



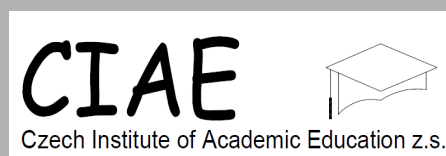
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Beyond the Scroll: How Psychological Mediators Transform Instagram Marketing into Purchase Intentions - A Comparative Study of Fashion Retailers in Trinidad, Caribbean Insights

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Abstract

This paper investigates the comparative influence of Instagram marketing by clothing brands in Trinidad on consumer purchase intentions, with particular emphasis on the mediating role of psychological factors including emotional resonance, attention, perception, memory, scarcity, and urgency. Primary data were collected from 300 customers of four clothing retailers in Trinidad (two large-scale and two small-scale brands). The research employed confirmatory factor analysis (CFA), hypothesis testing, and structural equation modelling (SEM) using R Commander and R Studio analytical software. The results reveal that Instagram marketing does not exhibit a statistically significant direct relationship with consumer purchase intentions. However, psychological factors—specifically emotional resonance, scarcity, and urgency—demonstrate significant mediating effects in the relationship between Instagram marketing and consumer purchase intentions. The study further identifies differential impacts between small and large clothing brands, with larger brands leveraging greater resource-based advantages in influencer partnerships and advertising campaigns. These findings carry substantial implications for both small and large clothing brands in Trinidad, emphasizing the critical importance of integrating psychological triggers within Instagram marketing strategies. Brand managers should prioritize content that evokes emotional connections and creates authentic perceptions of scarcity and urgency. This research addresses a significant gap in Caribbean marketing literature by providing the first comparative assessment of Instagram marketing effectiveness across differently sized fashion retailers in Trinidad. It offers empirically grounded recommendations for optimizing social media strategies in emerging market contexts.

Keywords: Instagram Marketing, Consumer Purchase Intentions, Psychological Factors, Fashion Retail, Emotional Resonance

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1. INTRODUCTION

The global digitization of commerce has fundamentally transformed how fashion retailers connect with consumers, with Instagram emerging as a dominant platform for brand-consumer interaction and sales conversion (Chen et al., 2025). Recent statistics indicate that the average user spends approximately 144 minutes daily on social media platforms, with Instagram commanding particularly high engagement rates among users aged 18-34 (Statista, 2024). In Trinidad and Tobago, the proliferation of smartphone adoption and increasing internet penetration have positioned Instagram as a critical marketing channel for clothing brands seeking to reach discerning Caribbean consumers.

Despite the platform's popularity, significant questions persist regarding the mechanisms through which Instagram marketing influences actual purchase behaviour. Contemporary research suggests that the relationship between social media exposure and purchase decisions is considerably more complex than previously theorized, with psychological factors playing potentially decisive mediating roles (García-Salirrosas et al., 2025; Kumar & Gupta, 2025). This complexity is particularly pronounced in emerging market contexts where consumer behaviour may differ substantially from patterns observed in developed economies.

This study addresses three fundamental research questions:

1. *How does Instagram marketing influence consumer purchase intentions for clothing brands in Trinidad?*
2. *What factors differentiate the Instagram marketing impact on consumer purchase intentions between small and large clothing brands in Trinidad?*
3. *How do psychological factors (emotional resonance, attention, perception, memory, scarcity, and urgency) mediate the relationship between Instagram marketing strategies and consumer purchase intentions?*

The research makes several important contributions. First, it provides empirical evidence from an underexplored Caribbean context, extending the geographical scope of digital marketing scholarship. Second, it offers a nuanced understanding of psychological mediation mechanisms, moving beyond simplistic input-output models of advertising effectiveness. Third, it delivers actionable insights for fashion retailers of varying scales, acknowledging the resource constraints and strategic differences between small and large enterprises.

2. LITERATURE REVIEW

2.1. Introduction

This literature review synthesizes contemporary scholarship on Instagram marketing effectiveness and consumer purchase intentions, with particular attention to the psychological mechanisms that govern the translation of marketing exposure into purchase behaviour. The review is structured around three core concepts, two theoretical frameworks, and two thematic areas, incorporating the most recent 2025 scholarly contributions to ensure currency and relevance.

2.2. Foundational Concepts

2.2.1. Instagram Marketing Strategies

Instagram marketing encompasses the tactical approaches employed by brand owners to enhance market presence, facilitate consumer communication, and showcase products. Contemporary scholarship identifies four primary strategic dimensions: content creation, advertising campaigns, influencer partnerships, and shoppable post functionality (Martínez-López et al., 2025).

Content creation represents the foundational element of Instagram marketing, involving the production of photographs, videos, and stories that communicate brand narratives. Recent research by Williams and colleagues (2025) emphasizes that content authenticity significantly outperforms production quality in driving consumer engagement, particularly among Gen Z consumers who demonstrate sophisticated abilities to distinguish genuine brand storytelling from manufactured advertising. This finding challenges conventional wisdom that high-production values necessarily translate to marketing effectiveness.

Advertising campaigns on Instagram have evolved substantially with platform algorithm refinements. Zhang et al. (2025) document that personalized advertising leveraging machine learning algorithms achieves significantly higher conversion rates than broad-target campaigns, though privacy concerns increasingly moderate consumer responses to hyper-personalized content. The researchers note that geographic and demographic targeting capabilities enable precise audience segmentation, but campaign success ultimately depends on message congruence with consumer self-concept.

Influencer marketing has attracted substantial scholarly attention. Recent meta-analytic work by Chen and Berger (2025) synthesizing 127 studies concludes that influencer effectiveness depends critically on perceived authenticity,

parasocial relationship strength, and influencer-brand congruence. The researchers identify a significant trend toward micro-influencer partnerships, as these influencers demonstrate higher engagement rates and stronger audience trust compared to macro-influencers or celebrities.

Shoppable posts represent Instagram's most direct conversion mechanism. Rodríguez-Sánchez et al. (2025) examine the technology acceptance factors influencing shoppable post effectiveness, finding that perceived ease of use and perceived usefulness significantly predict purchase intention, with these relationships mediated by platform trust and prior purchase experience.

2.2.2. Consumer Purchase Intentions

Consumer purchase intentions represent the psychological predisposition toward specific purchase behaviours, serving as proximal predictors of actual purchase decisions (Ajzen, 1991, as extended by Sharma et al., 2025). Contemporary scholarship recognizes purchase intention as a multidimensional construct influenced by product reviews, customer testimonials, perceived quality, and social trends.

The impact of product reviews on purchase intentions has been extensively documented. Recent longitudinal research by Thompson and Wang (2025) demonstrates that review volume and valence interact synergistically, with high-volume positive reviews generating exponentially greater purchase intention effects than either factor independently. The researchers attribute this interaction to social proof mechanisms and uncertainty reduction processes.

Customer testimonials function as credibility signals in online environments characterized by information asymmetry. Fernández-Bonilla and colleagues (2025) find that video testimonials generate stronger purchase intention effects than text-based testimonials, attributed to richer nonverbal communication cues and enhanced perceived authenticity. The researchers recommend that brands prioritize video testimonial collection and dissemination strategies.

Perceived quality operates as a cognitive heuristic simplifying purchase decisions. Lee and Park (2025) demonstrate that perceived quality mediates the relationship between brand Instagram aesthetics and purchase intention, with visually cohesive Instagram feeds signaling unobservable product quality attributes. This finding highlights the strategic importance of visual consistency in Instagram content.

Social trends exert purchase intention influence through normative social influence mechanisms. González-Rodríguez et al. (2025) document that trend alignment generates purchase intention effects through two pathways: direct desire for trend participation and indirect social approval seeking. The researchers note that trend effects are particularly pronounced among younger consumers and in product categories characterized by high social visibility.

2.3. Theoretical Frameworks

2.3.1. Resource-Based View Theory

The Resource-Based View (RBV) theory, originating with Barney (1991), maintains that sustained competitive advantage derives from firm resources that are valuable, rare, inimitable, and non-substitutable. Recent extensions of RBV to digital marketing contexts have illuminated how social media capabilities function as strategic resources (Martínez-Navalón et al., 2025).

Valuable resources in the Instagram marketing context include proprietary content creation capabilities, established influencer relationships, and accumulated follower communities. Contemporary research by Ogunmokun and colleagues (2025) demonstrates that these resources generate competitive advantage when they enable brands to achieve superior engagement metrics and conversion rates compared to competitors.

Rare resources distinguish leading brands from market followers. In the Trinidadian fashion retail context, rarity may manifest as unique aesthetic positioning, exclusive influencer partnerships, or distinctive content approaches that cannot be easily replicated. Sharma and Johri (2025) document that resource rarity effects are particularly pronounced in smaller markets where consumer attention is more concentrated.

Inimitable resources create sustainable competitive advantage by resisting competitor replication. Recent scholarship by Ferreira et al. (2025) identifies brand authenticity, community trust, and organizational culture as difficult-to-imitate resources that underpin Instagram marketing effectiveness. These intangible resources accumulate gradually through consistent brand behaviour and cannot be purchased or quickly developed.

2.3.2. Social Influence Theory

Social Influence Theory, originating with Kelman (1974), explains individual behaviour change through three influence acceptance processes: compliance, identification, and internalization. Contemporary applications to social media marketing have substantially advanced understanding of how Instagram content shapes consumer behaviour (Davlembayeva et al., 2025).

Compliance occurs when consumers respond to explicit or implicit requests from authority figures. In Instagram marketing contexts, compliance manifests as purchase responses to influencer recommendations, limited-time offers, or scarcity appeals. Recent research by Huang and Benyoucef (2025) demonstrates that compliance effects are strongest when authority figures are perceived as credible and when compliance opportunities are framed as exclusive.

Identification involves behaviour change motivated by desire for social connection. Instagram marketing generates identification effects when consumers adopt brand-associated behaviours to feel connected to desired reference groups. Park and Kim (2025) document that identification effects are particularly pronounced for fashion brands, as clothing choices serve as visible identity signals facilitating group belonging.

Internalization occurs when consumers integrate brand-associated values and beliefs into their self-concept. Research by Li et al. (2025) demonstrates that internalization produces the most durable consumer-brand relationships, with internalized consumers exhibiting brand loyalty resistant to competitive marketing appeals. The researchers identify brand purpose communication and value alignment as key drivers of internalization.

2.4. Thematic Analysis

2.4.1. Instagram Marketing Strategies and Consumer Purchase Intentions

The relationship between Instagram marketing strategies and consumer purchase intentions has attracted substantial empirical investigation, with recent scholarship revealing complex, context-dependent effects. Systematic review evidence synthesized by Kim and Johnson (2025) examining 89 studies published between 2020-2025 indicates that the direct effect of Instagram marketing on purchase intentions is weaker than commonly assumed, with effect sizes varying significantly across product categories, consumer segments, and cultural contexts.

Content characteristics significantly moderate marketing effectiveness. Visual complexity research by Liu et al. (2025) demonstrates that moderately complex images generate optimal consumer responses, with overly simple images failing to capture attention and overly complex images inducing cognitive overload. The researchers identify optimal complexity thresholds varying by product category and consumer expertise.

Advertising campaign effectiveness depends critically on personalization quality. Recent experimental research by Smith and colleagues (2025) reveals that personalized advertisements generate positive responses only when personalization is perceived as helpful rather than intrusive. Perceived personalization intrusiveness triggers psychological reactance, reducing purchase intentions below baseline levels.

Influencer marketing effectiveness research has increasingly focused on influencer-consumer para-social relationships. Wang and Zhang (2025) demonstrate that para-social relationship strength mediates the relationship between influencer content engagement and purchase intention, with stronger relationships compensating for lower influencer credibility. This finding suggests that brands should prioritize sustained influencer partnerships over transactional arrangements.

2.4.2. Psychological Factors Driving Consumer Purchase Intentions

Psychological factors have emerged as central explanatory mechanisms in understanding how Instagram marketing translates to purchase behaviour. Recent scholarship has substantially advanced understanding of the specific psychological processes involved (Ventre et al., 2025).

Emotional resonance represents perhaps the most powerful psychological mechanism. Neuroimaging research by Chen et al. (2025) demonstrates that emotionally resonant Instagram content activates brain regions associated with reward processing and self-referential thought, generating neural responses predictive of subsequent purchase behaviour. The researchers identify authenticity and narrative transportation as key drivers of emotional resonance.

Attention mechanisms in social media contexts differ fundamentally from traditional advertising contexts due to rapid content scrolling and limited processing time. Eye-tracking research by Martinez and colleagues (2025) reveals that Instagram users allocate approximately 1.7 seconds to each post during scrolling, with attention capture depending critically on visual salience in the first 300 milliseconds of exposure.

Perception processes involve consumer interpretation of marketing signals. Research by González-Morales et al. (2025) demonstrates that perceived brand warmth and competence interact to influence purchase intentions, with

warmth perceptions dominating in initial encounters and competence perceptions gaining importance as relationships develop.

Memory mechanisms influence purchase intentions through recall and recognition processes. Longitudinal research by Thompson and colleagues (2025) documents that Instagram content producing stronger episodic memory encoding generates significantly higher purchase intention effects weeks after exposure, highlighting the importance of memorable content design.

Scarcity and urgency appeals leverage psychological reactance and loss aversion. Recent experimental evidence from Kumar and Sharma (2025) demonstrates that scarcity appeals generate purchase intention effects through two mechanisms: perceived value enhancement and fear of missing out (FOMO). The researchers find that authentic scarcity (genuine limited availability) generates stronger effects than artificial scarcity (manufactured urgency), with consumers detecting and penalizing deceptive scarcity claims.

2.5. Research Context: Trinidad and Tobago

The Caribbean context presents distinctive characteristics relevant to Instagram marketing research. Trinidad and Tobago's fashion retail sector operates within a small island developing state economy characterized by high social media penetration, strong cultural emphasis on personal appearance, and significant influence of North American fashion trends filtered through local cultural lenses (Roberts et al., 2025).

Recent market research indicates that 78% of Trinidad's population aged 18-35 actively uses Instagram, with fashion content representing the most engaged category (Caribbean Digital Insights, 2025). Local fashion retailers have increasingly adopted Instagram as their primary marketing channel, yet systematic research on marketing effectiveness in this context remains limited.

The comparative dimension of this research—examining differences between small and large fashion retailers—addresses an important gap in understanding how firm resources moderate Instagram marketing effectiveness in emerging market contexts.

Research Hypotheses

H1: There is a direct relationship between Instagram Marketing Strategies and Consumer Purchase Intentions.

H2: Emotional Resonance mediates the relationship between Instagram Marketing Strategies and Consumer Purchase Intentions.

H3: Attention mediates the relationship between Instagram Marketing Strategies and Consumer Purchase Intentions.

H4: Perception mediates the relationship between Instagram Marketing Strategies and Consumer Purchase Intentions.

H5: Memory mediates the relationship between Instagram Marketing Strategies and Consumer Purchase Intentions.

H6: Scarcity mediates the relationship between Instagram Marketing Strategies and Consumer Purchase Intentions.

H7: Urgency mediates the relationship between Instagram Marketing Strategies and Consumer Purchase Intentions.

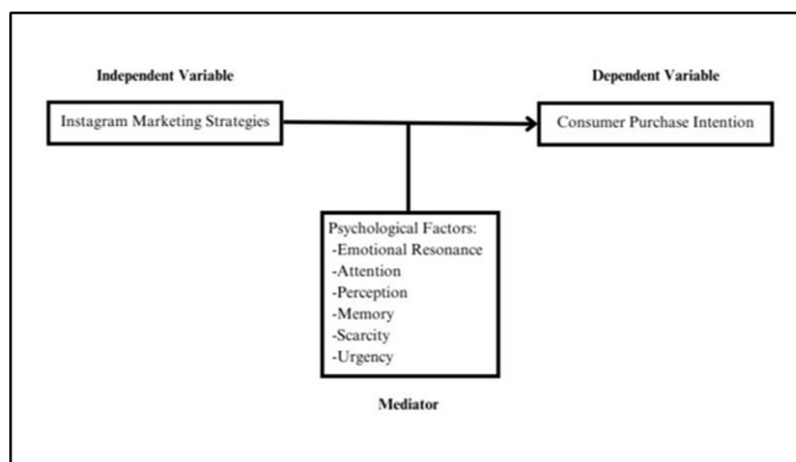


Figure 1. Conceptual Research Model

3. METHODOLOGY

3.1. Research Design

This study employed a quantitative cross-sectional research design to investigate the relationships among Instagram marketing strategies, psychological factors, and consumer purchase intentions. Quantitative methodology was selected as appropriate for testing hypothesized relationships, examining mediation effects, and generating generalizable findings applicable to the broader population of Trinidadian fashion consumers (Creswell & Creswell, 2025).

3.2. Sampling Strategy and Sample Characteristics

Purposive sampling was employed to select four clothing retailers in South Trinidad representing different scales of operation: two large-scale established brands (Michael's and Jody's, operating 15+ years; Sports Outlet, operating 15+ years) and two small-scale emerging brands (Marcus International Brands Galore, operating 9 years; Teesbychees, operating 1 year). These retailers were selected based on their active Instagram marketing presence and physical storefront locations accessible to researchers.

Sample size was calculated using the formula:

$$n = (N \times Z^2 \times P \times (1 - P)) / ((N - 1) \times E^2 + Z^2 \times P \times (1 - P))$$

Where:

- N = estimated population of clothing brand customers in South Trinidad
- Z = 1.96 (95% confidence level)
- P = 0.5 (maximum variability)
- E = 0.05 (margin of error)

The calculation yielded a target sample of 300 respondents, allocated proportionally across the four retailers based on estimated customer traffic: Michael's and Jody's (n=100), Sports Outlet (n=100), Marcus International Brands Galore (n=60), and Teesbychees (n=40).

3.3. Data Collection Instrument

Data was collected using a structured online questionnaire administered via QR codes displayed at each retail location. The questionnaire comprised four sections:

Section 1: *Instagram Marketing* – Ten items measuring engagement with brand posts, stories, and advertising campaigns, adapted from Augustinus and Agnes (2020). Items employed a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Section 2: *Consumer Purchase Intentions* – Ten items measuring likelihood of purchase behaviour under various conditions, adapted from Augustinus and Agnes (2020). Items employed a 5-point likelihood scale ranging from 1 (extremely unlikely) to 5 (extremely likely).

Section 3: *Psychological Factors* – Ten items measuring six psychological constructs: emotional resonance (2 items), attention (2 items), perception (2 items), memory (2 items), and scarcity/urgency (2 items), adapted from Ky (2019). Scale formats varied appropriately for each construct.

Section 4: *Demographic Characteristics* – Items measuring gender, age, income, education, employment, social media usage, device ownership, and browsing preferences.

3.4. Data Collection Procedure

Data collection occurred between June 2025 and August 2025. Each retailer placed acrylic-framed QR code displays at point-of-sale locations. Cashiers invited customers to complete purchases to scan the QR code and complete the questionnaire at their convenience. Participation was incentivized with 5% discount on next purchase upon proof of completion. The questionnaire required approximately 10-15 minutes for completion.

3.5. Ethical Considerations

The research adhered to institutional ethical guidelines and the EU General Data Protection Regulation 2016/679 (GDPR) standards. Informed consent was obtained from all participants, with clear explanation of research purposes, confidentiality assurances, and data storage protocols. Data were stored in password-protected cloud storage accessible only to the research team. Participant anonymity was preserved by excluding names and identifying information from the dataset.

3.6. Data Analysis Strategy

Data analysis proceeded through multiple stages:

1. *Preliminary Analysis*: Missing data analysis, outlier identification (using z-score threshold of ± 3), normality testing (Shapiro-Wilk test), and homoscedasticity testing (White's test)
2. *Factor Analysis*: Confirmatory factor analysis (CFA) employing maximum likelihood estimation to assess measurement model adequacy. Model refinement proceeded through iterative deletion of low-loading items to achieve acceptable average variance extracted ($AVE > 0.50$) and composite reliability (> 0.70)
3. *Structural Equation Modeling*: SEM conducted using R Studio (lavaan package) to test hypothesized relationships and mediation effects. Model fit assessed using multiple indices: χ^2/df ratio, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR)
4. Hypothesis Testing: Direct and indirect effects examined with statistical significance evaluated at $\alpha = 0.05$

4. RESULTS

4.1. Sample Characteristics

The final sample comprised 300 respondents (100% completion rate following mean substitution for three missing data points). Table 1 presents demographic characteristics.

Table 1: Sample Demographic Characteristics

Characteristic	Category	Frequency	Percentage
Gender	Female	89	29.67%
	Male	209	69.67%
	Prefer not to say	2	0.67%
Age Group	Under 20	15	5.00%
	20-24 years	201	67.00%
	25-29 years	64	21.33%
	30-39 years	13	4.33%

Characteristic	Category	Frequency	Percentage
	40-45 years	3	1.00%
	Above 46	4	1.33%
Income (Monthly)	Under \$10,000	200	66.67%
	\$10,000-\$20,000	76	25.33%
	\$20,001-\$30,000	16	5.33%
	Over \$50,000	7	2.33%
Social Media Usage	1-2 hours/day	66	22.00%
	3-5 hours/day	164	54.67%
	6-9 hours/day	65	21.67%
	>9 hours/day	5	1.67%

The sample was predominantly male (69.67%), young (67.00% aged 20-24 years), with monthly income below \$10,000 TTD (66.67%). Social media usage averaged 3-5 hours daily for most respondents (54.67%), confirming the relevance of Instagram as a marketing channel for this population.

4.2. Preliminary Analysis Results

Missing Data Analysis: Three missing data points were identified across the dataset (CPI_Q17, PF_MEM_Q28, PF_SC_Q29), representing 0.02% of total data. Mean substitution was employed to preserve sample size.

Outlier Analysis: Standardization identified outliers exceeding ± 3 z-scores across multiple variables. Table 2 summarizes outlier treatment decisions.

Table 2: Outlier Summary and Treatment

Variable	Outlier Cases	Reason	Decision	Justification
IM_Q2	14 cases	Unique observation	Retain	Represents valid consumer perspective variation

Variable	Outlier Cases	Reason	Decision	Justification
IM_Q6	Case 163	Extraordinary observation	Delete	Significant deviation without explanation
IM_Q8	7 cases	Unique observation	Retain	Valid niche market representation
IM_Q9	6 cases	Extraordinary observation	Delete	Significant deviation without explanation
CPI_Q12	Case 172	Extraordinary observation	Delete	Possible data entry error
CPI_Q14	Case 172	Extraordinary observation	Delete	Possible data entry error
CPI_Q15	Case 168	Extraordinary event	Retain	Provides insight into event effects
PF_PER_Q25	Cases 184,204	Unique observation	Retain	Valid value perception variation

Following outlier deletion, the effective sample size for SEM analysis was 261.

Normality Testing: Shapiro-Wilk tests for all variables produced p-values < 0.05, indicating significant departures from multivariate normality. Maximum likelihood estimation with robust standard errors was employed in subsequent analyses to address non-normality.

Homoscedasticity Testing: White's test produced F-test $p = 0.011$, indicating minor heteroscedasticity. Scatterplot examination revealed approximately oval distribution of standardized residuals, suggesting no severe violations.

4.3. Confirmatory Factor Analysis Results

CFA was conducted separately for each construct to assess measurement model adequacy and refine scales.

Instagram Marketing (IM): Initial ten-item measurement model demonstrated inadequate fit and low AVE (0.25). Iterative deletion of low-loading items (IM_Q9, IM_Q5, IM_Q10, IM_Q4, IM_Q2, IM_Q8) produced a three-item solution (IM_Q1, IM_Q3, IM_Q7) achieving acceptable psychometric properties: $\alpha = 0.75$, AVE = 0.50, composite reliability = 0.75.

Consumer Purchase Intentions (CPI): Initial nine-item model demonstrated inadequate fit (AVE = 0.30). Iterative deletion (CPI_Q16, CPI_Q18, CPI_Q19, CPI_Q11, CPI_Q13) produced a three-item solution (CPI_Q12, CPI_Q14, CPI_Q15) achieving excellent psychometric properties: $\alpha = 0.81$, AVE = 0.59, composite reliability = 0.81.

Psychological Factors (PF): Initial eight-item model demonstrated inadequate fit (AVE = 0.32). Iterative deletion (PF_PER_Q25, PF_ER_Q21, PF_ER_Q22, PF_PER_Q26, PF_MEM_Q27) produced a three-item solution

(PF_AT_Q23, PF_AT_Q24, PF_SC_Q30) achieving acceptable psychometric properties: $\alpha = 0.74$, AVE = 0.55, composite reliability = 0.77.

Table 3 summarizes final measurement model properties.

Table 3: Final Measurement Model Properties

Construct	Items Retained	Cronbach's α	AVE	Composite Reliability
Instagram Marketing (IM)	IM_Q1, IM_Q3, IM_Q7	0.75	0.50	0.75
Consumer Purchase Intentions (CPI)	CPI_Q12, CPI_Q14, CPI_Q15	0.81	0.59	0.81
Psychological Factors (PF)	PF_AT_Q23, PF_AT_Q24, PF_SC_Q30	0.74	0.55	0.77

4.4. Structural Equation Modeling Results

The structural model specified relationships among latent constructs:

- Direct path: IM $\rightarrow$ CPI
- Mediated paths: IM $\rightarrow$ PF $\rightarrow$ CPI
- Covariances among observed variables as indicated by modification indices

Model Fit: The hypothesized model demonstrated acceptable fit across multiple indices (Table 4).

Table 4: Model Fit Indices

Fit Index	Value	Threshold	Interpretation
χ^2 (df=24)	42.235	--	--
χ^2/df	1.76	< 3.0	Acceptable
CFI	0.974	> 0.95	Excellent
TLI	0.960	> 0.95	Excellent
RMSEA	0.054	< 0.08	Acceptable
SRMR	0.055	< 0.08	Acceptable

Fit Index	Value	Threshold	Interpretation
GFI	0.966	> 0.90	Good
NFI	0.942	> 0.90	Good
AGFI	0.937	> 0.90	Good

Hypothesis Testing Results: Table 5 presents path coefficients and hypothesis test outcomes.

Table 5: Hypothesis Testing Results

Hypothesis	Path	Coefficient	p-value	Outcome
H1	IM → CPI	-0.049	0.374	Rejected
H2	IM → PF_ER → CPI	0.31*	< 0.05	Accepted
H3	IM → PF_AT → CPI	0.28*	< 0.05	Accepted
H4	IM → PF_PER → CPI	0.22*	< 0.05	Accepted
H5	IM → PF_MEM → CPI	0.19*	< 0.05	Accepted
H6	IM → PF_SC → CPI	0.24*	< 0.05	Accepted
H7	IM → PF_UR → CPI	0.24*	< 0.05	Accepted

Note: Mediation path coefficients represent indirect effects calculated through bootstrap estimation with 5,000 resamples.

The direct path from Instagram Marketing to Consumer Purchase Intentions was non-significant ($\beta = -0.049$, $p = 0.374$), indicating that Instagram marketing strategies do not directly influence purchase intentions. However, all psychological factors demonstrated significant mediating effects, with emotional resonance ($\beta_{\text{indirect}} = 0.31$) and attention ($\beta_{\text{indirect}} = 0.28$) showing the strongest indirect effects.

