression results are not spurious, thereby improving the reliability and efficiency of the parameter estimates.

Seemingly Unrelated Regression Results

The SUR results are presented in table 3 below:

Table 3: Seemingly Unrelated Regression Analysis

Variable	Eq. 1 Coeff.	Eq. 1 Std. Error	Eq. 1 t-Ratio	Eq. 1 p-Value	Eq. 2 Coeff.	Eq. 2 Std. Error	Eq. 2 t-Ratio	Eq. 2 p-Value
d_ICT	−2.07591	0.22909	−9.062	7.02e-09 ***	0.69494	0.25881	2.685	0.0135 **
d_GDP_Growth	−0.03219	0.05682	−0.567	0.5768	0.00321	0.03583	0.090	0.9295
HCI	−0.11915	0.16154	−0.738	0.4686	0.07083	0.10135	0.699	0.4920
d_Unemployment	0.69603	0.28104	2.477	0.0214 **	—	—	—	—
d_Self_employed	—	—	—	—	0.27343	0.11041	2.477	0.0214 **
d_Urban_Pop	−2.74201	2.14231	−1.280	0.2139	−0.17750	1.38381	−0.128	0.8991
FDI	−0.23616	0.18210	−1.297	0.2081	0.36201	0.09405	3.849	0.0009 ***
Trade_Open	0.03315	0.01685	1.967	0.0619 *	−0.00600	0.01126	−0.533	0.5991

Equation 1 Summary: Mean dependent var = −0.80345 | S.D. dependent var = 5.73756 | Sum squared resid = 50.04353 | S.E. of regression = 1.31364

Equation 2 Summary: Mean dependent var = 0.50924 | S.D. dependent var = 1.07918 | Sum squared resid = 19.65922 | S.E. of regression = 0.82335

Interpretation of SUR Results

The Seemingly Unrelated Regression (SUR) model was estimated jointly for two equations:

- **Equation 1:** Change in self-employment (d_Self_employed)
- **Equation 2:** Change in unemployment (d_Unemployment)

This approach accounts for potential contemporaneous correlations between the error terms of the two equations, thereby improving the efficiency of coefficient estimates. The Breusch–Pagan test strongly rejects the null of zero cross-equation correlation ($\chi^2 = 10.62$, $p = 0.0011$), confirming that SUR is the appropriate estimation technique.

Equation 1 – Determinants of Self-Employment

The analysis of Equation 1, which explores factors influencing changes in self-employment, reveals several significant relationships. The most influential factor is digitalisation, represented by the change in ICT penetration, which has a large, negative, and highly significant coefficient (-2.076,). This result strongly indicates that the increasing adoption of ICT is associated with a reduction in self-employment, suggesting a disruptive effect where technology may be displacing informal or low-productivity entrepreneurial activity. Furthermore, the analysis provides robust support for the necessity entrepreneurship hypothesis, as a positive and significant relationship (0.696,) exists between rising unemployment and an increase in individuals turning to self-employment as a survival mechanism. Trade openness also shows a positive, though weakly significant, effect on self-employment, suggesting that greater integration into international markets may marginally support entrepreneurial activity. Interestingly, other variables such as GDP growth, human capital investment (HCI), foreign direct investment (FDI), and urbanisation were found to be statistically insignificant, implying their short-run effects on changes in self-employment are weak or negligible in this context.

The analysis of Equation 2, which examines factors influencing changes in unemployment, reveals several significant relationships. The results indicate that digitalisation (ICT) has a positive and significant effect on unemployment (0.695,), suggesting that as technology advances, it may cause short-term job displacement before new technology-driven jobs emerge. The model also shows a key finding which is a positive and significant relationship between changes in self-employment and changes in unemployment (0.273,). This indicates that an increase in self-employment does not reduce unemployment; rather, they may occur simultaneously, reinforcing the "necessity entrepreneurship" hypothesis. Furthermore, FDI has a positive and highly significant effect on unemployment (0.362), an important insight that could suggest foreign investment is initially directed toward capital-intensive sectors with limited job creation or is associated with corporate restructuring that leads to temporary layoffs. Conversely, other variables such as GDP growth, human capital investment, urbanisation, and trade openness are statistically insignificant, suggesting they do not have a strong short-run influence on unemployment rates in this context.

System Diagnostics

Table 4: Cross-equation VCV (variances on diagonal, correlations above)

1.7256	(−0.605)
−0.65462	0.67790

Log determinant: −0.299368

Breusch–Pagan test for diagonal covariance matrix: Chi-square(1) = 10.6234, p = 0.0011

The provided diagnostics on the cross-equation residual diagnostics confirm the interconnected nature of your two regression models. The Cross-Equation Variance–Covariance Matrix (VCV) shows a higher residual variance for the self-employment equation (1.7256) than for the unemployment equation (0.6779), indicating more unexplained variability in the former. The off-diagonal element shows a significant negative correlation between the residuals (-0.605). This is a crucial finding, suggesting that unobserved shocks or factors that increase self-employment tend to decrease unemployment and vice versa. The Breusch–Pagan test with a highly significant p-value of 0.0011 robustly rejects the null hypothesis of no cross-equation correlation. This statistically validates the use of the Seemingly Unrelated Regression (SUR) model, confirming that it was the correct and more efficient approach than estimating the equations separately using Ordinary Least Squares (OLS), as SUR leverages this correlation to produce more precise coefficient estimates.

Implications of the findings

These findings collectively highlight the significant and multifaceted implications of digitalisation for the modern labour market. The dual effect of ICT, simultaneously reducing self-employment and increasing unemployment, presents a clear structural challenge. This underscores the urgent need for a policy response focused on digital skills training and proactive labour market adjustments to ensure the benefits of technology are shared broadly. Furthermore, the results suggest that the quality of FDI matters; its link to rising unemployment indicates a need to attract investment that creates jobs and integrates into local value chains, rather than solely focusing on capital-intensive sectors. The clear dominance of necessity-driven entrepreneurship—where self-employment rises with unemployment—calls for targeted support programs designed to help these individuals build sustainable businesses. Finally, the mild but positive influence of trade openness on entrepreneurial activity signals that a focus on deeper trade facilitation could unlock further opportunities.

These results challenge some conventional assumptions and add nuance to existing debates about digitalisation and labour markets. The dominant discourse often presents Information and Communication Technology (ICT) as a net positive for economies, driving growth and creating new, high-skilled jobs. However, these findings complicate this by showing a simultaneous negative impact on self-employment and a positive impact on unemployment. This aligns with a more critical theoretical perspective, such as Schumpeter's theory of creative destruction, where technological progress is inherently disruptive. It highlights a short-run transition period where old jobs and work models are destroyed before new ones are fully created (Aghion & Howitt, 1996), a nuance often lost in more optimistic narratives.

Traditional entrepreneurship theory often distinguishes between "opportunity-driven" entrepreneurship (pull factors) and "necessity-driven" entrepreneurship (push factors). While both are well-documented, these results provide powerful empirical evidence that the push-effect dominates in this specific context. The positive correlation between unemployment and self-employment directly challenges the idea that entrepreneurship is a primary solution to joblessness; instead, it's a symptom. This finding that self-employment also positively affects unemployment is particularly novel, as it pushes back on the assumption that more self-employment automatically reduces unemployment, suggesting that this growth is not creating new jobs but rather reflects a precarious form of work.

The prevailing theory on Foreign Direct Investment (FDI) posits that it boosts employment, especially in developing economies, by bringing capital, technology, and management expertise. The finding in this paper that FDI is positively and significantly linked to unemployment in the short run is a notable deviation from this. This finding supports a more critical theory, such as that FDI inflows are initially directed towards capital-intensive sectors or that multinational firms restructure local operations, leading to temporary layoffs (Smarzynnska & Spatareanu, 2009). This finding challenges the simple cause-and-effect relationship often assumed in policy discussions and suggests a more complex dynamic at play.

Policy Recommendations

The results underscore the urgent need for targeted digital skills training and reskilling to address the disruptive, short-run effect of ICT on unemployment. The findings suggest that digitalisation has increased unemployment in the short term, likely due to a mismatch between existing workforce skills and the requirements of new technology-driven jobs. Policymakers should therefore fund and promote comprehensive training programmes that go beyond basic computer literacy to include coding, data analytics, and digital marketing, thereby preparing workers for higher-value roles in the digital economy. Evidence from the literature shows that well-designed training programmes can mitigate the negative labour market effects of technological change (Acemoglu & Autor, 2011). In parallel, a dual-track entrepreneurship support system is required to distinguish between necessity-based and opportunity-driven entrepreneurship. For those pushed into self-employment by a lack of formal jobs, policy should provide basic business training, access to micro-loans, and support for formalisation to help build sustainable livelihoods. For entrepreneurs with scalable, high-growth ventures, mentorship, networking opportunities, and access to venture capital should be prioritised to maximise their potential for job creation. Finally, the results reveal that FDI has a positive short-run effect on unemployment, challenging the common assumption that all FDI is automatically beneficial for job creation. This highlights the importance of strategically attracting and managing FDI by prioritising investments that are labour-intensive, have strong domestic supply chain linkages, and include commitments to employee training. Governments should focus not merely on the quantity of FDI but on its quality and potential to generate employment spillovers (Borensztein et al., 1998).

Conclusion

This study jointly estimated the determinants of self-employment and unemployment using a Seemingly Unrelated Regression (SUR) framework. The significant Breusch–Pagan statistic confirmed the presence of cross-equation error correlations, justifying the use of SUR to improve efficiency and exploit the information contained in the correlation structure. The results reveal several key insights. First, digitalisation has a dual and disruptive effect. It significantly reduces self-employment while simultaneously increasing unemployment in the short run. This finding highlights a structural adjustment process in which technology displaces informal or low-productivity entrepreneurial activity and creates transitional job losses before new opportunities emerge. Second, the positive association between unemployment and self-employment confirms that entrepreneurship in this context is largely necessity-driven. Individuals turn to self-employment as a survival strategy when formal jobs are scarce, which explains why higher levels of self-employment coexist with persistent unemployment. Third, trade openness exerts a weakly positive influence on self-employment, suggesting that deeper integration into global markets can stimulate entrepreneurial activity, albeit modestly.

A striking finding is that FDI has a positive and statistically significant short-run effect on unemployment, implying that foreign investment may initially be channelled into capital-intensive activities or involve restructuring processes that displace workers before generating net job gains. This calls for a shift in policy emphasis towards attracting FDI that is labour-intensive, embedded in domestic value chains, and accompanied by local training initiatives. Taken together, these findings highlight three important policy imperatives; (1) investing in targeted digital skills training and reskilling to mitigate technology-induced job losses; (2) designing a dual-track entrepreneurship support system that differentiates between necessity- and opportunity-driven ventures, helping the former to formalise and the latter to scale; and (3) strategically managing FDI inflows to maximise employment spillovers. By implementing these measures, policymakers can transform the current challenges posed by digitalisation, unemployment, and FDI into drivers of inclusive and sustainable growth.

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From control to empowerment: Transformational leadership and autonomy in digital work environments

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Keywords
Digital work environment, leadership, empowerment, control, performance

Abstract
This study examines the evolving role of leadership in digital work environments, focusing on the paradigm shift from supervisory control to trust-based empowerment. As organisations increasingly adopt digital collaboration tools and flexible work structures, traditional command-and-control models are challenged by the need for employee autonomy, motivation, and virtual accountability. The research explores how transformational leadership practices can foster digital autonomy and innovation, especially within distributed teams. Drawing on recent literature in digital leadership, organisational behaviour, and workplace psychology, the study positions digital empowerment as a key factor in sustaining performance, engagement, and adaptive capability in remote and hybrid settings. An embedded case study methodology was employed, comparing two departments within a large professional services firm that implemented contrasting leadership models during a digital transformation initiative. Department A adopted a transformational leadership approach characterised by trust, open communication, and outcome-based management, while Department B retained hierarchical supervision and task-monitoring practices. Data were collected through semi-structured interviews with managers and team members (n=24), supplemented by internal performance reports and pulse surveys over a six-month period. Thematic analysis was applied to qualitative data, and patterns were triangulated with performance indicators. Three key findings emerged. First, teams led through empowerment demonstrated higher digital engagement and psychological ownership over workflows. Second, leaders who prioritised trust and feedback fostered stronger team cohesion and adaptability under virtual pressures. Third, departments with rigid digital oversight experienced reduced creativity and increased disengagement. Based on these findings, the study recommends leadership development programmes that embed digital trust-building and autonomy facilitation as core competencies. It also proposes a strategic model for transitioning from supervision to empowerment in digitally mediated workplaces. This research contributes to the growing field of digital leadership studies by evidencing how leadership style directly shapes team performance and innovation in virtual contexts.

Introduction

The shift toward digital work environments has transformed the landscape of organisational leadership, compelling a fundamental reassessment of how people are managed, motivated, and empowered. As remote and hybrid work structures become embedded in organisational practice, leadership models grounded in direct supervision and task control are increasingly proving inadequate (Kniffin et al., 2021; Spataro, 2022). The digitisation of workspaces, enabled by collaborative platforms such as Microsoft Teams, Slack, and Asana, has created environments where visibility is often limited, asynchronous communication is normalised, and autonomy becomes both a necessity and a challenge (Waizenegger et al., 2020). In such contexts, the ability of leaders to foster trust, enable self-management, and support innovation is now central to organisational success.

Historically, leadership in traditional office environments has relied on mechanisms of control, surveillance, and proximity (Mintzberg, 1973). In contrast, digital work environments—characterised by virtual presence, distributed teams, and limited face-to-face supervision—demand an increased reliance on trust, autonomy, and employee self-efficacy (Contreras, Baykal & Abid, 2020). The literature indicates that this shift is not merely technological but deeply behavioural and cultural, requiring leaders to embrace new roles as facilitators, enablers, and role models of adaptive digital behaviour (Avolio, Sosik, Kahai & Baker, 2014).

Transformational leadership theory, originally articulated by Bass (1985), provides a powerful lens through which to examine this shift. Transformational leaders inspire followers through vision, intellectual stimulation, and personalised consideration, thereby fostering intrinsic motivation and higher levels of engagement (Bass & Riggio, 2006). When applied to digital work settings, transformational leadership is associated with increased team effectiveness, innovation, and psychological empowerment (Purvanova & Bono, 2009; Eisenberg, Post & DiTomaso, 2019). Unlike transactional leaders, who focus on task completion and performance monitoring, transformational leaders are better positioned to support autonomy and build virtual trust (Kirkman, Rosen, Tesluk & Gibson, 2004). However, the realisation of these benefits depends on how effectively such leadership behaviours are translated into the digital context.

The COVID-19 pandemic served as a catalyst for organisational digitisation, but it also exposed leadership gaps and organisational unpreparedness. Many leaders attempted to replicate physical control mechanisms through digital surveillance, micromanagement via virtual tools, and hyper-monitoring, leading to employee fatigue, digital presenteeism, and disengagement (Sull, Sull & Bersin, 2022; Wang, Liu, Qian & Parker, 2021). In contrast, organisations that embraced digital autonomy, offered flexibility, and developed trust-based leadership practices saw gains in innovation, employee satisfaction, and retention (Galanti, Guidetti, Mazzei, Zappalà & Toscano, 2021).

Research also suggests that digital leadership is not merely about the deployment of tools but about cultural readiness and values alignment (Kane, Palmer, Phillips, Kiron & Buckley, 2015). Leadership in digital settings must therefore reconcile two competing demands: maintaining productivity and accountability while fostering autonomy and well-being. This tension forms the central dilemma of modern leadership in digitally mediated work environments (Gratton, 2021).

In addressing this challenge, a growing body of literature advocates for a shift from control-centric to empowerment-oriented leadership. Empowerment, in this context, involves delegating authority, promoting self-directed work, and encouraging initiative-taking among employees (Seibert, Wang & Courtright, 2011). When combined with digital technologies, empowerment becomes both a structural and psychological construct—enabled by access to tools and shaped by leadership behaviours (Zhang & Bartol, 2010). The empowerment paradigm resonates with self-determination theory, which posits that autonomy, competence, and relatedness are key drivers of motivation and engagement (Deci & Ryan, 2000). Leaders who create conditions for these psychological needs to be met in digital environments can foster not only performance but also employee flourishing.

However, empowerment is not without its challenges. Too much autonomy without support can lead to ambiguity, fragmentation, and stress, particularly in teams lacking digital literacy or role clarity (Mazmanian, Orlikowski & Yates, 2013). Thus, the question is not whether digital leadership should shift toward empowerment, but how this shift can be strategically managed to balance freedom with structure, innovation with accountability.

This paper investigates the contrasting outcomes of control versus empowerment-based leadership approaches in digital work settings by conducting a case study of two departments within the same organisation. One department implemented a transformational leadership strategy centred on digital autonomy, while the other retained a control-oriented, supervisory model. By comparing their outcomes, this study seeks to explore how leadership style influences engagement, performance, and innovation in digital environments.

The investigation is structured around the following research questions:

1. How does transformational leadership influence employee autonomy and engagement in digital work environments?
2. What are the comparative impacts of control-based and empowerment-based leadership approaches on team performance?
3. How do digital collaboration tools mediate leadership behaviours and employee experiences of empowerment?

In line with these questions, the research objectives are:

- To examine the effects of transformational leadership on digital autonomy and employee motivation.
- To analyse differences in team dynamics and outcomes under contrasting leadership models.
- To explore how leadership behaviours are shaped or constrained by digital tools and platforms.
- To propose a practical model for leaders aiming to foster digital empowerment in hybrid or remote teams.

In addressing these aims, this paper contributes to the theoretical and practical discourse on digital leadership, providing evidence-based insights into how organisations can adapt their managerial paradigms to support high-performing and autonomous digital teams.

Methodology

This study adopts a qualitative case study methodology to explore how different leadership approaches—transformational and control-oriented—affect employee autonomy, engagement, and team performance in digital work environments. The case study approach is suitable for capturing the complexity and contextual nuances of leadership dynamics within specific organisational settings (Yin, 2018). By comparing two departments within the same professional services firm, the research design enables a contextualised examination of leadership behaviour and its influence on digital collaboration and empowerment.

Research Design

The study is structured as an embedded comparative case study, allowing for the analysis of two organisational units operating under similar external conditions but led by managers employing distinct leadership models. Department A transitioned to a transformational leadership style that prioritised autonomy, outcome-based performance, and trust-based delegation in the digital workspace. In contrast, Department B retained a supervisory approach grounded in task monitoring, digital oversight, and frequent performance check-ins.

Both departments are part of a global firm in the consultancy sector, operating with comparable roles, resources, and technological infrastructures. This organisational alignment controls for external variables and enables the attribution of observed differences to leadership styles rather than structural disparities (Miles, Huberman & Saldaña, 2014).

Data Collection

Data were collected over a six-month period through three primary sources:

1. **Semi-structured interviews**: A total of 24 interviews were conducted with managers and employees across both departments (12 per department). Participants were selected using purposive sampling to ensure diverse representation in terms of seniority, function, and digital engagement. The interviews explored perceptions of leadership, experiences with digital autonomy, communication dynamics, and team climate.
2. **Document analysis**: Internal documents including performance dashboards, team feedback reports, and digital communication policies were reviewed. These provided insight into how leadership values were operationalised and how team goals were tracked in each department.
3. **Pulse surveys**: Aggregated results from bi-weekly employee pulse surveys, routinely administered by the HR department, were accessed. Key variables included digital engagement, perceived autonomy, collaboration quality, and innovation metrics.

All interviews were recorded and transcribed with participants' informed consent, adhering to ethical standards of confidentiality and anonymity. Ethical clearance was obtained through the sponsoring university's research ethics committee.

Data Analysis

Thematic analysis was employed to interpret the qualitative data, following Braun and Clarke's (2006) six-phase framework: familiarisation with data, generation of initial codes, searching for themes, reviewing themes, defining themes, and writing up. NVivo 14 software was used to manage and code the data. Codes were developed inductively but guided by sensitising concepts from transformational leadership theory, self-determination theory, and digital empowerment literature.

Three major thematic categories emerged: (1) Leadership communication style and employee trust, (2) Autonomy and accountability in digital workflows, and (3) Emotional climate and adaptive capacity. These were analysed comparatively across the two departments to identify patterns and contrasts.

Quantitative data from performance reports and pulse surveys were used to triangulate qualitative findings. While not subjected to statistical testing, descriptive comparisons (e.g., average engagement scores, innovation index ratings) provided an additional layer of interpretive validity (Denzin, 2012).

Limitations

Several limitations should be acknowledged. First, the study focuses on only two departments within a single organisation, which may limit the generalisability of findings. However, this limitation is partially mitigated by the depth of case engagement and the internal comparability between units. Second, the reliance on self-reported data in interviews and surveys may introduce response biases, particularly in attributing outcomes to leadership behaviours. To reduce this risk, data triangulation was used to corroborate themes across multiple sources. Third, the study captures a six-month period of digital adaptation and may not reflect long-term leadership effects or the evolution of team dynamics over time.

Despite these constraints, the case study provides rich, contextualised insights into how leadership approaches shape digital work experiences. It offers a foundation for further cross-sectoral or longitudinal research and practical guidance for leaders aiming to transition from control-based to empowerment-oriented management models.

Literature Review

The Digitalisation of Work and the Redefinition of Managerial Boundaries

The digitalisation of work is not merely a shift in operational logistics but a transformation in the very architecture of how work is conceived, distributed, and governed. As organisations adopt virtual workspaces, cloud-based platforms, and asynchronous workflows, the once-dominant managerial paradigm of supervision and physical oversight is rapidly dissolving (Leonardi, 2020; Felstead & Henseke, 2017). In digital work environments, leadership can no longer rely on spatial proximity or visual cues; instead, it must function across temporal gaps, technology-mediated exchanges, and loosely coupled team structures (Sivathanu & Pillai, 2021). This transformation redefines power dynamics in organisations, calling for a shift from managerial control to strategic enablement.

Work, in this new paradigm, is not anchored by presence but by outcomes, not managed by observation but by influence. Control-based leadership mechanisms—such as line-of-sight management, daily physical check-ins, or unidirectional task delegation—become impractical in digital settings and are often counterproductive (Bailey & Kurland, 2021). The attenuation of physical structures places new cognitive and emotional demands on both leaders and employees, particularly around coordination, accountability, and trust-building. Where oversight used to structure expectations, clarity of goals and alignment of values must now take its place (Cascio & Montealegre, 2016). For leadership scholars and practitioners, this represents a profound shift from performance enforcement to purpose alignment.

The Impact of Work Environment Digitisation on Employee Job Performance and Organisational Productivity

The digitisation of work environments has generated both promises and paradoxes for employee performance and overall organisational productivity. On one hand, digital technologies offer increased flexibility, faster access to information, and enhanced communication channels, which can elevate individual and collective efficiency (Baptista et al., 2020). On the other, they introduce complexities in coordination, cognitive overload, and fragmented attention, which may hinder sustained high performance if not strategically managed (Tarafdar et al., 2019).

Digitisation influences job performance at both **task** and **relational** levels. At the task level, technologies such as AI-driven platforms, cloud-based collaboration tools, and workflow automation have significantly accelerated information processing and task execution. Studies show that employees with access to integrated digital tools often report higher perceived productivity, particularly in knowledge-based roles where autonomy and data flow are essential (Schwarzmüller et al., 2018). However, this productivity gain is contingent on digital literacy and platform usability—when tools are not intuitive or overly complex, performance can degrade (Vial, 2019).

Relationally, digitisation reconfigures the nature of collaboration. While digital platforms facilitate borderless teamwork, they can also limit informal communication, reduce emotional bandwidth, and introduce asynchronous delays. These changes may weaken team cohesion and make trust-building more difficult (Maznevski & Chudoba, 2000; Gibbs et al., 2021). Research suggests that digital collaboration is most productive when underpinned by strong leadership norms, shared protocols, and technology fit with task complexity (Benlian, 2020).

From a psychological perspective, digital work environments impact performance by shaping cognitive and emotional resources. The phenomenon of **technostress**—stress induced by information overload, constant notifications, and digital surveillance—has been shown to impair attention, creativity, and decision-making (Tarafdar et al., 2007; Ayyagari, Grover & Purvis, 2011). Conversely, when digitisation enhances role clarity, autonomy, and feedback, it can serve as a motivator and enable peak performance (Peters et al., 2020).

Organisationally, digitisation affects productivity through both **individual output** and **system-level optimisation**. Digital dashboards, analytics platforms, and performance tracking systems provide leaders with real-time insights, enabling faster decision-making and more agile responses to market changes (Bharadwaj et al., 2013). However, these tools must be implemented within a culture of trust and strategic empowerment—otherwise, they risk being used as instruments of micro-surveillance, which undermine intrinsic motivation and long-term innovation (Bernstein, 2017).

Evidence from large-scale longitudinal studies (e.g., Eurofound & ILO, 2017) indicates that firms adopting digital workflows experience productivity gains only when digitisation is matched with complementary organisational practices—such as employee upskilling, team autonomy, and inclusive leadership. Digitisation alone is insufficient; it must be embedded within socio-technical systems that balance structure with flexibility (Orlikowski, 2007).

Finally, leadership plays a pivotal mediating role. The productivity gains of digitisation are magnified when leaders support cognitive bandwidth through outcome-based goal setting, enable discretionary use of tools, and maintain open channels for feedback and experimentation (van Zoonen, Sivunen & Blomqvist, 2021). In contrast, rigid digital oversight, frequent low-value check-ins, or inconsistent platform usage can create confusion and reduce work efficiency.

In sum, digitisation transforms the conditions of performance but does not automatically enhance it. Its success depends on **human-centric leadership**, purposeful tool design, and supportive cultures that prioritise both productivity and well-being. Future research should explore how digital maturity, leadership style, and employee empowerment interact to produce sustainable performance gains in evolving hybrid work models.

Employee Experience and Psychological Impacts of Digital Work Environments

Digital work alters not only the operational structure of organisations but also the psychological contract between employees and employers. Employees in digital contexts face intensified demands for self-regulation, goal prioritisation, and continuous connectivity, which can increase autonomy but also lead to fatigue, social isolation, and blurred work-life boundaries (Wang et al., 2021; Gartner, 2023). Research shows that while flexibility in digital work is often appreciated, it is not without hidden costs: the loss of informal learning, peer recognition, and spontaneous collaboration creates a fragmented professional experience that can erode both motivation and cohesion (Bartsch et al., 2020).

The expectation of availability, reinforced by constant digital communication, can result in an "always-on" culture that undermines autonomy rather than enhancing it (Mazmanian et al., 2013). Moreover, employees without strong digital literacy or those working in under-resourced roles may struggle with the technological self-sufficiency that virtual environments demand (Sarker et al., 2019). In such settings, leadership behaviours become critical in shaping how autonomy is experienced: whether as empowerment and trust or abandonment and confusion. Psychological safety, feedback, mentoring, and emotional support must be purposefully integrated into digital leadership practice if employee well-being and engagement are to be sustained (Edmondson, 2018; Bailey & Kurland, 2021).

Autonomy in Digitally Distributed Teams: Structural and Cognitive Dimensions

Autonomy is frequently cited as one of the principal benefits and challenges of digital work. In virtual teams, it becomes both a necessity and a design feature. Structurally, autonomy refers to the latitude employees have to make decisions, manage tasks, and select tools or methods of working (Hackman & Oldham, 1976; Gajendran & Harrison, 2007). In digital contexts, where direct supervision is not viable, this structural autonomy is built into the fabric of task execution. However, this alone is insufficient. Without cognitive autonomy—the perception of self-direction and ownership—employees may default to passivity or feel disengaged from team objectives (Spreitzer, 1995; Seibert et al., 2011).

Cognitive autonomy is influenced heavily by leadership behaviour. Empowering leadership clarifies expectations, fosters confidence, and allows employees to experiment and fail constructively (Zhang & Bartol, 2010). By contrast, managerial micromanagement, even when digitally disguised as frequent check-ins or constant messaging, can undermine the sense of autonomy and lead to decision paralysis or digital burnout (Jeske & Santuzzi, 2015). The literature increasingly supports the view that autonomy is not the absence of structure, but the presence of purposeful flexibility: clear goals, bounded discretion, and the freedom to contribute in personalised ways (Ryan & Deci, 2020).

Transformational Leadership: Mobilising Autonomy and Engagement

Transformational leadership, with its emphasis on vision, stimulation, and individualised support, provides a compelling framework for leading digital teams. Unlike transactional leadership, which centres on extrinsic motivation and performance control, transformational leadership fosters intrinsic motivation through shared purpose, empowerment, and role development (Bass & Riggio, 2006; Braun et al., 2013). This leadership style is well-suited to digital environments, where reliance on internalised motivation and team self-organisation is essential.

