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### The Performance of Construction Businesses in the Lower Northeastern Region 1 of Thailand According to the Balanced Scorecard.

#### 基于平衡计分卡视角的泰国东北部下部第一区建筑企业绩效研究

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#### Abstract:

This study aims to examine the direct effects of entrepreneurial orientation and marketing mix factors on the performance of construction businesses based on the Balanced Scorecard framework, as well as the indirect effect of entrepreneurial orientation on business performance through marketing mix factors as a mediating variable. A quantitative research design was employed, and data were collected using questionnaires from 230 construction business owners with more than one year of business experience. The study was conducted in four provinces in the Lower Northeastern Region 1 of Thailand. The data were analyzed using descriptive and inferential statistics. The findings indicate that both entrepreneurial orientation and marketing mix factors have direct positive effects on the performance of construction businesses based on the

**Keywords :** Entrepreneurial orientation; Marketing mix; Balanced Scorecard; Construction business.

**关键词:** 创业导向; 营销组合; 平衡计分卡; 建筑企业。



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Balanced Scorecard framework. In addition, entrepreneurial orientation was found to have an indirect effect on business performance through marketing mix factors. Therefore, this study provides useful insights for defining best practices in business operations, improving efficiency, creating competitive advantage, and identifying appropriate management approaches for construction businesses.

### 摘要:

本研究旨在探讨创业导向和营销组合因素对基于平衡计分卡框架的建筑企业绩效的直接影响，并分析创业导向通过营销组合因素这一中介变量对企业绩效产生的间接影响。本研究采用定量研究设计，通过问卷调查的方式收集数据，研究对象为230名具有一年以上经营经验的建筑企业业主。研究区域包括泰国东北部下部第一区的四个府。数据采用描述性统计和推断性统计方法进行分析。研究结果表明，创业导向和营销组合因素均对基于平衡计分卡框架的建筑企业绩效产生直接正向影响。此外，研究还发现，创业导向能够通过营销组合因素对企业绩效产生间接影响。因此，本研究为确定企业经营最佳实践、提高经营效率、形成竞争优势以及识别适合建筑企业的管理方法提供了有益参考。

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## 1. Introduction

Thailand's 13th National Economic and Social Development Plan (2023–2027) sets 13 key goals aimed at advancing the country across four key dimensions: production and services, opportunity and equality, sustainability of natural resources and the environment, and factors supporting national transformation [1]. The construction industry forms an important part of this national transformation agenda. During 2012–2021, total construction investment accounted for an average of 8.1% of Thailand's gross domestic product (GDP). During 2023–2024, the construction industry was expected to grow at an average annual rate of 4.5–5.5%. This growth was primarily driven by government investment in large-scale projects, particularly those related to the development of the Eastern Economic Corridor (EEC), which were expected to accelerate in order to achieve the objectives of the EEC Transportation Infrastructure Action Plan, Phase 2 (2022–2026). Meanwhile, private-sector investment in both residential and commercial real estate projects showed signs of improvement [2].

Currently, the construction business in the Northeastern region of Thailand is highly competitive due to the expansion of the economy, transportation systems, and industrial estates. This has increased demand for construction in the region and led to a corresponding rise in the number of construction contractors. Nakhon Ratchasima Province has the highest number of registered construction businesses, followed by Buriram Province. Furthermore, the

provinces of Lower Northeastern Region 1, namely Nakhon Ratchasima, Chaiyaphum, Buriram, and Surin, are among the most competitive areas for construction businesses due to the large number of construction companies operating in the region [3]. Therefore, construction business owners in Lower Northeastern Region 1 of Thailand must continuously adapt by developing operational strategies that are timely and responsive to customer needs.

A considerable body of related research supports the view that entrepreneurial orientation affects organizational performance. Entrepreneurial orientation reflects the characteristics and behaviors of entrepreneurs who seek to introduce new products, brands, or processes in order to create competitive opportunities [4]. However, limited research has examined the mediating role of marketing mix factors in the relationship between entrepreneurial orientation (EO) and organizational performance based on the Balanced Scorecard (BSC). The literature suggests that marketing mix factors (7Ps) represent an important variable influencing BSC-based performance. Entrepreneurs' knowledge and understanding of the marketing mix can help increase their competitive opportunities. Entrepreneurial orientation may not influence business performance only directly; rather, it may also exert an indirect effect through the marketing mix [5,6]. Moreover, previous research has shown a clear relationship between EO and the 7Ps, as well as between EO-related activities and organizational performance [7].

