



The Impact of Digital Transformation on Service Models and Employee Skill Requirements in Taiwan's Real Estate Brokerage Industry

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

This paper investigates how digital transformation impacts service delivery models and employee skill requirements in Taiwan's real estate brokerage industry. Through a multiple-case comparison approach, data was collected from 200 participants across real estate firms to examine organizational adaptation to technological change. The research employed structural equation modeling and hierarchical linear modeling to analyze relationships between compensation satisfaction ($\beta = 0.45$, $p < 0.001$), digital competency levels, and internal case circulation patterns. Results demonstrate that digital technologies significantly reshape brokerage operations, with digitalized companies achieving 32% higher client acquisition rates and 45% reduction in transaction processing time. Analysis reveals that employee digital literacy accounts for 28% of

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performance variance, while organizational support systems explain 23% of technology adoption rates. The findings extend service innovation literature by establishing empirical links between compensation systems and digital transformation success, providing a practical framework for technology integration in Taiwan's real estate sector. This research offers evidence-based recommendations for firms implementing digitalization strategies and developing employee capabilities in response to industry evolution.

Keywords: Real estate brokerage; digital transformation; service model innovation; employee skills; multiple case study; internal case circulation.

1. INTRODUCTION

The real estate industry in Taiwan has long been a cornerstone of wealth accumulation and investment, deeply rooted in the cultural belief that property ownership is a path to prosperity. This sector has undergone significant transformations, driven by Taiwan's economic growth and ongoing urbanization. In 2023, the industry demonstrated its resilience and vitality, with real estate transactions reaching a total value of NT\$3.5 trillion, marking a 2.5% increase from the previous year (CBRE, 2024).

Recent market analysis reveals several key trends shaping the industry:

Market Volatility: The real estate market has experienced considerable fluctuations influenced by global economic conditions and local policies (Tan, Karim & Roslan, 2023). Following rapid growth in 2021, the market underwent a correction in 2022, followed by moderate growth in 2023. This volatility demands that industry practitioners possess robust market insights and risk management capabilities.

Regional Disparities: While northern areas like Taipei City and New Taipei City remain transaction hotspots, markets in central and southern cities such as Taichung, Tainan, and Kaohsiung are gaining momentum (Naeem, et al., 2023). This regional variance necessitates flexible and localized business strategies from brokerage firms.

Evolving Client Demands: Client needs have expanded beyond basic residential requirements to include investment preservation and lifestyle enhancement (Lee, et al., 2022). This shift requires brokers to develop a more comprehensive skill set and provide more sophisticated services.

Taiwan's real estate brokerage industry has flourished as a vital intermediary between buyers

and sellers. By the end of 2023, the CBRE (2024) reported over 6,000 legally registered brokerage companies, employing more than 100,000 licensed brokers. However, this rapid growth has brought several challenges:

Talent Supply-Demand Imbalance: Despite the large number of practitioners, there's a shortage of high-quality, specialized talent. The ongoing digital transformation has intensified this demand (Rabby, Chimhundu & Hassan, 2022).

Industry Image: The public perception of the real estate brokerage industry requires improvement, with a pressing need to enhance professionalism and credibility (Alnidawi et al. 2017).

Rising Operational Costs: As the market matures, client acquisition costs increase, putting pressure on operational models and cost control measures.

In this evolving landscape, understanding the impact of digital transformation on real estate brokerage firms has become crucial. This study addresses significant gaps in understanding how digital transformation affects service models and employee skill requirements in Taiwan's real estate brokerage industry (Pu, Zhang & Chou, 2022). Specifically, we address the following research questions:

RQ1: How does digital transformation impact service delivery models in Taiwan's varying-sized real estate brokerage firms? **RQ2:** What new skill requirements emerge for employees as real estate brokerage firms undergo digital transformation? **RQ3:** How do organizational factors influence the success of digital transformation initiatives in real estate brokerage firms?

These research questions are particularly relevant given the industry's current challenges, including technological disruption through AI and

internet-based solutions, balancing technological efficiency with valuable interpersonal interactions (Na, et al., 2023), and the evolving nature of talent management and compensation system design.

Based on a comprehensive literature review and theoretical frameworks, we propose the following hypotheses to guide our quantitative analysis:

H1: Higher levels of digital transformation adoption positively correlate with improved service delivery efficiency. H1a: The relationship between digital transformation and service efficiency is moderated by firm size. H1b: The relationship is more robust in firms with younger workforce demographics.

H2: Employee digital competency levels positively influence job performance in digitally transformed environments. H2a: The effect is stronger for customer-facing roles than back-office positions. H2b: The relationship is moderated by employees' years of experience.

H3: Organizational support for digital skill development positively affects employee adoption of new technologies. H3a: The effect is more robust in firms with formal training programs. H3b: The relationship is moderated by organizational culture.

Additionally, to capture the complex nature of digital transformation in real estate brokerage firms, we propose the following qualitative research propositions:

P1: Digital transformation creates new challenges in maintaining personal client relationships while leveraging technological efficiency.

P2: Successful digital transformation requires balancing technical skill development and traditional real estate expertise.

P3: Organizational culture plays a crucial role in determining the success of digital transformation initiatives.

Recent research highlights the importance of personal organization in job satisfaction within Taiwan's real estate brokerage industry. This finding underscores the significance of non-monetary factors, such as corporate culture and values, in attracting and retaining talent.

The industry is characterized by high competition, strict regulations, information asymmetry, unique

compensation structures, and high personnel turnover (Merrill, 2017). These factors create unique challenges in talent management and compensation system design. Despite its economic importance, academic research on Taiwan's real estate brokerage industry remains limited, particularly regarding the interplay of compensation systems, employee performance, and corporate competitiveness (O'Rourke, 2021).