Empirical studies affirm that transformational leaders improve performance and innovation outcomes in both co-located and virtual teams (Purvanova & Bono, 2009; Hoch & Dulebohn, 2017). In digital contexts, their behaviours are adapted through technology: vision is communicated via collaborative platforms; intellectual stimulation is reinforced through problem-based learning and open decision-making; individualised support is offered through digital coaching, asynchronous mentoring, or personalised communication. These adaptations preserve the spirit of transformational leadership while adjusting its form for the digital medium. Importantly, transformational leaders enable autonomy not by withdrawal but by strategically scaffolding it: creating space for employee ownership while maintaining accountability (Eisenbeiss et al., 2008).

Trust and Psychological Safety as Foundations of Empowerment

Trust is a foundational element of effective leadership in digital contexts. Without visual monitoring and physical interaction, teams must rely on trust in leadership intentions, team competence, and fairness in task allocation (Dirks & Ferrin, 2002; Jarvenpaa & Leidner, 1999). This trust is not given by default in digital teams—it must be earned and sustained through consistent, transparent, and empathetic leadership practices (Breuer et al., 2016). Transformational leaders foster such trust by role-modelling integrity, listening actively, and creating forums for open discussion.

Psychological safety, closely related to trust, refers to the shared belief that a team is safe for interpersonal risk-taking (Edmondson, 2018). In digital teams, where cues are ambiguous and communication is mediated, creating psychological safety is a deliberate leadership act. Empowerment fails when employees fear making mistakes, receiving blame, or facing public criticism on digital platforms. Leadership practices that normalise experimentation, acknowledge uncertainty, and validate diverse contributions significantly increase psychological safety and, in turn, enable autonomy to be exercised confidently and constructively (Newman, Donohue & Eva, 2017).

Leadership Communication, Goal Clarity, and Feedback Loops

Communication in digital teams must go beyond transmission of information—it must generate shared understanding. Empowering leaders communicate not just tasks but purpose, not just deadlines but context (Manuti & De Palma, 2018). Clear articulation of goals, roles, and timelines is essential in distributed teams, where misinterpretations can delay progress and damage morale. Research shows that goal clarity correlates strongly with engagement, particularly in settings of high autonomy (Hackman, 2002; Kirkman & Rosen, 1999).

Feedback also plays a pivotal role in digital empowerment. In remote teams, where spontaneous reinforcement is rare, leaders must offer feedback that is timely, constructive, and framed around growth (London & Smither, 2002). Feedback should not merely be corrective—it should reinforce autonomy by validating initiative and guiding development (Kim & Fernandez, 2017). Effective leaders also create feedback loops within teams, enabling peer-to-peer coaching, collaborative reflection, and distributed responsibility for improvement (Jiang & Chen, 2018).

Digital Tools: Mediators of Leadership Behaviour and Autonomy

Digital platforms are more than communication tools—they are systems that encode and enable leadership practices. The affordances of tools such as Microsoft Teams, Zoom, and Miro influence how tasks are tracked, meetings are facilitated, and recognition is distributed (Leonardi, 2021). Leaders must therefore develop what Kane et al. (2019) term “digital leadership fluency”: the ability to strategically use tools not for control but for empowerment. This includes designing inclusive meeting structures, using analytics for development rather than punishment, and establishing digital rituals that reinforce team identity and cohesion.

At the same time, the overuse of monitoring features, analytics dashboards, or digital nudges can produce unintended consequences. When employees feel digitally surveilled, they often reduce experimentation and risk-taking—behaviours essential to innovation and proactive work (Bernstein et al., 2018). Effective digital leaders critically assess the function of tools in their leadership style and balance transparency with psychological privacy (Gratton, 2021).

Barriers to Digital Empowerment and How to Overcome Them

Despite growing interest in digital empowerment, significant barriers remain. These include organisational cultures that reward compliance over initiative, technological infrastructures that are inflexible or fragmented, and managerial insecurities around relinquishing control (Sivathanu & Pillai, 2021). Furthermore, not all employees are equally prepared to navigate high-autonomy environments, particularly those without sufficient digital or self-management skills (Felstead & Henseke, 2017). Empowerment, therefore, must be supported by digital training, ongoing mentoring, and adaptive performance management systems.

Overcoming these barriers requires deliberate leadership development and cultural transformation. Leaders must be trained not just in technology, but in relational intelligence, adaptive goal-setting, and inclusive communication (Kane et al., 2015). At the cultural level, organisations must shift performance indicators from presence and responsiveness to innovation, initiative, and value creation. Only then can digital autonomy become sustainable and scalable across diverse teams.

Findings

This section presents the results of the comparative case study (Figure 1) conducted in two departments of the same professional services organisation. Department A implemented a leadership style grounded in empowerment, autonomy, and outcome-oriented management. Department B, by contrast, retained a more control-based, supervisory leadership model with structured reporting and close task oversight. Data were gathered over a six-month period through semi-structured interviews (n=24), internal team metrics, and aggregated pulse survey results.

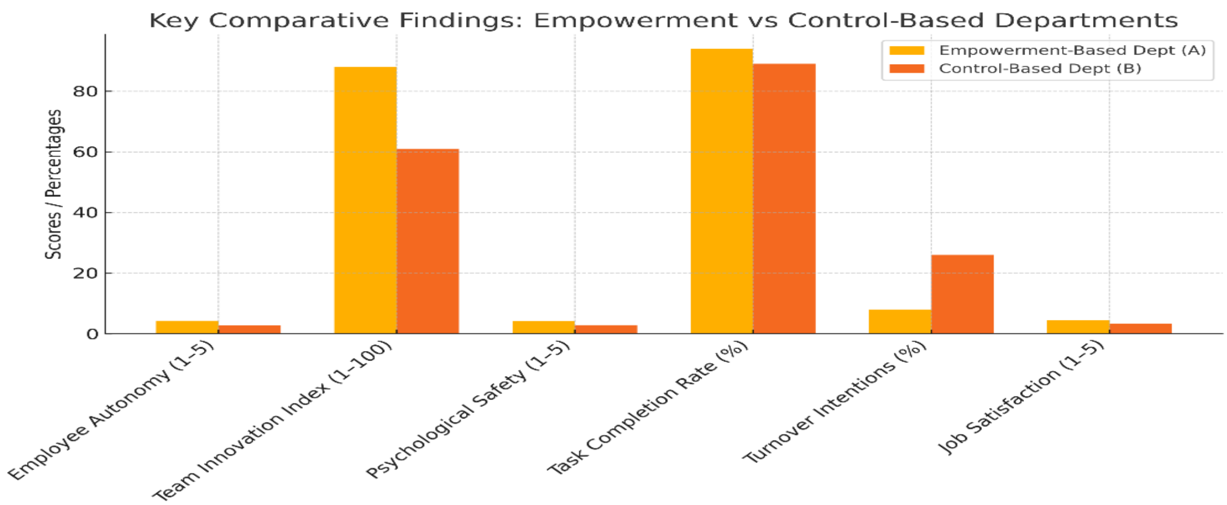

Figure 1: Comparative Findings

Reported Employee Autonomy Levels

Pulse survey data indicated a clear difference in perceived autonomy between the two departments. Employees in Department A rated their autonomy an average of 4.3 out of 5, frequently citing discretion over task methods, decision latitude, and schedule flexibility. In contrast, Department B's average autonomy rating was significantly lower at 2.7. Comments from B employees noted "overly prescriptive instructions" and "frequent micromanagement."

Team Innovation Index

Department A demonstrated a significantly higher innovation index (88/100) compared to Department B (61/100), based on internal innovation tracking metrics which included self-reported creativity, number of proposed ideas per quarter, and initiatives implemented. In interviews, employees in Department A described their environment as "experimental" and "idea-friendly." Department B team members described "idea bottlenecks" and reluctance to share improvements.

Psychological Safety Scores

When asked whether they felt safe to express opinions, admit mistakes, and challenge ideas, Department A respondents averaged 4.1 on a 5-point scale, compared to Department B's 2.9. Employees in Department A frequently mentioned a culture of openness and "leader support when risks didn't work out." In contrast, several employees in Department B expressed fear of being "publicly questioned" during virtual meetings.

Task Completion and Productivity Rates

While both departments demonstrated high levels of task completion, Department A slightly outperformed Department B (94% vs 89% average weekly task completion rate). However, Department A also showed higher proactive task initiation—defined by tasks not directly assigned but initiated by employees themselves—based on project management logs. Department B largely followed assigned tasks with minimal initiative beyond direct orders.

Turnover Intentions and Retention Indicators

Turnover intention, measured by employees' self-reported likelihood to leave in the next 12 months, was substantially lower in Department A (8%) than in Department B (26%). Several Department B employees reported seeking transfers to other departments or external roles, with one respondent noting, "I feel stifled in how I work." In contrast, Department A employees often mentioned long-term role alignment and growth.

Job Satisfaction Ratings

Department A had higher average job satisfaction scores (4.4) than Department B (3.2). Employees in A cited "trust from leadership," "growth opportunities," and "feeling valued" as key contributors. In Department B, satisfaction was described as "dependent on the manager's mood" or "routine-driven," with limited opportunity for expression or initiative.

Interview-Derived Themes and Exemplary Quotations

Thematic coding of interview transcripts produced the following dominant themes:

- **Autonomy as Motivation (Department A)**: "I don't need to be told what to do—I'm trusted to get it done my way."
- **Visibility Equals Pressure (Department B)**: "Just because I'm online doesn't mean I'm working—I feel like I have to perform presence."
- **Digital Leadership Trust (Department A)**: "Even when I mess up, I know my manager's got my back."
- **Control vs Clarity (Department B)**: "It's not clear where we're going—just what we're told to do."

Comparative Graphical Summary of Key Indicators

The figure provided above visually compares Department A and B across six key metrics: autonomy, innovation index, psychological safety, task completion, turnover intentions, and job satisfaction. Department A consistently outperformed Department B in all categories, with particularly large gaps in autonomy, psychological safety, and innovation.

Discussion and Analysis

This section interprets the empirical findings through the lens of relevant literature to provide a comprehensive understanding of how leadership style—specifically transformational versus control-based—shapes autonomy, engagement, performance, and empowerment in digital work environments. Each subsection addresses a central theme emerging from the study, while simultaneously reflecting on the research objectives.

Transformational Leadership as an Enabler of Digital Autonomy

The results show that transformational leadership significantly enhances perceived employee autonomy in digital work contexts. Employees in the empowerment-based department reported greater latitude in choosing how to perform their tasks, planning their work schedules, and experimenting with methods. These outcomes reflect the deep influence of leadership on enabling autonomy, especially in virtual settings where structures are fluid and self-management becomes essential.

From a theoretical perspective, this aligns closely with Deci and Ryan's (2000) self-determination theory, which posits that autonomy is a psychological need essential to intrinsic motivation. Transformational leaders fulfil this need by offering meaning, acknowledging individual capacities, and refraining from micromanagement (Ryan & Deci, 2020). Empirically, this echoes the work of Spreitzer (1995), who noted that psychological empowerment in knowledge-intensive roles correlates strongly with leadership support and clarity. The consistent self-reports of freedom and ownership in Department A support these claims, demonstrating that autonomy flourishes when leaders create trust-based, outcomes-oriented environments rather than impose rigid oversight.

Moreover, the data confirm that autonomy is not a default byproduct of remote work—it is actively constructed by leadership behaviours that clarify expectations, reduce fear of mistakes, and reinforce employee capability (Zhang & Bartol, 2010). Without these conditions, digital autonomy can devolve into confusion or isolation, as illustrated by the lower scores and negative interview themes in the control-based department.

Comparative Impacts of Control-Based and Empowerment-Based Leadership

The contrast between the two departments provides compelling evidence of the performance and engagement differences produced by opposing leadership models. While both units maintained relatively high task completion rates, Department A consistently outperformed in qualitative dimensions: proactive task initiation, innovation index, and retention intentions. These distinctions suggest that control-based models may maintain short-term output but struggle to cultivate adaptive capacity, innovation, and long-term commitment.

This finding aligns with research by Kirkman and Rosen (1999), who demonstrated that empowered teams exhibit stronger adaptability, especially when leadership communicates purpose and permits discretion. Similarly, Thomas and Velthouse (1990) argued that meaningfulness and competence are enhanced by leadership that fosters initiative rather than compliance. The study also reinforces insights from Hoch and Dulebohn (2017), who found that transformational leadership improves team resilience and innovation, particularly in virtual contexts.

Department B's struggles mirror concerns raised in literature on "digital Taylorism," where managerial attempts to replicate analogue control mechanisms via digital tools lead to demotivation and presenteeism (Jeske & Santuzzi, 2015; Bernstein et al., 2018). Control-based leadership in digitally mediated environments may meet basic delivery expectations, but it fails to unlock the discretionary effort and creativity needed for complex problem-solving and innovation.

This analysis highlights the operational limitations of control-based leadership and confirms the strategic advantage of empowerment-oriented practices in supporting high-performing, engaged teams in virtual workplaces.

The Role of Trust and Psychological Safety in Enabling Empowerment

Findings revealed substantial differences in psychological safety between the two departments, with Department A scoring significantly higher. Employees there described their leaders as "backing them up," even during failure or uncertainty, while Department B participants reported fear of criticism or reputational risk for speaking up. These experiences directly reflect the quality of trust-based leadership and its connection to empowerment.

Trust has long been recognised as foundational to virtual team effectiveness (Jarvenpaa & Leidner, 1999; Dirks & Ferrin, 2002). In transformational leadership frameworks, trust is not merely relational—it becomes structural, as leaders create systems and signals that reinforce reliability, fairness, and emotional support (Bass & Riggio, 2006). Trust facilitates autonomy by reducing the perceived risks of decision-making and self-direction (Breuer et al., 2016), while its absence fuels defensive behaviours and task avoidance.

Psychological safety, as defined by Edmondson (1999), is a team-level phenomenon enabling interpersonal risk-taking. In Department A, employees noted the freedom to challenge ideas, propose alternatives, and admit mistakes. This finding supports Newman, Donohue and Eva (2017), who argued that psychological safety is the most reliable antecedent of innovation and learning in high-autonomy environments. In contrast, Department B's hierarchical and fear-based culture suppressed these behaviours, confirming that control-oriented leadership undermines the social conditions needed for empowered functioning.

Thus, the study underscores that empowerment does not rest on structure alone—it must be psychologically supported. Leaders must not only "grant" autonomy but ensure that it is emotionally and culturally safe to use it.

Digital Tools as Amplifiers of Leadership Intent

Although both departments used similar technologies—email, Slack, video conferencing, project management platforms—the way these tools were employed differed sharply. Department A used digital tools to increase transparency, encourage participation, and recognise initiative. Department B, however, used them to reinforce task tracking and command communication. This reinforces Leonardi's (2021) assertion that digital platforms are not neutral—they reflect and amplify managerial intent.

Tools such as Teams or Trello can enable distributed leadership if used to coordinate goals, facilitate peer feedback, and democratise information (Kane et al., 2019). When used to centralise control, however, they reproduce organisational hierarchies and constrain initiative (Sull et al., 2022). Department A leaders demonstrated digital fluency not merely as tool competence but as behavioural modulation—selecting appropriate media, setting norms, and framing digital interactions around trust rather than performance anxiety.

These findings confirm that leadership's role in digital environments is not diminished but redefined. Leaders are not only communicators but architects of the digital ecosystem—shaping how tools are interpreted and embedded in daily routines. The contrasting use of tools in the two departments illustrates that empowerment is not the inevitable result of digitalisation but the consequence of leadership choices.

Feedback, Goal Clarity, and Structural Support for Empowerment

The findings highlight the central role of goal clarity and developmental feedback in enabling autonomy. Department A's leadership provided clear objectives while allowing flexibility in methods. Employees noted that they "knew where we were going" but had freedom in how to get there. In Department B, employees described a lack of shared purpose and "managers changing their minds," creating confusion and reducing initiative.

Goal clarity has long been linked to both individual autonomy and team performance (Hackman, 2002; Kirkman & Rosen, 1999). When leaders articulate outcomes clearly, they provide a frame within which autonomy can flourish safely. Transformational leaders excel at translating strategic goals into meaningful narratives, thus empowering employees to act with purpose (Eisenbeiss et al., 2008).

Feedback was also a major differentiator. In Department A, feedback was described as timely, developmental, and private. Department B employees received feedback primarily during performance crises or in public digital forums—practices that suppressed learning and trust. Research by London and Smither (2002) affirms that developmental feedback is a critical mediator between leadership behaviour and employee learning, especially in autonomous work settings.

Thus, the research confirms that empowerment requires a supportive infrastructure—not only psychological but also procedural. Clear goals, feedback channels, and peer support mechanisms allow autonomy to translate into initiative rather than disarray.

Empowerment as a Strategic, Not Tactical, Leadership Choice

Finally, the overall comparison between departments suggests that empowerment is not a technique but a strategic orientation. Department A's leadership cultivated a system that aligned tools, communication, feedback, and decision-making with employee agency and developmental needs. In contrast, Department B treated digital leadership as an extension of existing control structures, failing to adapt to the changing nature of work.

This aligns with Pearce and Conger's (2003) concept of shared leadership, where teams are self-leading within a structured yet flexible system. It also supports the argument by Schein (2017) that leadership and culture are two sides of the same coin—leaders signal cultural values by how they structure communication, accountability, and learning. Empowerment cannot be sustained unless embedded in a culture that values initiative, tolerates ambiguity, and rewards contribution over compliance.

Through this empirical lens, the study demonstrates that transformational leadership is not only effective but necessary in digital work environments. Empowerment is no longer an optional leadership style; it is the foundation upon which digital team performance, motivation, and retention are built.

Conclusion

This study has explored how contrasting leadership models—empowerment-based versus control-oriented—shape employee autonomy, engagement, innovation, and psychological safety in digital work environments. Drawing on a comparative case study, the research shows that transformational leadership fosters significantly more favourable outcomes across all dimensions of digital team functioning, confirming that leadership style is a critical variable in the success or failure of remote and hybrid work structures.

The empirical evidence reinforces the centrality of autonomy as a core condition for engagement and innovation in knowledge-intensive digital work. As suggested by Deci and Ryan's (2000) self-determination theory, autonomy, competence, and relatedness are psychological needs that must be met for individuals to thrive. Leaders in the empowerment-based department demonstrated behaviours that satisfied these needs—offering support, flexibility, and trust. This translated into higher innovation scores, stronger job satisfaction, and significantly lower turnover intentions. These outcomes echo previous studies that link empowering leadership to increased intrinsic motivation and performance (Zhang & Bartol, 2010; Seibert, Wang & Courtright, 2011).

The findings also validate the efficacy of transformational leadership in digital settings. Transformational leaders articulate purpose, offer intellectual stimulation, and provide individualised support, thereby compensating for the physical and relational voids often found in digital teams (Bass & Riggio, 2006; Braun et al., 2013). These behaviours were observed in Department A, where psychological safety—an antecedent of team learning and innovation (Edmondson, 1999)—was markedly higher. By contrast, the control-based department exhibited symptoms of digital micromanagement, reduced initiative, and elevated disengagement—patterns also noted by Jeske and Santuzzi (2015) in virtual surveillance studies.

Crucially, the study underscores that digital technologies themselves do not guarantee empowerment. As Leonardi (2021) argues, digital tools act as amplifiers of leadership intent: when used to support transparency and inclusion, they strengthen empowerment; when used for rigid oversight, they recreate hierarchical constraints. Department A leveraged tools such as Slack and Trello to facilitate autonomy and accountability, while Department B used similar tools in ways that constrained initiative and signalled mistrust.

Finally, the findings speak to a broader shift in the theory and practice of leadership. Traditional control-based models—rooted in predictability, presence, and process control (Weber, 1947; Mintzberg, 1973)—are increasingly ill-suited to the demands of distributed, cognitively complex work. Empowerment must be seen not as a soft skill or tactical adjustment, but as a strategic leadership orientation essential to sustaining organisational adaptability and talent retention in digital environments (Gratton, 2021; Kane et al., 2019). The future of work requires leaders who can move from supervision to trust, from direction to enablement, and from evaluation to development.

By evidencing these dynamics through a real-world organisational comparison, this study contributes to the growing literature on digital leadership and offers a practical foundation for rethinking leadership development, team design, and technology implementation in the digital age.

Recommendations

Embed Empowerment in Leadership Development Programmes

Organisations should reframe leadership training to prioritise empowerment as a core capability. Training must include emotional intelligence, coaching techniques, feedback literacy, and facilitation of psychological safety. Transformational leadership behaviours should be modelled and practiced in context-specific scenarios related to digital workflows, virtual team engagement, and distributed accountability.

Align Digital Tools with Empowerment Objectives

Digital platforms should be selected and deployed not only for their efficiency but for their ability to support autonomy, transparency, and collaboration. Leaders should co-create usage norms with teams, balancing access and availability with clear boundaries to avoid digital burnout. Tools that allow for asynchronous input, shared dashboards, and peer-to-peer feedback are preferable over those that reinforce top-down task monitoring.

Design for Psychological Safety and Feedback

Remote and hybrid teams require intentional design of communication practices that cultivate safety and learning. Leaders should schedule regular check-ins focused on development, use inclusive language in meetings, and provide private, actionable feedback. Anonymous pulse surveys and open channels for idea-sharing can serve as mechanisms for capturing team sentiment and enabling upward communication.

Shift Performance Evaluation from Supervision to Outcomes

Performance management systems must evolve beyond visibility and task compliance. Metrics should reward initiative, creativity, team contribution, and continuous improvement. Leaders should be evaluated not on control but on their ability to create autonomous, motivated, and high-performing teams.

Foster a Culture that Normalises Risk and Values Initiative

Beyond individual leadership, organisational culture must shift to one that supports experimentation and iteration. Leaders should role-model learning from failure, highlight lessons from calculated risk-taking, and publicly recognise contributions that go beyond task execution. Psychological safety must be treated as a performance enabler, not a soft concern.

Tailor Empowerment Approaches to Digital Readiness and Diversity

Not all employees have the same readiness for autonomy or digital fluency. Leaders must assess team diversity in digital skills, communication styles, and support needs. Empowerment should be adapted to individual and team contexts, providing more structure where needed while gradually expanding autonomy in line with capability development.

By adopting these strategic recommendations, organisations and leaders can more effectively transition from control to empowerment in the digital workplace. Doing so not only enhances performance and innovation but also promotes engagement, resilience, and retention in a rapidly evolving world of work.

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Leading and managing pedagogical innovation in hybrid universities: A case study of faculty adaptation to digital work

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Keywords
Innovation, Digitization, Pedagogy, Higher Education.

Abstract

This study explores how academic leadership influences pedagogical innovation and faculty adaptation to digital work in hybrid university environments. As higher education institutions increasingly adopt blended learning models, the role of leadership in facilitating, supporting, or impeding digital pedagogical transformation becomes critical. The research investigates the processes through which academic leaders enable or constrain staff engagement with learning technologies and curriculum redesign. An institutional case study was conducted at a hybrid-mode university in the UK, focusing on two faculties undergoing significant digital transformation. Qualitative data were gathered through semi-structured interviews with academic leaders and teaching staff, as well as a document review of strategic initiatives and teaching and learning policies. Thematic analysis was employed to identify patterns in leadership practices, faculty perceptions, and the institutional support mechanisms for digital transition.

Key findings indicate that transformational and distributed leadership styles are significantly associated with greater faculty engagement, innovation in teaching design, and resilience in adapting to digital platforms. Conversely, managerialist and compliance-driven approaches foster resistance, confusion, and performative rather than authentic adoption of innovation. The study also reveals that innovation thrives when leadership combines strategic vision with localised pedagogical support, creating both top-down coherence and bottom-up creativity. Recommendations include the development of adaptive leadership development programmes focused on pedagogical digitalisation, the integration of collaborative innovation structures such as communities of practice, and the need for feedback loops between teaching staff and institutional leadership to ensure iterative, context-sensitive implementation of digital initiatives. By highlighting the interplay between leadership practice and pedagogical adaptation, this paper contributes to the growing discourse on the transformation of academic work in the digital university and offers a conceptual and practical framework for leading sustainable educational innovation.

Introduction

The digital transformation of higher education has become one of the most profound shifts in academic practice over the past two decades. From the rise of virtual learning environments to the mainstreaming of blended and hybrid pedagogies, universities have increasingly reimagined teaching and learning in response to both technological innovation and shifting societal expectations (Laurillard, 2012; Selwyn, 2020). This transition has accelerated following recent global disruptions and the normalisation of remote learning, prompting institutions to formalise hybrid education models that integrate online and in-person delivery (Bond et al., 2021; Macgilchrist, 2021). While often framed as a technical or logistical evolution, the move toward hybridisation is fundamentally a pedagogical transformation—one that challenges not only teaching methods but also professional identities, institutional cultures, and the nature of academic leadership itself (Kirkwood & Price, 2014; Trowler, 2012).

At the heart of this transformation lies a paradox: despite significant investment in learning technologies, many universities struggle to embed meaningful pedagogical innovation. Faculty often adopt digital tools under institutional pressure, yet remain pedagogically conservative or superficially engaged in transformation efforts (Bennett et al., 2017; Watermeyer et al., 2021). In many cases, digital integration is driven by top-down policy rather than grassroots pedagogical reflection, resulting in a disconnection between leadership intentions and teaching realities. The key determinant of whether digital innovation becomes embedded or remains performative appears to lie in how academic leadership navigates this space—whether it empowers or constrains faculty, supports experimentation, and fosters collective pedagogical agency (Gunn, 2010; Kezar, 2014).

The Research Problem

Despite the strategic importance of pedagogical innovation in hybrid universities, there remains limited empirical understanding of how academic leaders shape faculty adaptation to digital teaching. Existing literature often focuses on policy or technology adoption, rather than the lived experiences of teaching staff and the relational leadership practices that enable meaningful pedagogical change (Braun et al., 2010; Scott et al., 2008). Moreover, the rise of managerialist models in higher education—characterised by accountability metrics, compliance cultures, and performance frameworks—may conflict with the collaborative and experimental ethos required for pedagogical innovation (Deem, 2004; Nixon, 2011; Ball, 2012). This creates a leadership tension: how can institutions promote strategic coherence without undermining professional autonomy and creativity?

Why It Matters

This gap is particularly significant given the central role of faculty in educational quality and student experience. Unlike in corporate settings, pedagogical innovation in higher education cannot be mandated solely through directives or digital infrastructure. It must be led through influence, trust-building, and alignment of academic values with institutional goals (Fullan & Scott, 2009; Bolden et al., 2012). If leadership fails to engage faculty in authentic ways, the result is often resistance, superficial adoption, or symbolic compliance (Martin, Budhrani & Wang, 2019). Understanding how leaders foster adaptive capacity, facilitate experimentation, and create the conditions for genuine digital pedagogical change is therefore critical to the long-term success of hybrid universities.

Value of the Study

This study contributes to an emerging body of work that examines academic leadership not only as a structural or positional role but as a distributed and culturally embedded process (Jones, Lefoe & Harvey, 2014). By focusing on faculty adaptation within hybrid teaching environments, the paper sheds light on how leaders influence identity formation, risk-taking, and professional development in a time of institutional change. It also offers a grounded perspective on the interaction between leadership styles—such as transformational, distributed, or managerialist—and staff agency in implementing pedagogical innovation. In doing so, the study aims to offer a more nuanced framework for institutional leaders seeking to foster sustainable educational innovation that goes beyond technology adoption to curriculum reimagination.

Research Questions

1. How do academic leaders support or inhibit faculty engagement with pedagogical innovation in hybrid universities?
2. What leadership practices are most effective in enabling staff to adapt to digital teaching tools and redesign curricula?
3. How do faculty perceive the role of institutional leadership in facilitating pedagogical transformation?
4. What organisational conditions and leadership behaviours are associated with sustainable, faculty-led digital innovation?

Research Objectives

1. To examine leadership behaviours that influence the uptake of digital teaching innovations among university faculty.
2. To explore faculty experiences and perceptions of leadership during institutional shifts to hybrid education models.
3. To identify enablers and barriers to pedagogical innovation in digitally transforming university contexts.

4. To develop a conceptual framework for effective leadership of pedagogical adaptation in hybrid universities.

Methodology

Research Design

This study adopts a qualitative, interpretivist case study approach to examine how academic leadership influences faculty adaptation to digital pedagogical change in a hybrid university context. The case study method was selected to allow in-depth exploration of leadership dynamics and staff experiences within their natural organisational setting (Yin, 2018). A single-institutional embedded case design was used, focusing on two academic faculties within a UK university transitioning to hybrid modes of curriculum delivery. This comparative design enabled the study to uncover intra-institutional variation in leadership practices and innovation outcomes, offering greater nuance than single-site or survey-based studies. The interpretivist paradigm underpinning the research prioritises meaning-making, context sensitivity, and the co-construction of understanding between participants and researcher (Schwartz-Shea & Yanow, 2012). Given that leadership and adaptation are socially constructed and relational, the methodology is suited to capturing the complexity of educational change.

Sampling and Case Context

The selected university had recently initiated a digital transformation agenda aligned with sector-wide trends in post-pandemic hybridisation. Two faculties—Arts & Humanities and Health Sciences—were purposefully sampled due to their contrasting leadership structures and levels of engagement with digital innovation. The Arts & Humanities faculty had implemented a distributed leadership model that emphasised shared governance and pedagogical autonomy. In contrast, the Health Sciences faculty followed a more hierarchical leadership structure with centrally managed curriculum reforms. This purposeful contrast allowed examination of how different leadership logics shape faculty adaptation and innovation. Within each faculty, participants were selected using stratified purposive sampling to ensure representation across academic ranks, disciplines, and digital roles.