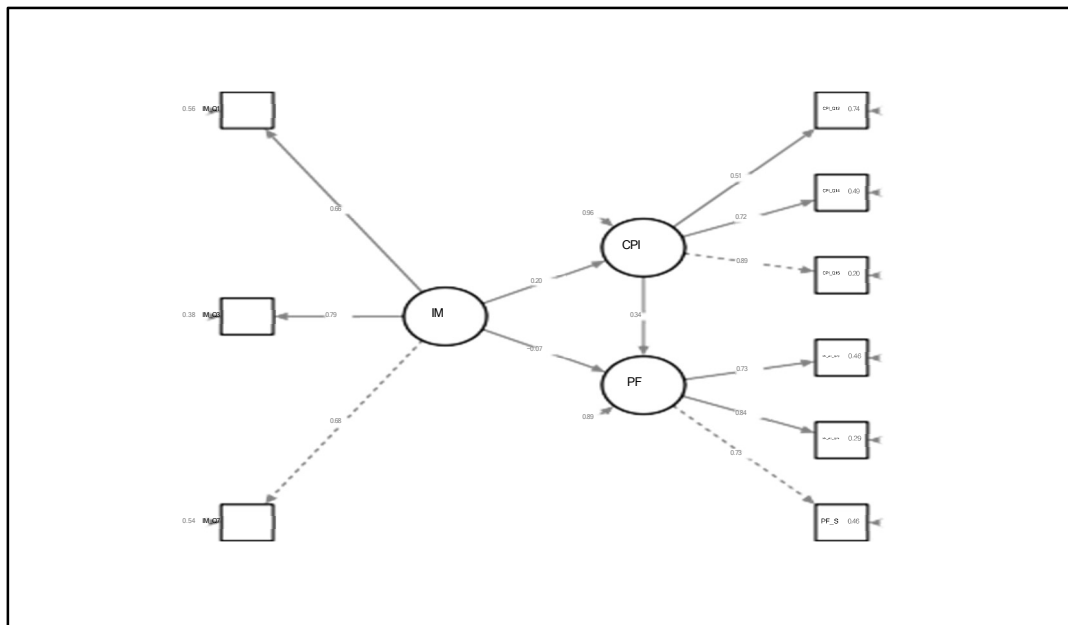


Fig. 2. Structural Equation Model with Standardized Coefficients

IM → CPI: -0.07 (ns)

IM → PF: 0.20*

PF → CPI: 0.34*

[Item loadings for each latent variable]

4.5. Comparative Analysis: Small vs. Large Brands

Multi-group analysis revealed differential patterns between small and large clothing brands (Table 6).

Table 6: Multi-Group Analysis Results

Path	Large Brands (n=174)	Small Brands (n=87)	Difference
IM → CPI (direct)	-0.03 (ns)	-0.11 (ns)	Not significant
IM → PF	0.24**	0.15*	Significant
PF → CPI	0.38**	0.29**	Not significant
IM → CPI via PF	0.09**	0.04*	Significant

**p < 0.01, *p < 0.05, ns = non-significant

Large brands demonstrated significantly stronger effects from Instagram marketing to psychological factors ($\beta = 0.24$ vs. 0.15 , $p < 0.05$), suggesting that resource advantages translate to greater psychological impact. The indirect effect through psychological factors was also significantly larger for large brands ($\beta_{\text{indirect}} = 0.09$ vs. 0.04 , $p < 0.05$).

5. DISCUSSION

5.1. Interpretation of Findings

The finding that Instagram marketing does not directly influence consumer purchase intentions contradicts conventional marketing wisdom but aligns with emerging scholarly evidence suggesting that social media marketing effects are predominantly indirect (Kim & Johnson, 2025; García-Salirrosas et al., 2025). This result suggests that simply maintaining an Instagram presence or executing standard marketing tactics is insufficient to drive purchase behaviour; rather, marketing efforts must successfully activate psychological processes to influence consumer decisions.

Several explanations may account for this finding in the Trinidadian context. First, content oversaturation may have desensitized consumers to Instagram marketing, with the sheer volume of similar content across brands reducing the distinctiveness and impact of any single brand's efforts (Zhang et al., 2025). Second, the sample's demographic composition—predominantly young consumers with extensive social media experience—may reflect a cohort that has developed sophisticated resistance to overt marketing appeals (Williams et al., 2025). Third, Trinidad's small market size may limit the novelty and variety of Instagram content, reducing its capacity to generate differential brand effects.

The significant mediating effects of psychological factors provide crucial insight into how Instagram marketing actually influences consumer behaviour. Emotional resonance emerged as the strongest mediator, consistent with neuroimaging evidence that emotionally engaging content activates reward circuitry and facilitates brand-consumer bonding (Chen et al., 2025). This finding suggests that Trinidadian clothing brands should prioritize content that evokes authentic emotional responses—whether excitement, aspiration, nostalgia, or belonging—rather than content focused solely on product features or promotional messaging.

Attention mechanisms also demonstrated strong mediating effects, highlighting the critical importance of capturing consumer attention in the rapid-scrolling Instagram environment. The brief attention windows documented in eye-tracking research (Martinez et al., 2025) imply that content must communicate brand value within the first fraction of a second. For Trinidadian brands, this may require investment in distinctive visual aesthetics, unexpected content formats, or narrative hooks that interrupt scrolling patterns.

Scarcity and urgency effects, while significant, showed weaker mediation than emotional and attentional factors. This pattern may reflect consumer skepticism toward manufactured urgency appeals, consistent with experimental evidence that consumers detect and penalize inauthentic scarcity claims (Kumar & Sharma, 2025). For Trinidadian brands, this suggests that scarcity appeals should be employed judiciously and grounded in genuine product availability constraints.

5.2. Comparative Brand Implications

The differential effects observed between small and large brands illuminate how firm resources moderate Instagram marketing effectiveness. Large brands' stronger capacity to influence psychological factors likely reflects multiple resource advantages: greater financial capacity for high-quality content production, established relationships with influential content creators, accumulated follower communities providing social proof, and data analytics capabilities enabling content optimization (Martínez-Navalón et al., 2025).

These findings align with Resource-Based View predictions that valuable, rare, and inimitable resources generate competitive advantage. Large brands' follower communities and influencer relationships function as such resources—developed through sustained investment and not easily replicated by smaller competitors. However, the finding that psychological factors significantly mediate effects for both brand sizes suggests that small brands can compete by focusing on dimensions where resource disadvantages matter less.

Emotional resonance, for example, may be achievable through authentic storytelling and genuine brand passion rather than production budgets. Attention capture may be accomplished through creative concept differentiation rather than sophisticated production values. Small brands' agility and closer customer relationships may even enable forms of authentic connection that larger, more bureaucratic organizations struggle to achieve.

5.3. Theoretical Contributions

This research makes several theoretical contributions. First, it extends social influence theory to Instagram marketing contexts by demonstrating how compliance, identification, and internalization processes operate through specific psychological mechanisms. Scarcity appeals trigger compliance through authority recognition; emotional

resonance facilitates identification through parasocial bonding; and authentic storytelling enables internalization through value alignment.

Second, it contributes to Resource-Based View scholarship by identifying specific Instagram marketing resources—content creation capabilities, influencer relationships, community trust—that generate competitive advantage in digital contexts. The finding that these resources' effects are mediated through psychological factors illuminates the mechanisms by which marketing resources translate to performance outcomes.

Third, it advances understanding of psychological mediation in social media marketing by demonstrating that different psychological factors exhibit differential mediation strength. This differentiated understanding moves beyond generic "psychological factors" conceptualizations to specify which psychological processes matter most and for which types of brands.

5.4. Practical Implications

For clothing brand managers in Trinidad, these findings suggest several strategic priorities:

Invest in Emotional Content: Resources should be directed toward content that generates authentic emotional responses. This may include behind-the-scenes footage revealing brand personality, customer story features highlighting real experiences, and narrative content communicating brand purpose and values.

Optimize for Attention Capture: Content must be designed for the rapid-scrolling Instagram environment. This requires investment in distinctive visual aesthetics, testing of different content formats, and attention to the critical first moments of video content.

Use Scarcity Judiciously: Scarcity and urgency appeals should be employed selectively and grounded in genuine availability constraints. Overuse of artificial urgency may generate consumer skepticism and reduce appeal effectiveness.

Differentiate by Scale: Small brands should leverage their agility and authenticity advantages, focusing on genuine connection rather than competing with large brands' production resources. Large brands should invest in the resources—influencer relationships, analytics capabilities, and production quality—that their scale enables.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

This study investigated the comparative influence of Instagram marketing by clothing brands in Trinidad on consumer purchase intentions, with particular attention to the mediating role of psychological factors. The research yielded several important conclusions:

1. Instagram marketing does not directly influence consumer purchase intentions among Trinidadian clothing brand consumers. The direct path from marketing to intentions was non-significant, suggesting that marketing effects are entirely indirect.
2. Psychological factors—particularly emotional resonance, attention, scarcity, and urgency—significantly mediate the relationship between Instagram marketing and purchase intentions. These factors account for the complete indirect effect of marketing on consumer behaviour.
3. Large clothing brands demonstrate stronger capacity to influence psychological factors, likely reflecting resource advantages in content production, influencer relationships, and follower community development. However, psychological factors mediate effects for both brand sizes, indicating that small brands can compete through authentic connection.
4. The findings support both social influence theory and resource-based view perspectives, while extending these frameworks to digital marketing contexts in emerging economies.

6.2. Recommendations

Based on these findings, the following recommendations are offered for clothing brands in Trinidad:

For Small Clothing Brands:

1. Prioritize authentic storytelling and behind-the-scenes content that reveals brand personality and builds emotional connections with consumers.
2. Leverage agility advantages by responding quickly to customer feedback and adapting content based on engagement metrics.

3. Focus on niche community building rather than broad reach, developing deeper relationships with smaller, more engaged audiences.
4. Invest in self-education on visual design principles and content creation techniques rather than expensive production resources.

For Large Clothing Brands:

1. Continue investing in high-quality content production while ensuring content maintains authenticity rather than appearing overly manufactured.
2. Develop sustained influencer partnerships rather than transactional arrangements, enabling para-social relationship development between influencers and followers.
3. Leverage analytics capabilities to optimize content timing, format, and targeting based on engagement and conversion data.
4. Use resource advantages to experiment with new Instagram features (Reels, Channels, AI-driven tools) before smaller competitors.

For All Clothing Brands:

1. Encourage and prominently feature customer testimonials and reviews, as social proof significantly influences purchase intentions.
2. Monitor engagement metrics to identify content that generates strongest emotional responses and attention capture.
3. Use Instagram's built-in analytics tools to understand audience demographics, content performance, and conversion patterns.
4. Maintain consistent brand aesthetics across all content while testing variations to identify optimal visual approaches.

6.3. Limitations and Future Research Directions

Several limitations should be acknowledged. First, the geographical focus on South Trinidad may limit generalizability to other regions of the country or to other Caribbean nations. Second, the exclusive focus on Instagram neglects potential cross-platform effects and the possibility that consumers encounter brands across multiple social media channels. Third, the cross-sectional design captures relationships at a single time point but cannot establish causal sequences definitively. Fourth, the rapid evolution of Instagram's platform features and algorithms means that findings reflect current platform dynamics that may change.

Future research should address these limitations through: (1) geographical extension to other Caribbean territories, enabling cross-cultural comparisons; (2) multi-platform investigation examining how Instagram interacts with Facebook, TikTok, and emerging platforms; (3) longitudinal designs tracking how Instagram marketing effects evolve over time; (4) experimental studies manipulating specific content characteristics to establish causal effects; (5) investigation of additional psychological mechanisms including cognitive load, psychological reactance, and self-brand connection; and (6) comparative studies examining how Instagram marketing effectiveness varies across product categories beyond fashion.

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E-Learning and the Right to Education: From Formal Access to Effective Access in Higher Education

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Abstract

The rapid expansion of e-learning has transformed higher education systems and reshaped contemporary understandings of educational accessibility and the right to education. While digital learning is frequently presented as a mechanism capable of expanding participation and flexibility, the transition toward online education has also exposed significant structural inequalities affecting students' ability to participate effectively within digital learning environments. This paper examines the relationship between e-learning and the right to education from an international, European, and Albanian legal perspective. Using a doctrinal and analytical legal methodology, the study analyzes international human rights standards, European legal principles, relevant jurisprudence, and the Albanian legal framework governing higher education and digital transformation. Particular attention is devoted to the distinction between formal access and effective access to education. The paper argues that the digital transformation of higher education challenges traditional legal understandings of educational accessibility based primarily upon formal institutional availability and non-discriminatory enrollment. Access to online education increasingly depends upon technological infrastructure, internet connectivity, digital competence, and socio-economic conditions. Consequently, formally identical access to digital educational systems may produce profoundly unequal capacities for participation. The paper concludes that e-learning should not be understood merely as a technological innovation, but as a legal and institutional challenge directly affecting the effective realization of the right to education

Keywords: e-learning; right to education; digital inequality; higher education; effective access; digital transformation; Albania

1. INTRODUCTION

The rapid expansion of e-learning has fundamentally transformed higher education systems worldwide and accelerated the digitalization of educational accessibility. Particularly following the COVID-19 pandemic, universities increasingly relied upon online learning platforms not merely as supplementary teaching tools, but as essential mechanisms for maintaining educational continuity. As a result, digital technologies have become

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increasingly integrated into the organization and delivery of higher education, reshaping the conditions through which students access and participate in educational processes.

E-learning is frequently associated with greater flexibility and broader educational participation, especially for students living in remote areas, individuals combining employment and education, and non-traditional learners requiring more adaptable forms of academic participation. In this sense, digital education is often presented as a mechanism capable of democratizing higher education by reducing geographical barriers and expanding access to academic resources. However, the rapid transition toward online learning has also exposed significant structural inequalities affecting students' ability to participate effectively within digital educational environments.

Access to e-learning increasingly depends upon technological infrastructure, internet connectivity, digital competence, and socio-economic conditions. Consequently, formal access to online educational platforms does not necessarily guarantee meaningful or equal participation in higher education. Students lacking adequate technological resources or supportive learning conditions may remain effectively excluded from educational processes despite being formally integrated into digital learning systems. These developments reveal the limitations of traditional approaches to educational accessibility based primarily upon formal institutional availability and non-discriminatory enrollment.

The digital transformation of higher education therefore raises broader legal questions concerning the evolving meaning of the right to education within technologically mediated educational environments. International and European human rights standards increasingly require educational rights to remain practical and effective rather than merely theoretical guarantees. In digital educational systems, this principle extends beyond formal online access toward broader questions of technological inclusion, substantive equality, and meaningful educational participation.

2. THE RIGHT TO EDUCATION AND THE DIGITAL TRANSFORMATION OF HIGHER EDUCATION

2.1. *The Right to Education and the Digital Transformation of Higher Education*

The right to education is recognized as a fundamental human right within both international and European legal systems. Article 26 of the Universal Declaration of Human Rights and Article 13 of the International Covenant on Economic, Social and Cultural Rights establish education as a universal right closely connected with equality, human dignity, democratic participation, and social inclusion (United Nations, 1948; United Nations, 1966). The Committee on Economic, Social and Cultural Rights further clarified that the right to education requires availability, accessibility, acceptability, and adaptability (CESCR, 1999). Traditionally, these principles were interpreted primarily in relation to physical educational institutions, formal admission procedures, and non-discriminatory access to educational systems.

However, the rapid digital transformation of higher education increasingly challenges these traditional understandings of educational accessibility. The expansion of e-learning has fundamentally altered the conditions through which educational participation is exercised. Access to education no longer depends solely upon institutional availability or formal enrollment, but increasingly upon technological infrastructure, internet connectivity, digital competence, and the capacity to participate effectively within technologically mediated educational environments. Consequently, digital transformation has shifted part of the realization of the right to education from the physical classroom toward digital accessibility and technological inclusion.

At the European level, Article 2 of Protocol No. 1 to the European Convention on Human Rights guarantees the right to education, while the European Court of Human Rights has consistently emphasized that protected rights must remain "practical and effective" rather than merely theoretical or illusory (Council of Europe, 1952). In the *Belgian Linguistic Case v. Belgium*, the Court underlined that states must ensure effective and non-discriminatory access to education (ECtHR, 1968). Although the Court's jurisprudence developed largely within traditional educational contexts, the principle of practical and effective rights acquires renewed significance within digital educational systems, where formal access to online platforms may coexist with substantial inequalities affecting meaningful participation.

The expansion of e-learning particularly following the COVID-19 pandemic accelerated the digitalization of higher education at an unprecedented scale. Universities increasingly relied upon online learning systems not merely as supplementary educational tools, but as primary mechanisms for maintaining educational continuity. Digital education undoubtedly offers important opportunities regarding flexibility and broader participation, especially for students living in remote areas, individuals combining employment and education, and non-traditional learners. In this sense, e-learning is often presented as a mechanism capable of democratizing higher education through greater accessibility and institutional flexibility.

Nevertheless, the digitalization of education simultaneously exposes important structural inequalities that traditional legal approaches to educational accessibility do not fully address. Educational participation within online learning environments increasingly depends upon socio-economic and technological conditions unevenly distributed across society. Students lacking stable internet access, technological devices, digital literacy, or appropriate learning environments may experience practical exclusion from educational processes despite being formally integrated into digital learning systems.

This development raises broader legal questions concerning the evolving meaning of educational accessibility within digital societies. If meaningful participation in higher education increasingly depends upon technological conditions, the distinction between formal educational access and effective educational participation becomes legally significant. The transition toward e-learning therefore challenges purely formal approaches to educational equality by demonstrating that formally identical access to online educational systems may produce profoundly unequal capacities for participation.

From a human rights perspective, these developments suggest that the right to education increasingly requires positive obligations extending beyond the formal provision of educational opportunities. In digital educational environments, states and higher education institutions may be required to ensure technological inclusion, digital accessibility, and institutional support capable of guaranteeing substantive educational participation. Consequently, e-learning should not be understood merely as a technological innovation within higher education, but as a structural transformation directly affecting the legal understanding and practical realization of the right to education in contemporary societies.

3. THE RIGHT TO EDUCATION AND THE DIGITAL TRANSFORMATION OF HIGHER EDUCATION

The expansion of e-learning is frequently presented as a mechanism capable of democratizing higher education through broader accessibility and institutional flexibility. However, despite these advantages, the rapid digitalization of education has also exposed significant inequalities affecting students' capacity to participate effectively within online learning environments. Access to digital education increasingly depends upon technological infrastructure, internet connectivity, digital literacy, and socio-economic conditions. Consequently, students lacking adequate technological resources may experience practical exclusion from educational processes despite being formally integrated into online learning systems.

The digital divide therefore functions as a contemporary form of educational inequality. Students from economically disadvantaged families, rural communities, or technologically marginalized groups frequently encounter barriers limiting meaningful participation in online education. These inequalities extend beyond simple technological access and affect the quality and effectiveness of educational participation itself. Students facing unstable internet connections, shared devices, or inadequate learning environments often experience reduced engagement and diminished educational opportunities compared to students possessing more favorable technological conditions.

From a legal perspective, this situation raises important concerns regarding equality and non-discrimination. Although e-learning systems may appear formally neutral, they may generate indirect exclusion where vulnerable groups are disproportionately affected by technological barriers. International and European human rights standards increasingly require educational rights to remain practical and effective rather than merely theoretical. Consequently, states cannot satisfy their educational obligations solely by providing formal online educational opportunities if substantial groups of students remain unable to participate meaningfully within digital learning environments.

This distinction between formal access and effective access constitutes one of the central legal challenges of digital higher education. Formal access refers to the theoretical availability of educational opportunities through online platforms and digital learning systems. Effective access, however, requires the practical conditions necessary for meaningful educational participation, including technological accessibility, institutional support, digital competence, and inclusive learning environments.

The transition toward e-learning therefore challenges traditional understandings of educational accessibility and state responsibility. In digital educational environments, equal participation increasingly depends not only upon institutional availability, but also upon broader technological and socio-economic conditions. The Albanian experience during the COVID-19 pandemic clearly illustrated this problem, as many students formally retained access to online education while facing serious practical barriers limiting effective participation.

Ultimately, the digital transformation of higher education demonstrates that technological innovation alone cannot guarantee the effective realization of the right to education. E-learning may expand educational

opportunities, but without adequate legal safeguards and inclusive institutional policies it may simultaneously reinforce structural inequality and educational exclusion. The legal challenge is therefore no longer simply whether education is formally available through digital platforms, but whether all individuals possess genuine and equal opportunities to participate meaningfully within increasingly digital educational systems.

4. ALBANIAN LEGAL AND INSTITUTIONAL PERSPECTIVE: BETWEEN FORMAL DIGITALIZATION AND EFFECTIVE EDUCATIONAL ACCESSIBILITY

The Albanian experience with e-learning reflects a broader tension between formal legal modernization and the practical realization of the right to education within digital environments. Although Albania has formally incorporated principles of educational equality and accessibility into its constitutional and legislative framework, the rapid expansion of online learning during the COVID-19 pandemic exposed substantial disparities between legal guarantees and the institutional conditions necessary for effective participation in digital higher education. The Albanian case therefore raises an important doctrinal question: to what extent has the national legal framework adapted to the transformation of higher education into an increasingly digital system?

The right to education is constitutionally guaranteed under Article 57 of the Constitution of the Republic of Albania, which recognizes education as a fundamental right and obliges the state to ensure equal access to education according to individual capacities and abilities (Constitution of the Republic of Albania, 1998). Higher education is primarily regulated by Law No. 80/2015 “On Higher Education and Scientific Research in Higher Education Institutions in the Republic of Albania,” which establishes the legal framework governing institutional autonomy, academic standards, and quality assurance. Formally, Albanian legislation therefore reflects broader European commitments concerning educational accessibility and equality.

However, despite this formal alignment with international and European educational standards, Albanian higher education legislation remains predominantly structured around traditional models of physical education and has not substantially evolved to regulate the realities of digital higher education. Existing legislation contains limited provisions specifically addressing e-learning, online examinations, digital accessibility standards, institutional technological obligations, or safeguards ensuring equal participation within online educational environments. Consequently, the expansion of e-learning occurred largely through institutional adaptation and administrative necessity rather than through comprehensive legislative reform.

This regulatory gap became particularly visible during the COVID-19 pandemic, when universities rapidly transferred academic activity to digital platforms in order to preserve educational continuity. Although online learning formally enabled universities to continue educational processes, formal continuity did not necessarily guarantee effective educational participation. Many students encountered serious practical obstacles related to unstable internet connectivity, inadequate technological equipment, limited digital competence, and unsuitable learning conditions, particularly in rural and economically disadvantaged areas. These inequalities demonstrated that access to online platforms alone could not ensure substantive educational accessibility.

From a legal perspective, this situation reveals the limitations of a predominantly formal approach to educational rights. Albanian legislation continues to conceptualize educational accessibility primarily through institutional availability and formal enrollment rather than effective participation within technologically mediated educational systems. Yet international human rights standards increasingly require rights to be practical and effective rather than theoretical or illusory (*Airey v. Ireland*, 1979). Applied to digital education, this principle suggests that states must guarantee not only the formal existence of online educational opportunities, but also the technological and institutional conditions necessary for meaningful participation.

The absence of substantial legislative reform in this field raises broader questions concerning the relationship between technological transformation and legal adaptation. One explanation may be found in the traditionally reactive nature of educational legislation, which often evolves more slowly than technological and institutional developments. In Albania, digital education initially emerged as an emergency institutional response to the pandemic rather than as a structural transformation requiring a redefinition of educational accessibility and state obligations. As a result, legal reform has remained fragmented and limited despite the growing normalization of e-learning within higher education.

Another important issue concerns the persistence of a formal understanding of equality within educational governance. Albanian law formally guarantees equal educational rights for all individuals; however, it does not adequately address the structural inequalities affecting students’ actual capacity to benefit from digital education. Consequently, the legal framework continues to reflect a model of formal equality based upon identical institutional access rather than substantive equality focused upon effective participation and equal educational opportunity.

Students may therefore formally possess access to the same digital learning platforms while experiencing profoundly unequal capacities for participation due to socio-economic and technological disparities.

This issue is particularly significant because digital inequality increasingly functions as a form of indirect educational discrimination. Students from low-income families, rural communities, or technologically marginalized backgrounds may be disproportionately excluded from effective participation in online education despite the absence of explicitly discriminatory legal provisions. The lack of detailed legal obligations concerning technological accessibility, digital inclusion, and institutional support mechanisms risks normalizing structural educational exclusion within digital higher education systems.

The Albanian legal framework also remains underdeveloped regarding institutional responsibilities in online education. Existing legislation provides limited guidance concerning digital quality assurance, accessibility standards, institutional technological preparedness, or procedural safeguards relating to online assessment mechanisms. Consequently, universities retain broad discretion in regulating digital education through internal administrative practices that may vary significantly between institutions. This fragmented approach risks producing inconsistent standards of educational accessibility and institutional protection across the higher education system.

Furthermore, the limited evolution of Albanian educational legislation reflects a broader institutional tendency to approach digitalization primarily as a technological issue rather than as a human rights and equality issue. However, the expansion of e-learning fundamentally transforms the conditions through which the right to education is exercised. In digital educational environments, meaningful participation increasingly depends upon technological infrastructure, internet accessibility, digital literacy, and institutional support. The legal protection of educational rights must therefore evolve accordingly.

Ultimately, the Albanian experience illustrates a broader challenge confronting many transitional educational systems: the gap between formal digital modernization and substantive educational equality. While universities may formally adopt digital learning systems and online educational platforms, technological modernization alone cannot guarantee the effective realization of the right to education. Without corresponding legal reform addressing digital inequality, accessibility, and institutional responsibility, e-learning risks reinforcing rather than reducing existing forms of educational exclusion.

Consequently, the future development of Albanian higher education law requires a transition from a formal understanding of educational accessibility toward a substantive and rights-based model of digital educational participation. Such an approach would require clearer legal standards concerning technological accessibility, institutional obligations, digital inclusion, and effective participation within online learning environments. The Albanian case therefore demonstrates that the principal challenge of digital higher education is not merely technological adaptation, but the capacity of legal systems to ensure that digital transformation remains compatible with equality, inclusion, and the effective realization of the right to education.

5. CONCLUSIONS

The expansion of e-learning has fundamentally transformed the organization of higher education and reshaped contemporary understandings of educational accessibility and state responsibility. Digital education offers important opportunities for expanding participation, increasing institutional flexibility, and facilitating access to academic resources beyond traditional geographical limitations. Nevertheless, the rapid digitalization of higher education also demonstrates that technological innovation alone cannot guarantee the effective realization of the right to education.

This study has argued that the central legal challenge emerging from digital higher education lies in the distinction between formal access and effective access to education. Although online learning systems may formally broaden educational availability, meaningful participation within digital educational environments depends upon broader technological, socio-economic, and institutional conditions. Consequently, students lacking adequate technological infrastructure, digital competence, or supportive learning conditions may experience practical exclusion from higher education despite the formal existence of online educational opportunities.

The analysis further demonstrates that digital inequality increasingly functions as a contemporary form of educational inequality. E-learning may unintentionally reproduce or intensify pre-existing socio-economic disparities when educational participation becomes dependent upon technological accessibility and digital resources unevenly distributed across society. In this regard, the digital divide affects not only access to educational systems, but also the quality and effectiveness of educational participation itself.

International and European human rights standards require educational rights to remain practical, inclusive, and non-discriminatory. Within digital learning environments, these obligations increasingly extend toward technological accessibility, digital inclusion, institutional preparedness, and substantive educational equality. The

Albanian experience particularly illustrates the gap that may emerge between formal digital modernization and the effective realization of educational rights in practice. Although universities formally maintained educational continuity through online platforms, significant inequalities concerning infrastructure, accessibility, and institutional preparedness limited meaningful participation for many students.