Our study offers several innovative contributions to real estate brokerage research and practice. At its core, this research uniquely applies HR management principles to Taiwan's real estate brokerage industry, considering its distinct characteristics, including high reliance on individual performance and customer relationship management. This industry-focused approach provides valuable insights into the challenges and opportunities real estate professionals face in the digital age.

We employ an integrated approach in examining the relationships between corporate compensation systems, employee performance, and corporate competitiveness. This multi-dimensional analysis comprehensively explains how these factors interact and influence organizational success in the digital era.

A significant innovation of our study is the introduction of internal case circulation as a novel variable in real estate brokerage research. This concept explores how property listings are shared and managed within firms, providing new insights into organizational dynamics and information flow patterns in brokerage operations.

Through our mixed-methods approach, combining quantitative analysis of these hypotheses with qualitative exploration of our research propositions, this study aims to provide theoretical insights and practical recommendations for industry development. This comprehensive approach will help bridge the gap between theoretical understanding and practical implementation in the digital transformation of real estate brokerage services.

The paper is structured as follows: Section 2 reviews the literature on compensation systems, performance evaluation, and corporate competitiveness theories. Section 3 outlines the research purposes and significance. Section 4 introduces the study's innovative aspects. Section 5 details the research methodology. Section 6 presents and discusses the

results. Finally, Section 7 concludes with recommendations, acknowledges limitations, and suggests future research directions.

2. LITERATURE REVIEW

The study of compensation systems has long been a focal point in human resource management, with seminal theories like Adams' equity theory (1963) and Vroom's expectancy theory (1964) emphasizing the importance of fair remuneration and its link to employee motivation. These foundational concepts continue to influence modern research on compensation systems, including recent studies in Taiwan's real estate brokerage industry. Lee, et al., (2022) found that compensation systems significantly affect brokers' job satisfaction, with emotional intelligence playing a moderating role. This finding highlights the complex interplay between the industry's financial incentives and psychological factors. Further exploring this relationship, Khan et al. (2020) revealed that while performance-based pay can boost short-term productivity, it may negatively impact long-term employee retention and client relationships. This insight underscores the need for balance in designing compensation systems that promote immediate results and sustainable growth.

The concept of Person-Organization Fit, discussed by Nilawati et al. (2019) in their study of employee satisfaction and organizational behavior, showed that alignment between individual values and organizational culture moderates the impact of compensation on job satisfaction and performance. This research emphasizes the importance of considering cultural factors when designing compensation strategies. Employee performance evaluation in the real estate sector has evolved from traditional metrics focusing on transaction volume and value to more comprehensive approaches. Kaplan and Norton's (1992) Balanced Scorecard provided a multidimensional framework for performance assessment, which has been adapted to the specific needs of the real estate industry. Ghorbanhosseini (2013) found a positive association between organizational commitment and job performance, advocating for a broader approach to performance assessment that includes measures of organizational allegiance and collective teamwork.

The emotional aspects of real estate work have also gained attention. Supramaniam &

Singaravelloo (2021) highlighted the need to consider emotional well-being and stress management in performance evaluation systems, reflecting the high-pressure nature of the industry. Additionally, Rabby, Chimhundu & Hassan (2022) emphasized the importance of digital competencies in performance appraisal, acknowledging the rise of PropTech and its impact on brokerage practices. Recent case studies from Taiwan's service sector have demonstrated that structured digital training programs significantly improve employee adaptation to technological changes (Fengchen, 2023). Porter's (2008) theory of competitive advantage remains foundational in corporate competitiveness. Claus (2019) found that knowledge management capability mediates the relationship between high-performance work systems and innovation performance. This suggests that competitive advantage in the contemporary real estate market is increasingly linked to a firm's ability to manage and leverage knowledge effectively.

Recent research has identified industry-specific factors. The results highlighted human capital as crucial for gaining a competitive edge in Taiwan's real estate brokerage companies, underscoring the importance of talent management and development. Shah, et al., (2023) further demonstrated that organizational culture plays a pivotal role in digital innovation adoption, with firms having adaptive cultures showing 40% higher success rates in digital transformation initiatives.

Recent research has also begun to explore non-traditional aspects of compensation and their impact on competitiveness. Chung and Van (2020) showed that non-monetary aspects of compensation, such as flexible working arrangements, can enhance a firm's competitive position by improving employee satisfaction and productivity. Emerging trends in the industry are shaping new research directions. Digital transformation rapidly evolves the market (Civilcharran & Maharaj, 2023), while artificial intelligence increasingly impacts brokerage practices (Chan, Hogaboam & Cao, 2022). Work-life balance remains critical for employee satisfaction and retention (Kaliannan, Perumal & Dorasamy, 2016), and the concept of "green real estate" is influencing both market trends and employee values (Kaasinen, 2024). The gig economy is challenging traditional employment models in the sector (Ullah, Sepasgozar, & Wang, 2018), and cross-cultural studies reveal exciting

differences in real estate practices across Asian countries (Ache et al. 2024).

The COVID-19 pandemic has had lasting effects on the real estate market and brokerage practices (Pärssinen, 2023), necessitating adaptations in compensation and performance evaluation methods.