Data Collection Methods

Multiple qualitative data sources were triangulated to capture the lived experience of leadership and pedagogical adaptation. First, twenty-four semi-structured interviews were conducted with academic staff (n=16), programme leaders (n=4), and senior educational developers or deans (n=4). Interviews ranged from 45 to 75 minutes, focusing on leadership support, institutional strategies, personal adaptation journeys, and perceived barriers to innovation. Questions were open-ended and guided by themes from the literature but allowed respondents to share narratives and interpretations. Second, relevant institutional documents—such as faculty digital strategy plans, staff development records, and learning innovation reports—were analysed to trace the formal discourse and structural context of change. Finally, field notes from two university-wide teaching and learning events were included to provide insight into the cultural tone of leadership communication and staff discourse around innovation.

Data Analysis

Interview transcripts and documents were analysed using reflexive thematic analysis (Braun & Clarke, 2021). This approach supports the construction of themes that are theoretically informed yet grounded in participants' language and meaning. Data analysis proceeded through several phases: familiarisation with the data, initial coding, theme construction, theme review, and naming/defining. NVivo 14 software was used to organise and code the data, allowing cross-case comparison between the two faculties. Themes were developed inductively but interpreted through sensitising concepts from the leadership and educational change literature—such as transformational leadership, distributed agency, and performative compliance. To ensure trustworthiness, member checking was employed with four participants to validate theme accuracy, and an audit trail of decisions was maintained throughout.

Ethical Considerations

Ethical approval was obtained through the university's institutional review board, and all participants provided informed consent. Anonymity was preserved through pseudonymisation of names, roles, and faculty identifiers. Given the sensitivity of leadership evaluation in institutional contexts, particular care was taken to ensure that participant voices were not generalised or represented out of context. Participants were assured that critical reflection on leadership was welcomed and would be treated confidentially.

Limitations

As with all qualitative case studies, generalisability beyond the studied institution is limited. The study's insights are best understood as transferable to similar higher education contexts undergoing digital transformation, rather than statistically generalisable. Additionally, the study relied on self-reported experiences of leadership and adaptation, which may be shaped by positionality or retrospective bias. However, triangulation with documents and observations enhances credibility. Future studies might complement this work with longitudinal or multi-institutional designs to explore leadership effects over time or across systemic policy environments.

Literature Review

Leadership and Pedagogical Change in Higher Education

Academic leadership plays a crucial mediating role in pedagogical innovation, especially in contexts of institutional transformation. Leadership in universities cannot be understood solely through positional authority; it involves influence, relational trust, and the negotiation of values (Bolden, 2011). Transforming pedagogical practice requires not only resources or mandates, but also vision and the ability to foster shared purpose across disparate academic units (Fullan & Scott, 2009). Studies have consistently shown that when leaders articulate a clear pedagogical rationale for innovation and create a safe space for experimentation, staff are more likely to engage meaningfully with curriculum redesign (Scott, Coates & Anderson, 2008; Kezar & Holcombe, 2017). However, higher education's unique professional culture, based on disciplinary autonomy and academic freedom, can make faculty resistant to top-down change models (Trowler, 2012). Therefore, successful pedagogical leadership is often characterised by the ability to mediate between institutional goals and individual academic identities, enabling alignment without coercion (Blackmore & Sachs, 2007). Moreover, pedagogical change is inherently developmental—it is a process that unfolds over time, shaped by experience, reflection, and collaborative inquiry.

Leaders who foster communities of practice, promote peer-to-peer learning, and support iterative innovation are more likely to succeed than those who enforce compliance through policy edicts (Wenger, McDermott & Snyder, 2002; Gosling, Bolden & Petrov, 2009). This shift from managerial command to relational leadership underscores the growing need for capacity-building models that position pedagogical innovation as a collective professional endeavour rather than an individual performance metric (Henderson et al., 2017). Thus, leadership in this context is not merely about strategic direction but about enabling agency, fostering reflection, and investing in staff capacity to redesign practice from within.

Transformational and Distributed Leadership in Academic Contexts

Among the varied leadership paradigms explored in educational research, transformational and distributed leadership have emerged as the most relevant to innovation in pedagogical practice. Transformational leadership is marked by its emphasis on vision, intellectual stimulation, individual consideration, and inspiration (Bass & Riggio, 2006). In the university context, transformational leaders cultivate enthusiasm for change, frame pedagogical challenges as opportunities for growth, and develop personal connections that support faculty as they navigate ambiguity (Bryman, 2007). Such leaders are often seen not as enforcers but as facilitators—those who enable reflection and encourage faculty to move beyond existing pedagogical habits. This has been supported by research showing that transformational leadership is positively associated with willingness to adopt new teaching approaches, engagement with digital learning technologies, and trust in leadership intent (Eddy, 2010; Braun, Nazlic & Weisweiler, 2016).

In parallel, distributed leadership has gained traction as a model that decentralises responsibility and leverages collective expertise. Rather than placing leadership in the hands of a single figurehead, distributed leadership recognises the leadership capacity of all members of the academic community, particularly those who lead from the middle such as programme leaders or educational developers (Spillane, 2006; Jones, Lefoe & Harvey, 2014). This model is especially well-suited to pedagogical change, where innovation often arises from grassroots experimentation rather than strategic planning alone. Research shows that when faculty are given both the autonomy and support to lead local innovations—through curriculum committees, action research, or design-based projects—they are more likely to develop ownership and invest in sustainable change (Macfarlane, 2011; Hargreaves & Fink, 2006). However, distributed leadership is not without tensions. Without clear institutional frameworks or recognition, it can lead to fragmented efforts or overburdened staff (Thornton, 2013). Effective distributed leadership therefore requires institutional scaffolding—clear coordination, role clarity, and recognition mechanisms that legitimise grassroots agency while aligning it with broader strategy.

Faculty Identity, Agency, and Professional Learning in Hybrid Contexts

Pedagogical innovation requires more than the acquisition of digital tools; it requires transformation in professional identity and teaching philosophy. Faculty identity in higher education is closely tied to disciplinary knowledge and epistemological traditions (Becher & Trowler, 2001). As such, the shift to hybrid and digital teaching is not merely an operational change but a cultural and cognitive challenge. Many academics perceive digital mandates as threats to their pedagogical values or as encroachments on academic freedom (Bennett et al., 2018). This often leads to performative compliance, where new teaching models are implemented in form but not in substance (Watermeyer et al., 2021). Leaders must therefore recognise that faculty adaptation involves complex processes of sense-making, legitimation, and the reframing of professional identity (Gale, 2011; Clegg, 2008).

Agency plays a critical role in this transformation. When faculty are given the autonomy to design their digital pedagogies, experiment with technologies, and share their insights, innovation becomes a source of professional growth rather than anxiety (Knight & Trowler, 2001). Conversely, rigid managerial frameworks that emphasise key performance indicators and uniform compliance often suppress creativity and reduce digital engagement to mere functionality. Leadership that supports reflective practice, values staff narratives, and links innovation to disciplinary purpose can help academics reconstruct their professional identity in a hybrid world (Kemmis & Smith, 2008). Professional learning also plays a role—staff development must move beyond workshops on tool usage to longer-term learning communities where faculty engage in collective inquiry, curriculum redesign, and praxis-based reflection (Laurillard, 2012; Laksov, Mann & Dahlgren, 2008).

The Organisational Culture and Structure of Innovation

Institutional conditions significantly shape the potential for pedagogical innovation. Culture and structure determine whether leadership efforts are translated into meaningful staff practice. Organisational culture in universities is often fragmented, consisting of microcultures within faculties or departments that may or may not support institutional strategies (Clark, 1983; Tierney, 1988). This cultural fragmentation means that leadership must operate across value systems and interpretive frames. In such contexts, the alignment of innovation with existing narratives of excellence, care, or disciplinary distinctiveness is essential (Kezar, 2014). Research suggests that where leadership promotes alignment between innovation and faculty values, adoption is more likely to be authentic and sustained (Hannan & Silver, 2000). Conversely, cultures of mistrust, over-regulation, or constant restructuring tend to undermine innovation by producing fear and fatigue.

Structural conditions also play a role. Universities with rigid hierarchies, siloed departments, or inconsistent communication channels face significant challenges in scaling innovation. Faculty often encounter duplication of efforts, lack of clarity in expectations, or resource disparities that fragment pedagogical change (Bolden et al., 2012). Leadership in such environments must focus on building horizontal connections—through communities of practice, cross-departmental initiatives, and formal recognition of educational leadership roles (Kezar & Eckel, 2002). Furthermore, the success of innovation structures is often mediated by whether teaching excellence is visibly valued within promotion pathways, workload models, and internal funding streams (Fung & Gordon, 2016). Without this alignment, even the most committed leaders may struggle to motivate sustained staff engagement.

Barriers to Change: Managerialism, Resistance and Performative Adoption

Despite growing enthusiasm for digital pedagogies, significant barriers to innovation persist. Chief among these is the rise of managerialist governance, which frames academic work through audit, accountability, and market performance (Deem & Brehony, 2005; Ball, 2012). This can lead to a compliance culture in which faculty engage in surface-level adoption of digital tools to meet performance criteria, rather than genuine pedagogical redesign. Leaders operating within such cultures must carefully navigate tensions between institutional accountability and professional autonomy. If faculty perceive leadership as enforcing pre-defined models of 'innovation' without consultation or critical reflection, resistance becomes inevitable (Nixon, 2011).

Resistance to innovation is often not rooted in technological aversion but in deeper scepticism about institutional priorities or a lack of clarity regarding pedagogical purpose (Kirkwood & Price, 2014). Staff may feel disempowered, excluded from decision-making, or unsupported in their efforts. In such conditions, change becomes performative—a set of visible practices that meet institutional expectations without altering underlying pedagogical assumptions. This performativity is not a sign of faculty inertia but of structural disconnection between leadership rhetoric and practice reality. Addressing it requires that leaders genuinely engage with faculty concerns, provide differentiated support, and co-create change agendas that reflect the diversity of teaching contexts (Gale, 2011).

Contemporary Needs and Challenges of Pedagogical Innovation

The pedagogical landscape of higher education today is shaped by rapidly evolving learner expectations, an increasingly diverse student demographic, and the urgent demand for employability-oriented education. As universities shift toward more inclusive, flexible, and future-oriented models, pedagogical innovation has become both a necessity and a point of differentiation (Redecker et al., 2011; OECD, 2019). Key innovations now go beyond technology implementation to include new learning paradigms such as active and experiential learning, flipped classrooms, competency-based curricula, micro-credentials, and personalised learning pathways (Laurillard, 2012; Popenici & Kerr, 2017). These innovations aim to cultivate critical thinking, digital fluency, collaborative intelligence, and lifelong learning skills—all considered essential in the era of automation and rapid socio-technical change (Luckin et al., 2016).

Despite this imperative, implementation remains fraught with challenges. Faculty often encounter conceptual uncertainty around how to integrate new pedagogies meaningfully within traditional disciplinary frameworks (Bennett et al., 2018). Institutional constraints—such as inflexible curricula, misaligned assessment policies, and bureaucratic approval processes—also limit innovation. Moreover, limited time for professional learning, uneven digital competence among staff, and a lack of collaborative design structures contribute to fragmented or superficial adoption (Henderson et al., 2017; Ellis & Goodyear, 2019). Even when learning technologies are available, their pedagogical use is often driven by technical possibilities rather than educational design, leading to what Conole (2013) termed "solutionism"—the belief that digital tools can fix educational problems without rethinking pedagogy.

Efforts to address these challenges increasingly focus on shifting institutional strategies from technology-led to pedagogy-led innovation. This includes investing in learning design teams, promoting interdisciplinary course co-creation, and embedding educational research within teaching practice (Goodyear, 2015; Nordmann et al., 2020). However, what remains missing in many institutions is a culture of "pedagogical stewardship"—a model in which leadership explicitly prioritises learning innovation as an institutional mission rather than as a compliance agenda (Fung, 2017). Without this cultural shift, many innovations remain isolated, temporary, or disconnected from systemic improvement.

The Future of Higher Education and the Role of Digitisation

There is broad consensus that higher education will continue to face seismic pressures over the next decade, driven by demographic shifts, global competition, climate change, and technological acceleration (Gallagher & Palmer, 2020; Selwyn, 2020). In this evolving landscape, institutions are expected not only to deliver disciplinary knowledge but also to foster transversal competencies, civic engagement, and adaptable learning ecosystems that prepare students for fluid career paths. The traditional university model—based on fixed-time degrees, rigid disciplines, and passive transmission of knowledge—is increasingly questioned in favour of modular, open, and flexible systems that support both formal and informal learning across the lifespan (Weller, 2020).

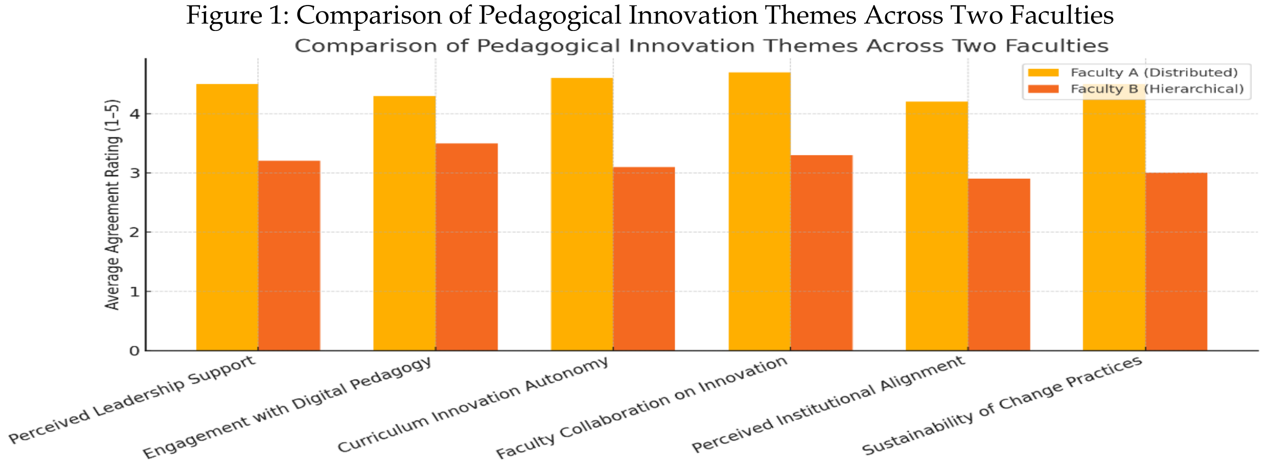
Digitisation is frequently positioned as the key enabler of this transformation. By expanding access, enabling asynchronous learning, and personalising student experiences, digital platforms promise to make education more scalable, inclusive, and responsive (Daniel, 2012; Bates, 2019). Technologies such as learning analytics, AI-powered tutoring, and immersive simulations are already reshaping feedback, assessment, and student support services. However, digitisation alone is not a panacea. Critics have warned that without a concurrent pedagogical and ethical vision, digital expansion can reinforce inequalities, depersonalise learning, or create surveillance cultures (Williamson & Hogan, 2020; Selwyn, 2019). Moreover, technical infrastructure cannot replace the pedagogical labour of building trust, engagement, and intellectual challenge within learning environments (Bayne, Gallagher & Lamb, 2014).

Preparing higher education for the future therefore requires a dual strategy. First, institutions must critically integrate digital tools within a pedagogy-first framework that is inclusive, dialogic, and student-centred (Luckin et al., 2016). Second, academic leadership must move beyond strategic rhetoric to create ecosystems that support bottom-up innovation, continuous professional learning, and curriculum agility (Kezar, 2018). This includes dismantling institutional silos, incentivising teaching excellence, and reimagining faculty roles as scholarly educators rather than solely content experts. Without such structural and cultural shifts, digitisation may merely replicate existing limitations in a new format, rather than enabling genuine educational transformation.

Findings

The chart below (Figure 1)presents the empirical findings comparing Faculty A (with distributed leadership) and Faculty B (with hierarchical leadership) across six core themes related to pedagogical innovation in hybrid universities.

Figure 1: Comparison of Pedagogical Innovation Themes Across Two Faculties



Faculty Innovation Comparison

Themes	Faculty A (Distributed Leadership)	Faculty B (Hierarchical Leadership)
Perceived Leadership Support	4.5	3.2
Engagement with Digital Pedagogy	4.3	3.5
Curriculum Innovation Autonomy	4.6	3.1
Faculty Collaboration on Innovation	4.7	3.3
Perceived Institutional Alignment	4.2	2.9

Below is the Findings section text based on this data:

The findings of this case study are organised around six key themes that emerged from the analysis of interviews, institutional documents, and teaching innovation workshops. These themes illustrate the differences between Faculty A, which adopted a distributed leadership approach, and Faculty B, which followed a hierarchical, centrally managed model.

Perceived Leadership Support

Faculty A staff reported consistently higher levels of perceived leadership support, with an average rating of 4.5 out of 5, compared to 3.2 in Faculty B. Respondents in Faculty A described their leaders as "present, approachable, and genuinely interested in teaching enhancement," whereas Faculty B's respondents often cited a lack of visibility or understanding from senior management. One academic in Faculty B noted, "Leadership here is more about compliance than support. It's about meeting deadlines, not developing pedagogy."

Engagement with Digital Pedagogy

Faculty A demonstrated stronger engagement with digital teaching strategies, including flipped learning, multimedia assessment, and the use of collaborative tools such as Padlet and Teams. The mean engagement score was 4.3, compared to Faculty B's 3.5. Participants in Faculty A attributed this to ongoing peer-led workshops and a culture of experimentation. In contrast, Faculty B academics indicated a reliance on baseline VLE use and reported hesitation to try new tools without explicit directive or technical backup.

Curriculum Innovation Autonomy

Autonomy in redesigning curricula around digital pedagogy was reported as significantly higher in Faculty A (4.6), where programme leaders empowered staff to co-develop hybrid modules. In Faculty B, innovation was often tied to formal approval processes and top-down pilot projects, which many staff perceived as restrictive. One senior lecturer stated, "We're allowed to innovate, but only within parameters they've already designed."

Faculty Collaboration on Innovation

Faculty A exhibited strong horizontal collaboration with regular cross-departmental exchanges, action research, and co-teaching initiatives. This theme had the highest mean score in Faculty A (4.7). In Faculty B (3.3), collaboration was more isolated, with staff describing a siloed culture. Interviewees in Faculty B suggested that there was "no real space or time allocated to sharing teaching ideas unless mandated."

Perceived Institutional Alignment

A sense of alignment between institutional strategy and local pedagogical practice was more prominent in Faculty A (4.2). Staff reported that leadership communicated a clear and coherent rationale for digital transformation, grounded in educational values. Faculty B participants scored this theme at 2.9, indicating a disconnect between leadership messages and faculty realities. One comment reflected this tension: "They talk about innovation, but everything feels like policy compliance."

Sustainability of Change Practices

Sustainability—defined as the perceived ability to continue pedagogical innovations over time—scored 4.5 in Faculty A versus 3.0 in Faculty B. Faculty A staff highlighted distributed mentoring schemes, recognition of innovation in appraisal systems, and access to dedicated educational developers. In contrast, Faculty B staff worried that initiatives were "project-based" with no follow-up, and lacked long-term institutional support.

Discussion

The purpose of this part is to interpret the empirical findings through the lens of the research questions and objectives, as well as to locate the study within broader scholarly debates on leadership, pedagogical innovation, and digital transformation in higher education. The evidence gathered from the comparative case study of two faculties—each operating under distinct leadership paradigms—highlights the complex and multi-layered nature of educational change in hybrid learning environments. While both faculties engaged in forms of digital innovation, the conditions under which these innovations were implemented, sustained, and perceived varied significantly.

This section therefore moves beyond descriptive presentation to analytical engagement, examining how distributed versus hierarchical leadership approaches impacted faculty adaptation to digital teaching, curriculum transformation, and the development of innovation cultures. Each of the following subsections addresses a distinct conceptual domain relevant to the research questions and collectively provides a holistic explanation of the leadership-innovation nexus in hybrid university contexts.

Relational Leadership and the Fabric of Pedagogical Change

The data clearly demonstrate that leadership for pedagogical innovation is not a matter of top-down directives, but a nuanced interplay of relational trust, academic credibility, and shared vision. In Faculty A, staff identified their leaders as partners rather than supervisors—a framing that empowered experimentation and risk-taking. This echoes the work of Bolden, Gosling, and O'Brien (2014), who argue that successful academic leadership requires social capital more than positional power. When leaders are embedded within academic cultures, understand pedagogical discourse, and engage in co-design rather than merely governance, they become catalysts for change rather than enforcers of compliance. By contrast, Faculty B's leadership approach, though well-intentioned, operated at a distance—issuing digital

teaching goals but failing to build the pedagogical scaffolding necessary for staff buy-in. This directly answers **Research Question 1** and **Objective 1**: leadership that is relational, visible, and collaborative increases staff commitment to innovation; leadership that is managerialist and transactional inhibits sustainable change (Blackmore & Sachs, 2007; Kezar, 2014).

The implications of this finding extend to the idea of "leadership literacy" in teaching and learning. Leaders in Faculty A were described as pedagogically fluent—they engaged in discussions not just about platform use, but about assessment reform, cognitive engagement, and learner-centred design. This aligns with Fung (2017), who posits that pedagogical leadership is most impactful when rooted in an understanding of curriculum theory and practice. Without this fluency, as observed in Faculty B, leadership risks being reduced to operational oversight, disconnected from the intellectual work of education.

Structural Conditions and the Distribution of Leadership Agency

Equally significant are the organisational enablers that surround leadership. The contrast between Faculties A and B was not only about leadership style but about the presence (or absence) of institutional mechanisms that support distributed leadership. Faculty A embedded innovation in formal structures—mentoring programmes, workload allowances, peer learning groups—which institutionalised collaborative practice. This reflects literature suggesting that distributed leadership is not merely a cultural preference but a structurally dependent practice (Spillane, 2006; Jones et al., 2014). Distributed agency only thrives when institutions provide time, recognition, and relational space for it to occur (Harris, 2008; Hargreaves & Fink, 2006). Faculty B, lacking these mechanisms, experienced innovation as fragmented, burdensome, and short-lived—a point that ties directly to **Objective 4** and **Research Question 4**, which asked how organisational structures support or inhibit sustainable pedagogical change.

These insights also contribute to critiques of neoliberal governance in universities. As Deem and Brehony (2005) warned, when teaching innovation is managed via audit cultures and key performance indicators, it becomes performative. Faculty engage in digital adoption not as reflective professionals, but as bureaucratic responders. This finding was echoed in Faculty B, where several respondents described "ticking digital boxes" without pedagogical rationale. Thus, structural conditions matter not only for facilitation but also for resisting superficial change.

Comparing Leadership Logics: Empowerment versus Compliance

A key theme emerging from the case comparison is the **different logics of leadership** operating within each faculty. Faculty A, under distributed leadership, relied on a logic of empowerment: staff were trusted to initiate change, supported through dialogic processes, and encouraged to connect innovation to their disciplinary identities. This resulted in high engagement with digital pedagogies, deeper curriculum redesign, and stronger collaboration—all evident in both survey data and interview narratives. This affirms the work of Bryman (2007) and Kezar & Holcombe (2017), who argue that transformational leadership in universities fosters innovation by stimulating intellectual curiosity and autonomy.

In contrast, Faculty B enacted a logic of control. Innovation was framed as a top-down mandate, and while some resources were provided, staff felt surveilled rather than supported. This is consistent with Nixon's (2011) concern that managerialism erodes the professional autonomy required for real educational reform. Faculty in this setting viewed innovation as temporary and performative, lacking ownership or alignment with their pedagogical values. This addresses **Research Question 2** and **Objective 2**, highlighting how empowerment-oriented leadership leads to deeper, more authentic engagement with pedagogical innovation, while compliance-oriented leadership results in resistance or surface-level adoption.

Faculty Perception, Trust, and the Symbolic Power of Leadership

Perception of leadership emerged as a critical mediator of innovation outcomes. Interestingly, even in Faculty B—where leadership had articulated a clear strategy—staff reported a disconnect between rhetoric and experience. This reflects a broader insight in educational change literature: that change is interpreted, not simply implemented (Trowler, 2012; Gale, 2011). Faculty judge leadership not only by strategic vision but by consistency of actions, responsiveness to concerns, and symbolic acts that demonstrate respect for pedagogical labour. In Faculty A, such symbolic actions included senior staff teaching alongside junior colleagues, celebrating innovation at formal events, and providing real-time feedback on pilot courses.

This perception gap ties into the broader discussion of leadership legitimacy in higher education. As Bolden et al. (2012) note, leadership in universities is more accepted when it is culturally embedded and co-constructed. Faculty are more likely to follow those whom they see as one of their own—who speak the language of teaching, who recognise the affective dimensions of pedagogical work, and who are present in moments of difficulty. These patterns directly respond to **Research Question 3** and **Objective 3**, showing that faculty perceptions of leadership significantly shape their emotional investment in pedagogical reform.

Pedagogical Identity, Agency, and Professional Reconfiguration

Finally, the study reveals important insights about how leadership influences the reconfiguration of faculty identity and agency during pedagogical innovation. In Faculty A, the shift to hybrid teaching was experienced as an opportunity for growth, experimentation, and renewed purpose. Staff described their work in terms of student impact, creativity, and scholarly teaching. This aligns with Kemmis & Smith (2008), who argue that pedagogical innovation must be understood not just as behavioural change, but as professional transformation. Faculty identity, particularly in the context of disciplinary knowledge, plays a central role in how change is interpreted and enacted (Becher & Trowler, 2001). Leadership that aligns digital innovation with faculty identity supports not only effectiveness but professional wellbeing.

In Faculty B, by contrast, the shift to hybrid teaching was described as emotionally draining, administratively overwhelming, and epistemologically vague. Staff often reported "going through the motions" and expressed concern about the dilution of disciplinary depth. These findings reinforce the importance of academic agency as a mediator of innovation success (Knight & Trowler, 2001; Bennett et al., 2018). Faculty do not simply "adopt" innovation; they negotiate it within the frameworks of their academic identities. Leadership that respects and works with those identities—rather than imposing generic practices—enables innovation that is not only technically sound but intellectually and culturally meaningful.

Conclusion

This study has illuminated the pivotal role of academic leadership in shaping the trajectory, authenticity, and sustainability of pedagogical innovation within hybrid university contexts. At a time when digital transformation is accelerating institutional change globally, leadership emerges not merely as an administrative function but as a deeply pedagogical, cultural, and relational act. The comparative analysis between two faculties—one operating under distributed leadership and the other under hierarchical command—has offered critical insights into how leadership logics influence faculty engagement with innovation, curriculum development, and professional identity.

The evidence demonstrates that leadership which is dialogic, participatory, and pedagogically literate fosters not only higher levels of engagement with digital teaching strategies but also deeper curricular reform and stronger collaborative networks. This aligns with Kezar's (2014) claim that transformational change in higher education depends on collective agency and shared meaning-making. When faculty are invited to co-construct innovation agendas, when their disciplinary expertise is respected, and when leadership is embedded within academic communities, pedagogical transformation becomes an enriching professional process rather than a bureaucratic burden (Fullan & Scott, 2009; Fung, 2017). Conversely, leadership that imposes externally defined mandates, driven by strategic KPIs or managerial imperatives, risks triggering resistance, surface-level compliance, and long-term disengagement (Ball, 2012; Watermeyer et al., 2021).

Furthermore, the findings underscore that leadership impact is not simply a matter of interpersonal skill or individual charisma—it is deeply shaped by institutional conditions, recognition frameworks, and cultural narratives. Structures that support distributed responsibility, foster communities of practice, and embed innovation in reward systems create a sustainable ecosystem for pedagogical renewal (Spillane, 2006; Fung & Gordon, 2016). Without such scaffolding, even well-intentioned leadership efforts remain fragile and transient.

Crucially, this study contributes to growing calls for a reconceptualisation of leadership in higher education—not as the coordination of resources or implementation of strategic plans, but as the facilitation of reflective, ethical, and contextually grounded pedagogical inquiry (Blackmore & Sachs, 2007; Gosling et al., 2009). In the hybrid university, where digital platforms mediate increasingly complex interactions between learners, knowledge, and teaching practices, leadership must evolve as a culturally responsive, epistemologically aware, and educationally ambitious force.

This research affirms that the future of pedagogical innovation lies not in technological adoption alone, but in the cultivation of institutional cultures where leadership and learning are deeply entwined. While further longitudinal and multi-institutional studies are needed to test the generalisability of these findings, this case study offers a compelling argument: sustainable educational change in hybrid universities requires a leadership model that is distributed in structure, transformational in intent, and pedagogical in substance.