Furthermore, these factors have not been sufficiently applied to construction businesses using Structural Equation Modeling (SEM), either in Thailand or internationally, which indicates a research gap and potential contribution to new knowledge in the Thai context. In particular, the context of construction businesses in other countries differs from that of construction businesses in Thailand. Based on the importance of these issues, this study examines factors affecting the performance of construction businesses in Lower Northeastern Region 1 of Thailand according to the Balanced Scorecard framework. The research objectives are as follows: (1) to examine the direct influence of entrepreneurial orientation on Balanced Scorecard performance; (2) to examine the direct influence of entrepreneurial orientation on the marketing mix; (3) to examine the direct influence of the marketing mix on Balanced Scorecard performance; and (4) to examine the indirect influence of entrepreneurial orientation on Balanced Scorecard performance through marketing mix factors. The target areas of the study are Nakhon Ratchasima, Chaiyaphum, Buriram, and Surin provinces. The research findings are expected to provide useful information for developing practical guidelines for construction businesses, improving operational efficiency, and strengthening competitiveness

## 2. Literature Review

### 2.1. Overview of Thailand's Construction Industry

The Thai construction industry is expected to grow by 3–4% per year during 2024–2026, driven mainly by government investment in large-scale projects, particularly those related to the Eastern Economic Corridor (EEC). Private-sector growth is expected to gradually recover, with an estimated growth rate of 3–3.5%. This recovery is supported by the improving economy and the expansion of government infrastructure. However, the construction industry continues to face several challenges, including: (1) rising costs of construction materials, labor, and transportation due to higher energy prices; (2) climate change; and (3) the goal of achieving net-zero carbon emissions. Therefore, entrepreneurs must accelerate investment in technology, learning, and development across all dimensions in order to reduce material waste and improve work efficiency [8].

Large-scale construction businesses are expected to continue expanding due to accelerated government investment in major projects. Large construction companies have the capacity to bid for and manage projects such as electric rail systems, double-track railways, motorways, and other infrastructure projects in various provinces throughout Thailand. In addition, large-scale private construction projects, including high-rise buildings and large commercial developments, are expected to continue increasing in number [8]. For small and medium-sized construction businesses

(SMEs), revenue is expected to remain stable in 2024 and recover in 2025–2026 due to broader economic recovery. Medium-sized construction businesses are likely to gain opportunities from larger-scale construction projects. However, they still face challenges related to rising costs and labor shortages, which may increase the risk of liquidity problems.

The overall outlook for construction material prices in Thailand during 2024–2026 indicates a likely increase. This is mainly due to recovering construction demand, rising imported raw material costs in line with global market prices, higher energy costs caused by prolonged geopolitical conflicts, labor shortages, and continued pressure from post-pandemic market conditions. Although the supply of imported steel from China has increased, cost pressures remain significant. Furthermore, the construction industry competes with the manufacturing and service sectors for labor, particularly migrant workers, which may lead to project delays and negatively affect construction business revenue [9].

The construction industry in Lower Northeastern Region 1 is highly competitive. Nakhon Ratchasima Province has the highest number of construction companies in the Northeastern region, followed by Chaiyaphum, Buriram, and Surin provinces, all of which rank among the top five provinces in the region in terms of construction business activity [3].

### 2.2. Concept of Organizational Performance Measurement Based on the Balanced Scorecard (BSC)

Previous studies indicate that the Balanced Scorecard (BSC) has become increasingly important in both organizational theory and management practice. Organizational performance can generally be measured using two types of indicators: financial performance indicators based on economic outcomes and non-financial performance indicators [10]. The BSC is closely related to management and long-term strategic control, as it helps organizations translate strategy into measurable performance outcomes. Therefore, the BSC framework provides a balance between financial and non-financial indicators and serves as an effective tool for evaluating sustainability-oriented performance. In addition, the concept of the Sustainable Balanced Scorecard helps organizations identify what should be measured and what actions should be taken to improve sustainability performance [11,12].

Kaplan and Norton introduced the Balanced Scorecard as a new approach to organizational performance evaluation [13]. This approach shifts the focus from purely financial indicators to a broader framework that includes financial, customer, internal process, and learning and growth perspectives. Each perspective focuses on a specific dimension of organizational performance.

The Balanced Scorecard concept is widely accepted

and used by businesses worldwide. It is an important management tool across the four perspectives mentioned above because it enables organizations to collect comprehensive data, evaluate performance, and establish clear goals for each perspective. These goals help organizations create value for both the organization and its customers at every stage of operation. Performance measurement based on the Balanced Scorecard emphasizes that effective organizations should regularly measure and evaluate their own performance in order to improve efficiency and competitiveness. In the past, performance evaluation was often based mainly on financial assessment, which did not fully cover all dimensions of organizational performance. Therefore, balanced performance measurement across multiple dimensions has become increasingly important [14,13,15,16].

### 2.3. Concept of Entrepreneurial Orientation (EO)

Entrepreneurial orientation refers to an organization's decision-making practices, processes, and behaviors aimed at identifying market opportunities, using existing products, and developing new products to achieve business success. It consists of innovation, risk-taking, competitive aggressiveness, proactiveness, and autonomy [17–21].

Previous studies have shown that autonomy, risk-taking, proactiveness, and competitive aggressiveness are statistically significant dimensions of entrepreneurial orientation [10]. Risk-taking has been found to have a positive influence on entrepreneurial orientation, although some studies indicate that risk-taking may not be strongly related to EO among small entrepreneurs [22]. Proactiveness can contribute to the rapid development of innovation [23]. Entrepreneurial orientation and firm performance have also been found to vary significantly across countries [24]. In addition, new entrepreneurs with strong EO characteristics may be better able to manage their businesses effectively [23,25]. A fluctuating business environment may have both positive and negative effects on organizational performance, encouraging organizations to improve their performance [26]. Organizational innovation capability has also been shown to have a positive relationship with firm performance [27]. Consistent with these findings, entrepreneurial orientation, particularly in terms of fostering business innovation, has a significant influence on business performance. Moreover, entrepreneurial orientation has a direct positive influence on competitiveness [28,29].