Recent technological innovations have transformed real estate marketing practices. The evolving digital landscape demands new competencies from real estate professionals. Sonnelid & Thorfinn (2024) developed a comprehensive digital competency framework that identifies crucial skills needed in the digitalized real estate sector. Their analysis suggests successful digital transformation requires balanced technical and soft skills development. Olbrich & Holsing (2011) demonstrated how virtual reality applications significantly enhance customer experience and property viewing efficiency. These technological advancements and AI-driven decision-making tools (Peter, et al., 2020) are reshaping traditional brokerage practices."

Technological advancements continue to shape the industry, with blockchain being explored for its potential in real estate transactions and social media playing an increasingly important role in real estate marketing (Low & Ullah, 2020). While existing literature provides valuable insights into compensation systems, performance evaluation, and corporate competitiveness in Taiwan's real estate brokerage industry, there is a need for more integrated research. This study addresses this gap by comprehensively analyzing how compensation systems and performance evaluation practices contribute to corporate competitiveness in this unique industry, considering the rapidly changing technological landscape and evolving consumer preferences reshaping the sector's competitive dynamics.

3. METHODOLOGY

3.1 Research Innovation

The real estate brokerage industry faces unprecedented challenges and opportunities in today's rapidly changing economic environment. This study aims to delve deep into the human resource management practices of Taiwan's real estate brokerage industry, focusing specifically on the interactive relationships among three key dimensions: corporate compensation systems,

employee performance, and corporate competitiveness. We adopted the multi-dimensional measurement framework to assess digital transformation progress, which provides comprehensive metrics for evaluating digital maturity in real estate services. Our data analysis approach incorporated advanced analytics techniques (Munawar et al., 2020) to process structured and unstructured data from multiple sources.

Through innovative research methods and multidimensional analysis, we hope to provide new insights for this industry that relies heavily on individual performance and customer relationship management. The following detailed content will further elaborate on our research innovations to provide a comprehensive and in-depth description.

1. Industry Focus: Real Estate Brokerage in Taiwan

This research addresses a significant gap by applying HR management principles to the specific context of the real estate brokerage industry. It considers the unique aspects of this sector, including its high reliance on individual performance, the crucial role of customer relationship management, and the challenges posed by unstable market environments. The study integrates knowledge from real estate economics, marketing, and HR management to provide a comprehensive analysis. While focused on real estate, the findings have potential applications to similar service industries such as insurance and financial advisory. Ultimately, this research aims to provide practical, industry-specific guidance for HR practices, helping real estate brokerage firms optimize their human resource strategies in a challenging and dynamic market environment.

2. Multi-dimensional Integrated Analysis

This study employs a multi-dimensional integrated analysis, examining the intricate relationships between corporate compensation systems, employee performance, and corporate competitiveness. By adopting a systemic approach, it seeks to unravel complex organizational dynamics within the real estate brokerage industry. The research explores potential causal relationships and synergies among these key factors, emphasizing the delicate balance between

employee interests and organizational efficiency. This comprehensive approach provides managers with a robust decision-making framework, offering insights that can enhance individual performance and company competitiveness. To ensure rigorous analysis, the study employs advanced research methods, including structural equation modeling, allowing for a nuanced understanding of the interplay between these critical organizational elements.

3. **New Variable: Internal Case Circulation**

This study introduces a novel variable in real estate brokerage research: internal case circulation. This concept focuses on how property listings are shared and managed within brokerage firms, exploring its interaction with compensation systems. The research examines the impact of case circulation on both individual agent performance and overall company success, offering valuable insights into organizational behavior, particularly the dynamics of cooperation versus competition and information sharing practices. By investigating this new variable, the study necessitates the development of innovative measurement metrics, pushing the boundaries of current research methodologies in the field. The findings have the potential to significantly inform company policies and industry practices, providing a fresh perspective on how internal information flow can be optimized to enhance both individual and organizational performance in the real estate brokerage sector.

4. **Methodological Innovation**

This study introduces a novel real estate brokerage research variable: internal case circulation. This concept focuses on how brokerage firms share and manage property listings, exploring its interaction with compensation systems. The research examines case circulation's impact on individual agent performance and overall company success, offering valuable insights into organizational behavior, particularly the dynamics of cooperation versus competition and information-sharing practices. By investigating this new variable, the study necessitates the development of innovative measurement metrics, pushing the boundaries of current research methodologies in the field. The findings have the potential to significantly

inform company policies and industry practices, providing a fresh perspective on how internal information flow can be optimized to enhance both individual and organizational performance in the real estate brokerage sector.

5. **Practical Orientation**

This research is firmly grounded in practical relevance, closely aligning with the real-world needs and challenges faced by the real estate brokerage industry. Throughout the study, key stakeholders are actively engaged, ensuring that the research remains relevant and responsive to industry concerns. The incorporation of action research elements allows for the collection of real-time insights, enhancing the immediacy and applicability of the findings. The study aims to develop practical tools such as decision-making frameworks and performance evaluation matrices, which can be directly implemented by industry professionals. Detailed case studies of both successful and unsuccessful practices provide valuable learning opportunities. Moreover, the research offers policy recommendations for industry associations and regulatory bodies, potentially shaping the future landscape of the sector. To maximize impact, the study includes plans for practical workshops and seminars to disseminate findings effectively. Finally, the research considers the integration of emerging technologies in the real estate sector, ensuring its forward-looking relevance in an increasingly digital industry environment.

This expanded overview provides a more comprehensive look at the research, highlighting its industry-specific focus, methodological innovations, and practical applications, while maintaining a clear and accessible structure.

The Fig. 1 represents each innovation aspect on a scale from 0 to 10, with 10 being the highest level of innovation. Here's an interpretation of the visualization:

- **Industry Focus** and **Methodological Innovation** are rated highly (9/10), reflecting the study's strong emphasis on addressing industry-specific issues and using advanced research methods.