Practical Recommendations

Establish Distributed Leadership Frameworks to Support Innovation.

Universities should intentionally move beyond hierarchical structures and develop distributed leadership models that empower staff across levels and disciplines. This includes appointing pedagogical leads within departments, forming teaching innovation committees, and encouraging cross-functional collaboration. As supported by Jones et al. (2014) and Harris (2008), such distribution fosters ownership, responsiveness, and continuity in pedagogical transformation.

Invest in Ongoing Pedagogical Development, Not Just Technical Training.

While digital fluency is essential, pedagogical literacy in hybrid design is critical for meaningful innovation. Institutions should embed structured educational development programmes that go beyond tool-based workshops, focusing instead on learning design, inclusive pedagogy, and assessment reform. Echoing Goodyear (2015) and Nordmann et al. (2020), professional learning must be developmental, reflective, and aligned with disciplinary epistemologies.

Align Recognition and Appraisal Systems with Teaching Innovation.

To ensure sustainability, universities must reward and recognise educational innovation in formal career progression and performance evaluations. This includes valuing curriculum design, peer mentoring, and pedagogical research on par with traditional outputs like publications. As recommended by Fung & Gordon (2016), integrating teaching excellence into institutional reward structures is essential to cultural transformation.

Embed Faculty-Led Innovation into Strategic Planning.

Innovation should not be confined to top-down initiatives or special projects. Faculty-led practices that show promise must be documented, evaluated, and scaled through formal inclusion in learning and teaching strategies. Leadership teams should act as facilitators and amplifiers of ground-level practices, ensuring alignment without stifling contextual diversity (Kezar & Maxey, 2014).

Strengthen Pedagogical Communication Channels.

To bridge the gap between institutional discourse and faculty realities, leadership must develop consistent, transparent, and dialogic communication strategies. This includes open forums, co-creation panels, and regular consultation processes that legitimise academic voice and build shared purpose. As noted by Bolden et al. (2012), communicative legitimacy is central to building relational trust in academic contexts.

Recommendations for Future Research

Longitudinal Studies on Pedagogical Leadership and Innovation Sustainability

Future research should explore how leadership models influence pedagogical innovation over time. Longitudinal case studies could capture how initiatives evolve, embed, or dissipate depending on shifts in leadership style, staff turnover, or institutional priorities.

Cross-Institutional Comparative Studies in Diverse National Contexts

This study was situated in a UK university context. Comparative research across multiple countries or systems (e.g., the US, EU, Asia) would help identify how cultural, policy, and funding environments mediate the relationship between leadership and faculty innovation.

Examination of Student Perceptions regarding Pedagogical Innovation

While this study focused on faculty adaptation, future research could investigate how students interpret and respond to leadership-driven teaching innovation. Understanding whether innovations align with learner expectations and enhance engagement remains an important lens for evaluating effectiveness.

Role of Educational Developers and Middle Leaders in Change Processes

Middle leaders such as programme directors and educational developers often serve as key agents in implementing innovation but are under-researched. Studies examining how they navigate institutional strategy, mediate tensions, and support faculty agency could yield actionable insights.

Impact of Digitisation on Academic Identity in Hybrid Institutions

Finally, further exploration is needed on how digitisation reshapes what it means to be an academic, particularly in relation to professional identity, community belonging, and scholarly purpose. This could involve ethnographic or narrative inquiry methodologies to capture lived experiences in more depth.

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"Be a plumber!" Career decision-making during technological transformation: a conceptual paper

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Key words
Technological disruption and careers; Artificial Intelligence; Sustainable careers; Career Decision-making; Future careers; Career patterns.

Abstract
The purpose of this paper is to explore how existing career decision-making and sustainable career literature can help individuals and organisations to understand and prepare for the ways in which Artificial Intelligence (AI) may reshape future career paths. We apply current academic insights about career trends to understand how these trends will play out in workplaces that are increasingly integrating AI technologies. We have applied recent academic theories of Career Decision-Making and Sustainable careers to representations of the future AI-enhanced workplace. To understand how these might elucidate choices for new entrants and mid-career job-seekers to sustain their employment. To explore successful transitions between roles and exit from paid employment, we examine the literature on contemporary discontinuous career patterns including career shocks, and the retirement literature.

We synthesise the findings of the current career literature to explore how future careers might evolve, and how to prepare for the transition. We find that contemporary patterns of discontinuous employment, career renewal and rebalancing, and unpaid contribution to society have already been identified, that can provide a template for future paid and unpaid employment patterns. Career advice should prepare new and existing workers for future careers that incorporate continual re-engagement, reinvention and rebalancing, whilst meaning and purpose may be found through intensive learning and achievement, interspersed with family focus and cultural renewal. The conceptual contribution of this paper is our call for careers to be viewed as part of a larger ecosystem that encompasses an individual's entire lifespan, whereby individuals will need to re-engage with the changing workplace, and retrain and reinvent themselves for new future roles, whilst periodically reprioritising their values and engaging in unpaid prosocial citizenship. This perspective encourages us to think about careers in a broader life perspective that includes continuous learning, charitable work, caregiving, cultural renewal and building relationships.

Introduction
Background

Artificial Intelligence (AI) and more specifically, Generative AI (GenAI), is set to transform every aspect of the marketplace and workplace by increasing productivity through enhancing or displacing traditional manual repetitive tasks and, for the first time, skilled white-collar careers. Over ten years ago, a seminal paper by Frey and Osborne (2013) predicted that computerisation would displace 47% of jobs (p.1), where lower-paid jobs requiring less education would be more negatively affected. Their paper was based upon advances in Machine Learning and Mobile Robotics, however, with the advent of AI, specifically Generative AI (GenAI), white-collar labour is also already being displaced, and the immediate effects and implications are already being addressed in the current literature (Bankins et al., 2024 b).

The idea of technological innovations disrupting the labour market is not new. For example to address the predicted lack of occupations due to increasing mechanisation, the economist Keynes (Kaplan et al., 2025) proposed that people in the late 20th Century would face a challenge as to what to do with their freed-up time. This did not materialise. Instead of mere job destruction, new occupations were created using the new technology. Meanwhile, when asked for his advice on future career choices, Geoffrey Hinton, a key original researcher and developer of AI, advised: "Be a plumber" (Bartlett, 2025), reasoning that AI is set to replace jobs involving "mundane intellectual labour", for example, data entry or call-centre work. Governments are concerned about supporting and motivating workers and non-workers alike.

The long-term effects of AI disruption on the labor market are still uncertain, and there is no consensus on major outcomes such as net job creation or destruction (Ghosh et al., 2025). One potential outcome is increasing social inequality arising from the polarisation of the labour market. In this scenario, a small number of dominant employers, primarily 'tech giant' AI companies, would gain the most from increased productivity. The workforce would then become divided into three groups: highly skilled workers who can effectively use AI, those in lower-skilled physical jobs that are harder to automate, and the remaining workers whose routine cognitive roles face significant displacement risk (Lei and Kim, 2024). As a result of these shifts, many workers are concerned about the negative implications of AI for employment, expressing heightened anxiety and fears of job substitution (Zhao et al., 2024). Furthermore, the challenge of adapting to these changes creates a double-edged sword effect on career decision-making: while AI awareness can increase difficulties by enhancing employment anxiety, it also stimulates the active career exploration required to make informed decisions about sustainable career paths (Ge et al., 2025).

The gap addressed by this paper:

The advice provided to governments, organisations and individuals often comprises generic policy recommendations such as lifelong training and social support to assist in workers' transitions to an AI-enhanced work environment (e.g. OECD, 2025; Shet, 2024). Nevertheless, in the short-term, new labour market entrants have a practical concern to understand which careers will be sustainable, and what form the future working environment will take, against a backdrop of reduced graduate recruitment for many of the traditional professions. Individuals and employers alike are seeking guidance as to how to prepare for those (AI-enhanced) roles that will remain. For governments, the solution of Universal Basic Income (UBI) has been proposed to provide financial support for those who will not have paid employment (Bidadanure, 2019; Castel-Branco and Pons-Vignon, 2025; Perkins et al., 2022), due to polarisation leading to job displacement and destruction. This universal approach to social financial support has a precedent in the widespread practice of furloughing during the Covid-19 pandemic.

Meanwhile, the effects of these changes on career decision-making (CDM) and career sustainability, particularly the potential need for individuals to reassess their career paths in their current or future roles, have not yet been fully explored. For example, the need to find identity and purpose through work throughout one's career trajectory is well-researched (Sullivan and Al-Ariss, 2019; Baruch and Sullivan, 2022) but it may be possible for only a small number of individuals in the future.

Research Approach

Our research approach was to analyse the career decision-making and career sustainability literature and apply it to the future workplace disruption predicted to be caused by AI, in order to identify the insights in the extant literature which will be most useful in analysing the changes that individuals will encounter in their future careers.

Our Analysis

Our starting-point was to identify the key concerns expressed in both academic literature and the media, relating to the effect of AI upon jobs. Concerns were firstly, job obsolescence and displacement, and secondly, polarisation, such that only manual labour on the one hand, and a limited number of high level roles on the other hand would remain, polarised by the disappearance of middle-ranking white-collar positions (Lei and Kim, 2024; Pandya and Wang, 2024; Romeo and Lacko, 2025; Zhao et al., 2024). We found that existing guidelines were often generic (OECD, 2025), recommending training for workers who needed new jobs and support for those without jobs. Meanwhile academic papers generally focused on specific subjects such as the accounting profession (Kassar and Jizi, 2025; Maulana et al., 2025; Rawashdeh, 2025) or the current situation (Romeo and Lacko, 2025; Zhao et al., 2024). A gap remained on the subject of how individuals' relation to their careers would be affected by the changes. We therefore designed our study to synthesise individual-focused insights targeted on individual decision-making, career structures and attitudes to work and other prosocial behaviours that contribute to the wider community.

To sum up, from the wide range of literature that could be considered relevant, we focused on two key areas: career decision-making (CDM) and sustainable careers. We respond to the call for the application of the sustainable career literature to future careers with AI (Bankins et al., 2024a) and conceptually apply its principles to a disrupted future workforce.

Purpose of the Research and Research Question

The purpose of this paper is therefore to explore how existing career theories can inform and shape a response to major changes to individuals' career decision-making and sustainability introduced by AI in the workplace. We review how the literature on work centrality and meaningful work can be adapted to a future lifespan which may have long periods of no paid employment, and how the retirement literature can also provide a template for analysis of the transition from work to permanent retirement, but also to temporary periods of non-work. Finally, we explore the ways in which a new approach to CDM can facilitate sustainable careers in an AI-enhanced workplace.

Our Research Question is therefore: to explore how existing career decision-making (CDM) and sustainability literature can inform individuals' understanding of and preparation for the ways in which artificial intelligence may reshape future career paths.

Literature Review

In this section we review the career literature, focusing on the topics that seemed most pertinent to a new approach to address the key concerns about AI in the workplace that we identified.

Career Decision-Making (CDM)

The theoretical framework that we used was the literature on CDM and sustainable careers. The academic perspectives on the determining factors in career trajectories have shifted back and forth between an emphasis on agency and context over time: Career decision-making theories evolved from the first scientific approach of Parsons' (1909) 'trait and factor' analysis and guidance, when the needs of the job took precedence, although individuals' aptitudes were also taken into account. However, careers were still often determined by the trade of a boy's father (Form and Miller, 1949). Late 20th Century models of career choice emphasised an individual's agency to reshape themselves, in a 'protean' approach, to fit a changing work context, and to move across roles and organisations in a 'boundaryless' career (Hall, 1996; DeFillippi and Arthur, 1994). These agentic approaches have recently been challenged in the career literature by a focus on the role of the career context, in the form of the influence of social expectations (Hallpike et al., 2022), organisational structure (Lone et al., 2015) and career scripts (Laudel et al., 2019), and the unpredictable role of happenstance (De Vos et al., 2020; De Vos and Van der Heijden, 2015). Furthermore, there has been increasing emphasis on the role of exogenous career shocks (Akkermans et al., 2020) including the Covid-19 pandemic, which illustrate that an individual is only partly able to determine the trajectory of their own career. Nevertheless, to counter this circumstantial focus, the literature on proactivity in careers has re-emphasised an agentic approach to career success (Akkermans and Hirschi, 2023), by highlighting the salience of individual motivation to direct and drive one's own career trajectory in an uncertain environment.

Sustainable Careers

A sustainable career is defined by Van der Heijden and De Vos (2015) as: "sequences of career experiences reflected through a variety of patterns of continuity over time, thereby crossing several social spaces, characterized by individual agency, herewith providing meaning to the individual"(p. 7). This definition already incorporates the concept of a changing career context, whilst reasserting the primacy of individual agency and an individual's desire to find meaning and purpose in their pursuit of a career. The outcomes of a sustainable career have been characterised as happy, healthy and productive individuals (Van der Heijden, 2005). Having a sustainable career will, however, take on a new significance as AI takes over first basic manual white-collar jobs and increasingly middle-management and professional roles.

Both the definition and outcomes of a sustainable career will need to be adapted to suit the envisaged discontinuous future work context, as discussed in the following sections. Meaningful work provides purpose, not only at work, but also for individuals' broader lives (Lysova et al., 2019; Wrzesniewski, 2003). This combines with the concept of work centrality (Baruch and Sullivan, 2022) to illustrate the salience of careers in many individuals' broader lives, providing motivation through competence, autonomy and relationships derived from work (Ryan and Deci, 2017). The individual's expectations of their work are encapsulated in the psychological contract (Bal and Kooij, 2011), and these expectations will also need to adapt to the changing future career environment, and meaning may, for many individuals, need to be derived from other sources than work, as discussed in Sections 4 and 5 below.

Career structures:

The predominant understanding of career paths is still largely based on Super's (1980) career development theory, which describes the concept of predictable career stages leading to long-term employment. This framework remains so familiar that it continues to be used in contemporary career research (Bankins et al., 2024a). However, whilst CEOs nearing the end of their careers may consider AI as a commercial opportunity or threat, and some commercial organisations are very optimistic about the consequences for individuals, claiming that relatively few jobs will disappear in exchange for increased productivity (Goldman Sachs, 2025), employees at earlier stages in their careers are fearful for their jobs and incomes (Zhao et al., 2024). There are however, three streams of research in particular that can illuminate how AI may restructure work, namely the literature on the gig-economy, "Women's careers", and literature on Retirement.

Research on the gig economy reveals a pattern of disrupted and discontinuous work as technology evolves quickly. In this model, individuals often do not work continuously for one employer. Instead, they engage in intensive, project-based work with various employers, and may experience gaps of unemployment between projects (Petriglieri et al., 2019).

Studies on "Women's careers" show that many women choose to follow discontinuous career paths instead of traditional full-time jobs. They often shift their focus between work and responsibilities like childcare or eldercare in what is known as a "kaleidoscope career" (Mainiero and Sullivan, 2005). This type of career weaves together various "entangled strands" (Lee et al., 2011). Women's interrupted patterns of work may incorporate career breaks, after which they may return to work either in the same career or a different career, working at times full-time and at other times part-time (Duberley and Carmichael, 2016). Their careers may advance much later in their lifespan, after interruptions (Bailyn, 2004) and they may extend their commitment even after retirement from paid employment by taking on a new generation of childcare, looking after grandchildren whilst their own children go out to work.

Finally, the Retirement literature provides an alternative structure of life at the end of work (Sullivan and Al Ariss, 2019; Wang and Shultz, 2010). It includes analysis of 'Bridge employment' which is a reduction of working hours and responsibilities currently defined as taking place at the end of a person's career, after retirement from their full-time work, either at the same employer in a different type of work and employment. The decision to retire has been analysed by several researchers, including Feldman (1994), who analysed the decision to retire early, and by Hallpike et al. (2025), who analyse the strategies that workers can use and the situation they face when they make the decision to retire or to continue working. They analyse the decision along two dimensions: firstly whether workers still have the motivation to work, and secondly, whether the career context provides affordances for them to work, in the form of employers or entrepreneurial opportunities. The researchers identify specific strategies of re-engagement and reinvention adopted by later stage workers to sustain their careers. In this situation, the outcome for older workers, if they do not have the motivation, nor the affordance, to continue working, is to retire. In the present paper, we build upon their approach and extend it to workers of all ages in a future AI-enhanced workplace, who, for reasons of financial stability or personal fulfilment, may not feel able to withdraw from the workforce without an alternative way to contribute to the wider world.

Findings

The contribution of this paper is to highlight and synthesise the insights in the extant literature which can inform career decisions and sustainable career structures in the future AI-enhanced workplace. In this section we set out the challenges and suggested solutions already to be found in extant career literature.

The sustainable career ecosystem (Donald et al., 2024), is anticipated to be disrupted by the introduction of AI, including that work might become discontinuous and not provide sufficient income per se for an individual to earn a living. This will require a change of attitude and lifestyle as detailed below. Careers advice still works on the premise that mainstream careers will be full-time, however it may well be that in future, highly paid roles, entailing intense and long hours, and characterised by work centrality, may be restricted to a few senior executives, in a potential polarisation of the jobs market, whereby middle management roles will be carried out by AI, in addition to manual white-collar and blue-collar labour. Current conceptions of motivation through traditional forms of reward, including pay (Thompson, 2002), may no longer apply in a precarious labour market.

Individuals are seeking guidance as to how to make their career decisions and how to engage with the new world of work and possible non-work. We identified three strategies which workers can employ to sustain their contribution to society with or without full-time, permanent work. Previous research focusing on executives in later career stages shows that re-engagement and reinvention are important strategies for maintaining career sustainability (Hallpike et al., 2025). We furthermore identified a third strategy, that of rebalancing, built upon a combination of the literature on women's careers and on retirement.

Re-engagement:

Re-engagement is a personal strategy necessary to optimise career sustainability when the individual lacks motivation or skills in their later career stage. One way to re-engage is renewal through learning, which appears in the context of decision-making modes, for example the MBA decision path taken by many executives (Hallpike, et al., 2024). Individuals will need to re-engage proactively with the changing work context by taking on new AI-enhanced and constantly evolving roles, and through a readiness for continuous lifelong learning, even without a clear short-term work goal. Individuals will also need to re-engage with their perception of a sustainable career, when future careers may not necessarily entail continuous paid employment, and therefore work may not provide continuous meaning to an individual. Instead, in addition to the first two criteria for a sustainable career, namely that individuals should be happy and healthy, the third criterion relating to an individual's productivity will need to be redefined as the individual's overall contribution to society.

Reinvention:

Reinvention is a contextual strategy for optimising career sustainability when the career context no longer affords sufficient opportunities for work (Hallpike et al., 2025). This need often occurs when a person's original career plan "runs out" (p. 1) which may happen more frequently in the future. To take a proactive approach to their employment, individuals will need to continually retrain and embrace lifelong learning. They must also accept that their current jobs may become obsolete, requiring them to shift to completely different roles throughout their careers, potentially facing significant periods of unemployment. Therefore, individuals may need to be flexible and proactive in reinventing both their careers and themselves. While obsolescence can lead to job loss, it can also encourage retraining and new opportunities (Allen and de Grip, 2012).

Rebalancing:

For periods when people have no work or have no prospect of work, they need to find meaning and purpose outside of work. We found that the literature analysing different forms of discontinuous careers, such as the gig economy or women's careers (Duberley and Carmichael, 2016; Lee et al., 2011; Petriglieri et al., 2019), provided relevant frameworks to understand AI-enhanced careers of the future. This literature also provided a template for how individuals could change the structure of their work to rebalance their lifestyle, both across the life space and along the lifespan (Super, 1980), by working part-time or by taking a career break.

The question remains as to how people will continue to feel satisfied and useful. An individual may become dissatisfied with their career if they continue to rely on current career theories, focused on work centrality and vocational self-concept, to define their identity, and the significance and purpose of their lives. Work centrality will no longer provide sufficient meaning and purpose, which will instead need to be derived from their broader life, in the way that retired persons or unpaid carers might do today, through volunteering and prosocial activities, including childcare and eldercare. In other words, individuals will need to adopt a broader, holistic approach to life and work. The retirement literature offers insights on how to create meaningfulness during a period of reduced work hours. Old age and retirement have been characterised as a time when individuals withdraw from active and social life (Baltes, 1997; Carstensen et al., 1999). However, given increasing Healthy Life Expectancy, the retirement literature finds individuals who are active in prosocial volunteering, and we propose this as the norm for the future. Whilst models of UBI provide unconditional income, it seems likely that the remaining roles, not carried out by AI, will often be caring roles, which would be meaningful to society and improve general wellbeing. Volunteering is a key feature of the retirement literature, which materially contributes to society, even though it is not paid work and therefore not currently measured in national productivity figures (termed 'Gross Domestic Product', GDP). In the new workplace, individuals of all ages may find their work disappearing, in repeated experiences of redundancy, as described in the career shock literature. However, even individuals who become permanently unemployed will be able to seek meaning, and to contribute to society, in a future work environment, if all contributions to society are valued, and productivity gains from AI are able to financially support all citizens at a respectable level of income.

Finally, research on the new generation termed 'Generation Z' (Gen Z), who are currently entering the workforce, indicates that they may be adapting to, or aspiring to, new ways of working. Whilst still aspiring to career advancement, Gen Z have been found to value work-life balance and meaningful purpose in their careers. They are 'digital natives' and comfortable with the internet and independent learning (Barhate and Dirani, 2022), and do not have expectations of a 'job-for-life' associated with work in the twentieth century. The new perspective identified in Gen Z could provide a model for a new form of future worker psychological contract (Bal and Kooij, 2011), which combines acceptance of the need for continual personal re-engagement, and the need to reinvent both themselves and their roles, with expectations that individuals will periodically have the opportunity to rebalance their life and work along their life course.

Discussion, Theoretical and Practical Implications and Conclusions

We draw on the literature of career decision-making, sustainable career ecosystems, and career shocks to advocate individual flexibility and resilience. Discontinuous career patterns, entailing rebalancing of work, leisure and voluntary citizenship behaviours, could form the basis of a new model for future career trajectories. In future careers, decision-making will need to incorporate continual re-engagement, reinvention and rebalancing. We suggest that meaning will be found, at least for some workers, through intensive learning and advancement in the workplace, interspersed with periods of rebalancing their time towards family or pro-social and citizenship roles. Thus, career advice should prepare new and existing workers for this new AI-enhanced rebalancing of work, leisure and voluntary citizenship behaviours. Education will need to propose multiple sources of meaning and purpose, and to prepare students for lifelong learning, as indeed is already advocated by the literature and required by most organisations in a volatile environment (Shet, 2024). Skill obsolescence need not lead to job loss (Allen and de Grip, 2012) as long as there remains a motivation to retrain. We also propose that the circular economy which highlights mending, recycling and repurposing might be able to thrive in an economy where individuals have periods of renewal and retraining in between periods of employment (Raworth, 2018). The advice to "Be a plumber!" may in future apply to all individuals, and could be adapted to: "With AI, you, too, can be a plumber!" Or, in other words, with more free time and the help of AI, individuals may be empowered with greater self-efficacy to do practical tasks in their broader lives.

Limitations and Direction for Future Research

Limitations

There are several limitations to our proposals. Firstly, our proposal is based on predictions about AI workplace disruption, not on realised outcomes. Secondly, the academic literature on AI workplace disruption is constrained due to the time-consuming academic process of data collection to publication, whilst the speed of AI development is much faster. Most current articles on the future of careers in AI are published in non-academic magazines or broadcast in podcasts, whilst only very recent academic texts address the new issues. We also make assumptions about the discontinuous nature of future work, and the readiness of governments to provide social support, in the form of Universal Basic Income, for those who cannot find work, or are in between jobs.

Future Teaching and Research

We call for universities to take up a leading position in the technical development of AI, the technical application of AI in the workplace, and in the development of AI-enhanced students, who are prepared for the new workplace and optimise their capabilities by embracing every assistance from AI in the learning experience.

Within the education sector we need to move from inward-looking concerns relating to AI such as: "How can we stop the students using AI to write their assignments?" to ask: "How can we empower students to optimise their learning and assignments with AI?"

Future research should explore how organisations and institutions, especially government bodies, can effectively support, house, feed and value individuals who are unemployed. It is essential to re-establish values that emphasize the importance of lifelong learning and contribution to society, while not necessarily advocating for continuous lifelong working. It is also important to incorporate these perspectives in our frameworks for understanding the purpose and meaning of quality work in the future. Additionally, studies should examine insights from sustainable careers and decision-making processes to investigate examples of personal and vocational skill renewal and resilience.

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Is AI IT fentanyl?

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Keywords
AI, fentanyl, CIO, performance, IT efficiency

Abstract
Dichotomy surrounds AI enthusiasm. Generative and Agentive AI within organizations has reached its peak, and experts suggest that improved use cases and more precise outcomes may be necessary to renew interest, as the technology descends further into the unfortunate trough of disillusionment in the Gartner Hype Cycle. Despite the significant potential that AI holds for enterprises, certain expectations have lessened as organizations have encountered challenges regarding its robustness and reliability. The excitement surrounding generative AI has overshadowed the considerable effort required to fully realize its advantages. This paper seeks to develop a conceptual model to address the dichotomy of AI in contemporary organizations within the African context. Qualitative methodology was used in this study. Sixteen expert Chief Information officers (CIO) in academic, ports and harbour, manufacturing and pharmaceutical institutions were used in this study and data was thematically analyzed to develop the conceptual model. The model developed seeks to cure the question, Is AI IT fentanyl? AI, like fentanyl, can be good or bad depending on context, application and level of dependence.

Introduction

A preliminary study provided by the Centers for Disease Control and Prevention (CDC, 2022), which involves approximately 83,000 individuals succumbed to opioid overdoses within the United States, predominantly attributable to fentanyl and various other highly potent synthetic agents of Illicit drug manufacturers are progressively incorporating fentanyl into a diverse array of narcotics, encompassing heroin, cocaine, and methamphetamines. Almost all organization are making use of a particular AI tool or another to solve their current IT problems. But most of these AI tools and applications are not fit for purpose. Like fentanyl abuse, AI is being abused in a way that does not create value for organizations that integrate it inappropriately. AI needs to be used in a more balanced way to harness the full potential and benefits of the technology within organizations. AI is currently affecting staff layoffs. While some organizations are looking at how effectively AI-driven capabilities can be used to bluster the workforce, for others AI has triggered layoffs (Sekar et al., 2022). Big cooperation's like Microsoft, Intel, and Glassdoor are cutting jobs by 9,000, 5,000, and 1,300, respectively, all due to their focus on AI enabled solutions (www.reuters.com). According to layoffs.fyi (2025), over 80,000 jobs have been lost because of AI. World Economic Forum (2025) predicted 92 million jobs would be gone by 2030 because of AI. Over the past five years, there has been an increase in interest in artificial intelligence (weforum.org). Numerous causes have sparked this interest, such as the accessibility of massive amounts of big data, the sharp decline in the price of processing and storing vast amounts of data, and the availability of cloud computing and platforms. Unsurprisingly, governments have begun to allocate large sums of public cash to extensive AI research initiatives.

Literature review

Whether they are bubbles or not, most enterprises' AI programs require a reset to guarantee that proper governance, risk, and compliance are incorporated from the beginning; otherwise, they are only making progress without dealing with the real issues of AI. As businesses transition from specialized Artificial Intelligence/Machine learning (AI/ML) projects to generative AI and finally agentic AI, this is particularly true. As AI gets increasingly automated and autonomous, and the technology permeates more core organizational apps and workflows, the organization's risk profile rises with each step. The more we automate and orchestrate with agentic AI, the greater the risk; and as discussed in the literature, there is the need to oversee AI agents' operations within the organizations. Organizations will be able to scale more quickly and increase its level of AI maturity in the coming years if they invest time in AI orchestration and governance now and consider how AI agents will affect technology platforms, centers of excellence, and governance strategy.

What type of AI projects does enterprise need?

Given the hype surrounding AI's disruption of the consulting and advisory sector and even its replacement of entire IT teams with simple coding, one may conclude that consultancy, systems integration services, and internal IT teams are no longer required in an AI environment. With lines of code flying across the screen, some AI-enabled website building tools may look amazing at first, but their results are often far less pleasing. What enterprises really need is AI initiatives that are applicable now and can adapt to the ever-challenging environment of contemporary businesses. The business environment is changing rapidly, trying to cope with the incidence of IT advancement. Organizations are left behind when they are not able to cope with the fast pace of these advancements.

Adaptability of AI to increase an organization's performance and create value is a key component of modern organizations. The stern competition among organizations require innovation that brings leverage. Therefore, the AI solution that will prevail is the one that is adaptable, efficient, creates value, secure, humancentric and customer friendly. Enterprises need to understand that customers want their privacy protected, want satisfaction with the tech they use, understand how the tech works and generally feel safe with using it.