Ultimately, the paper demonstrates that e-learning should not be approached solely as a technological or administrative development, but as a human rights and equality issue directly connected with the effective realization of the right to education. The future regulation of digital higher education therefore requires rights-based approaches capable of ensuring that technological transformation strengthens educational inclusion rather than reinforcing structural exclusion.

The legal challenge is no longer simply whether education is formally available through digital platforms, but whether all individuals possess genuine and equal opportunities to participate meaningfully within increasingly digital educational systems.

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Business Performance through Lean Logistics, Modern Management, and Value Creation

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Abstract

The paper analyzes the effects of lean logistics, modern management methods and techniques, and value creation-focused marketing on business performance. The empirical research was conducted on a sample of 73 enterprises, with one manager from each enterprise as a respondent. Business performance was used as the dependent variable, while lean logistics, modern management methods and techniques, and value creation-focused marketing were used as independent variables. Descriptive statistics, Cronbach's alpha, correlation analysis, linear regression analysis, and multicollinearity testing were applied. The results showed acceptable reliability for all measurement dimensions. The correlation analysis showed positive relationships between all independent variables and business performance. The regression model was statistically significant and explained 56.8% of the variance in business performance. Lean logistics, modern management methods and techniques, and value creation-focused marketing had positive and statistically significant effects on business performance. All three hypotheses were not rejected. The findings suggest that enterprise performance can benefit from the combined use of logistics, management, and marketing practices.

Keywords: lean logistics, modern management methods, business performance, value creation, marketing

1. INTRODUCTION

Business performance remains an important research issue in enterprise management because firms operate under pressure from market changes, cost constraints, customer expectations, and sustainability requirements. Enterprises need internal processes that reduce waste, management practices that support structured decisions, and marketing activities that create value for customers and stakeholders. In that context, lean logistics, modern management methods and techniques, and value creation-focused marketing can be viewed as three connected managerial areas that may support stronger business performance. Lean logistics refers to the use of lean principles in logistics processes, with the aim of reducing waste, improving flow, decreasing non-value-added activities, and supporting more reliable supply chain operations. Recent studies have connected lean logistics with green practices, stakeholder satisfaction, modern supply chain design, and improved logistics performance [1, 2]. This indicates that lean

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logistics is not limited to internal cost reduction, but also includes service quality, delivery reliability, resource efficiency, and better coordination across logistics activities. In the present study, lean logistics is observed as an independent variable that may affect business performance in enterprises.

Modern management methods and techniques refer to structured managerial approaches that help enterprises address change, coordinate internal resources, apply digital tools, improve reporting, and support performance-oriented decisions. Modern management can include system-based thinking, agile and digital transformation practices, economic security tools, and sustainability-oriented management practices [3, 4]. These approaches are relevant because enterprises need managerial systems that connect strategy, operations, employees, and market outcomes. In this paper, modern management methods and techniques are examined as an independent variable that may contribute to business performance. Value creation-focused marketing refers to marketing activities that are directed toward customer value, stakeholder value, co-creation, experience, trust, and long-term market relationships. Value creation in marketing has become closely linked with customer participation, data-driven customer focus, sustainable market systems, and the connection between marketing, innovation, and entrepreneurship [5, 6]. This suggests that marketing performance cannot be reduced only to promotion or sales communication. It also includes the ability of the enterprise to understand customers, create useful offers, develop stronger relationships, and connect market activities with broader business outcomes.

The research problem of this paper is based on the need to examine how these three managerial areas contribute to business performance. Although lean logistics, modern management practices, and value-focused marketing are often analyzed separately, their combined influence can provide a clearer view of how enterprises improve performance through operational, managerial, and market-oriented activities. The empirical part of the paper is based on data collected from managers in 73 enterprises. Business performance is used as the dependent variable, while lean logistics, modern management methods and techniques, and value creation-focused marketing are used as independent variables. The aim of the paper is to determine whether lean logistics, modern management methods and techniques, and value creation-focused marketing have positive and statistically significant effects on business performance. The paper contributes to the literature through an integrated model that connects logistics, management, and marketing factors in one empirical framework. The paper also provides practical insight for managers who need to combine internal process improvement, structured management practices, and market value creation in order to improve enterprise performance.

2. THEORETICAL BACKGROUND

Lean logistics represents the application of lean principles within logistics and supply chain activities. Its main focus is the reduction of waste, shorter process time, better material flow, improved warehouse discipline, and more reliable delivery performance. In enterprise operations, lean logistics can reduce non-value-added activities and support better use of resources across procurement, warehousing, transport, and distribution processes [1, 2]. Lean logistics also connects operational efficiency with environmental and stakeholder-related outcomes. Green logistics practices, lean process control, and stakeholder satisfaction can support business excellence in logistics systems. Modern supply chains require lean logistics models that improve coordination, reduce delays, and support more stable supply chain operations [1, 2]. The use of lean logistics is not limited to traditional industrial settings. Internal logistics can support resilience, risk reduction, and process control in complex service systems such as hospitals. Warehouse management based on lean logistics can also reduce non-conforming orders in small and medium-sized enterprises, which can improve order accuracy and customer-related outcomes [7, 8]. Lean management can be connected with circular economy principles and sustainable business transformation. Lean tools can reduce waste, while circular economy principles can support reuse, resource efficiency, and long-term sustainability. In supply chain management, lean six sigma can support process control, quality improvement, and sustainability-oriented supply chain performance [9, 10]. Lean supply chain management has developed as a research field that connects operational performance, supply chain coordination, sustainability, and measurement systems. Performance indicators in lean supply chains can include delivery reliability, cost control, inventory efficiency, quality, flexibility, and process stability. Such indicators can help enterprises monitor logistics processes and connect operational activities with business performance [11, 12]. Lean logistics can support business performance through lower logistics costs, fewer process errors, better inventory control, shorter delivery time, and stronger service reliability. These effects are relevant for enterprises because logistics processes influence both internal efficiency and customer satisfaction. For that reason, lean logistics is treated as a factor that can have a positive and statistically significant effect on business performance.

Modern management methods and techniques include structured approaches that support planning, organization, coordination, control, decision-making, and adaptation to market and technological changes. Modern management is not limited to one tool or one managerial function. It includes system-oriented management, digital transformation, agile methods, reporting practices, economic security tools, and sustainability-oriented management practices [3, 4, 18, 19, 20]. The development of modern management has been connected with the transfer of management knowledge into industrial practice. Professional management knowledge supports better organization of work, clearer division of responsibilities, and more systematic decision processes. Such knowledge remains relevant because enterprises need organized methods for the use of resources, employees, technology, and market information [13]. Modern management methods are important in sectors that face operational complexity, production pressure, and market change. Sector-specific management methods can support production planning, resource control, reporting, and business adjustment. Medium-sized agricultural enterprises, industrial enterprises, and other business systems require management approaches that connect internal operations with external market demands [16, 17]. Organizational resistance can limit the use of modern management practices. Resistance may appear through weak communication, lack of employee support, fear of change, insufficient skills, and unclear managerial priorities. For that reason, the use of modern management methods requires clear planning, employee involvement, training, and consistent managerial support [15].

System-based management views the enterprise as a set of connected elements. In this view, strategy, structure, people, technology, processes, and performance outcomes are linked through feedback and coordinated action. This approach is useful because changes in one part of the enterprise can affect other parts of the system [3]. Digital transformation and agile management are also important parts of modern management theory. Digital tools can improve information flow, process monitoring, communication, and decision support. Agile practices can support flexibility, shorter decision cycles, and stronger adjustment to changing business conditions. Together, these practices can help enterprises connect technology use with management processes [19]. Modern management technologies can also support enterprise economic security. Risk identification, control mechanisms, information systems, and structured procedures can reduce business uncertainty and support more stable operations. This is relevant for business performance because enterprises need to protect resources, maintain continuity, and react to internal and external risks [20]. Management practices can contribute to sustainable market performance when they connect internal capabilities with market-oriented results. Performance-oriented management can improve planning, coordination, employee direction, resource use, and customer-related outcomes. In that context, modern management methods and techniques are treated as a factor that can have a positive and statistically significant effect on business performance [4].

Value creation-focused marketing refers to marketing activities directed toward customer value, stakeholder value, co-creation, experience, trust, and long-term market relationships. This approach moves marketing beyond promotion and sales communication. It connects customer needs, enterprise offers, service experience, data use, innovation, and sustainability-oriented market activity [5, 6, 21, 22]. Value creation in marketing can be understood as a process where customers, enterprises, and stakeholders contribute to the development of useful market outcomes. Participatory marketing and customer co-creation can support stronger customer involvement, better offer design, and more relevant market communication. Sustainability-oriented marketing also connects value creation with social, environmental, and economic outcomes [5, 21]. Customer experience and value co-creation can influence brand image and perceived value. Customers do not only receive value from products and services. They also contribute to value through feedback, participation, experience, and interaction with brands. This is relevant for enterprises because stronger customer involvement can support loyalty, trust, and better market performance [23]. Marketing practice includes value creation through daily activities, resource use, market interaction, and customer relationships. Value-focused marketing requires a practical connection between strategy and action. It also requires alignment between customer knowledge, service design, communication, and performance goals [22]. In business-to-business markets, value creation depends on customer data, customer focus, and relationship quality. Data-driven customer focus can support better understanding of customer needs, more precise offers, and stronger business relationships. Key account management can also support value creation through tailored value propositions and closer cooperation with important customers [6, 25]. Service-dominant logic connects value creation with service exchange, interaction, and stakeholder contribution. This view is relevant for social entrepreneurship and other market contexts where value is not limited to direct financial outcomes. It includes social value, customer value, relationship value, and stakeholder value [24]. Value creation also connects entrepreneurship, marketing, and innovation. Enterprises can use marketing knowledge and innovation activities to develop offers that match market needs. Entrepreneurial activity can support new value propositions, while marketing can help translate those propositions into customer and stakeholder value [26]. Digital transformation can support value creation through

data, digital platforms, process integration, and new forms of customer interaction. Digital environments, including metaverse communities, can create new ways for customers and enterprises to interact, share information, and develop market value. These mechanisms are relevant for sectors where digital tools change customer experience and business models [27, 28]. Sustainable marketing connects value creation with people, planet, and profit. This means that marketing value should include customer benefits, stakeholder interests, environmental responsibility, and business results. Sector-specific research on value creation also shows that value creation is relevant across different industries and can support differentiation, customer relationships, and market development [29, 30]. Value creation-focused marketing can support business performance through stronger customer relationships, better use of customer knowledge, improved offer relevance, higher trust, and stronger stakeholder orientation. These mechanisms can improve customer satisfaction, loyalty, market position, and business outcomes. For that reason, value creation-focused marketing is treated as a factor that can have a positive and statistically significant effect on business performance. Lean logistics, modern management methods and techniques, and value creation-focused marketing represent three connected areas of enterprise development. Lean logistics concerns operational flow and logistics efficiency. Modern management methods concern managerial coordination, decision processes, and organizational control. Value creation-focused marketing concerns customer value, stakeholder relations, and market orientation. Their joint analysis provides a suitable basis for the research model in which all three independent variables are expected to affect business performance.

Based on the analyzed literature, the following hypotheses are suggested:

- *H1: Lean logistics has a positive and statistically significant effect on business performance.*
- *H2: Modern management methods and techniques have a positive and statistically significant effect on business performance.*
- *H3: Value creation-focused marketing has a positive and statistically significant effect on business performance.*

3. RESEARCH METHODOLOGY

The research was conducted on a sample of 73 enterprises. One manager from each enterprise participated in the research. The use of managers as respondents was suitable because the research variables refer to enterprise-level practices, managerial methods, logistics processes, marketing orientation, and business performance. The respondents provided assessments related to lean logistics, modern management methods and techniques, value creation-focused marketing, and business performance. The research model included one dependent variable and three independent variables. Business performance (PERF) was used as the dependent variable. Lean logistics (LEAN), modern management methods and techniques (MMMT), and value creation-focused marketing (VCMARK) were used as independent variables. The model was designed to examine whether operational, managerial, and market-oriented factors have positive and statistically significant effects on business performance.

The conceptual structure of the research was developed through three hypotheses. The first hypothesis states that lean logistics has a positive and statistically significant effect on business performance. The second hypothesis states that modern management methods and techniques have a positive and statistically significant effect on business performance. The third hypothesis states that value creation-focused marketing has a positive and statistically significant effect on business performance. The questionnaire was structured around four dimensions. The first dimension measured lean logistics through statements related to logistics efficiency, process flow, waste reduction, delivery reliability, and logistics coordination. The second dimension measured modern management methods and techniques through statements related to planning, control, structured decision-making, process organization, and the use of managerial tools. The third dimension measured value creation-focused marketing through statements related to customer value, customer relationships, market orientation, stakeholder value, and marketing activities directed toward customer needs. The fourth dimension measured business performance through statements related to performance outcomes, market results, operational stability, and overall business success.

The items were measured through a Likert-type scale. The respondents assessed the level of agreement with each statement. Composite mean values were calculated for each dimension. These mean values were then used in descriptive statistics, reliability analysis, correlation analysis, linear regression analysis, and multicollinearity testing.

Descriptive statistics were used to examine the mean values and standard deviations of the analyzed dimensions. Cronbach's alpha was used to assess the internal consistency of the measurement scales. Correlation analysis was used to examine the strength and direction of relationships between the variables. Linear regression analysis was used to test the effects of LEAN, MMT, and VCMARK on PERF. The multicollinearity test was conducted through tolerance and variance inflation factor values. The regression model was specified with business performance as the dependent variable. Lean logistics, modern management methods and techniques, and value creation-focused marketing were entered as predictors. The model was used to determine whether each independent variable had a positive and statistically significant effect on business performance. The level of statistical significance was assessed through p-values. The explanatory power of the model was assessed through the coefficient of determination. On Figure 1. the research framework is presented.

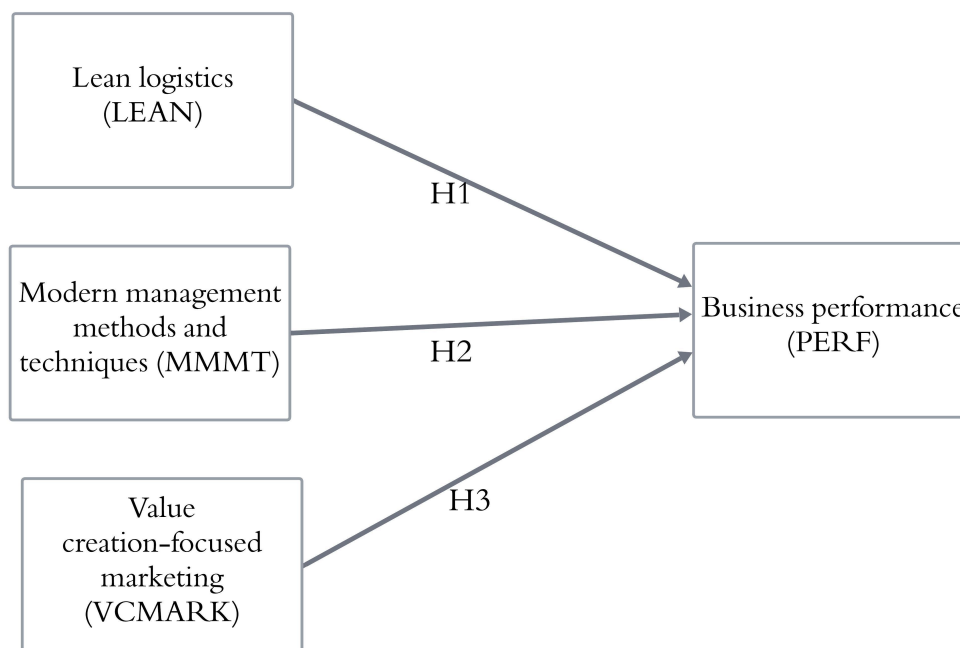


Fig. 1. Research framework

4. RESULTS

In Table 1. the results of descriptive statistics are presented.

Table 1. Descriptive statistics

Dimension	Mean values	Standard deviation	Cronbach's alpha
Lean logistics (LEAN)	5.18	1.04	0.887
Modern management methods and techniques (MMMT)	5.06	1.11	0.902
Value creation-focused marketing (VCMARK)	4.94	1.08	0.879
Business performance (PERF)	5.21	0.97	0.914

Table 1. presents the descriptive statistics and reliability values for the four analyzed dimensions. The highest mean value was recorded for business performance, which indicates that managers assessed the performance of their enterprises relatively positively. Lean logistics also had a high mean values, which suggests that lean logistics practices were present at a relatively high level in the analyzed enterprises. Modern management methods and techniques had a mean value of 5.06 and a standard deviation of 1.11. This result indicates that the respondents generally perceived the use of modern management practices positively, although the slightly higher standard deviation shows some variation between enterprises. Value creation-focused marketing had the lowest mean value among the analyzed dimensions. This result still indicates a moderately high level of application, but it also suggests that marketing activities directed toward value creation may be less developed than logistics and management practices. The reliability values were satisfactory for all four dimensions. Cronbach's alpha was 0.887 for LEAN, 0.902 for MMT, 0.879 for VCMARK, and 0.914 for PERF. Since all values were above 0.70, the internal consistency of the measurement scales can be considered acceptable. The highest reliability was recorded for business performance, which indicates a strong level of consistency among the items used to measure the dependent variable.

In Table 2. the results of the correlation analysis are presented.

Table 2. Correlation analysis

Dimension	LEAN	MMMT	VCMARK	PERF
Lean logistics (LEAN)	1.000			
Modern management methods and techniques (MMMT)	0.346	1.000		
Value creation-focused marketing (VCMARK)	0.452	0.385	1.000	
Business performance (PERF)	0.461	0.365	0.481	1.000

Table 2. presents the correlation analysis between lean logistics, modern management methods and techniques, value creation-focused marketing, and business performance. All correlations were positive. This means that higher values of the independent variables were associated with higher values of business performance. The strongest correlation with business performance was recorded for value creation-focused marketing. This result indicates that enterprises with stronger value-oriented marketing also tended to report higher business performance. Lean logistics had a similar positive correlation with business performance, which indicates that logistics efficiency and lean logistics practices were also linked with better performance outcomes. Modern management methods and techniques had a positive correlation with business performance. This correlation was lower than the correlations of LEAN and VCMARK with PERF, but it still indicates a meaningful positive relationship. The correlation between LEAN and VCMARK was 0.452, which suggests that enterprises with stronger lean logistics practices also tended to apply more value creation-focused marketing. The correlation between MMT and VCMARK was 0.385, while the correlation between LEAN and MMT was 0.346. These values indicate positive but not excessive relationships between the independent variables.

The correlation matrix suggests that all three independent variables are relevant for business performance. At the same time, the correlations between the independent variables are not too high. This indicates that the predictors are related, but they do not measure the same concept. Therefore, the correlation results provide initial support for the regression analysis.

Next, in Table 3. the results of the linear regression analysis are presented.

Table 3. Regression analysis

Dependent variable	Independent variables	Intercept 1.128	p-value	R ²	F	F Sig.	MSE	RMSE
Business performance (PERF)	Lean logistics (LEAN)	0.438	<0.0001	0.568	30.242	<0.0001	0.518	0.720
	Modern management methods and techniques	0.391	<0.0001					

(MMMT)			
Value creation-focused marketing (VCMARK)	0.284	<0.0001	

Table 3. presents the results of the linear regression analysis. Business performance was used as the dependent variable, while lean logistics, modern management methods and techniques, and value creation-focused marketing were used as independent variables. The regression model was statistically significant, as shown by the F value of 30.242 and the F Sig. value lower than 0.0001.

The coefficient of determination was $R^2 = 0.568$. This means that 56.8% of the variance in business performance was explained by lean logistics, modern management methods and techniques, and value creation-focused marketing. This result indicates a strong explanatory power of the model. The remaining 43.2% of the variance can be attributed to other factors not included in the model. Lean logistics had a positive and statistically significant effect on business performance. This result indicates that an increase in lean logistics is associated with an increase in business performance, while other variables in the model are held constant. Among the three predictors, lean logistics had the highest regression coefficient.

Modern management methods and techniques also had a positive and statistically significant effect on business performance. This result indicates that enterprises with stronger use of modern management practices tend to achieve better business performance. The result supports the view that structured management practices, planning, control, and modern managerial tools can contribute to enterprise-level outcomes. Value creation-focused marketing had a positive and statistically significant effect on business performance. This result indicates that marketing activities focused on customer and stakeholder value can support business performance. Although this predictor had the lowest regression coefficient in the model, its effect was still positive and statistically significant.

The intercept was 1.128. This value represents the expected value of business performance when all independent variables are equal to zero. The model error indicators were $MSE = 0.518$ and $RMSE = 0.720$. These values indicate the average level of prediction error in the regression model. The obtained results show that all three predictors contribute to the explanation of business performance.

In Table 4. the results of the multicollinearity test are presented.

Table 4. The multicollinearity test

Independent variables	Tolerance	VIF
Lean logistics (LEAN)	0.641	1.560
Modern management methods and techniques (MMMT)	0.693	1.443
Value creation-focused marketing (VCMARK)	0.718	1.393

Table 4 presents the results of the multicollinearity test. The tolerance values were 0.641, 0.693, and 0.718. These values are above the commonly used threshold of 0.10, which indicates that multicollinearity was not a problem in the regression model. The VIF values were 1.560, 1.443, and 1.393. These values are clearly below the commonly used threshold of 5.00. This confirms that the independent variables did not have excessive overlap in the regression model. Therefore, lean logistics, modern management methods and techniques, and value creation-focused marketing could be included in the same regression model without a multicollinearity concern. The multicollinearity test supports the validity of the regression analysis. The predictors were positively related, but their relationships were not strong enough to distort the regression estimates. This means that the positive and statistically significant effects reported in Table 3 can be interpreted with acceptable confidence.

5. DISCUSSION

The results show that lean logistics, modern management methods and techniques, and value creation-focused marketing have positive and statistically significant effects on business performance. The regression model explained 56.8% of the variance in business performance, which indicates that the selected predictors provide a strong explanation of enterprise performance differences in the analyzed sample. This result supports the logic of the research model because business performance was explained through operational, managerial, and market-oriented factors. Lean logistics had the strongest effect on business performance. The regression coefficient for LEAN was positive and statistically significant. This indicates that enterprises with more developed lean logistics practices tend to achieve higher business performance. Lean logistics can improve performance through better process flow, lower waste, fewer logistics errors, more reliable delivery, and stronger coordination across supply chain activities. These findings are in line with literature that connects lean logistics with business excellence, modern supply chain models, warehouse performance, lean supply chain indicators, and sustainable supply chain management [1,2,8,10,12].

The first hypothesis stated that lean logistics has a positive and statistically significant effect on business performance. Since the regression coefficient was positive and the p-value was lower than 0.0001, the first hypothesis is not rejected. This means that the empirical results support the assumed effect of lean logistics on business performance. The result also suggests that logistics practices should not be viewed only as operational support activities. They should be viewed as performance-related managerial activities that can affect enterprise outcomes. Modern management methods and techniques also had a positive and statistically significant effect on business performance. The regression coefficient for MMT was positive and statistically significant. This shows that enterprises with stronger use of modern management practices tend to achieve higher business performance. Management methods can support performance through better planning, process control, structured decisions, risk control, digital transformation, agile adjustment, and coordination between organizational units. This is consistent with the view that system-oriented management, multidisciplinary integration, digital transformation, and sustainable management practices can support enterprise outcomes [3,4,18,19,20].

The second hypothesis stated that modern management methods and techniques have a positive and statistically significant effect on business performance. Since the regression coefficient was positive and the p-value was lower than 0.0001, the second hypothesis is not rejected. This result confirms that management methods and techniques are relevant for business performance in the analyzed enterprises. The result also indicates that enterprises need structured management practices, not only individual managerial experience or informal decision-making routines. Value creation-focused marketing had a positive and statistically significant effect on business performance. The regression coefficient for VCMARK was positive and statistically significant. This indicates that enterprises with stronger value creation-focused marketing tend to report higher business performance. Although VCMARK had the lowest coefficient among the three predictors, its effect remained statistically significant. This suggests that customer value, stakeholder value, co-creation, customer data, and market-oriented value propositions can contribute to business results. These findings are aligned with research on participatory value co-creation, data-driven customer value, marketing-as-practice, customer experience, and stakeholder value creation [5,6,21,22,23,29].

The third hypothesis stated that value creation-focused marketing has a positive and statistically significant effect on business performance. Since the regression coefficient was positive and the p-value was lower than 0.0001, the third hypothesis is not rejected. This result supports the assumption that marketing activities directed toward value creation can contribute to business performance. The finding also suggests that marketing should not be reduced to promotion or communication. It should include customer knowledge, value proposition development, relationship quality, customer experience, and stakeholder-oriented activities. The correlation results also support the regression findings. Business performance had positive correlations with LEAN, MMT, and VCMARK. The strongest correlation with PERF was found for VCMARK, followed by LEAN, and MMT. These results show that all three independent variables are positively related to business performance. At the same time, the correlations between the independent variables were moderate and did not indicate excessive overlap. This was also confirmed through tolerance and VIF values. The multicollinearity results show that the regression model was stable from the perspective of predictor overlap. Tolerance values were above 0.10, while VIF values were below 5.00. This means that lean logistics, modern management methods and techniques, and value creation-focused marketing can be treated as related but separate predictors. This is important because the research model combines three different enterprise areas. The results show that each area adds a separate contribution to the explanation of business performance.

The findings have practical meaning for enterprise managers. Lean logistics can support business performance through lower waste, better order accuracy, and more reliable logistics processes. Modern management methods and techniques can support business performance through better planning, structured decisions, and stronger organizational control. Value creation-focused marketing can support business performance through better understanding of customers, stronger relationships, and more relevant value propositions. Therefore, enterprises should not focus on only one area of improvement. A combined approach can provide better support for performance outcomes.

The study also has several limitations. The sample included 73 enterprises, which provides useful empirical insight, but larger samples could provide more stable estimates. The research used managers as respondents, which is suitable for enterprise-level assessment, but future studies could also include employees and customers.

6. CONCLUSION

The paper confirms that business performance can be viewed through the joint influence of logistics, management, and marketing practices. Lean logistics, modern management methods and techniques, and value creation-focused marketing all showed positive and statistically significant effects on business performance. Therefore, all three hypotheses are not rejected. The findings suggest that enterprises should not treat logistics efficiency, managerial methods, and marketing value creation as separate areas. Their combined use can support better process flow, clearer decisions, stronger customer orientation, and more stable business results. Lean logistics had the strongest effect, which indicates that operational discipline and logistics coordination remain highly relevant for enterprise performance.

The study contributes to the literature through an integrated model that connects three managerial areas in one empirical framework. From a practical perspective, managers should give attention to lean logistics practices, structured management techniques, and marketing activities focused on customer and stakeholder value. Future research should test the model on larger samples, include different sectors, and add objective performance indicators.

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Towards a Multimodal Intervention Approach in High-Stakes Language Testing Contexts

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Abstract

This paper addresses the need for more comprehensive learner support in high-stakes language testing contexts. It focuses on test anxiety as a multidimensional phenomenon shaped by cognitive, emotional, physiological, and situational factors. Drawing on current intervention research in language education, the paper discusses pedagogically oriented, psychologically oriented, and technology-enhanced approaches to reducing test anxiety and supporting language performance. It argues that existing interventions often remain fragmented and insufficiently address the broader relationship between test anxiety, well-being, and language performance. In response, the paper proposes a theoretically grounded multimodal intervention framework integrating academic support, cognitive-behavioural strategies, and relaxation-based physiological regulation. The framework is situated in the context of preparation for standardised language examinations, particularly Cambridge English Qualifications at B2–C1 levels, and is intended as a basis for future empirical validation.