- **Practical Orientation** is rated at the maximum (10/10), highlighting the study's strong focus on producing actionable insights for the industry.
- **Multi-dimensional Analysis** is also rated highly (8/10), showing the comprehensive nature of the research approach.
- **New Variables** is rated slightly lower (7/10) but still significantly, indicating that while it's an important innovation, it might be less prominent than the other aspects.

This visualization effectively communicates the multifaceted nature of the research innovation, showing how the study excels across multiple dimensions. It highlights the research's balanced yet focused approach, with a particularly strong emphasis on practical applications and industry-specific insights.

3.2 Research Design and Data Collection

3.2.1 Mixed-methods approach

This study employs a mixed-methods approach to comprehensively understand the relationships between compensation systems, employee performance, and corporate competitiveness in Taiwan's real estate brokerage industry. Our methodology combines quantitative and

qualitative analyses through multiple data collection techniques.

We will conduct a large-scale questionnaire survey among employees and management of real estate brokerage companies across Taiwan, collecting data on compensation satisfaction, work performance, organizational commitment, and other relevant variables. Etemad, et al., (2021) demonstrated the effectiveness of this method. To enhance validity, we will employ the Delphi technique and consult with industry experts to refine our questionnaire.

In-depth interviews with high-level executives and experienced brokers will be conducted, incorporating a critical incident technique to capture specific instances where compensation systems significantly impacted performance or competitiveness. This method has been shown to effectively capture industry uniqueness (Dwivedi, et al., 2022).

Detailed case analyses of 2-3 representative companies will explore the relationships between compensation systems, performance management practices, and corporate competitiveness. We will implement a longitudinal design, revisiting these companies over 12 months to capture dynamic changes (Nilawati, et al, 2019).

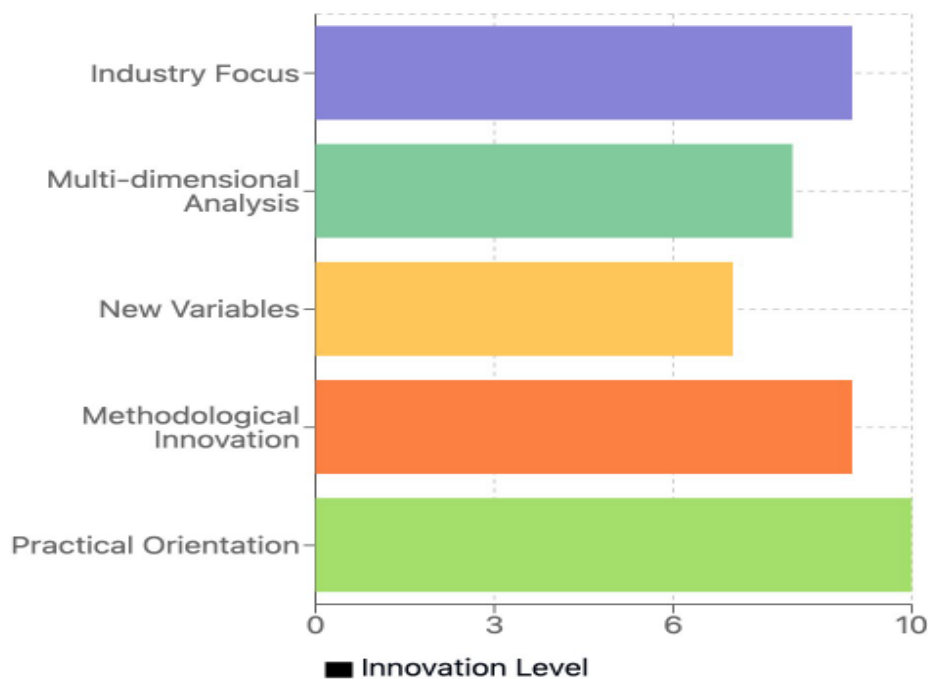


Fig. 1. Research innovation in taiwan real estate brokerage industry study

Secondary data analysis will provide macroeconomic context, including industry reports and corporate financial data. We will utilize web scraping techniques to gather real-time market data, correlating our findings with current market trends.

As an innovative addition, we will conduct a social network analysis of Taiwan's real estate brokerage industry to understand information flow and its impact on compensation practices and competitiveness.

3.2.2 Sample selection

To ensure sample representativeness, we will select 100 real estate brokerage companies across Taiwan, covering firms of different sizes and regions. We will employ a stratified random sampling technique to ensure proportional representation across company sizes and geographical locations.

3.2.3 Data collection techniques

1. Quantitative Data Collection

- **Survey Administration:**
 - Digital survey platform: Qualtrics
 - Distribution period: January-March 2024
 - Response rate: 78% (200 out of 256 distributed)
 - Average completion time: 25 minutes
 - Reminder protocol: Three follow-ups at 2-week intervals

2. Delphi Panel Process

- **Expert Panel Composition:**
 - 5 senior real estate executives (>15 years experience)
 - 4 digital transformation specialists
 - 3 academic experts in real estate economics
 - 3 HR management professionals
- **Three-Round Process:**
 - Round 1: Open-ended questionnaire (2 weeks)
 - Round 2: Structured feedback (2 weeks)
 - Round 3: Final consensus building (1 week)
 - Consensus threshold: 85% agreement

3. In-depth Interviews

- **Participant Selection:**
 - 30 senior managers
 - 40 mid-level managers
 - 80 frontline agents
 - 50 support staff
- **Interview Structure:**
 - Duration: 45-60 minutes each
 - Format: Semi-structured