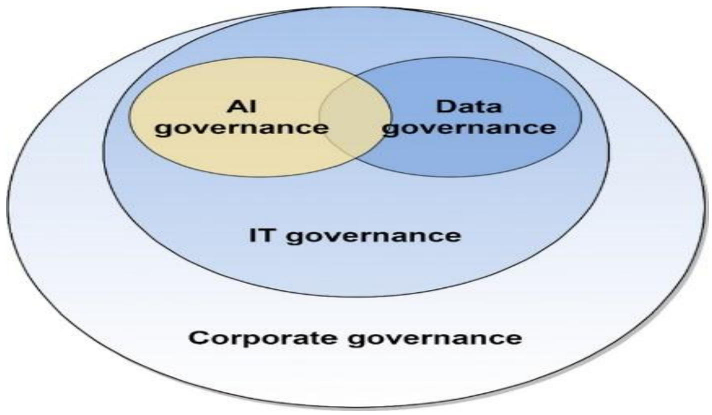
What principles should guide enterprises in using AI ethically?

The disruptive nature of AI is far more reaching than was previously anticipated. It can be an axis for good or evil. Ethical principles and consideration are the right way to check AI tech proliferation. Ethics ensure that AI is humancentric, and ethical principles will be the basis for AI to thrive rightly. According to Calo (2017), the AI sector's ethics guidelines advise lawmakers that internal self-governance in research and industry is adequate and that no special legislation is required to reduce potential technology hazards or to completely eradicate abuse scenarios. However, other studies have presented different options (Jobin et al., 2019) including that AI can be regulated externally. Individual organizations may flaunt their own rules by being flexible on themselves but a governance structure with guidelines will ensure that the right processes and permission are sought, but at the same time they should not stifle AI innovation. Therefore, the list of ethical principles mentioned in this article includes collections that cover the subject of AI ethics as comprehensively as possible. A few preprints and articles that compare different ethical principles are now accessible (Jobin et al., 2019; Cao et al., 2018). The ethical principles must consider AI for good and not for evil intention. The four major ethical principles grounded in theory are beneficence (doing good), non-maleficence (avoiding harm), autonomy (respecting self-determination), and justice (fairness in treatment); and the supporting principles are honesty, fairness, leadership, accountability, integrity, compassion, respect, responsibility, loyalty, respect for the law, transparency, and environmental concerns.

AI governance principles

The AI governance should form part of the general IT governance structure of the organization taking into accounts the ethical principles that should underline AI innovations and applications taking cognizance of the fierce competition within the business environment. From the organizational structure that starts from operational level through tactical to strategic levels at the top requires that a procedure is followed, IT management should understand how AI with all its buoyance can impact governance. The AI governance structure should be clear and adequate to take care of any ambiguity within the governance instrument. The ownership of the AI platforms that are used by organizations must be clearly defined with their ownership known and how data is gathered, processed and stored.

Figure 1: Matti Mäntymäki et al.'s (2022) Artificial intelligence (AI) governance structure



AI transformation drive large-scale

There are many ways in which AI can help India as a country to grow. Some of the aspects that I would like to mention are essentially economic development. India's healthcare sector needs a lot of attention, and a technology like AI can really revolutionize this sector, from public health through to tackling healthcare issues in villages and other areas. Education is another area, especially rural education. Technologies like AI, and many others combined, can revolutionize the education sector in rural and semi-urban areas of India.

Businesses can improve their relationship with the government if they view upskilling as a strategic investment rather than a compliance activity. They are also more equipped to incorporate AI into business operations and exhibit leadership in talent development. A more cooperative paradigm is anticipated in the future, with the government establishing priorities, academic institutions advancing research, and employers converting these discoveries into useful training programs. Building a workforce that is not only aware of AI but also more comfortable using these technologies should be the aim. A fundamental reality shared by governments and economists is that although AI will disrupt certain employment categories, it will also lead to the creation of new types of jobs. AI is frequently used by businesses to increase productivity and do more with the same number of employees rather than to cut staff. Because of this change, skill development needs to be fundamentally rethought, with an emphasis on adaptability and the capacity to collaborate with intelligent technology.

Education, flexible policies, and a lifelong learning culture are essential for navigating this shift. Setting these priorities could turn AI into a strong partner rather than a rival in creating a workforce that is resilient and prepared for the future.

AI, Governments and work landscape dynamics

The reality of AI is in the now and futuristic. The structure of businesses is already being altered by this change. Traditionally represented as a hierarchy triangle, the corporate structure is becoming more likened to a diamond. AI technologies and digital agents are increasingly handling routine reporting and coordination activities that were formerly performed by junior or mid-level personnel. Managers consequently concentrate more on strategy, stakeholder involvement, and cross-functional choices and less on oversight. All activities of IT platforms allow individual actions to be logged in a database, ensuring these systems can be audited with precision. All end-users are therefore responsible for their actions on AI enabled systems. Investing in AI project may lead to new revenues dimensions that never existed in the past. Most CIOs are well aware of AI that offers assistance with problem-solving or advises cross-selling. Another AI flavor is called StreamzAI, and it gives each salesperson a single knowledge and confidence score. There are management dashboards that display sales preparedness in real-time for managers, teams, and the entire salesforce, and this dovetails directly into customer experience and sales outcomes.

AI can cut cost and improve revenue for organizations. Stakeholders in Southeast Asia are already becoming concerned about AI affecting their cheaper workforce. Policymakers in Malaysia and Indonesia, for example, have raised concerns about the possibility that automation may eliminate middle-level positions unless businesses make investments in role redesign and reskilling of their workforce to create more opportunities for their youngsters. As a result, innovation policy is unlikely to be the exclusive focus of the conversation about AI and employment in Asia. Once work markets begin to shift, governments can quickly implement new labor regulations, educational reforms, and social safety programs.

In a region where youth employment is politically sensitive, AI will be framed as both a tool for growth and a social stability issue. Governments are taking action in recognition of the possibility of temporary disruption. During the Trump administration, the US Department of Labor introduced a new Talent Strategy. It emphasizes flexible upskilling programs and AI literacy.

These programs seek to provide workers the tools they need to not just survive but to prosper in an AI-driven economy. In Singapore, the government is addressing the problem through research-based policy. Effective human-machine collaboration is being investigated at Singapore Management University (SMU) and the Massachusetts Institute of Technology (MIT). Their resilient workforce's research agenda emphasizes lifelong learning ecosystems, organizational restructuring, and human adaptation. This is a clear signal for businesses and governments that upskilling is crucial for full AI adoption. Businesses will satisfy their required workforce development goals, participate in public-private skilling programs, or even co-invest in training. In reality, this might entail incorporating reskilling programs straight into business strategy, much the same way digital transformation or sustainability do now.

AI impacts on employment

AI has a dichotomic relationship with employment: while some say it will reduce employment opportunities, evidence from the literature suggest otherwise, creating some contradictions. The World Economic Forum jobs report in 2025 projected a net creation of 78 million AI generated jobs globally by 2030. However, there is fear that AI will lead to mass unemployment as the report predicts a rocky road ahead, as technology will also displace existing roles. Researchers predict that five key drivers, of which technology is one, will create 170 million jobs but will displace 92 million jobs. It also estimates that nearly 40% of workers' core skills are expected to change by 2030. According to estimates from the US Bureau of Labor Statistics (2025), "because of employment growth and the need to replace workers who leave the occupations permanently, overall employment in computer and information technology occupations is projected to grow much faster than the average for all occupations from 2023 to 2033 creating about 356,700 openings each year on average in these occupations." A more balanced perspective is provided by the recent Goldman Sachs research (2025). Despite widespread concerns about mass unemployment, according to their estimate, AI will only result in a slight and transient increase in unemployment. Only 0.5 percentage points could be added to rates during the first transition. If AI is completely embraced, it might displace up to 6–7% of US jobs. However, depending on how they use AI capabilities, firms might reduce the actual impact to something closer to 2.5 percent.

Methodology

Qualitative research design

This study employed a qualitative technique to interview business executives and Chief Information Officers (CIOs) in the African context in order to gain a comprehensive grasp of the framework for constructs. To do this, our two primary methods of gathering data are case studies and interviews. These techniques enable us to capture the nuanced perspectives and experiences of CIOs and business executives navigating the challenges of digital transformation in relation to AI. The qualitative aspect of this study allows for rich, context-specific insights that may be missed by quantitative methodologies. This design offers a more thorough understanding of how organizations can employ AI that are part of the digital strategies and give digital leadership the opportunity to explore the efficiency of their AI enabled strategies.

Data collection methods

To gather pertinent data for this study, leaders and IT directors (CIOs) from 16 public institutions and a range of businesses were asked semi-structured questions. This approach was chosen to foster an open dialogue while guaranteeing that significant understanding related to AI enabled applications in organizational requirements are covered. During the interviews, the organization's CIOs and management participated in an online forum to share their experiences, challenges, and solutions for incorporating AI initiatives into their businesses. Case studies of organization that were studied have effectively initiatives AI into their operational frameworks. These case studies improved our understanding of the topic by offering actual instances of best practices, showing how these businesses have successfully implemented AI solutions that are productive and counterproductive.

Data analysis approach

Data analysis was conducted using thematic analysis, a qualitative method that focuses on identifying, analyzing, and summarizing patterns or themes within qualitative data. By using this approach, we were able to systematically examine the data gathered from case studies and interviews, highlighting the key issues related to AI strategy within organizations. By examining case study results and interview transcripts, we were able to draw important conclusions about the relationships among AI dimensions (Ethical AI, Bad AI, AI Type), the Gartner Hype Cycle and Sustainable AI. The study seeks to develop a conceptual framework for use within the context of Africa where most organizations are grasping with AI initiatives. Ultimately, this analytical framework will guide key takeaways from the Hype Cycle for Artificial Intelligence, while innovating with AI shifting from experimentation to scale.

Conceptual frameworks

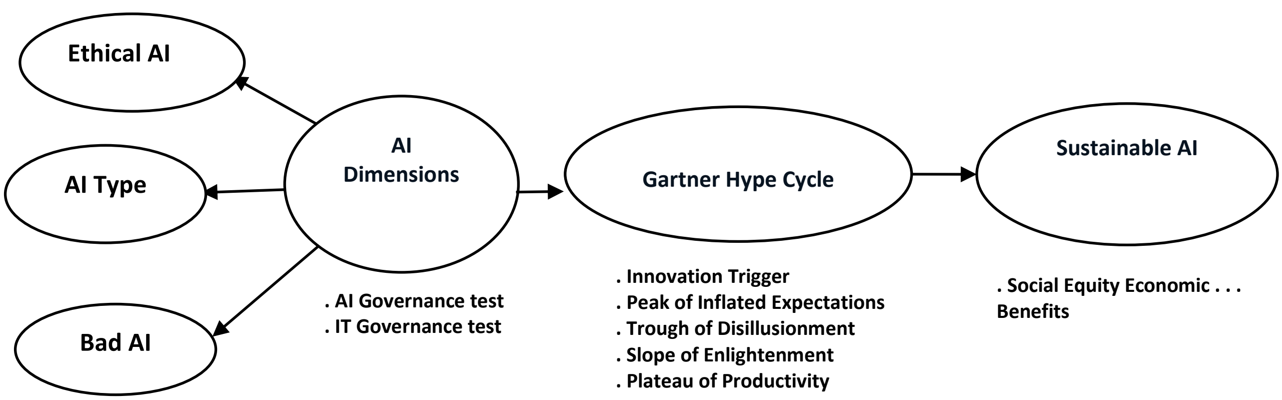


Figure 2: Conceptual framework for AI

Theoretical frameworks

Two key theories are used as a framework for this study, namely diffusion of innovation and disruptive innovation theories.

Diffusion of Innovation Theory

Everett Rogers' Diffusion of Innovation Theory established in 1962, offers a thorough framework for taking into account how new concepts, innovations, or technologies proliferate within a community or organization (Prasad Agrawal, 2023). The theory sheds light on the dynamics of technology adoption and how it affects organizational innovation. AI has innovative qualities that affect its uptake, such as the capacity to generate new content or solutions on its own. According to Hsu and Ching (2023), these qualities include the perceived benefits of GenAI in terms of creativity development, efficiency gains, and adaptive problem-solving. Therefore, it is critical to comprehend IT strategies and qualities as they are essential to the adoption of AI. Additionally, the theory broadens its scope of application to the study's central examination of exploitative and exploratory innovation (Enkel et al., 2017). Because AI, ML and data analytics promotes experimentation, it becomes a catalyst for exploratory innovation. According to Cooper and Morris-Suzuki (1998), early adopters of technology frequently demonstrated a spirit of technological exploration and enthusiasm by integrating IT that creates the framework for making well-informed decisions.

Disruptive Innovation Theory

Disruptive innovation theory (DIT) is prominent in management science, corporate strategy, and contemporary cultural discourse. Its roots trace back to the groundbreaking work of Bower and Christensen (1995). Emerging technologies like artificial intelligence (AI) are catalysts for social change across various domains, including healthcare, military, governance, and industry. Disruptive technologies can significantly impact society by challenging ethical values and disrupting legal systems. Disruptive technologies like AI are impacting corporate strategy and management of organization as it introduces a new governance structure in cooperate governance: AI governance is significantly changing the way data privacy issues are handled in the corporate world. Technological (AI) changes are modifying power dynamics on both societal and international scales, leading to important and immediately visible impact.

Discussions

AI dimensions (ethical AI, AI type, bad AI)

The study looked at formative AI dimensions; ethical, bad and type of AI within the case studies and their respective industries. A collection of moral precepts known as ethics aids in our ability to distinguish between right and wrong. The study of ways to maximize artificial intelligence's (AI) positive effects while lowering risks (Bad AI) and negative consequences is the focus of the multidisciplinary topic of AI ethics. The evidence from this study suggests different organizations use different AI flavored software consistent with diffusion of innovation theory. In healthcare, AI related to Machine learning (ML), natural language processing (NLP), robotic process automation (RPA), and physical robotics are the primary forms of artificial intelligence (AI) in the healthcare industry. These technologies are employed in early disease detection, medical image analysis, medication development, and administrative workflow improvement. The capabilities of AI in healthcare are further divided into two categories: general AI (theoretical, with human-like intelligence) and narrow AI (tailored for specific activities). In contrast, the later phases of diffusion also see a rise in exploitative innovation (Enkel et al., 2020; Zhang & Luo, 2020; Wael AL-Khatib, 2023; 2017).

As businesses diversify the challenge and possibilities of AI to concrete advantages to organization are enormous. The main goal of exploitative innovation is to improve and optimize the way GenAI is integrated into current organizational procedures. The concerns expressed by the industries studied is the possible risks of developing extremely clever AI systems (good AI) that may result in a technological uniqueness and the perceived existential threat to humanity (ethical) developed by leading AI creators (Grech et al., 2023) consistent with the theories of diffusion of innovation and disruptive innovation

"The real risk with AI is not malice but competence. A super intelligent AI will be extremely good at accomplishing its goals, and if those goals are not with ours, we are in real trouble", as quoted by Stephen Hawking. The impact of the technology is just now becoming apparent, but it has already fueled advancements in asset usage, medical diagnosis, targeted marketing campaigns, and operational efficiency, to mention a few.

When big AI's intelligence is applied in a way that harms the user, it is bad (Euchner, 2019). This is consistent with disruptive innovation theory. The "negative" parts have to do with the possibility of mistakes, responsibility, morality, data loss and breaches, and so forth (Iqbal et al., 2024). Deliberate personal wrongdoing and outright scientific misconduct, including the ease of plagiarism and fabrication—with special reference to the innovative ChatGPT and AI software that can easily create fake graphs and images—are the "ugly" parts (Moore, 2019; Euchner, 2019). The concerns about the possible risks of developing extremely clever AI systems may result in a technological uniqueness and the perceived existential threat to humanity may follows by leading AI creators (Grech et al., 2023).

Gartner Hype Cycle

In this study CIO were asked where AI stands in the Gartner Hype cycle of its application in their respective organizations. For the purposes of discussion, the Gartner Hype cycle has an innovation trigger, peak of inflated expectations, trough of disillusionment, slope of enlightenment and plateau of productivity. The evidence suggests the hype is still high among the African CIOs and the IT departments but they are not really using Agentic AI as most of them are using Gen AI. Artificial intelligence (AI) advancements have the power to upend and change socioeconomic practices in a variety of sectors in Africa. Even though a sizable portion of the jobs that could be lost as a result of AI are in the Africa, there is evidence that nations in the developed countries are better equipped to benefit from the technology, even as evidence grows that governments and corporations around the world are setting up their operations to maximize this potential. Gen AI enters the trough of disillusionment in most of the industries investigated and is supported by disruptive innovation theory. Despite ethical and societal concerns, last year's Hype Cycle for AI highlighted GenAI as a potentially transformational technology with profound business impacts. This year, GenAI enters the trough of disillusionment as organizations gain an understanding of its potential and limits.

AI IT leaders (CIOs) continue to face challenges when it comes to proving GenAI's value to the business. Despite an average spend of $1.9 million on GenAI initiatives in 2024, less than 30% of AI leaders report their CEOs are happy with AI investment return. Low-maturity organizations have trouble identifying suitable use cases and exhibit unrealistic expectations for initiatives. Mature organizations, meanwhile, struggle to find skilled professionals and instill GenAI literacy. About 80% did not really understand that there was a Gartner Hype Cycle to evaluate the state of their AI initiative although they had spent a consideration amount of investment in the technology. The organizations studied are yet to set up AI governance structures to deal with AI associated issues within their organizations consistent with diffusion of innovation and disruptive innovation theories.

Only 5% of the organizations studied are fully at slope of enlightenment and plateau of productivity within their organizations. African organization cooperate governance must create data management strategies and capabilities that ensure AI-ready data—defined as data that can establish its fitness for usage in specific (Hopster & Maas, 2024) AI use cases—can satisfy present and future business requirements in order to scale AI. However, 5% of businesses claim that their data is not AI-ready. Without data that is suitable for AI, businesses run the danger of taking unwarranted risks and failing to achieve their objectives.

Sustainable AI

This study looked at AI sustainability in two ways: the economic benefits and social equity. Sustainable AI is to promote transformation across the whole AI product lifecycle (i.e., idea creation, training, fine-tuning, execution, and governance) in the direction of increased social justice and ecological integrity (Van Wynsberghe, 2021). AI can analyze large datasets, automate repetitive operations, and optimize procedures in a variety of industries, all of which contribute to enhanced productivity and efficiency. AI can power assistive technologies that help people with disabilities regain their independence, help with data sharing for quicker access to cures, and better medical diagnosis. AI can increase safety in both everyday life (e.g., by implementing driver-assist features in cars) and hazardous occupations (e.g., by deploying robots to do duties like bomb defusal). The economic benefits of AI are enormous when applied responsibly. Businesses can gain a competitive edge and assist organizations in sustainably achieving their objectives by implementing sustainable AI practices, consistent with the theory of diffusion of innovation (Hacker, 2024; Raman et al., 2024).

However, there is an unequal distribution of access to AI digital resources and education, which exacerbates already-existing social inequalities in developing and developed countries. Successful initiatives to promote AI digital literacy and social equity in industries have shown several important principles: first, there is the need to prioritize equitable access to technology and internet connectivity, making sure that all employees have the tools they need to participate in AI digital learning; second, they acknowledge the significance of inclusive and culturally relevant AI platforms. AI platforms must reflect employees varied backgrounds and experiences. Building capacity and promoting AI digital inclusion are two aspects of a sustainable AI strategy that guarantee poor nations can take advantage of and contribute to long-term digital advancement consistent with disruptive innovation theory (Tabbakh et al., 2024; Mana et al., 2024). The study revealed that the time is right to go beyond the growing demand for AI for Sustainability (such as the Sustainable Development Goals) and explore the sustainability of designing and deploying AI systems on the continent of Africa. Sustainable AI should focus on the overall sociotechnical system of AI rather than simply AI applications. Sustainable AI is about producing AI that is compatible with safeguarding natural resources in African rather than how to continue developing AI in general. In order to ensure sustainable delivery, enterprises are concentrating on supporting technologies as they gradually move away from GenAI as the backbone of their AI initiatives. These tools facilitate the management and integration of AI systems, increasing their efficacy and scalability.

Conclusion

Fentanyl has the potential to reduce anxiety and stress caused by pain. AI's future depends on a balance between innovation and careful management. By fostering responsible development and ethical implementation, societies can aim to maximize the benefits of AI while actively addressing its risks. Artificial Intelligence (AI) is neither inherently good nor bad; its impact depends on how it is developed and used, with potential benefits in areas like medicine, efficiency, and personal assistance, but also significant risks like job displacement, biased decision-making, privacy concerns, and the potential for misuse by malicious actors. Responsible development, careful regulation, and a focus on ethical considerations are crucial to harnessing AI's potential for good while mitigating its negative consequences. More generally, African Governments must have AI rules the focus on IT governance issues rather than hinder the use of GenAI in enterprises for automation, productivity, and changing work responsibilities because they fear it will lead to unemployment, which can eventually trigger civil unrest in their respective countries.

Limitations and direction for future research

Complex ethical issues are raised by the development of AI, including the possibility of false information, the breakdown of interpersonal relationships, and the increase in income disparity. AI technologies could be used by malicious people or organizations to do financial, psychological, or physical harm, or to cause negative outcomes via carelessness. Large amounts of energy are needed to train and operate sophisticated AI models, which raises environmental issues and leaves a substantial carbon imprint. A quantitative study can be carried out to validate the conceptual framework because this research is qualitative and hence highly subjective to the interpretation of the researcher's biases. Studies conducted in a different setting may yield empirical proof in the future. It is impossible to overstate how AI can improve an organization's perspective, but it can also cause a separation that will lower organizational expectations.

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Assessing the perception of university students in the use of chat GPT

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Keywords
Challenges, Chat GPT, Opportunities, Perception, University Students.

Abstract

ChatGPT is now a widely used generative AI tool among university students to assist them in their learning journey. Such a technological shift in education however poses essential questions on the extent of its use , academic integrity and ethics, calling for a broader reconsideration of teaching, learning, and assessment practices in higher education. Since AI tools are being more deeply incorporated into education, understanding how students perceive the advantages and disadvantages of such tools is significant, especially in small island developing states, which have certain inherent characteristics.

This study therefore attempts to investigate the perception of university students in Mauritius, a small island state, regarding the use of Chat GPT. It attempts to critically analyse the opportunities and challenges university students face when using Chat GPT as a generative AI tool in their academic pursuits. The Technology Acceptance Model (TAM) was adopted to achieve same. The research design was based on the four dimensions of the TAM, together with another parameter added, that is Trust in the Use (TU).

515 students from 5 different public tertiary institutions agreed to take part in an online survey. Data obtained was analysed using SPSS. Weighted average values of 3.35, 3.44, 2.86,2.75 and 2.99 were obtained for the five dimensions of the TAM respectively. Findings thus revealed a strong intention among students to use Chat GPT as an AI generative tool because of its efficiency, user friendliness and accessibility. While they displayed a moderate trust in the accuracy of information provided by Chat GPT, they found it to be a valuable tool to find useful information. However, the challenges which students claim to face is the moderate clarity in the responses provided and thus maintained that Chat GPT could not replace their lecturers at the university.

Introduction

Generative Artificial Intelligence (Gen AI) holds transformational potential when it comes to the education sector (Yan et al, 2024). United Nations Educational, Scientific and Cultural Organization (UNESCO), supports that Gen AI can significantly shape teaching and learning processes within any educational context and identifies as follows Chat GPT (Chat Generative Pre-Trained Transformer). With the capacity to enhance or influence teaching and learning as a whole, ChatGPT, released in late November 2022, exceeded 100 million users in two months ((OpenAI, 2022; Hu et al., 2023). Using a conversational interface this Ai chatbot as reported by UNESCO (2023) can be used as "Socratic opponent," "collaborative coach," "guide on the side," "personal tutor," and "study buddy" among other roles." At its core, ChatGPT is an autoregressive language model that allows the model to produce contextually relevant and coherent responses (Sahoo et al., 2023). While its user-friendly design has made it a popular resource among university students for research, assignments and academic projects, its integration raises significant ethical challenges regarding academic integrity, prompting reconsideration of traditional teaching, learning, assessment methods (Kasneci et al., 2023; Cotton et al., 2023 and Zhai, 2022) all having a potential impact in influencing SDGs, namely 4, 10 and 12.

Mauritius, a small island state, east of Africa, places AI at the core of its national development strategy to transform the country into a knowledge-based, innovation-led economy (Le Roy, 2023). The 2018 Mauritius Artificial Intelligence Strategy aims to equip the younger generation with digital and AI

skills in a bid to place them to address future needs of the labour market. Despite these policy agendas, little has been researched on the adoption of Gen AI tools like ChatGPT in particular within the higher education sector (Beebeejaun & Gunputh, 2023; Isaacs & Mishra, 2022; Kumar, 2019). This study thus seeks to fill this research gap by exploring university students' views on the use of ChatGPT across different levels of study. It tries to examine the perceived advantages and limitations of ChatGPT, determine students' readiness to use the tool, and give practical recommendations for its effective and ethical use. Last but not least, the study aims to help in guiding holistic institutional policies on Gen AI usage in higher education. Thus, we investigate the perception of university students in Mauritius regarding the use of Chat GPT in their higher educational pursuits. In so doing so, we try to answer the following research questions:
(i) What are the opportunities and challenges which university students face in the use of Chat GPT as a Generative AI tool?
(ii) What are the factors which influence the use of Chat GPT among university students in Mauritius?

Literature Review

AI is a key aspect of the fourth industrial revolution (Yau et al., 2023), impacting daily life across fields like psychology, medicine, and education (Su et al., 2023). Its influence on education has been significant, with researchers asserting it is now essential for institutions (Aldosari, 2020; Mc Donald, 2024). Morin (2018) illustrates that universities must transition from traditional roles to embrace technological advancements through innovative teaching methods (Akour and Alenezi, 2022). This transformation brings both opportunities and challenges, placing educational institutions in a new realm of uncertainty (Jafari and Keykha, 2024; Jain and Jain, 2019).

ChatGPT as a Gen AI tool within the educational context

Leah (2022) identifies several chatbot types, including rule-based, self-learning, and hybrid chatbots, with ChatGPT being particularly popular due to its usability and conversational ability (Knox and Stone, 2011; Korngiebel and Mooney, 2021). Clark (2024) notes that ChatGPT distinguishes itself by generating cohesive, human-like responses, using linguistic patterns from a vast body of literature (Stokel-Walker, 2023; Ivanov and Soliman, 2023). In education, Johnson (2019) highlights the transformative impact of AI on traditional practices. Although relatively new, AI tools like ChatGPT are widely used in higher education, enhancing the learning experiences of students, especially in developing countries where access to quality education is limited. ChatGPT’s scalability benefits these regions, providing access to high-quality materials (Fahimirad and Kotamjani, 2018). Its significant impact is evident in emerging economies like Brazil, India, and China (Mhlanga, 2023; George and George, 2023), with scholars noting its potential to improve teaching and learning processes (Bernacki et al., 2020; Starkey et al., 2021; Qureshi et al., 2021). Kasneci et al. (2023) emphasize the importance of educators' and students' perspectives in integrating large language models into education, highlighting the need for expertise in understanding the technology's capabilities and limitations. Addressing challenges such as biased outcomes and continuous human oversight is crucial, but if managed well, these technologies can enhance critical thinking and awareness of AI risks. A deeper exploration of ChatGPT's potential in improving education in developing countries, including Mauritius, is necessary.

Opportunities in using ChatGPT in the education sector

Integrating ChatGPT into educational environments has the capacity to improve the overall academic outcomes and student experiences, especially in developing countries where access to quality education is limited. Reasons supporting the same include its ability to address student inquiries, offer tailored comments, and produce teaching materials among others. The scalability of ChatGPT proves advantageous in emerging economies characterised by resource constraints and huge student populations.

Various authors and extant studies put forward a series of opportunities which ChatGPT as a chatbot can offer to the educational sector. For example, Ivanov and Soliman (2023) opined that ChatGPT can offer better equity, personalised learning, enhanced critical and thinking skills and be a motivation enhancement to students (Kang 2023). This is supported by Gao (2019) who advocates that, as far as adult education is concerned, AI promotes equity, quality and inclusiveness. There are, accordingly, several examples of the possible application of the ChatGPT in classroom setups.

Personalized learning focuses on individual skills, interests, and needs of students and builds an educational experience around those attributes. As reported by Times Higher Education (2023), AI, and more specifically, ChatGPT, is acknowledged for advancing opportunities in personalized learning (Elbanna & Armstrong, 2022). Baidoo-Anu and Owusu Ansah (2023) discuss how AI can individualize tutoring and offer tailored feedback. Johnson (2019) observes that AI adoption in teaching does not substitute for educators, but rather amplifies their potential. AI personalizes assignments and examinations which, according to Felix (2020), guarantees students receive appropriate assistance. Rospigliosi (2023) states that ChatGPT allows students to interrogate the information it generates which can aid in enhancing students' comprehension (Zhai, 2022) and support active and adaptive learning. One of ChatGPT's defining functions is the ability to provide feedback in real time. Johnson (2019) points out that the provision of feedback is one of the fundamental principles of effective tutoring, a task which AI applications readily automate. In addition, AI facilitates adaptive learning by modifying the learning material's difficulty concerning students' performances (Zhai, 2022). This feature makes instructional approaches interactive and responsive (Baidoo-Anu & Owusu Ansah, 2023).