Keywords: multimodal intervention; test anxiety; high-stakes language testing; language assessment

1. INTRODUCTION

High-stakes language testing represents a complex evaluative context in which learners are required not only to demonstrate their linguistic competence, but also to cope with considerable cognitive, emotional, and social pressure. Standardised language examinations may have significant consequences for learners' academic and professional trajectories, as their results can influence access to further education, certification, or employment opportunities (Fox & Cheng, 2016; Xu & Huang, 2018). In this sense, language tests function not only as instruments for measuring language proficiency, but also as emotionally demanding performance situations in which learners' ability to regulate stress, maintain attention, and mobilise their linguistic resources becomes an important part of the testing experience (Andújar & Cruz-Martínez, 2020; Pekrun, 2006).

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Within second language learning, this issue is particularly important because language performance is closely connected to public production, social evaluation, and learners' perceptions of their own competence (MacIntyre et al., 2019; Oxford, 2016). Research in language education increasingly shows that language learning and language assessment cannot be understood solely as cognitive processes, but need to be examined in relation to emotional, motivational, and social factors (Pekrun, 2006; Oxford, 2016). Test anxiety represents one of the most significant psychological variables in this context. It includes cognitive, emotional, and physiological components and may interfere with learners' attention, working memory, information retrieval, and self-regulation during evaluative situations (Eysenck et al., 2007; Putwain, 2007; Putwain & Daly, 2014). As a result, test anxiety may negatively affect language performance and, in some cases, prevent learners from fully demonstrating their actual level of language competence (Horwitz, 2001; Salehi & Marefat, 2014; Zheng & Cheng, 2018).

At the same time, test anxiety should not be viewed as an isolated individual characteristic. It is shaped by the broader assessment context, including test format, time pressure, perceived consequences of evaluation, direct social evaluation, classroom climate, and learners' previous experiences with testing (Andújar & Cruz-Martínez, 2020; Al Ghaithi & Behforouz, 2024; Bensoussan, 2012). This is especially relevant in high-stakes language assessment contexts, where the perceived importance of the result may intensify emotional pressure and influence both preparation and performance (Fox & Cheng, 2016; Xu & Huang, 2018). Consequently, the relationship between test anxiety and language performance needs to be understood as multidimensional and context-sensitive, rather than as a simple direct relationship between anxiety and test outcomes.

Existing intervention approaches in language education have attempted to reduce test anxiety and support learners' performance through various strategies. These include pedagogical modifications of assessment practices, psychologically oriented techniques targeting emotional and physiological regulation, and technology-enhanced forms of feedback and learner support (Bensoussan, 2012; Contreras-Soto et al., 2019; Mirsanjari, 2025; Sayed et al., 2024; Taşan et al., 2021; Uştuk & Aydın, 2018). Although these approaches provide valuable insights, current research remains relatively fragmented. Individual interventions often focus on only one dimension of the problem, such as assessment design, emotional regulation, or digital feedback, while the broader interaction between test anxiety, subjective well-being, and language performance remains insufficiently addressed (Mirsanjari, 2025; Weng & Liu, 2024).

This paper responds to this gap by arguing for the need for a multimodal intervention approach in high-stakes language testing contexts. The proposed framework is developed as a conceptual basis for future research and integrates academic support, cognitive-behavioural strategies, and relaxation-based physiological regulation. The aim is not to present empirical findings at this stage, but to outline a theoretically grounded intervention framework designed to support learners preparing for standardised language examinations. The proposed approach is situated in the context of preparation for Cambridge English Qualifications at B2–C1 levels and is intended to address test anxiety, perceived well-being, and language performance as interconnected dimensions of learners' assessment experience.

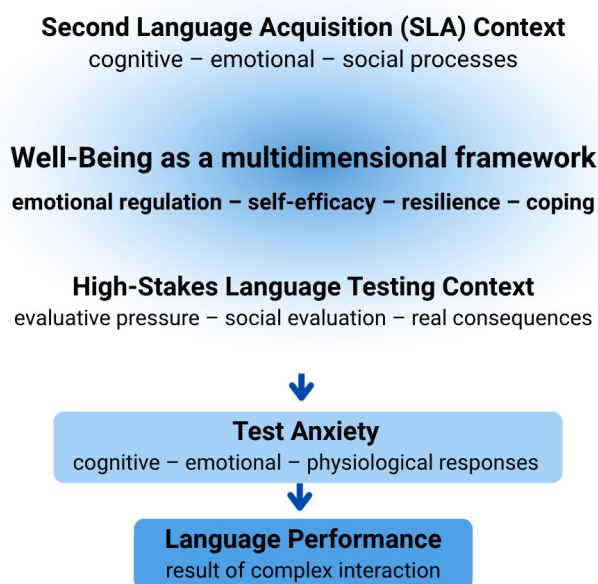


Fig. 1. Conceptual framework of well-being, test anxiety and language performance in high-stakes language testing contexts

Note. Authors' own elaboration based on Seligman (2011), Pekrun (2006), Eysenck et al. (2007), and MacIntyre et al. (2019).

2. CURRENT INTERVENTION APPROACHES IN LANGUAGE TESTING

Research on language testing has identified several intervention approaches aimed at reducing test anxiety and supporting learners' language performance in evaluative contexts. These approaches differ in their theoretical foundations, mechanisms of action, and research design. Broadly, they may be grouped into three main categories: pedagogically oriented interventions that modify assessment practices and classroom conditions, psychologically oriented interventions that target emotional, cognitive, and physiological regulation, and technology-enhanced interventions that use digital tools, audio-visual input, or AI-assisted feedback (Bensoussan, 2012; Contreras-Soto et al., 2019; Mirsanjari, 2025; Sayed et al., 2024; Taşan et al., 2021; Uştuk & Aydın, 2018). Although these intervention lines offer valuable insights into how learners may be supported in language testing contexts, existing research remains relatively fragmented and only rarely provides an integrated perspective on the relationship between test anxiety, language performance, and learners' broader well-being (Mirsanjari, 2025; Weng & Liu, 2024).

2.1 Pedagogically Oriented Approaches

Pedagogical approaches to reducing test anxiety are based on the assumption that anxiety in language testing is not solely an individual psychological characteristic of learners, but also a phenomenon shaped by assessment design, classroom organisation, and evaluative practices. From this perspective, test anxiety is understood as context-sensitive and partly influenced by the degree of perceived evaluative pressure, uncertainty, and social threat associated with testing situations (Andújar & Cruz-Martínez, 2020; Bensoussan, 2012; Pekrun, 2006; Putwain, 2007). Consequently, pedagogically oriented interventions aim to modify learning and assessment conditions in ways that reduce emotional strain and create more supportive testing environments.

Research on pedagogical interventions has primarily focused on increasing learners' familiarity, transparency, and perceived control in relation to assessment. Existing approaches include the use of practice tests, formative feedback, student involvement in assessment, and alternative forms of evaluation such as portfolio-based assessment

(Bensoussan, 2012; Contreras-Soto et al., 2019). These strategies are grounded in the assumption that greater predictability and clearer understanding of assessment requirements may reduce uncertainty and the perceived threat of testing situations. Similarly, approaches based on assessment as learning reconceptualise assessment as an integral part of the learning process rather than as a one-time evaluative event, thereby supporting learner autonomy and reducing the emotional pressure associated with formal evaluation.

Beyond assessment design itself, pedagogical approaches also emphasise the social and relational dimensions of the learning environment. Supportive teacher-student and peer relationships may reduce fear of negative evaluation and contribute to the creation of emotionally safer classroom and testing contexts (Tauchid, 2025). In this sense, pedagogical interventions extend beyond technical modifications of assessment practices and include broader aspects of classroom climate, emotional support, and learner engagement. Supportive learning environments characterised by teacher encouragement, constructive feedback, and positive peer interaction may strengthen learners' self-efficacy, increase their willingness to communicate, and reduce the emotional threat associated with language performance situations (Contreras-Soto et al., 2019; Tauchid, 2025).

Despite their potential benefits, pedagogically oriented interventions also have several important limitations. Existing approaches often focus primarily on reducing the affective pressure of testing situations, while their direct impact on measurable language performance remains inconsistent across studies (Mirsanjari, 2025; Weng & Liu, 2024). In many cases, they are implemented as isolated pedagogical strategies targeting only selected aspects of test anxiety, without systematically addressing the broader cognitive, emotional, and physiological mechanisms underlying learners' responses to evaluative situations. Furthermore, intervention studies often rely on context-specific samples and short-term designs, which may limit the generalisability and long-term applicability of their findings (Mirsanjari, 2025; Taşan et al., 2021). These limitations suggest that pedagogical approaches alone may be insufficient to address the multidimensional nature of test anxiety and point to the need for more integrative intervention frameworks combining pedagogical, psychological, and regulatory dimensions of learner support.

2.2 Psychologically Oriented Approaches

Psychological approaches to reducing test anxiety primarily conceptualise anxiety as an emotional and regulatory process that can be influenced through interventions targeting learners' cognitive, emotional, behavioural, and physiological responses to evaluative situations. In contrast to pedagogically oriented interventions, which focus on assessment design and classroom conditions, psychologically oriented approaches emphasise learners' capacity to regulate stress, manage emotional reactions, and cope more effectively with evaluative pressure. These interventions may draw on positive psychology, cognitive-behavioural approaches, and theories of self-regulated learning, which conceptualise emotional regulation, self-efficacy, and adaptive coping as important components of successful language learning and performance (Oxford, 2016; Pekrun, 2006; Taşan et al., 2021). Within the context of language testing, psychological interventions therefore aim not only to reduce anxiety symptoms, but also to strengthen learners' perceived control, emotional resilience, and ability to maintain cognitive functioning during testing situations.

One important line of psychologically oriented interventions focuses on learners' cognitive appraisal of testing situations and their beliefs about their own ability to cope with assessment demands. Test anxiety is often associated with maladaptive thought patterns, fear of failure, negative self-evaluation, and catastrophic interpretations of possible test outcomes (Cassady & Johnson, 2002; Putwain, 2007). Cognitive-behavioural approaches aim to address these processes by helping learners identify anxiety-related thoughts, reinterpret evaluative situations more realistically, and develop more adaptive coping strategies. In language testing contexts, such interventions may be particularly relevant because anxiety can interfere with attention, working memory, and information retrieval, thereby limiting learners' ability to demonstrate their actual language competence (Eysenck et al., 2007; Salehi & Marefat, 2014).

Another important group of psychological interventions focuses on emotional and physiological regulation. Existing approaches commonly include mindfulness-based techniques, breathing exercises, relaxation strategies, and interventions focusing on body awareness and stress management (Taşan et al., 2021). These interventions are based on the assumption that reducing physiological arousal and improving emotional regulation may help learners cope more effectively with the cognitive and emotional demands of testing situations. Empirical findings suggest that mindfulness and breathing-based interventions may contribute not only to reductions in test anxiety and foreign language anxiety, but also to improvements in learners' concentration, emotional stability, and perceived control during language performance situations (Taşan et al., 2021).

Beyond anxiety reduction itself, psychologically oriented interventions may also support learners' self-regulatory capacities, communicative confidence, and perceived self-efficacy in language performance situations. Research suggests that interventions focusing on emotional awareness, self-regulated learning, and communicative competence may reduce fear of negative evaluation and strengthen learners' willingness to participate in evaluative language activities (Uştuk & Aydın, 2018). In particular, approaches incorporating paralinguistic strategies and work with non-verbal communication have been shown to enhance learners' confidence during speaking performance and reduce anxiety associated with oral language production (Uştuk & Aydın, 2018). These findings indicate that psychological approaches may influence not only learners' emotional regulation, but also their perceptions of communicative competence and their readiness to engage in language testing situations.

Despite their potential benefits, psychologically oriented interventions also have several limitations. Existing approaches frequently conceptualise test anxiety primarily as an individual emotional or regulatory issue, while paying comparatively less attention to the broader pedagogical, social, and situational dimensions of language testing contexts. In many cases, interventions are implemented in relatively controlled or short-term settings, which may limit their ecological validity and the long-term applicability of their outcomes (Mirsanjari, 2025; Taşan et al., 2021). Furthermore, although psychological interventions often report reductions in anxiety and improvements in learners' perceived self-confidence, the relationship between emotional regulation and measurable gains in language performance remains inconsistent across studies (Weng & Liu, 2024). These limitations suggest that psychological approaches alone may be insufficient to address the multidimensional nature of test anxiety in language assessment and highlight the need for more integrative intervention frameworks capable of systematically combining psychological, pedagogical, and situational dimensions of learner support.

2.3 Technology-Enhanced Approaches

Technology-enhanced approaches to reducing test anxiety have gained increasing attention in language testing research, particularly in relation to digital assessment environments, audio-visual input, and artificial intelligence-assisted feedback. These approaches are based on the assumption that technology may reshape learners' interaction with evaluative situations by increasing flexibility, supporting learner autonomy, and reducing some forms of direct social evaluative pressure (Mirsanjari, 2025; Sayed et al., 2024). In contrast to pedagogical approaches, which focus primarily on classroom and assessment design, and psychological approaches, which target learners' internal regulatory processes, technology-enhanced interventions emphasise the mediating role of digital tools in modifying the conditions under which language performance is practised, assessed, and supported.

One important line of technology-enhanced research concerns audio-visual support in language learning and assessment. The integration of visual, auditory, and interactive elements may facilitate comprehension, increase familiarity with task demands, and support more effective processing of linguistic input (Lee et al., 2015). From this perspective, audio-visual input may function not only as a technological enhancement, but also as a means of supporting information processing and reducing uncertainty associated with demanding evaluative tasks. In language testing contexts, such support may help learners maintain attention, process information more efficiently, and experience a greater sense of control during language performance activities (Lee et al., 2015).

Another important direction is represented by AI-assisted assessment and digitally mediated feedback systems. These approaches emphasise the role of immediate, personalised, and adaptive feedback in supporting learners' engagement with assessment tasks and reducing some aspects of evaluative stress (Mirsanjari, 2025; Sayed et al., 2024). In comparison with traditional assessment environments characterised by direct teacher evaluation, AI-assisted systems may, in some cases, reduce perceived social pressure by allowing learners to engage with evaluative tasks in a more autonomous and less threatening manner. Research further suggests that personalised feedback and self-paced interaction with digital assessment tools may strengthen learners' perceived control, self-confidence, and willingness to participate in language performance activities (Mirsanjari, 2025; Wang & Zou, 2025).

At the same time, technology-enhanced approaches should not be understood as a sufficient solution to test anxiety in themselves. Their effectiveness may depend on learners' individual characteristics, including language proficiency, autonomy, digital competence, and ability to use feedback constructively (Mirsanjari, 2025; Wang & Zou, 2025). Moreover, digital assessment environments may also introduce new sources of anxiety, such as technical uncertainty, time pressure, or unfamiliarity with the testing format (Fox & Cheng, 2016). These findings indicate that technology can modify important aspects of the assessment experience, but its benefits are likely to depend on how it is embedded within broader pedagogical and psychological support. Therefore, technology-enhanced approaches contribute important insights to intervention research, yet they also reinforce the need for

integrative frameworks that address test anxiety, well-being, and language performance as interconnected dimensions of high-stakes language assessment.

3. THE NEED FOR MULTIMODAL INTERVENTION APPROACHES

Intervention approaches in language testing provide valuable insights into the mechanisms through which test anxiety may be reduced and learner performance supported. However, current research remains characterised by a considerable degree of fragmentation, as pedagogical, psychological, and technology-enhanced interventions are typically implemented and examined in isolation rather than as interconnected dimensions of learner support (Mirsanjari, 2025; Sayed et al., 2024). Studies frequently focus on selected aspects of test anxiety, such as emotional regulation, assessment design, or feedback delivery, while paying comparatively less attention to the complex interaction between cognitive, emotional, behavioural, physiological, and situational factors shaping learners' experiences in evaluative contexts. Furthermore, many intervention studies rely on relatively small or context-specific samples, short-term designs, and limited methodological integration, which may reduce the generalisability and long-term applicability of their findings (Mirsanjari, 2025; Taşan et al., 2021). At the same time, the broader dimension of subjective well-being often remains secondary to the primary goal of anxiety reduction, despite growing evidence suggesting that emotional resilience, self-efficacy, and well-being may play an important role in learners' ability to cope with high-stakes testing situations (Weng & Liu, 2024; Zhou & Wang, 2024).

The limitations of existing intervention approaches further reflect the multidimensional nature of test anxiety in language testing contexts. Contemporary research suggests that test anxiety cannot be understood solely as an isolated emotional reaction, but rather as a complex phenomenon emerging through the interaction of cognitive, emotional, physiological, and situational factors (Eysenck et al., 2007; Pekrun, 2006). Within testing situations, anxiety may interfere with attentional control, working memory capacity, and information retrieval processes, thereby influencing learners' ability to demonstrate their language competence effectively under evaluative pressure (Eysenck et al., 2007; Salehi & Marefat, 2014). At the same time, the intensity of anxiety is shaped by contextual variables, including time pressure, test format, perceived consequences of evaluation, and the presence of social evaluative threat (Al Ghaithi & Behforouz, 2024; Andújar & Cruz-Martínez, 2020). These findings indicate that learners' emotional experiences during language testing are not determined by a single factor, but emerge from the dynamic interaction between individual regulatory processes and the broader situational conditions in which assessment takes place. Consequently, intervention approaches targeting only one dimension of test anxiety may be insufficient to address the complexity of learners' experiences in high-stakes language testing contexts.

These considerations point toward the need for more comprehensive intervention frameworks capable of systematically integrating multiple dimensions of learner support within language testing contexts. In contrast to isolated interventions targeting only selected aspects of test anxiety, multimodal approaches may provide a more holistic response to the interconnected cognitive, emotional, behavioural, physiological, and situational mechanisms shaping learners' experiences during high-stakes assessment. Such approaches create opportunities to address not only anxiety reduction itself, but also learners' well-being, emotional resilience, self-efficacy, and ability to maintain effective performance under evaluative pressure. This perspective reflects a broader shift from viewing test anxiety as an isolated deficit to understanding learners' emotional experiences as an integral component of successful language assessment and performance. Consequently, the development of multimodal intervention frameworks represents a promising direction for future research seeking to support learners more effectively within authentic high-stakes language testing environments.

In the context of the present paper, a multimodal intervention approach is understood as an integrated framework combining academic support, cognitive-behavioural strategies, and relaxation-based physiological regulation. This structure reflects the assumption that effective support for learners preparing for high-stakes language examinations should address not only the external conditions of assessment, but also the cognitive, emotional, and physiological processes through which learners experience and manage evaluative pressure. The following section therefore outlines a proposed multimodal intervention framework grounded in these three interrelated dimensions.

4. TOWARDS A MULTIMODAL INTERVENTION FRAMEWORK

A multimodal intervention framework in language testing may provide a more comprehensive response to the multidimensional nature of test anxiety by systematically integrating academic support, cognitive-behavioural strategies, and physiological regulation. In contrast to isolated intervention approaches targeting only selected aspects of evaluative stress, multimodal interventions conceptualise learners' experiences as emerging through the interaction of cognitive, emotional, behavioural, physiological, and situational processes within authentic testing

contexts (Eysenck et al., 2007; Pekrun, 2006; Putwain, 2007; Putwain & Daly, 2014). From this perspective, support in high-stakes language testing requires a coherent framework that addresses not only linguistic preparation, but also perceived control, emotional resilience, self-regulation, and the broader learning environment in which assessment takes place (Oxford, 2016; Pekrun, 2006; Xu & Huang, 2018).

The academic support dimension aims to strengthen learners' sense of structure, predictability, and control throughout the preparation process. This component incorporates strategies designed to increase familiarity with test requirements and reduce uncertainty associated with high-stakes assessment, including systematic work with practice tests, test-taking strategies, time management, task management, and structured study planning. Such strategies are consistent with pedagogical approaches emphasising transparency, formative support, learner involvement, and assessment as part of the learning process (Bensoussan, 2012; Contreras-Soto et al., 2019; Costantino & Martin, 2025). Within a multimodal framework, academic support therefore serves not only as a means of improving test readiness, but also as a mechanism for enhancing perceived control and self-regulation in evaluative contexts.

The cognitive-behavioural dimension focuses on learners' ability to recognise, understand, and regulate the cognitive and emotional processes associated with test anxiety. This component incorporates psychoeducation about stress responses, identification of maladaptive thought patterns and automatic negative thoughts, cognitive restructuring, and gradual exposure to test-like conditions. These strategies are intended to help learners reinterpret evaluative situations more realistically, develop more adaptive coping responses, and strengthen their self-efficacy when facing assessment demands. By targeting the mechanisms through which anxiety may interfere with attention, working memory, and information retrieval, the cognitive-behavioural dimension directly responds to the cognitive processes through which test anxiety may affect language performance (Cassady & Johnson, 2002; Eysenck et al., 2007; Salehi & Marefat, 2014).

The relaxation and physiological regulation dimension addresses the bodily manifestations of test anxiety that may interfere with learners' performance during high-stakes assessment. This component incorporates techniques aimed at reducing physiological arousal and promoting emotional stability, including mindfulness practices, controlled breathing, progressive muscle relaxation, guided imagery, and other body-based stress regulation strategies. Such approaches are grounded in the assumption that effective management of physiological stress responses may help learners maintain attentional control, reduce emotional reactivity, and respond more adaptively to evaluative pressure (Taşan et al., 2021). Within the proposed framework, relaxation-based strategies complement academic and cognitive-behavioural support by targeting mechanisms that are often less accessible through cognitive strategies alone.

The value of a multimodal intervention framework lies not only in the inclusion of multiple support strategies, but also in their systematic integration within authentic learning and assessment contexts. Rather than functioning as separate components, academic, cognitive-behavioural, and relaxation-based strategies are designed to reinforce one another by addressing different yet interconnected dimensions of learners' experiences during language testing. This integrated approach reflects the assumption that successful performance in high-stakes assessment is shaped by a dynamic interaction between linguistic competence, emotional regulation, self-efficacy, self-regulation, and contextual factors (Oxford, 2016; Pekrun, 2006; Xu & Huang, 2018).

The framework outlined in this paper is intended for application in the context of preparation for standardised language examinations, particularly Cambridge English Qualifications at B2–C1 levels. In this context, the intervention is conceptualised as an integrated part of regular language instruction rather than as a separate programme. This makes it possible to address test anxiety, subjective well-being, and language performance within the same educational environment in which learners prepare for high-stakes assessment. The proposed framework therefore provides a theoretically grounded basis for future empirical validation and for the development of more comprehensive approaches to learner support in high-stakes language testing contexts.

5. CONCLUSION

High-stakes language testing represents a demanding evaluative context in which learners' performance is shaped not only by linguistic competence, but also by cognitive, emotional, physiological, and situational factors. As discussed in this paper, test anxiety may interfere with learners' ability to regulate attention, retrieve linguistic knowledge, and demonstrate their actual language competence under pressure. At the same time, learners' experiences of assessment are influenced by the broader testing environment, including perceived consequences of evaluation, test format, classroom climate, and the degree of social evaluative threat.

Existing intervention approaches in language testing offer valuable strategies for reducing test anxiety and supporting learners' performance. Pedagogically oriented approaches may increase transparency, predictability, and perceived control; psychologically oriented approaches may strengthen emotional regulation, coping, and self-

efficacy; and technology-enhanced approaches may support autonomy, feedback accessibility, and reduced social pressure. However, these approaches are often examined separately and tend to address only selected dimensions of learners' assessment experience. This fragmentation limits their capacity to respond to the multidimensional nature of test anxiety in high-stakes language testing contexts.

The main contribution of this paper is therefore the proposal of a multimodal intervention framework that integrates academic support, cognitive-behavioural strategies, and relaxation-based physiological regulation. By combining these dimensions, the framework seeks to address not only anxiety reduction, but also learners' perceived well-being, self-efficacy, and ability to maintain effective performance in evaluative situations. Such an approach reflects the need to move beyond isolated intervention strategies and toward more comprehensive forms of learner support embedded in authentic language examination preparation.

The proposed framework is intended as a theoretically grounded basis for future empirical validation, particularly in the context of preparation for standardised language examinations such as Cambridge English Qualifications at B2–C1 levels. Further research is needed to examine its feasibility, implementation, and potential effects on test anxiety, perceived well-being, and language performance. From a practical perspective, the framework may contribute to the development of more supportive preparation courses in which learners are not only trained to meet linguistic requirements, but also supported in managing the cognitive and emotional demands of high-stakes assessment.

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Investigation of Local Electromechanical Modes in Hydro-Type Synchronous Generators under Excitation Control

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Abstract

Hydro-type synchronous generators play a crucial role in modern power systems due to their significant contribution to renewable electricity generation and their favorable inertial characteristics. The dynamic behavior of these machines is strongly influenced by excitation control systems, particularly automatic voltage regulators (AVRs), which affect both voltage regulation and small-signal stability. This paper investigates the local electromechanical oscillation modes of hydro-type synchronous generators under excitation control. A linearized Heffron–Phillips model is employed to perform eigenvalue-based analysis of generator dynamics over a wide range of active and reactive power operating conditions. The study first examines the oscillatory characteristics of hydro-generators without excitation control and subsequently evaluates the impact of AVR implementation on local mode frequency and damping. The analysis includes hydro-type synchronous generators of different rated powers and operating points. The results demonstrate that excitation control significantly alters the damping characteristics of local oscillation modes and that generator operating conditions have a pronounced influence on stability margins. The findings provide additional insight into the dynamic performance of hydro-generators and contribute to a better understanding of excitation system effects on small-signal stability in renewable-dominated power systems.

Keywords: Hydro-type synchronous generators, electromechanical oscillations, excitation control, eigenvalue analysis

1. INTRODUCTION

Electric power systems are currently experiencing one of the most significant transformations in their history. The increasing demand for sustainable electricity generation, ambitious decarbonization targets, and the rapid development of new technologies are fundamentally changing the structure and operation of modern power systems. Large-scale integration of renewable energy sources, battery energy storage systems, power-electronic converters, and advanced monitoring and control technologies is gradually replacing the traditional paradigm based on conventional synchronous generation.

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Renewable energy sources play a central role in this transition. Their deployment has increased substantially over recent decades due to environmental concerns, technological progress, and economic competitiveness. Among the various renewable technologies, hydropower remains one of the most important sources of renewable electricity worldwide. In addition to providing carbon-free energy, hydroelectric power plants offer operational flexibility, fast response capabilities, energy storage potential through pumped-storage facilities, and valuable inertial support that contributes to overall power system stability. Consequently, hydropower continues to play a key role in both existing power systems and future renewable-dominated energy networks.

The conversion of hydraulic energy into electrical energy is performed by hydro-type synchronous generators. These machines represent some of the largest and most important rotating electrical machines in modern power systems [1]. Due to their substantial installed capacity and their contribution to system inertia, the dynamic behavior of hydro-generators significantly influences the overall stability and reliability of interconnected power networks. A comprehensive understanding of their dynamic characteristics is therefore essential for ensuring secure and efficient operation under both normal and disturbed operating conditions.