EO, as an indicator of a firm's processes, structures, and behaviors in pursuing opportunities, provides deeper insight into how sustainable entrepreneurs manage the paradox of entrepreneurial activity within the limits of economic, ecological, and social responsibility. Different configurations of EO may correspond to different sustainability decision profiles, and previous studies have shown how the reflexive

nature of EO interacts with sustainability orientation [30]. In addition, EO activated by grassroots innovation has been found to significantly influence entrepreneurial success in the Indian context [31]. Furthermore, when the influences of strategic drivers, such as entrepreneurial orientation, market orientation, and knowledge management orientation, are considered separately or in combination, the likelihood of cleaner production success increases, leading to a significant improvement in sustainable competitive advantage among small and medium-sized enterprises [32].

### 2.4. Concept of Marketing Mix (7Ps)

McCarthy described the four elements of the marketing mix as a conceptual framework for planning and implementing effective marketing activities. These elements include product or service, price, place or distribution channel, and promotion [33]. Since business involves not only selling products but also providing services, the marketing mix concept has been expanded to cover additional aspects of modern marketing. Three further elements have been added: physical evidence, process, and people. The value of each element is determined not only by the company and its activities but also by competition and changes over time. All marketing factors are interconnected and should be considered as a whole. They are largely shaped by the company's strategy and operations. The 7Ps marketing mix has been widely used by marketing firms, branding agencies, and other business service providers around the world [34,35].

The marketing mix has two important advantages. First, it helps demonstrate that the role of marketing managers involves balancing the advantages of their own competitive strengths with those of competitors. Second, it highlights another important dimension of marketing management by showing how marketing can be separated from other business functions and assigned to specialists. The marketing mix is a powerful concept because it simplifies marketing management and helps identify the components that influence a company's competitive position [36]. Consistent with previous findings, all seven elements of the marketing mix have been shown to significantly influence service quality, with consumers placing particular importance on place or distribution channels, which in turn affects repurchase decisions [37].

### 2.5. Review of Related Research

Entrepreneurial orientation is an important factor that business owners should possess. It consists of innovation, risk-taking, competitive aggressiveness, proactiveness, and autonomy [18,17]. These dimensions have a direct and positive influence on Balanced Scorecard performance. Entrepreneurial orientation also affects organizational growth, particularly in terms of increased profitability. Employees who demonstrate creativity in their operations can help create competitive

advantages through innovation, leading to improved financial efficiency and organizational growth. Organizations with strong entrepreneurial capabilities tend to have more flexible financial management systems than organizations with weaker capabilities. Organizations seeking success need to develop innovations and be willing to act as innovators and competitive leaders [38]. This is consistent with research showing that innovation has a positive effect on organizational performance [39]. In addition, entrepreneurial orientation has been found to positively affect the Balanced Scorecard, particularly in terms of financial performance measurement [40]. Based on the literature review and previous research, the following hypothesis was developed:

**H1:** Entrepreneurial orientation has a direct positive influence on Balanced Scorecard performance.

Entrepreneurial orientation is a crucial capability that should be developed and prioritized, as it has a direct positive influence on marketing mix factors [41]. Similarly, previous research found that entrepreneurs must apply marketing mix concepts in order to compete effectively in business [42]. Furthermore, entrepreneurs need marketing knowledge and the ability to apply marketing tools to achieve business success, thereby improving organizational efficiency and performance [5]. In the case of small and medium-sized enterprises (SMEs), entrepreneurial orientation has a direct positive impact on the marketing mix [43]. Based on the literature review and previous research, the following hypothesis was developed:

**H2:** Entrepreneurial orientation has a direct positive influence on the marketing mix.

The marketing mix is a tool for developing marketing strategies based on an analysis of the external business environment in order to satisfy customers and improve overall organizational performance. This is consistent with research showing that the marketing mix has a positive effect on financial performance measures [6]. It also increases customer satisfaction, trust, and purchase intention, which in turn affects customer-related performance. In addition to focusing on products, businesses should also focus on distribution channels, price, and marketing promotion, as these factors help meet customer needs and positively influence financial performance, including revenue and profit [44]. Furthermore, current marketing strategies increasingly rely on digital marketing technology to reach customer groups more easily and to facilitate performance measurement through digital data. Therefore, the Balanced Scorecard plays an important role in measuring and evaluating digital marketing strategies. This is consistent with research examining marketing mix factors affecting customer loyalty through a customer-oriented Balanced Scorecard perspective [45,46]. Based on the literature review and previous research, the following hypothesis was developed:

**H3:** The marketing mix has a direct positive

influence on Balanced Scorecard performance.