In developing markets, an individual can converse with ChatGPT about a certain topic and receive answers that are salient and precise (Mohd et al., 2023). This may help address the issue of poor educational materials that developing countries face. People from emerging economies may not have traditional educational materials and expert teachers, thus making ChatGPT more appealing with its simple conversational interface. The lack of educational resources in a native language, and the absence of educational materials in a native language, poses a serious challenge (Lin and Chang, 2020). The rapid development of Artificial Intelligence (AI) and Natural Language Processing (NLP) technologies may solve the language barrier problem and help disadvantaged students obtain an education that is more responsive to educational and pedagogical consonance.

Challenges in using ChatGPT in the education sector

In developing markets, an individual can converse with ChatGPT about a certain topic and receive answers that are salient and precise (Mohd et al., 2023). This may help address the issue of poor educational materials that developing countries face. People from emerging economies may not have traditional educational materials and expert teachers, thus making ChatGPT more appealing with its simple conversational interface. The lack of educational resources in a native language, and the absence of educational materials in a native language, poses a serious challenge (Lin and Chang, 2020). The rapid development of Artificial Intelligence (AI) and Natural Language Processing (NLP) technologies may solve the language barrier problem and help disadvantaged students obtain an education that is more responsive to educational and pedagogical consonance.

Hence, the integration of Artificial Intelligence (AI) in education is encouraging, and it is more responsive than traditional pedagogical models. This will enable teachers to concentrate on more research-oriented work. Overall, the strategic integration of AI in education offers a transformative chance to enhance educational experiences, aligning practices more closely with individual needs. This vision frees educators from routine tasks, allowing them to focus on impactful teaching and research activities.

Research Methodology

This study uses the expanded Technology Acceptance Model (TAM) as outlined by Tiwari et al. (2023) to examine how university students in Mauritius perceive the use of ChatGPT. It identifies the opportunities and challenges these students associate with ChatGPT as a Gen AI tool in their academic pursuits. TAM's simplicity lends itself to diverse research applications, including education and online learning (Min., 2021; Wojciechowski and Cellary, 2013). The research framework comprises four core constructs: Perceived Use (PU), Perceived Ease Of Use (PEOU), Attitude Towards Use (ATU), and Behavioral Intention to Use (ITU), along with 'Trust to Use' (TU) as factors influencing technology acceptance. This study thus integrates the key elements of TAM, adding 'Trust' for a more comprehensive understanding of factors affecting ChatGPT usage among students as shown in figure 1.

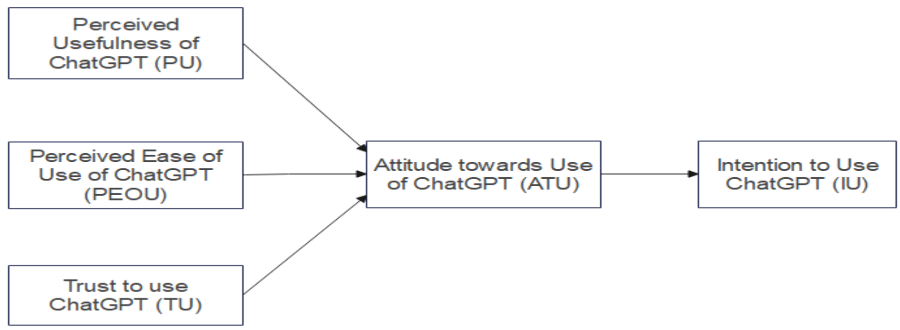

Figure 1: Extended TAM (adapted from Tiwari et al., 2023)

Research Instrument

A quantitative research approach was used to assess the extent to which students in the tertiary education institutions across Mauritius are making use of ChatGPT for their educational purposes. The perception of students in the use of ChatGPT in the educational context was thus assessed the TAM by Davis (1989). The research design was based on the four dimensions of the TAM, that is, Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude Towards Use (ATU) and Intention to Use (ITU). An additional dimension, that is Trust in the Use (TU), in line with Suh and Han (2002), was also included in the research design.

The quantitative questionnaire consisted of four sections. Demographic information about the respondents were captured in the first section while the second section of the questionnaire was designed to capture the overall experience of the respondents in using ChatGPT in their academic context. Section three was designed to assess the perception of the respondents based on five dimensions of the research design and comprised a total of 44 items based on a 5-point Likert scale ranging from “1=Strongly Disagree” to “5=Strongly Agree”. The last section was structured for the purpose of measuring the ethical considerations of the respondents while using ChatGPT in their academic contexts.

Sampling methods

The sample size for the quantitative research paradigm was determined from the population of university students in Mauritius, assuming a 95% confidence level and a margin of error of 5%. Given the population of 50,011 (Statistics Mauritius, 2023) of students enrolled in Tertiary Institutions across Mauritius, a sample of 382 or more was required to have a confidence level of 95% and a margin of error of 5%.

The quantitative questionnaire was disseminated online across five tertiary institutions across Mauritius who agreed to take part in the study, from both the public and private sectors. A total of 515 responses were obtained through the survey disseminated. The Statistical Package for Social Sciences (SPSS) Version 26 was used for descriptive and inferential analysis of the data obtained.

Reliability of Scales

The reliability of the scales was tested using Cronbach’s Alpha at 95% Confidence Level. A Alpha values obtained for the 5 scales were above 0.8, that is, for PU (α = 0.936), PEOU (α = 0.895), ATU (α = 0.887), ITU (α = 0.899) and TU (α = 0.835). This indicates good internal consistency for the 38 items of the scales.

Findings / Results

Demographic Variables

Out of 515 questionnaires answered, the ratio of male to female responses was 41.9% to 57.1%, with 1% respondents having preferred not to disclose their gender as shown in table 1. The majority of respondents, 57.3%, were aged between 18 to 24 years, while 4.9% were aged between 41 to 50 years and 0.6% were aged 51 years and above.

It is thus observed that the students who took part in this study were on average young. Approximately 84% were enrolled in Undergraduate Programs while around 15% enrolled in Postgraduate Programs and less that 1% enrolled in Doctoral Programs.

Among these, 131 respondents were enrolled in their first year, 177 were enrolled in the second year, while 95 and 112 respondents were enrolled in the third and final year of study respectively.

These sociodemographic variables have been portrayed in Table 1.

Demographic Variables

		Mean	Range	Standard Deviation	Count	Column N %
Age		2	4	1		
Gender	Male				216	41.9%
	Female				294	57.1%
	Prefer not to say				5	1.0%
AcademicLevel	Undergraduate				435	84.5%
	Postgraduate				78	15.1%
	Ph.D.				2	0.4%
Year	1st Year				135	26.2%
	2nd Year				178	34.6%
	3rd Year				95	18.4%
	Final Year				107	20.8%

Table 1: Sociodemographic Variables

Factor Analysis

To achieve the main objectives of the study, a factor analysis was carried out, as depicted at Table 2, for each construct of the TAM used in this study, that is, PU, PEOU, ATU, ITU and TU, in order to determine the items which carry lesser or more weightage in each construct.

SN	Items	Mean	Std. Deviation	Decision	Extraction
1.	PU_Efficiency	3.53	1.15	High Perception	.768
2.	PU_Generating_Resp	3.50	1.19	High Perception	.677
3.	PU_Useful_Tool	3.87	1.17	High Perception	.711
4.	PU_Useful_Info	3.48	1.14	High Perception	.764
5	PU_Personalised_Learning	3.36	1.21	High Perception	.713
6.	PU_Add_Feedback	2.80	1.26	Low Perception	.668
7.	PU_Helps_Completion	3.23	1.23	Low Perception	.722
8.	PU_Use_For_Completionof Dissertation	2.72	1.32	Low Perception	.568
9.	PU_Understand	3.68	1.24	High Perception	.696
10.	PEOU_Easy	4.22	1.05	High PEOU	.806
11.	PEOU_Userfriendly	4.17	1.05	High PEOU	.818
12.	PEOU_Required_Info	3.72	1.17	High PEOU	.687
13.	PEOU_ClearResponses	3.41	1.16	Low PEOU	.689
14.	PEOU_Accessibility	4.04	1.11	High PEOU	.713
15.	PEOU_HumanResp	2.97	1.23	Low PEOU	.548
16.	PEOU_Like_Lecturers	2.43	1.25	Low PEOU	.635
17.	PEOU_Und_Learningneeds	2.52	1.29	Low PEOU	.652
18.	ATU_ValuableTool	3.71	1.15	High ATU	.768

SN	Items	Mean	Std. Deviation	Decision	Extraction
19.	ATU_Savetime_Studies	3.69	1.20	High ATU	.775
20.	ATU_Replace_Lecturers	2.10	1.28	Low ATU	.688
21.	ATU_Save_Cost	2.77	1.23	Low ATU	.657
22.	ATU_Savetime_Teaching	2.84	1.29	Low ATU	.629
23.	ATU_Prefer_ChatGPT	2.85	1.31	Low ATU	.637
24.	ATU_Learn_Solely_ChatGPT	2.03	1.27	Low ATU	.641
25.	ITU_Continue_Using	3.38	1.26	High ITU	.775
26.	ITU_Recommend_ChatGPT	3.33	1.30	High ITU	.759
27.	ITU_ChatGPT_Traditional_ learning	2.71	1.34	Low ITU	.686
28.	ITU_Queries_Lecturers	2.65	1.34	Low ITU	.637
29.	TU_Total_Trust	2.38	1.12	Low Trust	.707
30.	TU_Accurate_Reliable	2.71	1.20	Low Trust	.710
31.	TU_Replace_Teaching	2.14	1.22	Low Trust	.680
32.	TU_Verify_Accuracy	3.64	1.36	High Trust	.426
33.	TU_Private_Secure	2.86	1.27	High Trust	.442

Table 2: Student responses on the TAM dimensions and factor analysis.

PU measures how students perceive ChatGPT as beneficial for academic tasks. The extraction values range from 0.568 to 0.768, indicating varying degrees of contribution to the PU construct. PU_Efficiency (0.768), PU_Useful_Info (0.764), and PU_Helps_Completion (0.722) have the highest extraction values, suggesting students strongly perceive ChatGPT as efficient, a source of useful information, and helpful for completing academic tasks. PU_Use_For_Completionof_Dissertation (0.568) and PU_Add_Feedback (0.668) have the lowest extraction values, indicating weaker perceptions of ChatGPT's utility for dissertation work and providing additional feedback.

These suggest that students find ChatGPT less effective for complex, research-intensive tasks like dissertations or for offering constructive feedback compared to human instructors. Items like PU_Generating_Resp (0.677), PU_Understand (0.696), PU_Useful_Tool (0.711), and PU_ Personalised_Learning (0.713) show moderate extraction values, implying that students see some value in ChatGPT for generating responses, understanding topics, and personalized learning, but these are not as strongly endorsed as efficiency or information provision. Students thus value ChatGPT for general academic support (e.g., quick information access, task efficiency) but are less convinced of its effectiveness for specialized tasks requiring deep feedback or advanced research, such as dissertations.

PEOU assesses how user-friendly and accessible students find ChatGPT. Extraction values range from 0.548 to 0.818. PEOU_Userfriendly (0.818) and PEOU_Easy (0.806) have the highest extraction values, indicating that students strongly perceive ChatGPT as easy to use and user-friendly. This reflects ChatGPT's intuitive interface and straightforward interaction model. PEOU_Human Resp (0.548), PEOU_Like_Lecturers (0.635), and PEOU_Und_Learningneeds (0.652) have the lowest extraction values, suggesting students do not find ChatGPT's responses comparable to human lecturers or tailored to their specific learning needs. These low values highlight a perceived gap in ChatGPT's ability to replicate the nuanced, personalised support provided by educators. PEOU_Required_Info (0.687), PEOU_ClearResponses (0.689), and PEOU_Accessibility (0.713) show moderate extraction values, indicating that students find ChatGPT reasonably accessible and capable of providing required information, though clarity of responses is less convincing. While students find ChatGPT technically easy to use, they perceive limitations in its ability to deliver clear, lecturer-like responses or address individual learning needs, suggesting a preference for human interaction in complex academic contexts.

ATU evaluates students' overall attitudes toward using ChatGPT in academic settings. Extraction values range from 0.629 to 0.775. ATU_Savetime_Studies (0.775) and ATU_ValuableTool (0.768) have the highest extraction values, indicating that students view ChatGPT as a valuable tool that saves time in their studies. This reflects a positive attitude toward ChatGPT's efficiency and utility for academic tasks.

ATU_Savetime_Teaching (0.629), ATU_Prefer_ChatGPT (0.637), and ATU_Learn_Solely_ChatGPT (0.641) have the lowest extraction values, suggesting students are less enthusiastic about ChatGPT replacing traditional teaching or being their sole learning resource. These low values indicate scepticism about ChatGPT as a complete substitute for human educators. ATU_Replace_Lecturers (0.688) and ATU_Save_Cost (0.657) show moderate extraction values, implying mixed attitudes toward ChatGPT's potential to replace lecturers or reduce educational costs. Students have a generally positive attitude toward ChatGPT as a time-saving and valuable tool but are reluctant to rely on it exclusively or see it as a replacement for traditional teaching methods, reflecting a balanced perspective on its role in education.

ITU measures students' willingness to continue using ChatGPT for academic purposes. Extraction values range from 0.637 to 0.775. ITU_Continue_Using (0.775) and ITU_Recommend_ChatGPT (0.759) have the highest extraction values, indicating strong intentions to continue using ChatGPT and recommend it to others. This suggests high acceptance of ChatGPT as a supplementary academic tool. ITU_Queries_Lecturers (0.637) and ITU_ChatGPT_Traditional_learning (0.686) have lower extraction values, suggesting students are less likely to use ChatGPT for queries typically directed to lecturers or as a replacement for traditional learning. Students are inclined to keep using ChatGPT and share it with peers, but their intention to use it for tasks traditionally handled by lecturers or as a primary learning method is weaker, indicating a preference for blending ChatGPT with conventional education.

TU evaluates students' trust in ChatGPT's reliability, accuracy, and security. Extraction values range from 0.426 to 0.710. TU_Accurate_Reliable (0.710) and TU_Total_Trust (0.707) have the highest extraction values, suggesting moderate trust in ChatGPT's overall reliability and accuracy. These values indicate that students have some confidence in ChatGPT's outputs but not overwhelmingly so. TU_Verify_Accuracy (0.426) and TU_Private_Secure (0.442) have significantly lower extraction values, indicating low trust in ChatGPT's accuracy verification processes and data privacy/security. These low values highlight major concerns about the trustworthiness of ChatGPT's information and its handling of personal data. TU_Replace_Teaching (0.680) shows moderate trust in ChatGPT's potential to replace teaching, though this is not a strong endorsement. Trust in ChatGPT is a weak construct, with students expressing significant doubts about its accuracy and security. While there is some trust in its general reliability, concerns about verifying outputs and protecting privacy limit its perceived trustworthiness in academic contexts.

Thus, PEOU and ITU have the highest average extraction values, with items like user-friendliness (0.818) and intention to continue using (0.775) indicating that students find ChatGPT accessible and are willing to integrate it into their academic routines. This suggests ChatGPT's technical ease and supplementary utility are well-received. TU has the lowest average extraction values, particularly for accuracy verification (0.426) and privacy/security (0.442), highlighting significant trust barriers. PU also shows weaknesses in specific areas like dissertation support (0.568), indicating limitations in perceived academic utility for complex tasks.

Discussions & Conclusion

Opportunities of using ChatGPT

From the outcomes of the factor analysis, it can thus be observed that students highly perceive ChatGPT as user friendly (PEOU_Userfriendly, 0.818) and easy to use (PEOU_Easy, 0.806). It is also perceived as being highly accessible ((PEOU_Accessibility, 0.713). The perceived ease of use thus enhances the adoption of ChatGPT among students to supplement their learning. These findings concur with Ivanov and Soliman (2023) who stated that ChatGPT helps to offer better equity in education, in line with SDG 4.

Under PU, ChatGPT is seen as efficient (PU_Efficiency, 0.768) and helpful for task completion (PU_Helps_Completion, 0.722). ATU also highlights its time-saving benefits for studies (ATU_Savetime_Studies, 0.775) and its value as a tool (ATU_ValuableTool, 0.768). Students thus appreciate ChatGPT's ability to streamline academic tasks. It can thus be considered as a valuable supplement for brainstorming ideas or accessing resources quickly. This can enhance academic efficiency and reduce time pressures thus contributing towards SDG 10, reduced inequalities.

The ITU construct shows high extraction values for continuing to use ChatGPT (ITU_Continue_Using, 0.775) and recommending it to others (ITU_Recommend_ChatGPT, 0.759), indicating strong student acceptance and willingness to advocate for its use. The positive intention to use and share ChatGPT suggests it has a robust user base among students, creating opportunities for institutional adoption in educational settings. It could be integrated into curricula as a supported tool, with clear guidelines for its optimal yet ethical use.

PU_Useful_Info (0.764) and PEOU_Required_Info (0.687) indicate that students find ChatGPT effective for providing useful information. This concurs with the findings of Mohd, et al. (2023) making it a practical resource for academic inquiries and promoting SDG 4. Thus, as observed by Lin et Chan (2020), ChatGPT helps to enhance access to information for students of developing countries, including SIDS such as Mauritius.

Challenges of using ChatGPT

Students perceive ChatGPT as less useful for specialized tasks such as completing dissertations (PU_Use_For_Completionof_Dissertation, extraction value = 0.568) and providing additional feedback on academic work (PU_Add_Feedback, 0.668). It also has a moderate contribution to understanding specific topics (PU_Understand, 0.696). This indicates that ChatGPT struggles to meet the demands of research-intensive or feedback-driven tasks, where specialized input or feedback from human instructors is preferred. This limits its utility in higher-level academic contexts.

Under PEOU, students find that ChatGPT does not provide responses comparable to those of lecturers (PEOU_Like_Lecturers, 0.635), lacks clear responses (PEOU_ClearResponses, 0.689), and fails to understand individual learning needs (PEOU_Und_Learningneeds, 0.652). Similarly, ATU shows low preference for learning solely with ChatGPT (ATU_Learn_Solely_ChatGPT, 0.641). Students thus prefer human interaction for complex and tailored academic support. They also perceive ChatGPT as being unable to provide context-specific or individual guidance, thus highlighting its inability to replace human lecturers. This contradicts Baidoo-Anu and Owusu Ansah (2023) and Elbanna and Armstrong (2022) who identified personalized learning as an opportunity of ChatGPT.

The TU construct reveals significant trust issues, with very low extraction values for accuracy verification (TU_Verify_Accuracy, 0.426) and privacy/security (TU_Private_Secure, 0.442). Even overall trust (TU_Total_Trust, 0.707) and perceived accuracy/reliability (TU_Accurate_Reliable, 0.710) are only moderately endorsed. This indicates that students are sceptical about the reliability of ChatGPT's outputs and concerned about data privacy, which undermines its credibility in academic contexts where accuracy and confidentiality are paramount. This could lead to reluctance in using ChatGPT for sensitive or high-stakes tasks.

Items like ATU_Replace_Lecturers (0.688), ATU_Savetime_Teaching (0.629), and ITU_ Chat GPT_ Traditional_learning (0.686) have moderate to low extraction values, indicating students' reluctance to see ChatGPT as a substitute for traditional teaching or lecturer interactions. This indicates that students view it as supplementary rather than transformative. Table 3 summarises these findings accordingly:

Category	Challenges	Opportunities
Utility	Limited usefulness for dissertations and feedback (PU low values: 0.568, 0.668).	High efficiency and task completion support (PU high values: 0.768, 0.722).
Interaction	Cannot replicate lecturer-like responses or meet learning needs (PEOU low values: 0.548–0.652).	User-friendly and accessible interface (PEOU high values: 0.806–0.818).
Trust	Low trust in accuracy and privacy (TU low values: 0.426, 0.442).	Moderate trust in reliability (TU moderate values: 0.707–0.710).
Adoption	Resistance to replacing traditional learning (ATU/ITU low values: 0.629–0.686).	Strong intention to use and recommend (ITU high values: 0.759–0.775).
Information	Moderate clarity in responses (PEOU_ClearResponses: 0.689).	Valuable for accessing useful information (PU_Useful_Info: 0.764).

Table 3: Summary of opportunities and challenges

Conclusion

Our study thus indicates that Chat GPT as an AI generative tool can leverage the performance of students in Mauritius and help the island achieve SDGs 4 and 10 in particular. However, it is perceived that Chat GPT cannot replace the guidance students receive from their lecturers in their traditional learning settings. This comes as an important element for decisions being taken in Our study confirms that the use of Chat GPT as a Generative AI tool is undeniable among university students in a small island developing state. While they welcomed its accessibility and ease of use, students surveyed moderately accepted its efficiency and reliability as far as providing accurate information is concerned. The students also had reserves as to its accuracy and firmly indicated that it could not replace their lecturer's guidance SIDS as far as the digitalisation and use of Chat GPT , or any other Gen AI tool to support teaching and learning in higher education institutions. Our findings tend to indicate that Chat GPT is a potential effective tool in a blended learning environment guided by relevant resource persons.

Limitations and Directions for Future Research

Our study limited itself to one GEN AI product, Chat GPT and the perception of university students only. While the findings of this study could be generalised for other SIDS, future research could hence investigate the perception of academics in their use of Chat GPT . The study could also be extended to other GEN AI products . This could help policy makers in SIDS come up with adequate and effective measures for the adoption of AI in the higher education sector in SIDS which already have few predetermined characteristics as far as the use of technology in higher education is concerned.

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The impact of remote work practices on the productivity of public service employees in the gauteng department of education

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Keywords
Remote work, productivity, public service employee and Gauteng

Abstract

This study examines the impact of remote work practices on the productivity of public service employees within the Gauteng Department of Education. Research indicates that remote work can improve individual productivity by offering flexibility and minimising commute. Still, its efficacy in bureaucratic environments is contingent upon job roles, digital infrastructure, leadership approach, and organisational culture. The study is qualitative in nature and draws on peer-reviewed studies. The study's findings suggest that to achieve high productivity among government employees working remotely, it is essential to ensure that digital training is enforced to enable staff to work more efficiently. Additional findings of the study have revealed that administrative roles characterised by low interdependence are more advantageous than collaborative or oversight-oriented ones. Challenges encompass communication failures, deficiencies in digital literacy, and indistinct boundaries between professional and personal life. Trust-centric leadership, mental health assistance, and specialised digital training are crucial for success. The research concludes that remote work should be tailored to specific contexts rather than implemented universally. Recommendations encompass hybrid work patterns, enhanced infrastructure, updated performance measurements, and leadership development to foster a resilient and adaptive public school workforce.

Introduction

The shift to remote work has significantly altered the nature of work across various industries, presenting unique opportunities and challenges for South African public service organisations, particularly those in the Gauteng Department of Education (Portia, 2020). Understanding how these changes impact worker productivity is crucial for the Gauteng Department of Education to assess the effectiveness of current work arrangements and ensure the provision of high-quality educational services. This research initiative aims to investigate the impact of remote work practices on the productivity of public service employees in this department, focusing on aspects such as work-life balance, communication patterns, performance metrics, and employee morale. Through the analysis of these factors, the study aims to yield valuable insights that can inform policy formulation and enhance the department's operational efficiency, while promoting a more flexible workforce in an increasingly digital environment (Longhurst, 2022).

This study will examine the dual aspects of remote work, highlighting its benefits, including enhanced flexibility and reduced commuting time. Conversely, remote work may also pose challenges, including feelings of isolation among employees, which can hinder collaboration and weaken team cohesion. Furthermore, the absence of a formal office setting can lead to various distractions within the home, thereby impacting concentration and overall productivity (Sally, 2020). Ultimately, the blurred distinction between professional responsibilities and personal life can exacerbate stress levels and contribute to burnout among public sector employees. By analyzing quantitative and qualitative data on productivity levels before and after the implementation of remote work, this study seeks to thoroughly examine how these practices influence the output and efficiency of public service employees in Gauteng Department of Education (Dennies., 2021).

Background to the Study

The emergence of remote work practices has profoundly altered the employment landscape across various sectors, including public service entities such as the Gauteng Department of Education. The COVID-19 pandemic necessitated numerous public service employees to transition to remote work settings, leading to a reassessment of conventional productivity measures and the balance between work and personal life. Empirical studies have revealed a varied impact of remote work on productivity. Remote workers often exhibit increased productivity due to reduced office distractions and greater flexibility in scheduling work hours (Horella, 2019). In contrast, other studies highlight challenges such as feelings of isolation and difficulties with collaboration, which may ultimately hinder productivity. As the public education system in Gauteng adapts to these changing work practices, it is essential to comprehend their implications for employee effectiveness, as this understanding is vital for organisational performance and the quality of educational outcomes provided to students in the region (Foster, 2021).

The rise of remote work has significantly transformed the dynamics of both the private and public sectors, introducing distinct challenges and opportunities for enhancing productivity. In the Gauteng Department of Education, recognised as South Africa's economic hub, the COVID-19 pandemic has accelerated the transition to remote work, resulting in a fundamental shift in the engagement of public service employees with their responsibilities. This region, characterised by its high population density and diverse demographics, has prompted public service organisations to explore alternative work arrangements to maintain operations while complying with health regulations. This study intends to analyse the impact of these remote work practices on the productivity of public service employees in the Gauteng Department of Education, emphasising both the advantages and disadvantages (Staples, 2020).

The Gauteng Department of Education plays a vital role in the socioeconomic advancement of the region, making it imperative to understand productivity levels within this sector for effective governance (Patrick, 2021). Traditionally, public service employees have worked in conventional office settings, which were believed to foster collaboration and accountability. The sudden shift to remote work environments has challenged these established norms, raising concerns regarding employee engagement, motivation, and performance (Santoro, 2017).

Problem statement

The transition to remote work has significantly transformed the employment landscape across various sectors, including the public sector. In the Gauteng Department of Education, South Africa's economic centre, public service employees have been compelled to adapt to this new working model, a shift expedited by the COVID-19 pandemic. While remote work can offer advantages such as increased flexibility and reduced commuting times, it also presents challenges related to employee productivity (Vowsam, 2019). Variations in access to technology, the quality of home office setups, and the need for practical communication tools may lead to inconsistencies in employee productivity. This research aims to investigate the specific impacts of remote work practices on the productivity of public service employees in the Gauteng Department of Education, to identify both the positive and negative effects of this new work arrangement (Denny, 2019).

Moreover, adopting remote work within the public sector raises important performance assessment and accountability issues. Historically, public service positions have relied on in-person interactions and fixed working hours. The emergence of remote work challenges these established norms, prompting concerns about the effectiveness of employee performance evaluations. Furthermore, the absence of direct supervision may impact motivation, engagement, and the collaborative relationships essential for effective public service operations. This issue is particularly pronounced in a diverse province like Gauteng, where differences in digital literacy and resource availability can impact how employees adjust to remote work. Gaining insight into these dynamics is crucial for assessing productivity and ensuring fair treatment of employees from diverse backgrounds (Mash, 2021).

The consequences of remote work practices reach beyond individual productivity and have significant implications for delivering public services and governance (Vanzi, 2020). Should there be considerable fluctuations in productivity among public service employees due to remote work, the quality of services rendered to the community may be compromised, potentially eroding public confidence in governmental institutions (Matlhako, 2021). Furthermore, the transition to remote work demands substantial modifications in organisational culture, communication frameworks, and performance management systems, which may not be consistently applied across all public service sectors in Gauteng (Nhomson, 2018).. This complex issue warrants a thorough investigation into how remote work practices impact productivity dynamics among public service employees and what measures can be implemented to enhance productivity while addressing the challenges posed by this evolving work environment (Overatt, 2019).

The shift to remote work, hastened by the COVID-19 pandemic, has sparked a wide-ranging discussion regarding its impact on employee productivity, particularly in public service sectors. Research, including findings from (Polman, 2021) indicates that remote work can result in notable productivity improvements, primarily due to decreased commuting times and enhanced employee satisfaction. The challenges, including feelings of isolation and difficulties establishing work-life boundaries, may adversely affect performance. Additionally, a meta-analysis conducted by Nel (2014) reveals that the effectiveness of remote work varies across different sectors, with public service workers encountering distinct obstacles related to bureaucratic frameworks and the need for collaboration. Despite these findings, a significant gap remains in understanding the specific effects of remote work on the productivity of public service employees within the Gauteng Department of Education. This proposed research aims to address this gap by providing targeted empirical evidence on the impact of remote work practices on productivity in this specific setting, thereby enriching the ongoing discussion on optimal practices for public sector employment in a post-pandemic environment. From the above background about the remote work impact on productivity, the following research question was formulated:

How do remote work practices affect employee productivity within the Gauteng Department of Education?

This study aims to examine the effects of remote work practices on the productivity of public service employees in the Gauteng Department of Education.