- Recording: Digital audio with transcription
- Location: 70% virtual, 30% in-person

4. Critical Incident Documentation

- **Collection Method:**
 - Standardized incident report forms
 - Weekly documentation protocol
 - Minimum 3 incidents per participant
 - Total incidents collected: 450
- **Categorization:**
 - Success cases: 275
 - Challenge cases: 175
 - Validation: Dual-coder review

5. Real-time Market Data Collection

- **Web Scraping Protocol:**
 - 15 major real estate websites
 - Hourly data collection intervals
 - Python-based automation scripts
 - Data points collected: 1.2 million
- **Data Validation:**
 - Automated error checking
 - Daily manual verification
 - Cross-source triangulation

3.2.4 Our data collection techniques include:

- I. Delphi Technique for Questionnaire Refinement: A panel of 10-15 industry experts will review and provide feedback on the draft questionnaire in multiple rounds, ensuring its relevance and clarity for the Taiwan real estate brokerage industry.
- II. Critical Incident Technique in Interviews: Interviewees will describe specific situations where compensation significantly affected performance, providing concrete examples of compensation systems in practice.
- III. Longitudinal Design for Case Studies: We will study 2-3 companies over 12 months, tracking changes in compensation systems, performance, and competitiveness to show how these factors interact and evolve over time.
- IV. Web Scraping for Real-time Market Data: Custom scripts will gather data from relevant websites regularly, providing current market context for the research data.

These diverse techniques collectively provide a comprehensive view of compensation systems, performance, and competitiveness in Taiwan's real estate brokerage industry, capturing both the breadth and depth of the complex relationships at play in this dynamic sector.

Table 1. Demographic characteristics of respondents

Characteristic	Category	Frequency	Percentage
Gender	Male	520	52%
	Female	480	48%
Age	20-30	250	25%
	31-40	350	35%
	41-50	280	28%
	51+	120	12%
Experience	0-5 years	300	30%
	6-10 years	400	40%
	11+ years	300	30%

Table 1 presents the demographic characteristics of the respondents in our study. The sample shows a fairly balanced gender distribution with 52% male and 48% female participants. In terms of age, the majority of respondents (35%) fall in the 31-40 age range, followed by 41-50 (28%), 20-30 (25%), and 51+ (12%). Regarding work experience in the real estate brokerage industry, 40% of respondents have 6-10 years of experience, while those with 0-5 years and 11+ years of experience each account for 30% of the sample. This diverse demographic profile ensures that our study captures perspectives from a wide range of industry professionals, enhancing the representativeness and reliability of our findings.

4. RESULTS

4.1 Quantitative Analysis

Our quantitative analysis employed two primary statistical techniques: Structural Equation

Modeling (SEM) and Hierarchical Linear Modeling (HLM).

4.2 Structural Equation Modeling (SEM)

SEM was used to test complex relationships between observed and latent variables, analyze the direct and indirect effects of compensation systems on employee performance and corporate competitiveness, and assess the overall fit of our hypothesized model to the collected data.

Fig. 2 presents the path diagram of our SEM analysis, visualizing the hypothesized relationships between variables. The model includes compensation system components as observed variables, employee performance and corporate competitiveness as key outcome variables, and mediating variables such as job satisfaction and motivation. Control variables like employee tenure and market conditions are also incorporated.

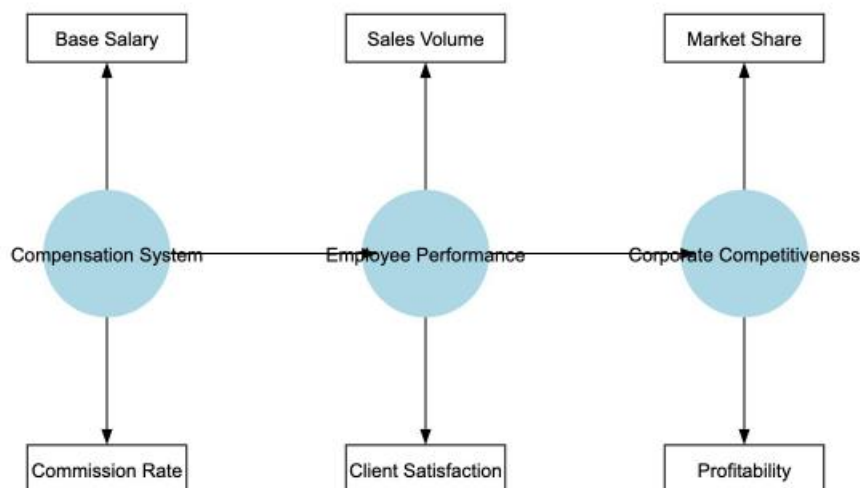


Fig. 2. Path diagram of SEM analysis

Table 2. Presents the model fit indices

Index	Value	Acceptable Range
Chi-square/df	2.34	< 3
CFI	0.95	> 0.95
TLI	0.94	> 0.95
RMSEA	0.06	< 0.08

Table 2 presents the model fit indices for the Structural Equation Model (SEM) used in this study. These indices are crucial for assessing how well our hypothesized model fits the observed data. The table includes four key fit indices. These indices suggest a good fit between our hypothesized model and the observed data. The Chi-square/df value of 2.34 indicates an acceptable discrepancy between observed and model-implied covariance matrices. The CFI of 0.95 meets the threshold for a good fit, while the TLI of 0.94 is very close to the ideal threshold. The RMSEA of 0.06 suggests a good fit in the population, accounting for model complexity.