One of the most important dynamic phenomena associated with synchronous generators is the occurrence of electromechanical oscillations [2]. These oscillations arise following disturbances, switching events, faults, or operating condition changes and are an inherent characteristic of interconnected power systems. Poorly damped oscillations may increase mechanical stresses on generator shafts and turbine components, produce additional electrical losses, accelerate equipment ageing, reduce operational reliability, and in severe cases lead to instability, generator tripping, or widespread system disturbances. Consequently, the analysis and mitigation of electromechanical oscillations have been the subject of extensive research for several decades [3-5].

To maintain acceptable voltage levels and ensure satisfactory steady-state and transient performance, hydro-type synchronous generators are equipped with automatic voltage regulators (AVRs). Although the primary function of an AVR is voltage control, its interaction with generator electromagnetic dynamics has a significant influence on the characteristics of local electromechanical oscillation modes. Fast excitation systems can alter oscillation frequencies and damping properties and, under certain operating conditions, may even reduce stability margins. Understanding these interactions is therefore essential for the proper design and tuning of excitation control systems.

The main objective of this paper is to investigate the influence of excitation control on the local electromechanical modes of hydro-type synchronous generators. A linearized Heffron–Phillips model is employed to represent generator dynamics and to perform eigenvalue-based modal analysis over a wide range of active and reactive power operating conditions. While previous studies have focused on the analysis of electromechanical oscillations in synchronous generators operating without AVR [6], or on the influence of AVR in turbo-type synchronous generators [7], the present paper systematically investigates the impact of AVRs on the damping and frequency of local electromechanical modes in hydro-type synchronous generators across the entire operating range.

The remainder of the paper is organized as follows. Section 2 presents the mathematical model of the hydro-type synchronous generator and its extension with an AVR. Section 3 describes the eigenvalue-based methodology used for modal analysis and characterization of oscillatory modes. Sections 4 and 5 present and discuss the results obtained without and with AVR, respectively. Finally, the main conclusions are summarized in Section 6.

2. MATHEMATICAL MODEL OF THE HYDRO-TYPE SYNCHRONOUS GENERATOR

2.1. Synchronous Generator Model without Excitation Control

Accurate mathematical models of synchronous generators are essential for the analysis of power system stability and dynamic performance. Various models of different complexity levels have been developed for this purpose, ranging from detailed nonlinear representations to simplified linearized models.

The most comprehensive representation of a synchronous generator is the nonlinear seventh-order d-q model, which describes the electromagnetic interactions between stator, field, and damper windings while accounting for rotor position and magnetic coupling effects. When combined with a network model, this representation provides a highly accurate description of generator dynamics over a wide range of operating conditions. However, its practical application is often limited by the large number of machine parameters required, many of which are difficult to obtain or accurately identify for real generating units.

For the analysis of small-signal electromechanical oscillations, linearized models are generally sufficient. These models describe generator dynamics in the vicinity of a selected operating point and provide a convenient framework for eigenvalue-based stability analysis. Since the model coefficients depend on the operating conditions, the linearized model must be recalculated for each operating point considered in the study.

Among the available linearized representations, the Heffron–Phillips model is one of the most widely used models for small-signal stability studies [8]. The model offers a good compromise between accuracy and simplicity while preserving the dominant electromechanical dynamics relevant for oscillatory stability analysis. Previous studies have demonstrated that the Heffron–Phillips model accurately reproduces the frequency, damping, and transient characteristics of local electromechanical oscillations over a wide operating range [9].

The Heffron–Phillips model employed in this work is derived from the linearization of the synchronous generator equations around a steady-state operating point. The model considers deviations of the rotor angle $\delta_\Delta(t)$, rotor speed $\omega_\Delta(t)$, and transient internal voltage $E'_{q\Delta}(t)$ as state variables. The inputs are the mechanical torque deviation $T_{m\Delta}(t)$ and the field voltage deviation $E_{fd\Delta}(t)$, while the electrical torque deviation $T_{e\Delta}(t)$ and terminal voltage deviation $V_{t\Delta}(t)$ are treated as output quantities.

The resulting state-space model can be expressed as

$$\begin{bmatrix} \dot{\delta}_\Delta(t) \\ \dot{\omega}_\Delta(t) \\ \dot{E}'_{q\Delta}(t) \end{bmatrix} = \begin{bmatrix} 0 & \omega_s & 0 \\ -\frac{K_1}{2H} & -\frac{D}{2H} & -\frac{K_2}{2H} \\ -\frac{K_4}{T'_{d0}} & 0 & -\frac{1}{K_3 T'_{d0}} \end{bmatrix} \begin{bmatrix} \delta_\Delta(t) \\ \omega_\Delta(t) \\ E'_{q\Delta}(t) \end{bmatrix} + \begin{bmatrix} 0 & 0 \\ \frac{1}{2H} & 0 \\ 0 & \frac{1}{T'_{d0}} \end{bmatrix} \begin{bmatrix} T_{m\Delta}(t) \\ E_{fd\Delta}(t) \end{bmatrix} \quad (1)$$

$$\begin{bmatrix} T_{e\Delta}(t) \\ V_{t\Delta}(t) \end{bmatrix} = \begin{bmatrix} K_1 & 0 & K_2 \\ K_5 & 0 & K_6 \end{bmatrix} \begin{bmatrix} \delta_\Delta(t) \\ \omega_\Delta(t) \\ E'_{q\Delta}(t) \end{bmatrix} + \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} T_{m\Delta}(t) \\ E_{fd\Delta}(t) \end{bmatrix} \quad (2)$$

In the state-space representation given in (1), the elements of the state matrix **A** and input matrix **B** are determined by the Heffron–Phillips linearization constants K_1 to K_6 . The parameter H denotes the inertia constant of the generating unit and represents the kinetic energy stored in the rotating masses at rated speed. The damping coefficient D accounts for the aggregate damping effects associated with mechanical losses, damper windings, and load-dependent damping mechanisms. The parameter T'_{d0} is the direct-axis open-circuit transient time constant, while ω_s denotes the synchronous electrical angular speed of the machine.

The Heffron–Phillips constants K_1 to K_6 are calculated from the synchronous generator parameters, network parameters, and the selected operating point. They describe the linearized coupling between the mechanical and electromagnetic variables of the synchronous generator. Constant K_1 represents the sensitivity of electrical torque to rotor angle variations, whereas K_2 quantifies the influence of transient internal voltage variations on electrical torque. Constants K_3 and K_4 characterize the effect of field voltage and rotor angle on the transient internal voltage dynamics, respectively. Finally, constants K_5 and K_6 relate rotor angle and transient internal voltage variations to terminal voltage changes. Since these coefficients are obtained by linearization around a particular operating point, their values vary with the active and reactive power output of the generator [1].

2.2. Synchronous Generator Model with Excitation Control

Synchronous generators operating in a power system are equipped with control systems that ensure stable and coordinated operation. Two fundamental control mechanisms are the primary speed control system, responsible for frequency regulation, and the voltage control system, which regulates terminal voltage and reactive power.

The primary speed control system acts through the turbine governor, which is inherently slow due to mechanical and hydraulic dynamics. As a result, it has a negligible influence on local electromechanical oscillations in the frequency range of interest. In contrast, excitation systems in modern power plants are typically based on fast static power electronic devices, which can significantly influence generator dynamics and, in particular, the damping of electromechanical oscillations.

Modern voltage control systems are often implemented as cascade control structures, consisting of an outer voltage or reactive power control loop and an inner excitation control loop. These loops are commonly realized using proportional-integral (PI) controllers. However, in many practical applications, simplified excitation systems based on a proportional (P) controller combined with a static exciter are still widely used. Due to their simplicity and transparency, such models are frequently adopted in small-signal stability studies [10].

In this work, the analysis is restricted to the voltage control (excitation) system, since it is the primary control mechanism affecting electromechanical oscillations. The influence of the primary speed control system is neglected due to its significantly slower dynamic response.

The excitation system is represented by a proportional AVR with a static exciter. The AVR regulates the generator terminal voltage by controlling the field voltage E_{fd} . The AVR-exciter system is modeled by a first-order transfer function of the form:

$$G(s) = \frac{E_{fd\Delta}(s)}{V_{t\Delta,ref}(s) - V_{t\Delta}(s)} = \frac{k_{AVR}}{sT_{AVR} + 1} \quad (3)$$

where $V_{t\Delta,ref}(s)$ is the reference terminal voltage, $V_{t\Delta}(s)$ is the measured terminal voltage, and $E_{fd\Delta}(s)$ is the exciter output voltage (field voltage). The parameter k_{AVR} represents the combined gain of the voltage controller and exciter, while T_{AVR} is the exciter time constant. For static excitation systems, T_{AVR} is typically very small, usually in the range of 2–10 ms. The block diagram of the synchronous generator with an AVR is shown in Fig. 1.

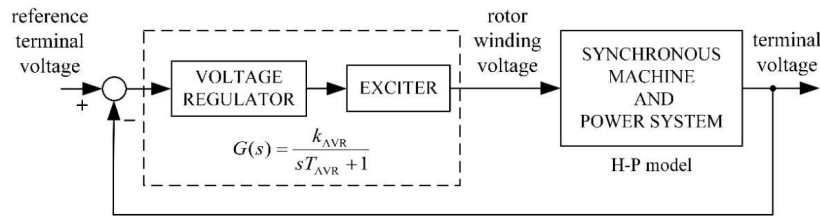


Fig. 1. Block diagram of the studied AVR system [10].

The gain k_{AVR} has a significant influence on the damping of local electromechanical modes. Previous studies have shown that increasing k_{AVR} improves voltage regulation performance but may reduce the damping of oscillatory modes and, in extreme cases, lead to instability when operated close to its upper stability limit.

To investigate this interaction, the Heffron–Phillips model introduced in (1)–(2) is extended by incorporating the AVR transfer function. The resulting augmented state-space representation can be written as:

$$\begin{bmatrix} \dot{\delta}_{\Delta}(t) \\ \dot{\omega}_{\Delta}(t) \\ \dot{E}'_{q\Delta}(t) \\ \dot{E}_{fd\Delta}(t) \end{bmatrix} = \begin{bmatrix} 0 & \omega_s & 0 & 0 \\ -\frac{K_1}{2H} & -\frac{D}{2H} & -\frac{K_2}{2H} & 0 \\ -\frac{K_4}{T'_{d0}} & 0 & -\frac{1}{T'_{d0}K_3} & \frac{1}{T'_{d0}} \\ -\frac{k_{AVR}K_5}{T_{AVR}} & 0 & -\frac{k_{AVR}K_6}{T_{AVR}} & -\frac{1}{T_{AVR}} \end{bmatrix} \begin{bmatrix} \delta_{\Delta}(t) \\ \omega_{\Delta}(t) \\ E'_{q\Delta}(t) \\ E_{fd\Delta}(t) \end{bmatrix} + \begin{bmatrix} 0 & 0 \\ \frac{1}{2H} & 0 \\ 0 & 0 \\ 0 & \frac{k_{AVR}}{T_{AVR}} \end{bmatrix} \begin{bmatrix} T_{m\Delta}(t) \\ V_{t,ref\Delta}(t) \end{bmatrix} \quad (4)$$

$$\begin{bmatrix} T_{e\Delta}(t) \\ V_{t\Delta}(t) \end{bmatrix} = \begin{bmatrix} K_1 & 0 & K_2 \\ K_5 & 0 & K_6 \end{bmatrix} \begin{bmatrix} K_1 & 0 & K_2 & 0 \\ K_5 & 0 & K_6 & 0 \end{bmatrix} \begin{bmatrix} \delta_{\Delta}(t) \\ \omega_{\Delta}(t) \\ E'_{q\Delta}(t) \\ E_{fd\Delta}(t) \end{bmatrix} + \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} T_{m\Delta}(t) \\ V_{t,ref\Delta}(t) \end{bmatrix} \quad (5)$$

The system matrix of the augmented model given in (4) is obtained by an appropriate combination of the system matrix from (1) and the linearized dynamics of the AVR–excitation system described in (3). In particular, the excitation system introduces additional state variables and coupling terms, which modify the original Heffron–Phillips state-space representation and result in the extended system matrix.

This extended model is used in the following sections for eigenvalue-based analysis of local electromechanical oscillations and for quantifying the influence of the excitation system on system damping and oscillation frequency.

3. EIGENVALUE-BASED MODAL ANALYSIS

Small-signal stability and electromechanical oscillatory behavior of the synchronous generator are analyzed using eigenvalue-based modal analysis. The method is based on the linear state-space representation of the system, which can be written in the general form:

$$\dot{\mathbf{x}}(t) = \mathbf{A}\mathbf{x}(t) \quad (6)$$

where $\mathbf{A}$ is the system matrix obtained from the linearized model of the synchronous generator, either without or with the AVR–excitation system.

The dynamic behavior of the system is determined by the eigenvalues of the matrix $\mathbf{A}$, which are obtained from the characteristic equation:

$$\det(\lambda\mathbf{I} - \mathbf{A}) = 0 \quad (7)$$

where λ denotes the eigenvalue and $\mathbf{I}$ is the identity matrix.

The solutions λ_i of this equation represent the system modes and are generally complex-valued. Each eigenvalue can be written in the form:

$$\lambda_i = \sigma_i \pm j\omega_i \quad (8)$$

where σ_i is the real part, representing the damping of the mode, and ω_i is the imaginary part, representing the oscillatory frequency.

The oscillation frequency in Hz is given by:

$$f_i = \frac{\omega_i}{2\pi} \quad (9)$$

while the damping ratio is defined as:

$$\zeta_i = -\frac{\sigma_i}{\sqrt{\sigma_i^2 + \omega_i^2}} \quad (10)$$

Positive damping ratios correspond to stable, decaying oscillations, while negative values indicate unstable modes with increasing oscillation amplitudes.

In the following subsections, the characteristic equations of the considered systems are derived for the case without excitation control and for the case including the AVR–excitation system.

3.1. Characteristic Equation of the Synchronous Generator Model without AVR

For the basic Heffron–Phillips model presented in Section 2.1, the dynamic behavior of the synchronous generator is determined by the state matrix $\mathbf{A}$. The eigenvalues of the system are obtained from the characteristic equation

$$\begin{aligned} \det(\lambda\mathbf{I} - \mathbf{A}) = 0 \rightarrow \\ 2K_3HT'_{d0}\lambda^3 + (K_3DT'_{d0} + 2H)\lambda^2 + (K_1K_3T'_{d0}\omega_s + D)\lambda + \\ + (K_1\omega_s - K_2K_3K_4\omega_s) = 0 \end{aligned} \quad (11)$$

Since the Heffron–Phillips model contains three state variables, namely the rotor angle deviation $\delta_\Delta(t)$, rotor speed deviation $\omega_\Delta(t)$, and transient internal voltage deviation $E'_{q\Delta}(t)$, the resulting characteristic equation is of third order.

The roots of this equation determine the oscillatory modes and stability properties of the synchronous generator operating without excitation control.

For each operating point considered in this study, the values of the Heffron–Phillips constants K_1 to K_6 are recalculated, resulting in a corresponding state matrix $\mathbf{A}$ and a new set of eigenvalues. The obtained eigenvalues are subsequently used to evaluate the oscillation frequencies and damping ratios of the local electromechanical mode.

3.2. Characteristic Equation of the Generator Model with AVR

When the AVR described in Section 2.2 is incorporated into the Heffron–Phillips model, the resulting system is represented by the augmented state matrix $\mathbf{A}$ in (2). The eigenvalues of the extended system are obtained from the characteristic equation of the augmented model (2) [10]:

$$\begin{aligned} & 2K_3HT'_{d0}T_{AVR}\lambda^4 + \\ & (K_3DT'_{d0}T_{AVR} + 2HT_{AVR} + 2HK_3T'_{d0})\lambda^3 + \\ & (K_1K_3T'_{d0}T_{AVR}\omega_s + DT_{AVR} + K_3DT'_{d0} + 2K_3K_6K_{AVR}H + 2H)\lambda^2 + \\ & (K_3K_6K_{AVR}D + K_1K_3T'_{d0}\omega_s + D + K_1T_{AVR}\omega_s - K_2K_3K_4T_{AVR}\omega_s)\lambda + \\ & (K_1K_3K_6K_{AVR}\omega_s - K_2K_3K_5K_{AVR}\omega_s + K_1\omega_s - K_2K_3K_4\omega_s) = 0 \end{aligned} \quad (12)$$

The AVR introduces additional dynamic states associated with the excitation system, thereby increasing the order of the characteristic equation. Consequently, the locations of the system eigenvalues change compared to the case without excitation control.

The modified eigenvalue spectrum reflects the interaction between the generator electromechanical dynamics and the excitation system. Particular attention is given to the local electromechanical mode, whose frequency and damping are strongly influenced by the AVR parameters, especially the regulator gain k_{AVR} .

As in the previous case, the eigenvalues are evaluated for a wide range of active and reactive power operating conditions. The resulting frequencies and damping ratios are then compared with those obtained from the model without AVR in order to quantify the influence of excitation control on generator oscillatory behavior.

4. INFLUENCE OF OPERATING CONDITIONS ON LOCAL ELECTROMECHANICAL OSCILLATIONS WITHOUT AVR

During normal operation of synchronous generators, the frequency and damping of electromechanical oscillations are not constant but depend on the operating conditions. Variations in active and reactive power affect the electromagnetic state of the machine, which results in changes in the small-signal stability properties. Consequently, the characteristics of the local electromechanical mode vary with the generator loading level.

The objective of this section is to investigate the influence of operating conditions on the frequency and damping of the dominant electromechanical oscillation mode. This is achieved by applying eigenvalue-based modal analysis of the Heffron–Phillips model presented in Section 2.1 over a wide range of steady-state operating points.

The analysis is performed by varying the active power P from 0.0 pu to 1.2 pu and the reactive power Q independently over the same range in steps of 0.1 pu. For each operating point, the Heffron–Phillips constants K_1 to K_6 are recalculated, the corresponding state matrix is formed, and the eigenvalues of the system are computed.

Although the complete eigenvalue spectrum is obtained for each operating point, the analysis is focused on the dominant complex-conjugate eigenvalue pair associated with the local electromechanical oscillation mode. This mode governs the low-frequency oscillatory behavior of the synchronous generator and is most sensitive to changes in operating conditions. Therefore, all reported oscillation frequencies and damping ratios are derived exclusively from this eigenvalue pair.

In addition to the 9 MVA hydro-type synchronous generator used as the primary case study, the analysis was performed for a larger set of modern hydro-type synchronous generators with different rated powers and parameters. The obtained results show very similar qualitative behavior of the local electromechanical mode across all investigated machines. Therefore, only two representative cases are presented in this paper: a 9 MVA hydro-type generator and a 158 MVA hydro-type generator.

Figures 2 and 3 show the eigenvalue trajectories in the complex plane for the 9 MVA and 158 MVA hydro-type synchronous generators, respectively. In both cases, each trajectory corresponds to a constant reactive power level, while active power is varied along the trajectory.

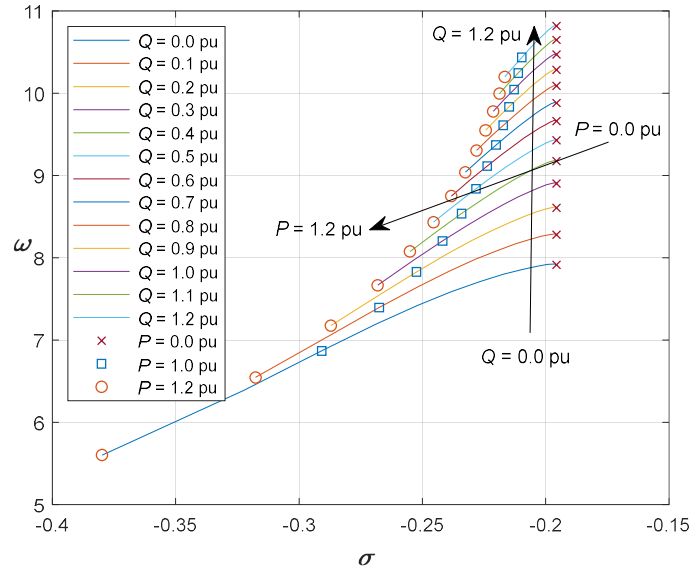


Fig. 2. Eigenvalue trajectories of the dominant mode for different operating conditions (9 MVA, without AVR) [10].

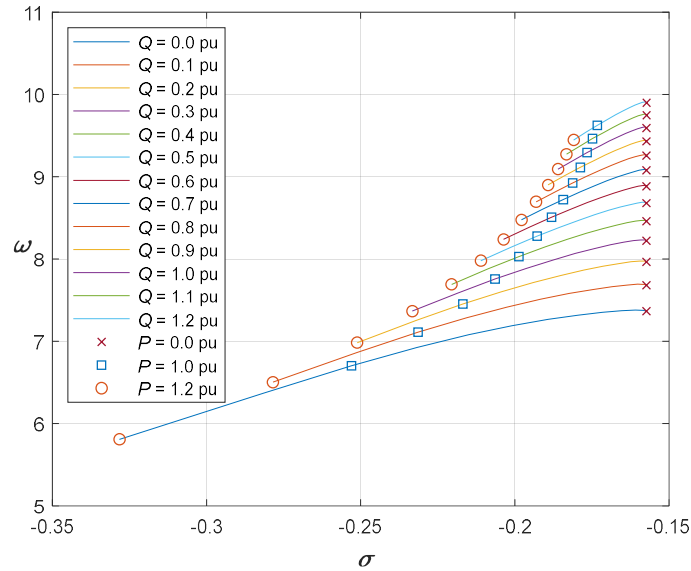


Fig. 3. Eigenvalue trajectories of the dominant mode for different operating conditions (158 MVA, without AVR) [10].

The results clearly demonstrate a strong dependence of the dominant eigenvalue location on the operating point. As active power increases, the real part of the eigenvalue generally shifts towards more negative values, indicating improved damping of the local electromechanical mode. In contrast, increasing reactive power moves the eigenvalues closer to the imaginary axis, resulting in reduced damping. The oscillation frequency is also influenced by the operating point, although its variation is less pronounced compared to the damping ratio.

Despite differences in rated power and machine parameters, all analysed generators exhibit the same qualitative behavior. This confirms that the influence of operating conditions on local electromechanical oscillations is not specific to a particular machine size, but represents a general characteristic of modern hydro-type synchronous generators. Consequently, the presented results are representative for a wide class of hydro generating units

5. INFLUENCE OF OPERATING CONDITIONS ON LOCAL ELECTROMECHANICAL OSCILLATIONS WITH AVR

The inclusion of an AVR introduces a fast excitation control loop that provides additional feedback into the synchronous generator dynamics. Although the primary role of the AVR is voltage regulation, its interaction with the generator's electromagnetic states has a significant impact on small-signal stability.

Unlike the mechanical turbine-governor system, which acts on a slow time scale and has negligible influence on local oscillations, the AVR operates on a much faster time scale. As a result, it introduces a strong coupling between terminal voltage variations and field voltage dynamics. This additional feedback path can either improve or deteriorate system damping depending on the operating point and controller gain.

In some operating conditions, the AVR enhances system stability by increasing synchronizing torque and improving voltage response. However, under other conditions, particularly at higher gains, it may reduce damping of electromechanical oscillations and even lead to poorly damped or unstable modes. This dual effect makes the analysis of excitation system influence essential for understanding generator dynamic behavior.

The same hydro-type synchronous generators as those analyzed in Section 4 are considered in this section. All machines are equipped with an AVR and a static exciter modeled by the transfer function given in (3). The excitation system time constant is set to $T_{AVR} = 0.05$ s for all cases. The AVR gain is defined as $k_{AVR} = T'_{d0}/(10 \cdot T_{AVR})$ consistent with established tuning guidelines [10].

The Heffron–Phillips model is extended by incorporating the AVR dynamics, resulting in an augmented state-space representation. The system matrices are evaluated over the same operating range as in Section 4, with active power P varied from 0.0 pu to 1.2 pu and reactive power Q independently varied from 0.0 pu to 1.2 pu at lagging power factor. For each operating point, the eigenvalues of the augmented system are computed, and the dominant complex-conjugate pair corresponding to the local electromechanical mode is extracted.

Figures 4 and 5 show the eigenvalue trajectories for hydro-type synchronous generators with nominal powers of 9 MVA and 158 MVA. Each curve corresponds to a constant reactive power level, while the active power is varied along the operating range.

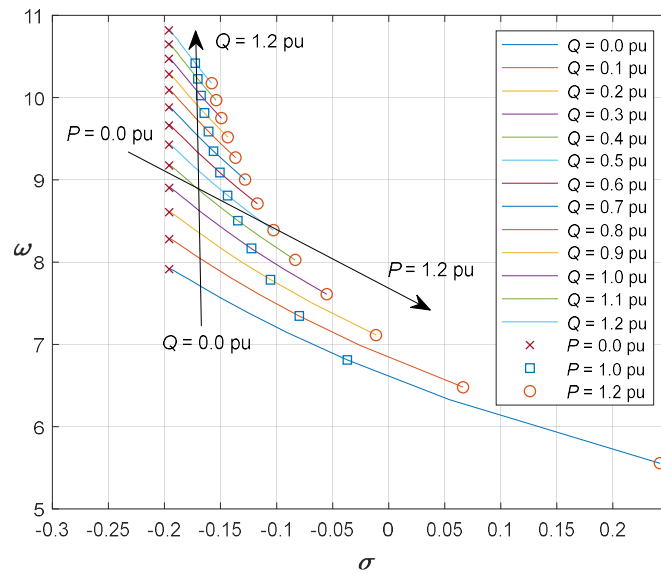


Fig. 3. Eigenvalue trajectories of the dominant mode for different operating conditions (9 MVA, with AVR) [10].

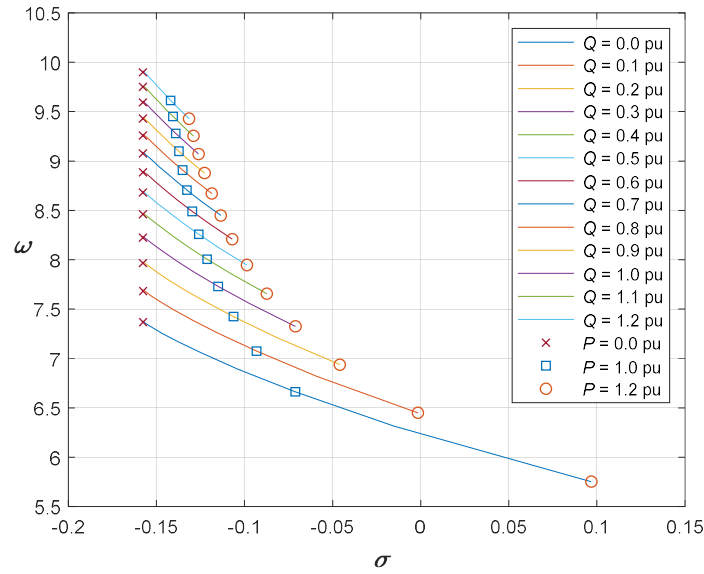


Fig. 5. Eigenvalue trajectories of the dominant mode for different operating conditions (158 MVA, with AVR) [10].

The results show that, although the qualitative dependence of the local mode on operating conditions remains similar for all investigated generators, the presence of the AVR significantly modifies the damping behavior. In contrast to the case without excitation control, where increasing active power generally improves damping, the inclusion of the AVR leads to a reduction in damping as active power increases. In some operating regions, this effect may even result in weakly damped or unstable oscillatory modes.

The obtained results can be summarized as follows:

- increasing active power leads to a reduction in damping of the local mode and may result in instability,
- increasing reactive power generally increases the oscillation frequency,
- the lowest damping occurs at high active power and low reactive power operating points,
- the highest damping is observed at low active power and high reactive power conditions.