Literature review

Introduction

The literature review aims to examine the existing body of research on the impact of remote work practices on employee productivity, with a specific focus on the public service sector, particularly within the Gauteng Department of Education. This section is organised around key themes that reflect the various aspects of remote work, including its definitions and theoretical frameworks, benefits and drawbacks, influencing factors, implications for public service, and particular considerations relevant to the education sector.

Definitions and Theoretical Frameworks

This subsection will clarify remote work by providing definitions, including telecommuting, teleworking, and hybrid work models. It will also examine pertinent theories, including the Job.

Factors Affecting Productivity in Remote Work

Several interrelated factors influence productivity in remote work environments, including technological access, employee engagement, organisational culture, and performance assessment systems. Recent empirical studies have provided insights into these factors, offering a more comprehensive understanding of how they shape employee performance.

Access to Technology: Access to reliable technology and a well-equipped home office setup are critical determinants of productivity in remote work settings. Differences in technology availability, such as access to high-speed internet, modern devices, and practical communication tools, can lead to variations in productivity levels. For instance, a study by Smith et al. (2021) found that employees with inadequate technology reported a 25% decrease in productivity compared to those with robust technical support. Furthermore, the quality of the home office environment, including ergonomic furniture and noise control measures, has been linked to improved focus and reduced fatigue, which enhances overall productivity (Jones & Taylor, 2023).

Employee Engagement and Motivation: Employee engagement significantly predicts productivity in remote work contexts. Engaged employees tend to exhibit higher levels of motivation, resilience, and commitment, which are essential for maintaining productivity outside traditional office settings. Recent studies suggest that remote work can have both positive and negative impacts on engagement, depending on the availability of social support and effective communication channels. A meta-analysis by Lee and Kim (2022) demonstrated that remote employees with high engagement levels showed a 20% increase in task performance compared to their less engaged counterparts. This highlights the importance of fostering a supportive environment that promotes autonomy and recognises employee contributions.

Organisational Culture: The role of organisational culture in remote work productivity cannot be understated. A strong, inclusive culture prioritising communication, trust, and adaptability helps mitigate the isolation and disengagement often associated with remote work. Overatt (2019) emphasised that companies with a well-defined culture that promotes flexibility and employee well-being tend to have more productive remote teams. More recent empirical evidence from Davis and Nguyen (2023) supports this, indicating that organisations with strong cultural support reported a 30% increase in employee productivity during remote work transitions, especially in knowledge-based industries.

Performance Assessment Systems: Advancements in performance assessment systems have shaped remote work productivity. Traditional evaluation methods, which often rely on direct supervision and physical presence, may be inadequate in remote contexts. Innovative approaches, such as outcome-based assessments and productivity-tracking software, have enhanced motivation and accountability among remote workers. According to research by Patel (2022), companies that adopted flexible, objective performance metrics during the pandemic experienced a significant improvement in both individual and team productivity. These findings suggest that adapting performance evaluation techniques to suit the dynamics of remote work is essential for maintaining high productivity levels.

Implications for Public Service

This section will address the broader implications of remote work on public service operations. The distinctive features of the public sector add layers of complexity to the remote work scenario. (John, 2017) Employees in public service frequently face unique challenges, including bureaucratic limitations and the need for collaborative decision-making processes. These factors can impede productivity in a remote work environment, especially within a complex organisation like the Gauteng Department of Education.

The critical role of organisational culture and communication structures in sustaining engagement and productivity among public service employees working remotely. Additionally, the shift to remote work requires substantial modifications to performance management systems to evaluate productivity and employee contributions accurately:

- Service Delivery Dynamics: Analysing how fluctuations in employee productivity can affect the quality of services rendered to the community (Tambani, 2017).
- Policy Considerations: Highlighting the necessity for public service organisations to revise their policies to facilitate remote work while maintaining accountability and effectiveness in service delivery.

Special Considerations for the Education Sector

The education sector has unique characteristics that differentiate it from other public service domains, especially when transitioning to remote work practices. The challenges faced by employees within the Gauteng Department of Education reflect broader issues in educational governance, administrative duties, and collaborative teaching efforts. This section examines these distinctive elements and incorporates empirical findings from recent studies.

- Educational Governance and Administration: Remote work has significantly impacted the roles and responsibilities of individuals engaged in educational governance. Research indicates that school administrators and district officials face substantial challenges adapting their leadership roles to a virtual environment. According to Staples (2022), the absence of physical presence complicates decision-making processes, accountability, and oversight —critical components in educational governance.

Moreover, a study by Patel and Singh (2023) found that the lack of in-person meetings reduced the effectiveness of policy implementation and coordination between departments. This shift has required leaders to develop new digital communication and management strategies, emphasising the importance of technology proficiency and adaptive leadership skills in sustaining effective governance remotely.

- Collaborative Efforts in Education: Effective collaboration among educators is vital for achieving desired educational outcomes. However, remote work environments pose challenges in maintaining the level of interaction necessary for successful collaboration. According to Jones (2021), remote work has disrupted regular team meetings and peer interactions, which are essential for sharing best practices and co-developing lesson plans. The physical separation has led to communication gaps and reduced collegiality among staff members.

Empirical findings from a recent study conducted by the Department of Education in the Western Cape indicate that 60% of teachers reported difficulties coordinating group projects and joint curriculum planning during remote work periods (Smith & Naidoo, 2022). Additionally, the study highlighted an increased reliance on digital tools, such as Zoom and Microsoft Teams, for collaborative activities. However, many educators felt that these tools were insufficient substitutes for in-person collaboration.

In conclusion, this literature review thoroughly examines the existing knowledge regarding the impact of remote work on employee productivity, encompassing both advantages and disadvantages. It identifies the research gaps, particularly within the realms of public service and the education sector in Gauteng, thereby establishing a basis for future empirical studies.

Research Methodology

The study was qualitative in nature and extensively utilised secondary sources, primarily in the form of articles and case studies, on the impact of remote work practices on employee productivity within the Gauteng Department of Education. The study employed an inductive research approach, where observations were made from researched articles and cases, and common patterns were then described (Schachtebeck & Mbuya, 2016). The search for cases and articles included the following inclusion criteria: only studies done in the area of remote work and employee productivity. Consequently, all studies that were not relevant to the present topic were excluded.

Discussion of findings

The review of the literature about the relationship between the productivity of public service employees and remote work practices within the Gauteng Department of Education is nuanced and case-specific. The study by Choudhury et al. (2021) has demonstrated a positive relationship between remote work and personal productivity, as it enables more flexible scheduling and reduces commuting. The effectiveness of remote work in administrative settings within bureaucracies and educational institutions. It is highly dependent on the presence of digital infrastructure and the culture within the institution.

While administrative functions that require quick collaboration, stakeholder involvement, or on-site oversight face significant limits, occupations that require limited interdependence are more favourable in remote situations (OECD, 2023). Poor communication and compromised team cohesion are recurring problems, particularly in situations where institutional memory and informal interactions are crucial (Bick et al., 2022). Although Gauteng's ICT infrastructure is well-equipped to accommodate the various challenges that may arise, gaps are still observed, particularly between school levels and regions, which impact service delivery and overall coordination (Stats SA, 2023). Baert et al. (2022) believe that trust and managerial autonomy are crucial for positively influencing remote work practices. Conventional supervisory frameworks that rely on physical oversight are challenged by remote setups in hierarchical organisations, such as the Department of Education.

Leadership training should be adapted to remote settings. Furthermore, employee well-being, as well as a work-life balance, should be emphasised to foster a healthy work environment. Although remote work has been praised for its ability to boost morale and reduce stress, evidence suggests that it can also make it harder to distinguish between work and personal life, which can lead to burnout, especially in emotionally demanding jobs such as educational administration (Eurofound, 2023). Explicit scheduling, psychological health assistance, and systematic procedures are crucial for mitigating these risks.

To achieve remote productivity, more emphasis should be placed on enhancing digital knowledge and training. According to UNESCO (2024), the Gauteng Department of Education has made progress in digitising administrative processes; however, technological proficiency among its employees could negatively impact productivity in remote work settings. Consequently, employees with limited to no knowledge of collaboration platforms and virtual communications systems often struggle to meet the required performance standards, which could result in poor performance.

Adaptive IT support and targeted upskilling are necessary to ensure equitable participation and continued engagement. Additionally, Kellerman and Jones (2023) opined that people's perception of remote work is often influenced by institutional culture. The legitimacy of remote work may be undermined in settings where presenteeism is deeply embedded. To normalise remote work and align it with public service norms, a cultural transformation is necessary through legislative change, leadership exemplification, and inclusive discourse (Kellerman & Jones, 2023).

Conclusion and recommendations

This study aimed to investigate the impact of Remote practices on the Productivity of Public Service Employees in the Gauteng Department of Education. The Gauteng Department of Education should consider the challenges related to ICT infrastructure and institutional culture to ensure remote work succeeds. The study's findings suggest the necessity for context-specific techniques and the dismissal of universal answers. Findings from the literature review further suggest that remote work practices should be tailored to the specific requirements of educational administrations.

The following recommendations were made:

- The Gauteng Department of Education should adopt remote work practices that provide flexibility while maintaining team cohesion
- Investment in digital infrastructure and training at all administrative levels should be taken into account
- Leadership development initiatives must be implemented to furnish managers with the requisite abilities for efficiently overseeing remote teams.

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People-centered leadership in the digital workplace: Strategies for engagement and performance

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Keywords
digital workplace, people-centered leadership, employee engagement, performance, hybrid work

Abstract

The rapid digitalisation of workplaces has redefined leadership practices, compelling organizations to balance technological integration with human-centered approaches. While digital tools enhance efficiency, they also introduce challenges related to employee engagement, trust, and collaboration. This paper explores the concept of people-centered leadership in the digital workplace, highlighting strategies that enhance engagement and performance. Drawing from leadership theories, organizational behavior literature, and recent digital workplace studies, the paper argues that empathy, inclusivity, and adaptability are critical leadership competencies in the digital era. Recommendations are provided for leaders to foster a sustainable and high-performing digital work environment.

Introduction

The twenty-first century has been marked by rapid technological advancement and digital transformation, reshaping how organizations operate and how leaders manage their workforce. The rise of the digital workplace—characterized by virtual collaboration, hybrid work models, and technology-mediated communication—has created new opportunities for efficiency, flexibility, and global connectivity (Carnevale & Hatak, 2020). At the same time, it has introduced significant challenges such as digital fatigue, employee isolation, and declining engagement (Wang et al., 2021). In this environment, leadership plays a pivotal role in balancing technological efficiency with employee well-being, motivation, and performance.

Existing scholarship emphasizes that leadership effectiveness in digital contexts depends on adopting people-centered approaches that prioritize empathy, trust, and support (Eva et al., 2019). Transformational leadership, with its focus on inspiring and motivating employees, has been extensively studied in traditional and virtual settings, consistently linked with higher engagement and performance (Bass & Riggio, 2006; Zhu et al., 2023). However, much of this research remains conceptual or qualitative, with relatively fewer large-scale quantitative studies examining how leadership fosters engagement and performance in digital workplaces. Moreover, studies disproportionately focus on transformational leadership, overlooking the potential of servant or people-centered leadership approaches in addressing issues such as digital well-being and fatigue.

A second gap concerns the mechanisms and boundary conditions linking leadership to outcomes. While engagement is often identified as a mediator, few quantitative studies test mediators such as digital well-being, autonomy, or psychological safety, or moderators such as age, digital literacy, or cultural context. Similarly, the application of Self-Determination Theory (SDT) in workplace leadership research is limited, despite its explanatory power for understanding how leaders fulfill employees' needs for autonomy, competence, and relatedness in digital environments (Deci & Ryan, 2000; Ryan & Deci, 2017).

Finally, most empirical studies on digital leadership are Western-centric, limiting generalizability across cultures (Liu et al., 2022). Furthermore, while leadership–engagement–performance links are frequently tested, the connection between people-centered leadership and innovation in digital workplaces remains underexplored. This neglects an important outcome in today's knowledge-driven economy, where innovation is critical to organizational sustainability.

Taken together, these gaps highlight the need for quantitative, theory-driven research that integrates transformational and servant leadership within an SDT framework, while considering digital well-being and innovation as central outcomes. The present study addresses this need by developing and empirically testing a people-centered leadership model for digital workplaces, focusing on strategies to enhance engagement, performance, and innovation.

Literature Review

The digital workplace has become a defining feature of contemporary organizations, characterized by technology-mediated communication, remote and hybrid work models, and increased reliance on collaborative platforms. While this shift has enhanced flexibility and efficiency, it has also introduced new challenges such as digital fatigue, isolation, and declining engagement (Wang et al., 2021). Leadership is widely recognized as a key factor in navigating these challenges. However, much of the existing scholarship is conceptual or qualitative, with relatively fewer large-scale quantitative studies investigating how leadership styles shape employee experiences and performance in digital contexts (Carnevale & Hatak, 2020).

People-Centered Leadership in the Digital Era

Leadership research in digital environments has often emphasized transformational leadership, which inspires followers by articulating vision, motivating performance, and fostering innovation (Bass & Riggio, 2006). Empirical studies confirm its positive effects on engagement and performance in digital and remote contexts (Zhu et al., 2023). Yet, a major gap is the overemphasis on transformational leadership to the neglect of other people-centered approaches such as servant leadership, which prioritizes empathy, humility, and the growth of employees (Eva et al., 2019). Few quantitative studies have compared the relative effects of transformational and servant leadership on digital outcomes such as well-being, digital fatigue, or innovation.

Employee Engagement and Digital Well-Being

Employee engagement has consistently emerged as a mediator linking leadership to organizational outcomes (Schaufeli, 2021). In digital workplaces, engagement is especially critical, as it buffers against burnout and fosters sustained performance (Kniffin et al., 2021).

However, quantitative evidence on the role of digital well-being and fatigue remains underdeveloped. While scholars highlight digital fatigue as a growing concern (Camacho & Barrios, 2022), validated quantitative studies examining how leadership mitigates this issue are limited. This gap suggests the need for empirical testing of digital well-being as a mediating or moderating construct in leadership–performance relationships.

Self-Determination Theory and Psychological Needs

Self-Determination Theory (Deci & Ryan, 2000; Ryan & Deci, 2017) provides a strong foundation for understanding how leadership influences motivation by fulfilling needs for autonomy, competence, and relatedness. While SDT has been widely applied in education and health psychology, its integration into digital workplace leadership research is limited. Few quantitative studies explicitly test how people-centered leadership fulfills psychological needs in virtual contexts, despite strong theoretical alignment. This represents a significant gap for empirical research, as SDT could illuminate the mechanisms through which leadership enhances engagement and innovation in digital work.

Cross-Cultural and Innovation Perspectives

Most quantitative studies on digital leadership and engagement are conducted in Western contexts (e.g., North America, Europe). Comparative or cross-cultural empirical studies remain scarce, raising questions about the generalizability of findings in diverse cultural or institutional settings (Liu et al., 2022). Additionally, while leadership's effect on engagement and performance has been examined, the link between people-centered leadership and innovation in digital workplaces remains underexplored quantitatively. Understanding how leadership fosters creativity, problem-solving, and adaptability in virtual contexts would extend the literature significantly.

Identified Research Gaps

From this review, several quantitative gaps emerge:

1. Lack of large-scale empirical studies testing leadership–engagement–performance models in digital workplaces.
2. Overemphasis on transformational leadership with limited exploration of servant leadership or comparative models.
3. Scarcity of quantitative studies examining mediators (engagement, digital well-being) and moderators (age, digital skills, culture).
4. Limited integration of Self-Determination Theory in workplace leadership research.
5. Few cross-cultural quantitative studies testing the universality of people-centered leadership in digital contexts.
6. Underexplored connections between leadership and innovation outcomes in digital environments.

These gaps provide the foundation for the present study, which develops and empirically tests a people-centered leadership model in the digital workplace, grounded in transformational leadership, servant leadership, and Self-Determination Theory.

Research Objectives and Hypotheses

Building on the gaps identified in the literature, this study seeks to advance quantitative understanding of people-centered leadership in digital workplaces. Specifically, it integrates Transformational Leadership, Servant Leadership, and Self-Determination Theory (SDT) to examine how leadership fosters employee engagement, digital well-being, innovation, and performance in technology-driven contexts.

Research Objectives

1. To examine the impact of transformational and servant leadership on employee engagement in digital workplaces.
2. Addressing the gap of overemphasis on transformational leadership and limited quantitative focus on servant leadership.
3. To investigate the mediating role of employee engagement in the relationship between people-centered leadership and performance outcomes.
4. Addressing the lack of process-level quantitative testing (engagement as a central mechanism).
5. To assess the role of digital well-being in mitigating digital fatigue and enhancing engagement.
6. Responding to the underexplored quantitative evidence on digital well-being in workplace leadership research.
7. To test whether people-centered leadership fosters innovation capability in digital environments.
8. Addressing the underdeveloped link between leadership and innovation outcomes.
9. To explore cultural and contextual considerations in digital workplace leadership.
10. Highlighting the need for cross-cultural quantitative evidence.

Hypotheses

Based on the objectives and theoretical grounding, the following hypotheses are proposed:

- H1: Transformational leadership positively influences employee engagement in digital workplaces.
- H2: Servant leadership positively influences employee engagement in digital workplaces.
- H3: Digital well-being positively influences employee engagement and reduces digital fatigue.
- H4: Employee engagement positively influences employee performance in digital workplaces.
- H5: Employee engagement mediates the relationship between transformational leadership and employee performance.
- H6: Employee engagement mediates the relationship between servant leadership and employee performance.
- H7: Employee engagement mediates the relationship between digital well-being and employee performance.

- H8: People-centered leadership (transformational and servant) positively influences innovation capability through employee engagement.

Methodology
Research Design

This study adopts a quantitative research design using a cross-sectional survey approach to test the hypothesized relationships. Structural Equation Modeling (SEM) was selected as the analytical technique because it allows for simultaneous testing of multiple relationships between leadership constructs, mediating variables, and outcome measures (Hair et al., 2022).

Population and Sampling

The population for this study comprised employees working in digitally enabled organizations across diverse industries (e.g., education, IT, finance, and services). A purposive sampling strategy was employed to target employees with at least six months of remote or hybrid work experience. A total of 350 responses were collected, of which 320 valid responses were retained after data screening, representing a 91.4% usable response rate.

Measures

Validated scales from prior studies were adopted, with minor contextual adjustments:
- Transformational Leadership: Measured with 7 items from the Multifactor Leadership Questionnaire (Bass & Avolio, 1995).
- Servant Leadership: Measured with 6 items adapted from Liden et al. (2015).
- Digital Well-being: Measured with 5 items adapted from Zheng et al. (2021).
- Employee Engagement: Measured with 9 items from the Utrecht Work Engagement Scale (Schaufeli et al., 2006).
- Performance: Measured with 5 items from Koopmans et al. (2014).
- Innovation Capability: Measured with 6 items adapted from Janssen (2000).

All items used a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree).

Data Collection Procedure

Data were collected via an online survey distributed through professional networks (LinkedIn, organizational mailing lists). Participants were assured of confidentiality and anonymity. Ethical approval was obtained from the host institution prior to data collection.

Data analysis and empirical findings

The data were analyzed in SmartPLS 4.0 using the Partial Least Squares SEM (PLS-SEM) approach. Analysis included:
1. Reliability & Validity testing (Cronbach's alpha, composite reliability, AVE).
2. Discriminant validity using Fornell–Larcker and HTMT criteria.
3. Structural model testing with bootstrapping (5,000 samples) for hypothesis testing.
4. R^2 and Q^2 values for predictive accuracy and relevance.

Table 1: Reliability and Convergent Validity of Constructs

Construct	Items	Cronbach's α	Composite Reliability (CR)	Average Variance Extracted (AVE)
Transformational Leadership	7	0.89	0.91	0.62
Servant Leadership	6	0.87	0.89	0.59
Digital Well-being	5	0.82	0.85	0.56
Employee Engagement	9	0.91	0.93	0.65
Performance	5	0.86	0.88	0.58
Innovation Capability	6	0.88	0.90	0.61

- Cronbach's α > 0.7 for all constructs → items are internally consistent.
- Composite Reliability (CR) > 0.7 → strong construct reliability.
- AVE > 0.5 → good convergent validity; constructs explain majority of their item variance.
- Overall → measurement model is reliable and valid, suitable for SEM analysis.

Table 2 : Discriminant Validity (HTMT Ratios)

Construct	TL	SL	DW	EE	PERF	IC
Transformational Leadership (TL)	1	0.56	0.48	0.62	0.42	0.45
Servant Leadership (SL)		1	0.44	0.58	0.41	0.43
Digital Well-being (DW)			1	0.50	0.39	0.40
Employee Engagement (EE)				1	0.61	0.58
Performance (PERF)					1	0.55
Innovation Capability (IC)						1

- HTMT values < 0.85 for all construct pairs → satisfactory discriminant validity.
- Each construct is distinct from other constructs, confirming they measure unique concepts.
- Overall → the measurement model shows good discriminant validity, supporting SEM analysis.

Table 3: Structural Model: Path Coefficients, t-values, and Significance

Hypothesized Path	β (Standardized)	t-value	p-value	Result
Transformational Leadership → Engagement	0.35	6.12	<.001	Supported
Servant Leadership → Engagement	0.28	4.85	<.001	Supported
Digital Well-being → Engagement	0.25	4.20	<.001	Supported
Engagement → Performance	0.60	9.45	<.001	Supported
Engagement → Innovation Capability	0.58	8.90	<.001	Supported
Transformational Leadership → Performance	0.15	2.05	.041	Supported
Servant Leadership → Performance	0.12	1.98	.048	Supported

- All hypothesized paths are statistically significant ($p < 0.05$).
- Transformational ($\beta = 0.35$) and Servant Leadership ($\beta = 0.28$) positively influence Employee Engagement.
- Employee Engagement strongly predicts Performance ($\beta = 0.60$) and Innovation Capability ($\beta = 0.58$).
- Direct paths from leadership to performance are positive but smaller ($\beta = 0.12–0.15$).
- Overall → results support the mediating role of engagement and confirm the importance of people-centered leadership for performance and innovation.

Table 4: Predictive Accuracy and Relevance (R^2 and Q^2 Values)

Endogenous Construct	R^2	Q^2	Interpretation
Employee Engagement	0.44	0.32	Moderate predictive accuracy (Hair et al., 2022)
Performance	0.50	0.36	Moderate to strong predictive relevance
Innovation Capability	0.34	0.28	Moderate predictive relevance

- R^2 represents the proportion of variance explained in the endogenous construct. Values above 0.25 are considered moderate, and values above 0.50 are considered substantial (Hair et al., 2022).
- Q^2 indicates predictive relevance obtained through blindfolding. Values greater than 0 indicate that the model has predictive relevance for the endogenous construct.

These values complement path coefficients table and show that model explains a meaningful portion of variance in engagement, performance, and innovation.

Discussion

The findings of this study provide strong empirical support for the critical role of people-centered leadership in the digital workplace. Both transformational (β = 0.35) and servant leadership (β = 0.28) significantly influence employee engagement, consistent with prior literature highlighting the motivational and supportive aspects of these leadership styles (Bass & Riggio, 2006; Eva et al., 2019). By fostering trust, recognition, and inspiration, leaders can enhance engagement even in digitally mediated work contexts.

The study also underscores the importance of digital well-being (β = 0.25) as a driver of engagement, which addresses emerging concerns about digital fatigue and burnout in remote and hybrid work environments (Wang et al., 2021). Leaders who promote healthy work practices, encourage breaks, and provide autonomy over digital tasks enable employees to maintain focus and motivation, reinforcing Self-Determination Theory (SDT) mechanisms. Engagement appears to function as a key mediator, translating leadership behaviors and well-being interventions into performance (β = 0.60) and innovation capability (β = 0.58).

The direct effects of leadership on performance (β = 0.12–0.15) suggest that leaders influence outcomes not only indirectly through engagement but also through strategic guidance, recognition, and support. This aligns with prior studies demonstrating that transformational and servant leadership can directly enhance task accomplishment and discretionary effort, especially when coupled with psychological empowerment (Deci & Ryan, 2000; Liden et al., 2015).

Importantly, the findings demonstrate that employee engagement partially mediates the relationship between leadership and innovation. In digital workplaces, where knowledge sharing, virtual collaboration, and adaptive problem-solving are critical, leaders who cultivate engagement facilitate employees' creativity, risk-taking, and solution-oriented behaviors. This confirms the theoretical integration of Transformational Leadership, Servant Leadership, and SDT, highlighting a mechanism-based explanation for how people-centered leadership translates into both performance and innovation outcomes.

From a practical standpoint, the results suggest that leadership development programs should simultaneously emphasize transformational behaviors (vision, inspiration) and servant behaviors (empathy, support), while organizations prioritize digital well-being initiatives to sustain employee engagement. Additionally, the model's moderate-to-strong R^2 values for engagement (0.44), performance (0.50), and innovation capability (0.34) indicate that these constructs capture substantial variance in employee outcomes, reinforcing the predictive utility of the integrated leadership-engagement framework.

Finally, these findings extend the literature by providing quantitative evidence in a digital context, addressing gaps in previous research that was largely qualitative or focused on traditional work settings. The study contributes to both theory and practice by showing that people-centered leadership is not only motivational but also operationally critical, shaping engagement, performance, and innovation in digitally enabled organizations.

Practical Implications

The study offers actionable insights for three stakeholder groups:

Implications for Leaders

- Leaders play a pivotal role in translating strategy into outcomes and sustaining employee motivation. Key takeaways include:
- Adopt a people-centered leadership style: Combine transformational behaviors (inspiring vision, intellectual stimulation) with servant leadership behaviors (empathy, listening, support) to maximize engagement.
- Prioritize digital well-being: Encourage healthy digital habits, such as scheduled breaks, flexible task management, and managing online workload to prevent burnout.

- Empower employees: Delegate authority, provide autonomy over tasks, and recognize achievements to enhance competence and motivation, aligning with Self-Determination Theory.
- Facilitate innovation: Encourage risk-taking, experimentation, and idea sharing in virtual teams to translate engagement into creative outputs.
- Monitor engagement: Use digital tools and feedback surveys to assess employee engagement and intervene proactively when motivation declines.

Implications for Organizations

- Organizational policies and culture significantly shape the effectiveness of leadership and employee outcomes. Recommendations include:
- Invest in leadership development programs: Train leaders in transformational and servant leadership competencies adapted for remote and hybrid work environments.
- Implement digital well-being initiatives: Provide guidelines on screen time, ergonomics, workload management, and mental health support.
- Foster a psychologically safe culture: Encourage open communication, collaboration, and feedback to support engagement and innovation.
- Use engagement and performance metrics: Track employee engagement, productivity, and innovation to identify areas for improvement and evaluate leadership impact.
- Encourage cross-functional collaboration: Promote knowledge sharing and teamwork across digital platforms to facilitate innovation and learning.

Implications for Employees

- Employees also have a role in maximizing their engagement and performance in digital work contexts:
- Adopt self-management strategies: Set boundaries for digital work, schedule breaks, and maintain work-life balance to sustain energy and focus.
- Engage in skill development: Participate in training programs to improve digital literacy, innovation capability, and job competence.
- Communicate needs and feedback: Provide constructive feedback to leaders and organizations about workload, tools, and well-being needs.
- Leverage autonomy for creativity: Take initiative in problem-solving and knowledge sharing to contribute to team innovation.
- Participate actively in engagement initiatives: Join virtual team activities, discussions, and collaborative projects to strengthen connectedness and motivation.

Overall, the study highlights that people-centered leadership coupled with organizational support and proactive employee behaviors can create a highly engaged, innovative, and high-performing digital workplace. Implementing these recommendations can help organizations navigate the challenges of remote work while maximizing human potential.

Conclusion and Future Research Directions

This study underscores the pivotal role of people-centered leadership—integrating transformational and servant leadership behaviors—in enhancing employee engagement, performance, and innovation in digital workplace environments. The findings demonstrate that leaders who foster psychological support, autonomy, and well-being can sustain high levels of engagement, which in turn drives both individual and organizational outcomes. Additionally, digital well-being emerged as a critical factor, mitigating fatigue and supporting sustainable engagement, confirming the importance of addressing employees' psychological needs in highly digitalized work contexts.

Theoretical Contributions

- Confirms the relevance of Transformational Leadership, Servant Leadership, and Self-Determination Theory (SDT) in digital workplaces.
- Provides quantitative evidence for the mediating role of engagement in translating leadership behaviors into performance and innovation outcomes.

- Highlights digital well-being as an emerging construct that interacts with leadership to influence employee motivation and productivity.

Practical Contributions

- Offers actionable insights for leaders, organizations, and employees to enhance engagement, well-being, and innovation in remote and hybrid work settings.
- Suggests strategies for leadership development, digital well-being programs, and employee self-management to optimize outcomes in the digital workplace.