Entrepreneurial orientation (EO) does not always have an immediate impact on organizational performance. Instead, it may function as an upstream factor that drives innovation and the adaptation of marketing and service mix strategies to suit the business environment [47,48]. An effective 7Ps strategy can then act as a mechanism for influencing customer satisfaction and reflecting tangible performance across all dimensions of the Balanced Scorecard framework [17,49]. Based on the literature review and previous research, the following hypothesis was developed:

**H4:** Entrepreneurial orientation has an indirect effect on Balanced Scorecard performance through marketing mix factors.

Based on the concepts, theories, related research, and hypotheses described above, the conceptual framework of the present research was formulated, as shown in Figure 1.

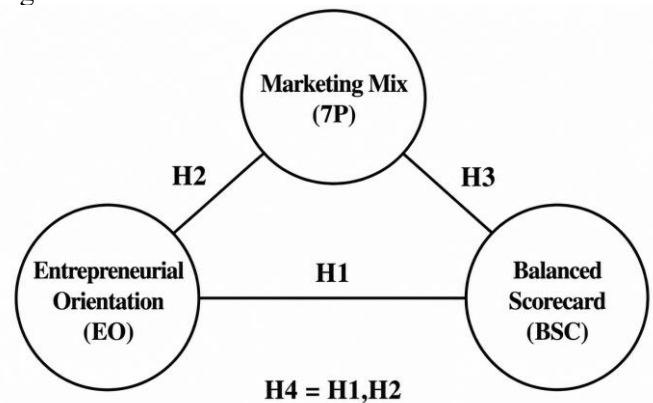


Figure 1. Research conceptual framework (Source / The authors)

### 3. Methodology

This study employed a quantitative survey research design. Questionnaires were used as the primary instrument for data collection.

The target population consisted of 6,066 construction business owners in Lower Northeastern Region 1 of Thailand who had more than one year of experience in the construction business. The study covered four provinces: Chaiyaphum, Nakhon Ratchasima, Buriram, and Surin. This population was selected because of the intense competition in the construction industry in these areas and the high number of construction businesses, with these provinces ranking among the top five in the Northeastern region [3]. The sample size was determined based on the criteria for Structural Equation Modeling (SEM), following the conceptual guidelines of Schumacker and Lomax and Kline [50,51]. A total of 230 respondents were included in the study.

A multi-stage sampling method was applied. This included non-probability sampling through purposive sampling, probability sampling through stratified random sampling, and quota sampling based on the proportion of construction business owners in the target

provinces. The sample sizes for Nakhon Ratchasima, Chaiyaphum, Buriram, and Surin were 108, 36, 47, and 39 respondents, respectively, representing 47%, 16%, 20%, and 17% of the total sample.

The questionnaire consisted of closed-ended questions using a Likert rating scale, which was applied as an interval scale for measuring the research variables. Three key factors were developed based on a review of relevant concepts, theories, and previous research. The first factor was entrepreneurial orientation (EO), consisting of five dimensions: autonomy, innovation, risk-taking, proactiveness, and competitive aggressiveness, with a total of 15 items. The second factor was the marketing mix (7Ps), consisting of seven dimensions: product or service, price, place and distribution channels, promotion, people, process, and physical evidence, with a total of 21 items. The third factor was organizational performance based on the Balanced Scorecard (BSC), consisting of four dimensions: financial, customer, internal process, and learning and growth perspectives, with a total of 12 items.

The content validity of the research instrument was assessed by three experts in fields related to the research variables using the Index of Item-Objective Congruence (IOC). The IOC values ranged from 0.67 to 1.00, exceeding the recommended threshold of 0.50 [52]. Reliability testing demonstrated excellent internal consistency, with an overall Cronbach's alpha coefficient of 0.966. The Cronbach's alpha values for EO, 7Ps, and BSC were 0.960, 0.960, and 0.961, respectively, all exceeding the recommended threshold of 0.70 [53].

Before data analysis, the collected questionnaires were screened to ensure completeness and suitability for analysis. Questionnaires with incomplete data were excluded from the analysis. The data were analyzed using descriptive statistics, including mean, percentage, and standard deviation, as well as inferential statistics, including Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM).

CFA was used to assess the measurement model, while SEM was applied to examine the structural relationships among the factors affecting the Balanced Scorecard performance of construction businesses. The analysis examined the consistency of the proposed structural model with the empirical data and assessed the direct, indirect, and total effects of entrepreneurial orientation on Balanced Scorecard performance through marketing mix factors. The data were analyzed using IBM SPSS Statistics for descriptive analysis and IBM SPSS AMOS for CFA and SEM.

## 4. Results

A general analysis of the sample of 230 respondents showed that 48.3% had been involved in the construction business for 6–10 years, while 40.4% had

more than 15 years of experience. Small, medium-sized, and large businesses accounted for 73.9%, 17.8%, and 8.3% of the sample, respectively. The majority of business owners, 67.4%, held a bachelor's degree. Regarding the types of services provided, most businesses, 60.9%, operated in the private sector. The Department of Business Development of Thailand classifies construction services into 17 categories. Among these, general building construction, residential building construction, and non-residential building construction were the three most frequently provided services, accounting for 61.3%, 57.0%, and 37.4%, respectively. The results of the analysis are summarized below according to the research objectives.