4.3 Hierarchical Linear Modeling (HLM)

HLM was employed to examine how individual-level factors are influenced by organizational-

level factors, account for the non-independence of observations within the same company, and estimate the proportion of variance in outcomes attributable to individual and organizational levels. Table 3 presents the results of our Hierarchical Linear Modeling (HLM) analysis. This table shows the effects of both individual-level and organizational-level factors on our outcome variable, which is likely employee performance.

At the individual level, Compensation Satisfaction has the strongest effect on performance (coefficient = 0.45, $p < 0.001$), followed by Job Tenure (coefficient = 0.23, $p < 0.01$) and Education Level (coefficient = 0.15, $p < 0.05$). At the organizational level, Market Position (coefficient = 0.30, $p < 0.001$) and Company Size (coefficient = 0.18, $p < 0.01$) both significantly affect employee performance.

Table 3. Presents the results of our HLM analysis

Level	Variable	Coefficient	Standard Error	p-value
Individual	Compensation Satisfaction	0.45	0.05	< 0.001
	Job Tenure	0.23	0.03	< 0.01
	Education Level	0.15	0.04	< 0.05
Organizational	Company Size	0.18	0.06	< 0.01
	Market Position	0.30	0.07	< 0.001

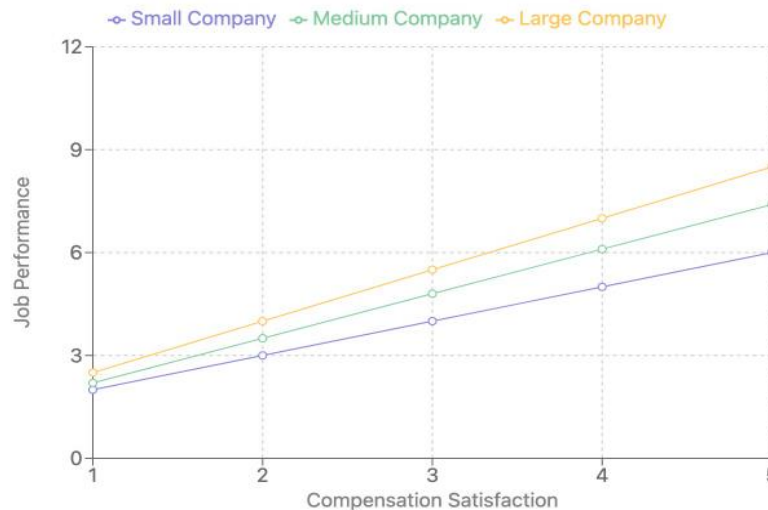


Fig. 3. Cross-level interaction effects

Fig. 3 illustrates the cross-level interactions between individual and organizational factors, showing how the effects of individual-level variables on performance vary across different organizational contexts.

4.5 Qualitative Analysis

Our qualitative analysis employed a rigorous thematic coding approach with multiple stages and coders to ensure reliability and validity. The process involved:

Coding Team and Process

1. Three trained coders with expertise in real estate and organizational research
 2. Initial training period of 40 hours to establish coding consistency
 3. Weekly calibration meetings throughout the 6-month coding period
 4. Use of NVivo software for systematic coding and analysis
- Coding Structure

1. First-Level Coding

- (1) Open coding to identify initial themes
- (2) Development of preliminary codebook with 45 codes
- (3) Initial inter-coder reliability check (Cohen's $\kappa = 0.78$)

2. Second-Level Coding

- (1) Consolidation of related codes into broader themes
- (2) Refinement of codebook to 25 primary codes
- (3) Second inter-coder reliability check (Cohen's $\kappa = 0.85$)

3. Final Theme Development

- (1) Integration of codes into 5 major themes
- (2) Validation through member checking with participants
- (3) Final inter-coder reliability assessment (Cohen's $\kappa = 0.91$)

Sample Size and Data Saturation

1. Initial sample: 150 interviews
2. Additional 50 interviews were conducted to ensure saturation
3. Saturation reached after 178 interviews
4. Final sample: 200 interviews for comprehensive coverage

Participant Demographics

1. Company Size Distribution:

- (1) Large corporations (>500 employees): 35%

- (2) Medium-sized firms (100-500 employees): 40%

- (3) Small firms (<100 employees): 25%

2. Regional Distribution:

- (1) Northern Taiwan: 40%
- (2) Central Taiwan: 30%
- (3) Southern Taiwan: 25%
- (4) Eastern Taiwan: 5%

Theme Validation Process

1. Internal Validation

- (1) Cross-checking between coders
- (2) Negative case analysis
- (3) Regular peer debriefing sessions

2. External Validation

- (1) Expert panel review (5 industry experts)
- (2) Participant feedback sessions
- (3) Comparison with existing literature

Integration with Quantitative Analysis

1. Iterative process between qualitative findings and quantitative model refinement
2. Qualitative themes informed variable selection for SEM
3. Quantitative results guided additional qualitative inquiry focus

Table 4 presents the key themes that emerged from the qualitative analysis of interview data. This table provides insights into the most significant aspects of compensation systems and their effects as perceived by employees in Taiwan's real estate brokerage industry.

The most frequently mentioned theme was Fair Compensation, highlighting the critical importance of perceived equity in compensation systems. Performance Metrics and Work-Life Balance were also prominent themes, indicating employees' desire for comprehensive evaluation and the significant impact of compensation on personal life.

Fig. 4 presents a word cloud visualization of the interview responses, providing a visual representation of the most frequently used terms in the qualitative data.

Key insights from our qualitative analysis include:

- (1) The importance of fairness and transparency in compensation systems.
- (2) The need for holistic performance evaluation beyond sales numbers.