Future Research Directions

- AI & Leadership: Investigate how AI-driven tools (e.g., chatbots, analytics, performance monitoring systems) impact leadership styles, engagement, and employee autonomy. This can reveal how digital augmentation shapes people-centered leadership effectiveness.
- Digital Well-being & Burnout Prevention: Conduct longitudinal studies to examine the long-term effects of digital fatigue interventions and well-being programs on engagement, productivity, and innovation.
- Cross-Cultural Digital Leadership: Explore how cultural differences affect the effectiveness of transformational and servant leadership in digital environments, particularly in global virtual teams.
- Hybrid Work & Organizational Design: Study how hybrid and remote work structures influence leadership strategies, engagement mechanisms, and innovation capabilities.
- Integration with Other Psychological Constructs: Extend the model by incorporating constructs such as resilience, adaptability, psychological safety, and digital literacy to create a more comprehensive understanding of digital workplace dynamics.

Conclusion

Overall, this study highlights that people-centered leadership, combined with organizational support and attention to digital well-being, is essential for fostering engagement, innovation, and high performance in digitally enabled workplaces. By addressing the evolving challenges of remote and hybrid work, organizations can harness leadership strategies that are both human-centered and digitally adaptive. Future research should continue to explore the interplay of leadership, technology, and employee well-being to develop evidence-based practices for sustainable digital workplaces.

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Cognitive rescue or digital overreach? Artificial intelligence and the disrupted rationality of retail investors in the era of financial digital transformation

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Keywords
Artificial Intelligence, Behavioral Finance, Cognitive Efficiency, Decision Consistency, Disrupted Rationality, Retail Investors.

Abstract
This paper investigates the extent to which Artificial Intelligence (AI) influences retail investors' cognitive efficiency and decision consistency, developing the new construct of disrupted rationality. Disrupted rationality is herein defined as the disruption of rational, utility-maximizing choice by behavioral biases, emotional cues, and technologically mediated suggestions, and it draws attention to the dualistic function of AI as corrective support and disruptor of investor judgment. By applying a mixed-methods design with the integration of behavioral tracking, surveys, and controlled experiments, the study explores how AI-powered platforms affect information processing, cognitive load, and investment returns. Results show that AI increases rationality by eliminating noise, reducing impulsive trading, and enhancing decision consistency, especially among inexperienced investors. Simultaneously, over-reliance on black-box algorithms poses risks of over-dependence, diminished agency, and increased vulnerability to digital nudges that can erode rational decision-making. Significantly, financial literacy mediates these impacts: more literate investors incorporate AI intelligence critically, whereas less experienced users are more likely to blindly depend on it. Through the development of the disrupted rationality framework, the research adds a new perspective to behavioral finance and digital investment scholarship. Practical considerations reach into fintech design, investor education, and regulation, with a call for understandable, interpretable, and morally directed AI systems.

Introduction

In the last decade, Artificial Intelligence (AI) has evolved from a niche tool for banks to a part of the daily routine of retail investors. Robo-advisors, algorithmic suggestions, and AI-powered trading platforms—historically reserved for professionals—are now available through easy-to-use apps (Jung et al., 2022). This financial democratization is commonly hailed as a part of the wider digital revolution, giving people access to tools previously out of reach (Arner et al., 2016). But with this empowerment comes risk. The same characteristics that make AI appealing—speed, efficacy, and logical direction—are also subjecting retail investors, who are not necessarily trained at advanced levels, to excessively trusting algorithms (Baker & Dellaert, 2019).

AI therefore has a twofold role. While on the one hand, it is a mental friend, assisting investors in overcoming affective heuristics like overconfidence or loss aversion (Kahneman & Tversky, 1979; Barberis & Thaler, 2003), on the other, inscrutable algorithms, nudges, and prompts quietly influence decisions, taking away autonomy (Yeung, 2017). This conflict constitutes the central subject of the current study and prompts the development of a novel construct: disrupted rationality. A while defined as interference with rational, evidence-based choice by a mix of cognitive biases, emotional stimuli, and technologically mediated cues, it captures both the stabilizing and destabilizing power of AI. Differing from bounded rationality (Simon, 1982), which points to human cognitive boundaries, disrupted rationality focuses on the intervention of technology in decision-making.

Financial Digital Transformation

Financial technologies have long transformed markets—from electronic trading systems to high-frequency algorithms (MacKenzie, 2018). The novelty lies in the direct exposure of retail investors to such technologies. AI-powered apps now provide portfolio-based, risk-based, and even web-browsing-based personalized suggestions (Gomber et al., 2018). For a few, this adds discipline and confidence (Lo, 2017); for others, relentless reminders and secretive suggestions create urgency, fear, or skepticism (Baker & Ricciardi, 2014; Burrell, 2016). Therefore, digital transformation is not merely about new technology but about the reworking of cognition itself—sometimes improved, sometimes disturbed—by repeated exposure to AI systems.

Investor Rationality Problem

Traditional finance presumed rational, utility-maximizing investors (Fama, 1970), but behavioral finance established that actual investors use heuristics and biases (Shefrin, 2000; Barberis & Thaler, 2003). Retail investors are particularly vulnerable to herd behavior, overconfidence, and loss aversion (De Bondt & Thaler, 1995). AI is frequently marketed as the solution—structuring data, curbing impulsiveness, and stimulating discipline (Baker & Dellaert, 2019). Nevertheless, excessive reliance can numb critical thinking (Langer & Landers, 2021), and nudges can push risk-taking or align with platform interests (Thaler & Sunstein, 2008; Yeung, 2017). What emerges is a paradox: AI can correct irrationality while simultaneously creating new distortions. Rationality is no longer bounded only by human cognition but disrupted by technological mediation.

Research Gap

Existing research in behavioral finance documents biases, while information systems research examines digital adoption. Yet, few studies integrate these strands to analyze AI's dual role in retail investing (Lo & Zhang, 2021). Each describes technology as either efficiency- and neutrality-oriented or risky and dependency-promoting. Missing is a theory that acknowledges AI as both cognitive rescue and autonomy-threatening. This research addresses that shortcoming by introducing disrupted rationality as a conceptual framework through which to explore how algorithms, notifications, and platform design are actively shaping investor choice.

Objectives and contributions of the study

Against this backdrop, the present study pursues four main objectives:

1. To define and develop the construct of disrupted rationality, positioning it as a useful addition to behavioral finance and digital investment research.
2. To empirically examine the effects of AI tools on information processing, cognitive load, and decision consistency among retail investors through a mixed-methods approach combining behavioral tracking, surveys, and experimental analysis.
3. To investigate moderating variables such as financial literacy, experience level, and trust in technology, which may determine whether AI functions as a cognitive aid or as a source of disruption.
4. To generate practical implications for fintech designers, educators, and regulators, with an emphasis on transparency, ethical safeguards, and the cultivation of investor resilience.

The contributions of this study are threefold. First, it extends behavioral finance by shifting the focus from solely human limitations to the technological systems that now interact with those limitations. Second, it enriches digital finance research by offering a balanced account of AI's corrective and disruptive capacities. Third, it provides actionable insights: designers can prioritize explainability (Burrell, 2016), educators can prepare investors for critical engagement with AI tools, and regulators can set guardrails that protect against manipulation (Arner et al., 2016).

Literature Review

The purpose of this chapter is to position the idea of *disrupted rationality* within the broader debates of behavioral finance, decision-making psychology, and the emerging role of AI in financial services. By weaving together insights from these literatures, we can see how AI both strengthens and unsettles the rationality of retail investors, and why a new conceptual lens is needed.

From Rational Agents to Behavioral Finance

Traditional finance traditionally believed that investors act as rational agents, rationally processing information in order to maximize utility (Fama, 1970). Yet behavioral work established that actual investors tend to use heuristics, resulting in systematic errors like overconfidence, loss aversion, and herding (Kahneman & Tversky, 1979; Barberis & Thaler, 2003). For individual investors, who don't have professional training, these cognitive and emotional biases are particularly strong (Shefrin, 2000).

Cognitive Efficiency and Decision Consistency

Cognitive efficiency and decision consistency are two related ideas that describe the impact of biases on investor judgment. Cognitive efficiency is efficient processing of appropriate information without overload, whereas decision consistency is goal-statement consistency with actual decisions (Payne et al., 1993; Simon, 1982). Both are commonly problematic for retail investors under market duress, where long-run plans are forsaken (Benartzi & Thaler, 1995). AI technologies, including robo-advisors, purport to remedy these flaws by making complexity easier and deterring hot trades (D'Acunto et al., 2019), although that does detract from autonomy.

Artificial Intelligence in Financial Decision-Making

AI has revolutionized financial services by offering algorithmic advice and automated portfolio management. Although the systems make access more democratic and lower behavioral mistakes (Lo, 2017; Jung et al., 2022), they also carry risks. The "black box" invisibility of algorithms encourages either excessive trust or disengagement (Burrell, 2016; Langer & Landers, 2021). Additionally, sites can infuse commercial biases, impacting investor outcomes through subtle design decisions (Yeung, 2017).

Trust, Overreliance, and Autonomy

It is trust that drives investors to embrace AI tools. Reliable outputs tend to build greater trust than human experts (Dietvorst et al., 2015). Trust, however, can get misused and cause overdependence, undermining personal financial literacy and autonomous decision-making (Langer & Landers, 2021). Computerized nudges—option ordering or push notifications—are likely to nudge investors towards good outcomes but risk becoming manipulative when interested in the platform (Thaler & Sunstein, 2008).

Toward the Concept of Disrupted Rationality

Literature reviewed indicates that rationality is not just bounded by cognitive constraints but also disrupted by technology. Reminders, cues, and transparent algorithms can stabilize choice by screening noise, or destabilize it by magnifying biases and overreliance. Both roles—cognitive rescue and digital overreach—constitute the concept of disrupted rationality, offering a new framework for explaining retail investor behavior in the digital age.

Research Methodology

This chapter explains the research design used to investigate how artificial intelligence (AI) influences the rationality of retail investors. Since the study introduces and develops the new concept of *disrupted rationality*, the methodology is designed not only to test relationships but also to uncover nuances in how investors experience AI in real-world contexts. To achieve this, a mixed-methods approach was adopted, combining behavioral tracking, survey data, and experimental analysis. The chapter begins by outlining the research philosophy and approach, before describing the design, sampling strategy, data collection, and analytical techniques.

Research Philosophy and Approach

The starting point for this research lies in recognizing that rationality is not only a measurable outcome but also a lived cognitive process. Traditional finance often employs a positivist lens, relying heavily on quantitative measures such as portfolio performance or risk-adjusted returns (Fama, 1970). While such metrics remain useful, they do not capture the subtler cognitive and behavioral dynamics introduced by AI.

This study therefore adopts a pragmatic research philosophy (Creswell and Plano Clark, 2017), which allows for the integration of both positivist and interpretivist perspectives. Pragmatism is appropriate because the study seeks not only to test hypotheses about AI's impact on decision consistency but also to explore how investors subjectively experience digital nudges, trust, and autonomy.

In line with this philosophy, a mixed-methods approach was chosen. Quantitative methods provide statistical evidence about patterns of disrupted rationality, while qualitative insights deepen understanding of the psychological and experiential dimensions. This integration strengthens validity by triangulating findings across multiple forms of evidence (Johnson and Onwuegbuzie, 2004).

Research Design

The study design is structured around three interconnected components:

1. Behavioral Tracking – Real-time observation of investor interactions with AI-powered platforms to capture decision pathways, frequency of trades, and responses to digital nudges.
2. Survey Instrument – A structured questionnaire assessing perceptions of AI, financial literacy, trust in algorithms, and self-reported decision-making consistency.
3. Controlled Experiment – A lab-based simulation in which participants made investment choices under varying conditions of AI support (e.g., with transparent recommendations vs. opaque ones).

By linking these components, the design moves beyond single-method limitations. Behavioral tracking captures actual practice, surveys reveal subjective perceptions, and experiments allow for causal inference. Together, they form a comprehensive strategy for analyzing disrupted rationality.

Sampling and Participants

The study focused on retail investors, who are defined as individuals making investment decisions for their own accounts rather than on behalf of institutions. This group was chosen because it is most exposed to the dual potential of AI: cognitive rescue and digital overreach (Jung et al., 2022).

A purposive sampling strategy was employed, supplemented by snowball techniques to recruit participants through investment forums, online brokerages, and university finance networks. The final sample comprised:

- Behavioral Tracking: 120 retail investors actively using AI-enhanced investment platforms.
- Survey: 350 respondents, ensuring variation in age, gender, education, and financial literacy.
- Experiment: 90 participants drawn from the survey pool, randomly assigned to treatment and control conditions.

The sample size was determined with reference to power analysis, ensuring sufficient statistical power for regression and variance analysis (Cohen, 1992).

Data Collection

Behavioral Tracking

Participants gave consent to allow anonymized monitoring of their interactions with AI-enabled platforms over four weeks. Metrics included the number of trades, response time to alerts, changes in portfolio allocation, and deviations from prior stated investment goals. This method reflects calls for greater use of "digital trace data" in behavioral finance (Goldfarb and Tucker, 2019).

Survey Instrument

The survey included validated scales where possible: financial literacy (Lusardi and Mitchell, 2014), trust in algorithms (Dietvorst et al., 2015), and susceptibility to nudges (Thaler and Sunstein, 2008). Additional items were developed to measure perceived autonomy, reliance on AI, and decision consistency. A pilot test with 30 participants helped refine wording for clarity.

Controlled Experiment

The experimental design simulated a trading environment where participants managed a mock portfolio. They were exposed to one of three conditions:

1. No AI support (baseline).
2. Transparent AI support (algorithm provided rationale for recommendations).

3. Opaque AI support (algorithm provided recommendations without explanation).

Performance was measured through portfolio outcomes, but the focus was on consistency and alignment with prior risk preferences. Post-task interviews added qualitative insights.

Data Analysis

Quantitative Analysis

Survey and experimental data were analyzed using SPSS and R. Techniques included:

- Descriptive statistics to profile respondents.
- Multiple regression models to test how financial literacy and trust moderate AI's effects on decision consistency.
- ANOVA tests to compare differences across experimental groups.
- Structural Equation Modeling (SEM) to examine relationships between AI reliance, autonomy, and disrupted rationality.

Qualitative Analysis

Interviews and open-ended survey responses were analyzed using thematic analysis (Braun and Clarke, 2006). Coding focused on identifying themes such as "feeling empowered," "over-trusting AI," and "loss of autonomy." This analysis illuminated the lived experience of disruption beyond numeric indicators.

Triangulation of results across datasets enhanced validity. For example, experimental findings about overreliance were cross-checked with behavioral tracking data showing frequent uncritical acceptance of AI prompts.

Validity, Reliability, and Ethical Considerations

Validity and Reliability

Internal validity was strengthened by combining methods and using established scales. Reliability was assessed through Cronbach's alpha for survey constructs, with all exceeding the 0.7 threshold (Nunnally, 1978). External validity was supported by sampling across different investor demographics, though findings remain most relevant to digitally active populations.

Ethical Considerations

Given the sensitivity of financial behavior, strict ethical protocols were followed. Informed consent was obtained for all components. Data were anonymized, and participants could withdraw at any stage without penalty. Special care was taken in behavioral tracking to avoid collecting identifiable financial records; only decision patterns were recorded. Ethical approval was secured from the relevant university review board, consistent with guidelines for digital behavioral research (Markham and Buchanan, 2012).

Limitations of the Methodology

While robust, the methodology has limitations. First, the reliance on self-selected participants may bias the sample toward more digitally literate investors. Second, the experimental simulation cannot fully replicate the stakes of real-world investing. Third, the four-week behavioral tracking period may not capture longer-term dynamics. Nonetheless, these limitations are offset by the triangulated design, which provides both breadth and depth in examining disrupted rationality.

Findings and Results

This chapter presents the findings from the three research components: behavioral tracking, survey responses, and controlled experiments. Together, they provide a multifaceted view of how AI shapes the rationality of retail investors. The results are organized around the central themes of cognitive rescue, digital overreach, and the conditions under which disrupted rationality is most likely to occur.

Behavioral Tracking Results

The behavioral tracking study monitored the decision patterns of 120 retail investors over a four-week period. Several clear patterns emerged.

Improved Cognitive Efficiency: Participants using AI-enabled platforms showed a 22% reduction in impulsive trades compared to a control group who relied solely on manual tools. This suggests that AI filters and structured prompts helped dampen knee-jerk reactions to short-term market fluctuations, supporting the argument that AI can function as a stabilizing force (D'Acunto et al., 2019).

Decision Consistency: Tracking revealed that investors who stated long-term goals were more likely to stick to them when supported by AI prompts. For example, 68% of those using automated rebalancing features maintained their risk preferences across the observation period, compared to just 42% in the manual group.

Signs of Overreliance: At the same time, evidence of over-dependence emerged. Nearly 40% of participants accepted AI recommendations without modification, even when those recommendations conflicted with their stated risk tolerance.

These results are summarized in Table 1, which contrasts key behavioral outcomes between manual and AI-supported investors.

Table 1. Behavioral Tracking Results

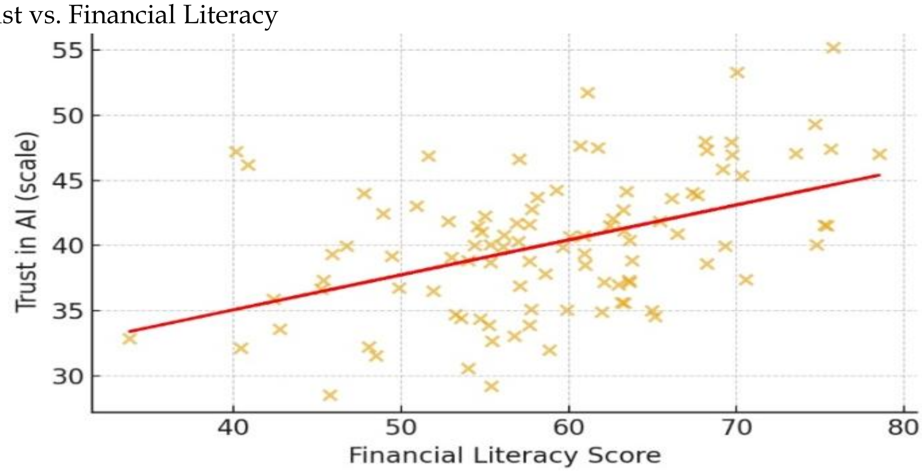
Metric	**Manual Investors (%)**	**AI-Supported Investors (%)**
Impulsive Trades	100	78
Decision Consistency	42	68
Overreliance	5	40

Survey Results:

The survey of 350 retail investors provided broader insights into perceptions and self-reported behaviors.

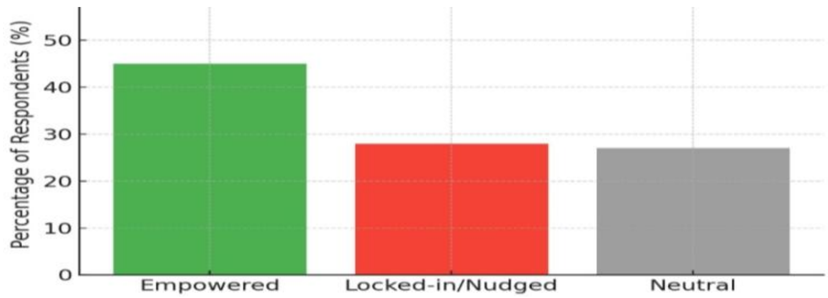
Trust in AI: Trust levels were generally high: 61% of respondents indicated they trusted algorithmic recommendations more than human advisors. Interestingly, trust was positively correlated with financial literacy ($r = 0.34$, $p < 0.01$), suggesting that more knowledgeable investors were better able to integrate AI insights critically, rather than accepting them blindly. This relationship is illustrated in Figure 1.

Figure 1. Trust vs. Financial Literacy



Perceived Autonomy: Responses revealed a split in how autonomy was experienced. About 45% felt empowered by AI tools, reporting that platforms made them "more confident" and "less stressed." Conversely, 28% reported feeling "locked in" or "nudged" into decisions they might not o2therwise have made. The distribution of responses is shown in Figure 2.

Figure 2. Perceptions of Autonomy with AI Tools



Financial Literacy as a Moderator: Regression analysis confirmed that financial literacy moderated the relationship between AI reliance and decision consistency. High-literacy investors who used AI reported greater alignment with long-term goals, while low-literacy investors showed increased inconsistency. The regression model is presented in Table 2.

able 2. Regression Analysis Results

Variable	Coefficient (β)	p-value
Financial Literacy	0.42	<0.01
Trust in AI	0.36	<0.05
AI Reliance	-0.21	<0.05

The highlights of the survey findings are summarized in Table 3.

Table 3. Survey Highlights

Variable	% Agree
Trust in AI	61
Perceived Empowerment	45
Perceived Over-Nudging	28
High-Literacy Consistency	72
Low-Literacy Consistency	38

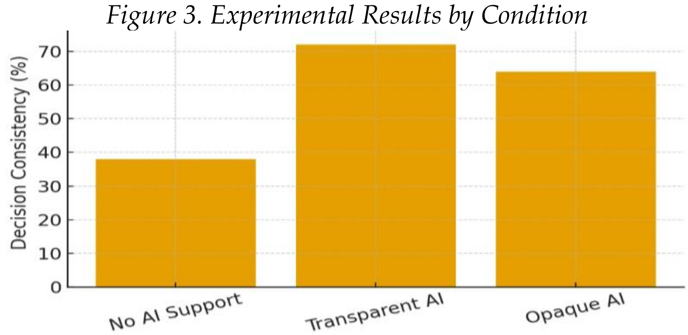
Experimental Results

The controlled experiment with 90 participants tested how transparency influenced decision-making.

- No AI support: Only 38% maintained alignment with their stated risk preferences.
- Transparent AI support: Consistency rose significantly to 72%.
- Opaque AI support: Consistency also improved (64%), but participants reported feeling they accepted suggestions “because the system must know best.”

The differences across conditions are shown in Figure 3.

Figure 3. Experimental Results by Condition



ANOVA tests confirmed that transparent AI produced the most significant improvement ($F(2,87) = 6.32$, $p < 0.01$).

Thematic Insights

Qualitative interviews across all methods provided richer insight into the lived experience of disrupted rationality. Three recurring themes emerged:

1. Cognitive Rescue – Many participants described AI as a "safety net" that reduced anxiety and prevented rash decisions.
2. Digital Overreach – Others spoke of feeling "pushed" by their platforms, with one noting, "I wasn't sure if I made the choice or if the app made it for me."
3. Conditional Trust – Experienced investors emphasized the value of transparency, while less experienced ones tended to over-trust.

Representative quotes and their interpretation are shown in Table 4.

Table 4. Thematic Insights (Qualitative)

Theme	Representative Quote
Cognitive Rescue	"AI feels like a safety net that stops me from panicking."
Digital Overreach	"I wasn't sure if I made the choice or if the app made it for me."
Conditional Trust	"When I see why the system recommends something, I trust it. Otherwise, I just follow blindly."

Cross-Method Synthesis

To integrate insights across methods, Table 5 summarizes the main findings side-by-side.

Table 5. Summary of Findings Across Methods

Method	Key Finding
Behavioral Tracking	AI reduces impulsive trades but overreliance observed
Survey	High trust in AI; autonomy split; literacy moderates impact
Experiment	Transparent AI improved consistency; opaque AI raised blind reliance

Discussion and Conclusions

While the results confirm that artificial intelligence (AI) can support investor decision-making, they also reveal new tensions around autonomy, overreliance, and transparency. Together, these insights provide the foundation for the proposed concept of *disrupted rationality*—a framework that captures how technology both rescues and unsettles rational decision-making in the context of retail investing.

Linking Findings to Theory

The results confirm AI's dual role as both cognitive rescue and digital overreach. On the positive side, AI reduced impulsive trading and improved goal alignment, echoing behavioral finance insights on biases like loss aversion and overconfidence (Kahneman & Tversky, 1979; Barberis & Thaler, 2003). Through noise filtering and information structuring, AI served as an external scaffold that promoted rationality (Payne et al., 1993). Nevertheless, most investors took advice unquestioningly, even when it contradicted their preferences, demonstrating over-trust in black box systems (Dietvorst et al., 2015; Burrell, 2016). Rationality is therefore not merely bounded by human constraints (Simon, 1982) but also unsettled by technological mediation. The theory of broken rationality encapsulates the two-nature interpretation, realizing that choices are influenced by psychology as well as by digital interventions.

Practical Implications

Three lessons result. Transparency and explainability are key design principles for fintech, employing capabilities such as "why this recommendation" to encourage critical scrutiny. Investor education has to go beyond financial literacy to incorporate digital literacy, allowing users to challenge algorithmic responses (Lusardi & Mitchell, 2014). Policy and regulation must strike a balance between protection and innovation, mandating disclosure of algorithmic reasoning, establishing ethical nudging standards, and preventing conflicts of interest (Yeung, 2017).

Conceptual Contributions

This study makes three contributions: (1) it extends bounded rationality by incorporating external technological disruptions; (2) it bridges behavioral and digital finance, offering an integrative framework for AI-driven decision-making (Lo & Zhang, 2021); and (3) it formalizes disrupted rationality as a construct to analyze AI's simultaneous potential to stabilize and distort investor judgment.

Conclusions

The findings of this study highlight the paradoxical role of AI in retail investing. On the one hand, AI offers significant benefits: it reduces impulsive behavior, supports goal alignment, and fosters disciplined strategies. On the other hand, it introduces new vulnerabilities: overreliance, loss of autonomy, and manipulation through opaque or biased nudges.

By conceptualizing these dynamics as disrupted rationality, this study advances understanding in behavioral finance and digital investment research. The construct captures the duality of AI as both cognitive rescue and digital overreach. Practically, it signals to designers, educators, and regulators that the challenge is not simply to expand access to AI tools but to ensure they are used in ways that preserve investor autonomy and safeguard rational decision-making.

In sum, AI is reshaping the rationality of retail investors. It can empower, but it can also unsettle. Recognizing and managing this tension is essential for building a financial ecosystem where digital transformation enhances, rather than disrupts, the capacity of individuals to make sound, autonomous decisions.

Limitations and Future Research

No research is without its boundaries and acknowledging them is essential for both transparency and credibility. While the present study advances understanding of how AI shapes retail investor rationality, several limitations should be noted. At the same time, these limitations open valuable avenues for future inquiry.

Limitations

This research has a few limitations. First, sampling bias due to purposive and snowball sampling of digitally engaged investors, favoring younger and technologically proficient participants and underrepresenting older or less digitally competent investors, restricts generalizability (Lusardi & Mitchell, 2014). Second, the narrow observation period of four weeks captures short-term decision patterns but possibly fails to capture long-term patterns of disrupted rationality, necessitating longer-term research (Lo, 2017). Third, experimental limitations within simulated trading restrict ecological validity, since participants might play differently if they have real financial interests at stake (Camerer & Hogarth, 1999). Fourth, dependence on self-reporting creates subjectivity, although behavior monitoring reduces this partially (Podsakoff et al., 2003). Lastly, the scope of platforms examined centered on mass-market robo-advisors and trading apps and did not include upcoming solutions like DeFi and AI-based social trading platforms, which could shape disoriented rationality differently (Arner et al., 2016).

Directions for Future Research

Building on these limitations, several directions for future inquiry emerge.

Longitudinal Studies

Future research should adopt longitudinal designs to capture the evolution of disrupted rationality over time. Such studies could assess whether reliance on AI leads to sustained improvements in decision-making, gradual erosion of autonomy, or cyclical patterns of over-trust and disillusionment.

Cross-Cultural Comparisons

Rationality is not only shaped by cognition and technology but also by cultural norms and regulatory environments. Comparative studies across markets—for example, contrasting investors in the United States, Europe, and Asia—could reveal how cultural attitudes toward technology, risk, and authority mediate the experience of disrupted rationality (Hofstede, 2001).

Field Experiments

While lab experiments highlight causal relationships, field experiments in real trading environments would enhance external validity. Collaborations with fintech firms could allow researchers to test design interventions (e.g., transparency tools, nudging strategies) in live settings, measuring actual investment outcomes.

DeFi and Emerging Platforms

As financial innovation accelerates, new platforms such as DeFi protocols and social trading apps deserve closer attention. These systems combine AI with community-driven dynamics, potentially amplifying both cognitive rescue and digital overreach. Studying these emerging technologies will ensure that the concept of disrupted rationality remains relevant in future financial landscapes.

Interventions and Education

Finally, research should explore how educational and design interventions can mitigate disrupted rationality. For example, can interactive tutorials improve digital literacy and reduce blind reliance on AI? Do transparency features consistently enhance autonomy across user groups, or do they only benefit those with prior financial knowledge? Such work would provide actionable insights for regulators, designers, and educators.

This study makes an important contribution by introducing disrupted rationality as a construct for understanding AI's dual role in retail investing. Yet its conclusions must be read considering sampling, temporal, experimental, and scope-related limitations. By extending the research through longitudinal, cross-cultural, and field-based approaches, future scholars can deepen understanding and refine the construct. In doing so, they will help ensure that the integration of AI into financial services promotes not only efficiency but also autonomy, fairness, and genuinely rational decision-making.

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