### 4.1. Results of the Analysis of the Main Research Factors

Entrepreneurial orientation among construction businesses in Lower Northeastern Region 1 of Thailand was found to be at a high overall level, with a mean score of 3.99. Among its dimensions, innovation had the highest mean score, at 4.04, followed by autonomy and competitive aggressiveness, both with mean scores of 4.02. Proactiveness and risk-taking also showed high mean scores, at 3.97 and 3.92, respectively.

The marketing mix factors had an overall mean score of 3.93, indicating a high level. When each factor was considered separately, product and service had the highest mean score, at 4.38. This was followed by process, price, people, place and distribution channels, physical evidence, and promotion, with mean scores of 4.27, 4.24, 3.88, 3.82, 3.58, and 3.32, respectively.

The Balanced Scorecard performance was also found to be at a high overall level, with a mean score of 3.90. Among its dimensions, the customer perspective had the highest mean score, at 4.06, followed by the financial perspective, internal process perspective, and learning and growth perspective, with mean scores of 4.01, 3.96, and 3.59, respectively.

The results of the analysis are presented in Table 1.

Table 1. Average level of EO, 7P, and BSC in the construction industry (Source / The authors)

<b>Entrepreneurial orientation</b>	<b>Mean</b>	<b>Level of meaning</b>
- Autonomous. (E1)	4.02	High
- Innovation. (E2)	4.04	High
- Risk-taking. (E3)	3.92	High
- Proactive action. (E4)	3.97	High
- Competitive aggressiveness. (E5)	4.02	High
<b>Total</b>	<b>3.99</b>	<b>High</b>
<b>Marketing mix</b>		
- Product or services. (MK1)	4.38	Highest
- Price. (MK2)	4.24	Highest
- Place and distribution channels. (MK3)	3.82	High

- Promotion. (MK4)	3.32	Moderate
- People. (MK5)	3.88	High
- Process (MK 6)	4.27	Highest
- Physical evidence (MK 7)	3.58	High
<b>Total</b>	3.93	High
<b>Balanced scorecard</b>		
- Financial perspectives. (BSC 1)	4.01	High
- Customer perspectives. (BSC 2)	4.06	High
- Internal processes perspectives. (BSC 3)	3.96	High
- Learning, and growth perspectives. (BSC 4)	3.59	High
<b>Total</b>	3.90	High

## 4.2. Results of the Structural Equation Modeling Analysis

Before conducting structural equation modeling, the researchers prepared the data by checking three essential conditions: (1) missing data, (2) normal distribution of the observed variables, and (3) multicollinearity. These checks were performed to ensure that the data were suitable for further analysis. The results are summarized below.

### 4.2.1. Missing Data

The data integrity check revealed no missing values. Therefore, all questionnaires were retained for further analysis [54].

### 4.2.2. Normality Test

To assess the normal distribution of the observed variables, the researchers followed Kline's approach, which suggests examining univariate normality rather than relying on the more complex multivariate normality test [51]. The absolute values of skewness should not exceed  $\pm 3.00$ , and the absolute values of kurtosis should not exceed  $\pm 10.00$ . The results showed that skewness values ranged from  $-0.940$  to  $0.136$ , while kurtosis values ranged from  $-0.524$  to  $6.224$ . These values were within the acceptable thresholds, indicating that the data were approximately normally distributed and suitable for further analysis.

### 4.2.3. Multicollinearity Test

The researchers also conducted a multicollinearity test to confirm that the variables were not highly correlated. Excessively high correlations among variables may lead to redundant measurement and inaccurate analysis results. Multicollinearity was assessed using three criteria: (1) tolerance values should be higher than  $0.01$ ; (2) Variance Inflation Factor (VIF) values should not exceed  $10$ ; and (3) bivariate correlation coefficients should not exceed  $0.90$  [51]. The results showed that tolerance values ranged from  $0.240$  to  $0.563$ , VIF values ranged from  $1.777$  to  $4.167$ ,

and correlation coefficients between pairs of variables ranged from  $0.400$  to  $0.659$ . Therefore, all variables were within acceptable limits, and no multicollinearity problem was identified.

## 4.3. Results of the Measurement and Structural Model Analysis Using CFA and SEM

The researchers reviewed relevant concepts, theories, and previous studies to develop the measurement model and examine whether the relationships between latent variables and their observed indicators were consistent with the empirical data. The data were analyzed using IBM SPSS Statistics for descriptive statistical analysis and IBM SPSS AMOS for Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM). The results of the three measurement models are summarized below.

### 4.3.1. Entrepreneurial Orientation Measurement Model

The model fit test for the entrepreneurial orientation measurement model included five observed dimensions: autonomy, innovation, risk-taking, proactiveness, and competitive aggressiveness. The results showed that the model met the required statistical criteria, as presented in Figure 2 and Table 2.

### 4.3.2. Marketing Mix Measurement Model

The model fit test for the marketing mix measurement model included seven observed dimensions: product or service, price, place and distribution channels, promotion, people, process, and physical evidence. The results showed that the model met the required statistical criteria, as presented in Figure 2 and Table 2.