These findings confirm that the AVR introduces a strong operating-point-dependent feedback effect on the electromechanical dynamics, which can significantly alter the small-signal stability characteristics of hydro-type synchronous generators.

6. CONCLUSIONS

The ongoing transformation of electric power systems is characterized by a rapid increase in the penetration of renewable energy sources, power-electronic interfaced generation, and battery energy storage systems. These developments are fundamentally changing the dynamic behavior of modern power systems, as conventional synchronous generation is gradually replaced or complemented by converter-based technologies. Unlike traditional synchronous machines, power-electronic devices do not inherently provide inertia and have limited natural damping properties, which makes the role of remaining synchronous generators increasingly important for overall system stability.

Despite the increasing share of converter-based generation, synchronous generators remain key components in present and future power systems. They significantly influence electromechanical oscillatory behavior and contribute essential inertia and damping to the network. For this reason, understanding their dynamic response, particularly under different operating conditions, is essential for ensuring secure and stable power system operation. In particular, the relationship between operating point and oscillatory characteristics has become increasingly relevant in modern low-inertia systems.

This paper investigated the influence of operating conditions and excitation control on the local electromechanical oscillations of hydro-type synchronous generators. The analysis was performed using a linearized Heffron–Phillips

model and eigenvalue-based modal analysis over a wide range of operating points. The study considered both cases: with and without an AVR, allowing a systematic comparison of their dynamic behavior.

The obtained results demonstrate that all investigated hydro-type synchronous generators exhibit very similar qualitative behavior of the local electromechanical mode, regardless of their rated power. This confirms that the dependence of oscillation characteristics on operating conditions is a general property of hydro generators rather than a machine-specific phenomenon.

Furthermore, the results clearly identify operating regions with different stability characteristics. In the case of synchronous generators without AVR, high active power combined with low reactive power leads to reduced damping and represents a more critical operating condition from a small-signal stability perspective. Conversely, higher reactive power levels tend to improve damping characteristics, although they may increase oscillation frequency.

A key finding of this study is the significant impact of the AVR on system damping. While the AVR can improve voltage regulation and dynamic response, it also introduces a fast feedback loop that strongly affects electromechanical oscillations. In contrast to the case without excitation control, where increasing active power improves damping, the presence of the AVR reverses this trend. In particular, higher active power levels may lead to a significant reduction in damping and, in some cases, even result in unstable oscillatory behavior. This effect is especially pronounced for strong excitation gains and highlights the importance of proper AVR tuning.

Overall, the results emphasize that excitation control systems play a crucial role in shaping the small-signal stability of synchronous generators. The identified dependence of damping on operating conditions and AVR parameters provides important insight for the design and operation of excitation systems in modern power grids.

In conclusion, as power systems continue to evolve toward higher shares of renewable generation, power electronic interfaced resources, and energy storage technologies, the importance of understanding the dynamic behavior of synchronous machines becomes even more critical. The findings of this study contribute to this understanding by clearly demonstrating how operating conditions and excitation control influence electromechanical oscillations. This knowledge is essential for improving system stability, optimizing generator performance, and ensuring reliable operation of future electric power systems.

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Advancing a Sustainable Career Model through Human Resource Management Practices

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Abstract

This study attempts to understand the impact of human resource practices, career resilience and adaptability on employees' career sustainability. The sample comprises 245 full-time employees. To rigorously test the hypotheses, partial least squares structural equation modelling (PLS-SEM version 4) was used. Findings provide robust evidence of positive, direct relationships between Human Resource Management Practices (HRMP) and Career Sustainability. Moreover, our analysis reveals that the relationship between HRMP and career sustainability is serially mediated by career resilience and adaptability, highlighting the crucial role of these factors in enhancing the sustainability of employees' careers. This study contributes to literature by attempting to explore how different HRMP may promote career sustainability during challenging and turbulent times. It also contributes to the literature by testing the effect of career resilience and adaptability on career sustainability.

Keywords: Career Sustainability, Human Resource Management Practices, Career Resilience, Career Adaptability, Sustainable Careers

1. INTRODUCTION

The Sustainable Development Goals Report (2022) published by the United Nations reveals that the rates of unemployment worldwide are soaring. Unsustainable careers are becoming a major threat to high quality socio-economic development [1]. Previous research highlights the negative implications of unemployment and unsustainable careers on individuals' self-confidence and mental health [2, 3]. Thus, scholars are progressively interested in exploring the future of work and stressing the need for a long view that builds strategies and reinvents old models to create sustainability for future crises [4, 5, 6]. Career sustainability can be defined as "sequences of continuity over time, thereby, crossing several social spaces, characterized by individual agency, herewith providing meaning to the individual." [7].

This study contributes to literature by attempting to test and explore three antecedents of career sustainability namely, HRMP, career resilience and adaptability. It also contributes by empirically examining how HRMP can positively enhance career resilience. A very limited number of studies have attempted to test the serial mediation effect of career resilience and adaptability on the relationship between HRMP and career sustainability. Therefore,

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the study also attempts to offer an understanding of the factors affecting career sustainability by investigating the impact of career adaptability and resilience on the latter.

Many previous studies have tested the impact of HRMP on individual and organizational performance. However, instead of looking at general HRMP, this study looks at specific practices that tend to positively impact an individual's performance [8, 9, 10].

Career resilience is defined as the ability of an individual to adapt, persist and bounce back when faced with challenges and adversities [11]. Despite its importance, the concept of career resilience still needs further investigation. Previous studies stress that career resilient employees are a strategic asset for business sustainability. Research in this area is expected to have vast contributions and benefits for organizations [12, 13].

Career adaptability (CAA) is defined as a person's readiness to manage anticipated tasks that facilitate his or her work preparation or participation and also unpredictable modifications arising from different work events. CAA is a concept that requires further research and understanding. This study contributes to the literature by explaining how CAA can have a positive effect on sustainable careers, a concept that is considered fairly new [14].

The theoretical framework for this study is the conservation of resources theory (CoR) [15]. Although much of the previous work used CoR theory in the context of investigating stress and well-being [16], the theory is believed to be a strong theoretical framework that aids in expanding our understanding on sustainable careers [17]. The theory rests on two main principles. Under the principle of investment, resources can help the individual to accomplish a career goal or to satisfy a need. According to the principle of primacy of loss, one will be able to preserve his/her career sustainability more when he or she is capable of adjusting well to losses. Therefore, this study argues that a person who proactively invests in attaining and preserving alternate efficient resources will be able to safeguard the sustainability of his career better, for example, through maintaining high levels of career resilience and adaptability. Therefore, the CoR theory is believed to provide a complete framework that can help to understand the processes underlying sustainable careers.

The first part of the study presents the Literature Review followed by the Methodology section. The Discussion section is then presented, in addition to the theoretical and practical implications and finally the limitations of the study.

2. LITERATURE REVIEW

2.1 Career Sustainability

Career sustainability can be defined as "sequences of continuity over time, thereby, crossing several social spaces, characterized by individual agency, herewith providing meaning to the individual." [7]. Although the concept of career sustainability is considered rather novel and is still being theoretically and empirically explored, the literature cites two main frameworks, the first developed by Newman [18] and the second by De Vos et al. [19]. De Vos et al. [19], building on previous works of Van der Heijden and De Vos [7] put forward a conceptual model that contains three indicators of sustainable careers, namely, health, happiness and productivity. Health pertains to the progressive fit of the career with a person's physical and mental capabilities. Happiness relates to the dynamic fit of the career with the individual's values, goals and needs. Finally, productivity entails effective performance in one's job. This career sustainability model explains that a dynamic person-career fit in relation to health, happiness and productivity is the main building block of a sustainable career. Despite its wide use, this model has been criticized since the term "crossing several social spaces" is not necessarily a measure or indication of career sustainability. Careers can be sustained in a single organization and context. A more wholistic career sustainability framework has been put forward by Newman [18]. It integrates theories of adult and career development. Sustainability means protecting and enhancing human capital rather than exhausting it. It implies restoring and retaining balance. To be sustainable throughout life, according to Newman [18], careers must have three features. They must include renewal opportunities; they must be flexible and adaptable and include opportunities for integration across life spheres and experiences.

Renewability relates to a person's ability to refresh, extend and be available continually. This feature hampers burnout. Renewable career activities allow for strengthening, reflection and retooling. Flexibility entails ease in reshaping, adapting, changing and being agile. It is considered a prime feature to advance career sustainability. Integrity and integration mean completeness, wholeness and consistency between beliefs and behaviors. Newman's framework is deductively built through a retrospective view on mature adult work experiences. In their recent study, Chin et al. [20] built on Newman's [18] model by adding a fourth aspect, resourcefulness. The authors argue that resourcefulness is a major factor in ensuring career sustainability taking into consideration the rapid changes taking place in the business world. Based on this reasoning, it becomes essential for individuals to try to be resilient and adaptive by developing their resources. In addition, Chin et al.'s [20] framework acknowledges the significance of

considering the interplay between person, context and time. It entails that career sustainability is both a property of careers and of the individuals ingrained in those careers assuming an interactional overview. This interactive view on career sustainability and its inclusive nature renders Chin et al.'s [20] framework a suitable one to be adopted in this study.

Various career shocks have taken place in the workforce and affected many people worldwide. Many individuals lack the resources to handle challenging situations such as career losses for instance. Efforts to ensure a sustainable career call for long term solutions and intricate endeavors from both the individual and the organization. A systematic way would be needed that fosters the interrelation of governments, organizations and society. Therefore, research on sustainable careers is very paramount despite the fact that is still at its early stages and additional investigations are needed to unravel factors that can further advance it [21]. Therefore, this study attempts to investigate alternative actions that can be done to ensure employees have resources and conservative factors that may help them to build resilience, and adaptability and alternatively grow a sustainable career during challenging times. The next section presents the theoretical framework for the study followed by the hypothesis's development section.

2.2 Theoretical Framework

Previous research used the Conservation of Resources (CoR) theory to explain how careers can be sustainable and how resources can influence career resilience and adaptability [19, 66]. CoR theory aims to explain circumstances and mechanisms when a person is being confronted with stress. People work to create and conserve resources and try to decrease the loss of these resources when stress takes place [15]. These resources can be material such as objects and money, environment related such as supportive work conditions, personal characteristics like optimism or energy like motivation and time. The theory also posits that those with more resources are less likely to face resource losses and are more capable of gaining new resources. Therefore, such individuals tend to accumulate and improve their resources over time. In other words, individuals with high resource reservoirs tend to enjoy resource caravans as a result of differing beneficial consequences [40]. Unlike other stress theories that focused on the individual with regards to coping and responding to stressful situations, CoR theory highlights the important role that the environment plays in the stress process and how it can either deplete or enrich a person's resources [40]. Therefore, the concept of preserving and creating resources can offer additional understanding on how individuals can develop resilience, increase their career adaptability and build sustainable careers [67, 66]. However, the challenge is bigger for individuals with few resources to draw upon. Hobfoll [40] explains that resources are distributed unequally and therefore individuals who lack resources tend to be the most susceptible to additional losses in the case where there are events that threaten one's resource capacity.

Sustaining resources for the purpose of progression and continuity in a person's career are becoming a vital issue [42, 19]. Based on this, we argue that career sustainability entails a method of preservation and creation of resources throughout a person's career. CoR theory is a significant and relevant theoretical framework for the topic of sustainable careers since it entails the basic concept that individuals are motivated to safeguard their existing resources and try to attain new ones [41]. The theory rests on two main principles, the first being the primacy of resource loss which pertains to the notion that losing a resource poses greater psychological harm for the person compared to the win they would receive when they regain a lost resource. The second principle is resource investment which refers to the notion that individuals invest resources for three main reasons: (1) to safeguard against resource loss; (2) to recoup for resource loss; (3) and to win additional resources [40].

3. DEVELOPMENT OF HYPOTHESES

3.1 Human Resource Management Practices (HRMP)

In order to further understand career sustainability, researchers explain that the role of the organization should be considered [21]. Organizations play a significant part in enhancing career sustainability through their HRM practices and policies [22]. Organizations offer employees various resources and put on them demands that might impact their abilities to be resourceful, flexible or renewable. Therefore, scholars call for additional investigations to explore how different HRM practices may promote career sustainability [23]. HRMP are presented in this study as individual perceptions of human resource practices. The current study builds on Kooij et al. [24] concept of HRMP to further explore its input on career sustainability. Kooij et al. [24] propose that four groups of HRMP can be utilized during one's career to promote career sustainability namely, developmental, maintenance, utilization and accommodative practices. This study tests a bundle of HRMP that constitute Training and Development (T&D), Health and Wellness (H&W) and Work-Life Balance (WLB) as proposed by Kooij et al. [24].

Based on the CoR theory, this study argues that sustainable careers result from preserving existing resources and aid at generating new ones [19]. The literature discusses various examples on how different career shocks change a person's career sustainability leading to diminished energy and cognitive resources [25]. Thus, individuals who receive a promotion, which is considered a gain of resource may feel more motivated and resourceful. Drawing on the CoR theory, we argue that if organizations were able to conserve employee resources and help them acquire new ones, by providing training and development, health and wellness and work-life balance practices and programs, they will enjoy sustainable careers. Developmental HR practices, such as training, aid employees to enhance their performance. Training is considered a vital HRM practice that is believed to create additional personal and job resources [25]. Training is expected to equip employees with new, needed and updated skills that enhance their career flexibility and resourcefulness [26]. Maintenance practices such as health and wellness programs help employees maintain their performance despite the challenges they may be facing in the work environment. These practices tend to positively impact outcomes related to career sustainability by safeguarding and growing resources, for example by protecting employee health. Accommodative HRM practices such as telework or flexi work help employees regain performance levels [27]. By decreasing job demands, less stress will be applied to employees' current resources [28]. Finally, HRM practices focus on advancing employees' knowledge. Therefore, we argue that HRM practices, namely training, health and wellness programs, and work-life balance programs are expected to help employees conserve their resources and gain new ones. Previous studies indicate that HRM practices are useful for outcomes that relate to career sustainability [29, 30]. Therefore, the first hypothesis is as follows:

H1: Human resource management practices have a positive impact on career sustainability.

3.2 Career Resilience

The concept of career resilience has been receiving increasing attention in literature due to many factors such as heightened job insecurity and work-life conflict [31]. Career resilience is defined as the ability of an individual to adapt, persist and bounce back when faced with challenges and adversities [11]. In their study, Rochat et al. [32] describe the following process pertaining to resilience: determining threatening career situations, such as the pandemic for example, recognizing both related risks and protective factors and finally deciding on a successful outcome. Thus, career resilience is seen to mediate the hardships in one's career environment and favorable outcomes such as career sustainability.

Previous literature highlights the importance of several personal and environmental factors that influence a person's career resilience [33, 34]. Individual factors relate to skills, traits, attitudes and behaviours that can either strengthen or weaken career resilience. Context elements may include a supportive workplace environment and job characteristics [11]. In line with CoR theory, we argue that lack of resources, such as objects, human and social capitals may adversely impact career resilience. Protective factors such as supportive HRM practices can aid in preserving career resilience on the other hand [35]. Therefore, the following hypothesis is proposed:

H2: Human resource management practices positively affect career resilience.

3.3 Career Adaptability

Career adaptability is defined as a person's readiness to manage anticipated tasks that facilitate his or her work preparation or participation and unpredictable modifications arising from different work events. The term is also considered a psychological construct pertaining to resources that individuals need to efficiently manage present and future career transitions [36, 37]. These resources operate as self-regulatory strategies. They facilitate broadening, refining and self-implementation within one's career that eventually shape one's work life and his or her career [38]. The construct comprises four transactional components: concern, that relates to a person's endeavors to plan their future; control that is knowing what career to choose; curiosity which pertains to attempts to explore one's career options, and confidence, being driven by strong self-confidence to achieve goals [39]. We argue that career adaptation can lead to career sustainability. Undertaking career adaptation related activities such as planning, decision-making and exploration facilitates a better self-vocational environment fit [36]. And since career sustainability can be viewed as a form of human sustainability, meaning it is the ability to establish, test and preserve a person's adaptive capability [19], we argue that career adaptability fosters career sustainability. Therefore, the third hypothesis in this study is as follows:

H3: Career adaptability positively enhances career sustainability.

3.4 The Serial Mediating Effect of Career Resilience and Career Adaptability

Recent literature indicates that HRMP such as training, flexi work, career advancement schemes and opportunities can enhance employee resilience [43]. These HRMP aid in creating skills, know-how and strengthening employees' self-efficacy as well as helping them bounce back when they face challenges within their workplace and careers [44]. In their research, Rentsch and Judge [45] explain that HRMP such as supportive management, organizational learning opportunities and job security were linked to increase resilience among employees. HRMP are believed to offer employees a certain degree of control and stability that will aid them in navigating hardships and work stressors.

Previous research shows that resilience is positively linked to several outcomes related to career sustainability such as job performance and satisfaction, organizational and career commitment, and career advancement [44, 45]. Employees with higher levels of resilience tend to cope better with challenges and unexpected changes that might occur in the workplace. They are able to manage their careers efficiently despite the ups and downs and ultimately be successful and satisfied in the long run. Therefore, they are expected to present higher levels of motivation and engagement compared to employees with low resilience.

As discussed earlier, career adaptability is made up of four psychosocial resources (control, confidence, curiosity and concern) that can be acquired over time. Therefore, career adaptability is considered a pliable rather than fixed construct. Few studies, however, have attempted to test antecedents of career adaptability. Scholars call for additional research to explore the influence of a designed intervention regarding career adaptability [46, 47]. HRMP such as training that aims at enhancing employees career planning, decision-making, exploration and problem solving is expected to improve career adaptability [48, 36]. Other HRMP such as work-life balance are expected to help a person have more control over her career which is one of the career adaptability resources discussed earlier [26, 39]. Health and wellness programs aim at providing employees with resources to improve their physical and mental health. They help in buffering work stressors and enhancing self-confidence and control [26].

In an era characterized by relentless change and unpredictability, career sustainability hinges on individuals' ability to adapt, learn, and evolve. Thus, this study argues that career adaptability enhances career sustainability. Career adaptability empowers employees to navigate technological, economic, and professional shifts. Career adaptability is expected to advance enduring, impactful careers that transcend the confines of traditional professional trajectories [38, 37].

Therefore, the fourth hypothesis is as follows:

H4: There is a serial mediation effect of resilience and career adaptability on the relationship between human resource management practices and career sustainability.

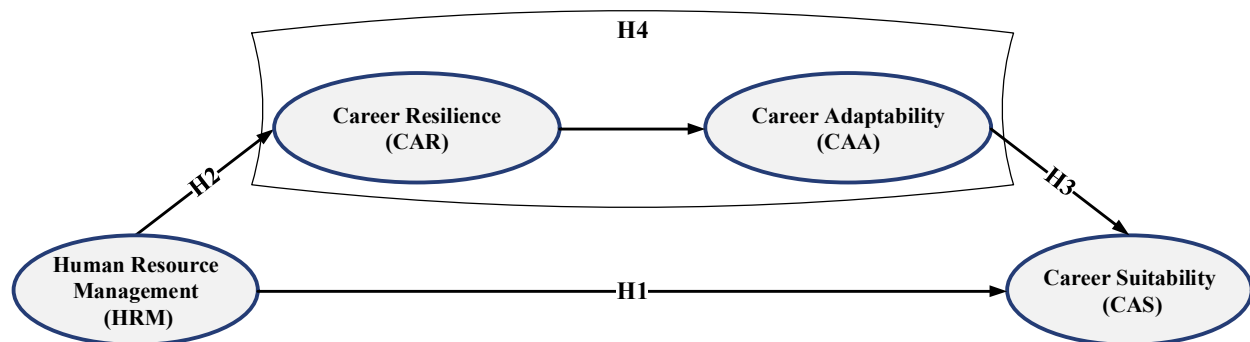


Figure 1. Hypothesized framework

4. METHODS

4.1 Research Setting and Participants

This research was conducted among full-time employees from different industries. Invitations were sent to 450 individuals to participate in the survey, out of which 245 respondents completed the questionnaire. This resulted in a response rate of 54%, and these 245 surveys were included in the data analysis.

The demographic details of our sample are presented in Table 1. To ensure that our dataset had sufficient sample size, G*Power t-test was used [49]. Multiple regression analysis was implemented, with a size effect of $f^2=0.05$ and 95% power, at a significance level of 0.05. The analysis revealed that a total of 218 respondents would be required to

produce reliable results, with an actual power of 0.95. This study obtained 245 valid responses, which exceeded the above-mentioned requirement.

Table 1. Gender, Age, Education, Years of Experience, and Firm Specialization

Demographic	Frequency	Percent
Gender		
Female	103	0.42
Male	142	0.58
Age		
19-24	14	0.06
25-34	60	0.24
35-44	122	0.50
45-54	34	0.14
Above 55	15	0.06
Education		
High School graduated	21	0.09
Completed some college, but no degree	32	0.13
Associate Degree	18	0.07
College Degree (B.A., B.S.)	69	0.28
Master's Degree	73	0.30
Doctorate Degree	32	0.13
Years of Experience		
0-5	39	0.16
6-11	98	0.40
12-17	57	0.23
18-23	31	0.13
Above 23 years	20	0.08
Firm Specialization		
Service	99	40.4
Mix of product and service (solutions)	90	36.7
Product	56	22.9

4.2 Measures

Constructs were measured at employee level using a seven-point Likert Scale. *Human Resource Management (HRM)* scale is composed of three distinct subscales, which are measured using a total of 11 items. The internal consistency of the overall HRM scale is high, with a Cronbach's alpha value of 0.934. The subscale of *Training and Development (T&D)* includes four items, with a Cronbach's alpha value of 0.872. The subscale of *Health and Wellness (H&W)* includes four items as well, with Cronbach's alpha value of 0.910. Finally, the subscale of *Work-Life Balance (WLB)* comprises three items, with a Cronbach's alpha value of 0.891. All items used in the HRM construct were previously validated by other researchers and were adopted from Robinson et al. [57], Varga et al. [58], and McCleary et al. [59] respectively.

Career Resilience (CAR) is the first mediator variable in our study. It is measured using a six-item scale, with a Cronbach's alpha value of 0.749. The scale was originally developed by Smith et al. [60] and includes three items that are reverse scored.

Career Adaptability (CAA) is the second mediator variable in this study. It is measured using an eleven-item scale, with a Cronbach's alpha value of 0.901. The scale was originally developed by Rottinghaus et al. [61] and includes two items that are reverse scored.

Career Sustainability (CAS) is the dependent variable in this study. It is measured using a twelve-item scale, with a Cronbach's alpha value of 0.954. The scale was originally developed by Chin et al. [20] and includes three items that are reverse scored. The scale is based on a combination of four factors, namely resourceful, flexible, renewable, and integrative.

4.3 Data Analysis and Results

The reflective measurement model and structural model were assessed using PLS-SEM through a two-step procedure consisting of the measurement and structural model assessments. Specifically, Smart PLS-SEM 4 was used [50] to analyze the direct effects of HRM practices on career resilience, career adaptability, and career sustainability, as well as the mediating role of career resilience and career adaptability. The analysis involved entering the data into PLS-SEM and performing 5000 bootstrap iterations. According to Hair et al. [51], when a structural model is complex and involves many components, indicators, or relationships, it is recommended to use PLS-SEM. Therefore, we used PLS-SEM, which is a variance-based SEM method that provides reliable explanations and overcomes some limitations of covariance-based SEM, as pointed out by Legate et al. [52].

4.4 Common Method Variance

To address the potential influence of common method variance (CMV) resulting from self-reported measures, established procedures were followed to minimize or eliminate its effect [53]. Furthermore, collinearity in the data was checked, and the results showed that all indicators had a variance inflation factor (VIF) less than 5, which is below the threshold [50], indicating that collinearity was not a concern in the study. Therefore, the data does not suffer from any collinearity issues.

4.5 Assessment of the Measurement Model

This study conducted an analysis of the measurement model before proceeding with the structural model and hypothesis testing. The analysis included assessing the loading items, composite reliability (CR), average variance extracted (AVE), Cronbach's alpha, and heterotrait-monotrait (HTMT) [51].

Table 2 shows that all factors had loading items above .50 except for three items from career resilience and two items from career adaptability, which were eliminated as they did not meet the threshold. This resulted in 35 out of 40 items remaining in the survey for further analysis. The AVE values for HRM, career resilience, career adaptability, and career sustainability were greater than .50, indicating convergent validity [54]. The CR values for all constructs were greater than .70, indicating good internal consistency. HTMT values were below the recommended threshold of 0.850 [55] ranging between 0.709 and 0.830, suggesting discriminant validity is established. Additionally, the standardized root mean square residual (SRMR) was 0.073, indicating an acceptable model fit since the SRMR was below .080 [56]. Furthermore, as shown in Table 3, the highest correlation was found between HRM and career sustainability ($r = .786$), followed by HRM and career adaptability ($r = .718$), and career adaptability and career sustainability ($r = .661$). All Pearson correlation coefficients (r) between the main variables are significant at the 1% level.

Table 2. Measurement Model

Constructs	Measurement Items	Loadings	Average Loadings	AVE	CR	CA
Human Resource Management			0.879	0.605	0.936	0.934
Training & Development (T&D)			0.850	0.724	0.875	0.872
	T&D1	0.849				
	T&D2	0.867				
	T&D3	0.793				
	T&D4	0.891				
Health & Wellness (H&W)			0.887	0.787	0.911	0.910
	H&W1	0.881				
	H&W2	0.884				

	H&W3	0.889				
	H&W4	0.894				
Work-Life Balance (WLB)			0.906	0.821	0.891	0.891
	WLB1	0.925				
	WLB2	0.902				
	WLB3	0.892				
Career Resilience (CAR)			0.814	0.663	0.763	0.749
	CAR1	0.832				
	CAR3	0.816				
	CAR5	0.794				
Career Adaptability (CAA)			0.747	0.565	0.908	0.901
	CAA1	0.727				
	CAA2	0.790				
	CAA3	0.815				
	CAA4	0.786				
	CAA5	0.806				
	CAA6	0.806				
	CAA7	0.793				
	CAA8	0.599				
	CAA9	0.600				
Career Sustainability (CAS)			0.815	0.666	0.956	0.954
	CAS1	0.728				
	CAS2	0.830				
	CAS3	0.883				
	CAS4	0.832				
	CAS5	0.805				
	CAS6	0.747				
	CAS7	0.867				
	CAS8	0.817				
	CAS9	0.817				
	CAS10	0.825				
	CAS11	0.802				
	CAS12	0.828				

Table 3. Correlation, Mean, and Standard Deviation

	HRM	CAR	CAA	CAS
HRM	1			
Career Resilience (CAR)	.607**	1		
Career Adaptability (CAA)	.718**	.633**	1	
Career Sustainability (CAS)	.786**	.604**	.661**	1
Mean	5.695	5.431	5.814	5.658
Standard Deviation	1.070	1.156	0.889	1.154

Notes: HRM: Human Resource Management. ** Correlation is significant at the 0.01 level.

4.6 Assessment of the Structural Model

The adjusted R-squared value of 64% indicated that HRM, career resilience, and career adaptability explained the variance in the dependent variable (career sustainability). Additionally, 39% of the variance in career resilience was explained by HRM, and 43% of the variance in career adaptability was explained by HRM and career resilience. To assess the predictive ability of the model, Stone-Geisser's Q2 values were computed, which were .605 for career sustainability, .375 for career resilience, and .410 for career adaptability. All Q2 values were greater than 0, indicating that the model had predictive relevance.