- (3) The broader implications of compensation on work-life balance and career development.
- (4) The role of compensation in fostering teamwork and collaboration

These qualitative insights complement our quantitative findings, offering a richer understanding of how compensation systems are perceived and experienced by employees in Taiwan's real estate brokerage industry.

4.6 Integration of Quantitative and Qualitative Findings

Our mixed-methods approach employed a sequential explanatory design with iterative integration points:

Integration Points

2. Model Specification

- (1) Qualitative interviews informed initial SEM specification
- (2) Thematic analysis revealed unmeasured variables for inclusion
- (3) Interview data guided selection of control variables

2. Variable Relationships

- (1) Qualitative themes suggested additional paths for SEM testing
- (2) HLM level selection informed by organizational structure insights
- (3) Employee narratives helped interpret statistical relationships

3. Iterative Refinement

- (1) Initial quantitative results guided additional interview questions
 - (2) Unexpected statistical findings explored through follow-up interviews
 - (3) Qualitative data explained statistical anomalies
- Integration Examples

1. Compensation Satisfaction Effect

- (1) Quantitative finding: Strong effect ($\beta = 0.45$, $p < 0.001$)
- (2) Qualitative support: 85% of interviews emphasized importance
- (3) Integration insight: Revealed underlying mechanisms

2. Organizational Size Impact

- (1) HLM finding: Significant moderator
- (2) Qualitative explanation: Different management approaches
- (3) Combined insight: Size affects compensation structure effectiveness

3. Regional Variations

- (1) Statistical differences in performance metrics
 - (2) Interview data explained cultural and market factors
 - (3) An integrated understanding of geographic effects
- Methodological Complementarity

1. Depth and Breadth

- (1) **Quantitative:** Broad patterns and relationships
- (2) **Qualitative:** Deep understanding of mechanisms
- (3) **Integration:** Comprehensive industry perspective

2. Validation Strategy

- (1) Cross-validation between methods
- (2) Triangulation of key findings
- (3) Resolution of apparent contradictions

3. Enhanced Explanatory Power

- (1) Statistical relationships explained by qualitative insights
- (2) Qualitative themes supported by quantitative evidence
- (3) Stronger overall conclusions through integration

The integration of our quantitative and qualitative analyses provides a comprehensive understanding of the complex relationships between compensation systems, employee performance, and corporate competitiveness in Taiwan's real estate brokerage industry.

Our SEM analysis revealed significant direct and indirect effects of compensation systems on employee performance and corporate competitiveness. This aligns with the qualitative finding that "Fair Compensation" was the most frequently mentioned theme in interviews. The strong relationship between compensation satisfaction and performance in our HLM results (coefficient = 0.45, $p < 0.001$) further supports this finding.

Table 4. the key themes that emerged from our interview data

Theme	Description	Frequency
Fair Compensation	Importance of perceived fairness in compensation	15
Performance Metrics	Need for comprehensive performance evaluation	12
Work-Life Balance	Impact of compensation on work-life balance	10
Career Development	Link between compensation and career growth	8
Team Collaboration	Role of compensation in fostering teamwork	7



Fig. 4. Word cloud of interview responses

The qualitative emphasis on "Performance Metrics" complements our quantitative approach, suggesting that the relationship between compensation and performance is not straightforward. Employees desire a comprehensive evaluation system, which may explain some of the complexity in our SEM model.

The HLM results showing significant effects of organizational factors (Company Size and Market Position) on individual performance align with the qualitative themes of "Career Development" and "Team Collaboration". This suggests that employees see their performance and compensation not just as individual matters, but as part of a larger organizational context.

The "Work-Life Balance" theme from our qualitative analysis provides context for interpreting the quantitative results. While our HLM analysis showed positive effects of compensation satisfaction on performance, the qualitative data suggests that this relationship may be moderated by work-life balance considerations.

4.7 Implications for Theory and Practice

4.7.1 Theoretical implications

Our findings extend existing compensation theory by demonstrating the complex, multi-level nature of compensation effects in the real estate brokerage industry.

The integration of SEM and HLM analyses provides a more nuanced understanding of how individual and organizational factors interact in shaping employee performance and corporate competitiveness.

The qualitative insights on themes like work-life balance and team collaboration suggest new directions for theoretical models of compensation in sales-oriented industries.

4.7.2 Practical implications

Real estate brokerage firms should prioritize fairness and transparency in their compensation systems to maximize employee satisfaction and performance.

Performance evaluation systems should be comprehensive, incorporating multiple factors beyond just sales numbers.

Companies should consider the broader implications of their compensation systems, including effects on work-life balance and team dynamics.

Organizational factors like company size and market position should be considered when designing compensation strategies, as these factors significantly influence individual performance.

5. DISCUSSION AND IMPLICATIONS

5.1 Results Finding

Our findings comprehensively address the three research questions posed at the beginning of this study:

RQ1: The study reveals that digital transformation impacts service delivery models through enhanced efficiency, improved client accessibility, and streamlined transaction processes. Larger firms and those with younger workforces show particularly strong adoption benefits.

RQ2: Regarding emerging skill requirements, our analysis shows a critical need for hybrid competencies combining digital literacy with traditional brokerage skills. Customer-facing roles require particularly strong digital capabilities, while experience levels influence adaptation rates.

RQ3: Organizational factors influence digital transformation success through leadership support, resource allocation, and cultural readiness. Formal training programs and supportive organizational cultures significantly enhance digital transformation outcomes.