### 4.3.3. Balanced Scorecard Performance Measurement Model

The model fit test for the Balanced Scorecard performance measurement model included four observed dimensions: financial perspective, customer perspective, internal process perspective, and learning and growth perspective. The results showed that the model met the required statistical criteria, as presented in Figure 2 and Table 2.

In addition, the measurement model demonstrated acceptable convergent validity, with an Average Variance Extracted (AVE) value of  $0.569$ , which exceeded the recommended threshold of  $0.50$ . This indicates that the latent constructs explained a sufficient proportion of variance in their observed indicators.

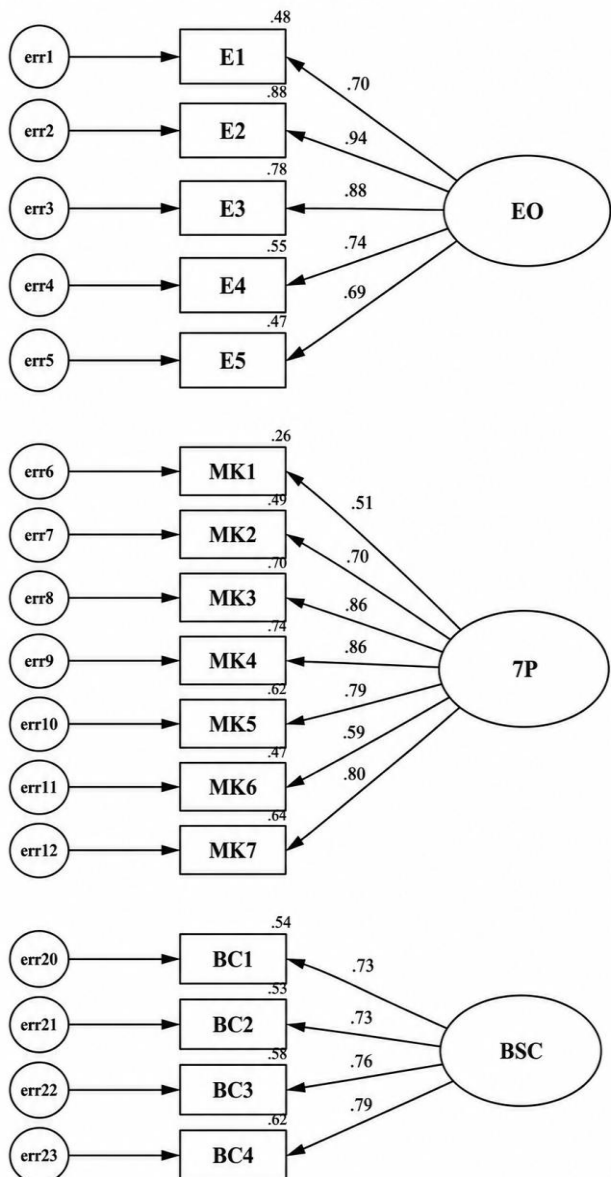


Figure 2. Measurement model analysis using confirmatory factor analysis (Source / The authors)

Table 2. The Constructed model analysis by using SEM and statistical value of each factor ( Source / The authors)

Statistics	Factors		
	EO (Entrepreneurial Orientation)	7P (Marketing Mix)	BSC (Balanced Scorecard)
Chi-sq/DF (Chi-Square to Degrees of Freedom Ratio)	1.60	2.18	2.01
GFI (Goodness-of-Fit Index)	0.99	0.97	0.99

TLI (Tucker-Lewis Index)	0.99	0.97	0.98
RMSEA (Root Mean Square Error of Approximation)	0.05	0.07	0.07
RMR (Root Mean Square Residual)	0.003	0.01	0.006
SRMR (Standardized Root Mean Square Residual)	0.0091	0.0270	0.0183
CFI (Comparative Fit Index)	0.998	0.988	0.994
Interpretation	Passed	Passed	Passed
References	Hair, et al. (2010); Kline (2011); Awang (2012).		

Table 3. Results of Model Fit Indices, for the Structural Equation Model (Source / The authors)

Statistics	SEM
Chi-sq/DF (Chi-Square to Degrees of Freedom Ratio)	2.628
GFI (Goodness-of-Fit Index)	0.901
TLI (Tucker-Lewis Index)	0.931
RMSEA (Root Mean Square Error of Approximation)	0.084
RMR (Root Mean Square Residual)	0.029
SRMR (Standardized Root Mean Square Residual)	0.0091
CFI (Comparative Fit Index)	0.953
CR (Composite Reliability)	0.892
AVE (Average Variance Extracted)	0.569
Discriminant validity	0.754 > r

A review of relevant concepts, theories, and previous studies was used to develop the research framework, as

shown in Figure 1. The structural equation model was then tested by comparing the computed covariance matrix of the proposed model with the sample covariance matrix obtained from questionnaire data collected from 230 respondents. The results indicated that the proposed model was consistent with the empirical data and met the recommended model fit criteria. In addition, the model explained 70% of the variance in Balanced Scorecard performance, indicating a substantial explanatory power. The relevant statistical criteria are presented in Figure 3 and Tables 3 and 4.