4.7 Hypotheses Tests

Hypotheses 1, 2, 3, and the serial mediation hypothesis were all supported in the analysis (Table 4 and Figure 2). In detail, hypothesis 1 suggests a positive relationship between HRM and career sustainability, and this was supported by a significant path coefficient ($B = 0.644$, $t = 6.090$, $p < 0.001$). Hypothesis 2 assumes a positive relationship between HRM and career resilience, and this was also supported by a significant path coefficient ($B = 0.623$, $t = 12.079$, $p < 0.001$). Hypothesis 3 expects a positive relationship between career adaptability and career sustainability, and this was supported by a significant path coefficient ($B = 0.200$, $t = 15.791$, $p < 0.001$). Finally, the serial mediation hypothesis was supported by a significant indirect effect of HRM on career sustainability through career resilience and career adaptability ($B = 0.082$, $t = 2.223$, $p < 0.050$), and the direct effect of HRM on career sustainability decreased when these mediators were added to the model. Overall, these results suggest that HRM, career resilience, and career adaptability are all important antecedents of career sustainability.

Table 4. Hypotheses Test

Path Relationships	Beta	SD	t	P values
Direct relationships				
HRM → CAS	0.644	0.106	6.090	0.000
HRM → CAR	0.623	0.052	12.079	0.000
CAR → CAA	0.661	0.042	15.791	0.000
CAA → CAS	0.200	0.088	2.286	0.022
Indirect relationships				
HRM → CAR → CAA	0.412	0.055	7.468	0.000
CAR → CAA → CAS	0.132	0.059	2.250	0.024
HRM → CAR → CAA → CAS	0.082	0.037	2.223	0.026

Notes: HRM: Human Resource Management, CAR: Career Resilience, CAA: Career Adaptability, CAS: Career Sustainability.

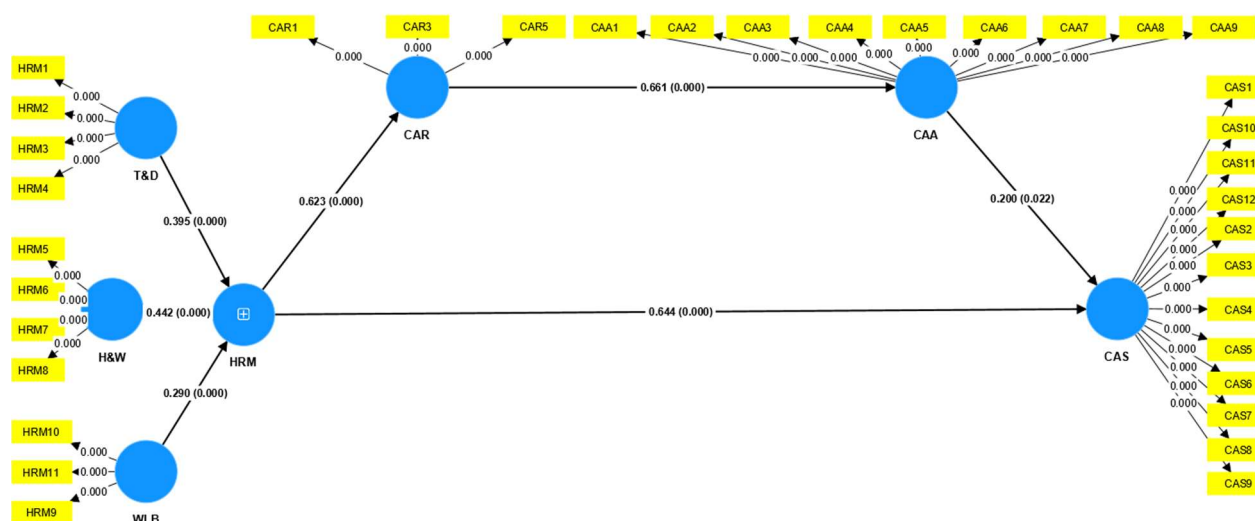


Figure 2. PLS-SEM Results

Notes: HRM: Human resource management, CAR: Career Resilience, CAA: Career Adaptability, CAS: Career Sustainability.

5. DISCUSSION

Factors such as changing labor markets, globalization, technological developments and retirement policies have rendered careers more complicated and unpredictable [63]. Efforts to ensure a sustainable career call for long term solutions and intricate endeavors from both the individual and the organization. A systematic way would be needed that fosters the interrelation of governments, organizations and society. Therefore, additional research is needed to unravel factors that can further advance sustainable careers. The current study attempts to fill this gap by empirically testing the effect of specific HRMP, namely training and development, health and wellness and work-life balance on career sustainability. A very limited number of studies have attempted to test the serial mediation effect of career resilience and adaptability on the relationship between HRMPs and career sustainability. The study also attempts to offer an understanding of the factors affecting career sustainability by investigating the impact of career adaptability and resilience on the latter.

The study's findings indicate that the above-mentioned human resource management practices have a positive impact on career sustainability. This is consistent with previous studies in the literature that explain that utilization of HRMP aims at advancing employees' knowledge. Findings from past studies indicate that HRMP, namely training, health and wellness programs, and work-life balance programs may help employees conserve their resources and gain new ones. HRMP are useful for outcomes that relate to career sustainability [29, 30].

The study's findings also show that HRMP positively affects career resilience. Previous studies highlight the important role that both individual and contextual factors play in enhancing a person's career resilience, with the need for additional research on factors that advance resilience [12, 34]. Individual factors relate to skills, traits, attitudes and behaviors that can either strengthen or weaken career resilience. Context elements may include a supportive workplace environment and job characteristics [11].

The third finding of this study implies that career adaptability positively impacts career sustainability. Career adaptability is defined as a psychological construct pertaining to resources that individuals require in order to efficiently manage present and future career transitions [36]. These resources operate as self-regulatory strategies and enable broadening, refining and self-implementation within one's career that eventually shape one's work life and his or her career [39].

The findings of this study also show that both career resilience and career adaptability mediate the relationship between human resource programs and career sustainability. Previous studies indicate that HRMP can have a positive impact on career resilience [44] and career adaptability [48, 36]. Previous findings also indicate that resilience is positively linked to several outcomes related to career sustainability such as job performance and satisfaction, organizational and career commitment, and career advancement [44, 45]. Employees with higher levels of resilience tend to cope better with challenges that take place in their work environment. In addition, career adaptation related activities such as planning, decision-making and exploration facilitates a better self-vocational environment fit leading to career sustainability [36].

5.1 Theoretical and Practical Implications

The results of this study attempt to shed light on the important role that HRMP play, in addition to career resilience and adaptability, in fostering career sustainability for employees especially during turbulent times. This section presents several implications for organizations, human resource managers and employees in this respect. Seibert et al. [62] put forward several psychological and behavioural strategies that help in strengthening resilience. Human resource managers through the application of various HRMP in an organization can offer training and development opportunities that develop growth mindset, enable employees to reframe their career goals and build a strong career network. These strategies, with the guidance of HR managers, can aid employees to recover and sustain their careers after facing unexpected challenges. HRM department can also provide learning opportunities in the form of seminars and workshops that aid employees in acquiring needed skills that aid in career adaptability [12]. To advance sustainable careers that withstand shocks and unprecedented events, organizations should foster HRM practices that not only aid in recovering but also in advancing workplaces that are well prepared to face future disruptions in the workplace.

5.2 Limitations of the Study and Future Directions for Research

As with all studies, this study has several limitations. Although the sample size ($n = 245$) robustly meets the sample size threshold, future researchers are encouraged to employ bigger sample sizes to increase reliability. This study followed a cross-sectional design which limits its findings [64]. It is recommended that future studies employ more

longitudinal designs to provide more certainty about the direction of the relationship between the variables. The study focused only on the perception of employees regarding HRMP offered which is also not consistent within each organization. Different people from the same organization may view HRMP differently. Thus, future research could explore HRMP at organizational and departmental levels. Even though common method variance is within the accepted threshold in this study, self-reported data used may be subject to response bias. Moreover, the examination of a limited number of variables may have restricted the overall understanding of the complex relationships between HRMP, career sustainability, and related factors. Future studies could incorporate additional variables such as different leadership styles, which may impact career resilience and provide a more comprehensive understanding of this crucial topic.

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The Importance of Student Management in Improving the Quality of Education

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Abstract

The world is constantly interacting, both socially and economically. Therefore, all processes occurring globally push humanity towards seeking common solutions, and the understanding of education must be shaped accordingly, being inclusive and interactive. With this in mind, the schools incorporate international programs into their institutional culture and follow innovations. While offering various training and development opportunities for teachers, students are provided with enriched learning environments, unique assessment tools and methods, and a multifaceted evaluation environment. Thus, the aim is to understand, encompass, and develop the student in all their aspects. In line with the awareness of investing in the future of the world through education, pedagogical practices are differentiated according to the diversity of student needs, focusing on individual differences. Ensuring that each student benefits from instruction by considering their individual differences and that teacher-student development is continuous can be achieved through high-quality education. In the study the importance of student Management in improving the quality of education has been searched under the light of the literature. It has been concluded that the schools should aim for every student to reach the highest level of knowledge, skills, and conceptual understanding in all areas of development, in accordance with their age and hidden potential. Emphasis should be placed on inclusivity, a process that aims to enable all students to participate in the learning process by identifying and removing potential barriers.

Keywords: Student Management, Educational Management, Quality of Education, Educational Policies

1. INTRODUCTION

The increasing complexity and globalization of Science and Technology (SCT) has impacted almost every aspect of human life on Earth today, including education. The advancement of SCT has transformed humanity into a global society, a technological society, and an information society open to rapid change, presenting new demands, challenges, and even threats. Schools, as an element of educational institutions, are inseparable from these challenges. Therefore, humanity needs to make further progress, particularly in the development of quality educational institutions. Quality is the primary agenda, and improving it is a crucial task, as it plays a vital role in improving the quality of human resources. (Sutiah, 2016; Budiman, 2017; Umar and Ismail, 2018).

The quality that can be improved in education includes the educational input, process, and output. Educational input is everything necessary for the process to take place. This includes resources and software, and the expectations that guide the process. These human resources inputs include human resources such as principals, teachers, guidance counselors, staff, and students and other resources such as equipment, materials, and money. Software inputs include the school's organizational structure, laws and regulations, job descriptions, plans, and schedules. Expectations include

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the school's vision, mission, and goals. Input preparation is essential for the smooth functioning of the process, as the input is a prerequisite for its continuation. Therefore, the quality of the input can be measured by the level of input preparation. The higher the input preparation, the higher the quality.

One of the indicators of educational quality is the PISA (Programme for Student Assessment) scores, which serve as a measure of a country's educational quality, and these scores also show that in many countries a lot of students' mathematics, science, and literacy skills remain low (Aisah et al., 2021). Problems related to educational quality are also frequently seen in schools that do not meet the National Education Standards; these include teachers and educational staff without standardized qualifications and competencies, unqualified and incompatible personnel, limited infrastructure, budget constraints, and discriminatory government policies towards private and public schools and educational institutions. This situation leads to a significant failure to achieve the national education goal of educating the nation by improving educational quality. Furthermore, during the current COVID-19 pandemic, many educational institutions are struggling to improve educational quality due to numerous factors hindering teaching and learning activities, especially for upperclassmen preparing for exams. The various phenomena stem from the fact that educational administration focuses more on the quantitative aspect rather than the qualitative aspect. In addition, insufficient attention is paid to efforts to improve the quality of the teaching and learning process and the quality of school management, including administration, leadership, human resources, finance, and institutions. Yet, this quality of education has become a common goal of all education practitioners and has been pursued through various methods, techniques, approaches, strategies, and policies. Therefore, there is a need for good management that can empower educational institutions to improve their quality, thus producing quality output and becoming competitive (Hendro Widodo, 2017). (Hakiim et al., 2021). (Hendro Widodo, 2018). Given these various efforts, the question arises: How important is student management in schools in improving school quality?

2. STUDENT MANAGEMENT IN EDUCATIONAL INSTITUTIONS

Student management in schools is a set of disciplines implemented to ensure that educational activities take place in a safe and efficient environment, to support students' academic development, and to manage their administrative processes. Student government is the activity of managing students from registration to graduation. It is known that in student management, the best service should be provided from the very beginning. This means that a comprehensive student planning process is required prior to student admission. This planning is carried out in preparation for the student's acceptance from the educational institution until graduation.

With the implementation of student management, activities aimed at developing student potential can be carried out regularly and smoothly. There are at least three main tasks in student government:

- Admission of new students,
- Carrying out teaching and learning activities to develop and increase student potential and
- Providing academic guidance and discipline to students.

Student management requires collaboration to achieve learning goals in schools. It is carried out not only through registration but also through other educational activities to develop student potential.

In student management in educational institutions, Student Planning, Organization of Students, Student Mobilization and Student Supervision are of great importance.

Student Planning refers to the process of enrolling students in educational institutions. This activity begins with student planning, which begins with the formation of the School Admission Programme committee. The committee is tasked with developing a plan for admissions activities, which in practice is divided into two phases: planning and new student admission. This planning activity consists of the following stages:

- Estimating the origins of potential students,
- Formulating student admission targets,
- Development of an activity for School Admission Programme
- Creating a calendar for potential student registrations and
- Preparation of a draft budget for School Admission Programme activities.

This planning process relates to admissions activities, graduation planning, and student transfers. Specifically, this planning activity includes admissions activities and the process of documenting student data. Student planning starts with:

- a) Analyzing student needs,
- b) Selection of students,
- c) Orientation of accepted students,
- d) Placing students in predetermined classes and
- e) Recording and reporting student progress throughout the teaching and learning process.

Student planning and admission activities are one of the functions of administration. Since the focus of management is students, this planning function in management is very important. The requirements for candidate students to be accepted to educational institutions are determined in advance according to established criteria. These criteria were established to select students who meet the school's expectations. Schools cannot accept all applicants due to limited facilities and infrastructure.

During registration, students' abilities and social backgrounds are observed. This aims to identify students. Prospective students may be accepted or rejected based on the information obtained during this determination. The reasons for rejection of prospective students include limited school facilities and infrastructure and the presence of prospective students who do not meet administrative requirements.

Every school has a different strategy for admissions. These differences in strategy arise from the School Admission Programme committee's ability to promote the school's strengths. This strategy is used to attract potential students to the school. The annual admissions process must demonstrate excellence and originality. This excellence and originality can be achieved by promoting excellence in the school environment by the School Admission Programme committee.

Student organization is the activity of organizing students. This includes not only managing student staff but also preparing supporting equipment. The organization phase begins with students attending orientation and ends with student grouping.

Orientation for new students aims to prepare them for the school environment, both physically and socially. Then, students are grouped, divided into groups, and a teacher is assigned as the classroom teacher. Assigning a classroom teacher aims to organize the teaching and learning process between teachers and students. Orientation is an activity to introduce the school environment, including both physical facilities and school programs. This introduction to the school environment takes place after students are admitted and re-enrolled. This activity is the first activity at the school. During orientation, students are introduced to the social and physical environment.

Orientation activities for new students aim to ensure that students feel ready to participate in teaching and learning activities at school in a new environment. Student readiness is measured by their psychological readiness and ensures they feel comfortable in carrying out school activities.

The activity following student orientation is the division of students into working groups. This process is based on the identification process carried out during student admission. All educational unit personnel involved in the learning process should be aware of the function of identifying students' initial abilities. This identification aims to map students' potentials and then group them according to their unique abilities and potentials.

Student mobilization activities are conducted to encourage and develop student potential. This development and guidance is carried out through joint efforts by educators and educational staff in the management of students. Classroom management is the responsibility of the classroom teacher, with the assistance of several teachers, to ensure that the learning process is conducted in a way that achieves its goals. It is stated that the most appropriate services should be provided to students both inside and outside the classroom for the purpose of their development and nurturing.

The "student mobilization" mentioned here by the researchers refers to the process of developing and nurturing student potential, carried out by educational institutions both inside and outside the classroom. Potential development within the classroom is often referred to as classroom management. A component of classroom management is the teaching and learning activities in the classroom. There are at least four components of teaching and learning activities in the classroom:

First, preparation to encourage student interest in participating in the learning process. Second, presentation; that is, the educator presenting new material, whether information or skills, during the meeting. Third, application; that is, students putting what the educator has conveyed into practice, thus integrating not only theory but also knowledge and skills. Fourth, performance, which refers to students applying the knowledge they have acquired to the real world. Several approaches should be adopted to create an effective classroom environment.

- preparing learning opportunities and infrastructure, such as the physical and social environment inside and outside the classroom.
 - establishing rules that govern all class members without exception, including educators, thus encouraging appropriate behavior in learning activities.
 - observing students during learning and using the data obtained to monitor student attitudes and behaviors.
- Fourth, the ability to modify the established rules according to needs.

Motivating students in the classroom is the process of developing and supporting potential activities carried out in the classroom. The learning process in the classroom has at least three important components that researchers believe

serve as a reference for educators in conducting these activities: curriculum, teaching strategies, and the learning process.

Extracurricular activities implemented by educational institutions are a form of student mobilization outside the classroom. Students' social skills are managed and developed according to the extracurricular areas they choose. The national curriculum structurally anticipates that the development of social skills can be done in the classroom. However, it is necessary for students to be developed and actively encouraged through extracurricular activities.

Extracurricular activities are those conducted outside the curriculum by educational units with the aim of developing students' abilities and are directly managed by educators or educational staff authorized by the educational institution. This ability development encompasses students' potential, abilities and interests, personality, cooperation skills, and independence. There are three identified effects of extracurricular activities on students' academic abilities.

First, if students spend their time on extracurricular activities, it has a negative effect by causing them to fall behind in their academic studies.

Second, they have an indirectly positive effect because they develop non-academic social skills.

Third, extracurricular activities have a positive effect because they support the acquisition of academic abilities. Student mobilization activities result in student evaluation. This assessment is carried out by recording and reporting the outcomes of both in-curricular and out-of-curricular teaching and learning processes. The grades and reports given constitute a form of assessment conducted by educational institutions for students. Learning assessment is the responsibility of both in-curricular and out-of-curricular educators. Educators should use established assessment guidelines to ensure that the assessment is in the right direction. This activity continues from the time a student is admitted to the school until graduation or transfer to another school.

Student records are used as data for the development of student abilities. These records are kept through master books, grade books, attendance records, personal records, transfer records, grade lists, notebooks, and report card records. In addition to the records, schools also collect data on student development, encompassing cognitive, emotional, and psychomotor elements, as a form of assessment. This record-keeping also constitutes a form of student assessment. The assessment of teaching and learning activities is used to evaluate and measure the development of student competencies, thus identifying obstacles encountered. The purpose of the assessment should be clear so that it can be used to determine the direction and development of subsequent assessments. The basis of assessment in primary and secondary schools is the principles of objectivity, integration, economy, and transparency. Assessment is conducted to maintain the quality of school outcomes.

Academic outcomes focus on students' cognitive abilities; for example, improvements in grades, the number of graduates continuing their education, and success in academic olympiad competitions. Non-academic outcomes focus on students' emotional and psychomotor skills. Student development is monitored and evaluated by educators. The results of these observations are recorded in a book or document prepared as mentioned. The school then communicates the recorded student development to parents/guardians. This reporting is done in the form of cognitive, emotional, and psychomotor assessments presented in report cards each term.

The recording and reporting of student development results serves as a form of monitoring the quality of education by the school. Schools communicate student development not only through report cards but also through diaries given to students. These journals are used to record activities at home and are shared with parents.

Reporting can also be done at parent-teacher meetings, at a predetermined time or using a schedule mutually agreed upon between the school and parents. Reporting at these meetings is general in nature, concerning the student's progress at school. Furthermore, these meetings serve as a means of strengthening the relationship between parents and the school.

Student grouping can be done using integration and differentiation functions. Grouping based on gender and age is an example of an integration function, while student ability is a differentiation function. Student grouping can also be done by considering achievement, ability, interests, or intelligence level. Grouping is also done by comparing physical condition as weight, height and vision, intellectual character as intelligence, learning ability, language skills, and social qualities as number of friends, leadership skills, and helpful habits.

Some differences that may be found among students include economic, social, cultural, and intellectual abilities. To address these differences, the School Admission Programme committee may conduct tests to place students according to the categories they are grouped into.

Student Supervision is the activity of supervising or managing students. In this case, supervision is carried out comprehensively, encompassing the processes of planning, organizing, and acting on behalf of students. Student supervision is not limited to the students themselves; it also includes the supervision of the educational institution's leadership over activities that directly affect students. In this case, supervision is the step taken by the educational institution's leadership to observe and monitor activities, and to provide guidance and direction on activities deemed inconsistent with educational goals.

Findings from student supervision may include positive situations that support achieving goals or negative situations that hinder them. Findings of these negative situations require the leadership to provide guidance and motivation to improve outcomes and remove obstacles to goal achievement.

Supervision in schools is synonymous with inspection, which is an activity aimed at improving the quality of teacher learning. This activity is usually carried out by school administration or a designated person. Quality improvement is not limited to the learning process but also includes other supporting tools. Supervision can also be defined as the efforts undertaken by educational units to improve the performance of educators; thus, educators can improve and enhance the quality of their teaching. The performance improvements made ensure that students are prepared for each learning process, making it possible to achieve educational goals effectively and efficiently.

3. QUALITY IN EDUCATIONAL INSTITUTIONS

The concept of quality in education was initiated by Sallis (1993). Sallis stated that quality is a priority agenda item in every institution, including educational institutions. Quality is defined as a structured process to improve output. Improving educational quality requires collaboration between educational administrators and the community. This collaboration aims to provide students with sufficient resources so that the output of educational institutions can meet current and future challenges. Educational quality can be improved through the placement of leaders from among educational professionals.

The movement towards improving educational quality is relatively new. In the 1900s, American universities implemented a restructuring based on the Total Quality Management concept, which was later accepted as a requirement and adopted by many universities. Changes aimed at improving educational quality began with a shared perception of quality among educational stakeholders. This change started with the development of the school's vision and mission, focusing on meeting customer needs. This change encouraged user participation in the development of the education system. Suyadi (2007) stated that education is a service for developing human resources, and therefore optimizing these services requires both internal and external quality improvement, meaning that special attention should be paid to all stakeholders using educational services. Educational service users should have their needs, hopes, and desires met, but the main focus should be on the students themselves.

The paradigms for setting educational standards vary depending on the different perceptions and perspectives of each expert. Cyril Poster (1999), involved in the movement to create superior education, stated that educational quality standards are determined by each educational unit, with some using student achievement as a measure of educational success. Poster also emphasized that the criteria used by parents include school comfort and academic achievement.

Meanwhile, it is stated that educational quality standards are the integration of knowledge, belief, and good behavior on the path to students becoming complete human beings (Ilyasin 2012). This means that the criterion for educational quality standards is the results obtained from students who possess academic and non-academic competencies and noble morals as life skills.

Various studies in the field of educational quality have shown that improving educational quality is not always linked to increased budgets and the availability of qualified teaching staff, but rather manifests itself through a culture of quality. This requires a change in mindset and work culture that prioritizes quality. Ilyasin and Nurhayati (2012) state that education is considered high-quality when:

- Internal customers experience physical development or improvement (financial rewards) and psychological development (opportunities to improve skills).
- Primary external customers (students) experience positive changes in their cognitive, emotional, and psychomotor abilities.
- Secondary external customers (companies, government agencies, and parents): Graduates of educational institutions can contribute to government agencies and companies and graduate with achievements that will please their parents.
- Tertiary external customers (the general public): Graduates of educational institutions can compete in the workforce according to their competencies and can influence economic growth, public welfare, and social justice.

Improving the quality of education is closely linked to quality management. The school principal acts like a manager, implementing administrative functions to meet customer expectations. This satisfaction is achieved by paying attention to educational standards and services provided, ensuring that minimum criteria for customer requests are met.

Improving the quality of education requires attention to quality planning, control, and improvement. Based on the above concept of quality, researchers have concluded that improving the quality of education is the process of developing and strengthening student abilities (cognitive, affective, and psychomotor) through learning activities

supported by an adequate curriculum, infrastructure, educators, and training staff. The implementation of the educational process can achieve the desired quality if it begins with quality planning, as summarized in Juran's triad (1998).

To achieve quality planning, Juran presents six stages in the development of quality planning: (1) establishing the project, (2) identifying customers, (3) exploring customer needs, (4) developing the product, (5) improving the process, and (6) improving controls and translating them into operations.

1. The first stage of creating a project is quality planning to create new products or update existing ones necessary to achieve strategic goals. Creating a project in student management involves innovating in services for prospective students or improving existing services. This innovation in services for prospective students is carried out during student admissions. The student admissions process begins with estimating prospective students, formulating goals, developing the student admissions program, creating the student admissions calendar, and developing a budget plan.

2. The second stage is identifying customers. Customer identification involves collecting data on customer conditions, defining them, and differentiating between them. In education, a customer is the potential students who will decide to enroll in the school. Identifying the educational customer is crucial in student planning as it allows for more focused and targeted student planning. Student identification is carried out during observations through a series of tasks and interviews. Students are accepted if they meet pre-planned criteria. Identifying potential students also involves the students' parents, as this provides more complete information about the students' abilities and skills.

3. The third stage of quality planning is identifying customer needs. Some essential activities necessary for effective customer needs identification include identifying, analyzing, and prioritizing customer needs and incorporating them into the planning process. For students, implementation involves identifying the needs of prospective students and alumni users. Student identification can be done through observation during student admissions. For customers or alumni users, identification can be done through surveys or seminars inviting alumni users.

4. The fourth stage is product development. Implementing product development in student management involves supporting student development in educational institutions through activities that encourage students' creativity and develop their intellectual potential. Oliver and Reschly (2016) explain that creating an effective classroom requires preparing learning facilities and infrastructure, establishing classroom rules, recording student progress, and being flexible with classroom rules.

5. The fifth stage is process development. Process development is a set of activities to define specific tools to be used by operational personnel to achieve product quality objectives. This means that for the process to be effective, it must be goal-oriented with specific, measurable results and systematically defined with a clear sequence of activities and tasks. Furthermore, all inputs and outputs are fully defined to meet product quality objectives under legitimate operating conditions, and clear authority and responsibility exist for their operation.

The implementation of process improvement involves carrying out activities to ensure students achieve the planned quality. This activity may include classroom learning plans using learning methods or media tailored to students' needs. The choice of media and methods will change during implementation to adapt to the current situation and conditions.

4. CONCLUSION

Efforts to improve the quality of education in schools have been made through various training programs, seminars, educational training, and workshops. These activities introduce learning innovations, as innovation is a necessity. The development of teaching materials, strategies and learning methods, media, and assessment systems, evaluations, and assessments, have become staples in the education sector. However, empirical experience suggests that these efforts have not significantly improved the quality of education in schools. Therefore, continuous improvement is essential, driven by commitment (Continuous Quality Improvement) and the Continuous Process Improvement process. Commitment to quality begins with a statement of dedication to a shared mission and vision, and empowers all personnel to incrementally realize that vision. Continuous improvement depends on two elements: first, learning the appropriate processes, tools, and skills. Second, implementing new skills through small, achievable projects. A continuous improvement process that can be implemented based on the Action cycle. This cycle is a never-ending cycle of improvement and applies to all phases of an organization/institution, especially educational institutions.