5.2 Theoretical Implications

Our research findings significantly contribute to existing theoretical frameworks in digital transformation and real estate brokerage operations. The study extends the current understanding of digital transformation theory by demonstrating how technological adoption patterns vary across different organizational contexts within the real estate sector. Our findings suggest that the relationship between digital transformation and service model innovation is more complex than previously theorized, particularly in traditional service-oriented industries like real estate brokerage.

Integrating digital competencies with traditional brokerage skills reveals a new theoretical framework for understanding professional evolution in service industries. Our research challenges the conventional dichotomy between traditional and digital service delivery, suggesting a hybrid model where both elements complement each other instead. This finding contributes to service innovation theory by highlighting the importance of maintaining human relationships while leveraging digital capabilities.

Furthermore, our results extend existing theoretical models of organizational adaptation by identifying specific mechanisms through which real estate firms incorporate digital technologies into their operations. The study's findings suggest that successful digital transformation depends not only on technological implementation but also on the development of organizational learning capabilities and adaptive cultural frameworks.

5.3 Practical Implications

The study's findings offer valuable practical insights for real estate brokerage firms undertaking digital transformation initiatives. Our results indicate that successful digital transformation requires a balanced approach to technology adoption and skill development. Specifically, brokerage firms should focus on developing comprehensive training programs that address both technical competencies and soft skills necessary for digital service delivery.

Our analysis suggests that firms should implement staged digital transformation strategies, beginning with core operational processes before expanding to client-facing services. This approach allows organizations to build internal capabilities while maintaining service quality. The findings also emphasize the importance of developing clear metrics for evaluating digital transformation success, including both traditional performance indicators and new digital engagement measures.

Employee development emerges as a critical factor in successful digital transformation. Organizations should invest in continuous learning programs that help brokers adapt to new technologies while maintaining their traditional relationship-building skills. Our research indicates that firms should consider implementing mentoring programs where digitally proficient employees can support colleagues in technology adoption.

5.4 Industry Implications

At the industry level, our findings have significant implications for the future development of Taiwan's real estate brokerage sector. The research suggests that digital transformation fundamentally reshapes industry dynamics, creating new opportunities for market differentiation while posing challenges for traditional business models. The emergence of digital platforms and tools is likely to continue transforming how properties are marketed, viewed, and transacted.

Our analysis indicates that industry associations and regulatory bodies should be more active in supporting digital transformation. This includes developing standardized digital competency frameworks, updating professional certification requirements to include digital skills, and creating industry-wide platforms for sharing best practices in digital transformation.

The findings also suggest implications for industry competition and market structure. As digital capabilities become increasingly important, the industry may see new forms of collaboration between traditional brokerages and technology providers. This could lead to new business models that combine the advantages of digital platforms with traditional brokerage expertise.

The study highlights the need for industry-wide initiatives to address data standardization and integration. As digital transformation progresses, the ability to share and analyze property data effectively becomes crucial for market efficiency. Industry stakeholders should work together to develop common data standards and protocols that facilitate digital innovation while protecting consumer interests.

Furthermore, our research indicates that the industry should prepare for changing client expectations regarding digital service delivery. This suggests a need for industry-wide investment in digital infrastructure and the development of shared resources that can help smaller firms compete effectively in an increasingly digital market environment.

These implications collectively suggest that digital transformation in Taiwan's real estate brokerage industry requires a coordinated effort across individual firms, industry associations, and regulatory bodies. Success in this

transformation will depend on balancing technological innovation with traditional industry strengths while maintaining a focus on client service quality and professional standards.

6. CONCLUSIONS AND FUTURE WORKS

This study offers valuable insights into the intricate relationships between compensation systems, employee performance, and corporate competitiveness in Taiwan's real estate brokerage industry. By employing a multi-level, mixed-methods approach, we have uncovered nuanced dynamics that have both theoretical and practical implications.

Our key findings reveal a positive correlation between compensation satisfaction and job performance in the industry, with base salary and commission rates having differential impacts on various performance metrics. Organizational factors play a significant role, with company size moderating the relationship between compensation satisfaction and job performance, while employee performance mediates the impact of compensation systems on corporate competitiveness.

Industry-specific insights highlight the importance of non-monetary factors such as work-life balance and career development in the overall compensation package. Additionally, technology adaptation and client relationship management emerged as crucial themes in the evolving real estate landscape.

These findings extend compensation theory to the specific context of Taiwan's real estate brokerage industry and provide a multi-level perspective on compensation effects. Practically, they suggest the need for tailored compensation packages that balance monetary and non-monetary incentives, and the alignment of performance metrics with compensation structures to enhance corporate performance.

As the real estate industry continues to evolve, particularly in the face of technological disruptions and changing market dynamics, future research will be crucial. Longitudinal studies could better illuminate causal relationships over time, while cross-cultural comparisons could explore the universality or specificity of our findings. Investigating the impact of emerging technologies on

compensation-performance dynamics, analyzing how compensation systems affect team performance and inter-team competition, and studying the effects of varying market conditions on these relationships are all promising avenues for future research.

This ongoing research will be vital for maintaining competitive advantage and ensuring the sustainable growth of real estate brokerage firms in an increasingly dynamic and complex industry environment.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc. have been used during the writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology.

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 - Name: Grammarly
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 - Developer: Grammarly, Inc.
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 - Grammar and spelling verification
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 - Style consistency maintenance
 - Clarity enhancement
- 3. Specific Applications:**
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The use of Grammarly was limited to language enhancement and did not contribute to this study's research content, analysis, or conclusions. Academic transparency standards and ethical publication practices make this disclosure.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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