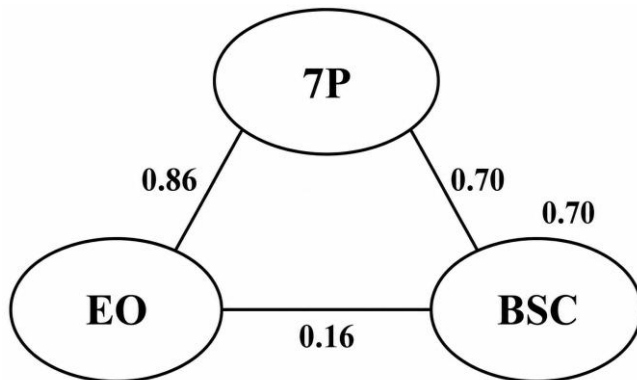


Figure 3. Result of SEM analysis. (Source / The authors)

Table 4. The direct influence of entrepreneurial orientation, marketing mix factors on performance factors according to the Balanced Scorecard. (Source / The authors)

(Direct Effect: DE)	Factor Loadings
EO → BSC	0.16***
EO → 7P	0.86***
7P → BSC	0.70***
R <sup>2</sup>	0.70

\*\*\* p < 0.001.

#### 4.4. Direct Effects of Entrepreneurial Orientation and Marketing Mix Factors on Balanced Scorecard Performance

##### 4.4.1. Direct Effect of Entrepreneurial Orientation on Balanced Scorecard Performance

Entrepreneurial orientation had a statistically significant positive direct effect on Balanced Scorecard performance at the 0.01 significance level, with an influence coefficient of 0.16. Therefore, Hypothesis 1 was supported.

##### 4.4.2. Direct Effect of Entrepreneurial Orientation on the Marketing Mix

Entrepreneurial orientation had a statistically significant positive direct effect on the marketing mix at the 0.01 significance level, with an influence coefficient of 0.86. Therefore, Hypothesis 2 was supported.

##### 4.4.3. Direct Effect of the Marketing Mix on Balanced Scorecard Performance

The marketing mix had a statistically significant positive direct effect on Balanced Scorecard performance at the 0.01 significance level, with an influence coefficient of 0.70. Therefore, Hypothesis 3 was supported.

##### 4.5. Indirect Effect of Entrepreneurial Orientation on Balanced Scorecard Performance through Marketing Mix Factors

Entrepreneurial orientation had an indirect effect on Balanced Scorecard performance through marketing mix factors as a mediating variable. The indirect effect coefficient was 0.60, calculated by multiplying the path coefficient from entrepreneurial orientation to the marketing mix, 0.86, by the path coefficient from the marketing mix to Balanced Scorecard performance, 0.70. Therefore, Hypothesis 4 was supported.

The results of the direct and indirect effect analyses are presented in Figure 3 and Table 5.

Table 5. The indirect influence of entrepreneurial orientation on performance factors of construction businesses according to the Balanced Scorecard, with marketing mix factors as a mediating variable (Source / The authors)

(Indirect Effect: IE)	Factor Loadings
EO → 7P → BSC	(0.86)(0.70) =0.60***

\*\*\* p < 0.001.

## 5. Discussion

The discussion of the results is presented according to the research objectives and hypotheses.

### 5.1. Direct Effects of Entrepreneurial Orientation and Marketing Mix Factors on Balanced Scorecard Performance

#### 5.1.1. Direct Effect of Entrepreneurial Orientation on Balanced Scorecard Performance

The results showed that entrepreneurial orientation had a direct positive effect on Balanced Scorecard performance, with an influence coefficient of 0.16. Therefore, Hypothesis 1 was supported. This finding indicates that construction businesses with stronger entrepreneurial orientation are more likely to achieve better performance across the dimensions of the Balanced Scorecard.

This result is consistent with previous studies showing that entrepreneurial orientation and its sub-dimensions, such as innovation, risk-taking,

proactiveness, autonomy, and competitive aggressiveness, can positively influence organizational performance and Balanced Scorecard-based performance outcomes [17,18,28,38,40,55–57]. In the context of construction businesses, entrepreneurial orientation may help firms respond more effectively to market uncertainty, improve internal processes, introduce innovation, and strengthen competitiveness.

### **5.1.2. Direct Effect of Entrepreneurial Orientation on the Marketing Mix**

The results also revealed that entrepreneurial orientation had a direct positive effect on the marketing mix, with an influence coefficient of 0.86. Therefore, Hypothesis 2 was supported. This relatively strong coefficient suggests that construction business owners with a higher level of entrepreneurial orientation are more likely to develop and apply effective marketing mix strategies.

This finding is consistent with previous research indicating that entrepreneurial orientation contributes to the development of marketing capabilities and supports the effective application of marketing mix factors [5,41–43,58,59]. In practical terms, entrepreneurs who are innovative, proactive, and willing to take calculated risks are more likely to improve their product or service offerings, pricing strategies, distribution channels, promotion, personnel management, service processes, and physical evidence.