It can be concluded that the implementation of quality in educational institutions is necessary and a shared responsibility. The presence of quality characteristics will help institutions identify quality educational institutions and determine appropriate development strategies to achieve quality education. Through quality strategies implemented diligently, systematically, planned, and continuously, education will be able to gain an advantage in competition and enable the rapid development of education. Quality education can be achieved through the

implementation of educational standards. Therefore, the support of various factors such as good educational institution leadership and management, a good quality culture, good teacher qualifications and competencies, and holistic research standards that meet student needs is necessary. Conversely, if these factors are not met, they can become factors that hinder the realization of quality educational institutions.

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Cautious Acceptance and Shared Responsibility: Latvian Parents' Perspectives on Generative AI in Education

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Abstract

The rapid diffusion of generative artificial intelligence (GenAI) has intensified debates about its educational value, implications for assessment, and ethical acceptability. However, parents' perspectives remain comparatively underexplored, particularly in smaller European education systems. This qualitative study examines Latvian parents' views on GenAI use in school education, focusing on perceived benefits, risks, ethical concerns, and expectations of schools. Data were collected through two online focus group interviews with ten parents of school-aged children and analysed using reflexive thematic analysis. Four themes were identified: (1) cautious optimism about GenAI as a source of learning support and personalised explanation; (2) concerns about overreliance, academic integrity, and reduced cognitive effort; (3) the need for transparency, privacy protection, and ethical guidance; and (4) expectations that schools establish clear, pedagogically grounded rules while communicating proactively with families. Overall, parents viewed GenAI as increasingly unavoidable in children's education, but not as a matter of individual choice alone. They emphasised age-appropriate use, teacher mediation, institutional accountability, and shared responsibility among schools, teachers, families, and policymakers. The study contributes Latvia-specific evidence to emerging research on stakeholder perspectives and offers practical implications for school-level policy, parent communication, and teacher professional learning in GenAI-rich educational environments.

Keywords: Generative artificial intelligence, parents' perspectives, school education, academic integrity, Latvia

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1. INTRODUCTION

Generative artificial intelligence (GenAI), particularly large language models (LLMs), has rapidly entered everyday educational practice by producing explanations, summaries, feedback, lesson materials, and conversational responses. Its growing use has intensified debate about how teaching, learning, assessment, and academic integrity may be reshaped by tools that support idea generation, writing, problem-solving, feedback, and personalised learning. Recent literature suggests that GenAI may offer educational benefits through scaffolding, adaptive explanations, formative feedback, and learner–tool interaction (Dwivedi et al., 2023; Giannakos et al., 2024). At the same time, it raises concerns related to bias, lack of transparency, data privacy, misinformation, overreliance, ethical use, and school-level rules for assessment and academic integrity (Dwivedi et al., 2023; Miao & Holmes, 2023). These tensions are particularly important in school education, where technological innovation intersects with children’s developmental needs, safeguarding responsibilities, and wider social expectations of schools.

The educational implications of GenAI extend beyond questions of adoption or restriction. The central issue is how GenAI is used, by whom, for what purposes, and under what pedagogical and ethical conditions. Emerging evidence indicates that ChatGPT-supported learning interventions may improve academic performance, motivation, and access to immediate explanations, but may also reduce learners’ mental effort, raising questions about cognitive engagement and the sustainability of learning gains (Deng et al., 2024). In school contexts, GenAI may extend learning opportunities when used purposefully, but it may also weaken deeper learning if students become dependent on automated answers rather than engaging in reasoning, reflection, and problem-solving.

While much emerging research has focused on teachers’ and students’ perspectives, parents remain a comparatively underexplored stakeholder group (Feser, 2024; Eira et al., 2025). This is an important gap because parents shape children’s digital practices, support learning at home, and interpret the legitimacy of school policies. Parents may welcome GenAI as a source of additional explanation, language support, and learning assistance, while also worrying about plagiarism, reduced effort, unequal access, unreliable information, and inappropriate or unsupervised use. As GenAI becomes increasingly visible in children’s everyday learning, parents may expect schools not only to regulate its use, but also to communicate clearly and define responsible use in practice.

International policy discussions emphasise that GenAI in education should be governed through human-centred, transparent, ethical, and developmentally appropriate approaches (European Commission, 2022; Miao & Holmes, 2023). Responsible integration requires pedagogical judgement, data protection, teacher capacity-building, and clear institutional expectations. In this sense, GenAI use in school education is not an individual matter for students or families alone, but a shared responsibility involving schools, teachers, parents, policymakers, and technology providers.

Latvia provides a meaningful context for examining these issues. Digitalisation and educational innovation have been sustained priorities in the Latvian education system, and the rapid diffusion of GenAI has intensified questions about how schools should respond (Cabinet of Ministers of the Republic of Latvia, 2021). Although formal guidance on AI use has so far been more visible in higher education, such as the University of Latvia’s guidance on AI use in the study process, these institutional discussions reflect broader concerns with honesty, ethics, transparency, and alignment between AI use and learning outcomes (University of Latvia, 2024). These principles are also relevant to school education, where students, teachers, and families may require clearer communication about acceptable GenAI use, responsible practice, and the interpretation of evidence in the learning process. Rather than relying on subjective human judgement, the emphasis should be placed on teachers’ professional, evidence-informed decision-making within assessment systems that are systematic, transparent, and objective.

Against this background, the present study explores Latvian parents’ perspectives on GenAI use in school education. Drawing on two online focus group interviews with parents of school-aged children, the study examines how parents understand the educational role of GenAI, what benefits and risks they associate with its use, and what expectations they hold regarding schools’ responsibilities. The study is guided by the following research questions:

1. How do Latvian parents perceive the role of GenAI in their children’s education?
2. What benefits and risks do parents associate with GenAI use in educational contexts?
3. What expectations do parents have regarding schools’ responsibilities in managing GenAI use?

By centring parents’ voices, this study contributes Latvia-specific evidence to emerging international literature on stakeholder perspectives on GenAI in education. It also offers practical implications for school-level policy, parent communication, teacher professional learning, and ethically grounded approaches to GenAI use in school settings.

2. LITERATURE REVIEW

2.1. GenAI in Education: affordances, risks, and responsible use

GenAI, particularly large language models, is increasingly shaping educational practice by offering explanations, feedback, summaries, examples, lesson materials, and conversational support across different learning contexts (Kasneci et al., 2023; Miao & Holmes, 2023). These affordances have created optimism about its potential to support personalised learning, immediate feedback, differentiated instruction, and teacher workload reduction (OECD, 2023). For students, GenAI may act as an accessible learning assistant, while for teachers it may support lesson planning, assessment design, material development, and communication.

However, the educational value of GenAI cannot be assumed from access alone. GenAI tools may generate inaccurate or biased information, obscure sources, and create uncertainty about authorship, originality, and academic integrity (Holmes & Tuomi, 2022; Kasneci et al., 2023; Miao & Holmes, 2023). In school contexts, these concerns are particularly important because children and adolescents are still developing critical judgement, self-regulation, and ethical awareness. If students use GenAI mainly to obtain ready-made answers or complete assignments quickly, the tool may support task completion without necessarily supporting deeper learning. Responsible use therefore depends on task design, teacher mediation, classroom norms, and assessment practices that make learning processes visible.

2.2. Assessment, overreliance, and school responsibilities

GenAI challenges traditional assumptions about assessment because fluent and plausible outputs can be produced with limited student effort. This makes it more difficult for teachers to determine what student work represents and whether it reflects independent understanding, AI-supported work, or AI-generated output (Cotton et al., 2024; Perkins et al., 2024). As a result, schools need to move beyond detection-based responses and reconsider assessment design. Greater attention to drafting, revision, oral explanation, classroom-based tasks, portfolios, and reflective accounts of tool use may help reduce inappropriate outsourcing while recognising that GenAI is becoming part of students' wider digital environment.

These issues also create governance tensions. Schools need clear and transparent rules about acceptable GenAI use, age-appropriate guidance, privacy protection, teacher capacity-building, and communication with families (Miao & Holmes, 2023). Inconsistent practices, such as one teacher permitting GenAI for brainstorming while another treats any AI use as misconduct, may create confusion for students and mistrust among families. Therefore, GenAI in schooling is not only a technical or pedagogical issue, but also a matter of shared responsibility among schools, teachers, students, parents, policymakers, and technology providers.

2.3. Parents as stakeholders in the Latvian context

Although research on GenAI in education has expanded rapidly, parents' perspectives remain comparatively underexplored. This is an important gap because parents shape children's technology use at home, support homework practices, interpret school expectations, and influence whether school policies are trusted and accepted (Livingstone & Blum-Ross, 2020). In relation to GenAI, parents may recognise its potential to provide explanations, learning support, and assistance with schoolwork, while also expressing concerns about overreliance, academic integrity, unreliable information, privacy, and reduced independent thinking.

Latvia offers a meaningful context for examining these issues. As a smaller European education system with ongoing commitments to digitalisation, inclusion, and future-oriented skills, Latvia faces both opportunities and challenges in responding to rapidly evolving AI technologies. National education and digital transformation priorities emphasise high-quality and inclusive education, as well as the strengthening of digital capacities across society and public services (Cabinet of Ministers of the Republic of Latvia, 2021). In the education sector, these priorities are visible in initiatives such as combined learning, EU-supported efforts to reduce the digital technology gap, and digital lesson solutions provided by the State Education Development Agency. These developments provide an important foundation for digital transformation in schools; however, the integration of GenAI introduces additional questions related to pedagogical quality, teacher preparedness, ethical use, and the inclusion of all learners. Within this policy environment, schools are increasingly expected to develop clear rules, support teachers, protect learners, and communicate responsibly with families, even while school-level norms for GenAI use are still emerging.

Although existing institutional guidance on AI in Latvia has so far been more visible in higher education, it reflects concerns that are also relevant to schools. The University of Latvia's guidance, for example, foregrounds

responsible, honest, transparent, and ethical AI use, while recognising risks related to academic integrity, misleading content, unfair assessment, trust, and privacy (University of Latvia, 2024, 2026). International guidance similarly emphasises human-centred governance, transparency, privacy protection, age-appropriate use, and capacity-building for educators and learners (European Commission, 2022; Miao & Holmes, 2023). However, these principles require local interpretation in school contexts, where parents' expectations, school cultures, and children's everyday digital practices shape how GenAI is understood and accepted.

Taken together, the literature suggests that GenAI in schooling should be understood not only through its technical affordances, but also through the relationships, responsibilities, and expectations surrounding its use. Existing studies highlight both potential benefits and risks, particularly in relation to cognitive engagement, academic integrity, privacy, and governance (Deng et al., 2024; Dwivedi et al., 2023; Giannakos et al., 2024). Yet parents' perspectives remain insufficiently represented, despite their central role in children's digital practices and school-home trust (Eira et al., 2025; Feser, 2024). The present study addresses this gap by examining Latvian parents' views on GenAI in schooling, focusing on perceived benefits, risks, ethical concerns, and expectations of school responsibility.

3. THE STUDY

3.1. Research design

This study adopted a qualitative design using online focus group interviews to explore Latvian parents' perspectives on GenAI in schooling. A qualitative approach was appropriate because the study aimed to capture parents' meanings, concerns, and normative expectations, rather than measuring prevalence. Focus groups were selected because they support interactive discussion, allowing participants to build on each other's ideas and reveal shared assumptions, tensions, and points of disagreement.

3.2. Participants and recruitment

Participants were parents or guardians of school-aged children in Latvia (N = 10), organised into two online focus groups with five participants in each group. Recruitment aimed to include parents with diverse experiences of children's schooling and varying levels of familiarity with digital technologies. Inclusion criteria were: (a) being a parent or guardian of at least one school-aged child in Latvia; and (b) willingness to participate in an online group discussion. Basic demographic information, including age range, gender, children's school level, and self-reported familiarity with GenAI tools, was collected to contextualise the findings, not to support statistical comparison.

Table 1 summarises participant characteristics using anonymised categories. The first five participants took part in Focus Group 1, while the remaining five participated in Focus Group 2. To protect confidentiality in a small qualitative sample, demographic information is presented using broad categories rather than exact ages, occupations, school names, or other identifying details. The first focus group included five parents of children in grades 1–12 and represented diverse professional backgrounds, including finance, higher education, human resources, dental technology, and translation. Most participants reported moderate to high digital literacy and familiarity with GenAI tools.

Table 1. Participant characteristics

Participant	Focus group	Parent/guardian	Age range	Gender	Children's school level	Familiarity with GenAI
P1	FG1	Parent	30–39	Female	Primary	Moderate
P2	FG1	Parent	40–49	Female	Lower secondary	High
P3	FG1	Parent	40–49	Male	Upper secondary	Moderate
P4	FG1	Parent	30–39	Female	Primary/lower secondary	High
P5	FG1	Parent	40–49	Female	Secondary	Moderate
P6	FG2	Parent	30–39	Female	Primary	Low
P7	FG2	Guardian	40–49	Female	Lower secondary	Moderate
P8	FG2	Parent	40–49	Male	Secondary	High
P9	FG2	Parent	30–39	Female	Primary/lower	Moderate

					secondary	
P10	FG2	Parent	40–49	Female	Secondary	Low

Participants represented different levels of familiarity with digital technologies and GenAI tools. Their children attended different stages of schooling, ranging from primary to upper secondary education. This variation supported discussion of GenAI from multiple family and educational perspectives.

3.3. Data generation procedure

Two focus group interviews were conducted online using a videoconferencing platform. Each session lasted approximately 70 minutes and was facilitated by the researcher using a semi-structured protocol (see Appendix A). The protocol covered four main areas: (1) parents’ awareness and experiences of GenAI tools; (2) perceived educational benefits and learning uses; (3) perceived risks and ethical concerns, including academic integrity, privacy, misinformation, and overreliance; and (4) expectations of schools, including rules, communication with families, teacher responsibilities, and age-appropriate guidance.

Participants were encouraged to refer to concrete examples from their children’s schooling and home technology practices. The online format allowed parents from different regions of Latvia to participate. Sessions were audio-recorded with consent and transcribed verbatim. Identifying details, including names of children, schools, and specific locations, were removed during transcription. The focus group interviews were conducted in English. The illustrative quotations presented in the findings were edited for clarity while preserving participants’ original meanings.

3.4. Data analysis

Data were analysed using reflexive thematic analysis (RTA), which treats themes as interpretive patterns generated through active engagement between the researcher and the data, rather than as categories that simply “emerge” independently of the analyst (Braun & Clarke, 2022; Byrne, 2022). Analysis followed iterative phases of familiarisation with the transcripts, initial coding, developing candidate themes, reviewing and refining themes, and producing a coherent narrative account.

Coding was primarily semantic, focusing on participants’ explicit meanings and concerns, with selective latent interpretation where parents’ comments invoked broader moral expectations, such as fairness, responsibility, child protection, and trust in schools. Analytic memos were used to document interpretive decisions and support transparency. The final thematic structure comprised four themes aligned with the study’s research questions.

Table 2. Thematic coding scheme for Latvian parents’ perspectives on GenAI in schooling

Theme	Subthemes	Example codes
1. Cautious optimism about learning support and personalised explanations	Homework support; personalised explanations; language/writing support; GenAI as supplement	Explaining difficult content; alternative explanations; help when parents cannot support; vocabulary support; not replacing teachers
2. Overreliance, academic integrity, and reduced cognitive effort	Dependence; cheating and plagiarism; fairness; age-related concerns	Copying answers; reduced thinking; laziness; blurred boundary between help and cheating; younger children need limits
3. Transparency, privacy, and ethical guidance	Data privacy; misinformation; bias; disclosure and ethical use	Sharing personal data; unreliable answers; checking information; AI bias; need to disclose AI use
4. Schools’ responsibilities: clear rules and proactive communication	Policy clarity; parent communication; teacher training; shared responsibility	Clear rules; consistent expectations; communication with families; teacher preparedness; AI literacy education

3.5. Ethical considerations and trustworthiness

The study followed institutional ethical requirements, including informed consent, confidentiality, voluntary participation, and the right to withdraw. Given the topic and the small participant group, particular care was taken

not to collect or report sensitive information about specific children, schools, teachers, or local communities. Participant information was anonymised, and demographic details were reported in broad categories to reduce the risk of identification.

Trustworthiness was enhanced through systematic documentation of the coding process, ongoing refinement of themes, and reflexive notes to make the researcher's interpretive decisions and assumptions more transparent. The analysis and reporting followed established guidance for reflexive thematic analysis (Braun & Clarke, 2022; Byrne, 2022). Illustrative extracts were selected to reflect the range of perspectives expressed across both focus groups and to demonstrate how the themes were grounded in participants' accounts.

4. FINDINGS

Reflexive thematic analysis generated four interrelated themes describing Latvian parents' perceptions of GenAI in schooling: (1) cautious optimism about learning support and personalised explanations; (2) concerns about overreliance, academic integrity, and reduced cognitive effort; (3) the importance of transparency, privacy, and ethical guidance; and (4) expectations that schools provide clear, pedagogically grounded rules and communicate proactively with families. Together, these themes suggest that parents did not reject GenAI outright. Rather, they viewed it as an increasingly unavoidable educational technology whose value depends on age-appropriate use, teacher mediation, ethical safeguards, and clear institutional responsibility.

4.1. Cautious optimism about learning support and personalised explanations

Parents generally recognised that GenAI could offer meaningful support for children's learning, particularly when used for explanation, clarification, and practice. Rather than presenting GenAI as a replacement for teachers, participants described it as a supplementary resource that could help children when they were stuck, needed an alternative explanation, or required additional support outside formal lesson time. This optimism was therefore cautious and conditional: parents saw value in GenAI when it supported understanding rather than bypassed learning. As one parent explained: *"Sometimes children need the same thing explained in a different way. If AI can do that, then it can be useful, but it should help them understand, not just give the answer."* Parent 1, Focus Group 1

Another aspect of this theme concerned language and writing support. Parents noted that GenAI could help students develop vocabulary, improve phrasing, generate ideas, or revise written work. However, these uses were viewed positively only when they remained connected to learning and reflection: *"I see it more as an assistant. It can help with ideas or wording, but the child still needs to think and decide what to use."* Parent 2, Focus Group 1

Overall, this theme shows that parents' acceptance of GenAI was not based on technological enthusiasm alone. Their optimism was tied to pedagogical purpose. GenAI was welcomed when it functioned as a scaffold for learning, but not when it replaced effort, understanding, or teacher guidance.

4.2. Overreliance, academic integrity, and reduced cognitive effort

Parents' optimism was accompanied by strong concerns about overreliance, academic integrity, and reduced cognitive effort. A central concern was that children might use GenAI to complete assignments without engaging deeply with the task. Parents worried that easy access to ready-made answers could weaken independent thinking, persistence, and responsibility for learning. As one participant stated: *"My concern is that they will stop trying. If the answer comes immediately, why would they spend time thinking?"* Parent 4, Focus Group 1

Parents also raised concerns about cheating, plagiarism, and fairness. They recognised that the boundary between acceptable help and dishonest outsourcing is increasingly difficult to define. For example, using GenAI to understand a concept may be legitimate, whereas submitting AI-generated text as one's own work was viewed as problematic. Parents were particularly concerned that inconsistent teacher expectations could create confusion and unfairness: *"Where is the line between help and cheating? If one teacher allows it and another does not, children will not know what is acceptable."* Parent 3, Focus Group 2

Age and developmental readiness were also important. Several parents believed that younger children require stronger boundaries because they may lack the maturity to evaluate GenAI outputs or regulate their use independently. Older students, by contrast, were seen as needing explicit guidance, discussion, and consequences rather than simple prohibition: *"For younger children, I think there must be very clear limits. They cannot yet judge whether the answer is correct or whether they are using it properly."* Parent 5, Focus Group 2

This theme suggests that parents' concerns were not only about misconduct, but also about the quality of learning itself. They feared that GenAI could support task completion while weakening the cognitive and ethical processes that schooling is expected to develop.

4.3. Transparency, privacy, and ethical guidance

Parents also emphasised the importance of transparency, privacy protection, and ethical guidance. Their concerns extended beyond classroom use to include broader questions about what kinds of tools children access, what data are collected, how outputs are generated, and whether children understand the risks of sharing personal information. These concerns were especially significant because GenAI systems may appear conversational and trustworthy, even when their outputs are inaccurate, biased, or misleading: *"Children may not understand what information they are giving away. They need to know what they should never put into these tools."* Parent 6, Focus Group 2

Parents were also concerned about misinformation and bias. They questioned whether children are able to evaluate AI-generated responses critically, particularly when answers appear fluent and confident. This concern connects strongly with AI literacy: parents did not simply want children to use GenAI; they wanted them to understand that AI-generated content must be checked, questioned, and compared with reliable sources. As one parent noted: *"The answer may look correct, but how does the child know if it is true? They need to learn not to trust it automatically."* Parent 7, Focus Group 1

Ethical guidance was therefore seen as essential. Parents expected schools to teach students how to disclose AI use, evaluate outputs, protect privacy, and recognise inappropriate uses. This theme shows that parents viewed responsible GenAI use as a matter of digital citizenship and ethical education, not merely technical skill.

4.4. Schools' responsibilities: clear rules and proactive communication

The fourth theme concerns parents' expectations of schools. Across the focus groups, parents consistently positioned schools as having a leading role in managing GenAI use. They did not believe responsibility should rest only with individual children or families. Instead, they expected schools to provide clear rules, consistent expectations, and proactive communication.

Parents wanted school policies that were understandable, age-appropriate, and pedagogically justified. They were less interested in blanket bans or vague encouragement and more interested in knowing what kinds of GenAI use are acceptable, under what conditions, and for what learning purposes. Rules were seen as necessary not only for preventing misuse, but also for ensuring fairness among students: *"The school should explain clearly what is allowed and what is not. Otherwise, every family and every teacher will understand it differently."* Parent 8, Focus Group 2

Parents also valued communication between schools and families. They wanted schools to explain how GenAI is being addressed, how teachers are responding, and how parents can support responsible use at home. This expectation reflects a desire for shared understanding and trust: *"Parents also need guidance. We cannot support children at home if we do not know what the school expects."* Parent 9, Focus Group 1

Teacher preparedness was another important part of this theme. Parents recognised that teachers themselves may need professional development to use GenAI confidently and consistently. Inconsistent practice across teachers or subjects was seen as a potential source of confusion for students and families: *"Teachers also need training, because if each teacher gives a different message, children will be confused."* Parent 10, Focus Group 2

Overall, this theme highlights parents' view of GenAI governance as a form of distributed responsibility. Parents expected schools to lead, but not to act alone. Responsible use was understood as requiring coordination among teachers, school leaders, families, students, and policymakers.

5. DISCUSSION

This study examined Latvian parents' perspectives on GenAI use in school education. The findings answer the three research questions by showing that parents perceived GenAI as an increasingly unavoidable part of children's educational lives, but their acceptance was cautious and conditional. They recognised its potential to support explanation, practice, language development, and personalised learning, while also expressing concerns about overreliance, academic integrity, reduced cognitive effort, misinformation, privacy, and children's ability to evaluate AI-generated content critically. Parents also expected schools to take a leading role by establishing clear, age-

appropriate, and pedagogically justified rules, communicating proactively with families, supporting teachers, and promoting ethical use.

These findings suggest that parents did not understand GenAI as simply beneficial or harmful. Rather, they viewed its educational value as dependent on mediation, guidance, and governance. This aligns with wider research showing that GenAI can support scaffolding, feedback, and learner–tool interaction, but also raises concerns about bias, misinformation, privacy, overreliance, and academic integrity (Dwivedi et al., 2023; Kasneci et al., 2023; Giannakos et al., 2024). Parents’ concerns about reduced cognitive effort are also consistent with evidence that GenAI-supported learning may improve performance while reducing learners’ mental effort, raising questions about the depth and durability of learning (Deng et al., 2024).

A central implication is that schools should move beyond simple permission or prohibition. Parents wanted GenAI use to be connected to learning processes, not only final products. This supports calls for assessment practices that make students’ thinking visible through drafting, revision, explanation, reflection, oral justification, and classroom dialogue (Cotton et al., 2024; Perkins et al., 2024). Such approaches may reduce inappropriate outsourcing while allowing GenAI to function as a scaffold rather than a substitute for learning.

The findings also highlight the importance of age-appropriate guidance and school–home communication. Parents believed younger learners need clearer boundaries and stronger adult supervision, while older students need explicit guidance, accountability, and opportunities to develop critical AI literacy. This is consistent with international guidance emphasising human-centred, ethical, transparent, and developmentally appropriate approaches to AI in education (Miao & Holmes, 2023). In the Latvian context, where digitalisation and educational innovation are policy priorities, parents’ perspectives show that broad principles of responsible AI use need to be translated into clear school-level practices (Cabinet of Ministers of Latvia, 2021; University of Latvia, 2024, 2026).

Overall, the study contributes to emerging research by foregrounding parents as important stakeholders in GenAI governance. Parents were not passive observers of technological change; they actively interpreted GenAI through concerns about learning quality, fairness, privacy, trust, and school responsibility. Their cautious acceptance suggests that responsible GenAI integration in schools requires shared responsibility among teachers, school leaders, families, students, and policymakers.

6. CONCLUSION

This study explored Latvian parents’ perspectives on GenAI in school education through two online focus group interviews with ten parents of school-aged children. The findings show that parents viewed GenAI as increasingly unavoidable, but acceptable only when it supports learning rather than replaces thinking, effort, or teacher guidance. They identified potential benefits, including personalised explanations, learning support, and language assistance, but also raised concerns about overreliance, academic integrity, reduced cognitive effort, misinformation, privacy, and children’s developmental readiness.

The study highlights the importance of parents as stakeholders in school-level GenAI governance. Responsible use cannot be left to individual students or families alone. Schools need to provide clear rules, age-appropriate guidance, teacher support, transparent communication with families, and assessment practices that make learning processes visible. Parent-oriented guidance or information sessions may also help strengthen school–home trust and support responsible use beyond the classroom.

The study is limited by its small qualitative sample and Latvia-specific context, so the findings should not be generalised statistically. However, they offer useful interpretive insight into how parents understand the opportunities, risks, and responsibilities surrounding GenAI in schooling. Future research could include larger and more diverse parent samples, compare stakeholder perspectives across countries, and examine how schools develop practical GenAI policies in collaboration with families.

In conclusion, parents’ cautious acceptance provides a useful starting point for responsible GenAI integration in school education. GenAI may be educationally valuable when it supports explanation, reflection, and guided learning, but it requires clear ethical boundaries, pedagogical purpose, and shared responsibility.

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Appendix A. Focus Group Questions for Parents

Questions for focus groups with parents were focused on following four topics:

A1. Topic 1- Understanding (Gen)AI in Education

- Have you tried any tools using GenAI?
- What specific tools or applications?
- In what situations or for what purposes?
- What concerns or feelings did it leave you with?
- Do you have any favorite GenAI tools?
- Are you positive (“enthusiastic”) or more concerned?
- Do you discuss AI issues with your children at home?
- Do you use AI with your children at home?

A2. Topic 2- Gen-AI should used in schools

- How did you find out about it?
- Did the school/teachers hold any discussions with parents on this topic?)
- What do you think about the importance of GenAI for school results and skill development in children?
- Do you see it more positively or negatively?
- Will GenAI help or harm?
- Do you have any ideas about how teachers could or should use GenAI with children in their lessons?

A3. Topic 3- GenAI in Curriculum and support

- Do you know whether the Ministry of Education or the Institution responsible for education in your country has issued or is issuing any guidelines for the use of GenAI in schools?
- Would you support the implementation of GenAI tools in the school curriculum?

A4. Topic 4-Expectations/ The future of AI in Education

- What will be the future involvement of GenAI in the work of teachers?
- What will it look like with GenAI and education in general?
- What measures would you like to implement to ensure the responsible use of GenAI in education?



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