### **5.1.3. Direct Effect of Marketing Mix Factors on Balanced Scorecard Performance**

The results further showed that marketing mix factors had a direct positive effect on Balanced Scorecard performance, with an influence coefficient of 0.70. Therefore, Hypothesis 3 was supported. This finding indicates that effective management of marketing mix factors can improve construction business performance in financial, customer, internal process, and learning and growth perspectives.

This result is in line with previous studies showing that marketing mix factors and their sub-components have a positive influence on organizational performance and Balanced Scorecard-based outcomes [6,44–46,60,61]. For construction businesses, the effective use of marketing mix strategies can enhance customer satisfaction, strengthen market positioning, improve service delivery, and support financial performance.

## **5.2. Indirect Effect of Entrepreneurial Orientation on Balanced Scorecard Performance through Marketing Mix Factors**

The results showed that entrepreneurial orientation had an indirect positive effect on the performance of construction businesses in Lower Northeastern Region 1 of Thailand through marketing mix factors. The indirect effect coefficient was 0.60. Therefore, Hypothesis 4 was supported.

This finding suggests that entrepreneurial orientation does not influence Balanced Scorecard performance only through a direct path. Rather, marketing mix factors play an important mediating role in transforming entrepreneurial orientation into measurable business performance. In other words, construction business owners who demonstrate entrepreneurial orientation may achieve better performance when they are able to translate entrepreneurial behavior into effective marketing mix strategies.

This result is consistent with previous studies indicating that entrepreneurial orientation can function as an upstream strategic factor that supports marketing adaptation and business performance through mediating mechanisms [17,47–49]. In the construction business context, this means that innovation, proactiveness, risk-taking, autonomy, and competitive aggressiveness may improve performance more effectively when combined with appropriate marketing strategies, including product or service development, pricing, distribution, promotion, people, process, and physical evidence.

## **6. Conclusion**

First, in terms of entrepreneurial orientation, construction business leaders should possess technological leadership capabilities and be able to adapt technology and innovation to construction operations. This can help improve work quality, enhance operational efficiency, and better respond to customer needs and satisfaction.

Second, in addition to product and service quality, construction businesses should place greater emphasis on other marketing mix factors, including process, pricing, people, distribution channels, physical evidence, and promotion. These factors are important for strengthening customer relationships and improving business competitiveness.

Third, the effective application of entrepreneurial orientation and marketing mix factors contributes to Balanced Scorecard performance in terms of the customer perspective, financial perspective, internal business processes, and learning and growth. These dimensions collectively support the creation of competitive advantage in the construction industry.

Finally, the findings indicate that entrepreneurial orientation alone may not be sufficient to achieve strong business performance. The application of marketing mix knowledge plays an important role in improving the performance of construction businesses. Therefore, construction businesses should develop clear marketing strategies and business plans that better respond to customer needs. Continuous analysis of internal and external factors is also essential for developing appropriate strategies, setting organizational goals, optimizing internal processes, improving efficiency, and achieving better business outcomes.

## 7. Research Limitation

A significant limitation of this study was related to the data collection process. Due to concerns about online fraud and data privacy in Thailand, some construction business owners were hesitant to participate in the survey. As a result, the researchers had to contact potential respondents by telephone in advance to explain the purpose of the study and request their cooperation. Nevertheless, some business owners from the target sample were unwilling to participate, which may have affected the data collection process.

## 8. Future Research

Future research should incorporate qualitative research methods to gain a more comprehensive and in-depth understanding of the phenomena related to this topic. Such methods may include in-depth interviews and focus group discussions with executives, employees, and other stakeholders involved in the construction business. These approaches would allow participants to express their opinions more freely, exchange perspectives, and share practical experiences related to construction business performance.

In addition, future studies should examine innovative factors that influence the sustainable performance of construction businesses in social, economic, and environmental dimensions. This would help extend the practical application of the findings and provide more comprehensive guidelines for improving performance and sustainability in the construction industry [64].

## Authors' Contributions

Mr. Watcharawit Thongnuapad graduated with a master's degree in business administration at Khonkaen University. He is studying in Ph.D. Program in civil engineering and works as an officer of Division of Asset Management at Suranaree University of Technology. Professor Dr. Suksun Horpibulsuk, an expert in civil engineering research and a consultant for educating private and governmental organizations. He has published research papers in national and international journals. Assoc.Prof.Kwunkamol Donkwa has worked at Suranaree University of Technology for more than 30 years, cooperated on this study. The public interest in business management, business innovation, and the aging society is increasing both domestically and internationally. Furthermore, there is expertise in advanced statistics, and research is published in both domestic and international journals. This collaboration has a common interest in the issue of performance according to the balanced scorecard of construction businesses.

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No other funding was received from any external parties for the research to be conducted.

## Institutional Review Board Statement

The Human Research Committee of Humanities and Social Sciences, Suranaree University of Technology, Project Code EC-2022-06, considered this research on the innovation factors of engineers in Thailand's construction industry on February 8, 2022. Since the study involved human respondents, information sheets and informed consent should be clearly stated. Detailed projects were provided to allow the target group autonomy in deciding whether to participate, and the project posed no greater risk than minimal risks in daily life.

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